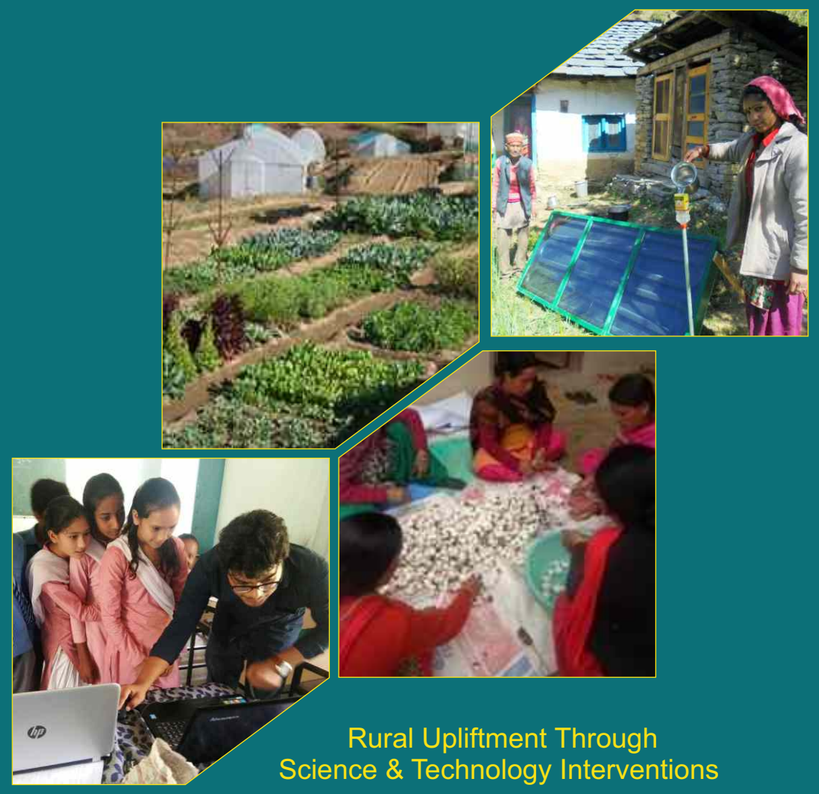


Rural Upliftment Through
Science & Technology Interventions

Himachal Pradesh Council for Science,
Technology & Environment (HIMCOSTE)
34, SDA Complex, Kasumpti, Shimla, Himachal Pradesh,
India. Pin code – 171009
E-mail: hpsciencecongresss2018@gmail.com,
Contact No. +91 177 2621992, 2620998 (Fax)

Indian Institute of Technology Mandi
Kamand Campus, VPO Kamand,
Distt. Mandi, Himachal Pradesh, India
Pin Code - 175005
E-mail: hpscicong2018@gmail.com
Contact No. +91 1905-267001, 267009 (Fax)

Websites:
www.himcoste.hp.gov.in | www.hpbiodiversity.gov.in | www.iitmandi.ac.in

3rd Himachal Pradesh Science Congress

ABSTRACT & SOUVENIR

3rd Himachal Pradesh Science Congress

Theme : Rural Upliftment Through Science & Technology Interventions

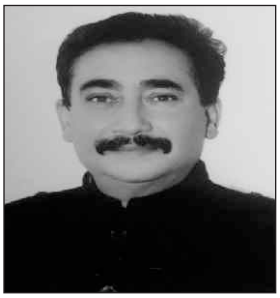
ABSTRACT & SOUVENIR

October 22-23, 2018
Venue: Indian Institute of Technology, Mandi

3rd Himachal Pradesh Science Congress

ABSTRACT & SOUVENIR

Theme : Rural Upliftment Through Science & Technology Interventions



Message
Cabinet Minister

I am glad to know that 3rd Himachal Pradesh Science Congress is being held at at IIT Mandi on Oct 22 - 23, 2018 on the theme “Rural Upliftment Through Science & Technology Interventions''. I am happy to know that a large number of eminent scientists, faculty, research scholars and students from several States would be participating in the Conference and discussing their valuable research outputs, innovations and experience in different thematic areas of the Congress.

More than 64% of the population of India lives in villages. Thus, the development of rural India shall reflect development of the whole country. A rational decision on technologies for sustainable development will only be able to take our villages, and hence India, forward.

This Conference would also give an opportunity to young researchers to make presentation of their innovative ideas and research results. I am confident that this Conference would come up with important technological interventions for rural upliftment of villages in H.P. It is of symbiotic importance for all the Universities and Institutions based in Himachal Pradesh to join hands to develop technologies for upliftment of rural communities of the State.

I hope the scientific presentations, discussions and other activities that are going to be held during the Conference would be of great help and would definitely create new milestones. I hope this Congress would be an ideal platform to launch a coordinated effort by all the major stakeholders on possible applications of Science & Technology for Rural Upliftment in State.
I wish this event a grand success.

Vipin Singh Parmar
Minister of Science & Technology
Govt. of H.P

Message

Patron

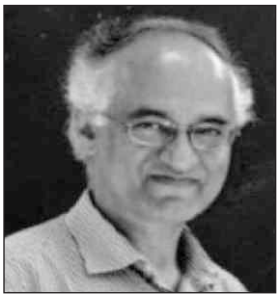
It is indeed a great pleasure and pride for me that the 3rd Himachal Pradesh Science Congress is being held at IIT Mandi on Oct 22-23, 2018 on the theme “Rural Upliftment Through Science & Technology Interventions''.

The spirit of India lives in villages and only by changing the face of rural areas, we can hope for a better future for the State and nation as a whole. HIMCOSTE is engaged in Rural Upliftment in Himachal through its many fold development schemes, working in a participatory manner transferring technology to selected rural areas in the State.

I strongly believe that the knowledge shared and gained by the delegates would go a long way in addressing the problem of rural region of Himachal Pradesh. I am sure that the deliberations in this Congress on various subject areas would disseminate knowledge of this field throughout the scientific community in the country. It is of paramount importance for all the Universities and Institutions based in Himachal Pradesh and other Indian states to join hands to develop technologies for enhancement of livelihood of rural mountain communities. I also trust that the souvenir would prove to be an effective instrument to present the vision of the Congress.

I wish all the delegates the best and believe that the Congress will dwell at length on all the issues related to the themes. I wish this event a huge success.

R.D Dhiman, IAS
Additional Chief Secretary
(Environment, Science & Technology)
Government of Himachal Pradesh
Shimla



Message
Patron

The first Science Congress in India was held in 1914, over 100 years ago. The motivation of its organizers was to facilitate a meeting of practitioners of science so as to inculcate a scientific temper and respect for scientific methods and inquiry. Today we are proud to carry forward this tradition, albeit in an entirely changed context.

I am happy that this year the 3rd Himachal Pradesh Science Congress is being organized jointly by the Himachal Pradesh Council for Science, Technology and Environment (HIMCOSTE) and the Indian Institute of Technology Mandi. By bringing together students, researchers and practitioners from all parts of the State, we hope that this Congress will be a forum for exchange of ideas and for delivery of the fruits of S&T to the rural public.

The theme of this Congress – "Rural Upliftment Through Science & Technology Interventions" – is one that aligns closely with IIT Mandi's Mission:
"To impart education to produce professionals capable of leading efforts towards innovative products and processes for the development of the Himalayan region in particular and our country and humanity in general".

In this Science Congress, we have introduced an Industry Panel Discussion to deliberate on the delivery of S&T to the rural public. In the Pre-Congress Tutorials on 21st October, participants will get in-depth coverage of a variety of emerging topics, delivered by experts from IIT and other institutions.

I expect that this Congress will act as a catalyst for innovations in science and technology, and will initiate a productive conversation among stakeholders from different parts of Himachal Pradesh, and India, who share a common goal and vision for our collective future.

Timothy A. Gonsalves
Director
Indian Institute of Technology Mandi

Message
Convenor

The 3rd Himachal Pradesh Science Congress on the theme “Rural Upliftment Through Science & Technology Interventions" is being organised at Indian institute of Technology (IIT) Mandi on October 22nd-23rd, 2018.The organisation of this challenging scientific event would not have been possible without the relentless efforts of the Organizing Committee members, scientists who travelled from far away distances and participation of faculty members, students and researchers.

The Congress program has been planned to address recent advancements in Science & Technology for the rural upliftment. Keeping this in view, oral and poster presentations by eminent faculties and researchers within and neighbouring States and display of exhibition by R&D institutes, NGOs in the State has been organised. Two panel discussions of Industry and Academia on the theme is being conducted.

Without financial support, such event would not have been possible. We are extremely thankful to the National Biodiversity Authority (NBA), Chennai, Department of Science & Technology, Govt. of India (Science & Engineering Research Board) etc. for their financial support.

This is a great occasion for all of us to interact with the leading scientists from across the country and to evolve collaborative efforts for solving many of the hill specific Rural upliftment issues. The recently launched scheme of 'Vigyan Gram' by Govt. of H.P provides an opportunity for transfer of technology from laboratories in the State to the rural landscape in five selected remote villages.

We hope that all of you would enjoy the academic feast and warm hospitality of Himachal Pradesh with the rich heritage of the region and its culture.

Kunal Satyarthi, IFS
Member Secretary
Himachal Pradesh Council for
Science, Technology & Environment
(HIMCOSTE) Shimla
Himachal Pradesh

Message
Convenor

It gives me immense pleasure to welcome you all at the 3rd HP Science Congress at IIT Mandi. The Congress aims to bring together the researchers working in academia and other professions through research presentations and keynote addresses on the theme 'Rural Upliftment Trhough Science & Technology Interventions'

For the developing countries, advances in connectivity, Computer technology, Artificial Intelligence, biotechnology, GIS, structural transformation, have a tremendous potential to accelerate the growth of both rural and urban sectors. Indeed, it is transforming the livelihood of people and its application in rural areas is promising. The 3rd Himachal Pradesh Science Congress offers a platform to realise, share and validate the current research & development for Rural Upliftment done by researchers & scientists in various areas. This Congress is expected to help realize the future challenges and possible solutions by Science & Technology interventions.

It has been our privilege at IIT Mandi to convene this conference and showcase what is being pursued at the Institute and how such S&T pursuits have a shared goal towards the growth of the country. Our sincere thanks to distinguished guests, speakers, session chair/co-chairs, participants, exhibitors, sponsors, our co-host HIMCOSTE, large number of volunteers and members from IIT Mandi and the media for extending their valuable time in organizing this Congress. In the end I also thank the participants for coming from different parts of the state and I sincerely hope that they go back with an idea about what a real scientific and technological pursuit entails.

Arghya Taraphder
Prof. IITM

Contents

Programme

DAY-1
22nd October, 2018 (Monday)

Inaugural Function
Venue: : Auditorium, North Campus

8:00 - 9:00 hrs	Registration Venue: Registration Desk
9:00 - 10:00 hrs	Video on IIT Mandi, HIMCOSTE and Science in General
10:00 - 10:15 hrs	Arrival & Reception of the Chief Guest Visit of the Chief Guest to Exhibition Corner
10:15 - 10:25 hrs	Lighting of the Lamp & Felicitation of the Guests
10:25 - 10:35 hrs	Welcome Address by Dr. Timothy A. Gonsalves Director, IIT Mandi
10:35 - 10:45 hrs	Special Address by Sh. Kunal Satyarthi, IFS Member Secretary(EC), HIMCOSTE
10:45 - 11:30 hrs 11:30 - 12:00 hrs	1. Prof. Sanghamitra Bandyopadhyay Member, PM-Science Tech & Innovation Advisory Council 2. Speaker to be decided
12:00 - 12:20 hrs 12:20 -12:40 hrs	Address by Guest of Honor Address by Guest of Honor
12:40 - 13:00 hrs	Address by Chief Guest, Sh. Govind Singh Thakur, Hon'ble Minister of Forest, Govt. of Himachal Pradesh
13:00 - 13:15 hrs	Vote of Thanks
13:15 - 13:25 hrs	Group Photograph, Venue: Outside of of Auditorium
13:25 - 14:30 hrs	Lunch, Venue: Sports Hall Complex, North Campus

Scientific/Technical Session for Oral/Poster Presentations

Theme No.	Disciplines (Oral, Posters Numbers)	Time	Venue
Theme 2	Botany, Zoology & Animal Husbandry	14:30 – 17:30 hrs	Pearl Hall
Theme 3	Biochemistry, Microbiology & Biotechnology	14:30 – 17:30 hrs	Plum Hall
Theme 5	Forestry, Climate Change & Environmental Sciences	14:30 – 17:30 hrs	Persimmon Hall
Theme 6	Engineering Sciences, Technology & Innovations	14:30 – 17:30 hrs	Pomegranate Hall

14:00-18:30 hrs	**Poster Session for Themes 1, 4, 6 and 7,** Venue: Sports Hall Complex, North Campus
16:00-16:30 hrs	**Tea/Coffee Break,** Venue: Auditorium Lobby, North Campus
19:00-20:00 hrs	**Cultural Program,** Venue: Auditorium, North Campus
20:00-21:30 hrs	**Conference Dinner,** Venue: Sports Hall Complex, North Campus

DAY-2
23rd October, 2018 (Tuesday)

Inaugural Function
Venue: : Auditorium, North Campus

Theme No.	Disciplines (Oral, Posters Numbers)	Time	Venue
Theme 1	Agricultural & Horticultural Sciences	9:00 – 12:00 hrs	Pear Hall
Theme 4	Chemical Sciences, Earth Sciences & Renewable Energy	9:00 – 12:00 hrs	Plum Hall
Theme 7	Mathematical, Physical Sciences and Nano-Technology	9:00 – 12:00 hrs	Persimmon Hall
Theme 6	Engineering Sciences, Technology & Innovations (continued from previous day)	9:00 – 12:00 hrs	Pomegranate Hall

09:00-13:00 hrs **Poster Session for Themes 2, 3 and 5,** Venue: Sports Hall Complex,North Campus

10:30-11:00 hrs **Tea/Coffee Break,** Venue: : Auditorium Lobby, North Campus

13:00-14:00 hrs **Lunch,** Venue: Sports Hall Complex, North Campus

14:00-15:00 hrs **Panel discussion: Industry Panel;** Venue: Auditorium, North Campus (Panelists: Dr. Srikant Srinivasan, Ms. Sandhya Menon, Mr. Shantanu, Mrs. Indu Puri, Mr. Bharat Mohan and Dr. Rajan Kapur)

15:00-16:00 hrs **Panel discussion: Academia Panel,** Venue: Auditorium, North Campus (Panelists: Dr. S.K Chakrabarti, Dr. Ashu Gulati, Mrs. Indu Puri, Mr. Shubh Karan Singh, Dr. S.S Samant, Dr. H.S Dhaliwal, Dr. A.S Guleria, Dr. K. S. Verma, Sh. Kunal Satyarthi)

16:00-16:30 hrs **Tea/Coffee Break,** Venue: : Auditorium Lobby, North Campus

Valedictory Function & Prize Distribution

Venue: Auditorium, North Campus

16:30 - 16:50 hrs	Arrival and reception of the Chief Guest
16:50 - 17:05 hrs	Felicitation of Guests (Auditorium, North Campus)
17:05 - 17:20 hrs	Address by Prof. Timothy A. Gonsalves Director, IIT Mandi
17:20- 17:35 hrs	Address by Sh. Kunal Satyarthi, IFSMember Secretary(EC),HIMCOSTE
17:35 -17:50 hrs	Address by Sh. Anil Sharma Hon'ble Minister of MPP & Power Minister Govt. of Himachal Pradesh
17:50- 18:10 hrs	Address by Chief Guest Sh. Vipin Singh Parmar, Hon'ble Minister of Science & Technology, Govt. of Himachal Pradesh
18:10 - 18:35 hrs	Prize Distribution by Guests
18:35 – 18:45 hrs	Vote of Thanks
19:30 – 21:00 hrs	Dinner, Venue: Sports Hall Complex, North Campus

Organizing Committees

Registration

Dr. Varun Dutt (IIT Mandi)	
Dr. R. S. Thapa, Principal Scientific Officer (Coordinator), (HIMCOSTE)	
Dr. Pankaj Sharma	
Team 1	Ms. Ritika Kanwar & Mr. Rajneesh Sharma
Team 2	Ms. Vandana Sharma & Ms. Aditi Panatu
Team 3	Ms. Archna Negi & Mr. Dharmender
Team 4	Keynote/Chair/Co-Chair- Mr. Ajay Panwar, Mr. Raj Kumar
Team 5	Press: Mr. Manoj Kaul, Mr. Jitender Sharma & Ms. Jai Priya Verma
Team 6	Press: Sh. Manoj Kaul, Mr. Naresh Thakur, Mr. Jatinder Sharma & Mr. Prem Lal Thakur

Venue Arrangements

Mr. Umesh Pathania, T. O. (Coordinator), (HIMCOSTE) & Dr. Subrata Ghosh (IIT Mandi)	
Mr. Shashi Dhar	Mr. Kesang Wang Chuk
Mr. Ramesh Kumar	Ms. Monika Chauhan
Ms. Kalpana Negi	

Publications

Dr. Aparna Sharma, S.S.O. (Coordinator)	
Dr. M.L. Thakur	Ms. ArchanaNegi
Dr. Pankaj Sharma	Ms.Monika Chauhan
Mr. Ankush Prakash Sharma	

Purchase & Finance

Mr. Rajesh Chand Chauhan (Coordinator), Dr. Bharat Sing Rajpurohit (IIT Mandi)	
Mr. Gopal Jain	Ms. Poonam Dharma
Mr. Rajneesh Sharma	Mr. Dharmender

Transportation & Accommodation

Mr. Umesh Pathania, T.O. (Coordinator) Dr. Rajeev Kumar (IIT Mandi)
Mr. Gopal Jain
Mr. Shashi Dhar
Mr. Ramesh Kumar
Mr. Amit Rana
Mr. Ankush P. Sharma
Mr. Kesung Wang Chuk
Mr. Raj Kumar

Exhibition/Poster Display

Mr. ManojKaul, S.T.A. (Coordinator) Dr. Subrata Ghosh (IIT Mandi)
Mr. Kalit Bhardwaj
Mr. Tejinder Kumar
Mr. Shaman Chauhan

Organizing Committees

Results Preparation & Evaluation

Dr. S.S. Randhawa (Coordinator)
Mr. Shaman Chauhan
Ms. Aditi Panatu

Press & Media

Mr. Manoj Kaul (Coordinator), Dr. Devika Sethi, (IIT Mandi)
Mr. Jitender Sharma
Ms. Jai PriyaVerma

Technical Session Coordinators

Dr. Viswanath Balakrishnan (IIT Mandi)	
Dr. Pankaj Sharma, Ms. Monika Chauhan & (Agricultural & Horticultural Sciences)	Dr. R. S. Thapa & Mr. Rajneesh Sharma (Chemical Sciences, Earth Sciences and Renewable Energy)
Dr. M.L Thakur & Ms. Kalpana Negi (Botany, Zoology, and Animal Husbandry)	Ms. Ritika Kanwarb) & Mr. Ankush Prakash Sharma (Engineering Sciences, IT & Computer Sciences & Innovations)
Dr. Aparna Sharma & Ms.Vandana Sharma (Biochemistry, Microbiology & Biotechnology)	Mr. Ravi Sharma & Mr. Shaman Chauhan (Mathematical, Physical Sciences & Nano-Technology)
Dr. S.S. Randhawa & Ms. Archana Negi (Forestry, Climate Change and Environmental Sciences)	

Certificate Writing

Ms. Archana Negi
Ms.Monika Chauahan
Ms. Aditi Panatu
Ms. Jai PriyaVerma

Food and Cultural Programme

Dr. S. S. Randhawa (Coordinator), Dr. Prosenjit Mondal (IIT Mandi)
Dr. Prosenjit Mondal, IIT Mandi
Mr. Ravi Sharma
Mr. Jitender

Invitation Committee

Mr. Ramesh Pal
Mr. Narender Kaushal
Mr. Pankaj Kumar
Mr. Amit Dogra
Mr. Jai Prakash

Coordination Room

Dr. Aparna Sharma (Coordinator), Prof. Arghya Taraphder
Mr. Amit Rana
Mr. Ajay Panwar
Ms. Archana Negi
Ms. Monika Chauahan
Mr. Brij Bhushan

Office Vehicles

Mr. Durgesh
Mr. Surinder
Mr. Pritam

Assisting Staff

Mr. Roop Ram
Mr. Narayan
Mr. Umesh

Co-ordinators and Reviewers of Technical Sessions

Sr. No.	Discipline	Name of Person
1.	Agriculture and Horticulture Sciences	Dr. Pankaj Sharma, Senior Scientific Professional
2.	Botany, Zoology& Animal Husbandry	Mrs. Shubhra Banerjee, Sr. Scientific Officer, HIMCOSTE Dr. M. L. Thakur, State Project Director, UNEP GEF, HIMCOSTE
3.	Biochemistry, Microbiology & Biotechnology	Dr. Aparna Sharma, Sr. Scientific Officer, HIMCOSTE
4.	Chemical Sciences, Earth Sciences & Renewable Energy	Dr. R. S. Thapa, Pr. Scientific Officer, HIMCOSTE Prof. G.S. Chauhan, Department of Chemistry, HPU
5.	Forestry, Climate Change & Environment Sciences	Dr. S. S. Randhawa, Pr. Scientific Officer, HIMCOSTE
6.	Engineering Sciences, IT & Computer Sciences & Innovations	Mr. Ankush Prakash Sharma, Project Scientist, HIMCOSTE
7.	Mathematical, Physical Sciences & Nano Technology	Mr. Ravi Sharma, Sr. Scientific Assistant, HIMCOSTE

Summary of the Abstracts

Sr. No.	Theme	Oral Presentation	Poster Presentation	Total Abstracts Received
1.	Agricultural and Horticultural Sciences	26	31	57
2.	Botany, Zoology and Animal Husbandry	28	21	50
3.	Biochemistry, Microbiology and Biotechnology	29	28	57
4.	Chemical Science, Earth Sciences And Renewable Energy	21	17	38
5.	Forestry, Climate Change &Environmental Sciences	23	21	44
6.	Engineering Sciences, IT & Computer Science & Innovations	28	30	58
8.	Mathematics,Physical Sciences and Nano- Technology	17	15	32
	GRAND TOTAL	**172**	**164**	**336**

List of Participating Universities/Institutions/Schools

Sr. No.	University/institutions/schools
1.	Abhilashi University ChailChowk, Mandi-175028, (HP) INDIA
2.	ACC Wing, Indian Military Academy, Dehradun- 248007, (Uttarakhanad) INDIA
3.	Agriculture University, Jodhpur-342304, (Rajasthan) INDIA
4.	Akal College of Agriculture, Eternal University, Baru Sahib, Sirmour-173101, (HP) INDIA
5.	Alakh Prakash Goyal Shimla University, Shimla-171009, (HP) INDIA
6.	Arni University, Kangra-176401, (HP) INDIA
7.	Academy of Scientific and Innovative Research, Ghaziabad-201002, (UP) INDIA
8.	AMU Girls High School, Marris Road, Civil Lines, Aligarh-202001, (UP) INDIA
9.	Career Point University, Hamirpur -176041, (HP) INDIA
10.	Center For Converging technologies, University of Rajasthan, Rajsthan, INDIA
11.	Central Institute of Temperate Horticulture, Rangreth, Srinagar, Kashmir-190007, (J&K) INDIA
12.	Central University of Himachal Pradesh, TAB Shahpur, Kangra-176206, (HP) INDIA
13.	Chandigarh University, Gharuan, Mohali-140413, (Punjab) INDIA
14.	Chaudhary Charan Singh University, Meerut-250004, (UP) INDIA
15.	Chitkara University, Atal ShikshaKunj, Pinjore-Nalagarh National Highway (NH-21A), kalujhinda, Baddi, Solan-174103, (HP) INDIA
16.	College of Horticulture and Forestry, Neri, Hamirpur-177001, (HP) INDIA
17.	College of Veterinary Sciences and Animal Husbandry Selesih, Central Agricultural University, Aizawl-796015, (Mizoram) INDIA
18.	CORD Training Centre, Sidhbari, Kangra-176057, (HP) INDIA
19.	CSIR-Institute of Himalayan Bioresource Technology, Palampur, Kangra-176061, (HP) INDIA
20.	CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur, Kangra -176062, (HP) INDIA
21.	DAV University, Jalandhar-144012, (Punjab) INDIA
22.	Defence Terrain Research Laboratory, Defence Research and Development Organization, New Delhi-110054, (Delhi) INDIA
23.	Defense Institute of High Altitude Research Defense Research and Development Organization Leh, Ladakh-194101, (HP) INDIA
24.	Department of Biotechnology, Chandigarh Group of Colleges, Landran, Mohali-140307, (Punjab) INDIA
	Department of Biotechnology, State Forensic Science Laboratory Junga, Shimla-171218, (HP) INDIA
26.	Department of Biotechnology, University Institute of Engineering and Technology, Panjab University, Chandigarh-160014, INDIA
27.	Department of Genetics, University of Delhi, South Campus, Benito Juarez Marg, New Delhi-110021, (UP) INDIA
28.	Department of Physics, Punjabi University Patiala-147002, India Punjabi University college, Benra- Dhuri
29.	Department of Radiotherapy and Oncology (Regional Cancer Center), Indira Gandhi Medical College, Shimla-171001, (HP) INDIA
30.	Dr. B.R. Ambedkar National Institute of Technology, Jalandhar-144011, (Punjab) INDIA
31.	Dr. Y S Parmar University of Horticulture and Forestry Nauni, Solan- 173230 (HP) INDIA
32.	Forest Research Institute, Dehradun-248003, (Uttarakhand) INDIA
33	G.B. Pant National Institute of Himalayan Environment and Sustainable Development, Himachal Regional Centre, Mohal- Kullu-175101, (HP) INDIA
34.	Gautam Buddha University, Near PariChowk, Greater Noida-201308, (UP) INDIA

List of Participating Universities/Institutions/Schools

35.	Government Polytechnic Kangra-176001, (HP) INDIA
36.	Govt. Degree College Drang at Narala, Mandi-175012, (HP) INDIA
37.	Govt. Degree College Kullu, Dhalpur-175101, (HP) INDIA
38.	Govt. Degree College Mandi, Mandi-175001, (HP) INDIA
39.	Govt. Dungar College, Bikaner-334003, (Rajasthan) INDIA
40.	Govt. Inter College, Sallogi, Paudi Garhwal-246173, (Uttarakhand) INDIA
41.	Govt. Post Graduate College, Nahan, Sirmour-173001, (HP) INDIA
42.	Guru Jambheshwar University of Science and Technology, Hisar-125001, (Haryana) INDIA
43	Guru Nanak Dev Polytechnic College, Ludhiana-141006, (Punjab) INDIA
44.	Hemvati Nandan Bahuguna Garhwal University, Srinagar-246174, (Uttarakhand) INDIA
45.	Himachal Pradesh Council for Science, Technology & Environment (HIMCOSTE), Shimla-171001, (HP) INDIA
46.	Himachal Pradesh State Pollution Control Board, Shimla-171009, (HP) INDIA
47.	Himachal Pradesh Technical University, Hamirpur-177001, (HP)INDIA
48.	Himachal Pradesh University, Summerhill, Shimla-171005, (HP) INDIA
49.	Himalayan Forest Research Institute, Conifer campus,Panthaghati, Shimla 171013, (HP) INDIA
50.	Himalayan Research Group (HRG), Core Group, Department of Science and Technology (Govt. of India) UmeshBhavan, Chotta Shimla, Shimla-171002, (HP) INDIA
51.	I. K. Gujral Punjab Technical University, Kapurthala-144603, (Punjab) INDIA
52.	ICAR-Indian Agricultural Research Institute, Regional Station Katrain, Kullu Valley, Kullu-175129, (HP) INDIA
53.	ICAR -Central Institute of Research on Buffaloes, Sirsa Road, Hisar-125001, (Haryana) INDIA
54.	ICAR-Central Potato Research Institute, Shimla 171001, (HP) INDIA
55.	ICAR-Indian Agricultural Research Institute, New Delhi-110012, (Delhi) INDIA
56.	ICAR-Indian Agricultural Research Institute, Regional Station (C&HC), Amartara Cottage, Shimla-171004, (HP) INDIA
57.	ICAR-Indian Veterinary Research Institute, Regional Station, Palampur, Kangra-176061, (HP) INDIA
58.	ICAR-National Bureau of Agriculturally Important Microorganisms, Kusmaur, Mau-275103, (UP) INDIA
59.	ICFAI University Dehradun, Rajawala Road, Selaqui, Dehradun-248011, (Uttarakhand) INDIA
60.	Indian Institute of Science Education and Research, Knowledge City, SAS Nagar–140306, (Punjab) INDIA
61.	Indian Institute of Technology Mandi, Kamand Campus, Mandi-175005, (HP) INDIA
62.	Indian Institute of Technology, Kanpur-208016, (UP) INDIA
63.	Indian Institute of Technology, Ropar-140001, (Punjab) INDIA
64.	Institute of Forest Genetics and tree breeding, Coimbatore-641002, (Tamil Nadu) INDIA
65.	Jaypee University of Information Technology,Waknaghat,Solan-173234, (HP) INDIA
66.	KrishiVigyan Kendra Chamba at Saru, Chamba -176 314, (HP) INDIA
67.	KrishiVigyan Kendra, Mandi at Sundernagar, Mandi-175019, (HP) INDIA
68.	Kumaun University, The Hermitage, Mallital, Ayarpatta, Nainital-263001, (Uttarakhand) INDIA

List of Participating Universities/Institutions/Schools

69.	Laboratory of Organic Electronics, ITN, Linkoping University, Norrkoping, SE-60174, Sweden
70.	Livestock Products Technology Section, 3Division of Animal Nutrition, 1ICAR-Central Sheep and Wool Research Institute, Avikanagar-304501, (Rajasthan) INDIA
71.	Lovely Professional University, Phagwara -144411, (Punjab) INDIA
72.	Maharishi Markandeshwar (Deemed to be University), Ambala- Mullana-133207, (Haryana) INDIA
73.	MaharshiDayanand University, Rohtak-124001, (Haryana) INDIA
74.	Mahatma Gandhi Mission's College of Engineering and Technology Navi Mumbai-410209, (Maharashtra) INDIA
75.	National Centre for Cell Science, Pune University of Pune Campus, University Road, Ganeshkhind, Pune-411007, (Maharashtra) INDIA
76.	National Institute of Technology Hamirpur-177005, (HP) INDIA
77.	North and North East, International Competence Centre for Organic Agriculture (ICCOA),Bangalore, (Karnataka) INDIA
78.	Panjab University, Chandigarh-160014, INDIA
79.	Punjab Agriculture University, Ludhiana-141004, (Punjab) INDIA
80.	Punjab Engineering College, Chandigarh-160012, INDIA
81.	Punjabi University college, Benra- Dhuri, Sangrur-148024, (Punjab) INDIA
82.	Punjabi University, Patiala-147002, (Punjab) INDIA
83.	Rajiv Gandhi Chair, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar Campus, Srinagar-190025, (J&K) INDIA
84.	Regional Forensic Science Laboratory, Central Range, Mandi-175002
85.	Regional Horticultural Research Station, Jachh, Nurpur, Kangra-176201, (HP) INDIA
86.	Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad-211007, (UP) INDIA
87.	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow-226014, (UP) INDIA
88.	Shaheed Bhagat Singh State Technical Campus, Firozpur-152004, (Punjab) INDIA
89.	Shoolini University, Solan-173229 (HP) INDIA
90.	Sri Guru Granth Sahib World University, Fatehgarh Sahib-140407, (Punjab) INDIA
91.	Sri Sai University, Palampur, Kangra-176081, (HP) INDIA
92.	St. Bede's College, Shimla-171002, (HP) INDIA
93.	State Council for Science, Technology & Environment Shilong-793003, (Megahlaya) INDIA
94.	Thapar Institute of Engineering and Technology, Patiala-147004, (Punjab) INDIA
95.	University of Minnesota-Twin Cities St. Paul, Minnesota-55455, USA
96.	Veer Bahadur Singh Purvanchal University, Ghazipur-222001, (UP) INDIA
97.	Vellore Institute of Technology, Vellore-632014, (Tamilnadu) INDIA
98.	Viral Vaccine Laboratory, National Institute of Biologicals (NIB), Noida-201309, (UP) INDIA
99.	YMCA University of Science and Technology, Faridabad-121006, (Haryana) INDIA
	Total

Author(s) wise List of Participating Universities /Institutions /Schools

33.	Guru Nanak Dev Polytechnic College, Ludhiana-141006, (Punjab) INDIA	1
34.	Himachal Pradesh Technical University, Hamirpur-177001, (HP)INDIA	1
35.	Himalayan Forest Research Institute, Conifer campus,Panthaghati, Shimla 171013, (HP) INDIA	1
36.	Himalayan Research Group (HRG), Core Group, Department of Science and Technology (Govt. of India) UmeshBhavan, Chotta Shimla, Shimla-171002, (HP) INDIA	1
37.	ICAR-Indian Agricultural Research Institute, New Delhi-110012, (Delhi) INDIA	1
38.	ICAR-Indian Agricultural Research Institute, Regional Station (C&HC), Amartara Cottage, Shimla-171004, (HP) INDIA	1
39.	ICFAI University Dehradun, Rajawala Road, Selaqui, Dehradun-248011, (Uttarakhand) INDIA	1
40.	Indian Institute of Technology, Ropar-140001, (Punjab) INDIA	1
41.	Lovely Professional University, Phagwara - 144411, (Punjab) INDIA	1
42.	Maharishi Markandeshwar (Deemed to be University), Ambala- Mullana-133207, (Haryana) INDIA	1
43.	Mahatma Gandhi Mission's College of Engineering and Technology Navi Mumbai-410209, (Maharashtra) INDIA	1
44.	Punjab Agriculture University, Ludhiana-141004, (Punjab) INDIA	1
45.	Sri Sai University, Palampur, Kangra-176081, (HP) INDIA	1
46.	State Council for Science, Technology & Environment Shillong-793003, (Megahlaya) INDIA	1
47.	St. Bede's College, Shimla-171002, (HP) INDIA	1
48.	Vellore Institute of Technology, Vellore-632014, (Tamilnadu) INDIA	1
49.	Rajiv Gandhi Chair, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar Campus, Srinagar-190025, (J&K) INDIA	1
50.	Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad-211007, (UP) INDIA	1
51.	KrishiVigyan Kendra Chamba at Saru, Chamba -176 314, (HP) INDIA	1
52.	Krishi Vigyan Kendra, Mandi at Sundernagar, Mandi-175019, (HP) INDIA	1
53.	National Centre for Cell Science, Pune University of Pune Campus, University Road, Ganeshkhind, Pune-411007, (Maharashtra) INDIA	1
54.	ICAR-Central Potato Research Institute, Shimla 171001, (HP) INDIA	1
55.	1ICAR-Central Institute of Research on Buffaloes, Sirsa Road, Hisar-125001, (Haryana) INDIA	1
56.	AMU Girls High School, Marris Road, Civil Lines, Aligarh-202001, (UP) INDIA	1
57.	Laboratory of Organic Electronics, ITN, Linkoping University, Norrkoping, SE-60174, Sweden	1
58.	CORD Training Centre, Sidhbari, Kangra-176057, (HP) INDIA	1
59.	Indian Institute of Science Education and Research, Knowledge City, SAS Nagar–140306, (Punjab) INDIA	1
60.	Govt. Inter College, Sallogi, Paudi Garhwal-246173, (Uttarakhand) INDIA	1
61.	Government Polytechnic Kangra-176001, (HP) INDIA	1
62.	Regional Horticultural Research Station, Jachh, Nurpur, Kangra-176201, (HP) INDIA	1
63.	ACC Wing, Indian Military Academy, Dehradun-248007, (Uttarakhanad) INDIA	1
	Total	**337**

Author(s) wise List of Participating Universities /Institutions /Schools

Sr. No.	University/institutions/schools	No. of Abstract in 2018
1.	Jaypee University of Information Technology,Waknaghat,Solan-173234, (HP) INDIA	68
2.	Dr. Y S Parmar University of Horticulture and Forestry Nauni, Solan- 173230 (HP) INDIA	27
3.	Shoolini University, Solan-173229 (HP) INDIA	24
4.	Akal College of Agriculture, Eternal University, Baru Sahib, Sirmour-173101, (HP) INDIA	24
5.	Himachal Pradesh University, Summerhill, Shimla-171005, (HP) INDIA	22
6.	CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur, Kangra -176062, (HP) INDIA	18
7.	Chitkara University, Atal ShikshaKunj, Pinjore-Nalagarh National Highway (NH-21A), kalujhinda, Baddi, Solan-174103, (HP) INDIA	15
8.	G.B. Pant National Institute of Himalayan Environment and Sustainable Development, Himachal Regional Centre, Mohal- Kullu-175101, (HP) INDIA	14
9.	Career Point University, Hamirpur-176041, (HP) INDIA	11
10.	CSIR-Institute of Himalayan Bioresource Technology, Palampur, Kangra- 176061, (HP) INDIA	10
11.	Himachal Pradesh Council for Science, Technology & Environment (HIMCOSTE), Shimla-171001, (HP) INDIA	9
12.	Indian Institute of Technology Mandi, Kamand Campus, Mandi-175005, (HP) INDIA	8
13.	Alakh Prakash Goyal Shimla University, Shimla-171009, (HP) INDIA	8
14.	Punjabi University, Patiala-147002, (Punjab) INDIA	5
15.	ICAR-Indian Veterinary Research Institute, Regional Station, Palampur, Kangra-176061, (HP) INDIA	5
16.	National Institute of Technology Hamirpur-177005, (HP) INDIA	4
17.	Arni University, Kangra-176401, (HP) INDIA Delhi-110054, (Delhi) INDIA	4
18.	YMCA University of Science and Technology, Faridabad-121006, (Haryana) INDIA	4
19.	Regional Forensic Science Laboratory, Central Range, Mandi-175002	4
20.	Abhilashi University ChailChowk, Mandi-175028, (HP) INDIA	3
21.	Central University of Himachal Pradesh, TAB Shahpur, Kangra-176206, (HP) INDIA	3
22.	Panjab University, Chandigarh-160014, INDIA	3
23.	Shaheed Bhagat Singh State Technical Campus, Firozpur-152004, (Punjab) INDIA	2
24.	Defense Institute of High Altitude Research Defense Research and Development Organization Leh, Ladakh-194101, (HP) INDIA	2
25.	Punjab Engineering College, Chandigarh-160012, INDIA	2
26.	Chandigarh University, Gharuan, Mohali-140413, (Punjab) INDIA	1
27.	College of Horticulture and Forestry, Neri, Hamirpur-177001, (HP) INDIA	1
28.	DAV University, Jalandhar-144012, (Punjab) INDIA	1
29.	Dr. B.R. Ambedkar National Institute of Technology, Jalandhar-144011, (Punjab) INDIA	1
30.	Gautam Buddha University, Near PariChowk, Greater Noida-201308, (UP) INDIA	1
31.	Govt. Degree College Kullu, Dhalpur-175101, (HP) INDIA	1
32.	Govt. Post Graduate College, Nahan, Sirmour-173001, (HP) INDIA	1

Keynote Speakers / Chairs / Co-Chairs

DAY-1
22nd October, 2018 (Monday)

Inaugural Function
Venue: Auditorium, North Campus

8:00 - 9:00 hrs	Registration Venue: Registration Desk
9:00 - 10:00 hrs	Video on IIT Mandi, HIMCOSTE and Science in General
10:00 - 10:15 hrs	Arrival & Reception of the Chief Guest Visit of the Chief Guest to Exhibition Corner
10:15 - 10:25 hrs	Lighting of the Lamp & Felicitation of the Guests
10:25 - 10:35 hrs	Welcome Address by Sh. Kunal Satyarthi, IFS Member Secretary(EC),HIMCOSTE
10:35 - 10:45 hrs	Special Address by Dr. Timothy A. Gonsalves Director, IIT Mandi
10:45 - 11:30 hrs 11:30 - 12:00 hrs	1. Prof. Sanghamitra Bandyopadhyay Member, PM-Science Tech & Innovation Advisory Council 2. Speaker to be decided
12:00 - 12:20 hrs 12:20 -12:40 hrs	Address by Guest of Honor Address by Guest of Honor
12:40 - 13:00 hrs	Address by Chief Guest, Sh. Govind Singh Thakur, Hon'ble Minister of Forest, Govt. of Himachal Pradesh
13:00 - 13:15 hrs	Vote of Thanks
13:15 - 13:25 hrs	Group Photograph, Venue: Outside of of Auditorium
13:25 - 14:30 hrs	Lunch, Venue: Sports Hall Complex, North Campus

Technical Sessions

DAY-1
October 22, 2018 (Monday)

Technical Sessions	Technical Session I (Pearl Hall) (14:30 – 17:30)	Technical Session II (Plum Hall) (14:30 – 17:30)	Technical Session III (Persimmon HALL) (14:30 – 17:30)	Technical Session IV (pomegranate Hall) (14:30 – 17:30)
	Botany, Zoology & Animal Husbandry	**Biochemistry, Microbiology & Biotechnology**	**Forestry, Climate Change & Environmental Sciences**	**Engineering Sciences, IT& Computer Sciences & Innovations**
Session Chair & Lead Talk	**Dr. Ashu Gulati** Chief Scientist CSIR-IHBT, Institute of Himalayan Bioresource Technology (IHBT- CSIR) Palampur, H.P.	**Dr. Hari Nath Kasiganesan** Founder Director Akash Institute of Agricultural Medicine (A2M), Chennai, Tamilnadu	**Dr. K. R. Dhiman** Retd. Vice Chancellor Y.S. ParmarUniversity of Horticulture & Forestry Nauni, Solan	**Prof. Ujjwal Maulik** Professor Department of Computer, Jadavpur University
Session Co-Chair-1	**Dr. Sushma Sharma** Professor -cum- Chairman Himachal Pradesh University, Shimla	**Dr. T. N. Lakhanpal,** Ex Director Institute of Integrated Himalayan Studies (IIHS), Shima	**Dr. S. K. Bhardwaj** Head Department of Environmental Sciences Y.S. Parmar University of Horticulture & Forestry Nauni, Solan	**Dr. Rahul Vaish** Associate Professor School of Engineering, IIT Mandi
Session Co-Chair-2	**Dr Shyam Kumar Masakpalli** Assistant Professor School of Basic Sciences IIT Mandi	**Dr. Amit Prasad** Assistant Professor School of Basic Sciences, IIT Mandi	**Dr. Sumit Sinha Ray** Assistant Professor School of Engineering, IIT Mandi	**Dr. Sumit Sinha Ray** Assistant Professor School of Engineering, IIT Mandi
Session Coordinator	**Dr. M. L. Thakur** HIMCOSTE	**Dr. Aparna Sharma** HIMCOSTE	**Dr. S. S. Randhawa** HIMCOSTE	**Ms. Ritika Kanwar** HIMCOSTE
14:30 hrs-14:40 hrs	Lead Talk by Chair	Lead Talk by Chair	Lead Talk by Chair	Lead Talk by Chair
14:40 hrs-16:00 hrs	Oral presentations	Oral presentations	Oral presentations	Oral presentations
16:00 hrs-16:30 hrs	**Tea/Coffee at Foyer**			
16:30 hrs-17:00 hrs	Oral Presentation	Oral Presentation	Oral Presentation	Oral Presentation

14:00 – 18:30 hrs	**Poster Session for Themes 1, 4, 6 and 7,** Venue: Sports Hall Complex, North Campus
19:00 – 20:00 hrs	**Cultural Programme,** Venue: Auditorium, North Campus
20:00 – 21:30 hrs	**Conference Dinner,** Venue: Sports Hall Complex, North Campus

DAY-2
October 23,2018(Tuesday)

Technical Sessions	Technical Session V (Pearl Hall) (14:30 – 17:30)	Technical Session VI (Plum Hall) (9:00 – 12:00)	Technical Session VII (Persimmon Hall) (9:00 – 12:00)	Technical Session VIII (Pomegranate Hall) (9:00 – 12:00)
	Agricultural & Horticultural Sciences	**Chemical Sciences, Earth Sciences & Renewable Energy**	**Mathematical, Physical Sciences & Nano-Technology**	**Engineering Sciences, IT& Computer Sciences & Innovations**
Session Chair & Lead Talk	**Dr. S. K Chakrabarti** Director Central Potato Research Institute –ICAR,Shimla (Indian Council of Agricultural Research)	**Prof. Amalendu Pal** Emeritus Scientist(CSIR) Department of Chemistry Kurukshetra University	**Prof. Ramesh Oruganti** School of Computing and Electrical Eng. IIT Mandi	**Prof. Ujjwal Maulik** Department of Computer Jadavpur University
Session Co-Chair-I	**Dr. Y.C Gupta** Prof & Head Deptt of Floriculture and Landscape Architecture, Y. S. Parmar University of Horticulture & Forestry Nauni, Solan	**Dr. Anuj Sharma** Associate Professor Department of Chemistry IIT Roorkee	**Dr. Subrahmanian Moosath** HOD Mathematics Indian Institute of Space Technology, Bengaluru	**Dr. Rahul Vaish** Associate Professor, School of Engineering, IIT Mandi.
Session Co-Chair-II	**Sh. B. D. Sharma** Retd Head National Bureau of Plant Genetic Resources, Shimla	**Dr. Subrata Ghosh** Associate Professor Chairperson, School of Basic Sciences, IIT Mandi	**Dr. Syed Abbas** Associate Professor, Chairperson, School of Basic Sciences IIT Mandi	**Dr. Shubhajit Roy Chowdhury** Assistant Professor, School of Computing and Electrical Engineering, IIT Mandi
Session Coordinator	**Dr. Pankaj Sharma** HIMCOSTE	**Dr. R. S. Thapa** HIMCOSTE	**Mr. Ravi Sharma** HIMCOSTE	**Ms. Ritika Kanwar** HIMCOSTE
09:00 hrs-09:20 hrs	Lead Talk by Chair	Lead Talk by Chair	Lead Talk by Chair	Lead Talk by Chair
9:20 hrs-10:30 hrs	Oral presentations	Oral presentations	Oral presentations	Oral presentations
10:30 hrs-11:00 hrs	**Tea/Coffee at Foyer**			
11:00 hrs-13:00 hrs	Oral presentations	Oral presentations	Oral presentations	Oral presentations

09:00 – 13:00 hrs **Poster Session for Themes 2, 3 and 5,** Venue: Sports Hall Complex, North Campus

13:00 – 14:00 hrs **Lunch,** Venue: Sports Hall Complex, North Campus

14:00 – 15:00 hrs **Panel discussion: Industry Panel,** Venue: Auditorium, North Campus
(Panelists: Dr. Srikant Srinivasan, Ms. Sandhya Menon, Mr. Shantanu, Mrs. InduPuri, Mr. Bharat Mohan and Dr. RajanKapur)

15:00 – 16:00 hrs **Panel discussion: Academia Panel,** Venue: Auditorium, North Campus
(Panelists: Dr. S. K. Chakrabarti, Dr. Ashu Gulati, Dr. Indu Puri, Mr. Shubh Karan Singh, Dr. S. S Samant, Dr. H. S Dhaliwal, Dr. A. S. Guleria, Dr. K. S. Verma and Sh. Kunal Satyarthi)

16:00 – 16:30 hrs **Tea/Coffee Break,** Venue: Auditorium Lobby, North Campus

Valedictory Function & Prize Distribution

Venue: Auditorium, North Campus

16:30 - 16:50 hrs	Arrival and reception of the Chief Guest
16:50 - 17:05 hrs	Felicitation of Guests (Auditorium, North Campus)
17:05 - 17:20 hrs	Address by Prof. Timothy A. Gonsalves Director, IIT Mandi
17:20- 17:35 hrs	Address by Sh. Kunal Satyarthi, IFSMember Secretary(EC),HIMCOSTE
17:35 -17:50 hrs	Address by Sh. Anil Sharma Hon'ble Minister of MPP & Power Minister Govt. of Himachal Pradesh
17:50- 18:10 hrs	Address by Chief Guest Sh. Vipin Singh Parmar, Hon'ble Minister of Science & Technology, Govt. of Himachal Pradesh
18:10 - 18:35 hrs	Prize Distribution by Guests
18:35 – 18:45 hrs	Vote of Thanks
19:30 – 21:00 hrs	Dinner, Venue: Sports Hall Complex, North Campus

Sr. No	Authors	Affiliation	Title of the paper	Page	Abstract Selection (Oral/Poster)
1	Ajender, B.S. Thakur, Kishore Kumar Thakur and Niranjan Singh	Department of Fruit Science, Dr. Y S Parmar University of Horticulture and Forestry Nauni, Solan-173230, (HP) INDIA	EFFECT OF BORON ON GROWTH, FRUIT QUALITY AND PRODUCTION OF APPLE	1	Oral
2	Phuntsog Dolkar, Subham Gupta, Yashavi Sood, Tsering Stobdan and Anil Kant	Defense Institute of High Altitude Research Defense Research and Development Organization, Leh Ladakh -194101, (J&K) INDIA	SEXUAL DIFFERENCES AND SEASONAL VARIATION IN TOTAL PHENOLICS AND ANTIOXIDANT CAPACITIES IN HIPPOPHAE RHAMNOIDES LEAVES	1	Oral
3	Ashok Kumar, Bhavya Bhargava, Sanatsujat Singh, Sandeep Kumar and Sultan Singh	Floriculture Division, Department of Agro-technology of Medicinal Aromatic and Commercially Important Plants, CSIR-Institute of Himalayan Bioresource Technology, Palampur, Kangra-176061, (HP) INDIA	NOVEL CULTIVARS OF CALLA LILY- A HIGH VALUE FLORICULTURE CROP FOR SUSTAINABLE RURAL UPLIFTMENT	2	Oral
4	Rajesh Kumar	Department of Life Science, School of Basic Sciences Arni University, Kangra-176401, (HP) INDIA	STRATEGIES IN HONEYBEE MANAGEMENT FOR SUSTAINABLE BEEKEEPING IN HIMACHAL PRADESH	2	Oral
5	Renu Lata	G.B. Pant National Institute of Himalayan Environment and Sustainable Development, Himachal Regional Centre, Mohal- Kullu, Kullu-175126, (HP), INDIA	EFFECT OF CLIMATE CHANGE ON APPLE CULTIVATION IN NORTHWESTERN INDIAN HIMALAYAN REGION: A REVIEW	3	Oral
6	Geetika and Mushtaq Ahmed	Department of Environmental Sciences, School of Earth and Environmental Sciences, Central University of Himachal Pradesh, TAB Shahpur, Kangra - 176206, (HP) INDIA	EFFECT OF TRICHODERMA ON THE YIELD OF ALLIUM UNDER BIOTIC STRESS	3	Oral
7	Akansha Suyal and Nitika Thakur	Department of Biotechnology, Shoolini University of Biotechnology and Management Sciences, Bajol, Solan-173229, (HP) INDIA	TECHNOLOGICAL SOLUTIONS: COMBINING POTENTIALS OF INDIGENOUS HERBS OF DISTRICT SOLAN (HP) FOR DEVELOPMENT OF A BIOPESTICIDE FORMULATION- A BOOST FOR RURAL FARMERS	4	Oral
8	Priyanka Sharma, Mohinder Singh, S. K. Bhardwaj, R. K. Bhardwaj and Y. R. Shukla	Department of Environmental Science, Department of Entomology, Department of Vegetable Science, Dr. Y. S. Parmar, University of Horticulture and Forestry, Nauni, Solan-173230, (HP) INDIA	EFFECT OF WEATHER PARAMETERS ON SEED PRODUCTION OF CAULIFLOWER (BRASSICA OLERACEA VAR BOTRYTIS L.) IN MID HILLS OF HIMACHAL PRADESH	4	Oral
9	Piyush, Pratyush Verma, Rajkumar Jarial, Sushree Suhasmita Jian	National Institute of Technology Hamirpur - 177005,(HP)INDIA Vellore Institute of Technology, Vellore-632014, (Tamil Nadu) INDIA	AUTOMATED SENSORY BASED FARM CONDITION ASSESSMENT SYSTEM	5	Oral
10	N. D. Negi and S. K. Upadhyay	Department of Horticulture and Agroforestry, CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur, Kangra -176062, (HP) INDIA	BIOFORTIFICATION OF WHEAT FOR HIGH GRAIN MICRONUTRIENTS TO ALLEVIATE HIDDEN HUNGER	5	Oral
11	Saurabh Singh, S. S. Dey, Raj Kumar and Reeta Bhatia	Division of Vegetable Science, Division of Floriculture and Landscaping, ICAR- Indian Agricultural Research Institute, 110012, (New Delhi)INDIA	HYBRID BREEDING OF CAULIFLOWER FOR ENHANCING ANTIOXIDANT CAPACITY AND YIELD POTENTIAL EXPLOITING OGURA CMS AND DOUBLED HAPLOID LINES UNDER TEMPERATE CONDITIONS OF NORTH-WESTERN HIMALAYAS	6	Oral

Sr. No	Authors	Affiliation	Title of the paper	Page	Abstract Selection (Oral/Poster)
12	Parveen Chauhan, Abhishek Bhardwaj, Ankur Kaushal and Saurabh Kulshrestha	Faculty of Applied Sciences and Biotechnology, Shoolini University, Solan-173229, (HP) INDIA	CHARACTERIZATION AND DEVELOPMENT OF A DNA BASED AMPEROMETRIC BIOSENSOR FOR THE DETECTION OF PEPPER LEAF CURL VIRUS (PEPLCV)	6	Oral
13	Prashant Sahni, Arashdeep Singh, Savita Sharma and Baljit Singh	Department of Food Science and Technology, Punjab Agricultural University, Ludhiana - 141004, (Punjab) INDIA	EVALUATION AND QUALITY ASSESSMENT OF SPIRULINA ENRICHED FUNCTIONAL PASTA	7	Oral
14	Santosh Watpade, Pooja Bhardwaj, Rakesh Kumar, Baswaraj Raigond , K. K. Pramanick, Anil Handa, A. K. Shukla, Jitender Kumar and Tarvinder Kochhar	Indian Agriculture Research Institute, Regional Station, Shimla- 171004, (HP) INDIA Central Potato Research Institute CPRI Road, Bemloe, Near HP High Court, Shimla- 171001, (HP) INDIA	SEROLOGICAL AND MOLECULAR INDEXING OF MOTHER PLANTS OF APPLE FOR APPLE STEM PITTING VIRUS INFECTION IN KINNAUR DISTRICT	7	Oral
15	Amarpreet Kaur	Akal College of Engineering & Technology, Eternal University, Baru Sahib, Sirmour-173101, (HP) INDIA	PROBLEMS IN INDIAN AGRICULTURE & IMMERGENCE OF NEW TECHNOLOGY TO OVERCOME THEM	8	Oral
16	Pardeep Kumar, Sunandini Kachru and Parveen Sharma	Department of vegetable Science and Floriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya Palampur, Kangra-176062, (HP) INDIA	PROPAGATION THROUGH STEM CUTTINGS IN TOMATO: A NEW INNOVATIVE TECHNIQUE TO DOUBLE FARMERS' INCOME	8	Oral
17	S. Lata and Naresh Thakur	Departmet of Crop Improvement, CSK Himachal Pradesh Krishi Vishvavidyalaya Palampur, Kangra -176062, (HP) INDIA	QUALITY PROTEIN MAIZE FOR FOOD AND NUTRITIONAL SECURITY	9	Oral
18	Anjna, Pradeep Kumar Singh and Meenakshi Sood	Department of Electronics and Communication Engineering, Jaypee University of Information Technology, Solan -173234, (HP)INDIA	IDENTIFICATION AND DETECTION OF VARIOUS DISEASES IN COMMERCIAL CROPS	9	Oral
19	Rajender Thapa and Surinder Singh Deol	Himachal Pradesh Council for Science, Technology & Environment, 34-SDA Complex, Kasumpti, Shimla -171009, (HP) INDIA	APPLICATION OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM IN FORECASTING AGRICULTURAL OUTPUT USING SPACE AGRO- METEOROLOGY AND LAND BASED OBSERVATIONS	10	Oral
20	Shivi Sharma and Hemraj Saini	Department of Computer Science and Engineering, Jaypee University of Information Technology, Waknaghat, Solan-173234, (HP) INDIA	BIG DATA ANALYTIC FOR CROP PREDICTION IN INDIAN SCENARIO USING FAO HEURISTIC	10	Oral
21	M.H. Wani, Arshad Bhat, Iqra Qureshi and Abid Qadir	Rajiv Gandhi Chair, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar Campus, Srinagar-190025, (J&K) INDIA	PRODUCTION SYSTEM MODULE AS SCIENTIFIC INTERVENTION FOR RURAL UPLIFTMENT IN JAMMU AND KASHMIR	11	Oral
22	Pratibha Pandey, Tania Sharma, Tanvi Sharma and Ashok Kumar	Department of Biotechnology and Bioinformatics, Jaypee University of Information Technology, Waknaghat, Solan-173234, (HP) INDIA	EXTRACTION OF KERATIN FROM WASTE HUMAN HAIRS AND ITS CHARACTERIZATION	11	Oral

Sr. No	Authors	Affiliation	Title of the paper	Page	Abstract Selection (Oral/Poster)
23	Pankaj Sood, Ajay Sood, D.S. Yadav, L. K. Sharma, Kavita Sharma and Shakuntla Rahi	Krishi Vigyan Kendra, Mandi at Sunder nagar, Mandi -175019, (HP) INDIA Department of Entomology, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Kangra- 176062, (HP) INDIA	INVASIVE TOMATO LEAF MINER, TUTA ABSOLUTA: A THREAT TO SOLANACEOUS CROP CULTIVATION- A CASE STUDY FROM NORTH WESTERN HIMALAYAS	12	Oral
24	Bharati Kashyap and Y. C. Gupta	Department of Floriculture and Landscape Architecture, College of Horticulture, Dr. Yaswant Singh Parmar University of Horticulture and Forestry, Nauni, Solan-l73230, (HP) INDIA	RURAL UPLIFTMENT THROUGH DRIED FLOWERS MADE FROM LOCAL RAW MATERIALS	13	Oral
25	S. K. Gupta and Rajesh Kumar	Department of Plant Pathology, Dr. Y.S. Parmar University of Horticulture & Forestry, Nauni, Solan- 173230, (HP) INDIA	DAMPING –OFF OF TOMATO AND ITS INTEGRATED MANAGEMENT	13	Oral
26	N.D. Negi and S. K. Upadhyay	Department of Horticulture and Agroforestry, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Kangra -176062, (HP) INDIA	INNOVATIVE INTERVENTIONS IN NURSERY PRODUCTION TECHNOLOGIES OF IMPORTANT TEMPERATE FRUIT PLANTS FOR QUICK MULTIPLICATION AND REGULAR SUPPLY	14	Oral
27	Amar Singh, P. N. Sharma and A. B. Malannavar	Department of Plant Pathology, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Kangra - 176062, (HP) INDIA	BIOEFFICACY OF TRICHODERMA ISOLATES AGAINST SOIL-BORNE PATHOGENS CAUSING DISEASES UNDER PROTECTED CULTIVATION	15	Poster
28	Ambika Sharma, Imran Sheikh, Pritesh Vyas and H. S. Dhaliwal	Department of Biotechnology, Akal College of Agriculture, Eternal University, Baru Sahib, Sirmour -173101, (HP) INDIA	INTROGRESSION OF RECOMBINANT 1RSWR.1BL TRANSLOCATION AND RUST RESISTANCE IN BREAD WHEAT (*TRITICUM AESTIVUM L.*) CULTIVAR HD2967 THROUGH MARKER ASSISTED SELECTION	15	Poster
29	Jagdish Sigh Arya, Nishtha Thakur, Arshiya Chauhan, Narender Singh and Anil Kant	Defense Institute of High Altitude Research Defense Research and Development Organization, Leh Ladakh- 194101, (J&K) INDIA Department of Biotechnology and Bioinformatics, Jaypee University of Information Technology, Waknaghat, Solan-173234, (HP) INDIA	EVALUATION OF ONION GENOTYPES FOR QUALITY OF BULB DURING POSTHARVEST STORAGE IN AGRO-CLIMATIC CONDITIONS OF LADAKH	16	Poster
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01 AGRICULTURAL AND HORTICULTURAL SCIENCES

EFFECT OF BORON ON GROWTH, FRUIT QUALITY AND PRODUCTION OF APPLE

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The cultivated apple (*Malus domestica* Borkh.) is a member of family Rosaceae sub family Pomoideae. The proposed investigation was carried out at Telangi village of District Kinnaur Himachal Pradesh, to study the effect of boron application on the growth and production of quality fruits. There are situations where the absorbed nutrient may be poorly translocated within the plant. Further boron is less mobile in soil and immobile in plant system. Under such situations addition of this nutrient to the soil will be inefficient and foliar feeding provides the best possibility to supplement the nutrient requirement. The experiment consisted of ten treatments of boron viz. recommended dose of boron 1% at pink bud stage and one month after pink bud stage, 100g, 200g and 300 g of boron through soil application (Fall stage, mid-February and tight cluster stage). The results revealed that fall application of boron @ 200g/tree was found to be the best treatment with respect to annual shoot growth, fruit set, fruit retention, yield and other quality parameters which was at par with foliar application of boron @ 0.1% at pink bud stage.

SEXUAL DIFFERENCES AND SEASONAL VARIATION IN TOTAL PHENOLICS AND ANTIOXIDANT CAPACITIES IN HIPPOPHAE RHAMNOIDES LEAVES

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SBT leaves are reservoir of important health promoting bioactive compounds and are used for product development. In this study we made an attempt to delineate the gender differences and harvesting season on total phenolic content (TPC) and total antioxidant capacity (TAC) in SBT leaves. We collected leaf samples that comprised of 200 plants (100 ♂ and 100 ♀) from six natural populations and carried methanolic and acetone extraction for quantification of TPC and TAC. Significantly lower TPC (95.0±23.8 mg GAE/g DW) was observed in females as compared to males (100.8±23.9 mg GAE/g DW). Likewise, significantly lower antioxidant activity in terms of FRAP was detected in females (6.1±1.2 Fe2+mmol/g DW) as compared to males (6.5±1.1 Fe2+mmol/g DW). Significant increase in TPC was observed in male leaves from July to October followed by a significant decrease in November. However, increase in TPC was observed up to August in female leaves and then showed steady declining trend. Similar trend was observed in TAC in both the gender except that female also showed increasing TAC from July to October. October is the best time to harvest SBT leaves, and that leaves contain significantly higher hydrophilic than lipophilic phenolics and antioxidants.

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NOVEL CULTIVARS OF CALLA LILY- A HIGH VALUE FLORICULTURE CROP FOR SUSTAINABLE RURAL UPLIFTMENT

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Calla lilies are popular ornamental plants which are cultivated for their colorful blooms and silky foliage. Two species of calla lilies viz., *Zantedeschia aethiopica* (white blooms) and *Z. elliottiana* (coloured blooms) are of commercial importance and used both as flowering potted plants as well as cut flowers. The leaves are very striking and used in floral arrangements. Being moisture loving plants, white calla lilies are often used in landscape along bog gardens and moist borders. Presently, all the cultivars of calla lily in trade are introduced and subsequently mass multiplied through tissue culture. Calla lily cv. *'Him Shweta'* and *'Him Sumukh'* were developed by CSIR-Institute of Himalayan Bioresource Technology through hybridization and selection approach. The study was undertaken to examine the investments, costs, yield, returns and net profit from cultivation of *calla lily* cv. 'Him Shweta' from 1000 sqm area at Palampur, Himachal Pradesh. The cultivar was evaluated for three years with respect to flower production potential and other agronomic attributes viz., flower stalk length, stalk diameter, leaf size and numbers, plant height, number of flowers per plant and number of shoots under open field conditions. Average gross and net returns were Rs. 6.24 and 2.86 lakhs per year, respectively with BCR ratio of 4.26.

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STRATEGIES IN HONEYBEE MANAGEMENT FOR SUSTAINABLE BEEKEEPING IN HIMACHAL PRADESH

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The problems of deleterious influence of adverse weather conditions and non-availability of bee flora round the year, in a particular locality, is affecting beekeeping a lot. During certain periods of the year (summer and rainy seasons in India), weather conditions are not suitable for honeybees as the sources of nectar and pollen become scarce. Chances of attack by enemies like ants and wax moth also increase and the colonies may perish which ultimately affects honey production in next blooming season. In the present study, an effort was made to manage honeybee colonies during summer and rainy season. A highly palatable, nutritionally balanced and economically viable diet having gross nutritional value as, protein (24%), carbohydrate (45%), fats (1.4%), moisture (16.2%) and ash (14%) was formulated and fed to *Apis mellifera* colonies during dearth periods. Average consumption of diet was 88.45 gm/colony/week. The diet has positive influence on sealed brood area (3934.6cm2), unsealed brood area (2108.07cm2), bee population (27977), bee covered frames (7.8) and honey stores(1131.6cm2),when compared with control colonies. Also, bee colonies were managed during rainy season by keeping bowls filled with oil for preventing attack of black ants. The area near the apiary was kept neat and clean. It can be recommended at the end of study, that by managing the bees especially during dearth periods, beekeepers can derive more benefits from beekeeping venture.

EFFECT OF CLIMATE CHANGE ON APPLE CULTIVATION IN NORTHWESTERN INDIAN HIMALAYAN REGION: A REVIEW

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Mountains are the early and important indicators of climate change which depict far-reaching consequences on our ecosystem, agriculture and livelihood of the farmers. Apple is known as a most significant commercial fruit crop in Himachal Pradesh. In recent years, it has emerged as the leading cash crop amongst fruit crops. It occupies about 49 % of the total area under fruits and 72 % of the total area under temperate fruits, contributing about 85 % of total fruit production in the State. Apple and other stone fruit trees develop their vegetative and fruiting buds in the summer. As winter approaches, the already developed buds go dormant in response to both shorter day lengths and cooler temperatures. These buds remain dormant until they have accumulated sufficient Chilling Units (CUs) of cold weather. When enough chilling units accumulate, the buds are ready to grow in response to warm temperatures. If the buds do not receive sufficient chilling temperatures during winter to completely release dormancy, trees will develop different physiological symptoms like, delayed foliation, reduced fruit set and quality. These symptoms consequently affect the yield and quality of the fruits. The changes in climate in the form of erratic precipitation, increase in temperature, and lesser days serving as the chilling period have started affecting the mountain agricultural production systems and ultimately the food security of the people. Apple cultivation has shifted to higher altitudes and apple yield mainly in lower altitudes has declined due to inadequate chilling as the temperature at lower altitudes is rising. Therefore, the present study intends to review the effects of climate change on apple production and to assess the temporal and altitudinal comparison in the productivity of apple crop.

EFFECT OF TRICHODERMA ON THE YIELD OF ALLIUM UNDER BIOTIC STRESS

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Various economically important crops are susceptible to fungal diseases such as wilts, rots and smuts. A number of phytopathogens including *Fusarium, Botrytis, Phythium* and Rhizoctonia are responsible for huge crop yield loss all around the world. In order to overcome this problem, different fungicides such as benomyl and carbendazim are commonly used by the farmers. However, chemical fungicides are not only detrimental to the environment but are costly too. Moreover, chemical resistant strains of pathogens evolve over a period of time. Hence, biocontrol agents such as *Trichoderma* and Pseudomonas are better alternative than chemicals for combating the pathogens. *Trichoderma* species are well known biocontrol agents as well as plant growth promoting fungi. Recently *Fusarium proliferatum* has been reported to cause bulb rot in *Allium* species. In the present study we studied the comparative effect of *T. harzianum* and *T. virideon* the yield of onion plant in presence of *Fusarium proliferatum* and *carbendazim* in different combinations. It was found that although both these species of *Trichoderma* were able to antagonize the pathogen and had positive effect on onion yield but *T. harzianum* showed better result as compared to *T. viride*. Thus bulb rot of *Allium spp.* caused by *Fusarium proliferatum* can be controlled by using *Trichoderma spp.*

TECHNOLOGICAL SOLUTIONS: COMBINING POTENTIALS OF INDIGENOUS HERBS OF DISTRICT SOLAN (HP) FOR DEVELOPMENT OF A BIOPESTICIDE FORMULATION- A BOOST FOR RURAL FARMERS

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ORAL- 07

Organic farms India till date experience a decline in yield .The farmers engaged in agricultural practices experience loss in yield despite using best quality of seeds and manure for enhancing the soil profile. Thus, rural division of population lag behind thereby affecting the economic status.One of the reasons to account this cause is low efficiency of organic matter used to treat soil which in turn leads to a yield that is perishable. Organic farms use organic matter such as on farm inputs and off farm inputs to enhance soil fertility which provides minimal resistance to pest and plant pathogens. Recent research is now focussed on utilizing herbs which have biopesticide and biofungicide potential both on nursery and post harvest level to develop an IPM (Integrated Pest Management) strategy.Genus Rhamnus is indigenously known for its pest – repellent properties and has less scientific literature which generally focus on the extraction of Emodin ; an essential oil extracted from the bark along with some phytochemicals.Till date the literature highlights the above research whereas the antimicrobial potentials that can be useful in biopesticide formulation still remain unexplored. In order to develop bio-dynamic formulations focussing on bio-pesticide potentials.And further the activity can be enhanced by combining potential bioactive compounds from unidentified herbs and an efficient biopesticide can be used to prevent the disease spread in the life cycle .Population as farmers can easily understand the potential of these herbs and effectively use it in local preparations against important pest and diseases.Thus, socio-economic aspects in the rural division of population will be uplifted by technological interventions thereby contributing to enhancement of nutritional status of every group of population.

EFFECT OF WEATHER PARAMETERS ON SEED PRODUCTION OF CAULIFLOWER (*BRASSICA OLERACEA VAR BOTRYTIS L.*) IN MID HILLS OF HIMACHAL PRADESH

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The effect of weather parameters on seed production of cauliflower (*Brassica oleracea var. botrytis L.*) was studied during 2014-15 and 2015-16 at three locations viz., Nauni, Saproon and Kandaghat with variable weather conditions in Solan district of Himachal Pradesh. The location Nauni was warmest, followed by Kandaghat and Saproon. Significant variations in seed yield and yield contributing characters of cauliflower were observed due to execution of different weather conditions. The minimum number of days to initiation of seed stalk, flower initiation, 50 per cent flowering, and seed set in cauliflower were observed at Nauni, followed by Kandaghat and Saproon. Number of pods per plant and number of seeds per pod were found highest at Saproon (1055.2pods/plant; 18.4seeds/pod) which is the coolest location as compared to other two. The maximum seed yield (239.6 kg/ha) was also obtained from this location. The lowest seed yield (174.0 kg/ha) was recorded at Nauni. The forenoon humidity during October to December exhibited significant and positive correlation with seed yield. Whereas, minimum temperature during January to March and maximum temperature during April to June showed significant and positive correlation with cauliflower seed yield.

AUTOMATED SENSORY BASED FARM CONDITION ASSESSMENT SYSTEM

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India has emerged as a fast-developing economy in the world where almost 60 % of the population reside in villages and rely on agriculture as a means of livelihood. Unfortunately, very little scientific interventions have been exercised by technocrats and engineering community of India in this sector. As a result, majority of farming operations are outdated even in modern era of twenty first century in our country. Agriculture sector, despite being an important part of our growing economy and has been ensuring production of sufficient food grains to our people from the last couple of years, the agriculture community by and large has often been shunned and many of its problems have not been taken seriously. This paper presents a fully automated sensory based condition assessment farming system designed to help the farmers in dealing with the various issues concerning agriculture operations and safety. Some of which are infertile soil conditions leading to decreased crop output, inefficient irrigation, damage of crops due to stray animals and the possibility of fire happening in the dry seasons. This system will consist of a micro controller, which is used to issue commands for irrigating the crops, detecting the occurrence of fires (using infrared sensors) in both the farmlands and in the adjoining areas. It will also provide the farmer regular reports on his mobile phone via GSM module, stating the condition of the soil (pH and moisture level). This would help the farmer ascertain as to what sort of fertilizer should be used to improve the soil condition. In addition to the farming system, an automated electric fencing system will also be employed to guard the crops from stray animals. Thus, by using appropriate scientific tools, the usual farming operations can be effectively carried out to motivate farmers in national endeavor.

BIOFORTIFICATION OF WHEAT FOR HIGH GRAIN MICRONUTRIENTS TO ALLEVIATE HIDDEN HUNGER

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All the edible blueberries belong to the genus *Vaccinium* and there are mainly four types viz., northern highbush, southern highbush, rabbiteye and lowbush blueberries exist in the world. Blueberries are now grown on commercial scale worldwide; the United States of America is the leading producer in the world with annual production of 2,14,708 MT followed by Canada (1,20,929 MT) although, Canada has maximum acreage. In Asia, the total area under its production is estimated to be 11,135 acres; the bulk of this is in China and Japan. Current reported planting of blueberries in India consist only of research trials. Its commercial cultivation has not been reported yet, but at CSKHPKV, Palampur few cultivars were introduced and have shown adaptive to this climate, since the soil is slight acidic and climate during winter remains cool enough to meet out chilling requirement up to some extent. From the experiments conducted at CSKHPKV, Palampur, it was observed that southern highbush cultivars viz., Jewel, Misty, Gulf Coast and Sharpblue have shown very encouraging results with satisfactory growth, flowering and fruiting under mid-hill conditions of HP. Similarly, two rabbiteye blueberry cultivars viz., Alapaha and Austin are also performing well under prevailing agroclimatic conditions. All these genotypes had TSS content more than 10 % which has been reported as minimum quality index in blueberries. The maximum berry weight was recorded in cultivar Jewel and minimum in Alapaha. In terms of production efficiency of these genotypes, the average yield was observed to be 200 - 250 g per bush which is very low when compared with other blueberry growing countries of the world where, its production have been reported to 2 to 10 kg per bush. From our studies, it can be concluded that the southern highbush as well as rabbiteye blueberry cultivars can be grown under mid-hill conditions of HP and have very good potential in diversification of fruits and can be a boon for socio economic upliftment of rural people of the State as well as the nation also.

HYBRID BREEDING OF CAULIFLOWER FOR ENHANCING ANTIOXIDANT CAPACITY AND YIELD POTENTIAL EXPLOITING OGURA CMS AND DOUBLED HAPLOID LINES UNDER TEMPERATE CONDITIONS OF NORTH-WESTERN HIMALAYAS

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The *Brassica* vegetable crops are rich source of important antioxidant compounds having anti cancer and health promoting properties. The F1 hybrids development with respect to nutritional quality is one of the main breeding objectives in the modern era across the world. Hybrid breeding exploiting heterosis offers important tool to maximize yield and quality traits in crop plants. Our study is the first report of determining heterotic combinations utilizing cytoplasmic male sterile and doubled haploid (DH) inbred lines for antioxidant compounds and high productivity in snowball cauliflower. The lack of information regarding genetic variability, inheritance and inter-relationships among antioxidant and yield related traits in snowball cauliflower evoked an experiment utilizing 150 genotypes of cauliflower including Ogura CMS lines, DH lines and F1 hybrids to formulate breeding strategies for the development of antioxidant rich and productive cultivars for the temperate and hilly regions of Western Himalayas. Significant variability was observed for CUPRAC, FRAP, ascorbic acid, total phenolic content, vitamins and horticultural traits suggesting the scope for improvement of these traits in cauliflower by adopting various breeding techniques. The slightly higher magnitude of phenotypic coefficient of variation (PCV) than genotypic coefficient of variation (GCV) for all the studied traits indicated small influence of environment on accumulation of these traits. The high heritability accompanied with high genetic gain for the studied traits indicated the predominance of additive genes which could be enhanced by hybridization followed by selection. Moreover, the correlation analysis indicated scope for simultaneous improvement of antioxidant capacity and yield related traits in cauliflower.

CHARACTERIZATION AND DEVELOPMENT OF A DNA BASED AMPEROMETRIC BIOSENSOR FOR THE DETECTION OF PEPPER LEAF CURL VIRUS (PEPLCV)

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Plant virus diseases are major factor that affects the agricultural crops around the world. Thus, an accurate and ultra-sensitive detection is very essential for on time diagnosis and is a prerequisite for efficient control in field conditions. Various diagnostic methods have been reported with the required level of sensitivity. The objective of the study is to develop an ultra sensitive DNA based amperometric biosensor which can detect the presence of gemini virus mainly pepper leaf curl virus (PepLCV) at very minute concentrations up to nanograms. Plant leaf samples with visible symptoms of PepLCV such as leaf curl with cup-shaped, upward curling leaves, yellowing, and stunted plant growth were collected from field and stored at -80°C in laboratory. Genomic DNA from the symptomatic leaves was isolated using phenol: chloroform method. To confirm the presence of PepLCV in symptomatic samples, specific diagnostic coat protein (CP) primer pairs were used in PCR amplifications with total nucleic acids extracted from the plant. The amplified product showed 96% similarity with chilli leaf curl virus segment A, complete sequence (Accession-DQ673859.1). Development of an ultra sensitive DNA based amperometric biosensor for quick detection of PepLCVis still under process and the amperometric response would be measured after hybridization of specific probe with single stranded genomic DNA (ss-DNA) from the plant samples.

EVALUATION AND QUALITY ASSESSMENT OF SPIRULINA ENRICHED FUNCTIONAL PASTA

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Microalgae is an important biological resource containing wide array of nutrients. Spirulina is consumed as dietary supplement in the form of powder and tablets due to its high protein content and nutraceutical potential of its associated pigments. Hence, the present investigation was aimed to develop functional pasta by incorporation of Spirulina platensis powder. Blends of semolina and Spirulina platensis powder were prepared at level of incorporation of 1.5, 3, 4, 5 and 6 % and the influence of level of incorporation was studied on the quality attributes of the supplemented pasta by evaluating its cooking quality, colour, sensory attributes and phytochemical composition. The increase in the level of supplementation resulted in increasing the cooking time, increasing weight of the cooked pasta, decreasing the cooking loss and no significant change on the volume expansion. L* and a*values of the pasta decreased with the increase in the level of supplementation. Incorporation of Spirulina powder markedly improved the colour and appearance of pasta upto3 % level of incorporation, however, further addition resulted in decreased score of colour and appearance. The flavor score of pasta decreased with the increase in the level of supplementation. Pasta maintained good sensory attributes up to 3 % level of supplementation along with enhancing its protein content, phytochemicals and anti-oxidant activity. Thus, Spirulina powder can be used at 3 % level of incorporation for the development of functional pasta.

SEROLOGICAL AND MOLECULAR INDEXING OF MOTHER PLANTS OF APPLE FOR APPLE STEM PITTING VIRUS INFECTION IN KINNAUR DISTRICT

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Apple Stem Pitting Virus (ASPV) belonging to the family Betaflexiviridae and genus *Foveavirus*, is one of the major viruses of apple, which is prevalent all over the world. Since it is a latent virus its elimination during selection of mother plant in field condition is not possible. Hence study was planned to index mother plants and to record the incidence of ASPV in the apple orchards of Kinnaur district, which is famous for its quality apple fruits. Extensive surveys were conducted in different areas viz., Kalpa, Sangla, Nichar and Pooh of Kinnaur district. During the survey severe virus-like symptoms were observed on the leaves of some of the apple trees. Total 227 leaf samples were collected and tested using Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay (DAS-ELISA).In order to confirm the results obtained by DAS-ELISA the same samples were also tested with more sensitive technique Reverse transcription polymerase chain reaction (RT-PCR). RNA was extracted from the leaf samples and subjected to RT-PCR using coat protein (CP) gene primers (which were specific for a part of the ASPV), along with positive, negative and internal controls [NADH dehydro genase subunit 5 (NAD5)gene in mitochondrial mRNA of the apple]. The controls were added so as to reduce the risk of false negative results and to rule out the contamination problem in the tested samples. A positive amplification of 370bp was obtained from the infected samples. Thus, RT-PCR results revealed higher incidence of ASPV in Sangla area (92.3 %), followed by Kalpa (89.1 %), Pooh (66.6 %) and Nichar (58.8 %).Out of 227 plants, 45 were found to be free from ASPV infection and they can be utilized as a mother plant for production of virus-free planting material.

PROBLEMS IN INDIAN AGRICULTURE & IMMERGENCE OF NEW TECHNOLOGY TO OVERCOME THEM

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India is the largest agricultural powerhouse worldwide and the leading producer of spices, pulses, and milk. Not only that, our country has the largest area that is used to cultivate cotton, wheat, and rice. Agriculture held almost 75% share in India's GDP a few decades ago. Today, the share has gone down to around 14%. However, agriculture continues to be the source of livelihood for about 50% of the working population, three-quarters of which is based in the rural parts of India.In a nutshell, agricultural is vast industry and has an impact on every citizen of the country, either directly or indirectly. Like any other sector, agriculture too has its own set of challenges, some of which are very critical and impeding. Let's take a look at some of the major problems that India faces in relation to agriculture and their possible solutions. Importance of Agriculture:-A major portion of National income comes from Agriculture. Agriculture provides raw materials to industries, Agriculture creates employment opportunities, Agriculture plays a crucial role in our international trade, Agriculture creates infrastructural facilities, Importance for industrial development, Agriculture feeds the large population of our country. Problems in Agriculture Sector:- Lack of proper land reform measures, Lack of credit facilities, Lack of fertilizers, Lack of proper agriculture research, Small and uneconomic holdings, Inadequate irrigation facilities, Defective marketing facilities, Soil erosion, Pests and plant diseases, Soil erosion, Very high dependency on. monsoons. Green revolution is the term connecting the agriculture sector. Green revolution means the tremendous hike in the agricultural production and productivity during the mid of 1960's. It is also known as the New Agricultural Strategy comprises IADP, IAAP and HYVP. Hike in agricultural production and productivity, Increase in food production, Boost the production of cereals, Fall in poverty, More employment is created, More irrigational facilities developed, More infrastructure is created, More land is added to agriculture, Better distribution of land, More research on agriculture.

PROPAGATION THROUGH STEM CUTTINGS IN TOMATO: A NEW INNOVATIVE TECHNIQUE TO DOUBLE FARMERS' INCOME

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Tomato is one of the most popular vegetables cultivated round the year in one or another part of the country from temperate to tropical region. Protected cultivation technology holds special significance for hilly areas of Himachal Pradesh where arable land is scanty and there is a great variation in agro-climatic conditions. Every year, the area under protected cultivation is increasing and farmers are facing problem of quality planting material. Moreover, there are a few identified hybrids or varieties which perform well under protected environment thereby, limiting the choice of the growers to grow the varieties or hybrids available in the market. The exploitation of stem cuttings is a new concept and not common in India but is being practiced in countries like Japan to clone a perfect replica of the original plant. Rooting hormones are being used in commercial horticulture to improve plant growth and yield. In this technology, from a single plant, number of rooted cuttings can be produced and hence will reduce the cost incurred on the purchase of hybrid seed.An experiment was copnducted during 2016-17 in a Randomized Block Design with three replications and data were recorded on root, horticultural and quality parameters in tomato. The results obtained showed that vegetative propagation of tomato plant through stem cuttings has proved to be an efficient method for cheaper multiplication and cultivation of tomato plants throughout the year. The present study revealed that IBA and cow urine significantly enhanced rooting of tomato stem cuttings. Treatment RH1C3G2 (RH1 = IBA, C3 = 150 ppm and G2 = Soil) was found to be best as it recorded maximum number of roots per cutting (27.67), root length (8.57cm) and plant height (240cm). Treatment CUC2G2 (CU = Cow urine, C2 = 10% and G2 = Soil) was observed to be best for days to first flowering (28.67), days to first harvest (69.33), number of marketable fruits per plant (38.67), marketable fruit yield per plant (2.15 kg) and average fruit weight (55.60g). RH2C1G1 (RH2 = NAA, C1 = 250 ppm and G1 = Soilless) recorded highest ascorbic acid content (20.75mg/100g) in tomato fruits. Data indicated that there was no significant effect of different treatments on survival percentage of the stem cuttings, harvest duration (days), fruit firmness (kg/cm^2), pericarp thickness (mm) and TSS (^{o}Brix).

QUALITY PROTEIN MAIZE FOR FOOD AND NUTRITIONAL SECURITY

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Maize is the basis for food security in some of the world's poorest regions in Africa, Asia, and Latin America. Normal maize endosperm consists of approximately 9-12% protein; however, it is deficient in two essential amino acids viz., lysine and tryptophan, which leads to poor net protein utilization and low biological value of traditional maize varieties. About 70% of protein is prolamine composed of several proteins known as zeins which are rich in glutamine and hydrophobic amino acids. Protein deficiency especially in children causes kwashiorkor, a potentially fatal syndrome characterized by initial growth failure, irritability, skin lesions, oedema and fatty liver. The bio-fortification of conventional maize by doubling the amount of lysine and tryptophan that are essential for humans and monogastric animal sthrough the identification of a mutant genotype, popularly known as opaque-2 (o2), with reduced zeins protein fraction gave rise to quality protein maize (QPM). The QPM is 'nutricereal' bred with improved biological value, digestibility and serve protein requirements in a person diet, especially children, young, pregnant women and lactating mothers. It offers 90 per cent of the nutrition value of skimed milk, which according to UNICEF, is the standard for adequate nutritional value. The crop is also an important component of livestock feed especially in developed nations where 78% of total maize production is used for livestock feed. The adoption of QPM genotypes by farmers has been found to be limited mainly due to the minimal collaboration between maize breeders, farmers, agricultural extension workers, and other relevant stakeholders. Therefore, there is need to use participatory plant breeding (PPB) to enhance and improve the adoption and popularization of QPM varieties among resource poor farmer for upliftment of their livelihood.

IDENTIFICATION AND DETECTION OF VARIOUS DISEASES IN COMMERCIAL CROPS

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Plant diseases have turned into a dilemma as it can cause significant reduction in both quality and quantity of agricultural products. Plant diseases hamper the production of agriculture products and most of the plant diseases are caused due to bacteria or fungus. Plant disease identification and detection by some automatic technique proves beneficial as it reduces large amount of work done for monitoring plant diseases. Automatic detection of plant diseases with the help of image processing techniques is an important research topic as it proves beneficial in monitoring the better production and quality of crops, and augments the early detection of the symptoms of diseases as soon as they appear on plant leaves. The existing methods to detect plant diseases rely on human eye interpretation, which may not be accurate and are more time consuming. The present study is carried out on automatic disease detection of plant leaf and fruit parts of commercial crops i.e. tomato and capsicum. An image processing based technique is proposed which automatically detect the symptoms of diseases as soon as they appear on the plant parts. RGB images of both healthy and diseased plants are captured then pre-processing of these images is performed to enhance the image contrast. Segmentation is performed with K-means clustering technique; it provides efficient results in segmentation RGB images. Finally, features are extracted from the segmented diseased image and then classification is performed. This technique provide fast, accurate, automatic and cheap solution for the early identification of plant diseases and also help the farmers in the identification of diseases at an early stage and provide useful information to take the precautionary measures.

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APPLICATION OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM IN FORECASTING AGRICULTURAL OUTPUT USING SPACE AGRO- METEOROLOGY AND LAND BASED OBSERVATIONS

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Crop forecasting is essential for various agricultural planning purposes, including pricing, export/import, contingency measures, etc. Crop forecasting using remote sensing satellite imageries is one of the major application areas of remote sensing technology, which showcases the use of remote sensing data provided by the sensors/satellites launched by Indian space agency, Indian Space Research Organisation (ISRO). HP Remote Sensing Centre in collaboration with Space Mahalanobis National Crop Forecast Centre (MNCFC) New Delhi and State Agriculture Department initiated Forecasting Agriculture output using Space, Agro-meteorology and Land based observations (FASAL) programme in Himachal Pradesh. The present study has provided single crop forecasting for wheat crop for 7 major wheat growing districts i.e. Bilaspur, Hamirpur, Kangra, Mandi, Sirmour, Solan&Una. Optical remote sensing data is used for crop area enumeration, crop condition assessment and production forecasting. Wheat categories and other land use categories are classified based on digital supervised classification of IRS LISS III & Landsat-8 Sensors. A single date satellite imageries corresponding to maximum vegetative growths stage of wheat was considered. Based on the identification of wheat crop representative sites for ground truth survey using Survey of India maps 50K and Global Positioning System-camera for field data collection was carried out to in the month of March 2018 by the team. Selective field survey was coincided with the satellite pass over the target districts to improve the interpretation accuracy. Based on these training sites digital supervised classification was carried out and statistics generated for wheat area and production of wheat was estimated based on Remote Sensing, district boundary mask in GIS and agro meteorological models much before the wheat harvesting. For Bilaspur district 20,500 ha area with 37,700 tons of production was estimated; Hamirpur 20,200 ha with 35,100 tons; Kangra 93,500 ha with 17,2500 tons; Mandi 58,500 ha with 11,3600 tons; Sirmour 17,400 ha with 43,500 tons; Solan 21,300 ha with 47,000 tons and Una 37,600 ha with 79,600 tons of wheat was forecasted in the month of March 2018.

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BIG DATA ANALYTIC FOR CROP PREDICTION IN INDIAN SCENARIO USING FAO HEURISTIC

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Agriculture plays a significant role in the economic development of a country as more than 60% of the people's livelihood depends on it. Though the food grain production in the country has increased manifold yet the yield has been observed to be adversely affected by the vagaries of nature. In the present paper the data taken from Food and Agriculture Organization (FAO) for a period of 1961-2014 have been evaluated to determine a particular trend of different agriculture and fruits crops. A framework to store a huge amount of data like soil, yield, productivity etc using Hadoop Platform has also been provided. The historical data will be quite helpful in taking the best possible business decision using machine learning technique like K-mean clustering and statistical algorithm which will facilitate in the prediction of production of different crops from 2014-2023.The outcome emerging by using various statistical tools like ARIMA model and liner regression techniques may undoubtedly help the farmers, researchers and scientists to take proper decisions pertaining to accurate yield/production etc which is very essential for scientific planning in agriculture.

PRODUCTION SYSTEM MODULE AS SCIENTIFIC INTERVENTION FOR RURAL UPLIFTMENT IN JAMMU AND KASHMIR

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Most of the developing nations are agrarian in nature, and they strive for achieving sustain ability in their livelihood pattern. These economies are characterized by low income, low productivity, less infra structural base etc. India being one the developing countries and is striving for removing the poverty in the rural areas. There are many interventions for rural upliftment and one such potential instrument is application of new and hybrid seeds. Jammu and Kashmir being one of the States in India, where there is a wide gap persistent among rural and urban areas. The present paper has taken the most profitable and world famous spice saffron into consideration by using new and hybrid corms(seed). The highly priced spice is cultivated in state on an area of 4496 hectares. By providing new technology (production system module) in the form of growing material in saffron to the farmers, so that the socio - economic condition of farmers in rural Kashmir gets boost and upliftment. The results of the study revealed that not only the productivity of saffron has increased multi-fold but also the income of farmers has increased from Rs 206353 to Rs 605407 by using the new production system module developed by SKUAST-K, with the result, the economic conditions of the farmers in the area has become much better and they are living a decent life.

EXTRACTION OF KERATIN FROM WASTE HUMAN HAIRS AND ITS CHARACTERIZATION

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Keratin is basically a protein that is found in human hair, skin etc. It has unique biological and chemical properties such as bio compatibility and high tensile strength. Keratin is highly stable and biodegradable bio polymer which it can be used in various industrial applications. There are two main types of keratin proteins, namely alpha-keratin and beta-keratin. Keratin is insoluble in aqueous media or double distilled water and resistant to the attack of proteolytic enzymes. In the present study, human hairs were used as a source of keratin substrate. The waste human hairs were collected from local market saloon of Distt Solan, Himachal Pradesh. The collected hairs were thoroughly washed with detergent and rinsed with distilled water followed by drying it in the incubator oven at 50°C for 24 h. Thereafter, hairs were chopped into small pieces and dissolved in alkaline solution of NaOH at selected concentrations of 2%, 4%, 6%, 8%, and 10% for 24h. The human hair hydrolysate was subjected to precipitation with concentrated HCl under vigorous stirring on a magnetic stirrer. The precipitates of keratin were collected by centrifugation at 12000 rpm for 20-30 min. The precipitates were further dialyzed with distilled water and lyophilized to obtain the pure keratin powder. The total yield of the extracted keratin was approximately 63% w/w. The extracted keratin can be used to various industrial applications.

INVASIVE TOMATO LEAF MINER, TUTA ABSOLUTA: A THREAT TO SOLANACEOUS CROP CULTIVATION- A CASE STUDY FROM NORTH WESTERN HIMALAYAS

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Agricultural biosecurity globally has been on a vulnerable juncture owing to increased international trade, large scale movement of agricultural produce between countries and within the country inviting not only the accidental introduction of invasive insect pests in the new horizons but threatening cultivation of crops globally. In last 25 years, at least 10 species of insect and mite pests have invaded India, of which tomato pinworm, Tutaabsoluta and fall armyworm, Spodo pterafrugiperda are the most recent ones. Surprisingly, these two species of insect pests have not been reported earlier from any adjoining countries having terrestrial borders with India. Among the two species, T. absolutais a neotropical and one of the most devastating pests capable of causing up to 90-100% damage in tomato yield and fruit quality under greenhouses and field conditions. The pest has been classified as the most serious threat for solanaceous crop production worldwide. The pest has also been reported from Himachal during 2015 in Solan area under open conditions, and in epidemic form in various vegetable growing areas of Himachal thereafter especially in solanaceous and legume crops.The survey studies revealed the presence of the pest from the three agro ecological zones i.e. low, mid and high hills in districts Una, Sirmour, Hamirpur, Bilaspur, Solan, Shimla, Kangra, Mandi and Kullu of the state. The pest was observed causing serious damage to solanaceous crops especially tomato, brinjal, potato and legumes like french bean. The pest was prevalent in epidemic form in tomato and brinjal crops grown under protected conditions in Mandi, Kangra and Kullu districts of Himachal Pradesh. No such epidemic of the pest from Northern India was earlier reported. The damage was very severe in these crops under protected conditions. The studies revealed that the pest caused complete failure of these crops under protected conditions where percent leaf infestation (blotch) and fruit damage varied from 42-76 & 28-62 % in tomato and 26-50 and 11-32 % in brinjal, respectively in different areas. Under open conditions, the percent leaf infestation (blotch) varied from 1.7 to 18, 0.6 to 5.2, 0.5 to 3.2 and 0.3 to 2.1 % in tomato, brinjal, potato and French bean crops respectively in the state. The fruit damage observed in case of tomato, brinjal and French bean varied from 0.5 to 9.8, 0.2 to 0.9 and 0 to 0.4% in different areas, respectively. The weekly trap catch at different locations studied also revealed an average catch of 39.4 to 70.8 adults per trap per week under protected conditions and 5.2 to 18.9 adults per trap per week under open conditions. Solanaceous crops especially tomato and potato are important crops of the region, the epidemic of this invasive pest is a serious concern especially due to its peculiar damage and failure of control measures for its management. The spread of pest under open conditions especially in summer tomato and potato may pause serious threat to small and marginal farmers who are earning their livelihood from cultivation of these commercial crops. There is an urgent need to keep close vigil for the pest in different regions of the state to establish its status and look for suitable modules for its effective management. Invasion by such insect pest is indeed a serious threat to agricultural production and a concern for national agricultural biosecurity as further invasion of exotic pests can only be stopped by strengthening our National Agricultural Biosecurity.

RURAL UPLIFTMENT THROUGH DRIED FLOWERS MADE FROM LOCAL RAW MATERIALS

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The 'Dry –Flowers' is a well established industry today. From the last two decades the dry flowers are contributing about 1/3rd to the total floricultural export. In the year 2014-15 out of total floricultural export of Rs 460.8 crores, about Rs 329.30 was contributed only by the dried flowers. United States, United Kingdom, Germany, Netherlands and United Arab Emirates were the major importing countries of Indian dry flower products during the same period. India is the fifth largest exporter of dried flowers and second largest exporter of dry foliage in the world, and the industry exports 500 varieties of flowers from India to 20 countries. India is one of the major exporters of dried flowers to the tune of 7% of world trade in dry flowers. West Bengal accounts for around 70% of the dry flower export from India.

This business can bring multifold change in the income of the rural people farmer if the technology reaches to every nook and corner. Locally available raw materials like; unused agricultural crops and wastes of crops like Sorghum bicolor, *Pennisetum glaucum*, *Zea mays, Eleusinespp, Linum utilissimum*; native flora like *Acer oblongum*, *Anaphalismargaritacea*, *Barleriacristata, Verbascumthapsus* , many types of cones and ferns ; and dryflower crops like *Helichrysum bracteatum*, *Limonium sinuatum, Lagurusovatus, Briza maxima* and *Bromus rubens* etc. These materials can be utilized to make different types of value-added products like; wall pictures, pot –pourri, flower arrangements, mirrors, floral rakhis, soap cases, key rings and other gift items. In the paper, different types of raw materials, methods of drying, colouring bleaching and preparation of value-added products will be discussed.

DAMPING –OFF OF TOMATO AND ITS INTEGRATED MANAGEMENT

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Tomato (*Solanum lycopersicon*) is an important off season vegetable cash crop of mid hills of Himachal Pradesh which is grown during March to October. Nursery of the crop is raised twice i.e. in March-April (irrigated crop) and May –June (rainfed crop).During nursery raising, the seedlings are severely infected with damping-off disease which causes substantial seedling mortality both at pre- and post emergence stages. Studies were, therefore, conducted to record the incidence of the disease in Solan district, identification of the associated pathogen and its integrated management. Surveys conducted during 2016 and 2017 crop seasons revealed that the disease was widespread and the incidence ranged from 41.33 to 85.33 per cent. The associated pathogen was isolated and on the basis of morphological characters like coenocytic mycelium, sporangia (23.08 -34.87 x 22.33 x 33.56 um) round in shape with thin walls without papillae and oospores (18.58 -26.95 x 18.36 -26.78 um) round in shape with thick and smooth walls, identified as *Pythium spp.* which was further confirmed through molecular analysis as *Pythium ultimum* Trow. This constitutes the first report of association of *P. ultimum* with this disease in Himachal Pradesh. For disease management, soil solarization, bio control agents and fungicides were used alone and in combination. During soil solarization mean soil temperature was increased by 6.8°C at 5 cm depth and increment in temperature decreased with the increase in soil depth. Soil solarization for 30 days was sufficient to kill *P. ultimum* at 5 cm soil depth. Among different bioagents evaluated, *Trichoderm aharzianum* caused maximum mycelia inhibition under in vitro and also found effective both as seed treatment and soil application against the disease under pot conditions. Among different fungicides tested, Metal resulted in minimum pre-emergence damping-off. Drenching of Apron XL, Curzate M-8, Metal, Ridomil Gold and Sectin caused complete reduction in post-emergence damping-off. Integration of soil solarization, seed treatment and soil application of *T. harzianum* was found to be the most effective in reducing the incidence of damping-off under nursery conditions.

INNOVATIVE INTERVENTIONS IN NURSERY PRODUCTION TECHNOLOGIES OF IMPORTANT TEMPERATE FRUIT PLANTS FOR QUICK MULTIPLICATION AND REGULAR SUPPLY

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At present, most of the temperate fruit plants are being multiplied conventionally through grafting and budding onto either seedling or clonal rootstocks. This technique of plant propagation takes almost two years to attain saleable size i.e. from seed sowing to raise seedlings and further grafting or budding onto them. However, with the advancement in propagation technologies such as tissue culture, has emerged as an option to reduce this problem and to ensure regular supply of fruit plants to the growers. But this method of plant propagation (tissue culture) is highly precise and requires trained persons. Moreover, the protocol for *in-vitro* multiplication of most of the fruit plants has not been standardized yet. The other advance methods for quick multiplication of fruit plants are micro-grafting/shoot tip grafting and epicotyl grafting etc. but the commercial use of such technology in fruit plants is limited. Therefore, the studies on stenting i.e. direct grafting and rooting and summer grafting techniques were conducted at CSKHPKV, Palampur on cherry, pear, apple, apricot, peach, plum and kiwi under polyhouse conditions with the objective of reducing the nursery raising duration of these fruit plants. When plum cultivar Meriposa was grafted onto non-rooted cuttings of Pixy (clonal rootstock), the grafting success was recorded as high as 94.19 % with the production of saleable plants up to 90 %. Similarly, in sweet cherry, application of IBA at 5000 ppm to the non-rooted cuttings of clonal rootstocks was found to be the best treatment as it increased root formation and subsequent growth of stentlings. Stentlings attained saleable height at the end of growing season with well-developed roots. Pear cv. Baggugosha on Qunice, apple on MM-111, apricot on Pixy plum and peach on Florda guard responded satisfactorily to stenting method of plant multiplication. In another intervention, the Scarlet Gala cultivar of apple, when grafted onto seedling rootstocks during active growing season (May, June and July) on different dates recorded 100 per cent bud take success with proper wound healing of graft unions. The plants grafted on June 12 attained maximum height (71.17 cm) at the end of growing season with well developed root system and healing of graft unions. From these interventions it can be concluded that, the simultaneously grafting and root development was not only possible in non-rooted cuttings of Pixy plum, colt cherry, MM-111, Flordaguard and cuttings of kiwi but this method can be commercially adopted to multiply these plants under polyhouse conditions in mid-hill areas of HP. Similarly, apple can be grafted during active growing season under poloyhouse conditions and the nursery stocks can be produced in one season. Further, these rapid propagation methods are very important when plant materials are limited due to the long nursery production duration and dramatic expansion in acreage under these fruit crops in the state and to ensure regular supply of planting materials to the stakeholders.

BIOEFFICACY OF TRICHODERMA ISOLATES AGAINST SOIL-BORNE PATHOGENS CAUSING DISEASES UNDER PROTECTED CULTIVATION

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Protected cultivation has emerged as major income generating entrepreneur in the hill States of India. Capsicum, Tomato and Cucumber are mainly grown in poly house during off season successfully as protected environment provides favorable conditions for the plant growth. In spite of protection from insect pest and weather vagaries, protected environment also provide congenial conditions for many soil borne pathogens. Survey conducted during 2017-18 revealed the prevalence of damping-off, root rot, collar rot, stem rot and wilt diseases in capsicum and tomato. Fungal pathogenic species of *Pythium, Phytophthora, Rhizoctonia, Fusarium, Sclerotium* and *Sclerotinia* have been observed to be associated with these diseases as a sole cause or as a complex. The efficacy of five different strains of Trichoderma i.e. TH-1, SMA-5, DMA-4 (*Trichoderma harzianum*), TV-1 (*Trichoderma viride*) and JMA-11 (*Trichoderma koningii*) were evaluated in-vitro against these isolated soil borne pathogens. Among the five *Trichoderma isolates*, the isolate TV-1 resulted in maximum *mycelial* inhibition against *Phytophthora capsici* (59.3 %), *Fusarium oxysporum* (88.9) and *Rhizoctonia solani* (64.5%). It was followed by SMA-5 isolate which resulted in maximum mycelial inhibition of *Pythium sp.* (63.00%) and *Sclerotium rolfsii* (54.1%). The isolate DMA-4 gave maximum mycelial inhibition of *Sclerotinia sclerotiorum* (81.6%). The isolates TV-1 and SMA-5 were found to be most effective against all the pathogens resulting in significant mycelial growth inhibition.

INTROGRESSION OF RECOMBINANT 1RSWR.1BL TRANSLOCATION AND RUST RESISTANCE IN BREAD WHEAT (*TRITICUM AESTIVUM L.*) CULTIVAR HD2967 THROUGH MARKER ASSISTED SELECTION

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Bread wheat is one of the world's main cereal crops with best grains for bread making. The 1RS.1BL translocation replacing short arm (1BS) of wheat chromosome 1B with short arm (1RS) of rye (Secale cereal L.) has been very widely used due to the genes for multiple disease resistance, abiotic stress tolerance and higher yield on 1RS. However 1RS.1BL has poor bread making quality due to the presence of Sec-1 locus coding for secalin proteins causing sticky dough. Recently recombinant 1RSWR.1BL translocation without Sec-1 locus has been developed. An elite wheat cultivar HD2967 with good bread making quality is highly susceptible to rust particularly stripe rust. The recombinant 1RSWR.1BL translocation and rust resistance genes Lr57 and Yr40 have been pyramided in HD2967 through marker assisted selection. The major QTLs for superior root traits for higher yield performance on telomeric end of 1RSWR.1BL tightly associated to powdery mildew resistance gene Pm8has been monitored through the linked marker. The improved BC2F4 derivatives of HD2967 with HMWGS Glu-A1 (2*) + Glu-B1 (17+18)+ Glu-D1 (5+10),1RSWR.1BL, Lr57+Yr40 and Pm8 is expected to have higher and stable yield with better bread making quality.

POSTER - 03

EVALUATION OF ONION GENOTYPES FOR QUALITY OF BULB DURING POSTHARVEST STORAGE IN AGRO-CLIMATIC CONDITIONS OF LADAKH

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Onion bulbs of long day genotypes viz. Red Cereole, Katarina Red 3, Katarina Red 7, Supreme, Cyrus, Lock Roy, Legend, Wall Brown, Brown Spanish and a Local Cultivar were stored for 50, 100, 150 days in controlled atmosphere 2±1ºC and 75±1% Relative humidity. The experiment was laid in randomized block design with three replications. The observations viz. dry matter, TSS, hardiness of bulb, total sugar, non-reducing sugar and reducing sugar loss in weight (%), Rotting (%) Sprouting (%), Sprout length (cm), Incident of black mold (%), Marketable bulbs (%) were recorded throughout the storage period. In all genotypes, dry matter, TSS, total sugar and non-reducing sugars, rotting (%) sprouting (%), sprout length (cm), incident of black mold increased gradually during storage. While hardiness/firmness of bulb, ascorbic acid, reducing sugar, physiological losses in weight, marketable bulbs were decreased gradually during storage period. Similar pattern of increase and decrease of all the observed traits were shown by all the genotypes. On the other hand at genotypic level, significant variation was observed for their storage potential. Genotypes Red Cereole, Katarina Red 3 and Katarina Red 7 were found to be superior with repect to many of the post-harvest traits and most importantly gave highest marketable bulb at the end of storage. So it is concluded that onion genotypes Red Cereole, Katarina Red 3 and Katarina Red 7 have good storage potential that could be stored overwinter at high altitude. So it is recommended to cultivate these if objective is to store onion to extend availability in temperate regions.

POSTER - 04

EFFECT OF DIFFERENT ROOTSTOCKS AND SOIL MANAGEMENT TREATMENTS ON GROWTH AND PHYSIOLOGICAL PARAMETERS IN NEW PLANTATIONS OF APPLE UNDER REPLANT CONDITIONS

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Apple orchards planted in late sixties in Himanchal Pradesh and North Western Himalayan region have shown symptoms of declining productivity as these plants have completed their economic life span. Due to limited land and choice of crops for smaller micro climatic niches and incomparable economic equivalence of other fruits with apple, orchardists are compelled to replant old apple orchard sites. There has been substantial increase in the importance of declining orchards which need to be changed. Therefore, standardization of suitable agro-techniques to combat replant problem in apple for better field survival rate and productivity under replant conditions for sustain ability of apple industry in the state. In present study there were 20 treatments comprising of four apple rootstocks i.e. Seedling, M.793, MM.111 and M.7 and five different treatments i.e. control, soil fumigation, Plant growth promoting *rhizobacteria* (PGPR), biocontrol and combined (Soil fumigation + PGPR + Biocontrol) with three replications. The pooled data over the years 2015 and 2016 reveled that M.793 rootstock had significantly maximum growth and vigour parameters, chlorophyll content and photo synthetic efficiency. Among the treatments, highest growth and vigour parameters, chlorophyll content and photo synthetic efficiency were recorded maximum in combined treatment. The interaction between rootstocks and treatments revealed that combinations of M. 793 combined treatment recorded maximum growth and vigour traits chlorophyll content, rate of photosynthesis, transpiration rate, stomatal conductance, water use efficiency and minimum stomatal resistance compared to other rootstocks and treatment combinations under replant situations, which can be exploited for the management of replant problem in apple.

BIOFORTIFICATION OF WHEAT FOR HIGH GRAIN MICRONUTRIENTS TO ALLEVIATE HIDDEN HUNGER

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Dietary deficiency of mineral micro nutrients mainly of iron (Fe) and zinc (Zn) known as *"hidden hunger"* affects a majority of global human population. Most of the elite bread wheat cultivars have poor mineral micro nutrient content 10-30 mg kg-1 while the daily requirement is 40-60 mg kg-1. The modern milling and processing further reduces the level of micro nutrients. Several wild *Triticum* and progenitor and non-progenitor *Aegilops* species possess two to three-fold higher grain Fe and Zn content than wheat have been utilized for transfer of various useful traits for disease resistance, micro nutrient content and quality improvement. Biofortification through wide hybridization and modern biotechnological approaches offers a cost effective and sustainable approach to biofortify cereal crops, for alleviation of micro nutrient deficiency. Several addition /substitution lines of group 2 and 7 chromosomes of related wild *Aegilops* species with high grain iron and zinc content have been developed. The linkage drag with low yield and harvest index is the major bottleneck for their exploitation. Precise transfer of useful variability from related wild species into elite wheat cultivars have been achieved by induced homoeologous pairing and radiation hybrid approach. Intron Targeted Amplified Polymorphic Primers (ITAP) have been developed for monitoring the fine transfers of selected metal homeostasis genes (YSL15, NRAMP5, IRT2, IRO3, NAM, NAAT1, NAS2, FRO2 and FRO7) from the donor *Aegilops* species in all the derivatives obtained from all the above approaches. During biofortification of wheat, up to 30-50% higher grain Fe and Zn have been achieved without any linkage drag.

STUDIES ON REPLANT PROBLEM IN PEACH [PRUNUS PERSICA (L.) BATSCH]

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The present investigation was conducted with an objective to identify biotic causes of peach replant problem. A survey of declining peach orchards was conducted and rhizospheric soil samples were collected from nine locations of District Sirmour, Himachal Pradesh. The process of isolation and identification of fungal pathogens yielded following biotic suspects *Aspergillus flavus, Aspergillus nidulanse, Aspergillus niger, Aspergillus oryzae, Penicillium chrysogenum, Penicillium expansum, Penicillium griseofulvum, Alternaria alternata, Acremonium byssoides, Acremonium strictum, Acremonium kiliense, Gilmaniella humicola, Geotrichum candidum, Chaetomium murorum, Phoma destructive, Fusarium oxysporum, Fusarium solani, Mycelia sterilia, Fusarium equiseti and Humicola grisea*. Some of these fungi have been previously identified while others represent new candidates. Subsequently Koch's postulates investigations will assess their possible roles in peach replant disease.

CHALLENGES THAT ENDANGER THE ECONOMIC VIABILITY AND ECOLOGICAL SUSTAINABILITY OF CROP DIVERSIFICATION IN HIMACHAL PRADESH

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POSTER - 07

The study was conducted in all the four zones of Himachal Pradesh with one representative district from each zone. All is, however, not well with the ongoing process of crop diversification in the State. Some impending challenges that endanger the economic viability and ecological sustain ability of cash crops were lack of irrigation facilities, small land holding, fluctuating price, malpractice by traders at the time of auction, inadequate storage facilities, soil erosion, loss of water holding capacity, loss of genetic diversity of planting material, lack of processing facilities and lack of proper knowledge about the application of insecticides pesticides and fertilizers. The cultivation of high value crops, have started showing increasing symptoms of unsustainability due to, among other things, falling soil fertility, erratic weather conditions and the emergence of numerous insects, pests and diseases. The adoption of same cropping sequence year after year has caused the loss of micro nutrients leading to deterioration in the overall soil health. The high incidence of diseases has led to an excessive use of agrochemicals that has given rise to a vicious cycle of falling productivity-more use of chemicals–further fall in productivity, and so on. This has not only escalated the production cost but has also affected environment and bio-diversity adversely. The markets yards do not have adequate space to house the produce brought for sale or are located at distant places.

STANDALONE SOLAR POWERED AUTOMATED ELECTRIC FENCING SYSTEM FOR FARMERS

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POSTER -08

In India, the ever increasing population trends from the past couple of decades have compelled policy planners at government level to ensure significant budgetary allocations in the agriculture sector for enhancing production. It has also been noticed that in several parts of the country, the farmers are forced to leave agricultural operations in their farm due to increased attack of stray animals causing damage to their crops. This paper highlights some aspects of design and development of a smart fence system to aid the farmers in combating the threat caused by wild animals effectively. The fencing system would be powered by solar energy during day time and during the nights it will be powered by a backup supply. This will allow the system to operate without becoming a burden on the power grid. To determine the location of the animal, a rotating camera will be placed in the centre of the field. The fences have been divided into 8 zones, allowing quicker detection of the animals. When an animal comes in contact with the fence, it would receive a jolt of electricity. If this doesn't deter the animal, then the next time a high intensity beam along with a pre recorded audio of either a human or dog will be used to scare the animal. Also a GSM module will be used to send a message to the farmer. This system will also allow the farmer to remotely disable it and would activate only when a stray animal approaches the fence surrounding the field.

PHYSICO-CHEMICAL CHARACTERISTICS OF KIWI FRUIT CULTIVAR ALLISON IN RESPONSE TO DEFICIT IRRIGATION AND IN SITU MOISTURE CONSERVATION

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The effect of different irrigation levels and in situ moisture conservation techniques on physico-chemical characteristics of kiwi fruit cv. Allison was investigated in this study. The experiment was performed in the experimental site of Department of Fruit Science, Dr Y S Parmar UHF, Nauni, Solan (H P) during the year 2011-12. This experiment was arranged in Randomized Block Design. Seven treatments viz., irrigation at 80 per cent (T1), 60 per cent (T2) and 40 per cent Field Capacity (T3), T2 plus grass mulch (T4) or black polythene (T5) and T3 plus grass mulch (T6) or black polythene (T7) were applied from March to October with three replications. The deficit irrigation and in situ moisture conservation treatments significantly influenced the fruit quality characteristics. The fruit size, fruit weight, titratable acidity and ascorbic acid content were found to be significantly higher in well irrigated vines (T1) followed by the vines irrigated at 60% FC plus black polythene mulching (T5). These fruit quality attributes were found to be most inferior in the vines irrigated at 40 per cent of FC. The DI increased the fruit firmness and TSS, total sugars, reducing sugar and non-reducing sugar contents of fruit over the standard irrigation and DI plus mulching treatments. Present findings clearly demonstrated that under moderate water stress condition, the use of black plastic mulch may be beneficial as it helped to conserve moisture under DI regime and resulted in fruit quality and production attributes comparable to those in well irrigated vines. It may also reduce the high irrigation requirement of kiwi fruit in areas where sufficient water is not available.

FIELD EFFICACY OF BIOPESTICIDES AND CLAY AGAINST FRUIT FLY (*BACTROCERA SPP.*) IN CUCUMBER

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Cucumber (*Cucumis sativus*) is one of the most important and popular vegetable crops grown in Himachal Pradesh. The major pests of cucumber are Bactroceracucurbitae and *B. tau. B. cucurbitaeis* recognized as the predominant species infesting cucumber. 30% to 100% fruits are damaged by the fruit flies under field conditions. Studies on field efficacy of biopesticides and clay against fruit fly (*Bactrocera spp.*) on cucumber were carried out during 2018. Efficacy of different test materials i.e. Neem kavach (1500ppm), Daman (*Beuveriabassiana* -1.0%W.P.) (1×109CFU/gm)and Clay were observed against fruit flies. Results revealed that maximum infestation was recorded in control (67%) whereas minimum (33.89%) infestation was found in cucumber plots sprayed with Daman (B. bassiana1×109) @ 1.5% followed by Neem kavach (34.44%) @ 4.0% and Clay (44%) @ 15%. Impact of different concentrations was also observed on the yield and the highest yield (145.63Q/ha) was obtained in 4% per cent Neem kavach (1500ppm) treated plots followed by Daman WP (*B. bassiana*) (112.15Q/ha) applied @1.5%.Under field evaluation, in all the treatments no phytotoxicity symptoms were observed. Based on these studies, Neem kavach (1500 ppm) and Daman WP can be included in the module for integrated pest management against fruit flies. *B. bassiana* based formulation also holds promise and can be evaluated further by increasing the concentrations. Clay needs to be further evaluated by using commercial formulation (Surround 50 WP) which has better adherence to surface and hence may prove better.

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INTROGRESSION OF RECOMBINANT 1RSWR.1BL TRANSLOCATION AND RUST RESISTANCE IN BREAD WHEAT (*TRITICUM AESTIVUM L.*) CULTIVAR HD2967 THROUGH MARKER ASSISTED SELECTION

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Bread wheat is one of the world's main cereal crops with best grains for bread making. The 1RS.1BL translocation replacing short arm (1BS) of wheat chromosome 1B with short arm (1RS) of rye (Secale cereal L.) has been very widely used due to the genes for multiple disease resistance, abiotic stress tolerance and higher yield on 1RS. However 1RS.1BL has poor bread making quality due to the presence of Sec-1 locus coding for secal in proteins causing sticky dough. Recently recombinant 1RSWR.1BL translocation without Sec-1 locus has been developed. An elite wheat cultivar HD2967 with good bread making quality is highly susceptible to rust particularly stripe rust. The recombinant 1RSWR.1BL translocation and rust resistance genes Lr57 and Yr40 have been pyramided in HD2967 through marker assisted selection. The major QTLs for superior root traits for higher yield performance on telomeric end of 1RSWR.1BL tightly associated to powdery mildew resistance gene Pm8has been monitored through the linked marker. The improved BC2F4 derivatives of HD2967 with HMWGS Glu-A1 (2*) + Glu-B1 (17+18)+ Glu-D1 (5+10),1RSWR.1BL, Lr57+Yr40 and Pm8 is expected to have higher and stable yield with better bread making quality.

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IMPORTANCE OF MARIGOLD FLOWER PRODUCTION TO INCREASE INCOME OF FARMERS IN HIMACHAL PRADESH

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In earlier days the cultivation of flowering plants was limited to landscape gardening and these were not grown as cash crop. Due to high margin of profit in flower cultivation now a day's floriculture business is flourishing. Today, floriculture is sermonized as most remunerative profession with much higher potential returns per unit area than that of some other horticultural crops. There is an increasing demand of flowers all over the world. Flowers are extensively used for decoration, making essential oils, perfumes and medicines, etc. In India, marigold is one of the most commonly grown flowers and is extensively used in religious and social functions. It is used as a loose flower, pot plant, bedding plant and also in great demand for making garlands. Its habit of free flowering, short duration to produce marketable flowers, wide spectrum of attractive color, shape, size and good keeping quality attracts the attention of flower growers. Besides its pristine uses, both leaves and flowers posses' medicinal properties against boils, carbuncles, ear ache and act as blood purifier, as a cure for bleeding piles, eye diseases and ulcers. The essential oil present in Tagetes spp. is used in perfume industry and world demand is about 10 tonnes annually. All parts of plant contains essential oil which has pronounced odour and act as repellent to flies and insects. Coloured pigment, known as lutein, extracted from flowers is also used in poultry feed to intensify the yellow color of egg yolks and broiler skin. Cultivation of marigold also helps in controlling nematode population in field and also improves soil porosity. So, cultivation of marigold is a supplement way to increase the income of farmers in Himachal Pradesh.

MOLECULAR BREEDING FOR IMPROVEMENT OF PROTEIN QUALITY OF LOCAL MAIZE CULTIVARS OF HIMACHAL PRADESH

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Maize (*Zea mays L.*) is a major cereal crop for livestock feed, human consumption and several industrial uses but it is deficient in lysine and tryptophan. Deficiency of these two amino acids causes some of the fatal diseases like pellagra, kwashiorkor etc and also malfunctions due to lack of proteins. Genotypes with opaque2 (o2) mutant and o2 modifiers having increased lysine and tryptophan level but without the negative effect of soft endosperm have been developed and known as 'Quality Protein Maize' (QPM). In this study, Opaque2 gene was transferred from VQL1 and VQL2 to Local White Cultivar(LW) and Local Red Cultivar (LR) of Himachal Pradesh using linked molecular marker umc1066. The kernels of homozygous o2o2 BC2F3:4cobs of LR and LW were screened for opaqueness under transmitted light. The opaque2 allele is recessive and the endosperm modifiers are polygenic. The cobs with less than 25% opaqueness were selected. Nearly 50 o2o2 homozygous BC2F4 progenies of each of LW and LR were phenotypically screened in 2018 for maximum recovery of recurrent background and crossed in all possible combinations to reconstitute their original population structure for further multiplication and release. The kernel biochemical analysis for enhanced tryptophan-lysine amino acids under progress.

INDIGENOUS ENTOMOPATHOGENIC NEMATODES AGAINST INSECT PESTS – AN ALTERNATIVE APPROACH FOR CROP PROTECTION

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Every year insect pests are responsible for the substantial loss in agriculture and to control their population has become a big challenge for the farmers. To conquer this big challenge numerous chemical insecticides have been developed, applied and achieved high degree of success. But application of insecticides results environment pollution, develops resistance inside host insect and also causes side effects on human health due to the residue of these insecticides on the produce. Entomo pathogenic nematodes (EPNs) naturally inhabits in the undisturbed soil providing protection for plants against various insect pests. These unique nematodes have symbiotic bacteria residing in their gut, which enhance its role in integrated pest management (IPM). This recent research has explored occurrence and distribution of these indigenous EPN species in the 5 districts (Kullu, Mandi, Shimla, Sirmaur and Solan) of Himachal Pradesh and also their bio-potentiality against (pod borer) in laboratory condition. In total, 131 soil samples were collected from 45 localities of 5 districts. 20 samples collected from Kullu, Sirmaur and Solan districts were found to be positive for EPN population. *Heterorhabditis bacteriophora* and *Steiner nemafeltiae* were isolated from the fruit orchards. In vivo culture of the EPNs was done using Corcyra cephalonica and mellonella as bait in *sectunder* laboratory condition. The pathogenic effect of the indigenous H. bacteriophora was also evaluated against *H. armigera* in petri plates.

INFLUENCE OF DIFFERENT WEATHER CONDITIONS ON PERFORMANCE OF APIS MELLIFERA COLONIES

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Honeybees play an important role as pollinator thereby increasing productivity of various cereal crops, fruits and vegetables. Thus they indirectly contribute to improve the national economy. Honeybees feed upon the male germ plasma (pollen)and juices(nectar) from the flowers and fruits. Honeybees can be managed in better way only after having proper knowledge about the behavior under different weather conditions. The weather conditions affect the performance and productivity of honey bee colonies by various means. In the current study, efforts were made to study the behavior of honey bees under different weather conditions. Observations were taken on twenty colonies of *Apis mellifera* on sunny day, cloudy day and windy day in relation to pollen intake, foraging speed and aggression etc. It was found that pollen intake and foraging activity of bee colonies were maximum on the sunny day whereas values of all these parameters were on lower side on the cloudy day and windy day respectively. Aggression in behavior was observed maximum on windy day whereas bees were found less aggressive on cloudy and sunny day respectively. It can be concluded at the end of study that honey bees performed best in bright sunny day as compared to windy and cloudy day.

EFFECT OF GROWTH HORMONES ON INDIRECT ORGANOGENESIS FOR ALTERNATIVE AND RAPID IN VITRO PROPAGATION OF STEVIA REBAUDIANA

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Stevia rebaudiana, commonly known as stevia, is an economically important sweetening medicinal herb species from the family Asteraceae. Although this plant is native in Paraguay, many countries including India has started to cultivate this plant in large commercial scale. In vitro propagation of stevia is needed to produce it in large amount to meet the industrial demand along with supplementation of those plants for high content of medically important secondary metabolites so this study is carried out to develop rapid micro propagation of *Stevia rebaudiana* by using indirect organogenesis to develop new phenotypes or genotypes. Leafs and nodes explant were collected from greenhouse grown plants of Stevia followed by sterilization with 0.1% HgCl2 and 0.5% Bavistine. After sterilization explants were inoculated on 8 MS media for callus induction with different Concentration of auxin and cytokines. MS media supplemented with IBA (0 to 3.5mg), IAA (0 to 3mg/l), Kinetin (0 to 3mg/l) and TDZ (0 to 3mg/l) in different concentration and combination were tested. MS medium with1mg/l kinetin and 3mg/l IBA showed 90% of callus induction from leaf explants in 17 days of culturing. Calli were subcultured for 6 times on same medium for 3 weeks incubation under optimized culture conditions. Calli were cultured on regeneration media and 3-4 microshoots were regenerated on MS medium supplemented with Kinetin (1mg/L) + IBA (3mg/L) in 20 -25 days of incubation. These shoots were further subculture to develop into plantlet. In case of nodal segments both direct and indirect organogenesis was found. Further studies would be carried out to extract secondary metabolism, sativoside and rebaudioside using HPLC and GCMS techniques so this developed protocol will provide of quality richherbs for industrial usage.

APPLICATIONS AND IMPACT OF ARTIFICIAL INTELLIGENCE IN AGRICULTURE FOR RURAL DEVELOPMENT IN AFRICA

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In rural areas throughout the world, agriculture represents the predominant land use and a major component of the viability of rural areas. With more than 60% of its 1.166 billion people living in rural areas, Africa's economy is inherently dependent on agriculture. More than 32% of the continent's gross domestic product comes from the sector. However, agricultural productivity still remains far from developed world standards. Over 90% of agriculture depends on rainfall, with no artificial irrigation aid. Individual agricultural activities on the farm takes effort, for example planting, maintaining, and harvesting crops need money, energy, labor and resources. The techniques used to cultivate the soil are still far behind from what has been adopted in Asia and Americas, lacking not only irrigation, but also fertilizers, pesticides and access to high-yield seeds. Artificial Intelligence is emerging as part of the solutions towards improved agricultural productivity. In this paper we explore applications of artificial intelligence to provide modernize techniques about the farming process. Based on our research, the most popular applications of artificial intelligence in agriculture appear to fall into three major categories: Agricultural Robots, Crop and Soil Monitoring, Predictive Analytics.

DOUBLING FARMERS' INCOME THROUGH THE CULTIVATION OF AROMATIC CROPS

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Plants are essential for humans since the origin of the planet in terms of goodness that we are receiving from them. One such important category in the plants is fragrance bearing plants. Over the last decade, there has been a significant increase in industrial demand of essential oils/aroma chemicals, and an expansion in the range of uses of essential oils, because of their application in the food, flavours, cosmetic & pharmaceutical industries. Market trend shows that the essential oils business will touch USD 11.19 Billion by 2022, at a CAGR of 8.83% from 2017 to 2022. Essential oil market in India is expected to witness higher growth rate in the next five years. Land holdings of the farmers in Himachal Pradesh are small and nowadays most of them are facing problems of wild animals' menace and weather vagaries, which are keeping them on toes. Hence, in order to come over these problems, it is essential that the farmers diversify their farming and adopt crops, which avoid such conflicts. CSIR-Institute of Himalayan Bioresource Technology, Palampur, HP, a constituent laboratory of Council of Scientific and Industrial Research, has launched a mission "CSIR AROMA MISSION" where farmers are encouraged through training and awareness programs to cultivate suitable aromatic based on agro climatic conditions of the area in unutilized and barren land where planting material and distillation facility is provided to the farmers' clusters. In the past one year, a total of 625 acres land has been covered under the promising aromatic crops viz., *Tagetes minuta, Rosa damascena, Cymbopogon sp., Valeriana jatamansi, Artemisia maritima* and *Dracoce phalum heterophyllum* till date. *Tagetes minuta* has turned out to be a golden crop as it could generate a net income of Rs. 1.5 lakhs/ha to the farmers in a season. Cultivation of these high value aromatic crops will benefit the hilly farmers and help in enhancing their income as compared to the traditional crops.

DOCUMENTATION OF MEDICINAL USES OF PLANTS IN GHARYANA

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The present study was documented on traditional knowledge of medicinal plants used by local people or traditional healers in Gharyana village of Shimla district, Himachal Pradesh. The plants were identified with the help of herbaria, floras and manuals on Himalayas and Himachal Pradesh. The knowledge was collected from local healers or Vaidya and from the literature. The study provides a brief knowledge about the traditional uses of ethno-medicinal plants and their parts for the treatment of many diseases like infections, respiratory disorders, diabetes, antidotes, cancer etc. All most all parts viz. leaves, seeds, roots, bark, twig, fruits, bulbs, oil, all the ground parts and whole plant were used against different diseases. The present study in Gharyana village reveals 57 medicinal plant species belonging from 51 genera and 34 families. The present study was therefore undertaken with the objective to identify some of the available medicinal plants and their probable use by the local people. Due to lack of knowledge and interest among the new generation, there is possibility of losing the wealth of traditional knowledge in the area, thus traditional practices of medicinal plants are vanishing fast. Thus there is need to preserve this wealth, therefore, it was aimed to document indigenous uses of medicinal plant of Gharyana village. The medicinal values of these plants in this paper are also confirmed by the WHO that herbal medicine serves the health needs of about 80% of world populations, especially for millions of people in the vast rural areas of developing countries.

INFLUENCE OF WEATHER PARAMETERS ON GROWTH AND YIELD OF DIFFERENT VARIETIES OF RADISH (RAPHANUS SATIVUS LINN.) UNDER ALLAHABAD AGRO CLIMATIC CONDITIONS

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Environment is the aggregate of all external conditions which influence growth and development of plants. Generally, crops are not profitable unless they are adapted to the region in which they are produced. An experiment was conducted at the Research farm, School of Forestry and Environment, SHUATS, Allahabad during Rabi season 2014-2015 to study the effect of weather parameters and sowing dates on three different varieties of radish. The experiment was laid out in Randomized Block Design (3x3 factorial) and replicated thrice. Seeds of the cultivars viz., Hill queen, Mino early and S.S11 were sown on three different dates i.e. Oct 7, Oct 17 and Oct 27. The growth characters of radish viz. plant height, root length, and yield was influenced by variable weather and variety under different sowing dates. Sowing time showed significant effect on growth and yield of radish. The findings of the study is revealed that the significantly highest plant height, root length and root yield was found in 3rd sowing i.e. Oct 27. It was observed that among all the varieties Mino early performed best with highest root yield about 13.10 t/ha. Root yield and phase wise prevailed weather relationship showed that, there exists significant negative association of bright sunshine hours, Tmax and Tmin while RH showed significant positive association during emergence phase to maturity phase. Among different stages, the maturity stage was most vulnerable with increase temperature because, increased temperature at this stage may lead to yield reduction. Combined effect of sowing dates and varieties showed that sowing on Oct 27, all varieties performed well in respect of yield and yield components. Mino early was found to be the best in respect of quality judged.

INTRODUCTION OF AROMATIC CROPS FOR SOCIO-ECONOMIC DEVELOPMENT IN RURAL AREAS OF HIMACHAL PRADESH

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The farmers of the State are facing problem of low agricultural income from traditional farming and has been forced to migrate to cities for earning their livelihood. Beside this, the menace of monkeys and wild animals are more prevalent which damage the grain crops/vegetables. Thus, there is an urgent need to introduce new crops, which have higher economic returns and are not being affected by weather vagaries and monkey/animal menace. Being hilly State with varying agro climatic conditions in different zones, cultivation of aromatic plants would be beneficial to Himachal's rural economy. There is dearth of quality planting material of aromatic crops and lack of awareness about these aromatic plants among the rural masses. Therefore, it is important to spread awareness and enhance the area under these crops to strengthen farming with improved varieties/cultivars and associated agro-technologies. CSIR-IHBT has developed quality planting material, agro and process technology and high yielding varieties of important medicinal and aromatic plants. These crops can be grown as inter crops in orchards. Monkeys and wild animals do not damage theses aromatic crops. So cultivation of these crops can prove to be a boon to the hilly farmers. Cultivation of aromatic crops viz., wild marigold (*Tagetes minuta*), mushkbala (*Valeriana jatamansi*) and rosemary (*Rosmarinus officinalis*) has been initiated at farmers' field in Ghat Panchayat of Seraj Block of Mandi district of Himachal Pradesh. Farmers were made aware about the cultivation and processing of these crops through training programs and field demonstrations. These aromatic crops can generate net revenue to the tune of Rs. 1.5-2.0 lakh per ha per year, at least twice than the field crops under the similar situation.

NURSERY DISEASES OF VEGETABLES AND THEIR BIOLOGICAL CONTROL

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Mid hills of Solan and Sirmour districts of Himachal Pradesh are suitable for the off-season vegetable production. Tomato and bell pepper are major off season crops that are grown over 12000 ha area in these two districts only and generate approximately 350 crore rupees business. The nursery for these crops are raised during March to April and May to June. During this period, the environmental conditions remains favourable for the development of various soil borne diseases like damping-off, root rot and wilts. During surveys of vegetable nursery growing areas 3-21 percent disease incidence was recorded. Diseased plant samples and soil from disease and healthy nursery were collected. *Pythium ultimum*, *Rhizoctonia solani* and *Fusarium* spp. were found to be associated with these samples. Among various microflora isolated from soil samples two isolates of *Trichoderma* (*Tichoderma viride* and *T. harzianum*) and two bacterial isolates (B1 and B2) have shown antagonistic activity against these pathogens during the preliminary studies.

UPLIFTMENT OF SOCIO-ECONOMIC STATUS OF RURAL PEOPLE OF LAGGA VILLAGE THROUGH NATIONAL INITIATIVE ON CLIMATE RESILIENT AGRICULTURE (NICRA) PROJECT

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Agriculture is the main occupation of the people of Himachal Pradesh and has an important place in the economy of the State. The economy of Chamba district is mainly agrarian as most population of the District is directly dependent on agriculture and related activities. Krishi Vigyan Kendra, Chamba is implementing National Initiative on Climate Resilient Agriculture (NICRA) project in Lagga village of Chamba district of H.P. NICRA Village Lagga in district Chamba lies in elevation ranging between 1500-2000 m height. The average rainfall is about 1100 mm annually. During winters, this area receives moderate to high snowfall. The NICRA village faces climatic variability like water scarcity, drought, cold waves, hailstorms and erratic rainfall. The important interventions carried out to address these vulnerabilities are divided into four modules like natural resource management, crop production, livestock and institutional interventions etc. The NICRA village has single cropping system. But after NICRA project maize, cabbage, cauliflower, apple, beans and potato are major crops grown in this area. At present there are 11 water harvesting structures, capacity ranges from 60,000-80,000 liter, helps the farmers to irrigate various crops in the whole village. The construction of poly house in the village started in the year 2011 when NICRA project started in the village in convergence mode with department of Agriculture. At present there are 30 number of protected structures/polyhouse size 1300 sq m in the village growing vegetables in protected conditions. Average yield of capsicum under protected cultivation was realized up to 545Q/ha with 3.28 BCR. Cultivation of vegetable crops in the area involved estimated income of Rs 5-6 lakh per farmers in single cropping season in the village. Spur type apple cultivation has been introduced on about 20 hectare in the village. Inter cropping (Apple+ Cabbage /cauliflower) is also one of the major and successful interventions in the NICRA village which is also being adopted by farmers of other villages in the district with same climatic conditions. Before NICRA, only 0.7 ha area was under cabbage and cauliflower and after NICRA, 23.5 ha area was taken up by these two crops. By adopting these interventions of inter-cropping and off-season vegetable cultivation, farmers of NICRA village were able to increase their socio-economic status and getting high net return per year. Demonstration on crop diversification with the introduction of spur type variety of apple was successfully conducted over an area of 20 ha. Before NICRA, only 5.12 ha area was under apple cultivation. The KVK organized 120 awareness and training programme during first phase of NICRA (2011-2017) project in which 600 farmers were trained. Exposure visit of sixty (60) farmers were conducted two times to CSK HPKV Palampur HP& PAU Ludhiana Punjab. NICRA project is now playing an important role in improving socio-economic conditions of rural population of Lagga village.

DEVELOPMENT AND NUTRITIONAL EVALUATION OF SORGHUM (*SORGHUM BICOLOR L.*) INCORPORATED FUNCTIONAL FOODS

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The experiments pertaining to the present investigation were carried out to study the nutritional composition of five cultivars of sorghum (Uoorja, SSV84, SSV 74, CSV19SS and CSV24SS) and incorporation of flour of highly nutritious cultivar for preparation of functional food products. Nutritional evaluation of five cultivars concluded that sorghum is a rich source of total polyphenolic contents (TPC), crude fat, crude fibre, and mineral contents. The highly nutritious cultivar Uoorja with protein content of 9.49%, crude fibre 2.82%, TPC (0.820 mg GAE/100g) and minerals such as iron (41.06 mg/kg), copper (7.59 mg/kg), zinc (37.08 mg/kg) and manganese (13.70 mg/kg) and highest popping capacity was selected for development of functional foods. Effect of incorporation of sorghum at different concentration was studied in terms of enhancement of nutritional quality and acceptability of different levels of sorghum flour determined by organoleptic evaluation of processed products. Organoleptic evaluation of products concluded that cookies were desirable only up to 75% while bread and noodles were moderately desirable only up to 15 and 30% replacement of wheat flour with sorghum flour, respectively. Popped sorghum in coronated ladoo were acceptable up to 75% replacement of popped amaranth with popped sorghum. There was a significant increase in ash, crude fat and crude fibre contents of products with increasing the level of sorghum flour in processed products which was mainly because of higher ash, crude fibre and fat content of sorghum flour than that of wheat flour. There was decrease in loaf volume of sorghum supplemented bread with increase in level of sorghum flour. It might be due to dilution effect of non-wheat flour on wheat gluten.

EX SITU CONSERVATION OF MEDICINAL PLANT SPECIES UNDER CSIR-PHYTOPHARMACEUTICAL MISSION

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Medicinal plants are not only a major resource base for the traditional medicine and herbal industry but also provide livelihood and health security. The global herbal trade of medicinal plants has been growing exponentially with an annual growth rate of 15% and it is likely to touch a scale of five trillion US$ by 2050. Increasing demand of medicinal plants resulted in the overexploitation and indiscriminate collection from the wild for domestic consumption and for export. As a result, the natural sources are rapidly depleting. Recognizing the high demand and exploitation of plant species, Council of Scientific and Industrial Research launched a “CSIR Phyto pharmaceutical Mission” which aims to improve the availability (through cultivation) of such medicinal plants which are in high demand by global and domestic industry. The major targeted crops of CSIR-IHBT under the mission are Picrorhiza kurroa, Inularacemosa, Valeriana jatamansi, Trillium govanianum, Podophyllum hexandrum, Fritillaria roylei and Saussurealappa etc. We have developed large scale good planting material of these medicinal plants and attempts are being made to ex situ conservation of these plants at different locations. The quality planting material is distributed to the farmers in order to meet the demand of industry and raise the economy of farmers. The demonstration plots of these plants have been maintained at farmer's field at village Shansha, Tehsil Keylong, L&S, village Supa, Tehsil Bharmour, district Chamba and village Chirgaon district Shimla in Himachal Pradesh.

ADDRESSING AGRICULTURAL CHALLENGES OF THE MID-HIMALAYAN MARGINAL FARMERS LIVING AROUND THE VILLAGES OF IIT MANDI

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We focused on understanding the agricultural challenges of mid-Himalayan farmers around IIT Mandi that needs urgent addressing. Based on our survey of about 50 farmers from 20 villages, we identified the following predominant challenges the local farmers face - hilly terrain, small land holdings, monkey and wild boar menace, lack of regular source of irrigation because of varying altitudes in hilly terrain rendering the agriculture to be predominantly rainfed, unawareness of several government schemes, direct link with the market etc. In order to address the issues, we undertook the following interventions and are testing its impact - a) We identified crops (*Tagetes* and Rose) that suits the region and have economic potential for field trials in this phase. b) Organized workshops, meetings (with industries and govt. agencies) and exposure visits (to IHBT) to sensitise the farmers about the opportunities of aromatic crops and herbs c) We established a farmer-academia-industry network at IIT Mandi which includes approximately 50 farmers, scientists (from IHBT Palampur and IIT Mandi) and local industries (Natural Biotech Products, Baggi and Kahna Aromatics, Kullu) for the buy-back, ensuring sustainable agriculture in the current scenario. We are also closely working with Enabling Women of Kamand (EWOK) group of IIT Mandi. Currently, about 20 farmers (including women farmers) have planted tagetes that we are closely monitoring and providing further support to facilitate industry buy-back of their crop for aromatic oil production. In the process we are learning about the challenges and exploring opportunities that can improve the livelihood of mid-Himalayan farmers. Current status will be highlighted in the presentation.

FROM WASTE TO WEALTH: SOLID WASTE MANAGEMENT FOR ENHANCEMENT OF AGRICULTURAL PRODUCTIVITY IN HIMACHAL PRADESH, INDIA

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Management of solid waste poses a great challenge and is a global problem being faced by all the developed as well as developing countries. The population living in cities is rising worldwide which has led to the accelerated solid waste generation. In major Indian cities, an enormous amount of organic waste is generated from day to day activities which remain unutilized and is either burnt or dumped in open sites creating several health and environmental hazards. In the present paper, the aspects of solid waste management pertaining to the agricultural application in Himachal Pradesh are reviewed. Himachal Pradesh generates around 345 tons of waste per day out which 50% accounts for the biodegradable matter. Instead of disposing this organic waste, it can be effectively recycled and used as compost to meet the nutritional requirements of the crops. Many studies have shown that the effect of using the chemical and synthetic fertilizers have led to decrease in the nutritional value of the crops. Excessive use of chemical fertilizers has not only proven to become expensive but also they get accumulated in the soil and causes bio-magnification leading to various health and environmental menaces. The application of the treated organic waste as nutrient supplier, fertilizer, compost etc. will be helpful in promoting its effective use in agricultural enhancement but will also be useful in solving the problem of disposal. Still, the effects of the waste materials in terms of the presence of heavy metals, organic pollution etc. must be taken into account.

POPULATION STRUCTURE OF RHIZOBIA AND RHIZOSPHERE MICROBIAL COMMUNITIES ASSOCIATED WITH PEA CULTIVATED IN DIFFERENT AGRO-CLIMATIC REGIONS

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Field pea (*Pisum sativum L.*) is a premier winter season grain legume crop widely cultivated and consumed throughout India. With the hypothesis that multiple species and sub-lineages of rhizobia are associated with pea cultivated in various agro-climatic regions of India, pea root-nodule samples were collected from different parts of India, including the trans-Himalayan and Western Himalayan region. Preliminary identification were performed by using MALDI-TOF MS and in-house mean spectra profile database of rhizobia followed by 16S rRNA gene sequencing of selective isolates. Results of both techniques confirmed that all isolates belong to genus Rhizobium. MALDI-TOF MS based analysis could differentiate the closely related sub-lineages of Rhizobium leguminosarum. The phylogenetic analysis based on concatenated sequences of atpD and recA genes indicated that the Rhizobium bangladesh ense was the most dominating species in the majority of the agro-climatic regions of India, where as the pea rhizobia from the trans-Himalayan regions belong to *Rhizobium leguminosarum* and *R. laguerreae. Rhizobium* vallis was explicitly recorded in the samples collected from Eastern Himalayan region and *R. aegypticum in* few sites of Western Plateau and Hills region. The presence of different lineages of pea rhizobia in the different region leads us to speculate the possible role of rhizosphere community structure in the selection of specific genotypes. Rhizosphere community analysis of 26 representative samples indicated the presence of ~730 bacterial genera. Proteobacteria, Bacteriodetes, Firmicutes, Actinobacteria and Verrucomicrobia are the most dominating phyla in the rhizosphere of pea cultivated in different agroclimatic regions of India. At genus level variation was observed in the abundance of *Agrobacterium, Bacillus, Clostridium, Devosia, Pseudomonas, Rhizobium* and *Sphingo bacterium* across the samples from Western Himalayan Region, Trans-Gangetic Plains Region, Western Plateau and Hills Region. Overall, we found multiple species of Rhizobium specific to different regions and Rhizobium bangla deshenseas widespread pea rhizobia in the majority of agro-climatic regions of India.

ISOLATION AND CHARACTERIZATION OF PLANT GROWTH PROMOTING RHIZOBACTERIA (PGPR) AND THEIR EFFECT ON SEED GERMINATION, PLANT GROWTH PROMOTION AND GRAIN YIELD OF WHEAT IN MID HILL ZONE OF HIMACHAL PRADESH

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Wheat (*Triticum astivum* L) a members of Graminae family. Currently, India is second largest producer of Wheat in the world after China with about 12% share in total world Wheat production. Wheat grows in temperate climate and it is staple food for 35% of world's population. Root colonizing bacteria (rhizobacteria) that exert beneficial effect on plant development *via* direct or indirect mechanisms have been defined as plant growth promoting rhizobacteria (PGPR). Keeping in view the scare knowledge of the composition of bacterial diversity associated with plant roots& their role in the growth promotion of wheat, present study has been undertaken. Present study reveals, the diversity of bacterial isolates from soil under wheat cultivation in Solan and Sirmour districts of Himachal Pradesh. Total Seventy rhizobacterial isolates were isolated from different locations of both the districts of which some were rainfed and some were irrigated. The characteristics of the bacterial isolates were determined using the colony characteristics, as well as biochemical properties. These isolates were then tested *in-vitro* for specific PGP attributes, such as production of siderophore, P-solubilization, ammonia, HCN and plant growth regulators. After screening for PGP attributes *in-vitro* conditions. Out of seventy PGPR isolates three isolates (Kn-7, De-21 and Dh-7) were found hyper potential PGPR. These three isolates had shown maximum PGP potential *in- vitro* conditions and thus were selected to preparation of bio formulation for the seed germination, plant growth promotion and total grain yield of wheat crop in the field experiment at farmers field in Solan district of Himachal Pradesh.

POSTER - 30

INNOVATIVE INTERVENTIONS IN NURSERY PRODUCTION TECHNOLOGIES OF IMPORTANT TEMPERATE FRUIT PLANTS FOR QUICK MULTIPLICATION AND REGULAR SUPPLY

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At present, most of the temperate fruit plants are being multiplied conventionally through grafting and budding onto either seedling or clonal rootstocks. This technique of plant propagation takes almost two years to attain saleable size i.e. from seed sowing to raise seedlings and further grafting or budding onto them. However, with the advancement in propagation technologies such as tissue culture, has emerged as an option to reduce this problem and to ensure regular supply of fruit plants to the growers. But this method of plant propagation (tissue culture) is highly precise and requires trained persons. Moreover, the protocol for *in-vitro* multiplication of most of the fruit plants has not been standardized yet. The other advance methods for quick multiplication of fruit plants are micro-grafting/shoot tip grafting and epicotyl grafting etc. but the commercial use of such technology in fruit plants is limited. Therefore, the studies on stenting i.e. direct grafting and rooting and summer grafting techniques were conducted at CSKHPKV, Palampur on cherry, pear, apple, apricot, peach, plum and kiwi under polyhouse conditions with the objective of reducing the nursery raising duration of these fruit plants. When plum cultivar Meriposa was grafted onto non-rooted cuttings of Pixy (clonal rootstock), the grafting success was recorded as high as 94.19 % with the production of saleable plants up to 90 %. Similarly, in sweet cherry, application of IBA at 5000 ppm to the non-rooted cuttings of clonal rootstocks was found to be the best treatment as it increased root formation and subsequent growth of stentlings. Stentlings attained saleable height at the end of growing season with well-developed roots. Pear cv. Baggugosha on Qunice, apple on MM-111, apricot on Pixy plum and peach on Florda guard responded satisfactorily to stenting method of plant multiplication. In another intervention, the Scarlet Gala cultivar of apple, when grafted onto seedling rootstocks during active growing season (May, June and July) on different dates recorded 100 per cent bud take success with proper wound healing of graft unions. The plants grafted on June 12 attained maximum height (71.17 cm) at the end of growing season with well developed root system and healing of graft unions. From these interventions it can be concluded that, the simultaneously grafting and root development was not only possible in non-rooted cuttings of Pixy plum, colt cherry, MM-111, Flordaguard and cuttings of kiwi but this method can be commercially adopted to multiply these plants under polyhouse conditions in mid-hill areas of HP. Similarly, apple can be grafted during active growing season under poloyhouse conditions and the nursery stocks can be produced in one season. Further, these rapid propagation methods are very important when plant materials are limited due to the long nursery production duration and dramatic expansion in acreage under these fruit crops in the state and to ensure regular supply of planting materials to the stakeholders.

POSTER - 31

POPULATION PARAMETERS OF ROOT-KNOT NEMATODE (*MELOIDOGYNE INCOGNITA*) ON CAULIFLOWER, BRASSICA OLERACEA VARBOTRYTIS

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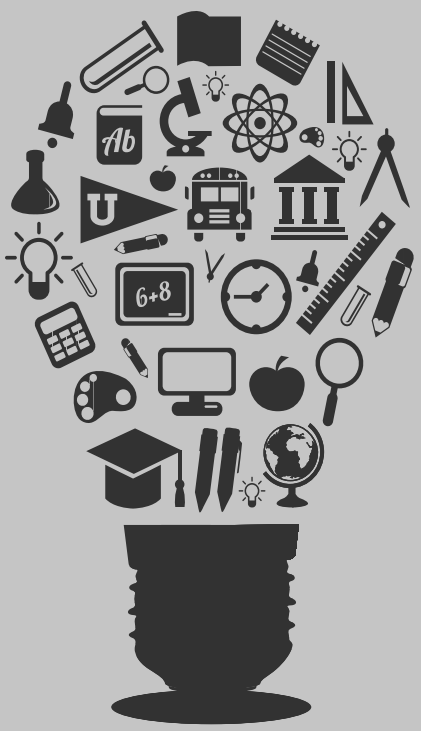
A life fertility table for M. incognita was developed at 25+1°C on cauliflower seedlings. The gross reproductive rate (GRR) of the nematode was 348.69 eggs/female, while the net reproductive rate (Ro) was 62.65 ♀s/♀ meaning thereby that species had capacity to multiply on cauliflower. The innate capacity for natural increase (rc) on the respective host was 0.19 eggs/ ♀/ day with approximate generation time (Tc) 21.61 on cauliflower. The true intrinsic rate of increase (rm) was found to be 0.19 eggs/ ♀/ day on cauliflower. The time to complete one generation by the nematode on cauliflower was 21.61 days. The species took 3.59 days to double its population on cauliflower. The value of the finite rate of natural increase (λ) on was found to be 3.59.

BOTANY ZOLOOGY & ANIMAL HUSBANDRY 02



CHANGES IN HAEMOGLOBIN CONCENTRATIONS IN UTERINE TORSION AFFECTED COWS AND THEIR CORRELATION WITH DURATION OF THE CONDITION

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Uterine torsion is an emergency condition affecting the large ruminants and a delay in taking corrective action can lead to severe monetary burden on the farmer resulting from consequences ranging from failure of the animal to conceive further and even causing death of animal each of which has a toll on financial condition of the farmer.

The following study was conducted to study the haemoglobin (Hb) changes during uterine torsion in 7 cows presented in teaching veterinary clinical complex, DGCN College of Veterinary and Animal Sciences, Palampur (HP) with the history of completion of gestation, colic symptoms and resorption of udder and subsequently diagnosed to be suffering from uterine torsion. Five cows that were presented within 24 hrs of uterine torsion were subjected to Schaffer's method of detorsion, whereas, 2 cows presented late for treatment (after > 72 hrs) had to be subjected to caesarean section. Blood samples were collected from each cow in EDTA vacutainers and Hb concentration was recorded with the help of auto-haemotology analyser.

Freshly presented cows had 10.04±0.94 and 10.42±0.42 g% mean Hb concentrations before and after the manoeuvre, respectively and responded successfully to the treatment. Whereas, cows presented late for treatment had mean Hb concentration 6.10±0.69 and 5.50±0.80 g % before and after surgery, respectively, and could not recover.

It could be concluded from the study that duration of torsion had a direct impact on the haemoglobin concentrations of the animal and subsequently fate of the affected animals.

TREMATODE INFECTION STATUS IN SNAIL POPULATION OF DESERT VILLAGE WATER SHEETS

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Rajasthan, the desert or arid State of India is well known for its tough and inhospitable environmental conditions. District Bikaner, where the study was carried out is known as semiarid region of this State. Scarcity of drinking water is the major issue for the communities (man, animals and plants) inhabiting this region. Fresh water bodies of this region are small and ephemeral in nature, and some species of Class Gastropoda present in these water sheets, acts as host for trematode parasites. These parasites cause serious infection and even causes mortality in dairy animals and create economic burden on stock holders. A year round investigation was carried out to study the trematode infection status in different snail population of two water bodies i.e. Nal village pond and Darbari village pond of district Bikaner. The study reveals that three different species of snail (*Indoplanorbisexustus, Gabbiaorculas* and *Digniostomapulchella*) were recorded in Nal village pond, while *Indoplanorbisexustus, Gabbiaorcula* and *Lymnaea acuminate* were recorded in Darbari village pond. Infection were only found in two species of Nal village pond i.e. *Indoplanorbi sexustus* and *Gabbiaorcula,* and percentage of infected snail was comparatively high in three monsoonal months. Nil infection were recorded in Darbari village pond snail population during entire study period.

ORAL- 03

CULTIVATION OF OFFSEASON LILIUM FOR UPLIFTMENT OF RURAL ECONOMY IN TRIBAL AREAS OF HP

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Lilium is a high value bulbous floriculture crop, which has a fourth rank in the international flower trade. CSIR-IHBT has developed package of practices on Lilium cultivation. Normal season of growing lilies is from October to April. From July to November, despite demand, there is no supply of lilium flowers in the market. CSIR-IHBT first introduced lilium cultivation in Lahaul for off-season flower production. Lahaul is known for off-season cash crops like potato, peas, cabbage and cauliflower. The duration of this crop is 4 months. As per the third party evaluation by National Productivity Council, Delhi, the employment generated through Lilium plantation from 5.8 hectares covered by 14.5 lakhs lilium plants is 17,400 man days per year. Net returns from sale of Lilium and bulbs per year was Rs. 116 lakhs. Comparative economics of Lilium with Pea and Potato in Lahaul & Spiti showed that the net return received by them was about 5 times higher than that obtained from Pea while about 6.67 times more net returns was obtained as compared to Potato crop. As a result of increased income from lilium cultivation, farmers have been able to increase their spending. The highest increase has been in case of assets, which is 24.55% followed by children education (20.51%), housing related expenses (17.96%) and clothing related expenditure (11.93%).

ORAL- 04

FOLLICULAR DYNAMICS FOLLOWING VARIOUS TREATMENTS IN POST-PARTUM DAIRY COWS

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The present experiment was conducted to study the effect of $PGF_2\alpha$ and antibiotic treatment on follicular dynamics in post-partum dairy cows. Twenty four lactating Jersey cross-bred dairy cows at University Dairy Farm, Himachal Pradesh Agricultural University, Palampur (32.6^{o}N, 76.3^{o}E, altitude 1290.8 m), India, were divided into three treatments (PG8, PG25, antibiotic) and a control group. Follicular dynamics was studied by examining follicular growth between successive examinations, mean number of follicles (small, 2-6 mm; medium, 6-10 mm and large,>10 mm),first ovulation and regression of corpus luteum of previous pregnancy in post-partum dairy cows. On transrectal ultrasonography at 3-day interval, increase in follicular size was more in cows in PG8 group (3.04±0.38 mm) as compared to other treatment groups. It was also found that mean number of large follicles present during the entire study were significantly less ($p<0.05$) in PG8 group (0.29±0.12) as compared to PG25 (0.64±0.19), antibiotic (0.57±0.17) and control group (0.71±0.16). Mean time required for the first post-partum ovulation was significantly lower ($p<0.05$) in PG8 group (23.17±2.81 days), while in PG25, antibiotic and control groups, this duration was 34.83±1.17, 33.67±2.33 and 33.20±2.80 days post-partum, respectively. Regression of corpus luteum of previous pregnancy was also examined and the mean time ($p>0.05$) required for its complete regression was 24.33±1.48, 26.67±1.48, 29.00±1.81 and 27.60±1.40 days post-partum in PG8, PG25, antibiotic and control group, respectively. Findings of the study corroborate the fact that more number of large anovulatory follicles in all the groups, except PG8, might led to delayed first ovulation post-partum.

TRADITIONAL KNOWLEDGE OF MEDICINAL PLANTS AMONG THE RURAL PEOPLE IN PANCHAYAT MAILY JAJED DISTRICT SHIMLA

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Traditional knowledge in India by and large comes in the category of implicit knowledge. This knowledge also reflects in the kind of traditional work whether it is an art, craft, healing practice, food practice to use to manage disease treatment. In the study area Maily Jajed Panchayat of District Shimla knowledge related to the traditional uses of medicinal plants is totally in the custody of elderly community members and local herbalists. The younger generation is unaware of the traditional knowledge, with few exceptions. Field data was collected through semi-structured interviews from the community members and local herbalists. Traditional knowledge on folk medicines is directly linked to the local culture, faith and perception. This knowledge is gaining high threat of extinction because of its limitation to a small section of the society in the region. Therefore, this study was planned with objective to document the medicinal importance of plants, conserve this precious indigenous knowledge, and share it among other communities through published literature. During the present field survey, total numbers of **66** plant species were explored out of it **64** were collected from wild and two species (*Aloe barbadensis* Mill*.,* and *Daturafastuosa* Linn*.)* from cultivated field. In the present study, herbs (52%) are dominant species in the study area. Other highly dominant species are tree (21%), climber (15%), shrub (11%) and fern (1%).The most frequently utilized plant parts were leaves (27%) it was followed by whole plants (20%), root (14%), tuber, fruit and bark (6%) each, stem, seed and latex (5%) each, flower (3%), gall, heart wood and young shoot (1%) respectively. Various parts of medicinal plants were used in the treatment of diseases of different body parts such as eyes, joints, bone fracture, skin care, toothache, tonsil, ulcers, diarrhoea, cold, cough and asthma etc. Therefore, future studies are recommended in similar regions for the documentation of this precious knowledge. Moreover, our study has also identified some important and newly reported medicinal plants from the ethnomedicinal perspective, which needs to be studied pharmacologically and toxicologically i.e *Helinus lanceolatus, Scindapsus officinalis* (Roxb.) Schott are newly reported in State.

INSECTICIDAL EFFICACY OF ESSENTIAL OILS FROM *ARTEMISIA MARITIMA* L. AND *ZANTHOXYLUM ARMATUM* DC. AND THEIR TWO MAJOR CONSTITUENTS AGAINST *PLODIA INTERPUNCTELLA* (HUBNER)

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Essential oils isolated from *Artemisia maritima*l. and *Zanthoxylum armatum* dc. were analyzed by mass spectroscopy (MS) and their main constituents were identified. Fumigant activity, repellent activity, progeny deterrency and antifeedant activity of essential oils and two constituents viz., alpha pinene and linalool were examined against the major stored product insect pest, *Plodia interpunctella* (hubner) (lepidoptera: pyralidae). 100% mortality was achieved by alpha pinene, linalool, *a. Maritima*and*z. Armatum* oils at all concentrations within 120 hrs against *p. Interpunctella.* Alpha pinene showed the highest repellent activity of 80.18±1.9, 88.36±1.4, 93.15±4.1% after 1, 3 and 5 hrs respectively followed by linalool and *Z. armatum* and showed remarkable activity at 6 µl/cm^2 against *P. interpunctella* with 76.24±1.1 and 66.42±2.8% repellence after 3 hrs followed by 80.46±1.8 and 72.26±1.4% after an interval of 5 hrs. In progeny deterrence tests alpha pinene and linalool were more potent than others producing 10.25±1.2 and 13.45±2.2 f_1 progeny of *P. interpunctella* with 74.66 and 66.74% deterrent activity even at a lowest concentration of 10 µl/ml, whereas 40.45±4.8 adults emerged successfully in control. Similarly highest antifeedant activity was revealed for alpha pinene followed by linalool while both the essential oils showed less fdi against the given pest. Responses varied with respect to doses of compounds and exposure time. Further, alpha pinene showed higher toxicity than linalool and it may be attributed to its chemical structure.

ORAL- 07

EARLY PREGNANCY DIAGNOSIS THROUGH ULTRASONOGRAPHY IN COWS TO COUNTER ECONOMIC LOSSES

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For maximizing reproductive efficiency, productive performance and early detection of reproductive problems early pregnancy diagnosis is crucial. In order to limit the expense of maintaining non-pregnant cattle, early diagnosis of pregnancy using ultrasonography, as a non-invasive techniques increases profit indirectly. With the concept of reducing the number of days to conception, pregnancy status of cattle at Day 21 post artificial insemination was studied in seven lactating Jersey cross-bred dairy cows of Himachal Pradesh at University Dairy Farm, Agricultural University, Palampur (32.6^{o}N, 76.3^{o}E, altitude 1290.8 m), India. Middle uterine arteries (MUA) of ipsi-lateral and contra-lateral sides to the CL were analysed using colour Doppler transrectal ultrasonography. Different indices like Pulsatility index(PI),Resistance index(RI) and Vascular Perfusion Index (VPI) were determined.

It was recorded that RI and PI was more in ipsi-lateral MUA than the contra-lateral MUA in pregnant animals. Among the pregnant and non pregnant animals RI and PI was greater in pregnant animal determining the development of new vasculature of foeto-maternal placental unit in the uterus, whereas the VPI was greater in non-pregnant animal stating the progress of new cyclic changes.

In conclusion, the blood flow determined in the ipsi-lateral artery through RI and PI was more in comparison to the contra-lateral artery directing to the side of pregnancy. Colour-Doppler imaging provided important information regarding early clinical diagnosis for pregnancy and ruling out the factors such as genital manipulation and iatrogenic embryonic mortality.

ORAL- 08

SEROLOGICAL ASSAYS AND MOLECULAR ANALYSIS PROVED IMMUNOGENICITY OF 66KDA PROTEIN OF *PLASMODIUM BERGHEI*

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Plasmodium, an apicomplexan parasite is known to cause malaria. The incidence of malaria cases is very high in the regions mainly affected by poverty. According to WHO, an estimated 3.3 billion people are at risk of being infected with malaria parasite and 1.2 billion are at high risk. The increasing health burden of malaria and its social impacts have led to making research plan for its elimination and control. Therefore, it is important to determine or investigate various target antigens which induce protection against *Plasmodium* parasite. *Plasmodium berghei* (nk-65) maintained in white swiss mice, *Mus musculus* (balb/c) was used to evaluate the role of a protective antigen against malaria. *Plasmodium berghei* is widely used in malaria research because of it's genetically relatedness to other species. In the current study, the role of 66 kda protein have been demonstrated in imparting protection against malaria in rodent mouse model (balb/c). 66 kda protein was purified and isolated through immunoadsorption technique. Immunization of mice with the purified antigen (66 kda) was assessed through various serological assays including elisa, dot-elisa, ifa and *in vitro* inhibition tests. Immunogenic characteristics of 66 kda protein were assessed using DNA amplification through polymerase chain reaction (PCR). Overall, results of this study provide evidence that 66 kda protein is highly immunogenic during experimental infection in mouse model. Studies on various antigenic proteins may pave the way to investigate new drug targets.

PREVALENCE AND DIVERSITY OF GASTROINTESTINAL HELMINTH PARASITES IN GOATS AND SHEEP OF SIRMAUR, HIMACHAL PRADESH

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Livestock farming of small ruminants mainly goats and sheeps is the backbone of rural agricultural economy in district Sirmaur of Himachal Pradesh. However, the health and productivity of these animals is severely affected by infestation of gastrointestinal helminth (GIH) parasites. We have determined the prevalence and diversity of GIH parasites in the fecal samples of domesticated sheep (n = 24) and goats (n = 80) from 35 villages within 6 tehsils of Sirmaur. Our findings revealed 79.2% and 93.7% infestation in sheep and goats, respectively. Coproscopic characterization facilitated identification of 15 genera of GIH parasites of which 9 were nematodes (*Ascaris, Capillaria, Haemonchus, Nematodirus, Oesophagostomum, Ostertagia, Strongyloides, Trichostrongylus* and *Trichuris)*, 4 were cestodes (*Diphyllobothrium, Hymenolepis, Moniezia* and *Taenia*), and remaining 2 genera (*Fasciola and Schistosoma*) were trematodes. Nematode infestation was predominant (90.4%) followed by trematodes (35.6%) and cestodes (16.3%). Higher prevalence of GIH parasites was observed in. goats as compared to sheeps whereas male animals exhibited higher infectionsthan the female counterparts. Prevalence of *Strongyloides* spp. was found to be highest (67.3%) followed by *Moniezia*, *Haemonchus* and *Trichostrongylus*. The study showed widespread GIH parasites infestation in domesticated sheep and goats inhabiting rural areas of Sirmaur and suggest an integrated helminth management strategy to reduce the detrimental impact on livestock health, productivity and sustainability of rural economy.

AN UPDATE ON *LANTANA CAMARA* TOXICITY IN ANIMALS IN HIMACHAL PRADESH

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Lantana camara weed toxicity is an important cause of livestock morbidity and mortality in Himachal Pradesh. When consumed in large quantity, the animals suffer from hepatotoxicity and photosensitization. Lantadene (toxic principle) profiling in leaves of *L. camara* from 10 districts revealed highest concentration in district Mandi (71.72 %) and lowest in Bilaspur (33.41%). The incidence of lantana toxicity cases in large cattle, (buffaloes) and small (sheep, goats) ruminants over a period from 2009 to 2013 were found to be highest in district Kangra (0.29%). Among these, the incidence of *L. camara* toxicity in cattle was maximum (0.49%) and that the female of the species were more commonly affected by its toxicity. In our laboratory, we conducted acute, sub-acute and sub-chronic toxicopathological studies in guinea pig laboratory animal model. It is well-known that guinea pigs exhibit the most typical symptoms, comparable to field cases of lantana toxicosis in ruminants. In sub-acute study (28 days), dose of 25 mg/kgbw of lantadenes (equivalent to approximately 50 g green leaves) produced typical gross and histopathological changes in liver and kidneys, and resulted in the highest levels of serum liver marker enzymes. Quantitative RT-PCR analysis of the liver revealed elevated expression of pro-inflammatory cytokines viz., TNFα, TGFβ, IL-1, IL-6 and COX-2. The sub-chronic study revealed that lantadenes produced pronounced nephrotoxicity followed by damage to liver and stomach. For accurate incidence record, immediate reporting of toxicity cases by farmers to the Veterinary Hospitals is required. This would help to strategize effective remedial and/ control measures.

POTENTIAL OF *PSEUDOMONAS PUTIDA* ON SOLUBILIZING SOIL ZINC IN RADISH CROP

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ORAL- 11

Raphanus sativus (Radish) a root vegetable that belongs to family Brassicaceace. It has been widely utilised for its high medicinal and therapeutic effects like antidiabetic, anti-cancerous, anti-inflammatory and antifungal. It is also utilised for treating jaundice, urinary disorders and improving cardiovascular system. Crop serves as a rich source of folic acid, vitamins (V-B6, V- C), minerals (K, Ca, Mg) and fibres. Zinc(Zn) being an important micronutrient, acts as a positive modulator in plants for enhancing various enzyme activities. Complex formation and low solubility of Zinc in soil leads to inefficient uptake by the plants, thus causing Zn deficiency.In the present study, efforts were generated to convert complex form of Zinc into readily available form (Zn^{2+}) using PGPRs (plant growth promoting rhizobacteria). *Pseudomonas putida* culture was inoculated at 6- leaf stage and impenetrable source of Zinc (Zinc oxide) was mixed with soil before sowing seeds. Parameters like total chlorophyll content and enzyme super-oxide dismutase (SOD) activity was analysed to study the effect of PGPRs on Zinc uptake in radish. Results concluded that *P. putida* culture with Zinc dose @40kg/hectare gave the most promising results. This study also provides an insight for utilising the potential of P.putida for increasing bioavailability of micronutrient in farmers' fields.

CYTOLOGY OF THREE SPECIES OF GENUS APHIS, MAJOR AGRICULTURAL AND HORTICULTURAL CROP PESTS

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In the present investigation three aphid species of genus *Aphis* were collected from cultivated fields in and around Shimla, Himachal Pradesh. These species of aphids are *A.crassivora, A.fabae* and *A. glycines*. Shiny black coloured aphids of *A.craccivora* were concentrated on the growing tips and pods of *Vigna mungo.* Blackish brown dusted aphids of *A.fabae* were found to heavily infest the leaves of *Zea mays*. Aphids of *A. glycines* were collected from the underside of the leaves of *Glycine max*. These aphids were gregarious in habit, and were light yellow coloured. The diploid chromosome number in all three species was found to be 2n=8. Aphid chromosomes have been studied mainly in order to identify cytogenetic characterization that could be useful for taxonomic identification, as well as for the analysis of karyotype evolution. A large number of insect genomes have been wholly sequenced in the last decades in order to better understand their evolutionary biology and, in particular for pest crop insects, to identify genes that could represent a potential target for their control in the field. In the present study, data concerning the chromosomal characterization could be extremely relevant to understanding the evolution of the sex chromosome and the sex determining system, which is a topic of great interest for pest crop insects. Aphids are insect pests of great economic importance as these tiny insects cause considerable damage to agricultural and horticultural crops by sucking the plant sap and also by transmitting a number of plants virus diseases. Out of about 4700 species described about 1000 species are pestiferous to crops throughout the world.

INCREASING THE PRODUCTIVITY AND PRODUCT QUALITY OF VEGETABLE CROPS USING ARBUSCULAR MYCORRHIZAL FUNGI

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The majority of vegetable crops are potential host plants of arbuscular mycorrhizal fungi (AMF). AMF can improve the nutrient and water supply, induce tolerance of environmental stress and resistance to root diseases and nematodes of their host plants. Therefore, inoculation of vegetable crops with AMF can be profitable and commercial inoculation products are available. While, the impact of AMF on diverse vegetable crops was described in the past, the deduction of their general significance for these crops in horticulture is missing so far. We examined the state-of-the-art capabilities of AMF to increase the productivity of vegetable crops by growth promotion, amelioration of stress, biocontrol of pathogens and improvement of the chemical quality. AMF can be effective to increase the drought and salt stress tolerance. They were supposed to be seen especially promising in biocontrol of root-knot nematodes and in increase of the chemical quality of vegetables for human nutrition. The efficiency of inoculation with AMF on their host plants was controlled by the genotype combinations (host plant × AMF), by soil properties and by the inoculation method.

ESTRUS INDUCTION RESPONSE IN SILENT ESTRUS COWS USING PGF2α

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Silent estrus has been elucidated as insufficiency of the behavioral estrus symptoms inspite of the normal cyclicity of the genital organs. Management of this condition is a major concern for the dairy industry, because inefficient heat detection causes significant economic losses. The present study was conducted in Livestock Instructional Farm Complex of College of Veterinary and Animal Sciences, Palampur, Himachal Pradesh, to enquire into the efficiency of estrus induction following the use of PGF2α in silent estrus cows.

Under this study protocol, 10 silent estrus cows following detection of mature corpus luteum by examination per rectum, confirmed by ultrasound scanning,were treated with single i.m dose of 500mcg PGF2α (cloprostenolsodium). Trans-rectal ultrasonography was performed to access the follicular pattern in response to $PGF_2\alpha$. Color Doppler technique was used to visualize the blood flow to the pre ovulatory follicle at fixed time insemination and to monitor the luteal blood flow prior and post $PGF_2\alpha$ treatment. Estrus induction rate was 80% (8/10) with mean follicular diameter as 9.511±0.59 mm and 10.88 ±0.55 mm at PGF2α administration and at Fixed time A.I, respectively. Luteal regression profile was generated prior and post $PGF_2\alpha$ administration, with mean corpus luteum diameter as 18.054±0.38 mm and11.39±0.10 mm before and after the treatment, respectively.

Of all the factors leading to low reproduction in bovine, the major constraint in the reproductive inefficiency of bovine lies in the fact that they exhibit silent estrus condition. Incorporation of $PGF_{2\alpha}$ as a treatment modality in silent estrus cows has made headways in the management of this condition. The deteriorating reproductive performance is to be ameliorated as the development of rural India shall reflect development of the whole country.

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MARKER ASSISTED GENE PYRAMIDING OF *OPAQUE2* WITH *SH2* IN DIFFERENT MAIZE LINES ALONG WITH ANALYSIS OF VITAMINS, AMINO ACIDS AND ITS ANTI-OXIDANT ACTIVITY

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Maize is the third most important staple cereal crop after wheat and rice, which is used for human consumption, bio fuels, livestock feed and also as raw material at industrial levels. Due to all these advantages, it has become a choice among the major crops for the farmers and breeders in the developing countries. But there are some significant flaws in the traditional maize such as; it is deficient in few vitamins and two essential amino acids (lysine and tryptophan) which are needed to produce proteins. Deficiency of these amino acids and vitamins lead to some of the fatal diseases like pellagra, kwashiorkor, night blindness and also other malfunctions. To prevent these deficiency diseases, maize has to be biofortified by incorporating the deficient amino acids and vitamins through breeding techniques to produce Quality Protein Maize (QPM). In the present study, the *opaque-2* gene was transferred from VQL-2 to the Punjab Sweetcorn-1 maize which was screened by using SSR marker *umc1066*. In the breeding strategy, 563 plants of BC_2F_2 generation were analyzed by MAS. Out of 563 plants, 172 plants were homozygous (*o2o2*), 254 plants were heterozygous (*O2o2*) for QPM and 137 plants were homozygous for non QPM. Reverse phase HPLC methods were also developed for the analysis of amino acids (lysine, tryptophan) and various other vitamins such as; B1, B2, B3, B4 and C. Tryptophan and lysine were higher in the sample VQL-1 (6.16mg/100g and 21.12mg/100g, respectively). High amount of vitamin B3 was also detected in VQL-2 (0.234µg/mL). The Punjab Sweetcorn-1 contained high amount of vitamins B1 and C (0.124 µg/mL and 0.352 µg/mL respectively). On the basis of vitamin C content in shrunken maize (Punjab Sweetcorn-1), the DPPH anti-oxidant assay was also performed which reported that the Punjab Sweetcorn-1 parental line showed higher anti-oxidant activity (i.e. 62.41%) than VQL-2.

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FACILITATING DISEASE CONTROL MEASURES AMONG SMALLHOLDER FARMERS THROUGH INDIGENOUS TECHNOLOGIES: EVIDENCES FROM TICK CONTROL MEASURES IN HIMACHAL PRADESH

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Tick and Tick borne diseases in particular are among the many factors which directly and indirectly hamper the growth of the livestock sector. The current use of synthetic acaricides has problems of resistance, environmental pollution, residues in meat, milk, hides and skins and natural toxicity. Tick infestation is a major problem affecting farm animals and the problem is acute in hilly regions such as Himachal Pradesh. Livestock owners who own small herd for their sustenance& food security find it difficult to seek alternative options. Demanding physical work and lack of interface with institutions hinders their imagination thereby any new measures of control. The current work of Department of Veterinary Extension Education, Dr G C Negi, College of Veterinary and Animal Sciences, Palampur in collaboration with National Innovation Foundation, India under HIMCOST funded project resulted in sharing a technology transfer model of exchanging technical know-how from research station/University system to farm field. The in-situ herbal preparations against Tick Infestation which can be prepared at farmers' field are being diffused for the benefit of livestock owners. These medications provide quicker relief, minimize tick resistance and are favorable to the environment. Thus, these herbal acaricides can facilitate quality livestock service at geographically distant locations. Sustaining such type of environment friendly technology is paramount and is more imminent in Hilly regions. The research work has demonstrated importance of leveraging animal husbandry department for technology demonstrations.

THREAT CATEGORIZATION OF FLORISTIC DIVERSITY IN KANAWAR WILDLIFE SANCTUARY, HIMACHAL PRADESH, NORTH WESTERN HIMALAYA

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All across the globe anthropogenic pressures linked with changing environmental conditions have led to rapid loss of biodiversity to a great extent. Many species have disappeared from natural habitats and many more are probable to disappear from the natural habitats in near future. Realizing the importance of biodiversity for the sustenance of life, threat categorization and conservation prioritization at local, regional and global levels are essentially required. Such situations have necessitated the assessment of biodiversity for IUCN threat categories and conservation prioritization. Thus, the present study has been conducted in Kanawar Wildlife Sanctuary. Total 731 species were recorded and assessed for threat categories, using various attributes *viz*., habitat specificity, population size, distribution range, use values, extraction, nativity and endemism of the taxa were used to calculate the Conservation priority index (CPI) for each species. Of the total species 163 (32 Trees; 35 Shrubs; and 96 Herbs) belonging to 117 genera and 60 families have been identified as threatened. Twenty eight species were identified as Critically Endangered, 21 species as Endangered, 38 species as Vulnerable, and 76 species as Near Threatened and remaining species as Least Concern.06 species were distributed in one habitat only, 39 species in two habitats whereas 118 species in 3 or >3 habitats. The communities with maximum percentage of threatened species i.e., *Pinus wallichiana*, *Picea smithiana*, *Quercus semecarpifolia, Cedrus deodara* , *Abies pindrow* etc. are deserve priority attention for conservation, due to richness of threatened species. Therefore, regular monitoring of the population of species, their habitats and communities supporting threatened species reveals that overexploitation and fragmentation of habitat are two major factors for species threat.

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POPULATION ECOLOGY OF *DELPHINIUM DENUDATUM* WALL. EX HK. F. & TH.: A CRITICALLY ENDANGERED MEDICINAL PLANT OF HIMACHAL PRADESH

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Delphinium denudatum Wall.ex Hk.f. & Th. is a Critically Endangered Himalayan herb, distributed between 1400-3600 m, amsl in the Western and North Western Himalaya. It grows in open grassland, moist rocky slope and margins of fields in all type of soil. It is a medicinal perennial herb upto 1m tall with blue or violet flower. Its roots are used in Ayurvedic and Unani systems of medicine. The roots are rich in Alkaloids i.e., delphinine, staphisagrine, delphocurarine, denudatine, denudatidine, etc. which have thermogenic, digestive, carminative, anti-inflammatory and febrifuge properties and help in curing various ailments such as odontalagia, dyspepsia, jaundice, renal, vesical calculi, inflammation, fever, ulcer, etc. Market demand and restricted occurrence in the Himalaya lead continues depletion of the natural populations due to unsustainable collection. 13 populations representing different habitats such as rocky, shady moist, rocky moist and shady moist degraded, and 5 aspects have been studied between 1563-1926m amsl. In the populations, richness of shrubs ranged from 2-11 and herbs, 10-33, total shrubs density ranged from 70-1750 Ind ha^{-1} and total herb density, 22.35-122.6 Ind m^{-2}, relative density of *Delphinium denudatum* was 1.12-14.79%. Concentration of dominance of shrubs ranged from 0.13- 0.59 and herbs, 0.07-0.99. Species diversity (H') of shrubs ranged from 0.60-2.20 and herbs 1.21-3.07. Among the populations, moisture content ranged from 9.09- 49.36%; pH, 5.48-7.69; total nitrogen 0.02- 0.70% and organic carbon, 0.96- 9.20 %. Changing climate, habitat fragmentation, overexploitation, and escalating human population are the most important factors responsible for quantum depletion and extinction of species. Promotion of mass scale propagation through conventional and in-vitro methods of such species and re-introduction in the in-situ conditions would help in the conservation.

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FATTY ACIDS PROFILE OF HILL CATTLE AND GADDI GOAT MILK

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Milk fat is the most complex of all the natural fats as it contains many different fatty acids. The fatty acids profile of milk is associated with many factors such as animal origin, lactation stage, ruminal fermentation, feed-related factors, seasonal and regional effects. The fatty acids composition in hill cattle, Jersey cross-bred cattle, Gaddi goat and local goat milk was analyzed by gas chromatography mass spectrometry (GCMS). Maximum levels of saturated fatty acids (SFAs) were present in local goat (78.80%) followed by hill cattle (72.58%), and Jersey cross-bred cattle (59.12%) milk. Extremely low levels of polyunsaturated fatty acids (PUFAs) were present in hill cattle, Jersey cross-bred, and local goat milk. In hill cattle milk, saturated palmitic acid (22.57%), stearic acid (15.92%) and monounsaturated oleic acid (26.17%) were present in higher amount. In Jersey cross-bred cattle, higher levels of saturated myristic acid (18.42%), stearic acid (29.04%) and monounsaturated oleic acid (31.26%) were detected. The fat present in goat milk was found to be a rich source of medium chain fatty acids. The occurrence of palmitic acid in higher amount might be responsible for intense flavour in local and Gaddi goat milk, but needs further research.

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CONERVATION AND MANGEMENT OF INSECT POLLINATIORS FOR SUSTAINABLE CROP PRODUCTION AND LIVELIHOOD ENHANCEMENT IN HIMACHAL PRADESH, NORTH WESTERN HIMALAYA

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The insects and other associated pollinators responsible for the successful fertilization and production of approximately 87 species of the world leading food crops i.e., fruits, vegetables or seeds comprises of 35% of global food production. Apple and majority of other temperate fruit crops requires pollinator's help for their pollination and fruit development. Due to increased anthropogenic pressures and habitat degradation, density and diversity of insect pollinators in wild and agro-ecosystems has greatly declined. The declined crop specific pollinator's diversity has adversely affected the quality and quantity of crop productivity. Realizing the importance of insect pollinators in quality apple production, Global Pollination Deficit Protocol was tested during 2011-2015 in 20 Apple orchards (i.e, Far and Near to natural habitat with and without the provisioning of bee supplemental bee hives) of Kullu Valley to assess the density and diversity of apple flower visitors and apple production among the treatment combinations. Across the selected apple orchards, 32 species of insect pollinators representing Honeybees, Solitary bees, Bumblebees, Carpenter bees, Syrphid fly, Drone fly, Bluebottle fly and Butterflies were reported. Higher density and diversity of insect pollinators were reported from the orchards located near to natural habitats and comparatively declining patterns of density and diversity were reported from the orchards located distant to natural habitats. Generally, high apple yield was recorded from the near to natural habitat orchards and comparatively low yield was recorded from the distant to natural habitat orchards. Among the treatment combination orchards, significant effect of supplemental pollination by *Apis mellifera* on apple productivity was recorded indistant habitat orchards. Therefore, the study suggest the various regional and location specific conservation practices to maintain diversity of insect pollinatorsfor the sustainable crop productivity i.e., promotion of beekeeping with Indian honey bee (*Apis cerana*); controlled use of chemical and pesticides; habitat restoration of pollinator's with plantation of seasonal bee flora to maintain bee forage and nesting sites; pollinator's conservation awareness education; and adoption of diversified agro- horticultural practices.

POPULATION ASSESSMENT OF A COMMERCIALLY VIABLE MEDICINAL PLANT *ACONITUM HETEROPHYLLUM* WALL. IN HIMACHAL PRADESH, NORTH WESTERN HIMALAYA

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Aconitum heterophyllum is an endangered and high value medicinal plant of the Himalayan Region, and is commonly known as Patish. It is a member of the butter cup, family-Ranunculaceae. The roots of this species contain alkaloids and have been used orally in many traditional systems of medicine in combination with other medicinal herbs to reduce cold, pneumonia and asthma. Due to overexploitation and habitat degradation, the natural populations of this species are depleting rapidly. Therefore, in the present study, population assessment of *A. heterophyllum* has been done in Himachal Pradesh, North Western Himalaya. Surveys were conducted in the six districts of Himachal Pradesh namely, Chamba, Kullu, Kinnaur, Lahaul-Spiti, Shimla and Sirmaur. The species was recorded from 31 sites and distributed between 2714-3880m amsl. Amongst the sites, density of *A. heterophyllum* ranged from 0.4-7.0 Ind m^{-2}, richness of shrubs ranged from 1-5 and herbs 12-51; total shrubs density 80-1370 Ind ha^{-1} and total herbs density 25.40-106.70 Ind m^{-2}. The relative density of *A. heterophyllum* ranged from 0.92-10.68 %; Concentration of dominance (Cd) of shrubs ranged from 0.27-1.00 and herbs 0.05-0.69; Species diversity (H') for shrubs ranged from 0.00-1.34 and herbs 0.86-3.39. The soil pH ranged from 5.61-7.55, moisture content ranged from 11.23-40.68%, total nitrogen ranged from 0.09-0.89%, total organic carbon 0.90-8.97% and total organic matter 1.55-15.46 %. The unsustainable exploitation of this species for trade from the wild may cause the early extinction. Therefore, monitoring of the populations of this species in relation of anthropogenic activities and climate change, development of propagation protocol, and establishment and maintenance in *ex-situ* and *in-situ* conditions with the participation of local inhabitants and Forest Department have been suggested.

FRUIT PRODUCTIVITY OF THREE MOST USED EDIBLE WILD TREE SPECIES IN KINNAUR DISTRICT, HIMACHAL PRADESH

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Edible wild plants offer variety of diet and contribute to household food security and provide different types of bioactive chemicals which increase the immune system of the body. In Himalayan region wild edible plants form an important constituent of traditional diets and medicine for thousands of years, particularly in the tribal and rural areas of the Himalayas. The present study was carried out in Kinnaur District of Western Himalayas during 2011 to 2013, with main objectives to estimate fruit yield of three wild edible fruit tree species viz. *Prunus cornuta*, *Prunus persica* and *Malus baccata* and their size class distribution. These species were considered most used on the basis of preference of species by the people. Population structure of three important species was analyzed by laying quadrats size of 10 X 10 m by stratified random sampling and fruit yield was determined by harvesting method and was recorded individually from tree. The size class distribution for three species showed lower number of individuals in lower diameter size class, indicating lesser numbers of recruits. The fruit yield increased with increase in diameter in *P. cornuta* and *M. baccata,* while in *P. persica* it was in increasing trend up to 31-40 cm diameter class and thereafter it decreased. The lesser productivity in higher diameter class of *P. persica* was mainly due to unhealthy tree in this diameter class. Overall, the fruit yield showed positive correlation with the Diameter at Breast Height (DBH). It is suggested that these species should be properly managed and sustainable harvesting of fruits should be practiced. These species have economic potential and can provide an opportunity for income generation to the local people, hence these should be included in forestry plantation programme by State Forest Department and local people should also be encouraged to grow these species.

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LAB TO LAND: A STORY OF WORLD'S FIRST CLONED ASSAMESE BUFFALO THAT WAS BORN AT AN INDIAN DAIRY FARM

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India has privileged to possess the largest and best breeds of livestock that have been immensely contributing to Indian economy and rural upliftment since decades. The Buffalo, named India's milk machine and meat factory, plays a pivotal role in India's rural economy. India has been engaged in excellent buffalo science and has become a leader in the field of buffalo cloning research and development. India is first country in the world to produce a cloned riverine buffalo that was produced in 2009. Recently, in December 2017, we added a feather in the cap of India by producing the world's first cloned buffalo in the field at the dairy farm. To clone Assamese buffalo, we airlifted tissue biopsy of Assamese buffalo from the College of Veterinary Science, Assam, which is approximately 2000 km away from our laboratory. The established somatic cells were fused with enucleated oocytes to produce cloned embryos using the optimized method of our lab (Selokar et al., 2012). Once the embryos reached to the blastocyst stage, they were transferred into five recipient buffaloes at the Hi-tech Sach Dairy Farm, which is 100 km away from our laboratory. One recipient was pregnant and delivered healthy calf having 53 kg birth weight. The calf is now growing normally and 9 months old. In addition, 27 pregnancies were established from the semen of the cloned Murrah bull which was produced earlier in 2015. These primary feats have realized the concept of 'Lab-to-Land' to transfer agricultural and allied technologies to the farmer's field. We suggest buffalo cloning technology can be used as a valuable tool to uplift the buffalo germ plasm in India.

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IN VITRO GROWTH AND MULTIPLICATION OF *VALERIANA JATAMANSI* JONES FROM DEIFFERENT EXPLANTS

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Valeriana jatamansi Jones syn. *Valeriana wallichi* popularly known as Indian Valerian (Mushkbala in Hindi, Sunganthdhawal or Tagara in Sanskrit) is distributed in all temperate regions of the World except Australia. This species have revealed that falls in endangered category and is at the verge of becoming extinct due to its over-exploitation for its rhizome having immense medical importance. On the basis of connection of ethnic information the tribes of Tehri-Garhwal Uttarakhand regard Valeriana as sacred plant and used in the preparation of Ubtan (a cosmetic) in marriage and religious ceremonies , also used as an insect repellant, used in diseases of eyes, blood and liver. Ethno-botanical studies conducted on Gaddi tribes of Bharmour area in Himachal Pradesh has reported the use of its leaves and roots for performing havan andis locally known as Nak Nahani. Also used as remedy for nervous and emotional stress. It is also considered useful in clearing voice and acts as stimulant in fever and nervous disorder. The paste of its roots is applied on wounds for better healing.

The present investigation on *"in vitro* multiplication of *Valeriana jatmansi* Jones from different explants" was conducted in the plant tissue culture laboratory of Department of Biotechnology, Shoolini Institute of Life Sciences and Business Management, Solan during the year 2012-13

The observations revealed that. Fresh, young and diseases free explants (apical bud, rhizome and leaves) were used as explants for starting the culture. The surface sterilization of explants, carried out under running tap water so as to completely remove the soil debris. The excised plants were dipped in 70% ethanol for 60 seconds. After pretreatment with 70% ethanol, the explants were washed in double distilled water twice, so as to lower the toxic effect of ethanol. Then sterilized with 0.1% $HgCl_2$ for 30 seconds and finally washed 3 times with autoclaved distilled water under laminar air flow cabinet. Less number of days for shoot regeneration occurred when M_9 medium containing 1.0 mg/l of BAP and 1.0 mg/l of IBA were used and maximum regeneration was found in the medium. For the shoot multiplication maximum growth was observed in MM_2 medium containing 1.0 mg/l of BAP.

PROBIOTICS IN ANIMAL HEALTH

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The word Probiotics is derived from the Latin word 'Pro' and Greek word 'Bios' which means' For Life' and this term is used for those microorganisms that are associated with the beneficial effects for humans and animals. Probiotics has a long history of safe use for promoting human health and this has motivated their use in animal also. The probiotic bacteria are being used as feed additive in poultry, aqua culture and livestock. The supplementation of these microbes in animal feed has resulted in improvement of growth rate and feed utilization, disease resistance and decrease in enter opathogen shedding. Recently, the role of gutmicrobiota in CNS function through gut-brain axis has been established. The importance of probiotic microbes in animal health has increased during last two decades as a result of scientific evidence being given through *in vivo* studies on animals. Antibiotic resistance has emerged as biological and ecological threats to the society due to wide and discriminate use of antibiotics and their residual effect on product. The use of probiotics is an effective and eco-friendly alternative to solve the problem of antibiotic resistence. Probiotic microbes alleviates health problems through different mechanisms such as competitive pathogen exclusion, synthesis of inhibitory metabolites, ability to alter gut environment, potential of immuno modulation and stress alleviation mechanism. The use of probiotics is increasing for human and animal health. Probiotics isolates are used in farm animals as direct fed microbial (DFM). The supplementation includes mixing of one or several live microorganisms with feed to benefit the animals.

PERCEIVED CONSTRAINTS AND ADOPTION OF QUALITY MILK PRODUCTION PRACTICES TO ENHANCE DAIRY FARMERS INCOME IN HIMACHAL PRADESH

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Rajasthan, the desert or arid State of India well known for its tough and inhospitable environmental conditions. District Bikaner, where the study was carried out known as semiarid region of this State. Scarcity of drinking water is the major issue for the communities (man, animals and plants) inhabiting this region. Fresh water bodies of this region are small and ephemeral in nature, and some species of Class: Gastropoda present in these water sheets, acts as host for trematode parasites. These parasites cause serious infection and even causes mortality in dairy animals and create economic burden on stock holders. A year round investigation was carried out to study the trematode infection status in different snail population of two water bodies i.e. Nal village pond and Darbari village pond of district Bikaner. The study reveals that three different species of snail (*Indoplanor bisexustus, Gabbia orcula* and *Digniostoma pulchella*) were recorded in Nal village pond, while *Indoplanor bisexustus, Gabbia orcula and Lymnaea acuminate* were recorded in Darbari village pond. Infection were only found in two species of Nal village pond i.e. *Indoplanor bisexustus* and *Gabbia orcula,* and percentage of infected snail was comparatively high in three monsoonal months. Nil infection were recorded in Darbari village pond snail population during entire study period.

ANTIOXIDANT ACTIVITY OF ALCOHOL EXTRACTS OF LINDENBERGIA INDICA AND SCOPARIA DULCIS

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The antioxidants are known for the prevention and treatment of oxidative stress related disorders, such as diabetes and cardiovascular diseases. Medicinal herbs possess many phytochemicals which are efficient scavengers of free radicals. The present study was conducted to assess the antioxidant activity of two medicinal herbs, *Lindenbergia indica* and *Scoparia dulcis* from the family Scrophuliaraceae. The dried plant materials (10 g each) were extracted in alcohol, separately.

Total phenolic content was determinedby Folin-Ciocalteau Method. The total phenolic content of *Lindenbergia indica and Scoparia dulcis* were 32.64 $\pm$ 0.17 and 45.13 $\pm$ 0.04 µg of GAE/µg of dry weight, respectively.

Antioxidant activity was measured by DPPH radical scavenging method. *Scoparia dulcis*shows above 50% DPPH radical scavenging activity at a concentration of 200 µg/ml. However, a concentration of 400 µg/ml of alcoholic extract of *Lindenbergia indica*, was required to achieve more than 50% DPPH radical scavenging activity. But the radical scavenging activity of *Lindenbergia indica* increased significantly at higher concentrations, and it scavenges above 70 % of free radical at a concentration of 500µg/ml.

The results have shown herbal formulations based on the alcohol extracts of *Lindenbergia indica* and *Scoparia dulcis* can be used for the prevention and treatment of oxidative stress related disorders.

GASTROINTESTINAL HELMINTH PARASITES PREVALENCE AND DIVERSITY IN COW AND BUFFALO OF SIRMAUR, HIMACHAL PRADESH

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ORAL- 28

In rural areas of Sirmaur district of Himachal Pradesh, large ruminants mainly cow and buffalo are indispensable for the nutritional needs of the population. However, livestock productivity is negatively impacted by gastrointestinal helminth (GIH) parasites resulting in considerable economic losses. In this study, the prevalence and diversity of GIH parasites was determined from domesticated cows (n = 97) and buffaloes (n = 43) inhabiting 37 villages within 6 tehsils of Sirmaur. Experimental evidences indicated, high infestation rate of 91.7% and 93% in cow and buffaloes, respectively. Coproscopic examination revealed 19 genera of GIH parasites of which 11 were nematodes (*Ascaris, Capillaria, Cooperia, Enterobius, Haemonchus*, *Oesophagostomum*, *Ostertagia*, *Strongyloides*, *Toxocara*, *Trichostrongylus* and *Trichuris)*,5 were trematodes (*Dicrocoelium*, *Eurytrema,Fasciola*, *Paramphistomum and Schistosoma*) and 3 were cestodes (*Hymenolepis*, *Moniezia* and *Taenia*). Nematode infestation was found to be highest i.e. 94.2% followed by trematodes (39.1%) and cestodes (10.8%). Higher prevalence of GIH parasites was observed in male animals compared to their female counterparts. Further, infestation levels were higher in buffaloes (93%) compared to cow (91.7%). Prevalence of *Ascaris* spp. was highest (63.5%) among all the animals surveyed. *Strongyloides, Moniezia*, *Haemonchus* and *Trichostrongylus* were other consistently detected GIH parasites in fecal samples. This study revealed widespread GIH parasite infestation in domesticated cow and buffaloes of rural areas of Sirmaur district and suggests an integrated helminth management strategy to minimize their detrimental effects on livestock health.

STUDIES ON SERUM MACRO AND MICRO MINERALS STATUS IN PREGNANT AND NON-PREGNANT DZOMO (YAK HYBRIDS)

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Himachal being a hill state, majority of the farmers' rear livestock that is main source of their livelihood. Dzomo or Churi, the crossbred of yak and cow, have been tamed since ages as a livestock animal in tribal areas serving as backbone of Himachal Pradesh with the least scientific studies in the species.

The study was conducted to estimate blood serum concentration of some minerals in pregnant and non-pregnant Dzomo. In order to measure concentration of minerals, clinical camps were organized in remote areas of district Kinnaur and blood was taken from Jugular vein from 15 pregnant and 15 non-pregnant animals. Atomic absorption spectrophotometer was used to assay various minerals. Analysis of serum samples revealed that blood serum concentrations of Calcium, Phosphorous, Magnesium, Sodium, Potassium, Zinc and Copper were 9.05±0.12, 3.77±0.15, 2.65± 0.15, 119.65±0.83, 3.21±0.12, 0.38±0.02, and 1.57±0.17 mg/dLin pregnant and 8.98±0.09, 3.77±0.18, 2.50±0.24, 120.24±0.99, 3.29±0.09, 0.40±0.02 and 2.14±0.50 mg/dL in non-pregnant animals, respectively. There was no significant difference (P>0.05) in blood serum concentration of any mineral between pregnant and non-pregnant dzomo.

It could be concluded from this study that pregnancy did not alter the normal physiological mineral concentrations in Dzomo. Further these parameters can be reference values for further investigation and future studies in this species.

PREVALENCE OF DIFFERENT REPRODUCTIVE DISORDERS IN BUFFALOES OF HIMACHAL PRADESH

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Buffaloes are major milk producers in the State and are producing 380.495 thousands tones of milk every year in spite of their small population of 7.16 lakhs. The milk production in buffaloes is mainly affected by their reproductive status. The main reproductive disorders which influence the production status of buffaloes are postpartum anestrus, infections, early embryonic mortality and repeat breeding after calving. The present study was undertaken to detect different reproductive disorder prevalent in buffaloes of Himachal Pradesh.

A total of 74 clinical camps were organized in 7 districts (Hamirpur, Bilaspur, Kangra, Mandi, Sirmour, Solan and Una) of Himachal Pradesh where 777 buffaloes were examined for various reproductive disorders. Clinical conditions recorded included repeat breeding (17.80%), anestrus (59.55%) and miscellaneous (6.63%) abnormalities, respectively. Other buffaloes examined were either pregnant or normal cyclic. In repeat breeder categories, endometritis was recorded in 16.18%, cervical pathologies in 0.16% and prolonged estrus in 1.46% buffaloes. True anestrus/small genitalia and silent estrus were recorded in 56.96 and 2.59 per cent buffaloes, respectively. In 41 miscellaneous reproductive disorders, 11 buffaloes had aborted (1.78%) and 30 buffaloes (4.85%) were showing other reproductive disorders like mummification, maceration, pyometra, mucometra, Hydrometra and Cervico-vaginal prolapse etc. All these buffaloes were treated at the spot with suitable medicines and varied response of treatment was recorded.

A REVIEW ON DISTRIBUTION OF THREATENED PLANT SPECIES IN HIMACHAL PRADESH, INDIA

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POSTER- 03

Exhaustive review of literature reveals that eight highly threatened plant species viz. *Aconitum deinorrhizum, A. heterophyllum, A. violaceum, Dactylorrhiza hatagirea, Eremostachys superba, Jasminum parkeri, Nardostachys grandiflora* and *Taxus wallichiana* are distributed between 2400m – 5000 m intemperate wet & dry zone as well as cold dry agro-climatic zones of Himachal Pradesh. These climatic zones fall in seven districts of Himachal Pradesh namely Kinnaur, Lahul&Spiti, Chamba, Kullu, Shimla, Mandi and Kangra. During the review, the distribution and locations of potential habitats of these eight threatened plant species in Himachal Pradesh have been documented based on the earlier reports by various researchers. *Aconitum deinorrhizum* is distributed in subalpine & alpine climatic zones(2400-5000m) of Himachal Pradesh (Lamba thatch, Odi-shagali thatch, Killar, Dodrakwar, Bashahr, Gorju thatch and Shangla valley). *A. heterophyllum* is distributed in temperate climatic zone (2400-4500m) of Himachal Pradesh (Sangla, Churdhar, Sirmour, Marol, Danda, Gamgul, Saru thatch, Shagali thatch, Chansal thatch, ChotaBhangal, Bara Bhangal, Dainsar, Hamsar, Rohtang, Manimahesh, Lamu, Pangi and Pattan Valley). *A. violaceum* is distributed in temperate and alpine climatic zone (3600-4800m) of Himachal Pradesh (Sach Pass, Tyasu Dhar, Mani Mahesh, Kugti pass, Bari Kanda, Chitkul-Rakchham, Mural Danda, Chanshal, Myar, Baralacha, Pin Valley National Park, Dhauladhar Wildlife Sanctuary, Shikari Devi, Great Himalayan National Park, Rohtang). *Dactylorrhiza hatagirea* is distributed in temperate and subalpine climatic zone (2800-4000m) of Himachal Pradesh (Shego, Gete, Mane in Patan valley& Pin Valley, Mural Danda, Marhi, Jutadhar in Holi, Dhanchu in Manimahesh, Churdhar, Sangla, Rakchham, Bhabha Valley). *Eremostachys superba* is distributed in temperate and sub-alpine climatic zone(2400-4000m) of Himachal Pradesh(Sangla Valley, Bushar, Udaipur, Bharmour, Holi). *Jasminum parkeri*h as restricted distribution and reported only from Bharmour region (3500-4500m) of Himachal Pradesh. *Nardostachys grandiflora* is distributed in temperate, subalpine & alpine zone (2400-4800m) of Himachal Pradesh(Holi, Bharmour, Sissu, Udaypur, Sainj, Tirthan Valley, DodraKwar, Jakha Kanda, Tangan, Khai, Manjiban). *Taxus wallichiana*is distributed in temperate, subalpine climatic zone (2400-3900m) of Himachal Pradesh (Choupal, Jalodi Pass, Sandhu, Rakchham, Badi Kanda, Nichar, Bhabha Valley,Churdhar, Udaipur, Karsog valley, Darang Ghati). Literature review reveals that climate change, habitat fragmentation and overexploitation for trade are the major factors, responsible for population decrease and extinction of the species from the natural habitats. It is accordingly envisaged to undertake population assessment of these threatened medicinal plant species and to document the current conservation and threat status.

SOME NOTEWORTHY AGARICOID MACROFUNGI OF HAMIRPUR REGION, HIMACHAL PRADESH

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During the present investigations on exploration of macrofungal species diversity of Hamirpur region of Himachal Pradesh, seventeen species of agaricoidmacrofungi were recorded. These include *Agaricus campestris*, *Coltricia perennis*, *Coprinellusdis seminatus*, *Cortinarius bolaris*, *Cystoagaricus trisulphuratus*, *Flammulina velutipes*, *Galerina autumnalis*, *Hygrocybe psittacina*, *Leucocoprinus birnbaumii*, *Macrolepiota procera*, *Marasmius siccus*, *Mycena pura*, *Panaeolus papilionaceus*, *Pholiota squarrosoides*, *Polyporus arcularius*, *Polyporus umbellatus* and *Termitomyces microcarpus*.

REVIEW ON ANTIMICROBIAL ACTIVITY OF DOMINANT INVASIVE PLANT SPECIES IN LOWER SHIVALIK HILLS OF HIMACHAL PRADESH

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Invasive plant species are threatening the ecosystem globally. These plants are constantly degrading the habitats and occupying the fertile lands to the extent that these are creating threat to the agricultural land and natural forests. The attempts to eradicate these plants remained unsuccessful. These plant species have high reproductive potential, longer seed viability and short life cycle. These are threat to the ecosystem, however, these can be useful in many ways. These are used as bio-fuels, for mud house preparations, for making papers and as antimicrobial agents. The three invasive plant species viz. *Lantana camara*, *Parthenium hysterophorus* and *Ageratum conyzoides* are dominant in the lower Shivalik hills of Himachal Pradesh. These are also among top twenty obnoxious weeds at the global level. Leaf and whole plant extracts of these plants have antimicrobial effect against human as well as plant pathogens. Methanol leaf extract of *Lantana camara*have antimicrobial properties against *Staphylococcus aureus.* Methanol leaf extract of *Parthenium hysterophorus* inhibits growth and reproduction of *Aspergillus niger*. Ethyl acetate leaf extract of *Parthenium hysterophorus*has effective antimicrobial properties against *Bacillus subtilis.* Petrolium ether extract of *Ageratum conyzoides* inhibits growth of *Bacillus subtilis.* The review of literature revels that the antimicrobial potential of these plants have not been exhaustively studied and there is a lot of a scope for future studies.

POSTER- 06

ANTIBACTERIAL ACTIVITY OF THE WILD EDIBLE FRUITS USED BY TRIBAL PEOPLE OF WESTERN HIMALAYA

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The present study aimed at evaluating the in vitro antibacterial activity of seven wild edible fruits *Prunus cornuta* (Wall) *Pyrus baccata* (L), *Elaegnus umbellata* (Thunb.) *Rosa brunonii* (Lindl) *Pyrus pashia* (Buch. Ham ex D.Don), *Prunus persica* (Linn.) and *Coccinia grandis* (L.) Voigt collected from the tribal region Bharmour of district Chamba Himachal Pradesh. Antimicrobial activity of the fruit extracts concentrations 200mg/ml. Antibacterial screening of wild edible fruits are investigated by Agar well diffusion method against the gram positive and gram negative bacteria that is *Staphylococcus aureus* and *Escherichia coli* bacterial strains respectively. The methanolic fruit extracts of these plants showed significant zone of inhibition. *Prunus cornuta* (15mm), *Pyrus baccata*(18mm), *Elaegnus umbellata* (20mm), *Rosa brunonii* (16mm), *Pyrus pashia* (13mm) *Prunus persica* (16mm)and *Coccinia grandis* (20mm) shows the zone of inhibition against *the E. coli* and *Prunus cornuta* (18mm), *Pyrus bacata* (22mm), *Elaegnus umbellata* (16mm), *Rosa brunonii* (19mm), *Pyrus pashia* (20mm) *Prunus persica* (14mm) and *Coccinia grandis* (23mm) shows the zone of inhibition against the *S. aureus.* From the current study, it may be concluded that these edible plants have the potential of antibacterial properties, which play a key role in controlling a variety of diseases caused by various pathogenic bacteria.

POSTER- 07

PLANT BIODIVERSITY CONSERVATION AT IIT MANDI- BOTANICAL GARDEN ESTABLISHMENT AND OUTREACH ACTIVITIES

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Mandi region of Himachal Pradesh is rich in phytodiversity, that provides pristine environment and livelihood to the local population. IIT Mandi, a premier institute of repute in the Kamand valley (1044 masl), located between the lush forest ranges has an eco-management plan to conserve its surrounding biodiversity. As a part of that, a Botanical and Medicinal Plant Garden has been developed at IIT Mandi The flora of the region is digitized scientifically in addition to the Herbarium. Attempts were made to identify each plant and provide useful information in the form of QR codes. Approximately 170 native, 25 medicinal and 5 edible plant species were successfully established in the garden that was initiated in 2015. The Garden Houses several sections such as Arboretum, edible plants of Himachal Pradesh, micro-orchard of Kaphal (*Myric aesculenta*), micro-orchard of three different types of Aakhe (*Rubus ellipticus, Rubus niveus* and *Rubus paniculata*), micro-orchard of Daru (*Punica granatum*) and medicinal plants etc. Research activities ranging from nutritional analysis of 15 wild edible plants to phytochemical analysis of selected plants (*Ocimum*, *Rhododendron*, Essential oils) have been carried with the goal to develop Agro-based technologies in the future. As an important activity, we routinely organize outreach activities (such as workshops, exposure visits) with focus on educating and conservation of biodiversity. Since last two years we hosted several schools for Botanical Garden educational tours and anticipate more outreach activities in the coming years.

ANTIOXIDATIVE ACTIVITY AND PROTEIN PROFILE IN SKIMMED MILK OF CATTLE AND *GADDI* GOAT OF HIMACHAL PRADESH

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This study reports anti oxidative activity and protein profile of *Gaddi* goat, local goat, hill cattle and Jersey cross-bred cattle milk. Total phenol, antioxidant activity, total protein and protein profiles were analysed in skimmed milk. A variation was noted in skimmed milk protein contents. Total phenol and DPPH radical scavenging activity was significantly (P<0.05) higher in native hill cattle skim milk. Average protein concentration in raw skimmed milk were 1.330.01, 1.030.02, 0.76±0.05 and 0.81±0.01 percent respectively, in hill cattle, Jersey cross-bred cattle, local goat and *Gaddi* goat. Total protein in skim milk was significantly (P<0.05) higher in hill cattle. Three proteins of 19.01, 22.08, 32.96 kDa were observed in *Gaddi* goat, but not in local goat milk. Also, above proteins were absent in cattle skim milk. Two proteins, 15.56 and 25.06 kDa were found in hill and cross-bred cattle skimmed milk, but were missing in goat skimmed milk. This study may be useful in differentiating cattle and goat milk.

AN IMPORTANT WILD GERMPLASM *PYRUS POLYCARPA* HOOK. F. AND ITS EXPLOITATION AS ROOTSTOCK FOR PEAR IN HIMACHAL PRADESH

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The genus *Pyrus* occupies an important position among different temperate fruits. There are two major groups of pears *viz.* Asiatic pears (*P. pyrifolia, Pyrus pashia, Pyrus pashia var. kumaonii, Pyrus polycarpa, Pyrus jacquemontiana, Pyrus griffithii and Pyrus Khasia*r) European pears (*P. communis*). Although most of the European and American species of *Pyrus* have already been collected and assessed for their botanical and horticultural characteristics.

Pyrus polycarpa Hook.f. was collected by ICAR-IARI, regional station, Shimla from Shillong and also from Sorarim (Meghalaya) at an altitude of 1300 m and 1350 m asl respectively and conserved as wild germplasm. Though it is used as a rootstock for pear in Meghalaya, its performance as a rootstock is under study in Shimla conditions. It is locally known as 'Diengloporam'. These plants were found in groups. It is vigorous and grows as tall as 22m in height. It has been categorized as more vigorous than the other collected species of *Pyrus*. Its plants are upright with young shoots wooly. The colour of bark is brownish with prominent elongated lenticels. Leaves are simple with an average length and breadth of 11.3cm and 5.6cm respectively, elliptic to ovate , apex acuminate , base cuneate , margins serrulate, phyllotaxy alternate, venation reticulate pinnate and petiole 1.7 cm in length. Flowering in the month of March-April, flowers 8-9 mm in glabrous and smooth corymbs; petals ovate; styles 2, united in the middle, glabrous. Fruits globose, borne at the end of small branches of the corymbs, ripen in early December and drop on maturity. The fruits are brownish on ripening and have tiny raised lenticels. The average length and breadth of fruits is 1 cm and 1.2 cm, respectively. It can be easily propagated through stooling. It shows resistant against powdery mildew and fire blight in current scenario, its harvest as rootstock for pear varieties will be very useful.

POSTER- 10

RURAL HEALTH ISSUES IN HIMACHAL PRADESH: CHALLENGES AND SOLUTIONS

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Himachal Pradesh is a hilly State located in the North- West of the country covering 55,673 square kilometres.87% of the households of Himachal Pradesh are rural. Around 6,176,050 people out of the total population of Himachal Pradesh live in rural areas whereas the resources are concentrated in the cities. People in these areas lack facilities like transport and communication, proper waste disposal system, housing, food safety and quality control and awareness programs. Some of the rural areas of Himachal Pradesh don't have access to light, electricity and medical facility in winter due to heavy snowfall. Due to close association of animals and humans in rural areas leads to disease like tuberculosis, rabies. Due to lack of clean water for drinking, unawareness of people towards sanitation and medical facility leads to burden of diseases in these areas. These problems can be tackled by collaborated efforts of human and animal related units, enforcement of legislations, continual rural education and awareness on health issues. People participation along with government efforts ensures to solve all these rural health issues and improve the economy of Himachal Pradesh.

POSTER- 11

FUMARIA PARVIFLORA EXTRACT ALLEVIATES ALCOHOL-INDUCED LIVER DAMAGE IN MICE

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Excess consumption of alcohol induces hepatic fatty infiltration, which has been suggested to sensitize the liver to further damage. To test this, *Fumaria parviflora* a herbal drug, was administered to mice chronically treated with alcohol by liquid diet feeding for (10%, 20%, 30% and 40%; 4, 2, 1 and 1 week) 8 weeks. Chronic exposure to alcohol caused sharp elevation in the activity of alanine aminotransaminases, cholesterol and triglycerides. Tissue biochemistry revealed significant reduction in glutathione reductase, glutathione peroxidase, catalase and increased in glutathione-S-transferase and super oxide dismutase activity. Alcohol induced oxidative stress was measured by estimating decreased level of reduced glutathione and increased amount of thiobarbituric acid reactive substances (TBARS). Alcohol administration significantly decreased the activity of aldehyde dehydrogenase, acetaldehydrogenase and increases the CYP2E1, triglycerides, esterified and total cholesterol level. It also enhances the immunological (Tumour necrosis factor alpha and Interlukin-6) amendment. *Fumaria parviflora* (300 mg/kg; conjoint treatment for 4 weeks continues from 20%) treatment after toxicant administration reversed alterations in blood and tissue biochemical variables including liver function test and markers of oxidative stress. *Fumaria parviflora* also showed genoprotective effect. Light and ultra structural studies of liver showed improved cellular architecture after *Fumaria parviflora* therapy and confirmed its hepatoprotective activity.

WILD EDIBLE PLANTS AS LIVELIHOOD OPTION FOR THE NATIVE COMMUNITIES OF CENTRAL HIMACHAL PRADESH, NORTH WESTERN HIMALAYA

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Wild plants play a very important role as livelihood of the local communities. Edible parts of wild plants (i.e., fruits, flowers, leaves, tubers, inflorescence, roots, tubers, rhizome, etc.) are the nature's gift to man-kind. These are not only delicious and refreshing, but, also the chief source of vitamins, minerals and proteins. The study was designed to document the use and conservation of wild edible plants in Central Himachal Pradesh, which is veritable emporium of economically important plants. A total of 150 wild edible plants were identified. Of these, herbs account for 51.33%, followed by tree (26%) and shrubs (22.66%). Fruits were the most harvested parts (46%), followed by leaves (44.33%), roots (23.33), whole plant (14.66%), bark (10%), aerial parts and seeds (7.33%), flowers (8%), and tubers (4.66%). These plants are consumed either raw (41.33%) or are consumed in cooked form i.e., roasted, boiled (36.66%), as vegetable, etc. 22% are utilized in both ways. Of the total edibles43.33% species are native to the Himalaya. 54% species were non-native (*Angelica glauca*) are endemic and (16.66 %) species near endemic to the IHR. Population assessment using quadrate methods, technique for sustainable harvesting, establishment and maintenance of nurseries for quality planting material; establishment and maintenance if *ex-situ* and *in-situ* conditions; and involvement of local communities and Forest Department in conservation have been suggested.

NEW EMPLOYMENT OPPORTUNITIES FOR RURAL UPLIFTMENT BY CULTIVATION OF TRILLIUM GOVANIANUM IN HIMACHAL PRADESH

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In Himachal Pradesh most of the populations live in the rural areas. The inhabitants are largely dependent on forest resources including medicinal plants for their livelihood. Among the commercially viable medicinal plants *Trillium govanianum*, a native species of Himalaya, distributed between the altitudinal ranges 2400-3500 m amsl is one of the commercially viable medicinal plant and there is a great demand for this species at local, national and international markets. The rhizomes of *T. govanianum*are used traditionally in folk medicine for dysentery, healing of wounds, inflammation, antiseptic, boils, menstrual and sexual disorders. But due to over exploitation and habitat degradation, the population of this species has decreased to a great extent. The study revealed that IC50 was recorded highest for rhizomes, followed by leaves and lowest for stems (i.e., 118, 140 and 200 mg/ml FW, respectively). The rhizomes, leaves and stems possess significant amounts of phenolic and flavonoid compounds as well as antioxidant properties. As the species is not under cultivation, development of agrotechniques would help the people in providing new employment opportunities and efforts towards developing cultivation practices much desired in Himachal Pradesh and North Western Himalaya.

POSTER- 14

PLANTS USED FOR MEDICINES BY THE INDIGENOUS *LAGAAL* COMMUNITY OF LUG VALLEY IN KULLU DISTRICT, NORTH WESTERN HIMALAYA

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The *Lagaal* community is native community residing in Lug valley of Kullu district, Himachal Pradesh, N.W. Himalaya. Since time immemorial, the native people have been utilizing bio-resources for their day-to-day needs. The goal of this study was to collect information and to document the folk medicinal plant knowledge used by the *Lagaal* community. Traditional remedies used for the treatment of various ailments are considered to be very important in the primary health care of people living in the valley. The aim of the study was also to evaluate their local importance for the treatment of various human diseases. The study was conducted from April to August 2018 in 4 villages namely; *Bhaliyani, Jathani, Badha Gran* and *Bhutti.* The native community of the studied villages includes Vaidya's and Hakim's who were interviewed. Total 26 plant species belonging to 26 genera and 20 families were recorded. The collected data were arranged in an alphabetical order and according to their botanical name, family, parts used, life form, mode of utilization and ailments or diseases for which it is used. Such novel information gathered from the native community is important in preserving folk indigenous traditional knowledge. Measures for the sustainability of the indigenous knowledge system of the native community for its future use have been suggested.

POSTER- 15

BURANSH IN GREAT HIMALAYAN NATIONAL PARK OF HIMACHAL PRADESH: DIVERSITY, REGENERATION PATTERN AND CONSERVATION

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Buransh (*Rhododendron arboreum* Sm.) is an evergreen small tree, having ecological significance with its supple red flowers which contribute to the aesthetic and sacred value of Himalayan forests. Due to human interferences, the natural population of Buransh are depleting rapidly. Therefore, the present study was conducted in Great Himalayan National Park (GHNP) of Himachal Pradesh to assess the population of species and suggest management options. The species was found in 30 sites between 1,510 -2,777m amsl, and represented by 4 habitats and 7 aspects. Quadrat method was followed for quantitative assessment of the species. Buransh was dominant in 01 site, although it was found in association with other tree species in other sites. It was best represented in Shady Moist (18 sites) habitat and North West (08 sites) aspect. Among the sites, density of *Rhododendron arboreum* was ranged from 10.00-300.00 Ind ha^{-1}; total basal area, 0.01-5.99 m^2ha^{-1}; IVI, 6.70-162.52; sapling density, 10.00-130.00 Ind ha^{-1} and seedling density, 20.00-130.00 Ind ha^{-1}. Among the sites, richness of trees ranged from 3-9, shrubs, 4-21 and herbs, 7-44. Species diversity (H') for trees ranged from 0.50-1.94, shrubs 1.31-2.64 and herbs, 1.29-3.45. Concentration of dominance (Cd) for trees ranged from 0.16-0.71, shrubs 0.08-0.30 and herbs, 0.04-0.40. The flowers of the plant are supposedly highly efficacious in checking diarrhea and blood dysentery and also used for making juice and chutney, which prevent headache and bleeding of nose. The extraction rate of the plant for fuel wood as well as flower petals for making juice is very high. Therefore, regular monitoring of the habitats of these species in relation to climate change and anthropogenic activities have been suggested for understanding the dynamics and accordingly plan for conservation.

EFFECT OF FEEDING GILOY (TINOSPORA CORDIFOLIA) AND FENUGREEK ON MILK MINERAL PROFILE IN JERSEY CROSSBRED COWS

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The study was conducted on Jersey crossbred lactating cows maintained at the Instructional Livestock Farm, College of Veterinary and Animal Sciences, CSKHPKV, Palampur (Himachal Pradesh), India. The lactating cows were randomly divided into four groups, each group having six animals. T_1, T_2 and T_3group cows received Giloy stem powder (150 g), Fenugreek seed powder (150 g), and a combination of both the herbs (75 g of each) respectively, mixed with the concentrate feed for 60 days while the control group (T_0) received only the concentrate. Milk sampling was done fortnightly, from Day 0 to Day 75. Milk samples were analyzed for milk mineral composition (Ca, P, Fe, Cu and Zn). Milk phosphorus values in Giloy supplemented animals were significantly higher than the control group animals on day 60 of supplementation. Herbal supplementation had no significant influence on any other mineral elements (Ca, Fe, Cu and Zn) estimated in milk.

A CASE REPORT OF CAPRINE RUMINAL ACIDOSIS

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A 4 year old male Gaddi goat was presented with a history of lateral recumbencyat ICAR- IVRI Regional station, experimental animal shed. The animal was reported to be recumbent from the morning with complete anorexia. The animal was dull and depressed. Mucus membrane was congested, Rectal temperature was 98.1˚F. Rumen motility was nil with a doughy consistency of ruminal content. Rumen liquor was collected with a sterile needle by intra ruminal puncture and the pH was observed to be 5.5. Diagnosis of ruminal acidosis was arrived by the clinical signs as well as ruminal pH.A stomach tube was passed and 50 ml ruminal content was removed. Treatment was initiated with fluid therapy like DNS@ 500 ml i.vo.d, Sodabicarb 7.5% W/V @40 ml i.vo.d, parenteral antibiotic like Amoxycillin clavulanate (Amoxirum forte®) @ 300mg i.mo.d. Supportive therapy with multivitamin (Polybion®) @ 2 ml i.mo.d, Neurokind® @ 3ml i.vo.d and Chlorpheniramine maleate (Avil®) @ 3 ml. i.mo.d. By the afternoon, the goat urinated and became alert. It started to bear weight on hind limbs. Rectal temperature got elevated by 1˚F. The antibiotic therapy was continued for 3 days and the animal recovered completely.

POSTER- 18

GUM YIELDING PLANT RESOURCES OF SOLAN AND SHIMLA DISTRICTS OF HIMACHAL PRADESH, INDIA

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Himachal Pradesh is known for its natural environment, hill stations and is one of the richest reservoirs of biological diversity due to diverse climatic conditions and altitude. Solan and Shimla are amongst the twelve districts of Himachal Pradesh. Gums are plant products formed primarily due to disintegration of plant cellulose. It is used as a thickeners, emulsifiers, adhesives, and stabilizers in food such as dairy products. Total of 31 species belonging to 23 genera and 18 families have been identified. Leguminosae is found to be dominant with 10 species. Due to its various uses in daily life, there is need of conservation of natural gums in their natural landscape and *ex situ* conservation.

POSTER- 19

OIL YIELDING HERBS OF SOLAN AND SHIMLA DISTRICTS OF HIMACHAL PRADESH INDIA

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Based on extensive exploration the diversity of oil yielding herbaceous plants of Solan and Shimla districts of Himachal Pradesh were studied. Oils obtained are either used for edible purpose or are used as cooking medium, preservation, transport, and medicinal uses. In the study, 18 species belonging to 18 genera and 15 families have been recorded and identified with scientific name, family name, common name, part used and elevation. Human beings are mainly responsible for loss of biodiversity due to various developmental activities and overexploitation of resources. So there is urgent need of attention and awareness among the peoples in this regard.

WILD EDIBLES PLANTS OF GREAT HIMALAYAN NATIONAL PARK IN KULLU DISTRICT OF HIMACHAL PRADESH, NORTH WESTERN HIMALAYA

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The rural communities of the Indian Himalayan Region are largely dependent on plant resources for their sustenance. Among the economically important plants, wild edibles are consumed as raw, roasted, boiled, fried, cooked or in the form of oil, spice and seasonal material jams and pickles. The local communities have rich indigenous knowledge base and traditional practices but require proper documentation for their long time conservation. The present study is an attempt to assess the wild edibles of Sainj valley, Great Himalayan National Park (GHNP) the World Heritage site, located in Kullu district of Himachal Pradesh. Considering, the importance of invaluable wild edibles plant wealth and disappearing traditional knowledge, an attempt has been made to; i) assess the diversity of wild edibles; (ii) analyse nativity and endemism; (iii) document indigenous uses and traditional practices; and (iv) suggest management options. Total 210wild Edibles, representing 20 trees, 38 shrubs, 151 herbs and 1fern were recorded. Various parts namely, whole plants, stem, rhizome, tuber, bark, aerial parts, leaves, flowers, fruits, roots, etc. were used by local communities. Of the total species, 88 species were natives, 12 near endemics and 02 endemics. Over utilization and habitat degradation may result in local extinction. Therefore, conservation of these species, studies on habitat ecology, development of conventional and *in vitro* propagation protocols; introduction in the natural habitats; education and awareness programs for the local communities have been suggested.

STUDIES ON THE BIOLOGY AND PREDATORY POTENTIAL OF *COELOPHORA SAUCIA* (MULSANT) A PREDATOR OF *APHIS POMI* DE GEER ON APPLE HOST IN INDIA

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Observations were made on young nursery plants and apple orchards to record the coccinellid predators of *Aphis pomi* De Geer on apple plants in Himachal Pradesh which is main apple growing state of India. Nine species of lady bird beetles were found feeding on green apple aphid, *Aphis pomi* De Geer on the apple nursery plants of Mashobra locality of Shimla district and Ner Chowk locality of Mandi district of Himachal Pradesh, India from 2003 to 2006. The results were reconfirmed in the last three years also i.e. 2014 to 2016. These coccinellid species belonging to Family Coccinellidae of order Coleoptera are *Cheilomenes sexmaculata* (F.), *Coccinella septempunctata* (L.), *Coccinella transversalis* Fabricius, *Coelophora bissellata* Mulsant, *Coelophora saucia* (Mulsant), *Harmonia dimidiata* (F.), *Hippodamia variegate* (Goeze), *Oenopia sauzeti* Mulsant and *Priscibrumis uropygialis* (Mulsant). Of these, *Cheilomenes sexmaculata* (F.), *Coelophora bissellata* Mulsant, *Coelophora saucia* (Mulsant), and *Harmonia dimidiata* (F.), were found to be very effective predators of green apple aphid. In the present study, the life cycles of *Coelophora saucia* (Mulsant) was studied during May to August months and feeding potential of larvae and adults of this species feeding on green apple aphid was recorded.

ASSESSMENT OF THE QUALITY AND ADULTERATION LEVEL OF RAW MILK COLLECTED FROM CONSUMER TABLE IN HIMACHAL PRADESH

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The present study was conducted to assess the milk quality and adulteration level in various places of Himachal Pradesh. Total 200 raw milk samples were collected directly from consumers table. Milk analysis was done firstly to assess the physico-chemical quality attributes, and further qualitative analyses of adulterants. The specific gravity of milk samples ranges from 1.010-1.032 (1.022±0.005). The fat percentage ranges from 1.0-9.2 (3.5±0.10), Solid Not Fat ranges from 3.6-12.8 (7.01±0.10) and Total Solid ranges from 4.6-19.2 (10.54±0.17). Total 74% milk samples in case of specific gravity, 69.5% samples for fat percentage, 82.5% samples for SNF, and 73.5% milk samples for TS were less than the minimum prescribed standards of FSSAI for specific gravity, fat, SNF, and TS for cow milk in Himachal Pradesh. Further zone-wise determination of physicochemical parameter of milk samples revealed that there was no significant difference ($p>0.05$) in specific gravity and % SNF content between Zone I and Zone II whereas, there was significant difference ($p<0.05$) of Zone III with Zone I and Zone II. No significant difference was observed between Zone I, Zone II, and Zone III in case of fat% and TS.

All these milk samples were analysed for presence of adulteration level by using a standard milk adulteration kit manufactured by HIMEDIA laboratories, Mumbai (India). Tests included were alizarin test, urea test, starch test, salt test, skim milk powder test, glucose test, formalin test, sugar test (sucrose), neutralizers test, detergent test, hydrogen peroxide test, maltose test, ammonium sulphate test, boric acid test, nitrate/ pond water test. Assessment of adulteration level depicted that water was the most common adulterant (74%) found in the milk samples followed by salt (18%), alizarin (13.5%), skim milk powder (9.5%), detergent (3%), sucrose (1.5%), glucose (1%), formalin (1%), and neutralizers (1%). Other tests performed were negative in all milk samples. None of the individual sample was found positive for all the synthetic ingredients (urea, detergent or soap, sodium hydroxide, vegetable oil, and salt) required for production of synthetic milk.

BIOCHEMISTRY MICROBIOLOGY & BIOTECHNOLOGY 03

BACOPA MONNIERI: RECENT UPDATES AND CURRENT KNOWLEDGE ON BIOSYNTHESIS, REGULATION AND PHARMACOLOGICAL EVALUATION OF SECONDARY METABOLITES

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In the recent times, the use of herbal products has increased tremendously in the western world as well as developed countries. One of the magnificent important medicinal plants extensively used therapeutically in the orient is *Bacopa monnieri*. This medicinally important plant shows various pharmacological properties like anti-inflammatory, anti-cancer, anti-oxidant, anti-pyretic and analgesic, etc., due to the presence of secondary metabolites (bacoside A and B). Nowadays, drugs (benzodiazepine anxiolytic drug, perphenazine, prochlorperazine, and thioridazine) are available in the market manufactured from different parts of *Bacopa monnieri*, because of the bioactive attributes, this plant is widely used in the herbal industry, thereby, placed in the category of endangered plant species. So, there is crucial need to undertake the *in-vitro* propagation strategies that will fulfill the escalating demand for this highly valuable medicinal herb. This review highlights and summarises our current knowledge and updates of *Bacopa monnieri*. Further, the review will also open the doors for upcoming research activities worldwide on *Bacopa monnieri.*

STATISTICAL OPTIMIZATION BY RESPONSE SURFACE METHODOLOGY TO ENHANCE ESTERASE PRODUCTION BY *BACILLUS LICHENIFORMIS*

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In the present study, response surface approach has been used to study the production of esterase from *Bacillus lichenifromis*. Interactions were studied for six different variables such as inoculum size, pH, temperature, galactose concentration, peptone concentration and incubation time.In Plackett-Burman design, only five variables concentration of beef extract, temperature, concentration of coconut oil, inoculum size and concentration of galactose were found to be important factors affecting esterase production significantly. The ANOVA analysis and three dimensional surface plots confirmed interaction among variables. After optimization using Response Surface Methodology (RSM), maximum activity of enzyme (1.053 U/ml) was found close to predicted value (0.988 U/ml) and the activity of the esterase increased by 1.3-fold as compared to activity obtained (0.82 U/ml) using one variable at a time.

STUDIES ON ISOLATION, PRODUCTION AND CHARACTERIZATION OF EXTRACELLULAR AMYLASE FROM HIGH ALTITUDE MICROBIAL ISOLATE

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ORAL- 03

The present studies involved isolation of extracellular amylase producing microbial isolates from soil samples of high altitude Shimla and Kinnaur district's apple orchards . Bacterial isolate NMI26 produced maximum extracellular enzyme both qualitatively and quantitatively. It was characterized morphologically, biochemically and by 16S rRNA gene sequencing technique and identified as *Bacillus cereus* NK91|MF280165|. The culture conditions for optimum amylase production were standarized with respect to temperature, pH, incubation time, carbon sources, nitrogen sources and inoculum concentration using One Variable at a Time (OVAT) approach. Maximum amylase production was observed at 30°C, pH 9.0, incubation time of 48 hours, inoculum concentration of 1 ml (having 1 OD equivalent to 8×10^8cells/ml) of 1% overnight grown culture. Starch was found to be the best carbon source and yeast extract the best nitrogen source in culture broth. Different substrates were tried (potato waste, apple pomace and wheat bran) for production of amylase under Solid state fermentation (SSF) and maximum production was found with potato waste. The enzyme was partially purified to 4.22 folds using ammonium sulfate precipitation and gel filtration chromatography on Sephadex G-100 column. The partially purified enzyme showed two bands on Native-PAGE with molecular weight of 48000 Da and 21000 Da on SDS-PAGE. It was characterized and had a pH optima of 9.4 and optimum temperature of 30°C. However, it retained 85% of its activity up to 60°C. The partially purified enzyme was thermostable and stable in presence of detergents. This makes it worthy for applications in detergent and starch processing industry.

SOIL ANALYSIS OF DIFFERENT REGIONS OF PUNJAB

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ORAL- 04

Soil is our prime natural and economic resource. It is a loose material which forms the uppermost layer of the earth's crust and consists of organic matter, organisms, water, air, and inorganic matter. However, the soil often wears itself out due to continued cropping, leaching and erosion resulting in reduced fertility and crop yields. Continued maintenance of soil fertility is indispensable for profitable and sustained agricultural production. Therefore there is a need to evaluate soil fertility from time to time. In this study, soil samples were collected from ten regions of Punjab (paddy, cotton, sugarcane and peanut fields). Parameters like pH, EC, macronutrients (N, P, K and S) and micronutrients (Zn, Fe, Cu, and Mn) were tested. The pH of the soil samples was slightly alkaline (7.5 – 8.5); electrical conductivity ranged from 0.1 – 0.75 dSm^{-} indicating that it is suitable for crop growth. All samples were sufficient in nitrogen and sulfur and unanimously deficient in available phosphorus. 50% of the samples were deficient in organic carbon, 70% in potassium and 45% in manganese levels. Based on these results, we conclude that nutritional status of Punjab soils needs improvement. Also, awareness must be spread among farmers to fully utilize the soil testing facilities provided by the Government agencies. Such analysis and appropriate recommendations will reduce the imbalanced use of chemicals. This will reduce fertilizer costs, chemical stress and avoid agricultural run offs and leaching thereby improving environment quality.

RHIZOSPHERIC MICROBES FROM CEREAL CROPS WITH MULTIFARIOUS PLANT GROWTH PROMOTING ATTRIBUTES FOR ALLEVIATION OF DROUGHT STRESS

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There are number factors leading to the food crisis all over the world such as increasing urbanization and industrialization that has led to the world's food security concern and these factors are affecting the climate in a severe way. Additionally, the use of the chemical fertilizers is also affecting the environment. The pressure of population is increasing with such an alarming rate that there is a critical need to enhance the agricultural productivity in an eco-friendly manner. Drought is one of the most common environmental stresses affecting the plant growth as well as the productivity of the crops. Plants growing under such unfavorable conditions undergo water limitations and also nutrient deficiencies. Plant associated microbes are well adapted to such adverse conditions and these microbes by different mechanisms can help the plant to overcome these environmental stresses. In present study, rhizospheric samples from different crops were collected from Baru Sahib, and 180 microbial isolates were obtained on different growth media. All the isolates were screened for drought tolerance on 5-10% PEG embedded plates. Among total isolates, 130 drought tolerant (5% PEG) rhizobacteria were screened for diverse plant growth promoting attributes including solubilization of phosphorus, zinc and potassium; production of siderophores, ammonia, HCN, and hydrolytic enzymes. On the basis of multifarious PGP attributes, 12 bacterial strains were used for seed germination plate assay, and for evaluation of plant growth under the controlled condition of drought stress. All the seeds inoculated with bacterial isolates had better root hair, increased shoot as well as root length as compared to the control. On the basis of morphological and cultural characteristics, it may be concluded that these may be belong to different genera such as *Azotobacter, Bacillus, Exiguobacterium, Paenibacillus, Pseudomonas* and *Serratia*. The results suggest that drought tolerant with multifarious PGP attributes would be surely as efficient bio-inoculants for plant growth promotion under rainfed conditions.

PROSPECTS FOR UPLIFTING THE SOCIO-ECONOMIC STATUS OF THE RURAL POPULATION THROUGH TECHNOLOGICAL IMPROVISATION IN SHIITAKE MUSHROOM CULTIVATION

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The global market demand of Shiitake mushroom (*Lentinula edodes*) for its taste, nutritive value and medicinal source is growing in good pace. It is the second most commonly cultivated mushroom in the world and is a rich sources of ergosterol, selenium, iron, lentinan, dietary fiber, protein, and vitamin C. Suitable climate of district Mandi and Kangra of Himachal Pradesh has led the State Govt. recognize these two districts to promote the cultivation of this mushroom among the rural population. At CSIR-IHBT we aimed to develop an inexpensive methodology of cultivation using split air-conditions and aluminum racks by utilizing the readily available saw dust substrate. So far we have tried the sawdust available from local timbers *viz. Populus alba, Mangifera indica L, Toona ciliate, Eucalyptus spp., Grevillia robusta* with varying proportion of rice and/or wheat bran. We are also currently working on improvising cultivation methods using locally available wheat & rice straw. Different protocols to enhance the vitamin D and selenium content in the nutritive value of Shiitake mushroom is under intensive study. Our long-term goal is to provide standard operating procedure for Shiitake cultivation in a cost effective manner with better nutritive properties for economic upliftment of the rural community.

POTENTIAL INHIBITION OF COPPER–INDUCED AGGREGATION OF HUMAN YD-ETHNOLICHNOLOGICAL NOTES ON LICHENS OF SIKANDRA DHAR REGION OF MANDI DISTRICT, HIMACHAL PRADESH

ORAL- 07

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The lichen thallus is a dual organism entity composed of symbiotic association between alga (photobiont) and fungi (mycobiont). Lichens contain 400 secondary metabolites, of which 230 are unique and specifically found in this group of plants. These secondary metabolites include depsides (e.g. olivetoric acid), depsidones (e.g. physodic acid), and dibenzonfuran derivatives (e.g. usnicacid). Because of presence of a wide range of secondary metabolites lichens are used variously as medicine, food, fodder, dyes and spices. During the lichen floristic studies undertaken during January 2018 to September 2018, three hundred specimens of lichens were collected from Sikandra dhar region of district Mandi (Himachal Pradesh). These specimens were then investigated morpho-chemo-taxonomically and thirty species of lichens have been identified. Out of these, seven species of lichens viz. *Aspicilia calcarea* (L.) Körb., *Cladoniaconiocraea* (Flörke) Spreng., *Dermatocarponvellereum* Zschacke, *Lecanorachlarotera* Nyl., *Parmotremaaustrosinense* (Zahlbr.) Hale, *Parmotrematinctorum* (Despr. ex Nyl.) Hale and *Puncteliaborreri* (Turner) Krogare of ethnolichenological importance. *Aspiciliacalcarea* is a source of nutrition for mites, snails and caterpillars. *Cladoniaconiocraea* is a good source of carbohydrates and mixed with flour. *Dermatocarponvellereum* has antimicrobial properties against human pathogens *viz.Staphylococcus aureus, S. faecalis* and *Pseudomonas aeruginosa.* *Parmotrematinctorum* has a good food value as it contains high protein content (14%) along with amino acids, ergosterol, iron and calcium. It is also a source of brown dye for textile. *Parmotremaaustrosinense* is antimicrobial and has antioxidant and antiphytopathogenic effect. *Puncteliaborreri* is medicinal and used to cure blurred vision, bleeding from uterus, bleeding from external injuries, sores, swelling, chronic dermatitis and localized swelling.

NOVEL DNA BIOSENSOR FOR *LEPTOSPIRA INTERROGANS* DETECTION

ORAL- 08

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A novel DNA biosensor based on *LipL32* gene of *Leptospira interrogans* has been developed. A single stranded DNA (ssDNA) probe based on *LipL32* gene was immobilized on carboxylated multiwalled carbon nanotubes electrode (with gold nanoparticles) and denatured leptospiral genomic DNA (G-DNA) was allowed to hybridize with the immobilized probe. Cyclic voltammetry (CV) studies were performed to study the electrochemical changes before and after hybridization on the electrode surface. The surface characterization studies of the developed biosensor were done using scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). The biosensor showed specificity to *L. interrogans* as determined by specificity studies. The sensitivity of the biosensor was 264.5 µA cm^{-2} ng^{-1} and lower limit of detection (LOD) 0.015 ng/6µl. The developed biosensor was found stable for 6 months at 4°C as shown by CV analysis.

MICROBIOMES FROM INDIAN HIMALAYAN REGION AND THEIR POTENTIAL APPLICATIONS IN AGRICULTURE AND ALLIED SECTORS

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In Himachal Pradesh, only 10% area of the state is under cultivation, of which 75% is rainfed, facing frequent water scarcity. The soils are acidic and low in fertility. The major cereal crops cultivated in Himachal Pradesh are wheat, barley, maize and rice. The low productivity of these crops mainly attributed to low temperature, and drought. Beneficial microbes are vital part of natural environment. In current era of focusing on sustainable agriculture, use of microbial consortium as bio-inoculants in agriculture is of great importance. The biofertilizers/biocontrol agents as living cell of microorganisms have ability to enhance soil micronutrients availability to plants and also protect the plants from the pest and disease through various biological processes. Microbial consortium has advantage of overlapped plant growth promoting capabilities of multiple microbes over single microbial species. In the present investigation we have isolated plant microbiome and extreme microbiome from different location in Himachal Pradesh and Jammu & Kashmir, India. A total of 1139, 557 extreme microbiomes of cold deserts and subglacial lakes; 392 endophytic and 280 rhizospheric microbes from cereal crops growing under the low temperature and drought stress conditions. The isolated microbes were characterized employing 16S rRNA and ITS/28S rRNA gene sequencing.Phylogenetic analysis based on 16S rRNA gene sequencing led to the identification of isolated bacteria into four phyla: Firmicutes (54%), Proteobacteria (33%), Actinobacteria (9%) and Bacteroidetes (5%) belong to different genera *Alternaria, Arthrobacter, Aspergillus, Bacillus, Brevundimonas, Cellulosimicrobium, Citricoccus, Curreya, Desemzia, Exiguobacterium, Janthinobacterium, Lysinibacillus, Paecilomyces, Paenibacillus, Penicillium, Planococcus, Providencia, Pseudomonas, Psychrobacter, Sanguibacter, Sphingobacterium, Sporosarcina* and *Staphylococcus.* Isolated microbes were screened for their Plant growth promoting attributes and cold active enzyme activities. The selection of native functional PGP microbes is a mandatory step for reducing the use of energy intensive chemical fertilisers. Microbial extracellular enzymes with optimal activity at low temperature provide opportunities to study the adaptation of life in cold habitats and the potential for biotechnological exploitation. These isolates by the virtue of PGP and cold active enzymes production activity may have potential applications in agriculture and industrial sectors.

PHYTOCHEMICAL ANALYSIS, ANTIOXIDANT AND ANTIMICROBIAL ACTIVITY ASSESSMENT OF ORANGE PEELS

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In the present-day scenario perishable fruit peels are considered as a new era of pharmaceutical products as they are rich in phytochemicals and act as antioxidant agents. The present study was undertaken to analyze the phytochemical constituents qualitatively in the orange peel extracts. The 1,1-diphenyl-1-picryl-hydrazyl (DPPH) radical scavenging activity of methanolic extract and distilled water extract was found to be better than other extracts used in the study. Silver nanoparticles were also synthesized with the aid of orange peel extract. Characterization of silver nanoparticles was carried out using UV-Visible spectroscopy and X-Ray diffraction. Synthesized sliver nanoparticles showed significant antibacterial activity against *Bacillus* sp. followed by *Salmonella*, *Proteus*, *Pseudomonas*, *Escherichia*, *Shigella* and *Staphylococcus* sp.

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ACID STRESS BASED MYCOBACTERIUM FORTUITUM MODEL: A WINDOW TO MYCOBACTERIUM TUBERCULOSIS LATENCY

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M. tuberculosis the etiological agent of tuberculosis, has ability to remain latent in an individual for extended periods of time without causing clinical disease, referred to as the latent form of tuberculosis. Initial infection with *M. tuberculosis* involves phagocytosis by macrophages, exposing the bacilli to a pH of 6.0 - 6.5, to control infection and growth. However, *M. tuberculosis* adapts to this acidic environment and has evolved survival strategies to combat such acidification. Genes documented to play an important role in *M. tuberculosis* latency were mined and bioinformatics analysis was done. Homologies of these genes among different species of mycobacterium lead to shortlisting of *Mycobacterium fortuitum* for further *in vitro* studies. *M. fortuitum* cultures were exposed to a pH range of 5.5, 4.5 and 3.5, with determination of cell viability at regular intervals. *M. fortuitum* pre-adapted cultures when subjected to acid stress were able to maintain a constant CFU for extended period of time, a characteristic feature of latent infection. During latent state the bacilli exhibited morphological changes, loss of acid-fastness and tolerance to commonly used antimycobacterials.To gain an insight into mechanism of latency involved, expression of key genes was monitored by qRT-PCR, which showed up regulation of such genes. Thus, an acid-induced model was developed for latent tuberculosis infection. Use of an *in vitro* model which is able to mimic the *M. tuberculosis* latent infection may further lead to the identification of novel drug targets and thereby lead to generate novel compounds as effective therapeutics against latent tuberculosis.

ORAL- 12

A MORINGA OLIEFERA BASED POTABLE WATER PURIFICATION SYSTEM FOR MASSES

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Water is essential for all living beings on the planet earth having limited availability. Obtaining clean water for drinking to humans and animals is a major concern as most of the water resources are polluted. The available methods for water purification like chemical treatment have adverse health effects and are found to be associated with various deadly diseases. The most popular method available now-a-day for water purification i.e. Reverse osmosis leads to water wastage and has also been used irrationally. It is having more negative rather than positive impact on human health. Alternative, safe methods of water purification with zero wastage are required if safe and healthy drinking water is to provide to everyone on this planet earth. We here propose a safe, easy to use and inexpensive way to purify potable water collected from vide range of drinking water sources without any water wastage. The present invention is a dip bag type water purification kit containing seed extract of *Moringa oliefera* tree. The efficacy of the developed kit to combat bacterial contamination from drinking has been analyzed and it was observed that the kit is able to remove all the bacterial contamination originated from *E. coli*, *P. aeruginosa*, *S. aureus*, *S. typhi* and MRSA. The minimum time required for the elimination of bacterial contamination and minimum dosage required for this activity has also been standardized. It has been observed that seed extract in tune of 100mg is required to treat 1 liter of water in short span of 5 min. It has also been observed that genotype/phenotype of the seeds and/or *Moringaoliefera* tree does not have any effect on the efficacy of the seeds for water purification. The developed method was also found suitable for the removal of heavy metal, and toxic industrial dyes from water thus having potential for industrial waste water treatment. We are also in a process of analyzing the efficacy of the developed kit for the removal of water borne viral and protozoal contamination.

GENOTYPING OF PROTOZOAN PARASITE *CRYPTOSPORIDIUM* INFECTING HAEMATOLOGICAL MALIGNANCY PATIENTS

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Opportunistic protozoan parasite like *Cryptosporidium* commonly cause chronic diarrhea in immunocompromised patients, however; they are uncommon agents of diarrhea among haematological malignancy patients. Therefore, we aimed to study, a) prevalence of *Cryptosporidium* among haematological malignancy patients and healthy subjects, b) clinical symptoms associated with the infection, and c) genetic characterization of *Cryptosporidium* among them 148 consecutive haematological malignancy patients and healthy subjects each were evaluated for *Cryptosporidium* using modified acid fast (Kinyuon's). Genetic characterization was done using polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP). Patients demographic details and clinical symptoms were filled in a predesigned questionnaire. Statistical analysis was done using SPSS 20. Patients with haematological malignancy [n=148, age 34.07±21.37, 96 (64.9%) male] more often had *Cryptosporidium* than healthy subjects [n=148, age 32.5±6.5, 105 (70.9%)] using modified acid fast staining and PCR [5/148, 3.4% vs. 0/148; p=0.024]. Patients with *Cryptosporidium* more often presented with diarrhea [5/49, 10.2% vs. 0/99; p=0.001]. The most common species of *Cryptosporidium* infecting patients was *Cryptosporidium hominis*. *Cryptosporidium* infection occurs frequently among haematological malignancy patients, particularly among those presenting with diarrhea. *Cryptosporidium hominis* is the commonest species identified among patients.

BACTERIAL TANNASE: AN EMERGING BIOCATALYTIC TOOL FOR BIODEGRADATION OF TANNIN RICH AGRO AND INDUSTRIAL WASTE

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Globally around five billion metric tons of agro waste is produced every year. In India alone around 960 million tons of solid waste is produced annually as by-products of municipal, agricultural, mining, industrial activities etc. Thus there is a continuously growing apprehension about these stockpiling wastes which are creating pollution and health hazards. A worthy and sustainable approach to deal with these accumulating wastes can be to utilize them as alternates of high cost raw materials for economic production of products having commercial value. Tannins are fourth most abundant molecules in plants after cellulose, hemicellulose and lignin. Several industries utilizing plant constituents as raw and processing materials generate extensively high volumes of waste water having plentiful tannins. The toxic tannery effluent wastes from tannery industries also possess superabundant levels of tannins as tannic acid. This is a well-documented fact that bacteria have the ability for efficient degradation of hydrolysable tannins and tannic acid. However there are very few research investigations involving Tannin biodegradation at fermenter level. Thus in this context we screened the potent tannin degrading bacterial isolates from different soil samples. Altogether 32 bacterial isolates showing potential for tannin degradation were obtained. Bacterial isolate BI-2 belonging to *Bacillus* sp.exhibited maximum tannin degradation and thus maximum enzyme activity (0.83 U/ml)under submerged conditions. *Bacillus* sp. BI-2 portrays an attractive potential for tannin degradation and thus it may be utilized for biotransformation of tannins extracted from various tannin rich agro and industrial wastes for making valuable products like Gallic acid.

RNA INTERFERENCE BASED COMPLEMENTARY MEASURE TO CONTROL APPLE LEAF BLOTCH DISEASE BY SILENCING THE VITAL GENES OF MARSSONINA CORONARIA

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Apple leaf blotch disease is the most devastating disease caused by *Marssonina coronaria* (Ellis & J.J. Davis) J.J. Davis and all the available commercial cultivars of apple are susceptible to this pathogen. Host Induced Gene Silencing (HIGS) is a promising approach to control fungal pathogens by utilizing RNAi method in which sncRNA molecules are produced in the host plant to target the vital genes of pathogens resulting in improved resistance of the plant without the expression of foreign protein. For this, virulent isolate of *M. coronaria* was isolated from the infected apple leaf and maintained as pure culture under *in vitro* conditions in the laboratory. High quality of melanin-free RNA was extracted for the isolation, cloning, molecular characterization, and *in silico* analysis of few genes from the un-annotated genome of *M. coronaria*. Further, two essential genes of this phytopathogen were *in silico* analysed to yield an off-target free stretch having effective siRNA and hairpin-RNAi constructs were developed using pSILENT-1 and pCAMBIA-1300 vectors. Silenced mutants, generated by the *Agrobacterium tumefaciens*-mediated genetic transformation of *M. coronaria* with these constructs were confirmed by PCR and qRT-PCR which showed drastic reduction in the transcript level of these genes. The mutants also showed significant reduction in growth, sporulation, mycelia dry weight and pigmentation. *In vitro* detached apple leaf infection assay revealed that the spores of the silenced mutants of one target gene showed low virulence whereas, the mutants raised from the other gene exhibited loss of virulence. To conclude, we have elucidated the role of two vital genes of *M. coronaria* by utilizing the RNAi approach and these genes are now being used to generate transgenic apple varieties expressing ncsRNA specific to these genes for HIGS to control apple leaf blotch.

BIOMEDICAL WASTE GENERATION AND MANAGEMENT IN HOSPITALS – CASE STUDY FROM SHIMLA

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Any substance considered as useless or not usable anymore after its primary use and is rendered to be defective and worthless is considered as 'waste'. Such examples include of waste like municipal solid waste, hazardous waste, sewage and radioactive waste. One such sub-category of hazardous waste is classified as biomedical waste containing all kinds of infectious and disease causing wastes arising from hospitals, nursing home dispensaries and other medical centres. Such wastes need to be handled carefully and disposed of efficiently to avoid the spread of any diseases. In this context, an effective Waste Management and disposal plan is required to carry out a detailed a complete set of actions to dispose of the waste with utmost care and thereby not cause any ill effects to the environment nearby. In this context an attempt was made to completely study the collection, transport, treatment and disposal activities of some renowned and established healthcare units in and around the State of Himachal Pradesh to determine the steps taken for an effective waste management in these units and to draw a more effective and efficient waste management policy in context to the waste generation pertaining to these healthcare units.

UTILIZATION OF PINE NEEDLE BIOMASS FOR THE PRODUCTION OF BIODIESEL BY ENZYMATIC HYDROLYSIS

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North Indian states especially in Himalayan Range land is full of rainforest including abundance woody tree full of cellulosic biomass. The fast-growing woody pine needle trees are promising feedstock for bio fuels. Pine needles causes serious problems to hilly area land, after shedding from the tree, these cover the grassland and does not allow the small flora and grass to grow. The cellulose of the pine needles can be hydrolysed into simple sugars by enzymatic means to make bioethanol. Cellulose degrading enzymes of microbial origin are not stable in free form for long time-period and in range of reaction media. In addition, the phenolic content slows the rate of reaction by cellulose. There has been a global debate over bio fuel impact on land use, carbon stores and other related issues and our attempt is to amplify the boons and deduct the bane. The substrate used is pine needles that were collected, washed and then oven dried for 24h.It was then grinded precisely and made powder form. Then for obtaining dried biomass,5 concentrations 0.2%, 0.4%, 0.6%, 0.8%, 1%, added 0.25mg substrate were made and kept at volume 10ml each. It was kept for 24 h in incubator and then centrifuged at 8000rpm for 10min. The supernatant was removed, and pre-treated biomass was dried for 48 h in hot air oven at 60°C.The dried biomass is subjected to DNSA test. The motive of this work is to ensure bio fuel production from waste biomass that is cost effective as well as sustainable.

DESIGN, SYNTHESIS, CHARACTERISATION AND EVALUATION OF ANTIMYCOBACTERIAL ACTIVITY OF PEPTIDOMIMETICS

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Peptoid DP-23 was synthesized via solid phase synthesis technique using Boc 1,3-diaminopropane as mimetic for N-ornithine. The synthesized peptoid was characterized by high performance liquid chromatography, and mass spectroscopy. Antimycobacterial activity of peptidomimetics along with standard antibiotic was carried out against *Mycobacterium smegmatis*. Minimum inhibitory concentration of both peptidomimetics was found to be 12.5 µg/ml. Further their stability was evaluated in human serum. Both compounds LP-23 and DP-23 were incubated with human serum at room temperature and at different time points 0hr, 3hr, 6h, 12h, 18h and 24h samples were withdrawn and processed to evaluate their degradation kinetics. Degradation kinetics revealed that peptoid DP-23 is quite stable in serum and remained intact even after 24 hours. So the results of our study suggested that designed peptoid DP-23 not only retained the activity of peptide LP-23 but it also enhanced its stability in human serum.

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ISOLATION, CHARACTERIZATION AND BIOFILM FORMING POTENTIAL OF RHIZOBACTERIA

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Among the diverse soil micro-flora, plant growth promoting rhizobacteria (PGPR) mark an important role in enhancing plant growth through a range of beneficial properties. This is often achieved by forming biofilms in the rhizosphere, which has advantages over planktonic mode of bacterial existence. PGPR biofilm formation and plant growth promotion are governed by effective root colonization of the host plant. The main goal is to reduce pollution and preserve the environment in the spirit of ecological agriculture. Since there is a profound need to explore methods of sustainable agriculture in an eco-friendly and organic way, research and exploration of the potential of such organisms is imperative.In this study, seven isolates were characterized for their response towards utilization of components of tomato root exudates i.e. sugars, amino acids and organic acids and bio-film formation. All the isolates expressed a high potential for biofilm formation. The extent of sugar utilization was found to be higher as compared to utilization of organic acids and amino acids. Several PGPR properties such as nitrogen fixation, IAA production, ammonia excretion, phosphate solubilization, HCN production, amylase production, catalase and lipase production were tested. Amount of IAA ranged from 7.77 – 17.77 µg ml^{-1} and ammonia excretion ranged from 0.83 – 100 µg ml^{-1}. The results show that these isolates have a high potential for plant growth promotion in the tomato rhizosphere. SEM micrographs for biofilm architecture and MALDI for the identification of the isolates was performed. Pothouse trials are being conducted for the realistic evaluation of these PGPRs.

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ISOLATION AND CHARACTERIZATION OF HALOPHILIC PGPRS

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Salinity is a major environmental stress that limits crop production. It affects up to 20% and 50% of the total cultivated and irrigated land respectively throughout the world. Toxicity of salt ions inhibits the luxuriant growth of plants. However, the ability of the plants to grow in high saline conditions is highly desirable so as to increase the area under cultivation. Plant growth promoting bacteria are known to benefit plant growth by various metabolic processes including remediation of saline stress. In this study, two halophilic bacteria were isolated from water samples taken from Chilika salt lake, Odisha (India). The isolates form yellow, raised and circular colonies, and grow in presence of 2-18% NaCl (w/v), with effective growth at 6% NaCl (w/v) in 72 hours. The isolates show production of lipase at up to 10% NaCl stress, are positive for indole acetic acid and HCN production. However, they do not exhibit activities of cellulase enzyme and nitrate reduction. The isolates were tested for their effect on germination of tomato seeds under 1% and 2% salt stress. Under both the conditions, the bacterial primed seeds expressed better average shoot length (1.82 cm and 1.56 cm) as compared to control (0.82 cm and 0.61 cm) after 5 days. This shows that the organisms have a bioremediation potential for supporting plant growth in saline soils. Pot-house studies to further support the results are underway.

ONE VARIABLE AT A TIME APPROACH TO ENHANCE LACTOBACILLUS L- ARGINASE PRODUCTION

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Cancer is one of the most threatening disease around the globe with second rank in the mortality rate. Chemotherapy and physical therapy are generally employed for its treatment but these therapies have their own side effects. Depriving nutrient or amino acid to which cancerous cells are auxotrophic could be a promising cancer therapy by virtue of more specific killing of cancerous cells. Arginase is an anti-cancerous enzyme which could be used in the treatment of human cancers by nutritional starvation therapy. Arginine, the substrate of arginase, is a semi-essential amino acid because normal cells have own synthetic machinery as well as can utilize from external cellular nutritional pool. Many cancerous cells like hepatocellular carcinoma, prostate cancer, human colon cancer and breast cancer are arginine auxotrophic, thus arginase has potential role as therapeutic enzyme. Since arginine is involved in various metabolic processes, signaling pathways and help in the proliferation of cancerous cells so targeting arginine deprivation with arginase could be effective in cancer therapy. Therefore, optimization of the factors responsible for arginase production was carried out to minimize the enzyme production cost.In present study,One Variable At a Time (OVAT) approach was used to study factors influencing the production of arginase from a GRAS (Generally recognized as safe) organism *Lactobacillus* species. 1% of 10 hr. old culture was found to be optimal as inoculum. The other optimal production conditions were found as 24 hr incubation at 40 °C with pH 6. The optimal medium composition was determined as 0.5% sucrose as carbon source, 0.6% yeast extract as nitrogen source and 15 mM arginine. After optimization 2.58 fold increase in enzyme production was found.

STANDARDIZATION OF BIOFILM FORMATION OF AN OPPORTUNISTIC PATHOGEN *MYCOBACTERIUM FORTUITUM* FOR RAPID DRUG SCREENING

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Nontuberculous mycobacteria (NTM) are emerging contaminants recognized as etiological agents responsible for several opportunistic human infections. Among NTMs,*Mycobacterium fortuitum* is an opportunistic pathogen responsible for pulmonary complications, skin lesions, infectious postsurgical wounds and post injection abscesses. *M. fortuitum*forms biofilms in clinical settings and is a major cause of nosocomial infections. Biofilm formation ability of this species has also been reported to play a significant role in their pathogenesis. Clinical manifestations arising out of contamination of medical equipments by *M. fortuitum* and other NTMs necessitates a study upon their adherence potential. In this study, *M. fortuitum* biofilm growth and quantification protocols were standardized. The attached mycobacterial cells were quantified using crystal violet (CV) assay employing 96-well microtiter plates. A solvent medium was chosen for biofilm dissolution and subsequent quantification by optical density (OD) over a range of wavelengths. The OD values gave an estimate of the amount of adhered cells. Since this value is linked to the total biofilm formed, enumeration of biofilm cells as CFU $mL^{-1}$was done to validate the association. The time for which the cell clusters had to be sonicated to achieve the actual viability count was also estimated and standardized. The standardization would prove beneficial in devising rapid screening protocols for study of inhibition activity against biofilm forming *M. fortuitum* and other NTMs. Faster screening of synthetic drugs and other compounds would greatly help in drug discovery efforts against such infections.

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ACHIEVEMENTS IN MICROPROPAGATION OF APPLE ROOTSTOCKS AND TRANSFORMATION OF MERTON793 WITH *ROL* B GENE FOR IMPROVED ROOTING ABILITY

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For large scale production and to meet the demand of apple rootstock plants to raise high density orchards, the technology of in vitro multiplication of dwarf and semi dwarf rootstocks was developed and refined for large scale rooting and field transfer. Several problems faced during the managing of micropropagation process were overcome by restricting greenhouse operations to a particular season of the year. To reduce the risk of somaclonal variations, multiple shoot cultures were tested at an early stage for trueness to type. The micropropagation protocols and shoot cultures so developed, were successfully used at Pilot scale by TERI, New Delhi under a "Network Programme on Apple", funded by DBT and local enterpreneures under HorticTech Mission. These tissue culture units have sold plants to farmers of H.P., J&K and other apple growing states. Merton 793, an excellent apple rootstock adapted to a wider range of soil types and recommended for replantation in orchards, is difficult to root. With the purpose of increasing its rooting ability, cloning of *rol B* gene from *Agrobacterium rhizogenes* and its transfer to leaves of M793, using *A. tumefaciens* mediated genetic transformation have been carried out. Thirty putative transgenic lines were obtained. Transformation was confirmed in five lines by PCR amplification and RT-PCR of the *rol B* and nptII genes. Evaluation of rooting and hardening indicated significant increase in rooting frequency and success in pots as compared to non transformed controls. In future, desirable advances can be achieved by active cooperation between university researchers, commercial laboratories and the actual growers.

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E2F1 GENETIC VARIANT PREDISPOSES WITH HEAD AND NECK CANCER RISK IN HIMACHAL PRADESH POPULATION

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Most of the cancers arise due to the mutations in genes that control cell-cycle.The transcription factor *E2F1*is one of the cell-cycle regulatory gene and deregulated expression of this gene is reported in various human cancers. In this study, we analyzed association of rs2071054(C/T) polymorphism of *E2F1* gene with the susceptibility to lung and head and neck cancer risk in Himachal Pradesh population. Five hundred and thirty five (305 patients and ethnically-matched 230 healthy controls) were analyzed from Himachal Pradesh. Genotyping was done by using Polymerase Chain Reaction-Artificial Restriction Fragment Length Polymorphism method.

In this study, we observed significant association of mutant allele (T)(OR = 1.392, 95% CI = 1.020-1.900, P= 0.03) with head and neck cancer risk. However, this variant is not associated with lung cancer risk in this population.

The rs2071054(C/T) polymorphism of *E2F1* gene might be a genetic risk factor to head and neck cancer susceptibility in Himachal Pradesh population.

ISOLATION AND CHARACTERISATION OF EFFICIENT CHLORPYRIFOS DEGRADING BACTERIAL ISOLATE CDB-4 AND CDB-16

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Pesticides play an important role in Indian agriculture to meet increasing demands for food and fibre. These are the substances intended for preventing, destroying and repelling any pest. Due to bulk handling or accidental release, they are accumulated in soil which leads to occasional entry into ecosystems that show lethal effects on living systems. Pesticides are of different type i.e organophosphates, organochlorines, pyrethroids and carbamate. Rigorous use of chlorpyrifos (organophosphate) has resulted in serious environmental problems. It is thus gravely important to develop bioremediation methods to degrade and phase out this pollutant from environment. In this study, new bacterial isolates CDB-4 and CDB-16 with high chlorpyrifos degradation efficiency were isolated by using an enrichment culture method and identified as *Bacillus* based on morphological and biochemical characterisations. These bacterial isolates showing high chlorpyrifos tolerance according to biomass assay and MIC (Minimum inhibition concentration) determination. Selected bacterial isolates have shown tolerance to high level of metal salts (NH_4^+, Na^+, Mg^{2+}, K^+, Hg^{2+} and Fe^{3+}) and antibiotics. Gas chromatographic(GC) analysis of chlorpyrifos degradation indicated that the microbial consortium degraded this compound with 91.26 % degradation efficiency. Thus, the present study suggests the promising use of consortium of bacterial isolate CDB-4 and CDB-16 for efficient bioremediation of chlorpyrifos.

CHLOROFORM EXTRACT OF *THALICTRUM FOLIOLOSUM* AS AN ALTERNATIVE SOURCE OF INDUSTRIALLY IMPORTANT PHYTOCOMPOUND, BERBERINE

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Thalictrum foliolosum belonging to family Ranunculaceae is an erect, rigid, perennial herb distributed in Chamba, Kangra, Kinnaur, Kullu, Mandi, Lahul-Spiti, Solan, Shimla and Sirmour districts upto an elevation of 3000 m in Himachal Pradesh, India. *Thalictrum foliolosum* is used traditionally as a tonic, antiperiodic, diuretic, febrifuge, purgative and stomachic. Berberine, a tetra isoquinoline alkaloid present in this plant has great industrial application owing to its therapeutic potential such as antileukaemia, antihepatoma, cardioprotective, anticancer activity and many more. The various solvent extracts of leaves of *Thalictrum foliolosum* was investigated for their antimicrobial and antioxidant activity of leaves. Among all extracts, methanolic extract showed higher antibacterial potential as compared to other two extracts. However in case of fungi, the highest activity was shown by chloroform extracts. The FTIR results showed the presence of berberine in all extracts of leaves of *T. foliolosum*. TLC analysis showed the higher amount of fluorescent berberine in chloroform extract as compared to methanolic extract. The present study showed that chloroform extract showed more prominent fluorescent bands. The chloform extract of leaves of *T. foliolosum* can be used as an alternative source of berberine which is known for its antimicrobial as well as antioxidants in food and pharmaceutical industries.

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SOMACLONAL VARIATION: A NOVEL STRATEGY FOR *IN VITRO* SELECTION OF APPLE ROOTSTOCK MM106 RESISTANT TO *PHYTOPHTHORA CACTORUM*

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The most widely used apple rootstock MM106 is highly susceptible to collar rot pathogen caused by *Phytophthora cactorum. In vitro* selection is advantageous on that it makes possible direct selection of novel phenotypes, under defined conditions, within limited space and short period of time. Keeping in view, an efficient plant regeneration method and *in vitro* selection protocol against collar rot pathogen were developed. Leaf explants resulted in organogenesis which was direct as well as through callus on eight combinations of BA (2-5mg/l) and NAA (0.5-1mg/l). The regeneration percentage was found to be varied from 20-60%. The highest regeneration frequency (60%) was observed on MS medium supplemented with 5mg/l BA and 1mg/l NAA with 8-9 shoots per explant. Fungal culture filtrates of three isolates of *P. cactorum*, were mixed and after four stepped filtration toxicity was checked. Healthy regenerants were multiplied to large numbers and exposed to selective medium containing different concentrations of FCF (20-80 per cent v/v) for selection of tolerant shoots. The critical concentration of FCF was found to be 74%, resulting in 37.8% survival of shoots after getting necrotic. Thereafter, the tolerant shoots were subjected to continuous and discontinuous cycles. Regenerants selected on 74% and 72% FCF showed 100% survival in discontinuous cycle while 33.3% and 50 % survival was observed in continuous cycles respectively. *In vitro* pathogenicity assay showed that seven out of eight regenerated shoots selected under selection pressure exhibited tolerance against *P. cactorum.* These tolerant shoots were multiplied, rooted and hardened.

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IDENTIFICATION OF NOVEL NATURAL INHIBITORS AGAINST CDK5/P25 FOR ALZHEIMER'S DISEASE

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The Alzheimer's disease (AD) is the most common progressive neurodegenerative disease of the modern era including the most common cause of dementia with ageing. According to a report, the Alzheimer disease is the sixth leading cause of death in the United States of America and by the year 2050 it will affect approximately 14 million individuals. Requirement of further drug is necessary to fight from this disease. The Cyclin-dependent kinases (CDKs) belong to the family of heterodimeric proline directed serine/threonine protein kinases. They play the key role in the microtubule associated tau protein phophorylation. In this study we have targeted the CDK5/p25 enzyme with the natural inhibitors. The subset of primary and secondary metabolites (n= 1, 67,741) was retrieved from ZINC database and screened against CDK5 enzyme in four rounds of virtual screening. After screening 407 compounds were selected for ADMET studies. Here we have predicted various descriptors like BBB penetration, HIA absorption, Caco-2 cell permeability, CYP enzyme inhibition, Pgp substrate/inhibitor, carcinogenicity, and toxicity and LD_{50} values. The ADMET studies suggested that our most compounds can cross the blood brain barrier. From ADMET studies we have taken 17 compounds with one reference compound. All these 17 compounds are again docked by Autodock and Autodock Vina using re-docking approach. After that the 4 compounds which showed the greater binding affinity and good ADMET descriptors than reference compound were employed for MDS studies. From MDS we have predicted that our predicted hits are best and can be used as an anti-Alzheimer agent in future. Further *in-vitro* validity of the result is required.

ABIOTIC CONDUCTIVE MATERIALS ENHANCE THE ELECTROCHEMICAL POTENTIAL DURING ANAEROBIC DIGESTION OF PINE NEEDLE

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The anaerobic digestion (AD) of organic waste is an eco-friendly method to produce green energy. In the present study we used forest pine needle litter and cow manure for AD process. The lignocellulosic complexities in pine needle are a big hurdle in the way of generation of renewable energy through AD process. The direct interspecies electron transfer (DIET) mechanism is an area of research in past few years to accelerate the process of AD for production of renewable energy, employing biotic (cytochromes, pili and flagella) and abiotic (conductive materials like activated charcoal, carbon cloth etc.). The present research focuses on the evaluation of conductive materials (activated charcoal powder, graphite powder and biochar powder) for AD using pine needle as substrate (1% optimized previously) along with cow manure as inoculum. The results indicate that graphite powder (5mM), activated charcoal powder (15mM) and biochar powder (15mM) were able to overcome the hindrances observed during AD process of pine needle. The graphite powder, activated charcoal powder and biochar powder were able to enhance the electrochemical potential by 2 times (0.75V), 1.5 times (0.56V) and 1.6 times (0.57V) respectively. Thus the present work indicates the potential role of graphite conducting material in enhancing AD process of pine needle litter through DIET mechanism.

POSTER - 01

TO ANALYZE THE ANTIMICROBIAL AND NUTRITIONAL VALUE OF MO "THE MIRACLE TREE" COLLECTED FROM LOWER HIMALAYAN ECOTYPE

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Moringa oleifera belonging to family Moringaceae, is a plant that grows in tropical and subtropical regions of the world and is widely cultivated throughout India. It is well known for its nutritional and medicinal values; almost every part of the plant can be used for food, medicinal or industrial purposes. The nutritional and medicinal values are due to the presence of certain primary and secondary metabolites synthesized by the plant. The objective of the study is to assess the antimicrobial potential and nutritional value of *Moringa* leaves of the lower himalayan ecotype.The phytochemical screening of samples revealed the presence of secondary metabolites such as alkaloids, flavonoids, phenolics, saponins and tannins. The antibacterial activity of ethanolic leaf extracts of *Moringa oleifera* were determined using well diffusion method. The crude ethanolic extract showed remarkable activity against the growth of pathogenic *Escherichia coli, Staphylococcus aureus* and *Pseudomonas aeruginosa* with the diameter zones of inhibition (DZI) of 12mm, 10mm and 9mm respectively. The minimum inhibitory concentration (MIC) of the ethanolic leaf extracts on *E. coli*, *S. aureus* and *P. aeruginosa were* at 6.25mg/ml, 3.12mg/ml and 6.25mg/ml. The HPLC analysis indicated the presence of various water soluble vitamins (B3, B6, B9 and B12). Further, isolation and identification of certain bioactive compounds with good medicinal and nutritional activity is in progress. These bioactive compounds can be used in curing many diseases like typhoid, diarrohea, hypertension, hyperglycemia and gastro-intestinal disorder.

POSTER - 02

ISOLATION AND CHARACTERISATION OF HYPOVIRULENCE ASSOCIATED dsRNA MYCOVIRUS FROM FUSARIUM

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Root rot disease of apple is caused by number of plant pathogenic fungi and *Fusarium* spp. is one of them. *Fusarium*, a genus of filamentous fungi, has many species which are serving as important pathogen to many diseases in crops. Curing oil borne fungal diseases is a major concern as fungicide treatment to infected soil raises environmental concerns. Biological control of soil borne fungal diseases by the use of myco viruses is a relatively new area with great promise. Myco viruses induce hypovirulence in certain plant pathogenic fungi which make them useful biocontrol agents. Dependence on fungicides can be reduced by debilitating the plant pathogenic fungi. An attempt was made to isolated s-RNA elements from *Fusarium* spp. infecting apple. Presence of mycoviral dsRNA was confirmed by isolation of dsRNA using CF-11 cellulose chromatography method followed by RT-PCR amplification with primer pairs designed from the RdRp sequences of different *Fusarium* myco viruses and then sequencing was done to find out the gene sequence of the invading myco virus. A sequence of 705bp was obtained after sequencing. BLASTn results had shown results i.e. the sequence was found to be 90% identical to the *Fusarium fujikuroi* IMI 58289 draft genome, chromosome FFUJ and 50% identical to *Fusarium fujikuroi* IMI 58289 related to phospholipase D, partial mRNA. Present investigation confirms the presence of dsRNA myco virus in *Fusarium* isolated from apple orchards and in future, mycoviruses can be used as biocontrol agents to combat fungal diseases and exploit them as tools to explore the physiology of their fungal hosts.

RESPONSE SURFACE METHODOLOGY FOR THE OPTIMIZATION OF ESTERASE PRODUCTION FROM BACTERIAL ISOLATE *SERRATIA* SP.

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Various production parameters were optimized for obtaining maximum enzyme production from a bacterial isolate *Serratia* sp. Esterase gave considerable activity in PM5 medium containing g/l peptone (10.0, w/v), NaCl (5.0 w/v), beef extract (10.0, w/v), yeast extract (2.0 w/v), cotton seed oil (1.0%, v/v). Further optimization of various production parameters resulted in maximum production at inoculum age of 18 hr, inoculum size 1% (v/v), temperature 45°C, pH 8.5, cotton seed oil (4.0%, v/v), peptone (2.0%, w/v) and maltose (1.0%, w/v). The statistical approach by using RSM showed results for optimizing the process parameters for maximum esterase production from bacterial isolate and allowed to check the interaction among six variables (concentration of peptone, concentration of maltose, incubation temperature, cotton seed oil concentration, inoculum size and pH). Out of these six variables, only four variables (inoculum size, pH, peptone concentration, cotton seed oil concentration) were found to have positive impact on enzyme production process as shown by Plackett- Burman design. These four factors were further considered under observation in CCD to optimize the production process. After optimization, maximum activity of enzyme was found to be 9.77 U/ml and the production of the esterase increased by 1.52-fold. Lack of fit was also found non-significant.

ENDOPHYTIC MICROBES FROM CEREAL CROPS AND THEIR POTENTIAL APPLICATIONS FOR PLANT GROWTH PROMOTION

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Endophytic microbiomes are ubiquitous in nature and reported from most of plants studies. Endophytes seem to contribute to plant fitness and growth, displaying plant growth promoting traits that can be applicable as eco-friendly manner in agriculture. The interactions between endophytes and plants can promote plant health and play a significant role in low-input sustainable agriculture for both food and non food crops. To analyze the diversity of plant growth promoting endophytic microbes, cereal crops were collected from different location in Sirmour, Himachal Pradesh, India. A total of 392 microbial isolates were isolated from internal tissue of plants using specific and selective growth media. The isolated microbes were screened *invitro* for plant growth promoting activities including biological nitrogen fixation; solubilization of phosphorus, zinc and potassium; production of siderophores, ammonia, HCN, and hydrolytic enzymes. The selected microbes on the basis of multiple plant growth prompting attributes were also screened for growth under the different abiotic stress of temperature (10-50°**C**), (5-15 NaCl concentration), and pH (4-8). Among screened isolates, the 11 efficient strains based on PGP activities were further tested for their ability to influence plant growth under *in vivo* conditions. Phylogenetic analysis based on 16S rRNA gene and amplified ribosomal DNA restriction analysis (ARDRA) using two restriction enzymes *Alu*I and *Bam*HI lead to identification of different genera including *Acinetobacter, Enterobacter, Erwinia, Pantoea, Pseudomonas, Rahnella* and *Serratia.* Theendophytic microbes with multiple plant growth promoting can be applied for plant growth promotion, crop productivity in eco-friendly manner.

POSTER - 05

OPTIMIZATION OF LIPASE PRODUCTION FROM POTENTIAL BACTERIAL PRODUCER BY PLACKETT-BURMAN DESIGN AND THEIR APPLICATIONS IN FOOD INDUSTRIES FOR HUMAN HEALTH DEVELOPMENT

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Lipases are triacylglycerol acyl hydrolases with E.C. number 3.1.1.3 and are found in wide diversity of sources i.e. plants, animals, soil and human beings such as blood, gastric juices, etc. Lipases catalyses transport of fats (lipids). Lipases are produced by higher eukaryotes as well as many microorganisms. Microbial lipases are most useful for human health development and industries. Lipases has so many biological actions such as digestion of nutrients, cholesterol transport and flavour enhancement in dairy products, milk chocolates, beverages, etc. hence is a promising enzyme. A bacterial lipase producing isolate C6 was screened and identified as *Bacillus siamensis* C6 (accession number- 446911) using 16S rRNA gene sequence analysis. In this study, the optimization of different process parameters i.e. pH, temperature, incubation time, inoculum size, etc. for the increase in *Bacillus siamensis* C6 was achieved using statistical methods. Firstly, the key parameters having positive and negative effect were screened by Plackett-Burman experimental design, then the levels of different positive factors were optimized using central composite design of Response Surface Methodology.

POSTER - 06

ISOLATION AND SCREENING OF POLYHYDROXYALKANOATES PRODUCING BACTERIAL STRAINS AND OPTIMISATION OF PRODUCTION FROM MOST EFFICIENT STRAIN

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Plastic accumulation is one of the major problems, the world is facing today and it is increasing 8 million metric tonnes a year. It is continuously affecting the environment creating problem for plants, wildlife, aquatic life as well as humans. This calls for an urgent need of replacing plastics with biodegradable bioplastics. Polyhydroxyalkanoate (PHA) is a unique biopolymer which is biodegradable and most close to plastics which is miscible with the conventional plastic. Considering the importance of PHAs, we have collected soil samples from dumping sites of Shimla and Solan districts of Himachal Pradesh for the isolation of polyhydroxyalkanoate (PHA) producing bacteria. A total of 104 isolates were isolated from different samples which were further screened for efficient PHA producing bacteria. Screening was done by culturing the bacteria on nutrient rich and deficient medium and was further screened by Sudan Black B staining and Nile Blue A detection method. The selected isolates were then assayed by crotonic acid assay for qualitative analysis. Bacterial isolate T1 was found to have maximum PHA production and was selected for optimization of different parameters. The production was found to be maximum with 7% inoculum size, galactose as carbon source, malt extract as nitrogen source at incubation temperature of 50° C and at pH 10.0.

DIVERSITY OF FUNGAL PATHOGENS ASSOCIATED WITH BLIGHT DISEASES OF TOMATO FROM SIRMAUR DISTRICT OF HIMACHAL PRADESH

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Tomato (*Solanum lycopersicum* L.) is an important horticulture crop of Himachal Pradesh and remains the backbone of rural economy in Sirmaur district. It is highly prone to several plant pathogens resulting in significant losses in production and quality. In the present study, incidence and causative pathogens of blight diseases of tomato were determined from 18 villages of district Sirmaur. Field observations revealed higher disease incidence and severity in the month of July which was correlated with higher rainfall and humidity. Blight disease incidences were highest in Pachhad tehsil where 87-100% of the plants exhibited typical blight disease symptoms. From the diseased plants, eleven isolates (TK1 - TK11) were obtained and further identified on the basis of colony coloration, texture, sporulation, zonation and margin patterns on five different culture media viz. potato dextrose agar, V-8 juice agar, rose bengal agar, Sabouraud dextrose agar and cornmeal agar. Microscopic analysis revealed septate hyphae bearing conidia with characteristic beak at the tip. PCR amplification of the ITS region, gene sequencing and phylogenetic analysis confirmed their close sequence resemblance to *Alternaria*. Isolates TK2, TK3, TK4, TK5, TK8, TK11 showed 99% similarity with *Alternaria alternata* and the remaining isolates were related to other *Alternaria* species. Our findings indicatedthe prevalence of blight diseases on tomato crops growing invarious regions of Sirmaur and suggest an integrated management strategy to effectively minimize the crop loss.

IMMOBILIZATION OF AMYLASE PRODUCING BACTERIAL STRAIN ON A SUITABLE MATRIX AND CHARACTERIZATION OF PHYSIOCHEMICAL PROPERTIES

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Amylase is an enzyme that hydrolyses starch into its monomeric compounds, a very common and essential reaction that takes place within various living organisms in order to generate or store energy. Hence, amylase is a very prevalent enzyme produced biologically by various kinds of living organisms. Among the various types of amylase, the microbial amylase meets the industrial demand for the mass production of commercial amylase. The use of immobilized cells offers several advantages over free cells, such as relative case of product separation, re-use of biocatalysts, prevention of washout, reduced risk of contamination and operational stability. Furthermore, using the entrapment technique, a dense cell culture can be established leading to improve productivity. Among different immobilization techniques, entrapment in calcium alginate gel offers many advantages due to its simplicity and non-toxic character. Immobilizing amylase producing bacterial strains on suitable matrix can be further used in waste water treatment, bioreactors, food industry, textile, detergent and paper industry.

POSTER - 09

EFFECT OF PHYTASE ON NUTRITIONAL, ANTINUTRITIONAL COMPOSITION AND MICRONUTRIENT DIALYZABILITY OF BIOFORTIFIED WHEAT GENOTYPES

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Phytase (Myo-inositol 1,2,3,4,5,6-hexa*kis*phosphatase) belong to special group of phosphate enzymes that are capable to hydrolysis of anti-nutrient such as phytic acid (Myo-inositol 1,2,3,4,5,6-hexa*kis*phosphate). Phytic acid is a chelating agent which binds to divalent cations (Iron and Zinc) making them insoluble and thus unavailable for intestinal absorption in monogastricanimals. In the present study, analysis of various biofortified wheat genotypes was carried out for minerals (Fe and Zn), inorganic phosphate, phytic acid and tannin and compared with parental wheat varieties PBW343+GPC+L*r*24 and HD2967+Y*r*40+L*r*57 as a control. For phytase application, wheat phytase was used to treat flour of different biofortified wheat genotypes. Followed by treatment it was observed that anti-nutrients (phytic acid and tannin) in treated flour were reduced and micronutrient dialyzability (Fe and Zn), protein content and inorganic phosphate were increased to different level over untreated samples, respectively. Overall, this approach was found useful to enhance the nutritional value of cereals seeds.

POSTER - 10

TRADITIONAL MEDICINAL PLANTS OF HIGHER ALTITUDE OF HIMACHAL PRADESH AS FUNCTIONAL FOOD INGREDIENT CUM FOOD PRESERVATIVE AND THERAPEUTICS AGAINST FUNGAL INFECTIONS.

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Candidiasis is a fungal infection caused by yeasts that belong to the genus *Candida.* Fluconazole and amphotericin B are most commonly used antibiotics to treat *Candidiasis*. Some strains of *Candida* have developed resistance to these antibiotics (and even multidrug resistance, MDR), which are difficult to treat.

The present study was done to investigate and compare the phytochemicals of different Himalayan medicinal plants (*Picrorhiza kurroa, Polygonum amplexicaule, Cythula tomentosa, Bergenia ligulata*) as antifungal agents, antioxidant and bioavailability enhancer of antifungal drugs such as fluconazole and amphotericin B.

Methanolic extracts of *P. amplexicaule* showed higher total phenolic content (549.33 ± 3.9 mg/gm GAE) and *B. ligulata* (Rhizome) showed higher flavonoid content (382.8 ± 2.4 mg/gm RE). Methanolic extracts of *B. ligulata* (roots, leaves) and *P. amplexicaule* showed higher antifungal potential as determined by agar well diffusion and broth dilution methods against *Candida albicans* (MTCC277 and ATCC90028) and *Saccharomyces cerevisiae* (H1086). Extracts of medicinal plants *B. ligulata* (leaves and roots) and *P. amplexicaule* (roots) enhanced the bioavailability and reduce dose of fluconazole and amphotericin B, thus providing better management to *Candidiasis.* Extracts of all the selected medicinal plants were also screened and compared for *in vitro* antioxidant potential using DPPH radical scavenging method. It was found that methanolic extracts of *P. kurroa* (IC_{50} value 5.62 µg/ml *and B. ligulata* (roots IC_{50}- 3.107 µg/ml, leaves (3.99µg/ml) showed higher antioxidant potential as compared to other medicinal plants and very similar to ascorbic acid. The data from the current study exposed the importance of traditional medicinal plants from higher altitudinal regions of Himachal Pradesh as functional food ingredients and food preservation and to treat fungal pathogens.

PROBIOTICS IN ANIMAL HEALTH: A REVIEW

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The word Probiotics is derived from the Greek word, which means 'For Life' and this term, is used for those microorganisms that are associated with the beneficial effects for humans and animals. Probiotics has a long history of safe use for promoting human health and this has motivated their use in animalalso. The probiotic bacteria are being used as feed additive in poultry, aquaculture and livestock. The supplementation of these microbes in animal feed has resulted in improvement of growth rate and feed utilization, diseaseresistance and decrease in enteropathogen shedding. Recently the role of gutmicrobiota in CNS function through gut-brain axis has been established. The importance of probiotic microbes in animal health has increased during last two decades as a result of scientific evidence being given through *in vivo* studies on animals. Antibiotic resistance has emerged as biological and ecological threats to the society due to wide and discriminate use of antibiotics and their residual effect on product. The use of probiotics is an effective and eco-friendly alternative to solve the problem of antibiotic resistence. Probiotic microbes alleviates health problems through different mechanisms such as competitive pathogen exclusion, synthesis of inhibitory metabolites, ability to alter gut environment, potential of immunomodulation and stress alleviation mechanism.

THERAPEUTIC POTENTIAL OF ESSENTIAL OILS FROM *CITRUS AURANTIUM* AND *EUCALYPTUS GLOBULUS* OF NORTH-WESTERN HIMALAYAN REGION

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Traditional medicinal plants of North Western Himalayan region offer a wealth of phytocompounds, including essential oils (EOs) that can be explored for antimicrobial activities with antioxidant potency. Essential oils are naturally occurring volatile liquid, complex compounds with strong odour.Essential oils from plants have been known since antiquity to possess various biological activities like antimicrobial, antioxidative, insecticidal, anticancer, anti-inflammatory properties etc. The present study was conducted to analyse the antimicrobial and antioxidant potency of essential oils from leaves of *Citrusaurantium* and *Eucalyptus globulus* collected from Solan, Himachal Pradesh. Furthermore, the essential oils were characterized using Gas chromatography–mass spectrometry (GC-MS) analysis for identification of phytocompounds. Fresh leaves from selected medicinal plants were collected and essential oils were extracted using hydro-distillation method. The percentage yield of essential oils was observed 0.2% (ml/g fresh weight)from*Citrus aurantium* and 1.6% (ml/g fresh weight)from*Eucalyptus globulus*. The antifungal activity was tested against *S. cerevisiae* as a standard control and two pathogenic strains of *Candida albicans*, whereas for antibacterial activity, *Staphylococcus aureus, Bacillus subtilis*, *Escherichia coli* and *Klebsiella pneumoniae* were used. Essential oils from both the plants showed a broad range of antimicrobial activity against all tested strains, which was evident from the Minimum Inhibitory Concentration (MIC) of essential oilsranging from0.15% to 0.62% (v/v) for fungal pathogen and 0.31% to 1.25%(v/v)for bacterial pathogens.Both essential oils exhibited strong antioxidant activity. GC-MS analysis of *Citrus aurantium* essential oil showed the presence of various phytocompounds such as 2-βPinene,Δ-3 Carene and Di-limonene.Therefore, it can be concluded that essential oils of medicinal plants serve as a simple and cost effective alternative remedy for curing bacterial and fungal infections with antioxidant properties useful for food industries.

POSTER - 13

EVALUATION OF ANTIHYPERTENSIVE COMPOUNDS VIA RENIN ANGIOTENSIN SYSTEM DERIVED FROM MEDICINAL PLANTSAND HERBS: AN *IN-SILICO*APPROACH

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Hypertension contributes to multiple cardiovascular diseases and the mechanism including hypertension remains unclear as it includes different organs like liver, kidney, lungs etc. and enzymes, although the involvement of homeostatic system i.e. Renin Angiotensin System (RAS) is established that regulate the blood pressure. Angiotensin Converting Enzyme (ACE) and Angiotensin Type 1 Receptor (AT1R) are the main components of the RAS system. The RAS components are upregulated under pathophysiological conditions mainly in diabetes, obesity andhigh salt intake. To circumvent the effect of the RAS on blood pressure several herbal drugs are in use as therapeutic agents. The mechanism of the majority of them is not known as how they act via RAS. We opted *in silico* approach, to decipher the binding affinity of the bioactive compounds present in medicinal plant and herbs with angiotensin converting enzyme and Angiotensin type 1 receptor predicting. Among the ten plants screened three plants i. e. *Sesame indicum, Allium sativum and Punica granatum* bearing compounds Sesamin, Oleanolic acid and Corilaginhave shown best binding affinity with ACE-10.2, -10.0 and -10.2 respectively. Howeve*r, Catharanthus, Punica granatum* and *Sesame indicum* harboring compounds Catharanthine, Corilagin and Sesamolin have shown best binding affinity with AT1R-9.0, -10.3 and -9.8 respectively.While the binding affinity of standard drugs Candisartan showed -9.7 and Captopril have -5.5 respectively.In conclusion, knowing the bioactivity of the compounds present in such plants would help in improving the efficacy and formulating the medicine for control hypertension or high blood pressure.

POSTER - 14

POTENTIAL OF RED PIGMENTS OF *RHODONELLUM PSYCHROPHILUM* STRAIN GL8 AS FUNCTIONAL FOOD INGREDIENT CUM FOOD PRESERVATIVE AND BROAD SPECTRUM DRUG AGAINST BACTERIAL AND FUNGAL PATHOGENS.

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Synthetic colours and pigments have caused irreparable loss to human health and environment. Thus, biological pigments are gaining much awaited attention in health, food, cosmetics and textile industries. Among natural sources, bacterial strains offer huge potential in terms of fast growth, easy and large scale culturing, simple techniques for extraction and purification of pigments. Therefore, microbial strains could become a sustainable source for the large scale production of biological pigments. In the current study, we isolated psychrophilic and red coloured bacteria from Pangong Tso lake of Leh and Ladhak. By 16S rDNA sequencing, a psychrophilic bacterium has been identified as *Rhodonellum psychrophilum* strain (GL8). 16S rDNA sequence of 1370 bp was submitted to the GenBank under accession no. MH031708.1.The *R. psychrophilum* strain (GL8) is Gram-negative, rod shaped, non-motile and produce intense red pigment. The optimum growth of *R. psychrophilum* strain (GL8) was observed between pH 5-9 and 4 °C. *R. psychrophilum* strain (GL8) could also grow in a medium containing 1 M NaCl, suggesting halo tolerant nature of the bacteria. R. psychrophilum strain GL8 showed lipase, catalase and L-glutaminase enzyme activity. The intracellular red color pigment was extracted using ethanol from *R. psychrophilum*(GL8). Purified pigment showed antimicrobial activity against *Escherichia coli, Candida albicans* (MTCC 277), *Saccharomyces cerevisiae* (H1086) and *Candida albicans* (ATCC 90028). The DPPH radical scavenging assay showed that red pigment has higher radical scavenging activity with IC_{50} value 13.159 µg/ml as compared to ascorbic acid value 28.151µg/ml. The UV absorbance spectra of the red pigment showed maximum absorption at 490 nm and have been identified as prodigiosin by LC - MS/MS spectra with molecular weight 324.

A REVIEW ON THE INCREASE OF SOIL FERTILITY BY USING ECO-FRIENDLY RHIZO-FERTILIZERS

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In Himachal Pradesh, there is only 40% area of land on which crops are cultivated. And there is a great need to increase the yield of the crops and which results in improvement of the economy of India. People are using chemical fertilizers which causes harm to soil fertility. Chemical fertilizers provide nutrients to soil directly but chemical fertilizers contain salts which are directly added to soil and increase the salinity of the soil. Soil is losing the minerals required for the plant growth. This is a major problem in H.P, the fertility of the soil is decreases because the farmers adding more and more chemical fertilizers. There is a solution for this major problem is "rhizo-fertilizers". Rhizo-fertilizers are the consortia of the microorganisms which are called PGPRs (plant growth promoting rhizobacteria). The most common genera of bacteria are: *Pseudomonas, Arthrobacter, Agrobacterium, Alcaligenes, Azotobacter, Mycobacterium, Flavobacter, Cellulomonas, Micrococcus* etc have been reported. They are the *Rhizobacteria* which promotes the plant growth when added with the charcoal, with in media solution near to root parts or in the soil directly, the rhizobacteria colonizes around the root rhizosphere and promotes the growth of the plant by increasing the solubilization of nutrients. The aim is to improve the fertility of the soil and increase the yield of crops by the minimum use of chemical fertilizer because yield of crops have direct impact on economy.

ELECTROCHEMICAL DNA BASED BIOSENSOR FOR THE DETECTION OF SELECTED FOODBORNE PATHOGENS

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Salmonella enterica and *Listeria monocytogenes* are two pathogens that cause foodborne illnesses. In the present study, a rapid DNA based nanosensor using specific NH_2 labeled probe was developed against *stn* gene of *Salmonella enterica* and *PlcA* gene of *Listeria monocytogenes*. These probes were immobilized on carboxylated multiwalled carbon nano tube and gold nanoparticle (c-MWCNT/Au-NP) and screen printed gold (SPGE) based electrode using 1-Ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC):*N*-Hydroxysuccinimide(NHS) and Mercaptopropionic (MPA) acid based cross linking chemistry. Electrochemical characterization studies of bare, immobilized and hybridized electrodes were further performed using cyclic voltammetry (CV), differential pulse voltammetry (DPV) and electrochemical impedance (EI) using methylene blue and potassium ferricyanide as an artificial electron donor. Electrode surface characterization was performed using scanning electron microscopy (SEM). The developed sensor for the detection of both pathogens was highly sensitive and specific having sensitivity of 4214 ($\mu A/cm^2$)/ng and lower limit of detection (LOD) was found to be 52 fg/6 µL with the regression coefficient (R2) of 0.992 using CV in *Salmonella enterica* and a sensitivity of2806 ($\mu A/cm^2$)/ng and lower limit of detection (LOD) was found to be 5.21fg/6 µLwith the regression coefficient (R2) of 0.844 using CV in *Listeria monocytogenes* as comparison to the conventional detection methods. Both the sensors were found stable for 6 months with only 10% loss in initial peak current in CV analysis on storage at 4°C.

HUMAN SALIVA AS A POTENT ANTIOXIDANT AGENT: A REVIEW

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Saliva is a good indicator for human oral physiology and pathology. Saliva is a watery substance secreted by the salivary glands. Three types of saliva are excreted-serous (watery), mucus (thick), and mixed. Different salivary glands produce different types, and each contributes to the overall all fluid that we call Saliva. 98% of saliva contains water and remaining 2% inorganic and organic substances. This review work reveals some important findings on saliva as a potent antioxidant. Study of saliva composition gives a definitive indication on the onset of periodontal disease. Total antioxidant capacity of saliva may influence in dental caries and also prevent oral cancer. There are several aspects of saliva on antioxidant properties. Saliva may be used for several damage control functions in human body. Further research work is required to prove the wound and burn healing capacity and antioxidant properties of specific enzymes or biomolecules present in human saliva.

SCREENING AND ISOLATION OF CARBONIC ANHYDRASE PRODUCING BACTERIA FROM COW SALIVA

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Carbonic anhydrase (CA) is a zinc-containing metalloprotein, in which the Zn active center plays the key role to transform CO_2 into carbonate. CAs is among the fastest enzymes known, which have a maximum catalytic efficiency 108 $M^{-1}s^{-1}$. As such, CAs is being utilized in various industrial and research processes to lower the CO_2 atmospheric emission. The microbial populations present in ruminant mouth contains a bacteria, protozoa and fungi in saliva which catalyses the breakdown of feed and other metabolites. Carbonic anhydrase producing microbes from cow saliva is the main interest of this study.The sample was collected from cow saliva with help of sterilized bud. Further collected saliva brought to the laboratory, labeled and immediately preserved at 4ºC before subjected into further analysis. The saliva sample was serially diluted up to 10^{-4} aliquot of each dilution. The plate assay was performed in Nutrient agar with 3mM nitrophenyl acetate (*p*-NPA) for the isolation of CA producing bacteria.The appearance of best yellow colors zones around the colonies indicated the production of carbonic anhydrase and undertaken for further study.And then isolated colonies were subjected to the Gram-staining and colony was found to be Gram-positive and rod shaped. Carbonic anhydrase producing microorganism from ruminant animal saliva is an unexplored area of research. The carbonic anhydrase enhances the hydration of CO_2 in aqueous solution.

WASTE MANAGEMENT IN VILLAGES BY THE USE OF MICROBIAL SYSTEM

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Traditionally, waste in rural India was managed well within the environment. The waste system was biodegradable, reusable or recyclable. Due to industrialization and the growth in the number of consumers there is rapid spread of these non-biodegradable wastes, particularly plastic packaging. Waste management system includes collection, transportation, treatment and disposal of waste. There is no proper waste management system in the villages due to unawareness and no proper waste disposal infrastructure. To maintain proper waste management system there must be 100% waste segregation. Lack of responsibility, action and applied resources by local Panchayats, Rural areas receive little attention. Despite the reality that approximately 75% of Indians are living in rural village environment that are legally responsible for providing for the collection, storage and disposal of waste in the villages. Improper disposal of waste create unhygienic environment and lead to various environmental issues and human health problems. Waste management system needs eco-friendly strategies for the disposal and treatment of waste. Biodegradation of waste by micro-organism (bacteria,fungi) prevents the release of polluters into the environment. The various strategies of waste management system have complex technical challenges. They also have wide variety of social and economical problem that must be managed and solve.

IN VITRO CALLUS INDUCTION AND REGENERATION OF SOLANUM LYCOPERSICUM CV. SOLAN VAJR FROM DIFFERENT EXPLANTS

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Tomato (*Solanumlycopersicum* L.), belonging to family Solanaceae, is a widely grown vegetable all over the world. Tomato is rich in vitamins, minerals and lycopene. Herein, attempts have been made to standardize the in vitro callusing and regeneration protocol from *in vitro* raised plant lets from the seed explants on MS basal medium. Seeds treated with 0.1% (w/v) bavistin for ten minutes and 0.5% (v/v) sodium hypochlorite for three minutes resulted in60.94% survival of seedlings, which were subsequently used as leaf, internode and root explants for callus induction. Different concentrations of 6-Benzylaminopurine (BAP) and Naphthalene acetic acid (NAA) were used for callus establishment, multiplication and regeneration. MS medium supplemented with 3.0 mg/l NAA + 1.0 mg/l BAP was found to be best for the growth of callus from the different explants. Internodal explants were found to be the best for callus induction resulting in 100% callus induction in comparison to the leaf and root explants which resulted in 95.21% and 81.11% callus induction, respectively. Moreover, MS medium supplemented with 1.75 mg/l BAP was found to be the best for shoot regeneration form the callus. These optimized concentrations of growth regulators are now being used to develop somaclones using *in vitro* cell selection of tomato cv.Solan Vajr against the buck eye rot disease.

COMPUTER AIDED DIAGNOSIS USING ULTRA SOUND IMAGES FOR THE DETECTION OF FIBROIDS AND OVARIAN CANCER

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POSTER-21

An estimated one woman in 75 develops ovarian cancer during her lifetime. In the women age group of 35 to 74, ovarian cancer is the fifth leading cause of cancer-related deaths. An ovary is one of two small, almond-shaped organs located on each side of the uterus that store eggs, or germ cells, and produce female hormones estrogen and progesterone. Ovarian cancer is a disease in which, depending on the type and stage of the disease, malignant (cancerous) cells are found inside, near, or on the outer layer of the ovaries. Fibroids are the most frequently seen tumors of the female reproductive system. Fibroids, also known as uterine myomas, leiomyomas, or fibromas, are firm, compact tumors that are made of smooth muscle cells and fibrous connective tissue that develop in the uterus. It is estimated that between 20 to 50 percent of women of reproductive age have fibroids, although not all are diagnosed. Some estimates state that up to 30 to 77 percent of women develop fibroids anytime during their childbearing years. Gynecologists use biomedical images to identify ovarian cysts and fibroids noninvasively. Imaging tests can show whether a pelvic mass is present or not, but they cannot confirm whether the mass is a cancer or not. These tests are also useful for the Gynecologist to diagnose whether an ovarian cancer has spread (metastasized) to other tissues and organs. There are various modalities that can be used for diagnosing and evaluating of ovarian cancer. It includes Ultrasound images, Computed Tomography (CT) scan, Magnetic Resonance Imaging, Barium enema x-ray, Chest x-ray and Positron Emission Tomography(PET) scan.Acomputer aided diagnosis technique to diagnose ovarian cysts and fibroids using ultrasound images is proposed in this paper. The first step in this technique after image enhancement is image segmentation of abnormal patches from ultrasound images using image segmentation methods. Texture features extracted from the segmented patch are to be used as input to the trained classifier for predicting the class of the patch as malignant or benign. This CAD system can help the gynecologist to screen and detect the presence of ovarian cysts and fibroids at an early stage and to assist in deciding whether a biopsy is required or not.

POSTER- 22

THE HUMAN SKIN MICROBIOME DATABASE

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The Microbiome is the total microbial community and biomolecules within a defined environment. Skin microorganisms have adapted to utilize the sparse nutrients available on the skin. The skin microbiome is inhabited by many of the bacterial species. Some of them have a key role in the development of skin disease. Many cutaneous microorganisms can produce molecules that inhibit the colonization of other microorganisms or alter their behavior. Bacteria have been linked to cancer through several mechanisms such as production of toxins, chronic inflammation, and carcinogenic metabolites. The skin microbiota of a healthy adult remains stable over time, despite environmental perturbations. We have developed the Human Skin Microbiome Database (HSMD) which provides the scientific community with comprehensive information on the species that are present in the human skin microbiota. It is manually curated, searchable metagenomic resource to facilitate investigation of human skin microbiota and will make it publicly accessible through web interface. This is achieved by combining a manually curated list of bacterial genomes from different skin diseases affecting humans. Our database provides the comprehensive information about species that are present in the human Skin microbiota.

DIATOM, A MICROSCOPIC ALGAE AS BIOMONITORING INDICATOR IN ECOLOGICAL AND FORENSIC SCIENCE STUDIES

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Earth crusts 71% of surface is covered with water. The aquatic flora and fauna include bacteria, fungi, algae, protozoa etc. Diatoms are unicellular algae included in class Bacillariophyceae. Diatoms act as a true evidence indicator for both in pollution and drowning cases or asphyxiation death studies. They played a very good role in ecological and forensic studies. Ecologically diatoms are very sensitive. Their increase or decrease in population indicates the aquatic environment health. Diatom species helpful in studying the Specific pollution sensitivity (SPI) index and Biological Diatom index (BDI). In asphyxia deaths, diatoms are observed under microscope after post mortem examination. Diatoms are compared in water where body was found. If diatoms are not present in the body means the victim didn't die by drowning after all. If diatoms found significantly different from those in water in which the body was found, it means that the victim has been deliberately drowned elsewhere and then moved to second location. Experts now agreed that diatom test for drowning can provide important evidence during forensic investigation.

DEVELOPEMENT AND EVALUATION OF MESOPOROUS POSS SYSTEM OF DOCETAXEL

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Polyhedral oligomericsilsesquioxane (POSS) devices are three dimensional, cage like structures with Si-O-Si linkages. Mesoporous POSS is a promising material for biomedical applications and drug delivery due to its biocompatibility, low drug leakage,high drug loadingand targeting potential. The present study involves development of mesoprous POSS systems of an anti-cancer drug Docetaxel (mPOSS-DXL). mPOSS system was prepared by a previously reported technique. The prepared system was loaded with the drug Docetaxel. The drug-mPOSS compatibility was determined by FTIR spectroscopy. The system showed high entrapment efficiency of > 90%. The mPOSS system showed sustained release upto 8 hrs. The SEM analysis confirmed the porous structure of docetaxel loaded mPOSS system. The in-vitro anti-tumour study carried out using Human Leukaemia cell line (MOLT-4) indicated lowest cell viability in case of mPOSS-DXL in comparison to pure DXL. This indicates improved cell uptake and cytotoxicity of the mPOSS-DXL system then pure DXL. Thus, from the above study it was observed that mPOSS system of Docetaxel showed high drug entrapment, sustained release and improved anti-cancer activity. The system can further be explored for it in vivo drug targeting potential.

EFFECTIVE ALKALINE METAL-CATALYZED OXIDATIVE DELIGNIFICATION OF WHEAT STRAW

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POSTER-25

Second generation feedstock such as forestry waste and agricultural waste (rice bran, wheat bran, wheat straw) are present in abundance in rural areas. Lignocellulosiccompositions of these feedstocks make them a potential energy source for biofuel production. To remove lignin content, pretreatments are done prior to enzymatic hydrolysis. This study majorly focuses on pretreatment process performed at high temperatures and alkaline conditions. Improvement of copper catalyzed alkaline hydrogen peroxide (Cu-AHP) pretreatment of wheat straw includes a combination of increasing hydrolysis yields, while decreasing process inputs through more efficient usage of H_2O_2 and addition of an alkaline extraction step prior to Cu-AHP pretreatment which could substantially lower the chemical input. In the present study, wheat straw has been used due to its easy availability and abundance (second abundant lignocellulosic residue in the world). Before pretreatment, compositional analysis of wheat straw was performed; this revealed that it contains 44% cellulose, 23.6% hemicelluloses and 16.6% lignin. Thermostable xylanase was produced from thermophilic bacteria *Geobacillus thermodenitrificans* X1 to be further used for hydrolysis of the pretreated biomass. Overall application of this study can be helpful in paper pulp industry and in biofuel production due to high sugar content obtained. A relatively pure lignin stream can be further utilized for value added products. Setup of such industry in rural places where the availability of biomass is in plenty will create opportunities for sustainable livelihood.

ENERGY CONSUMPTION PATTERN OF RURAL HABITATIONS IN LOW AND HIGH HILLS OF HIMACHAL PRADESH

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POSTER-26

The present work was conducted to study the energy consumption pattern in rural habitations of Sub mountain low hill sub tropical and High hills dry temperate zone of Himachal Pradesh, India. Households were selected on the basis of multistage random sampling in the selected areas. A pretested questionnaire schedule was prepared and used for conducting primary survey. The study indicated that 90-100 percent households in low hills used LPG as primary energy source, where as in the High hill dry temperate zone fuelwood was the main source of energy. On an average 4 to 8 LPG cylinders were used per household in a year. Electricity was also being used as a source of energy but mainly for lighting. It was found that with the increase in the altitude the per capita daily energy consumption increased in case of fuel-wood but the trend was reverse in case of electricity. About 95.67 percent people are using improved cookstoves in all the selected blocks of High hills while the value reduced to 46.00 percent low hills. The annual carbon dioxide emissions from every household in a year in low and dry temperate zone were 0.36 and 0.64 tonnes, respectively. The study indicated that in Himachal Pradesh fuelwood is the main contributor of CO_2 emissions and need to be replaced by LPG totally.

SCANNING ELECTRON MICROSCOPE AND PROTEOMIC ANALYSIS REVEALED BIOFILM ASSOCIATED PROTEIN IN MYCELIAL MORPHOTYPES OF *ASPERGILLUS TERREUS*

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Aspergillus terreus is a major etiological agent among fungal infections and emerged as a major clinical problem in staggering increasing number of immunocompromised patients. Being intrinsically resistance to standard antifungal Amphotericin B, the mechanism behind the resistance is not clear. To obtained the proteomic profile of mycelial form of *A. terreus*, the clinical isolate of *A. terreus* (NCCPF860035) was cultured in DMEM fed with 10% FBS at 37 °C for 48h. Protein extraction was carried from the harvested mycelia followed by nLC-ESI-MS/MS analysis. Data analysis was done by using Proteome Discoverer (V/2.2) against the Uniprot database. To identify the secretory proteins, we used SECRETOOL web tool. To get insight into the biofilm formation, scanning electron microscopy (Zeiss SEM, MA EVO -18 Special Edition) analysis was carried from *A. terreus* samples cultured in czapek dox broth without agitation at 28°C after 48hrs.

Using nLC-ESI-MS/MS, a total of 380 proteins were identified. From GO analysis using Blast2go software we have observed abundance of DNA binding and extracellular proteins. Further SECRETOOL analysis predicted 8 secretory proteins such as glucanase Crf1/allergen (Asp F9), allergen Asp F15, protein disulfide-isomerase, 1, 3-β-glucanosyltransferase, β-hexosaminidase and others are uncharacterized. Literature survey of these proteins suggested their role in biofilm formation. SEM analysis of static cultures of *A. terreus* showed stable biofilm formation at 48hrs time-point. Biofilm formation often seen as matrix enclosing cells adhered to each other and to the surface. Our SEM analysis showed extracellular matrix and mycelial cells in the network forming mycelial balls theses mycelial balls may coordinates *via* intracellular communication through biochemical signalling molecules.Our data provided catalogue of mycelial proteins, few of them as listed in result may participate in biofilm formation under optimum conditions. Further these protein needs investigations to establish their role in conferring resistance against antifungal agents, thereby contributing to pathogenesis of *A. terreus*

ANTIMICROBIAL PEPTIDES AS NOVEL DRUG CANDIDATES FOR TREATMENT OF MICROBIAL INFECTIONS

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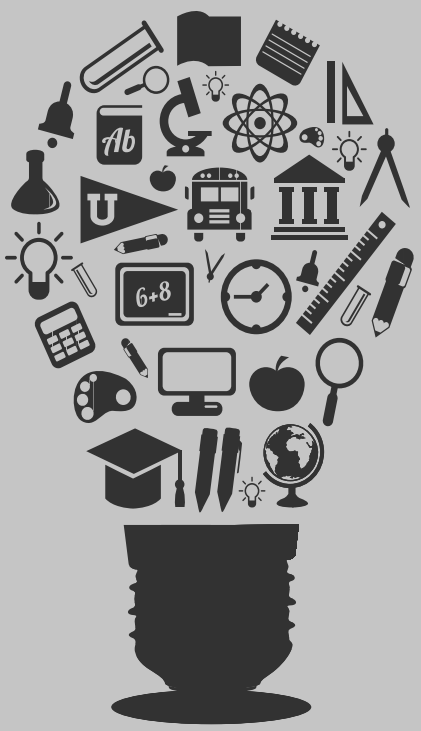
Antimicrobial peptides are distinct group of molecules produced by multicellular organisms in order to protect a host from pathogenic microorganism. These are oligopeptides with a divergent number of amino acids. They show wide range of antimicrobial activities against different microorganisms, including gram positive and gram negative bacteria, fungi, viruses and parasites. The efficiency of antimicrobial peptides to kill the growth of bacteria provides a great defence against innate immune system. These peptides not only kill or inhibit microorganisms in a short time but they also act by novel mechanisms of action due to which there is low propensity of resistance development against them. Since number of antimicrobials that are being developed from past few decades is low and antimicrobial pipeline is drying out, so there is a pressing need to develop new compounds having potential to inhibit resistant microbial strains. Therefore antimicrobial peptides are emerging as novel drug candidates to treat microbial infections.

CHEMICAL SCIENCES EARTH SCIENCES AND RENEWABLE ENERGY 04



ANALYSIS OF COST AND SOCIOECONOMIC IMPACT OF HYBRID ENERGY SYSTEM AND MICRO HYDROELECTRIC POWER PLANT FOR TOGO USING HOMER SOFTWARE

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Every sector of modern civilisation is dependent on energy which comes from various energy sources such as thermal energy, renewable energy and fossil fuels. Togo produces barely 40% of its demand for energy, therefore it is dependent on electrical energy generation systems of its neighbouring countries Ghana, Nigeria and Ivory Coast. At the level of rural electrification, the rate of access to electricity is 6.3% in 2016. Although, it is a country with strong solar and wind potential with untapped hydro potential but due to unavailability of hydroelectric power generation systems, country is not able to have its efficient utilisation. Therefore, there is an urgent need to set up and multiply electric micro-power plants in order to reduce energy dependence and increase the rate of access to electrical power in rural areas. This study is carried out for real time solution to the existing problem. This survey present a design of standalone hybrid (PV/Wind) and micro hydroelectric power systems and its socio economic impact by investigating the potentials of the solar, wind and hydraulic energy while considering various sensitivity variables for two different locations, namely Kara and Atakpamé, in Togo. Hybrid Optimization Model for Electric Renewable (HOMER) software is used to analyse the available data and economic feasibility of the proposed hybrid and micro hydroelectric power system. This study shows that incorporation of photovoltaic (PV), wind turbine generator (WTG) and micro hydroelectric plant can reduce the electric energy dependency of Togo on other countries and can participate in development of many rural villages with low operating costs.

PERFORMANCE EVALUATION OF FLAT PLATE COLLECTOR BASED SOLAR WATER HEATING SYSTEM USING PINE NEEDLES AS INSULATING MATERIAL

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The flat plate collector is one of the most prominent solar thermal technologies for water heating applications. This present study is focused on design and fabrication of a flat plate collector based water-heating system using locally available materials. Conventionally glass and ceramic wools are uses as insulating materials to minimize the involved heat losses. The designed flat plate collector using pine needles and rice husk was tested under different geo climatic conditions for suitability of applications. The performance of flat plate collector was observed higher using pine needle as insulating material as compared to rice husk. The efficiency of flat plate collector was 63% during sunny day, 52% during partially cloudy and 42% during cloudy days. Further, the emphasis has been given to the optimization of pine needles thickness as an insulating material. The thickness of pine needles was taken as 40mm, 60mm and 80mm. Pine needles with thickness 40mm attained a maximum temperature 55°C while 60mm thickness of pine needles able to achieved maximum temperature 63.8°C and with 80 mm thickness of pine needles insulation, it was 64.8°C. This variation may explain as lower insulation thickness (40mm) higher the bottom side heat transfer compared to 60mm thickness resulting increase in hot water temperature of 63.8°C. However, the temperature attained with 60mm and 80mm insulation thickness was more or less similar. This is concluded that the optimum thickness of the pine needle insulation is 60mm for the designed system.

ORAL- 03

LAND USE/LAND COVER CHANGE DETECTION OF SAINJ RIVER WATERSHED THROUGH REMOTE SENSING & GIS APPROACH

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Faster rate of industrialization, anthropogenic and socioeconomic activities and environmental changes, in local and regional area, are essential component responsible for vast land use/land cover (LULC) changes of the lower Sainj river basin. Remote sensing & GIS technology is very promising in mapping the LU/LC prevalence of a large area on different spatio- temporal scales. A series of systematically corrected ortho rectified Landsat imageries were used for classification. In the present study, Land use/Land cover change detection using Landsat-7 Enhanced Thematic Mapper Plus (ETM+) for October 2001 and Landsat-8 OLI (Operational Land Imager) for October 2016, were used and quantified the Land Use/Cover changes over a period of 16 years. Supervised classification methods has been employed using Support Vector Machine in ENVI 5.0 and ERDAS IMAGINE 2015.The study area categorized into six different classes, viz. water bodies, built-up/settlements, forest area, agriculture/plantation, vegetation/scrub and barren/open land. It has beenf ound that forest cover area decreased by 9.59 Km^2 of (-11.06) % and built up/settlement increased by 1.73 Km^2 (2.18)%, due to construction of new buildings and development of hydro-power, over the time period from 2001 to 2016.Post classification change detection method was used to understand the LU/LC changes in the study area. Built up expansion and change matrix processes has been carried out for same time period. The importance of remote sensing and GIS technique in mapping and detection for LULC change was also highlighted, which could be helpful to decision makers to particular decision support system for sustainable development of Hilly areas.

ORAL- 04

ESTIMATION OF PHYSICO-CHEMICAL PROPERTIES AND FATTY ACID COMPOSITION OF *ROSA BRUNONII* SEED OIL USING GC-MS AND FTIR SPECTROSCOPY

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Rosa brunonii (Rosaceae) is a wild shrub found in Kullu district of North Western Himalaya. Rosehip seeds oil is used throughout the world as one of the promising oils for skin care. Seed oil was extracted using CO_2 based supercritical fluid extraction method with the oil yield 3.36 to 4.2% in different years. Physico-chemical properties of oil were determined using American oil chemists' society (AOCS) methods. The acid, iodine, ester, glycerol (%), saponification and unsaponification values, refractive index at 40 ^{0}C and specific gravity of the seed oil were found 10.82, 154, 165.18, 9.05 %, 176 mg of KOH/g, 1.67 %, 1.4726 & 0.9317, respectively. The fatty acid composition was identified and measured as palmitic acid (4.71 %), stearic acid (2.56 %), oleic acid (10.28 %), linoleic acid (54.84 %), α-linolenic acid (21.46 %) and Υ-linolenic acid (<0.01 %) using (ISO) 5508:1990 & 5509:2000 method which is also confirmed using GC-MS analysis. Highest concentration was of linoleic acid (i.e., omega 6) and linolenic acid (i.e., omega 3). FTIR Spectroscopy used for the volatile compounds which shows C=CH- vibration from unsaturated fatty acid indicating high Unsaturation index. Microbial contamination was found <10cfu/g. All these parameters showed good quality profile of the oil.

DESIGN OF LOW COST SOLAR DRYING SYSTEM FOR REMOTE AREA APPLICATION USING LOCALLY AVAILABLE MATERIALS

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Solar thermal is a technology that is gaining rapid acceptance as an energy saving measure in preservation of agriculture and horticultural products. In the present work, indirect natural convection solar dryer was designed and developed for remote area application using locally available low cost materials such as wood, pine needles and other scrap materials. Pine needles are abundantly available in the Himalayan regions; and are used as insulation in solar dryer for minimizing heat losses. Conventionally, costly glass wool is used for same purpose. However, in plains, rice husk can be used for insulation. Since, the thermal conductivity of pine needles and rice husk is of the same order of glass wool. In initial phase apple slices of 2 mm thickness were dried with chimney height of 3.0, 4.5 and 6.0 feet respectively. The efficiency of the solar dryer was maximum of 10.38%, 9.39% and 8.98% whereas drying rate observed was 3.76 gm/min, 2.84 gm/min and 2.26 gm/min during sunny day, partially cloudy and cloudy day respectively for chimney height of 4.5 feet. During the experiment the average air velocity was 0.25 m/s. There are three trays among which in the middle and bottom tray weight reduction percentage of apple slices was observed 85.33% and 79.33% respectively which was smaller than the weight reduction percentage of 87.33% of top tray for the same chimney height. For the better performance of solar dryer, thedrying conditions can be optimized by repeating these experiments.

EFFICIENT REMOVAL OF Hg (II) IONS FROM WASTE WATER BY A NEW NANO-COMPOSITE POLY-O-TOLUIDINE TIN-ZIRCONIUM (IV) MOLYBDOPHOSPHATE

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A new composite cation exchanger poly-o-toluidine tin-zirconium (IV) molybdophosphate (PTD-SnZrMoP) was synthesized by the incorporation of conducting polymer poly-o-toluidine into a novel four components inorganic cation exchange material tin-zirconium (IV) molybdophosphate with two cations and two anions. The nano-composite cation exchanger has been characterized by FTIR, FESEM, TEM, XRD and TGA/DTA techniques. Elution behavior, thermal stability, pH-titration, chemical stability, distribution studies and quantitative separations of metal ions in binary synthetic mixtures and real life samples on poly-o-toluidine tin-zirconium (IV) molybdophosphate nano-composite exchanger were also investigated. The ion exchange capacity of the nano-composite ion exchanger (2.40 meq/g) has been observed to be higher as compared to that of its inorganic counterpart (1.95 meq/g). The nano-composite was found to be thermally stable and retained 60.40% of its ion exchange capacity up to the temperature of 400°C. Keeping in mind the end goal to research the tendency of the material in the separation of heavy metal ions, distribution studies were performed for 14 metal ions in four solvent mediums. It is apparent from the data presented That K_d values depended upon the nature of solvents. The PTD-SnZrMoP had the significant K_d values for Hg^{2+}, Ca^{2+}, Cr^{2+}, and Pb^{2+} metal ions indicated these metals were strongly absorbed on the material, while remaining metal ions were weakly absorbed. The selectivity was found to be in the order: $Hg^{2+} > Co^{2+} > Cr^{2+} > Pb^{2+} > Ca^{2+} > Zn^{2+} > Cd^{2+} > Fe^{3+} > Cu^{2+} > Mg^{2+} > Ba^{2+} > Sr^{2+} > Al^{3+} > Ni^{2+}$. It was observed from the K_d value that the uptake of Hg^{+2} is exceptionally high, whereas the remaining metal ions are poorly absorbed. Thus, the composite cation exchanger can be very well utilized for the separation of Hg (II) ions from the waste effluents.

ORAL- 07

SYNTHESIS, CHARACTERIZATION AND ANTIBACTERIAL ACTIVITY OF ZINC(II) COMPLEXES OF BIOLOGICALLY IMPORTANT HYDROXAMATE LIGANDS

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The importance of zinc in a wide range of cellular processes-cell proliferation, reproduction immune function and defense against free radicals is well established. It plays an important role in several aspects of health and the link between zinc deficiency and cancer has been described. Zinc because of exhibiting flexible coordination geometry forms variety of complexes. Of numerous oxygen donor ligands, hydroxamic acids RCONROH a group of weak organic acids as bio molecules have a great impact in pharmaceutical chemistry as highly efficacious in combating various etiological factors for novel anti cancer therapy and other related diseases. In view of above, zinc(II) complexes of composition $[Zn(3,5\text{-}(NO_2)_2C_6H_3(OH)CONHO)_2]$ (I) and $[Zn(3,5\text{-}(NO_2)_2C_6H_4CONHO)_2]$ (II) have beensynthesized by the reactions of $ZnCl_2$ with potassium 3,5-dinitrosalicylhydroxamate [3,5-$(NO_2)_2C_6H_3(OH)CONHOK$] and potassium 3,5-dinitrobenzohydroxamate [3,5-$(NO_2)_2C_6H_4CONHOK$] in 1:2 molar ratio in MeOH and characterized by physicochemical and spectroscopic techniques (IR, ^{1}H NMR and mass spectrometry). The bonding through carbonyl and hydroxamic oxygen atoms (O,O coordination) and tetrahedral geometry around zinc has tentatively been proposed. The electrochemical behavior of hydroxamate ligands as well as those of I and II studied by cyclic voltammetric technique has shown ligand-centered two irreversible reductions and one oxidative wave corresponding to R-NO/R-NHOH couple. Thermal behavior of complexes has been studied by thermogravimetric technique. The *in vitro* antibacterial activity assay against pathogenic gram -ve bacteria viz. *Salmonella typhi*, *Escherichia coli*; gram+ve*Bacillus cereus* and *Staphylococcus aureus* by MIC method has revealed their significant antibacterial potential relative to the standard Chloramphenicol drug.

ORAL- 08

VULNERABLITY INDICATORS AND THEIR IMPACTS ON FORESTS IN THE KINNAUR DISTRICT, NORTHWESTERN HIMALAYA, INDIA

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Forest has great importance from physical, social, and environmental point of views. Forest vulnerability assessment is incomplete without the study of the forest community in a particular area. Forest vulnerability has become one of the major concerns due to increasing anthropogenic pressure, changing human traditions, socio-economic activities and climate change threats at global, regional and local levels. The present case study is taken from Kinnaur district of the northwestern Himalaya. Kinnaur district has very fragile topography, and has less and sparse, but very important forest cover of the species like *Pinus gerardiana* (Chilgoza). Forest community of this region mainly belongs to forest derived products and economy. However, this region has a long history of physical hazards (i.e. landslides, floods, avalanches, earthquakes, etc.). The vulnerability of forest has been increased due to occurrence of hazards. The degree of hazards incidence were increased after the haphazard development in this region. The total geographical area of Kinnaur is 6,401 km^2, out of which forests constitute 9.8% (630.54 km^2) of the total area. However, the rest of the area falls under non-forest category.

VITAMIN B12 AS A REGULATOR OF BONE HEALTH

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In the early 1920's, the anti-anaemic effect of liver rich diet had been recognized. In 1923, *Minot and Morphy* were the first to test the radical concept that dietary intake of *raw liver* might help patients with *Pernicious Anaemia* (PA). The anti-anaemic substance from the liver was isolated by 1950 and called "vitamin B_{12}". B_{12} deficiency has been shown to lead to decrease **bone mineral density (BMD).** In men, significant effect was observed at the hip while in women at the spine. A study showed that low B_{12} levels (<200pm) were significantly associated with an increased risk of bone fractures.Further, downstream analysis of metabolomics data showed that **taurine** was the most highly unregulated molecule in B_{12} deficient livers and it could separate wild type animals from B_{12} deficient ones. **Taurine ($C_2H_7NO_3S$)** is a typical amino acid that contains sulphonyl group in place of carbonyl group.

Synthesis of Taurine: A method for preparing taurine using *monoethanolamine*, *H_2SO_4* and *sodium sulfite* as starting materials is of great interest from the view point of technology and reagent availability. The process for preparing Taurine by this method includes 3 main steps:

1. Preparation of 2-amino ethylsulfuric acid by sulfonation of monoethanolamine with H_2SO_4.

$$NH_2CH_2CH_2OH + H_2SO_4 \rightarrow NH_2CH_2CH_2SO_4H + H_2O$$

2. Synthesis of taurine by sulfonation of 2-amino ethylsulfuric acid with sodium sulfite.

$$NH_2CH_2CH_2SO_4H + Na_2SO_3 \rightarrow NH_2CH_2CH_2SO_3H + Na_2SO_4$$

3. Isolation of Taurine from the mixture of side products.

Taurine is found in large amounts in the brain, retina, heart and blood cells called platelets. The best food sources are raw meat, beef, eggs, shell fish, seaweeds etc. Studies and experimental evidences showed that Taurine is an essential factor that can rescue B_{12} deficiency induced growth retardation and low bone mass. B_{12} and Taurine specifically regulates bone formation and therefore have the potential to increase bone formation in diseases. Additionally, both these products are naturally derived and therefore use of these molecules likely pose no safety issues. It can be considered as a novel pathway in the treatment of bone and other metabolic disorders.

EFFECT OF pH ON THE BINDING EFFICIENCY OF BSA WITH IONIC SURFACTANTS: A SPECTROSCOPIC STUDY

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Use of surfactants in numerous household and industrial processes and their interaction with proteins in our day to day life has made protein-surfactant interactions a booming topic among the researchers of current era. Bovine Serum Albumin (BSA) is a heart shaped globular protein which resides in the hearts of many researchers due to its binding characteristics with different drugs and ligands. BSA is also known for its transport properties which makes it an eminent constituent of different drug delivery systems. BSA being structural homologue to Human Serum Albumin (HSA) allowed us to study its binding efficiency with ionic surfactants, Sodium dodecyl benzene sulfonate (SDBS) and Cetyl pyridinium chloride (CPC) at different pH. Steady state fluorescence and UV-Vis. Spectroscopic techniques were employed to study these interactions. Standard Gibbs free energy of binding ($\Delta G^0_{binding}$) was also calculated and was found to be negative in all cases. It signified that the binding of BSA with ionic surfactants is a spontaneous process.

ORAL- 11

KINETIC ASPECT OF MECHANISM OF OXYGEN REDUCTION REACTION IN PEDOT: A COMPUTATIONAL STUDY

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Oxygen reduction reaction is the rate limiting factor in the operation of fuel cells resulting in the combination of protons with oxygen and electrons to produce water. This computational investigation explores the mechanistic pathway of oxygen reduction reaction in Poly(3,4-ethylenedioxythiophene) [PEDOT] at the DFT level of theory by locating different transition states. Free energy profiles have been calculated to find the energetically favourable pathway out of two possible pathways i.e. four electron-four step process involving reduction of oxygen with protons to produce water (Reaction Path 1) or two electron-two step process resulting in the formation of H_2O_2 as an intermediate (Reaction Path II). The free energy profiles along the reaction route provide enough evidence to conclude that two-electron two step is energetically favourable.

ORAL- 12

A REVIEW OF SOLID WASTE MANAGEMENT TECHNIQUES IN HIMACHAL PRADESH

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There is a significant increase in the population in developing country like India and this has thrown a major challenge with the management of the waste generated. Waste are either scattered or disposed of unplanned in the open areas. Himachal Pradesh is one of the significant cities of India and holds a population of 6,856,509 and generates an amount of 350 tons per day. An attempt has been made through this study to assess the various techniques which are being followed and can be in applied with respect to the environmental and social well-being Himachal Pradesh. Financial constraints, institutional weakness, improper choice of technology and public apathy toward the solid waste have made the situation worsen. The current practices being followed in Himachal Pradesh involves the uncontrolled dumping of waste on the outskirts of the towns or cities have created serious environmental and public health problems. The study has revealed that all the cities, towns and districts are disposing the waste unscientifically in open dumps and open incinerators which is causing problem to public health and environment. The composition of the waste has shown mainly organic matter, so composting is an appropriate method for treatment of waste. Recyclable units must be set up so that recyclable waste can be transported directly to them which would in turn generate a certain amount adding to corporation's income. A few recommendations have been proposed for a better solid waste management in Himachal Pradesh.

QUALITATIVE AND QUANTITATIVE EVALUATION OF PHENOLIC COMPOUNDS THROUGH RP-HPLC IN SITAPHAL (*ANNONA RETICULATA*) AND AMALTAS LEAVES (*CASSIA FISTULA*)

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The leaves of sitaphal and amaltas were evaluated qualitatively and quantitatively for phenolic compounds and further evaluated for antioxidant activities. The leaves were washed, oven dried at 50°C and then grounded into fine powder. The powder and methanol (90%) were orbital shaken in 10:90 ratio for 8 hours. The filtrate thus obtained was rotatory evaporated under vacuum and extract obtained was evaluated for phenolic content and antioxidant activities. The RP-HPLC analysis results revealed the presence of 7 phenolic compounds in Sitaphal (Gallic acid, p-hydroxybenzoic acid, vanillic acid, syringic acid, p-coumaric acid, ferrulic acid and sinapic acid) and 5in amaltas extract (all except gallic and ferrulic acid). The syringic acid in sitaphal and vanillic acid in amaltas were found in highest amount, respectively as 97.40 and 49.15 ug/gm of leaf powder. The total phenolic content was 0.85 and 1.10 mg gallic acid equivalent per 100 mg of dry leaves powder for sitaphal and amaltas, respectively. The ferric reducing power per gram of dry leaf powder was 23.10 and 15.56 mM Fe+, respectively for sitaphal leaves and amaltas leaves whereas corresponding 2,2-diphenyl-1-picrylhydrazyl radical scavenging activity in % inhibition was 71.79 and 39.26 and 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid)radical cation scavenging activity as 63.71 and 92.76, respectively. The study concludes that the natural products have great antioxidant potential and may be further triedas natural food antioxidants to maintain oxidative stability.

COMPARATIVE STUDY BETWEEN FACTOR OF SAFETY OF A SLOPE USING CONVENTIONAL SOIL NAIL AND HELICAL SOIL NAIL

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Soil nailing is an effective technique to stabilize the slope. People are using conventional soil nail from long time but found various problem with installation process and its safety. To overcome the problem of conventional soil nail a new concept of reinforcing slope by using helical soil nail has been introduced. This paper examines a comparative study between factors of safety of conventional soil nail and helical soil nail. Assessment are made on the basis of Finite element method (FEM) using Plaxis 2D. The result shows that there is a significant increase in factor of safety when using helical soil nail.

ORAL- 15

A LOW-COST HIGH-EFFICIENCY RENEWABLE ENERGY BASED HYBRID POWER CONVERSION SYSTEM FOR RURAL HIMACHAL RESIDENTIAL APPLICATIONS

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Himachal Pradesh, being a hilly state, has generally clear sky and average solar radiation levels, favors commercial as well as domestic application of solar power. On the other hand, wind energy is inherently complemented with solar. Because of wide variations of climatic conditions large storage is needed for reliable and continuous power supply, which is environmentally hostile, uneconomical, and has less life span. Therefore, suitable hybrid energy conversion systems with highly efficient, low cost power electronic interfaces that combine good performance with instantaneous response are essential to integrate hybrid renewable energy resources into the Himachal residential applications. In this paper, various topologies which can integrate multiple energy resources were discussed. The need of renewable energy based technologies in the rural Himachal Pradesh with a case study was presented.

ORAL- 16

FLASH FLOOD VULNERABILITY ASSESSMENT BY USING GEO-SPATIAL TECHNIQUES :A CASE STUDY OF RIVER BEAS WITHIN THE STRETCH OF MANALI TO AUT IN KULLU DISTRICT OF HIMACHAL PRADESH

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This study performs an analysis of the flash flood occurrence and its influence zone model within the stretch of Manali to Aut in Kullu district of Himachal Pradesh. The major contribution of this paper is that it provides extensive information of flooding extents in terms of changes in landuse in relation to increase of flood water level. For the analysis of these objectives, the SRTM DEMs data (Contour and 3D Modelling), GEO Eye Satellite Images 0.5 meter were used that was further incorporated with field survey. All used data are finally integrated in an ArcMap and HECRAS to prepare a final flood hazard map for study area. It was observed that most affected areas are 15 mile, Patlikuhal, Babeli, Akhara, Sarvari, Dhalpur, Mohal, Bhuti, Bhunter and the road on the right bank. This study is beneficial to urban planners and policy makers to minimize the impacts of flash flood by adopting WEBGIS Model.

IMAGE PROCESSING TECHNIQUES FOR FORESTRY APPLICATIONS

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Digitized aerial photographs and satellite images of forests represent convenient data for developing computerized assessments of forestry resources. Such automatic tools are useful for a number of reasons, including the help with which they provide forest managers in classifying species. Some tools already exist for this purpose, and use texture information and classification based on parameters such as covariance matrices.This will allow the automatic assessment of economically and environmentally important parameters such as the number of tree crowns, the distribution of their diameters or the stem density. The analysis and the interpretation of satellite images by using object-based image analysis methods, with the goal of identifying changes in the field in terms of thematic transition from one class (land cover) into another can be done. Nowadays, based on remote sensing procedure, satellite multi-temporal and multi- sensor images for change detection purposes are considered very important issues in optimal management of environmental and ecological resources. In the current study, some different image processing techniques have been accordingly applied in order to determine the rate of forest alterations. An automatic system for early smoke source detection through the real time processing of landscape images has been developed.

ANALYSIS OF IMAGE FUSION TECHNIQUES ON MULTISPECTRAL AND HYPERSPECTRAL IMAGES

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These days remote sensing data is widely used by the researchers for the classification and detection of spatial distribution of vegetation. The images involve multis pectral (MS) and hyper spectral (HS) images. MS images contain less number of spectral bands with broader bandwidth whereas HS images contain large number of spectral bands with narrow bandwidth. Due to the difference in the number of spectral bands and bandwidth, MS images have high spatial resolution whereas HS images have high spectral resolution. MS data can be used for the classification of vegetation, but HS data makes it possible to discriminate among various biochemical and structural differences in vegetation. Thus, for efficient classification and mapping, images that have both high spectral resolution and high spatial resolution are required. Such images can be obtained by fusion of MS and HS images. Spatial resolution of hyper spectral images can be enhanced by fusion of HS data with MS data. High Spatial resolution HS data can be used in monitoring of ecosystem health, mapping vegetation cover of urban areas, detection and mapping of minerals and plant species etc. Large number of image fusion techniques has been described in literature that can broadly be classified into four categories as component substitution (CS), multi resolution analysis (MRA), spectral unmixing, and Bayesian probability. A review of these techniques has been carried out intensively and their performance has been evaluated quantitatively by evaluating different performance parameters.

REMOTE SENSING AND GIS MAPPING TECHNIQUES TO STUDY THE ENVIRONMENTAL DAMAGES IN INACCESSIBLE LANDSLIDE PRONE RURAL AREA OF DISTRICT KINNAUR, HIMACHAL PRADESH, INDIA

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The changed pattern of the heavy rainfall is attributed to climate change in the recent past. This has led to major landslides in remote and rural areas along the only lifeline Hindustan–Tibet road in Kinnaur district, Himachal Pradesh, India. Landslides have caused major loss to roads, agricultural fields, horticultural land, infrastructure and, settlement. The present landslides study area is located between Sarahan in district Shimla and Rekongpeo in district Kinnaur. The entire district has highly sloping surface and is generally inaccessible especially during monsoon season due to frequent landslides. The following study is based on remote sensing satellite image interpretation, GIS and field based GPS-camera. On the basis of the remote sensing satellite imagery interpretation starting from the Shimla-Kinnaur boundary along the Hindustan-Tibet (H-T) road, three major landslides were observed grassland on the right bank of Satluj river near village Kinfi and by using GIS (Geographic Information System) tools the aerial spread was measured as 4.30 ha, 3.61ha and 1.97 ha. respectively. Similarly 2.94 Km. upstream two landslides were detected at village Pashpa with damage of about 0.91ha of grassland and another damaging 1.82 ha of grassland. 6.65Km. upstream landslide near Chhota Khamba with loss of 9.90 ha of grassland and at 9.68Km. 9.79 ha landslide delineated at village Kandar. Further upstream three major landslide was delineated on the Wangtu-Kafnu link road on the right bank of Satluj covering 1.71 ha, 1.19 ha and 2.1ha area, these three consecutive landslides has cut off the only link to Kafnu valley. A major landslide was delineated below Unri village damaging 10 ha land of apple orchard, 4.20 ha grassland and 0.18 km length of H-T road was buried under the landslide debris. 0.79m upstream Choling landslide was also detected. At 6.39 Km. upstream Rakchham landslide damaged 6.31ha of grassland. Opposite Shonthong a landslide with spatial extent of 9.1ha was delineated. At 7.2 Km upstream of Rekongpeo another landslide was observed between Pangi and Ragura village which has damaged the forest plantation covering 5.82 ha. The above mentioned technique is best suited for the Himalayan state where the road connectivity is limited. This digital technique is easily accessible and user friendly. The statistics so generated is accurate and the data can be utilized by the respective state departments to manage their mitigation activities along with delivering remedial measures or providing precise compensation immediately since during natural hazards all other conventional techniques are non-functional in rural area of the State. Therefore to assess the actual damage in such terrains remote sensing satellite mapping and GIS technique is an excellent tool to measure accurately the spatial extent of the damages and to suggest appropriate remedial measures. This study would also form the basic database for future studies by various researchers as well.

THERMODYNAMIC AND THERMOACOUSTIC STUDIES OF RUTIN WITH ANIONIC SURFACTANT SODIUM DODECYL SULFATE IN HYDRO-ETHANOLIC SOLVENT SYSTEMS

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The research work represents the thermodynamic and thermoacoustic studies for well knownfalconoid; rutin with anionic surfactant sodium dodecyl sulphate (SDS).The studies were conducted in four different concentrations of ethanol and water i.e. 100% water, 30% v/v ethanol (water rich), 70% ethanol (ethanol rich) and 100% ethanol at five different temperatures (20 °C, 25 °C, 30 °C, 35°C and 40 °C). Various parameters such as conductivity, density, ultrasonic velocity and viscosity were determined and the resulting data were used to calculate the thermodynamic and acoustic parameters, namely, standard enthalpy change (H°_{m}), standard entropy change (S°_{m}) and standard Gibbs energy change (G°_{m}), apparent molar volume ($_{v}$) and apparent molar compressibility (00_{k}) as a function of surfactant concentration and temperature. These parameters along with other physico-chemical studies will be utilized in determining the stable drug-surfactant concentration which will be helpful for designing pharmaceutical formulations.

CHITOSAN-BASED ECONOMICAL BIO-SORBENT FOR FLUORIDE SORPTION FROM AQUEOUS SYSTEM

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Fluoride contamination in groundwater has become a global concern as it causes serious problems to the public health. More than 200 million people worldwide are consuming drinking water with a fluoride concentration higher than the guideline value of 1.5 mg/L and are 'at risk' of *fluorosis*. In view of that, herein, the present work aims to develop a green and environmental acceptable biopolymer based adsorbent for fluoride ions. The biopolymer based multi-functional sorbent was synthesized from activated chitosan. Chloroacetylation reaction was performed to integrate active group on the surface of chitosan. The integrated chloride functionality was furthermore explored to introduce tannin acid group via a simple reaction. The synthesized products were evaluated via FTIR and ^{1}H-NMR, SEM, EDS and elemental mapping to confirm their structures. The products were also assessed for their potential in fluoride ion sorption and the results supported exceptional sorption capability of 90% even at trace level, and in competitive ions. The equilibrium sorption data supported the maximum adsorption capacity of20.40 mg/g by the Langmuir model within the 60 minutes at pH ranges from 6-7. Therefore, in conclusion, the proposed receptor is simple and economical, and is even applicable at almost neutral pH of the medium. The earlier reported adsorbents based on metal oxides nanoparticles are also reported with good efficiency for F^{-} ions removal, but the extremely high-cost restricts their practical application.

POSTER - 01

TOPSIDE IONOSPHERE COMPOSITION AND ITS VARIATION WITH SOLAR ACTIVITY

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Topside atmosphere or ionosphere composition at an average altitude of ~500 km and its variation for 23rd solar cycle over Indian subcontinent region has been studied with data set obtained from in situ measurements made by separate electron and ion RPA aboard Indian satellite SROSS C2. It has been found that total ion density is directly affected by solar activity and hovers by 2 order of magnitude on moving from low to high solar activity period. O^+ is main contributor to total ion density. A perfect correlation of O^+ ion density with $F_{10.7}$ is confirmed by R^2 value (R^2=0.928). H^+, He^+ and O_2^+ are other important constituents of plasma at this altitude.

POSTER - 02

PERFORMANCE ANALYSIS OF LINEAR FRESNEL LENS BASED WATER PURIFICATION SYSTEM

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A Fresnel lens is a special type of compact lens, which was originally created for use in lighthouses but has been used in different applications. From the last decade the use of Fresnel lens has increased to great extent due to their simplicity in construction. Fresnel lens consists of several concentric rings on a piece of glass or polymer that refract the light and concentrates it at a single point called the focal point of the lens. The Fresnel lens water purifying system could be used in emergency situations where clean water is not available but another form of water source is such as a lake, river or sea. This water purification system is desired to be solely based on renewable energy, and to use a Fresnel lens as medium to direct enough energy to the system, for it to work efficiently. The proposed design consists of a large particle filter, an unprocessed water reservoir, a boiling chamber, a condenser, a clean water reservoir, a Fresnel lens, and the housing. The incoming solar radiation from the sun is focused and concentrated onto a receiver pipe using a Linear Fresnel Lens, heating the incoming impure water, at which point it is sprayed into condenser where it is re-condensed into pure potable water. With Linear Fresnel Lens based water purification system near about 5 litter water is purified in sunny day, 3.3 litter of water in partially cloudy day and 2.5 litter water in cloudy days when the solar radiation is very less This paper also presents the solar radiation received at the destination location where the system is installed. The main purpose of this study is to set up a solar based water purification system in rural & semi urban area to provide safe & hygienic drinking water at a reasonable price.

USE OF HYBRIB PV-DIESEL SYSTEM IN RURAL ZONES OF SOME COUNTRIES IN WESTERN AFRICA- AN OVERVIEW

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Africa is considered as the "Sun continent" means the continent where the sun's influence is the greatest. According to the "World Sunshine Map", Africa continent receives more hours of bright sunshine during the year than any other continent on the earth. Also, many of the sunniest places on the planet lie in the western part of the Africa. The distribution of solar resources across Africa is fairly uniform and is more than 85% of global horizontal irradiation of 2,000 kWh/m2 /year. Despite of this very high solar potential, very less solar energy is being used and many of the rural zones of these countries are not having the access to electric power till now. In West Africa, 60% of rural populations do not have electricity. For the socio-economic development of rural zones of western Africa, it is very necessary to fulfill their demand of electric power with the efficient use of these available energy resources. By efficient use of these available solar potential, such demands from the African rural areas can be fulfilled. For the solution of this existing problem, many projects have been implemented by using the photovoltaic energy systems. But due to the uncertainty and variability of solar radiation, more efficiency of these systems can be achieved by combining of solar energy source with diesel generator. Today, many of these micro-systems have been installed but more effort must be done to achieve the goal. This paper presents the state of art of hybrid PV-diesel technology for rural electrification in western Africa. Furthermore, main current issues - related to design, technical aspects and implementation of these systems are discussed, hence to help the decision makers for future prospects of solar energy in these countries.

GENERATION OF POWER THROUGH RENEWABLE ENERGY (WIND ENERGY) IN RURAL AREAS

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This paper is focused on electricity generation through wind energy. I am taking an example of a 9-MW wind farm using Induction Generators driven by variable-pitch wind turbines. A wind farm consisting of six 1.5 MW wind turbines is connected to a 25 KV distribution system exports power to a 120 KV grid through a 25 km 25 KV feeder. The 9 MW wind farm is simulated by three pairs of 1.5 MW wind turbines.

POSTER - 05

ANALYSIS OF SOLAR ENERGY POTENTIAL IN MALAWI FOR RURAL UPLIFTMENT

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This paper will focus on analysis of solar energy potential in Malawi by predicting the average energy yield in a period of the five previous and recent years. Aim of this work is to address the electrical energy needs that the country is facing, as it has been surveyed that only 10% of the total population of the country has access to the nation's main electricity grid supply and the rest of the population is dependent on the use of biomass resources. Present electrical power generation capacity of Malawi is 361MW and researchers have indicated that this generated electrical power is not meeting with the demand of the already connected population. National electricity demand is 450MWand there is a deficit of 89MW to achieve the overall electrical power demand in the country. At the same time efforts are taking place to provide the electrical energy sources to that population which is dependent on biomass resources only because this source of energy is the main cause of disappearance of 2.5% of the country's forest yearly. Therefore, 70MW of power is to be added to the national power grid of Electricity Supply Corporation of Malawi (ESCOM) in collaboration with Independent Power Producers (IPPs). Average solar resource of the country is 5.8kWh/m^2/day and ranges from 1642.5 to 2555 kWh/m^2/year.There are some notable photovoltaic activities in Malawi in different locations of the country, the major application being at Kamuzu International Airport which has an installed capacity of 850kW grid connected system which was brought into working condition in September of the year 2013. Other activities include implementation of hybrid systems with wind turbines having generation capacities of 25kW.

POSTER - 06

WATERMELON KETONE

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Watermelon ketone also known as calone, is methylbenzodioxepinone. CALONE is one of few ingredients which act as main constituent for many shampoo, shower gel, soap, sprays, body deodorants, etc. It is a flavor & fragrance chemical compound with special odorant, discovered by Pfizer in 1966. Calone is an unusual odorant, which has a sea-breeze note with slight floral overtones. One single perfume ingredient, calone 1951, is responsible for the appearance of entire new perfume family of aquatic scents. It has been used as a scent component since 1980s for its watery, fresh, ozone accords and as a more dominant note in several perfumes of marine trend , beginning in 1990s .

It's naming was derived as :

Camilli + Albert +Laloue + ketone = CALONE

CYTOTOXICITY OF Co/Fe DOPED AND (Co, Fe) CO-DOPED ZnO NANO PARTICLES AGAINST(HeLa) Hep2C CELLS

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The Co/Fe doped and (Co, Fe) co-doped ZnO Nanoparticles (NPs) of composition ZnO, $Zn_{0.85}Co_{0.15}O$, $Zn_{0.85}Fe_{0.15}O$, $Zn_{0.85}Co_{0.10}Fe_{0.05}O$ and $Zn_{0.85}Co_{0.05}Fe_{0.10}O$ have been successfully synthesized via mechanochemical method. The structural and morphological studies of thenewly synthesized samples have been carried out by Fourier transform infrared (FTIR), Transmission electron microscopy (TEM), Scanning electron microscopy (SEM), X-ray diffraction (XRD) and Energy dispersive X-ray (EDX) spectroscopic techniques. The XRD analyses of as prepared samples have shown these to be pure single phase and crystalline with hexagonal wurtzite crystal structure. The average crystallite size of the samples calculated from Debye-Scherrer equation and Rietveld analysis have been found to lie in 17-36 nm and 10-31 nm range respectively. The substitution of dopants in ZnO matrix has been evidenced from FTIR spectra.. TEM, SEM and EDX studies of the samples have shown considerable changes in the morphology of ZnO NPs with Co/Fe doping and (Co, Fe) co-doping. The samples have displayed spherical to hexagonal disc and rod like morphology free from any extra elemental impurity. The cytotoxicity of the as prepared nanoparticles has been examined by 3-(4, 5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay against mammalian transformed cell line Human Cervix carcinoma (HeLa) Hep2C cells. The $Zn_{0.85}Co_{0.10}Fe_{0.05}O$ samples have exhibited high cytotoxicity among all samples with % cell viability 9.54 at 100 µg/mL. The cytotoxicity has been observed to vary with concentration whereby cell viability decreases with increased concentration.

WATER QUALITY ASSESSMENT IN THE RIVER SATLUJ BASIN, NORTH WESTERN HIMALAYA

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Respondents in Tangling village (Kinnaur) perceived that they did not depend, directly or indirectly, on River Satluj water, for livelihood and agricultural options. The springs and *'chashme'* are the sources of water. By using prioritize matrix questionnaire, the most destructive activities are road construction, dumping wastes in the river, tunnel construction and deforestation. Among the natural hazards, landslides are increasing in the Kinnaur region, e.g., Urni village, Pangi village, etc. which are due to construction activities like dams, tunnels, etc. About 29% of the respondents viewed that climate change has been impacting hydropower, 61%of water level of river is reduced due to river diversion for hydropower and disturbs its natural regime. As the river water level decreases due to diversion, it further leads to decrease in water flow quantity.67% villagers responded that groundwater is deteriorating. Approximately, 80% know about the climate change in terms of rainfall, temperature etc. 55% individuals responded that fishes found in bulk a decade before but now rarely found in the upper region of the Satluj basin such as Powari, Spillo, etc. due to construction activities like dams, tunnels, roads, etc. 99% villagers have pits for sewage disposal and proper sanitation but open defecation is also being practiced in some places. Effects of construction activities have found affecting the local temperature that have a mixed response. There is a need to maintain all alike aspects with a view to sustainable development.

POSTER - 09

PRESENT SCENARIO AND CHALLENGES OF SOLID WASTE MANAGEMENT PRACTICES IN SHIMLA, HIMACHAL PRADESH

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The study comprises the overview of present scenario of municipal solid waste management processes in Himachal Pradesh State Capital, Shimla. Municipal solid waste management is one of the essential issues with respect to public health and environmental safety. The municipal corporation authorities of Shimla, Himachal Pradesh are going through a critical phase in order to manage the huge quantity of waste generation on the daily basis in the respective region. The generation of municipal solid waste in Shimla is reported as 70 tonnes per day and the per capita waste generation is estimated as 0.35 kg/capita/day. Out of total waste generated in the city, approximately 70% of the waste is directly disposed of in the open dumps. In this aspect, there is huge inconsistency between the waste generation and the waste treated in the city. Moreover, there is the shortage of environmentally sound treatment and waste disposal facilities in the study region of Himachal Pradesh. The present investigation also revealed the physical characterisation of municipal solid waste in Shimla, Himachal Pradesh. The information regarding the waste characterization is the mandatory issue for the selection and operation of the efficient waste disposal and overall management facilities. The physical characterization of municipal solid waste also proves beneficent for providing the baseline data to attain the intended waste management goals. The characterization study revealed that the municipal solid waste of Shimla, Himachal Pradesh is rich in biodegradable waste i.e. 62.00% and the second highest fraction of waste is paper waste i.e.22% out of total waste production. However, in this perspective, some remedial strategies are also recommended in the present study for the effectual management of municipal solid waste in Shimla, Himachal Pradesh.

POSTER - 10

A REVIEW ON PARTIAL REPLACEMENT OF CONCRETE INGREDIENTS WITH WASTE MATERIALS

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Concrete is an important construction material as it is used in almost every type of construction. The huge construction increases the demand for construction materials these days. Traditionally, concrete has been primarily composed of cement, aggregates (fine and coarse) and water. The production of cement is highly energy intensive and also it is generating green house gases. The cost of construction is very high due to unavailability of natural materials for producing cement and aggregates. This problem can be solved by total or partial replacement of concrete components with waste materials. There is significant research going on feasibility of waste materials as a replacement to the concrete ingredients. Replacing the concrete ingredients with various waste materials may lead to energy saving and also provides important environmental benefits. This paper includes a review of waste materials used as a partial replacement of concrete ingredients and focuses on the studies conducted on the use of waste materials such as fly ash, blast furnace slag, waste glass, rice husk ash, silica fume etc. This paper also includes previous investigations done on the mechanical and durability properties of concrete produced using partial replacement of cement and aggregates by waste materials.

IS GEOTHERMAL ENERGY THE MAIN SOURCE TO TRIGGER THE EARTHQUAKES ?

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We know that the earth is a bountiful source of thermal power; continuously producing heat at depth, primarily by the decay of naturally occurring radioactive isotopes like uranium, thorium, and potassium, etc...We are also aware of the fact that amongst the number of non-conventional sources geothermal power of earth is one, which has vast prospect to meet out the energy requirements. On the other hand the devastating earthquakes around the globe, which are supposed to be originated by the plate tectonic movements. In this work, we investigated the heat profile data of the Indian subcontinent landmass and the major earthquakes so far taken place in the region. Astonishingly a direct mapping has been noticed between the two data samples. This clearly indicates a fairly good connect of heat beneath with the earthquake dynamics noticed on the surface. We know that earth is a highly dynamic planet and some activity is relentlessly going on in the interior of it, and the main source of the dynamism is the heat inside. The heat exerts buoyant pressure towards the surface where it leads to geo-dynamism and geothermal events like spectacular volcanoes, high heat flow regions etc…In the light of our recent work, we reiterate that harnessing the geothermal energy from various geothermal sites, in the one hand would help in solving the growing energy needs, and on the other, reduce the magnitude and risk of devastating earthquakes.

IMAGE PROCESSING FOR FORESTRY USING DATA MINING TECHNIQUES

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Imaging based systems play a very vital role in revolutionizing any technique or process, Foresting and agriculture are also among the beneficiaries of the same. The increasing availability of data and methods to analyze them help us in finding useful patterns in terms of variables like species, volume, size and density. This write-up aims to present some of these methods.

Data acquisition has become easy with availability of images with high spatial resolution through GIS technology. Once we have gathered the data, we then need to perform classification of objects in order to extract features by remote sensing. The process can be enumerated as below: (Pre-Processing and Area Selection, Classification, Modelling). The captured data is taken and then filtered to exclude noise, irrelevancy and redundancy. After filtering the image, a relevant area is selected. This is done by drawing a polygon around the required region and using RGB color techniques to identify features. Any further processing has to be done in the selected area. The selected area is then processed to extract features. This is done based on the requirement and data availability. For instance, if aim is to grade mango fruit from the available mango forest then mango becomes our feature and grading it based on shape is called as classification. A mango can be graded by using the sub features (features of identified object mango) and comparing with available data on mango grading (like length, height, color etc). This is the step where automated model is prepared which can be applied to other regions or area. A model has all information to classify an object into suitable class and it becomes more efficient when sample space of input used for model creation is increased. There are several applications of image processing in forestry. They include counting of fruits, classification of fruits, checking quality of a tree by recognizing stem thickness and roughness. Image processing can also be used to grade the quality of leaves and crops.

POSTER - 13

EARTHQUAKE EVALUATION, REPAIR AND STRENGTHENING OF STONE MASONRY BUILDING USED IN DHARMSHALA TOWN

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The collapse of non-engineered masonry structures are one of the greatest cause of casualty due to major earthquake events around the world. Unreinforced, non-engineered and low-strength brick masonry structures comprise a large percentage of buildings in the Himalayan region and have been extensively damaged during earthquakes. Due to the high seismic hazard of the region and the inherent vulnerability of non-engineered masonry structures, a seismic assessment of masonry construction in this region is imperative. The report elaborates upon some issues in regard to earthquake risk reduction of non-engineered buildings. The major causes of severe damage observed in non-engineered buildings in the past earthquakes are presently briefly and critical elements to be incorporated in new constructions are highlighted. This study investigates a recently developed retrofitting technology specifically aimed at preventing or prolonging the collapse of adobe (mud brick) buildings under strong earthquakes. This technology uses common shot crete, wire meshing, fiber reinforced polymer packaging straps to form a mesh, which is then used to prevent brittle masonry collapse. The retrofitting technique is tested using static, diagonal loading of model wall panels. It is shown that the proposed technique effectively prevents brittle collapse of the panel and the loss of debris. Partial meshes of various orientations are also investigated in order to better identify the action of the mesh. Next, costs and benefits of earthquake prevention measures are indicated. Finally a practically feasible and economically viable scheme of earthquake resistant new building construction and seismic retrofitting of existing unsafe buildings is outlined.

POSTER - 14

BIG DATA ANALYTICS INFERENCE FOR PRECISION MEDICINE TO DECIPHER REGULATORY INTERACTIONS IN LUNG CANCER

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There is a huge demand of big data analysis with generation of next generation sequencing. Next generation sequencing falls in various omics categories viz. Genomics, Transcriptomics, Proteomics, and Metabolomics. Data scattered in various omics layers need to be integrated to get understanding of regulatory interactions and hub nodes. Regulatory interactions may help in understanding of exact mechanism of action on the basis of patient profiles data. For better understanding and demonstration we have considered lung cancer as a query dataset. We did screening and normalizing transcriptomic dataset from online databases such as NCBI-SRA, Human Protein Atlas Database, Cosmic Database, etc. Selected dataset was compared with differential expression profile. On the basis of expression profile, gene ontologies, and co-expressed genes screening of key genes/proteins which are responsible for patient specific variations need to be identified. Selected candidates will be considered for SNP analysis to find out the differences in native and disease associated proteins. Molecular Dynamics simulation studies will be performed to give inference to deviation from native to disease in terms of RMSD and RMSF values. This study will provide a systematic way to understand the regulatory interaction and screen out potent molecules, which can be used for patient profile basis precision medicine therapies.

A GREENER APPROACH TO SYNTHESIS AND CHARACTERIZATION OF THIOL AND SULFONIUM INTEGRATED STARCH FOR ARSENIC REMOVAL

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Arsenic contamination of ground water is the most serious global concern. It is very difficult to remove arsenic completely via conventional adsorbent from groundwater in both of the speciation. In the present study starch thiomer, sulfonium starch and iron immobilized starch derivatives were used for the removal of As(III) and As(V) from the aqueous system. The batch experiments were performed as a function of initial As(III) and As(V) concentrations, contact time and pH values. Results supported a little preferential sorption for As(V) (95%) in comparison to As(III) (92%) via thiomer, while sulfonium structure showed similar affinity for As(III) and As(V) sorption [92.7% for As(III) and 93% for As(V)] at pH 5.0. The results also supported that synthesized thiomer and sulfonium structure are selective to arsenic and only marginal affect is observed with competitive anions except phosphate. Arsenic sorption mechanism in different synthesized derivatives has also been confirmed by SEM-EDX. Isotherm studies indicated that the Langmuir model is preferential, while in kinetics pseudo-second-order kinetic model is superior in describing the adsorption process for As(III) and As(V) adsorption via synthesized starch derivatives. From this study it is concluded that the excellent adsorption for As(III) and As(V) by thiomer and sulfonium structure would be a better solution and can be explored for commercialization in arsenic contaminated water.

AFFORDABLE HOUSING IN RURAL DEVELOPMENT

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Rural development is the process of improving the process of improving the lifestyle of people in the rural areas. The rapid increase in the population of India in the past few decades has resulted in the shortage of houses in the country as well as in the rural areas. Developing countries like India still struggle to provide shelters for all due to the presence of low-income groups mainly in the rural areas. Another reason of this problem is that there is large gap between the income of rich and poor. So Affordable Housing has become an important topic for the development of the rural areas. Some general issues like unplanned urbanization, illiteracy and unemployment has also a great influence behind the shortage of housing in the rural areas. Considering this problem, it is very difficult to develop affordable housing appropriately in the rural areas. This research lays an overview on the current situation of affordable housing in rural areas with some case studies within around the world in order to find out some solutions to the problems of appropriate improvement of affordable housing projects in the rural areas. With the development of affordable houses in rural areas, the cost of construction of the houses reduces which is a benefit in the rural areas. So with appropriate framework for affordable housing in terms of the planning and management there is development in the rural areas.

SYNTHESIS, ISOLATION AND CHARACTERIZATION OF (PYRAZOL-4-YL) ACETIC ACID DERIVATIVES

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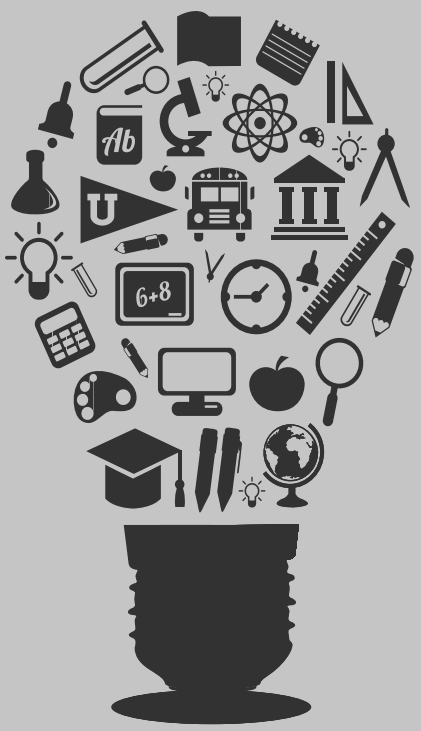
Pyrazole derivatives have been used in medicine since long and have enormous potential as pharmaceutical agents due to their biological activities such as endocrinological, anti-inflammatory, anti-hyperglycemic and many others. The literature review showed that the use of Vilsmeier-Haack reagent is an effective intra molecular cyclizing tool and a number of heterocyclic compounds have been synthesized till now. The hydrazone**3**prepared from acetophenone and phenylhydrazine was subjected to Vilsmeier-Haack reagent and after usual work up 4-formylpyrazole**4** was obtained. The 1,3-diphenyl-4-formylpyrazole**4** was converted into methyl 1,3-diphenyl-1*H*-pyrazole-4-carboxylate**8** *via* various intermediates such as (1,3-diphenyl-1*H*-pyrazol-4-yl)methanol**5**, 4-(chloromethyl)-1,3-diphenyl-1*H*-pyrazole**6**, and 2-(1,3-diphenyl-1*H*-pyrazol-4-yl)acetonitrile**7**. The methyl 1,3-diphenyl-1*H*-pyrazole-4-carboxylate**8** is a key scaffold which was further used for Knoevenagel condensation with various aldehydes but unfortunately we could manage only one product, namely, 3-(3-bromophenyl)-2-(1,3-diphenyl-1*H*-pyrazol-4-yl)acrylic acid**10**. The all intermediates and the final target **10** were characterized by their spectral data.

FORESTRY, CLIMATE CHANGE AND ENVIRONMENTAL SCIENCES 05



A REVIEW OF ENVIRONMENTAL FLOW METHODS FOR APPLICATION IN THE LARJI HYDROPOWER PROJECT, HIMACHAL PRADESH

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Ecological flows are the water that is left in a river ecosystem or discharged into it for a particular reason for managing the state of that ecosystem. Inability to maintain such flows may prompt a decline in the health of ecosystem which depends upon the water. Minimum flow is a general phenomenon used to depict a flow required to maintain the health of the river ecosystem. Hydropower is the most economical and nonpolluting sources of energy among all other forms of energy.Larji Hydro-power has an installed capacity of 126 MW. It is situated on Beas River in Kullu area of Himachal Pradesh and claimed by HPSEB. The catchment area of the Hydropower project is spread over an area of 4921 sq.km. The Larji dam site is situated at an elevation of 2299 m MSL. The undertaking was finished in September 2007. To address the issues related to producing hydropower, water is drafted from the dam at a colossal rate, doing such prompts the overexploitation of the water in the dam failing to maintain the 15% minimum ecological flow in the dam to maintain the ecosystem in a run. Diverse methodologies have been received to evaluate the environmental flow. A present review has recognized excess of more than 200 environmental flow methods accessible around the world. Display research work endeavors to review different ecological flow assessment methods to find a reasonable method for the Larji Hydropower Dam. The methods for e-flows assessment can be grouped into four classes based on the input data requirements: Hydrological methods, Hydraulics methods, Habitat simulation methods,and Holistic methods. A critical review of the methods will be done according to their preferences, impediments and likewise, the relevance of the method is finished by reviewing numerous past works completed in international, national and local level. This provides a review of appropriateness methods in the chose ponder area for future work.

ENVIRONMENT AND SUSTAINABLE DEVELOPMENT –NEW STRATEGIES WITH A VISION FOR FUTURE

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Sustainable development is a socio-ecological process characterized by the fulfilment of human needs while maintaining the quality of the natural environment indefinitely. It is only through new sustainable approaches to development that the planet's fragile ecosystems can be protected and the aims of human development be furthered. The goal of environmental sustain ability is to minimize environmental degradation and to halt and reverse the processes they lead to. This paper deals with an approach to sustainable development emphasizing the need for new conceptions of global development that take cognizance of the fact that social and environmental problems are interconnected. One of today's environmental challenges is to find ways of strengthening the scientific and socio-economic perspectives to help authorities make decisions and produce sustainable development strategies with a vision for future. The Government has emphasized the need for a coordinated approach to sustainable development in India and around the world. This is also evident by its action on climate change, human health and the environment, its support for the building and maintenance of green infrastructure in and its recognition of the unique relationship tribal people have with the natural environment. The strategies will identify common goals and actions towards ensuring healthy human and natural environments, supporting emerging governance systems, advancing appropriate use of natural resources, building vibrant communities and influencing international activities. Sustainable Development is about a more inclusive society, which provides for better protection of the environment and use of natural resources and shares the benefits of economic growth.

STUDIES ON ABATEMENT OF INDOOR AIR POLLUTION THROUGH HOUSE PLANTS

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ORAL- 03

Indoor air quality (IAQ) has become a serious concern due to increased urbanization (32% of Indians live in urban buildings). Reduction in fresh air intake can also result in the accumulation of gaseous contaminants like volatile organic compounds (VOCs) within the indoor environment, leading to a variety of occupant health concerns. Since urbanites spend in excess of 90% of their life in indoors. The quality of the ambient indoor environment can have serious implications. In the present studies, the real time readings of Volatile Organic Compounds (VOCs) and CO2 in morning and evening hours with keeping three potted plants of Areca Palm *(Dypsis lutescens)* were recorded at two different sites i.e. Canteen and Library of CSIR-IHBT, Palampur. Real time readings of VOCs in two sites of IHBT were recorded with Q-TRAK Indoor Air Quality Monitor (Model 7575, TSI Corp.). By keeping Areca Palm plants, 60% reduction in VOCs level was recorded in the morning hours at Canteen site whereas 45% reduction found in VOCs level at Library. In evening hours, VOC's were reduced 35% and 30% in the Canteen and Library, respectively.

AIR POLLUTION TOLERANCE AND PERFORMANCE EVALUATION OF TREE SPECIES ALONG VEHICULAR POLLUTION GRADIENT IN WESTERN HIMALAYA

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ORAL- 04

Increasing air pollution and loss of green cover is a prime global concern. This issue calls for screening of pollution tolerant tree species that can be integrated into green belt development. Recognizing this, the present study analyzed air pollution tolerance, and performance of commonly occurring plant species along a pollution gradient in western Himalaya. Based on distance from the road, three sites viz., highly polluted (HP), moderately polluted (MP), and least polluted (LP) were pre-identified. From these sites leaves of twenty-six tree species were collected, and analyzed for dust accumulation, total chlorophyll, relative water content, ascorbic acid, and leaf extract pH using standard protocols. Later, assessment of Air Pollution Tolerance Index (APTI), and Anticipated Performance Indices (API) was calculated. The results showed variations in all biochemical estimates. The pH, RWC, andtotal chlorophyll increased with decreasing pollution while ascorbic acid increased with increasing pollution. Dust capturing potential of Ficuscarica (1.191 mg/m2), and Toonaciliata (0.820 mg/m2) was relatively higher. Based on the results of APTI, Grevillea robusta was classified as tolerant. It scored significantly higher values (21.06, 21.19, and 19.61 in LP, MP, and HP sites, respectively). Quercus floribunda, G. robusta(68.75% each), Juglansregia (68.7%), and T. ciliata (62.50%) were good performers in HP sites. Acer caesium, Betulautilis, Morusalba that had low API scores (43.75%) were predicted as poor performers. Thus, G. robusta, Q. floribunda, J. regia, T. ciliata, and F. carica were evaluated as best performers. They could be integrated into plantations drives along road side for environmental management.

IMPORTANCE OF TO ON BARK AND ITS ALTITUDINAL VARIATIONS IN SELECTED TREES FROM FARMER'S FIELDS OF DIFFERENT SITES IN HIMACHAL PRADESH

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Toona ciliata M. Roem. (Toon) is a large deciduous tree with well spreading crown and fissured bark belongs to family Meliaceae. Apart from its distinctive timber property, tree is also recognized for its medicinal valueas well as other traditional uses (tannin and dye), where bark is used for coloring twines, making string bags etc. Clinically, its extract is used to cure ulcers, leprosy rheumatism and posses insect repellent property. The bioactivity of *Toona ciliata* bark extract has been already studied by Chowdhury et al., (2003) and examined with moderate anti-tumor activity.In Himachal Pradesh, toon trees distribution have been recorded between altitude ranging from 370m (Una) to 1650 m (Shimla) in farm fields, roadsides and forest areas. Trees were selected on field bunds, where study started with extraction of bark sample from standing stem having diameter ranging from 30-35 cm of 25 locations (having different altitude) comprises nine districts of HP. Measurements and data were collected at D.B.H of toon trees to explore the difference in bark percentage among different sites. The bark per cent was found to be maximum (14.47 %) in Bhota(Hamirpur)and minimum (10.97 %) in Nahan (Sirmaur), whereas non-significant altitudinal variation of bark per cent has been observed. This study nullify the effect of altitude for extraction of bark, which means Himachali farmers can collect bark itself from their fields without choosing suitable site. Further, extracted bark can be use for local purpose and rest of the wood for construction purpose.

INNOVATIVE ENERGY SOLUTIONS TO MOUNTAIN HOUSEHOLDS DOMESTIC NEEDS OF WATER AND SPACE HEATING

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Rural areas in Indian Himalayan Mountains are facing energy crisis and high dependence on fuel wood and dung in cold deserts poses a potential threat to the ecology, health of household inmates and involve women drudgery. HRG designed and fabricated solar water and space heating systems of locally available material with the help of local artisans. Water heating system were installed at 45° angel on the roof top facing south and room heater on south facing wall of living room with air inlet and outlet opening in living space. Space heating panel suck room air for heating in the panel with sun and blow air in living room at maximum 65° C to warm the room at about 12-15° C and provide thermal comfort to the mountain people..Water heating system coil holds 18.0 liters of water and is heated to 70-80°C within 30-45 minute of solar illumination. Households draw 100-120 liters hot water at maximum temp 90° C even in winter months. These interventions of solar water and space heating collectively were observed to mitigate around 5.0 metric tone of carbon emission/Household /annum in fuel wood/dung dependent household and save annually 40% of fuel wood/dung.Use of solar aided devices in space and water heating resulted in reduction of indoor pollution and women drudgery in collection of fuel wood/dung. Alternative sources of clean energy to rural households further help in forest conservation, agriculture productivity, reduction in indoor pollution and provide productive time to household members in the mountains.

SURFACE FUNCTIONALIZATION OF LIGNIN-RICH NATURAL FIBERS BY ENZYMATIC BIOGRAFTING – A GREEN WAY WITH HUGE POTENTIAL

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ORAL- 07

Natural fibers are major raw material in food packaging, composites and textile industries but usually displays a very poor microbial and moisture resistance. There are many chemical methods to modify the surface of natural fibers but problem is the appropriate handling and disposal of the large amount of hazardous chemicals. Surface functionalization of natural fibers by alternative green methods may outshine the chemical methods for effective industrial use. Therefore, efforts should be focused on green surface functionalization of natural fibers instead of chemical methods. Enzymatic surface functionalization is a green way, whichprovides innovative solutions to increase the performance of natural fibers with new properties including strength & stiffness, resistance to moisture & microbial attack. Enzymatic surface functionalization of antibacterial and other natural molecules on natural fibers is an environmentally friendly and best approach to incorporate desired functionalities for successful industrial applications. Laccase, lipases, peroxidases are among the enzymes being investigated for functionalization of organic molecules onto lignin for improved properties of natural fibers. Lack of availability of suitable antibacterial molecules in large amounts and cost-effectiveness are the major problems for the commercialization of this method.

STANDARDIZATION OF TECHNOLOGICAL INTERVENTION FOR PRODUCTIVITY ENHANCEMENT OF FOREST SPECIES AND THEIR USE IN LIVELIHOOD ENHANCEMENT AND POVERTY ALLEVIATION

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ORAL- 08

Himachal is in the western Himalayas. Covering an area of 55,673 square kilometres, it is a mountainous state. Most of the state lies on the foothills of the Dhauladhar Range. Due to extreme variation in elevation, great variation occurs in the climatic conditions of Himachal. The climate varies from hot and sub humid tropical in the southern tracts to, with right from more elevation, cold, alpine, and glacial in the northern and eastern mountain ranges. Himachal experiences three seasons: summer, winter, and rainy season. Summer lasts from mid-April till the end of June and most parts become very hot 28 to 32 °C (82 to 90 °F). Winter lasts from late November till mid March. There lower shivlalik region is abode of variety of trees with multiple produce. These not only squester carbon but also yield many products for the lively hood of the people of rural and urban rareas. species like harar, baheda, aonla, lasura, kathal, dheu, Jamun, reetha neem, tejpttaetc have great scope in the conservation of forests and lively hood enhancement. The studies were conducted at Regional Horticultural Research and Training Station ,Jachh sitiuated at 400 m above msl to standardize the modern techniques to conserve , propagate and multiply the rare and on the verge of extinction germ plasm of these species. The techniques have been tried and standardized first time at this station to propagate the superior germ plasm of above stated species. Because of this the germ plasm which otherwise would have been lost is conserved and transplanted at the farmers field to get early , high value produce and production at shortest possible time. The selections made from the wild are now almost recognized as varieties and fetching good price in the market. Thedemad for these kind of improved stock is increasing day by day. The efforts are increasing the foret productivity by planting tree out side the forest and the multiple products and increasing the income of the farmers.

ENERGY CONSUMPTION PATTERN IN RURAL HABITATIONS OF DIFFERENT AGRO-CLIMATIC ZONES OF WESTERN HIMALAYAN REGION, INDIA

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The present work was conducted to study the energy consumption pattern in rural habitations of different agro climatic zones (Sub mountain low hill sub tropical, Mid hill sub Humid, High hills wet temperate and High hills dry temperate zone) in Himachal Pradesh, India. Households were selected on the basis of multistage random sampling in the selected areas. A pretested questionnaire schedule was prepared and used for conducting primary survey. Study revealed that about 90-100% households in the study area used LPG as primary energy source, which was followed by fuel wood (92.81%) and agricultural waste (67.64) in all the zones except High hills dry temperate zone, where fuel wood (100.00&) was the main energy source. Electricity was also being used as a source of energy but mainly for lighting. It was found that with the increase in the altitude the per capita daily energy consumption increased in case of fuel-wood but the trend was reverse in case of electricity. The fuel consumption varied with the family size, income and land holdings. The annual carbon dioxide emissions from every household in a year in low hills, mid hills, high hills wet and dry temperate zones were 0.36, 0.35, 0.34 and 0.64 tonnes, respectively. The main source of carbon dioxide in all the study sites was found to be fuel wood followed by dung cakes, LPG and electricity.

POTENTIALS OF PLANT EXTRACTS FOR THE DIMENSIONAL STABILITY OF *LANNEA COROMANDELICA* (HOUTT.) MERR. WOOD

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Wood is a natural, renewable engineering material that facilitates its use for indoor and outdoor applications. But due to some undesirable properties such as dimensional instability under varying moisture conditions, susceptibility to degradation etc. has limited the service life of wood. The chemical treatments, although are effective methods of improving the service life of unprotected wood but cause environmental pollution and hence emphasis has now paid towards the development of eco friendly plant extracts that can offer substantial advantages for wood protection. Therefore, the present investigation was carried out to test the potentials of plant extracts viz. *Lantana camara* L. and Ageratum conyzoides L. treatments at different concentrations viz. 0.25%, 0.5%, 1.00%, 1.50% and 2.00% in different solvents viz. petroleum ether and methanol on the dimensional stability of Lannea coromandelica (Houtt.) Merr. wood samples in three different planes viz. longitudinal, radial and tangential. The results elucidated that the highest swelling has been observed in tangential plane followed by radial plane and longitudinal plane. Among the plant extracts the maximum swelling and shrinkage was found in *Ageratum conyzoides* L. and minimum was recorded in *Lantana camara* L. extract treated wood samples. All the concentrations have significant effect on the dimensional changes of wood samples as the samples have shown improved dimensional stability over control.

QUANTIFICATION AND CHARACTERIZATION OF URBAN SOLID WASTE GENERATED IN DHARAMSHALA TOWN AND ITS GREENHOUSE GAS EMISSION POTENTIAL

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The increasing concentration of geogenic pollutants in water has become a global issue. Fluoride is one of the geogenic contaminant which is found in excess in surface or groundwater due to geographical, environmental, municipal and industrial waste, leaching of fertilizers and pesticides used in agriculture. Fluoride above the permissible level results health problems, such as fluorosis, urolithiasis, kidney failure, cancerand even lead to death. Therefore, it is essential to detect fluoride in ground-water.Many techniques has been used for the fluoride detection but colorimetricis one of the best on-site detection method. In view of that herein we designed and synthesized chemo sensor based on dialdehyde starch with phenythio semicarbazide group for F- ion recognition. The addition off luoride ions to the receptors causes a dramatically observable colour change from pale yellow to darkyellow/brown in DMSO:H_2O medium. Our synthesized chemosensor has apparent advantages over other methods, such as highsensitivity, selectivity over other anions, operational simplicity, on-site detection and respond within fraction of second even in aqueous medium.

EROSION CONTROL AND DISASTER MANAGEMENT USING BIODEGRADABLE GEOMESHES

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Industrialization has improved the economy of most of the countries in the world but at the cost of earth's environment. After population growth, soil erosion is the most critical problem to the world's terrestrial eco system. It occurs due to wind, water, and other human activities; among these, erosion induced by water running down the slopes during rainfall is known as “runoff soil erosion”. It is prevalent over 53% of Indian land area and leads to major disasters like land sliding, floods, desertification, etc. North-Western Himalayan regions including the states of Jammu Kashmir, Himachal Pradesh, Uttarakhand, Punjab and Haryana are the frequent victims of such disasters. Flooding in Uttarakhand and Jammu Kashmir (2013 & 2014), and degradation of 20,000 km2 land in Hoshiarpur district in Punjab (1852- 1981) are the best examples of those disasters. 'Bioengineering Technique' using natural vegetation and biodegradable geomeshes can effectively mitigate such problems. Therefore, in this study, geographical and rainfall conditions of Himalayan regions have been considered, and runoff erosion control performances of jute and coir geomeshes is studied using Siwalik region soil. Testing is performed in a modified Bench-scale erosion tester based on ASTM D 7101 standard. From this study it is observed that both jute and coir geomeshes increase the erosion control percentage, due to the obstruction offered by the geomeshes which reduces the runoff water velocity. Further, geomeshes1` covered soil surface observed to have better vegetation growth. Among coir and jute geomeshes, jute performs better due to the better drapability and higher water retaining capacity.

CONSERVATION OF THREATENED TAXA THROUGH ESTABLISHMENT OF BOTANICAL GARDEN

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The Indian Himalaya is characterized by varied climatic conditions, topography, ecology, and altitudinal variations ranging from 300 m to 8000 meters above sea level. It has been recognized as one of the 34 global biodiversity hotspots in the world. It supports nearly 8000 species of flowering plants of which about 40% are endemic. Around 1748 species of medicinal plant with various traditional and modern therapeutic uses are found in Western Himalaya. Overgrazing by domestic livestock, overexploitation for traditional medicine& industry purpose, unplanned and poorly managed tourism, use of fire to clear land poses an additional threat to forest land, as fires sometimes spread out of control has led to environmental deterioration.Introduction and conservation of rare, endangered and threatened plants is one of the major thrust areas of the Institute. During the year 2017-18, eight species were collected from different locations of Western Himalayas. These plants include *Hyoscyamus niger* L. (EN), *Jasminum parkeri* Dunn (CR), *Rauvolfia serpentina* (L.) Benth. ex Kurz (CR), *Saussurea costus* (Falc.) Lipsch. (EN), *Taxus wallichiana* Zucc. (EN), *Valeriana jatamansi* Jones (VU), *Ferula jaeschkeana* Vatke (VU) and *Dioscorea deltoidea* Wall. ex Griseb. (EN).For conservation reason, propagating material of plant including rhizomes, stem cuttings, established plants, and seeds were gathered from different locations of Western Himalaya. These propagating materials were given various growth regulator treatments. Plants were raised in nursery beds &increased in number. Later they will be reintroduced in their native habitat so as to take them out of Rare, Endangered & Threatened category.

CLIMATE CHANGE AND FORESTS: AN UNCERTAIN FUTURE

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Climate change is one of the most important global environmental challenges in the history of mankind. Climate of the planet earth is always in a state of change as a natural process influenced by both natural variability and induced environmental changes due to anthropogenic reasons. Over the past half-century it has already affected forest ecosystems and will have increasing effects on them in the future. Forests and their conservation or loss influences climate, and it in turn is a key driver of the changes in forest ecosystems. The carbon-regulating services of forests are at risk of being lost entirely unless current carbon emissions are reduced substantially. Emissions of green house gases are causing warming of earth globally resulting in global temperature increase. Impact of this unprecedented increase in temperature is predicted to be particularly severe in tropical areas, which mainly include developing countries, including India. Understanding recent changes in climate and forest ecosystems is a complicated task. Many drivers and dimensions of environmental change have been operating simultaneously, including atmospheric CO2 concentrations, nitrogen deposition rates, and tropospheric ozone concentrations as well as land use practices, invasive species and global trade causing considerable and measurable environmental changeover the time. Forests as major biological scrubber can capture and retain large volumes of carbon over long periods and additionally operate both as vehicles for capturing additional carbon and as carbon reservoirs by careful forest management. Thus maintaining a dynamic equilibrium and resilience over time and space is important in the continued delivery of ecosystem goods and services sustainably.

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MALABAR NEEM *(MELIA DUBIA)* - A POTENTIAL MONEY SPINNING TREE OF SHORT DURATION FOR LOW AND MID HILLS OF HIMACHAL PRADESH

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The ever-expanding population requires an enormous amount of wood, which in turn, puts intense pressure on the existing forest wealth of India. The production potential of trees for wood generation is restricted to about 0.7 cubic metre/hectare/year in the country as compared to the world average of 2.1 cubic metre/hectare/year. This results in a huge gap between demand and supply. Planting fast-growing trees outside the forest in the form of farm-forestry or agro forestry is the only way to meet the goal. In the past two decades, wood-based industries and plantation companies have emphasized on introducing exotics trees like *Eucalyptus* and Poplar to fulfill the requirement of raw wood. Controversies surrounding the monoculture of exotic trees for soil health and ecological threats to indigenous vegetation are known to everyone. *Melia dubia* (Malabar Neem) is one such indigenous tree species which is fast growing and can be cultivated in altitude ranging from 500 to 1600 m above mean sea level. The productivity of *Melia dubia* is higher than *Eucalyptus* and Poplar. The wood quality of *Melia dubia* makes it a perfect raw material for manufacturing plywood, match sticks, paper industry, making furniture, musical instruments, packing cases and agricultural implements. Wood from this tree fetches a good market price. On-farm trial of 17 improved genotypes of *Melia dubia* procured from Forest Research Institute, Deharadun at College of Horticulture and Forestry, Neri, Hamirpur, Himachal Pradesh revealed that low and mid hills of Himachal Pradesh are ideal for the growth of *Melia dubia.*

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AN ESTIMATE OF APPLE CHILL UNIT ACCUMULATION TREND IN HIGH HILL DRY TEMPERATE REGION OF HIMACHAL PRADESH

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The amount of cold needed by the plant to resume normal spring growth following the winter dormancy period is commonly referred as its chilling requirement. The cumulative chill unit accumulation for apple crop was estimated by using Utah modelat 2500-3000 m amsl (Kinnaur) during the period of 1994 to 2015 from daily maximum and minimum temperature. The study showed a decreasing trend of the order of -9.892 chill unit hours per year as per the regression equation (y = 1179. 0 - 9.892x). Maximum (1436.6) chill unit (CU) was accumulated during the year 1999 whereas, minimum (876.8) during 2005. The present investigation also revealed a decreasing trend of monthly accumulation of chill unit hours during 1994-2015 for four winter months i.e., November – February. The maximum decrease of 4.232 chill unit (CU) per year was observed for the month of November, followed by December (2.513 CU per year), January (0.710 CU per year) and February (2.165 CU per year). The decrease in chill units may be due to the overall increase in maximum temperature over a period in the study area. The study also revealed that the chill unit for the last two decades i.e., 1996-2005 and 2006-2015 followed a decreasing trend of 108.4 CU decrease per decade as per the regression equation y = 1220 - 108.4x. On an average 1065.95 CU hours were available for apple crop at an altitudinal gradient of 2500-3000 m amsl in Kinnaur during last 22 years i.e., 1994-2015 which is just less than the average requirement i.e., 1200-1600 Chill Unit Hours of delicious group and thus is a serious concern as far as delicious apple cultivation in the coming years is concerned. Thus in order to cope up with changing climatic scenario plantation of spur varieties with medium chill requirement were promoted and increasing green cover through plantations of native species, reducing forest degradation and emissions, creating awareness among the native communities have been suggested.

FOREST BASED AGRICULTURAL TOOLS AND IMPLEMENTS: THEIR USE AND IMPORTANCE TO BHANGALISIN THE CHHOTA BHANGAL REGION OF WESTERN HIMALAYA

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Tribal communities residing in Himalaya are mainly agro-pastoralists and depend on agriculture for their livelihood. Use of plant derived products for making traditional agricultural tools and implements is an important part of their lifestyle. Unfortunately, over time, the use of these tools and implements is declining. With this background, the present study was initiated to document the various traditional agricultural tools and implements used by Bhangalis of Chhota Bhangal, Himachal Pradesh. Door to door surveys (n= 240), focus group discussion and participatory rural appraisal were carried out in the Chhota Bhangal to elicit information on the agricultural tools and implements, their uses, and plants species used for making these. It was found that a total of 16 tools and implements were used by the Bhangalis for agriculture purpose under four categories. Of these, maximum 10 were used for post-harvest management, while 3 were used for tillage purpose, 2 were used for intercultural operation and the minimum 1 was used for harvesting. For making these tools and implements, species from nearby forests were used. For making these products 10 species belonging to 8 families were used. Maximum of these belong to family Pinaceae (n=3). With respect to life form, 70 % of the species used were trees. Cedrus deodara, Picea smithiana and Quercus semecarpifolia were the most commonly used species. It was revealed that the use of traditional agricultural tools and implements is declining in the study area and the market forces are the main reason behind this.

CHRACTERIZATION OF MEDICAL WASTE TOWARDS MICROALGAL-BASED BIOREMEDIATION

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The medical waste generated in a considerable amount from the hospitals and other diagnostics clinics have a hazardous effect on the environment and other resources. The waste released from different streams contains a large number of toxic, infectious and radioactive compounds. The waste management permits the proper guidelines to dispose of this waste worldwide. The radiographic waste in hospitals and clinics includes fixing and developing solution which has a high number of silver and other content during the processing of x ray films. The x ray waste considers one of the hazardous chemicals due to the presence of heavy metal. The spent media of fixer and developer solution during x-ray were collected and characterized. There are various parameters such as pH, TS, TSS, TDS, conductivity, density, BOD, COD and TKN (TotalKjeldahl Nitrogen estimation) were performed. The fixer solution used in the radiographic processing has max. Biological oxygen demand (BOD) 11850 mg/l and chemical oxygen demand (COD) 520400mg/l which is more than the spent developing solution. The further analysis reveals that both fixer and developer solution contains a higher value of each parameter which is above then the permissible environmental limits.

SOLID WASTE MANAGEMENT UNDER DYNAMIC SITUATIONS: AN INTUITIVE WAY

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Solid waste management is one of the key problems in front of government. The waste resources are being characterized here into static and dynamic. Static resources are fixed collection points whose exact position is previously known, whereas dynamic resources are those whose position is not fixed but they must need attention for proper execution. Varies solutions have been adapted by government for its management such as door to door collection, identification of dump sites etc for management of static waste. But there are less intentioned given to the waste which is dynamic in nature as its position is not fixed. In this paper, some techniques have been proposed to collect the dynamic waste from different sources and convert them into static one for proper disposal/management. The paper is divided in four sections. First section will introduce readers to static solid waste management and also with our terminology of dynamic waste. Second section introduces with different dynamic waste resource and techniques projected to solve these issues. Third section provides some awareness, advantages of these techniques which must be spread among all for proper execution. Finally, Fourth section lists conclusion and future scope of the work.

IMPACTS OF CLIMATE CHANGE ON POTATO PRODUCTIVITY IN PUNJAB

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The present study was carried out to assess the impact of climate change on potato productivity in Punjab, using Wofost Food STudies crop growth simulation model. Three potato cultivars belonging to three different maturity group were used (Kufri Badshah- late maturity; Kufri Jyoti-medium maturing; Kufri Pukhraj-early bulking). The analysis was done for baseline scenario (2000) and for future climate scenarios of the year 2030, 2050 and 2050 for two RCP's (4.5 and 6.0). Potential production of potato cultivars was estimated for 13 different locations across Punjab. Under baseline scenario, the mean productivity of Kufri Badshah, Kufri Jyoti and Kufri Pukhraj was 58.3, 54.4 and 56.9 t/ha, respectively. For RCP 4.5 the increase in CO2 concentration alone is expected to bring an increase for Kufri Badshah, Kufri Jyoti and Kufri Pukhraj with respective values of 6.7, 7.2 and 7.1% in 2030, 10.8, 11.6 & 11.4% in 2050 and 14.0, 15.0 & 14.8% in 2080. But the corresponding increase in temperature is likely to decline the mean productivity by 2.6, 3.8 & 3.8% in 2030, 6.5, 8.7 & 9.3% in 2050 and 14.4, 17.6 & 18.4% in 2080, for Kufri Badshah, Kufri Jyoti and Kufri Pukhraj, respectively. It is estimated that for RCP 4.5 under the combined influence of change in temperature and CO2, the productivity of potato cultivars will not be affected in 2030 and 2050 over the baseline scenario, but will decline in 2080 (Kufri Badshah -1.9%; Kufri Jyoti -4.1% and Kufri Pukhraj -5.2%) in Punjab. Similarly, for RCP 6.0, the increase in CO2 concentration alone is expected to increase the productivity of Kufri Badshah, Kufri Jyoti and Kufri Pukhraj by 6.2, 6.7 & 6.6% in 2030, 10.1, 10.8 & 10.6% in 2050 and 18.6, 19.9 & 19.7% in 2080. However, extent of increase in yield due to CO2 is negated by increased temperature with respective values of 4.7, 1.1 &1.0 in 2030, 3.6, 4.8 & 4.7% in 2050 and 12.0, 15.0 & 15.5% in 2080. As such, combined effect of change in temperature and CO2 for RCP 6.0 will not affect the productivity of potato cultivars over the baseline scenarios for 2030, 2050 and 2080.Results, further revealed that the negative effect of climate change on potato productivity can be counter balanced to some extent by changing the dates of planting and/or selection of suitable varieties for the location

A COMPARISON OF TREE SPECIES COMPOSITION AND COMMUNITIES ALONG ALTITUDINAL GRADIENT IN KARSOG FOREST DIVISION OF HIMACHAL PRADESH

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The forests of Karsog Forest Division in district Mandi, H.P. were temporally analyzed for change in tree species composition. The data/enumeration records were procured from the State forest department of Himachal Pradesh. The forests were analyzed on the basis of two parameters, i.e. the species composition in different communities and variations along altitudinal gradients. We analyzed 143 forest compartments to study the change in tree species in total thirteen delineated communities, out of which six were pure forest communities and seven were mixed forest communities having an total area of 6, 547 ha. Forests were also analyzed altitudinal gradient wise viz. 1000-1500, 1500-2000, 2000-2500 and 2500-3000 m amsl. The change in density (Ind/ha) in tree species was calculated between two enumeration years, i.e. 1986 to 2013. Results showed that out of thirteen communities only three pure communities *(Pinus roxburghii, Abies pindrow and Quercus leucotrichophora)* and all mixed communities showed increased density except two mixed communities, i.e. *Quercus leucotrichophora*- Broad Leaved and *Cedrus deodara*-Broad Leaved mixed community. Altitudinal gradients,1000-2000 m showed increase in tree density while above 2000-3000 m, a gradual fall in tree density was observed. The paper provides concerted view on tree species change over a period of time in Karsog Forest Division. Such studies in the State will help in developing management strategies of the forests by identifying the gaps in the systematic enumeration records.

STUDY OF ENVIRONMENTAL HEALTH STATUS IN FOUR LANE ROAD CONSTRUCTION AREA OF BILASPUR DISTRICT (H.P): AN ECONOMIC PERSPECTIVE

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The present study accesses the economics of environmental health in construction of four lane work area in Bilaspur District. Households are exposed to many environmental health problems in their livelihood due to construction of new highway road and this lead to disturb their economy by directly or indirectly. We demonstrated that environmental degradation poses a significant threat to human health. This study has examined that how environmental degradation could disturb the overall efficiency of the household's economy. Clearly, the loss of health due to environment degradation is substantial and calls for interventions Thus environment policy interventions can in turn save money in health care cost. This work will help in policy making and further environment health research. Harmful consequence of degradation to human health are felt but subsequent risk of being ignored in policy making. Then we explain the changes in economy of environmental health of household's and impact of project on health economics of households. We concluded that the maximum people are suffering from common disease occurred by road construction and minimum people are suffering from chronic respiratory disease. Due to suffering of disease's health economy of households is changing continuously.

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SCENARIO OF MUNICIPAL SOLID WASTE MANAGEMENT IN INDIA: A REVIEW

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Municipal Solid Waste (MSW)is one of the chief areas of concern all over world. This trend of increase in MSW has been associated with the urbanization. Urbanization has become a global phenomenon but its ramification is more pronounced in developing countries like India. MSW generation showed different trend along with the positive correlation with economic development in terms of per capita waste generation. Solid waste management is already a mammoth task in the developing country like India. MSW generation varies from place to place which is directly proportional to socio-economic status of population, climatic factors, geographical conditions etc. The paper gives the current scenario of India in respect of the municipal solid waste generation, its quantity, quality, the management practices being followed and treatment options. MSW management is one of the most overlooked basic services provided by the Government of India. The lack of infrastructure for collection, transportation. Treatment and disposal of MSW , proper waste management planning, financial constraints, lack of technical know-how and callous public attitude have made situation more worse leading to environmental as well as public health issues . Nevertheless, in spite of being many negative issues related to MSW management, it also provides opportunities that helps in reducing the negative impacts but also meet up demand for energy and employment generation. The paper has presented a brief overview of MSW with the objective to discuss about the challenges and opportunities faced in MSW management in a developing country like India.

WATER FOOTPRINTS OF VILLAGE PURTIALA, JAWALAMUKHI SUB- DIVISION, KANGRA DISTRICT, HIMACHAL PRADESH

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Water is a transparent, tasteless, odorless, and nearly colorless chemical substance that is the main constitution of Earth's streams, lakes, and oceans, and the fluids of most living organisms. Water plays an important role in the world economy. Approximately 70% of the freshwater used by human goes to agriculture. India is a country of vast biological, geographic, and climatic diversity. It has total geographic area of 329 Mha. Excluding bodies of water, India's total land area is estimated at 297 Mha. The water footprint is defined as the volume of water needed for the production of goods and services consumed by the inhabitants of a country. This concept is developed in analogy to the ecological footprint. The water footprint can be divided into an internal and an external water footprint. Global water saving is created when a product that is traded has a higher virtual water content in the importing state than in the exporting state. A study to assess the water footprint, water demand and water supply in Village Purtiala sub-division Jawalamukhi district Kangra is conducted in IPH Jawalamukhi. As the people of Purtiala Village are much dependent on the water supply from IPH Jawalamukhi it naturally imposes a pressure on the local water resources and IPH Jawalamukhi. It is much clear that in last three to four years the population is increasing, the demand of water is also increasing per year. There is much stock of water to be distributed in the present era but in future the conditions may be reverse. Since not so far research has been done on “water footprints''the study is a beginning in this direction and not an end. Much more research is yet required to be done.

EXTREME WEATHER EVENTS IN HIMACHAL PRADESH WITH SPECIAL REFERENCE TO CLOUDBURST AND FLASHFLOOD IN LAST THREE DECADE

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Human induced climate change has contributed to the changing patterns of extreme weather events across the globe, from longer and hotter heat waves to heavier rains. While natural variability continues to play a key role in extreme weather. Climate change has shifted to the odds and changed the natural limited, making certain types of extreme weather more frequent and more intense. Extreme weather events are on the rise, and the indications are that it will continue to increase more in both predictable and unpredictable ways. Increase in temperature, rainfall, rainfall variables and intensities in the State may lead to accelerated summer flows which leading to situations like flash/flashfloods in north western regions of the State. Health risks also associated indirectly with extreme events in sub montane, low hills, and humid agro climatic zones of the State.

In Himachal Pradesh due to extreme weather events mainly cloudburst and flashflood in past three decades, there were so many losses of lives and damage to the properties, cloudburst formed flash flood and landslides in hilly areas. The main regions in Himachal Pradesh are like Kullu, Kinnaur and the high altitude regions of Himachal Pradesh. In this study Kullu, Kinnaur and Mandi district had highest number of cloudbursts and flash floods.

Whereas in last 5 years this is estimated that total damage to the houses, crops and public properties lead to 4 % revenue loss of total estimated budget of Himachal Pradesh. It is also revealed that revenue losses are continuously reduced since 2014-15 i.e. 3.36%, 2015-16 i.e. 3.17%, 2016-17 i.e. 2.64% and in 2017-18 loss is only 2.55% that due to appropriate implementation state disaster management plan.

The present paper is based on the secondary data/information and aims at giving an account of various incidences of flashfloods and cloudburst in their multi-facet impacts on the Himachal Pradesh. The paper also tries to analyze the spatial similarities and differences in the flood prone areas to find out the policy imperatives for the sustainable development.

POSTER - 03

UTILIZATION OF PLASTIC WASTE IN THE CONSTRUCTION OF PEDESTRIAN PATH: A REVIEW STUDY

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Disposal of plastic waste in environment is considered to be a big problem due to its very low bio degradability (i.e. long service life). Recently few days back due to heavy rain in hilly areas the plastic waste started flowing through the small tributaries of river. Most of the nations have taken some serious steps for recycling these plastic wastes to avoid adverse impact on environment and human health. Therefore, finding alternative methods of disposing waste by using environmental friendly methods are becoming a major research issue. In some researches, high density polyethylene waste was mixed with Portland cement to investigate the possibility to produce plastic cement and use that mix in pedestrian of villages. The experiments were done by using the waste of polyethylene packages include bottles, e plastic and food crates. After studying various research papers concluded that there is a possibility to produce plastic cement from polyethylene waste to some extent and replacement of plastic waste can be done up to 40%. But by adding some admixture and plasticizer this percentage get increased and their density was decreased, ductility increased, and the work ability improved. The construction of good quality of pedestrian path in village will help them to transfer their crop, milk, vegetables and fruits etc to link roads. In India there was a scheme at panchyat or block level to construct a pakka path with concrete in every village to help women, so they could carry water from natural resource. But it was not successful at hilly areas because of temperature variation and frost action.

POSTER - 04

FOREST FIRE IN HIMACHAL PRADESH: AN IMPACT ANALYSIS

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Forest fires create a myriad of environmental, social and economic impacts. The fire incidence prone areas has mostly the gymnosperms species like *Pinus* , *Cedrus* , Oak etc. which catches fire easily, while as the lots of medicinal species in the temperate regions also get destroyed. As a result leads to the ecological and economic loss to the state. The impact of this damage involves not only the amount of timber burnt but also environmental damage to forested landscapes leading, in some cases, to land and forest degradation and the prevention of vegetation recovery. However, further more improvement required to enhance the process of better assessment, monitoring and management of the forest resources of the planet earth.

Forest fire is a perennial phenomenon in the state. Even as all the forest types are potentially vulnerable to fires with most of temperate and sub-tropical forests experiencing ground fires if winters go dry, it is the Sub – tropical Pine Forests (Chir Forests) spread over 1258.85 km² (3.4 % of total forest area of the state) that experience the heaviest annual forest fires during the dry months of March to June. Forests are not uniformly distributed throughout the state but are mostly confined to higher hills and interior valleys because the lower and more accessible areas, the forests have been cleared for cultivation and settlement. At the district level, Chamba has maximum area under forests and most of it is under very dense and moderately dense forests. The extent of forest fires in the state over the last ten years in the different districts are as total of 572 fire cases have been reported during 2008-2009 and the total area affected area was 6.586 ha, the affected area raised four times more till 2010, whereas 1906 incidences of fire occur during 2009-10 ; 870 incidences of fire occurred during 2010-11 meanwhile 168 fire incidences happened during 2011-12 .In the year 2012-13 highest number of fire incidences(1798) occurred with the huge economic loss of 2,76,82,589 crore in this decade.

VULNERABLE TROPICAL RAIN FOREST : AMAZON

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The practice of this aphorism is concerned regarding largest tropical rain forest of the world :- Amazon. Which is approx 5500000km2 . It denoted as lungs of our mother earth. Because Amazon absorbing more carbon dioxide from the atmosphere than it put back into it. It traps 15% of globally CO2 emission. Amazon rainfall is made by the Amazon rain forest itself. So that's why Amazon bio diversity is dense and evergreen. It has different and unique verities of tropical and medicinal plants along with 1400 species of mammals , 1500 species- birds, rare green anaconda, 1500 species – amphibians, 2500 species fishes (Additionally 1000 un described species) and regarding insects , more than 90% of animal species in Amazon are insects. But if we see real scenario then 14% of world total deforestation occurs in Amazon. And in addition to carbon release associated with deforestation NASA has estimated that if deforestation level proceed then remaining world forest will disappear in about 100 years. And studies done by green peace showed that 300 billion tons of carbon, 4 times the annual greenhouse gas emission from fossil fuels are stored in trees.

So now if we want to hold our ongoing activities regarding clean Amazon then it's very difficult because protecting area larger than India and it almost next to impossible. So it is very important to make a proper planning for sustainable development (Green energy, Vertical farming) in territory countries of Amazon. Because Amazon's effect is not restricted only for South America, it will affect whole ecosystem of the world.

EFFECT OF CLIMATE VARIABILITY ON CHILL UNITS ACCUMULATION AND FRUIT DEVELOPMENTAL STAGES ON APPLE PRODUCTIVITY IN KULLU DISTRICT OF HIMACHAL PRADESH, INDIA

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The present study was carried out during 2017-18 in State center for climate change, Himachal Pradesh. The secondary data of maximum, minimum temperature and rainfall was collected from IMD (Indian Meteorological Department), Shimla. The cumulative chill units hours available for apple crop were calculated by using UTAH model for the period of 1970 to 2015 and a decrease of 7.455 chill units (CU) hours per year was recorded. Chill units for the last five years i.e. 2011-2012, 2012-2013, 2013-14 and 2014-15 revealed a decreasing trend of the order of 68.09 CU. The temperature and the annual rainfall variability was determined by the Standardized Anomaly Index (SAI). The Mann-Kendall test was used for trend analysis. Mann-Kendall statistical test for the mean annual, mean annual minimum and maximum temperature from 1970 to 2015 showed significant warming trends The Mann-Kendall test revealed an increasing trend in standardized anomaly index at Kullu district. Present investigation revealed highest apple productivity (8.68 tons/ha) in the year 1990 with the maximum temperature (16.7°C), minimum (2.03°C) and rainfall (102.73 mm) in winters and lowest (0.001 tons/ha) in 2011. A significant positive correlation (r=0.5121*) was observed between productivity and minimum temperature for January, February (r = 0.4911*) at 1500-2000 m amsl. Thus the climatic conditions have been projected to become unfavorable for apple cultivation in Kullu district for coming year.

POSTER - 07

IMPACT OF CHANGING CLIMATIC CONDITIONS ON CHILL UNITS ACCUMULATION ON APPLE PRODUCTIVITY IN SHIMLA DISTRICT OF HIMACHAL PRADESH, INDIA

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The present study was carried out during 2014-15 in the Shimla district of Himachal Pradesh, which is situated at 31.61°N 77.10°E. The Cumulative chill units hours available for apple crop were calculated by using UTAH model for the period of 1970 to 2016 and a decrease of 13.391chill units (CU) hours per year was recorded at Shimla alley of Himachal Pradesh. Maximum apple productivity was recorded in 2012 (17.4 t/ha) and minimum in 2000 (0.6 t/ha). Data on apple productivity in Shimla district for last decade (2005-2014) showed a decreasing trend from 2012 of the order of 0.112tons/ha /year as per the regression equation y = -0.1125x + 5.6203. Thus the climatic conditions have been projected to become unfavourable for apple cultivation in Shimla district for coming year.

POSTER - 08

MAPPING OF *PINUS GERARDIANA* WALL. (CHILGOZA PINE) IN KINNAUR DISTRICT: AN IMPORTANT CONIFER OF NORTH-WESTERN HIMALAYAS

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Pinus gerardiana commonly known as Chilgoza Pine belongs to family Pinaceae. This pine is native to the northwestern Himalayas in Northwest India, eastern Afghanistan, Pakistan and grows at elevations between 1600 and 3300 metres. In Himachal Pradesh, it is distributed in Kinnaur and Chamba Districts. But it's mostly abundance /occurrence are found in Kinnaur district. It occurs in association with *Cedrus deodara*, *Quercus ilex*, *Fraxinus xanthoxyloides* and *Pinus wallichiana.* It is known by various names in different areas of its natural occurrence. It is commonly known as Chilgoza or Neoza in Hindi and Ree in Kinnaur. The tree grows in loose, light and barren soils, metamorphosed crystalline rocks, granites and quartzite formations and virtually regarded as the "champion" of Rocky Mountains. Chilgoza forests often grow on steep slopes. It is an important conifer and it is at higher risk of extinction. Major reason for its extinction are the cones or seeds are devoured or eaten by birds and wild animals; extensive lopping and failure of harvesting practices and developmental activities like construction of road and buildings which results lower of its natural regeneration. The study and mapping of *Pinus gerardianais* going to carried out in Moorang, Pooh, Kalpa and Kilba Forest Ranges of Kinnaur Forest Division. In reference to the Neoza Working Circle of Kinnaur District, total area under the Neoza/Chilgoza Pine is 2844.53 Ha. Moorang Forest Range has highestchilgoza/ neozapine area(1435.83 Ha.). Survey and mapping is being carried out at Ribba, Rispa, Rarang, Akpa, Jangi, Lippa, Moorang and Thangi forests of Moorang Forest Range. At above mentioned locations, pure patches of *Pinus gerardiana* forests and also mixed forests have been taken through GPS. Different aspects have been recorded while doing the survey i.e. North to Northeast, South to Southeast, Southwest etc. After that LISS IV images would be used for supervised classification on ERDAS Imagine Software.

HEAVY METALS ANALYSIS OF UNDERGROUND WATER OF BBN AREA, SOLAN, HIMACHAL PRADESH

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Water resource management is an important part of human life, as we know that 70% of human body is water content. A human used average of 302-378 liters of water in daily life so the purity of water is one of the most important areas of human concern. It is very important to check the quality of drinking water periodically. Underground water is a major source of drinking water in India especially in Himachal Pradesh. But the quality of underground water is regularly decreases in the surrounding of some industrial areas of BBN (Baddi - Baroutiwala-Nalagharh), district Solan of Himachal Pradesh. We can improve the water quality by keeping water source safe from chemical contaminants in an effective and protective way through the application of regular check up and with interventions by taking exact measure periodically before it is supplied for usage. The aim of present research is to investigate the level of some common heavy metals (Copper, Iron, Lead, Mercury, Cadmium, Zinc, Manganese etc.) of underground water in BBN area. Underground water samples are collected from four different locations in the surrounding of BBN area. Collected samples are analyzed for heavy metals. For the comparison of obtained results Bureau of Indian Standards (BIS: IS: 10500, 2012) guidelines are used. Accordingly, the results show that some heavy metals are within the accepted range, but some heavy metals (Cu, Fe, Zn and Mn) are at alarming state as compared to the BIS, 2012, thereby suggesting the need for treatment and precautionary measures for use of the particular underground water.

ASSESSMENT OF TOXIC ELEMENTS IN SEWAGE SLUDGE OF SHIMLA TOWN OF HIMACHAL PRADESH

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Investigation was conducted to determine the concentrations of toxic elements As, Cd, Cr, Fe, Ni, Pb and Zn in sewage sludge of Shimla town. Sludge samples from five STP's sites of town was collected and analyzed for toxic elements by injecting filtered samples into Inductively Coupled Plasma Emission Spectrometer-6300 DUO. The toxic elements were in the range of As (4.13-12.01), Cd (1.12-9.84), Cr (9.72-22.55), Fe (1205.97-4989), Ni (16.65-41.46), Pb (22.47-48.41), and Zn (380.67-618.63) mgl-1, respectively. The comparison of the ranges of toxic elements with the pollution concentration limit (PCL) prescribed by US EPA. The present study indicated that sludge samples having toxic elements (As, Cd, Cr, Fe, Ni, Pb and Zn) within the permissible limits. The disposal of Sewage Sludge or its application on farmlands is of public health concern, owing to the potentials of toxic metals in sewage sludge to deteriorate soil & ground water quality. The addition of sewage sludge to soils could affect potential availability of toxic metals in soil.

POSTER - 11

IMPACT OF INVASIVE ALIEN PLANTS ON THE NATIVE FLORA OF SHIMLA TOWN

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Biodiversity plays diverse roles at global as well as local levels and provide a range of important economic and essential social and environmental goods and services. This rich biodiversity today is being affected by the vagaries of rampant environmental degradation. Not long ago, Shimla had a rich repository of temperate plant diversity, with high degree of nativity, which is gradually being replaced by alien species. In addition, the anthropogenic effects leading to environmental degradation are expected to have greater effects on native plant diversity. The current lack of region specific plant information of native flora is a major bottleneck. Today, maintenance of environment is the most challenging problem for this historic town and this has necessitated strict management decisions from the National Green Tribunal (NGT) to address this urban ecological problem. Studies to document and analyse the flora of a region/area through botanical surveys, phenological assessments, comparison of plant species from primary and secondary data are required to analyse effects of climate change for preparing a baseline of alien flora for future research and management. This study focuses on understanding how native plants are gradually being replaced by alien plants, many of which have become invasive. It enlists a total of 152 alien plant taxa from the study area of which 39 taxa turning invasive of which 24 are a serious threat to the native flora. The study also highlights the perils of erratic urbanisation of the town coupled with the high rise in tourism, which is aiding the climate change and subsequent global warming.

POSTER - 12

IMPACT OF DROUGHT STRESS ON SECONDARY METABOLITES OF MEDICINAL PLANTS

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Medicinal plants have been integral part of our daily life for thousands of years. These are reservoirs of curative elements used by a large population of world in the treatment of various diseases. Medicinal plants are widely used as alternative therapeutic tool for the prevention and curing of many diseases. Medicinal plants contain biologically active chemical substances such as saponins, tannins, essential oils, flavonoids, alkaloids and other chemical compounds, which have curative properties. Plants, because of their sessile nature, are the foremost organisms which always face several environmental stresses such as extreme temperature, drought, water logging, salinity etc. Secondary metabolities are synthesized by plants due to adaptation in response to biotic and abiotic stresses. Drought stress is one of the most important factors limiting plant growth and crops production worldwide more than any other biotic or abiotic stress. Although the effects of drought stress on crops have been extensively studied but researches on the behaviour of medicinal plants under drought stress have not been so extensive. This review summarizes researches about impact of drought stress on active substances of some medicinal plants.

ANALYSIS OF POLLUTION PARAMETERS OF WATER BODIES OF KALUJHANDA VILLAGE IN SOLAN, HP

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Water bodies (ponds) are the soul of a rural community and need to be regularly maintained as their purpose of existence is fading away due to lesser involvement of rural population to preserve them. Understanding their importance, the water quality of four ponds located in Village Kalujhanda, in Dharampur Tehsil in Solan District of Himachal Pradesh State, India has been analyzed. As per preliminary data collected, the possible ponds sources of inflow in the ponds are stormwater runoff, groundwater and grey water from households in their catchment. Presently, the usage of the ponds appears to limit to dumping of waste, bathing of cattle, and groundwater recharge but to a lesser extent.

To evaluate water quality of the ponds, the water samples as grab samples were collected from ponds with two numbers from each pond and sampling location within the pond was selected based on the ease of accessibility of sampling locations. The water quality samples were tested for pH, hardness, chlorides, turbidity, dissolved oxygen, total dissolved solids and total solids. The range of various parameters such as pH, hardness, chlorides, turbidity, dissolved oxygen, total dissolved solids and total solids was 6.3-7.2; 145-280 mg/L; 40-130mg/L; 1.8-163.8 NTU; 1.8-6.7mg/L; 145-655mg/L; 415-1205mg/L respectively. As per Indian Standard drinking water specifications (IS 10500:1991) the desirable limits of these parameters are 6.5-8.5; 300mg/L; 250mg/L; 5 NTU; 9.17mg/L; 500mg/L respectively. The difference in values from IS code clearly implies that the issue of pollution of water bodies should be addressed for the upliftment of the rural population.

उचित जल प्रबन्धन न होने से पहाड़ों में जल की हानि।

महेन्द्र सिंह राणा
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जहां एक और सम्पूर्ण विश्व जल की समस्या से ग्रसित हैं। वहीं हम उचित जल प्रबन्धन न होने से पहाड़ों में प्रतिवर्श हजारों लीटर शुद्ध जल बरबाद कर देते है। बरसात के मौसम में स्थानीय लोगों द्वारा जल प्रबन्धन किया जा तो वर्श भर के लिए जल संचय किया जा सकता हैं तथा गर्मियों के मौसम में जल समस्या से बचा जा सकता है। हमने अपने क्षेत्रों के गांवों का सर्वेक्षण किया तो पाया कि बरसात में प्राकृतिक जल स्रोत शुद्ध जल से लबालब रहते हैं ,निरंतर दिन रात प्रवाहित होते रहते हैं, जिससे लाखों ली0 जल प्रतिमाह बर्बाद होता रहता है।

हमने सिलोगी कड़थी, भुवरसैंण, जसपुर, ग्वील आदि अनेकों गांवों का सर्वेक्षण किया तो पाया कि ग्रामीणों द्वारा प्राकृतिक जल स्रोतों का उचित प्रबन्धन नही किया जाता जिससे हजारों ली0 जल व्यर्थ हो रहा है। जैसे सिलोगी में लगभग 65 परिवार है जिनके सदस्यों की संख्या 350 के करीब है, जिनके लिए प्रतिदिन औसतन 50 से 60 ली0 पानी की आवश्यकता होती है जबकि मात्र एक प्राकृतिक जल स्रोत से प्रतिदिन लगभग 72000 ली0 जल व्यर्थ जाता हैं। यदि हम इस जल का सही संचय या प्रबन्धन कर देते तो ये ही जल पूरे सिलोगी गांव को वर्शभर के लिए पर्याप्त था। जिससे कि गर्मियों व सूखे के समय हमें जल की समस्या से नही जूझना पड़ेगा। उचित जल प्रबन्धन न होने के कारण एक अन्य समस्या देखी गयी कि प्राकृतिक जल स्रोतों में धारा की गति काफी व्रीव होती हैं, जिससे कि धारा को यदि सही दिशा में समायोजित नही किया गया तो धारा से खेतों में जल भराव व पहाड़ी की मिट्टी भी कटने लगती हैं, जिससे कि धीरे – धीरे मिट्टी की पकड़ कमजोर होने लगती है, तथा भूस्खलन का खतरा बढ़ जाता है।

अतः पहाड़ों में भूस्खलन तथा जल समस्या से बचना हैं तो हमें बरसात के समय जल का उचित प्रबन्धन करना होगा। इसी बात को ध्यान में रखकर बच्चों को साथ लेकर प्राकृतिक जल स्रोतों के संरक्षण एवं प्रबन्धन के लिए हमने ग्रामीणों को भी जागरूक करने का प्रयास किया, जिसमें काफी हद तक सफलता मिल रही है।

USE OF SOME IMPORTANT MEDICINAL PLANTS IN HIMACHAL PRADESH: A REVIEW

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Medicinal plants are traditionally used to prevent diseases, maintain health, and to cure ailments. Plants with compounds such as triterpenoids, flavonoids, hentriacontane, 16-hentriacontanone, adiantone, isoadiantone, ß- sitosterol, fernene, 2-methoxy-5, 40-dimethylbenzenebutanal, methyl octadecanoate acid, kaempferol, quercetin, 3,4',7-trihydroxyl-3', 5-dimethoxyflavone, catechin, epicatechin, afzelechin, epiafzelechin, mesquitol, ophioglonin, aromadendrin, phenol, dichloromethane, phytol, coumarins, glycosides etc. have been reported to possess strong biological activities which are now gaining much importance. In this review, most important medicinal plants like *Datura innoxia, Jasminum miltiflorum, Adiantum incum, Acacia catechu, Azadirachta indica, Emblica officinalis, Ranunculus arvensis, and Salvia plebeian* are discussed regarding their bioactive molecules and uses in traditional medicine in Himachal Pradesh. Himachal Pradesh (Land of God) emerging as a hub of medicinal plants, 160 species of medicinal plants is grown in this zone. In the hilly areas of Indian Himalaya, the inhabitants largely depend on plants for curing various diseases. The indigenous knowledge and traditional practices of medicinal plants are vanishing fast. The present ethnobotanical review revealed that the local people of Himachal Pradesh, particularly those living in remote and high altitude areas largely depend upon the local plant resources to meet their daily requirements. All the medicinal plants also play a great role in earning their livelihood and for primary health care. These plants play important role in the lifestyle of the local civil populace and have always been revered. A new arena of research may open on the specific plants for its specific curable properties in Himachal Pradesh.

BIOREMEDIATION AND MANAGEMENT OF E- WATSE

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Robust increase in a number of electrical and electronic products worldwide has increased the e-waste discharge. Literature survey revealed that volume of e-waste is expanding every year and 2 million metric ton is contributed by India. In 2018, it was predicted to reach the volume of 49.8 million metric ton globally. E-waste is mixture of hazardous organic and inorganic substances, not only harmful to environment but also causes loss of resources. Apart from hazardous materials, it also encompasses valuable metals that are present in large amount than ores. Thus, e-waste processing can be profitable if metals are extracted. Two approaches, Pyrometallurgy and hydrometallurgy, are conventionally used for processing the generated e-waste. Production of toxic by-products and high cost of processing is the barrier to limit the processes. However, researchers are continously exploring for more ecological and economical methods. Bioleaching has emerged as one eco-friendly method of Biohydrometallurgy, found to be plausible for mobilization of metals from e-waste. Cynogenic bacteria and chemolithotrophic bacteria are the bacterial agents used for the bioleaching process. Cynogenic bacteria such as *Chromobacterium violaceum*, *Bacillus megaterium* and Pseudomonas sp. have been reported to extract the metals by releasing the cyanide. Whereas, chemolithotrophic bacteria such as *Acidothiobacllus ferrooxidans*, *Leptospirillum ferrooxidans* releases the Fe3+ during the oxidation phase, which serves as an oxidizing agent that aids in the reduction of metals from e-waste. Thus, these positive attributes providing both economical and ecological benefits, have drawn the interest of various scientific hub for the e-waste treatment.

TEMPORAL CHANGES IN TREE SPECIES COMPOSITION IN KULLU FOREST DIVISION OF HIMACHAL PRADESH

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The data of Kullu forest division was collected from forest working plans and compartment history files. The results revealed change in tree species composition in the form of density and in relative per cent change in the species from initial (1949) and final (1994) year of assessment and also include the community wise change in species composition along the elevational gradient. For analysis of tree species, compositional data approach is also being followed. A total of eight forest communities were delineated in this division at different elevations (ranged between 1500 to 3000m).The total tree density of Cedrusdeodara increased from year 1949 to 1994 like *Pinus wallichiana, Abies pindrow* and *Picea smithiana* community. The total tree density of *Quercussemecarpifolia,* Broad leaved and *Cedrusdeodara-Picea smithiana* community is increased unlike *Picea smithiana* which decreased from year 1949 to 1994.At elevation 1500-2000 m, density showed the maximum value *(Pinuswallichiana)* for the year 1994-95 as compared to year 1949-50.The total density of all the species, also showed the increased values from year 1949-50 to 1994-95. Similarly, at 2000-2500 m elevation, *Picea smithiana* was showing the maximum value for species density for the year 1949-50 which showed a declined value with time (1994-95).While at 2500-3000 m elevation, it was observed that *Picea smithiana* was showing the maximum value for species density for the year 1994-95 and a declined value for the year 1949-50.While the total density showed the increase in values with time for the year 1949-50 to the year 1994-1995.

CHANGES IN TREE SPECIES COMPOSITION ALONG DIFFERENT ELEVATIONS OF SERAJ FOREST DIVISION OF KULLU DISTRICT (HIMACHAL PRADESH)-A FOREST BASED STUDY

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The present study was conducted in Seraj forest division of Kullu district of Himachal Pradesh having three forest ranges i.e. Banjar, Sainj and Tirthan. The total assessed area under these three forest ranges is 2979.04 ha. Three elevations zones viz.,1500-2000m, 2000-2500m and 2500-3000m amsl were selected based on availability of data. Each elevations zone is categorized species wise and the total numbersis calculated for two years (1986 and 2013) of enumeration. Tree density and relative percent change fortree species was calculated to observe the change. Results revealed that the lowest elevation zone(1500-2000 m),the density of *Pinus wallichiana, Cedrus deodara and Quercus leucotrichophora* is decreased while the other species showed a negligible change. In elevation zoneof *2000-2500* m, all species showed a declinein tree density except *Taxus baccata* which increased from 10 to 12 Ind/ha. At highest elevation zone (2500-3000 m) the species viz.,*Cedrus deodara*, *Pinus wallichiana* and *Picea smithiana* showed increased density while *Abies pindrow, Quercus semecarpifolia* and *Taxus baccata* a slight decrease was observed. It was also observed that total tree density was more in higher elevation range than the lower range. The study will definitely help in clear understanding the temporal variation in trees and mitigating the loss of tree species in their natural growing areas.

ASSESSMENT OF FLORISTIC DIVERSITY IN THE ALPINE PASTURE OF PRASHAR , DISTRICT MANDI, HIMACHAL PRADESH

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Assessment of floristic diversity provide basis for devising suitable strategies for conservation of the plant resources. Accordingly, a study was conducted to understand the floristic diversity of alpine pasture of Prashar, District Mandi, Himachal Pradesh during the year 2017 .The location of the pasture lies at 31044'57.7"N latitude,77006'55.1" E longitude and 2550-2750 m elevation. A total of 72 plant species belonging to 27 families and 58 genera were recorded from the study area. Dominant families were Lamiaceae, Rosaceae, Asteraceae, Poaceae and Polygonaceae. On the basis of IVI, *Rumex nepalensis* recorded the highest value (16.81) followed by *Poa alpina* (12.57) and *Impatiens glandulifera* (11.95). The lowest value for IVI was observed by *Mazus surculosus* (1.15). The ratio of A/F indicates the distribution pattern of all the species was contiguous. Out of 36 medicinal plant species recorded from the pasture, two species viz; *Roscoea alpina* and *Selinum vaginatum* fall in the category of threatened plants. The distribution pattern of most of plant species was contiguous. The better conservation of natural resources can be done through promotion of community based conservation, ex-situ conservation through tissue culture, developing cultivation technologies and nurseries of medicinal plants etc.

A REVIEW OF ECOLOGICAL FLOW METHODS: METHODOLOGIES AND APPLICATION IN THE LARJI HYDROPOWER PROJECT

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Ecological flows are the water that is left in a river eco-system or discharged into it for a particular reason for managing the state of that ecosystem. Inability to maintain such flows may prompt decline in the health of ecosystem which depends upon the water. Minimum flow is a general phenomenon used to depict a flow required to maintain the health of the river ecosystem. Hydro power is the most economic and nonpolluting sources of energy among all other forms of energy. Larji Hydro-power has a installation capacity of 126 MW. It is situated on Beas River in Kullu area of Himachal Pradesh and claimed by HPSEB. The catchment area of the Hydropower project is spread over an area of 4921 sq.km. The Larji dam site is situated at an elevation of 2299 m MSL. The undertaking was finished in September 2007. To address the issues related to producing hydropower, water is drafted from the dam at a colossal rate, doing such prompts the over exploitation of the water in the dam failing to maintain the 15% minimum ecological flow in the dam to maintain the ecosystem in run. Diverse methodologies have been received to evaluate the environmental flow. A present review has recognized excess of more than 200 environmental flow methods accessible around the world. Display research work endeavors to review different ecological flow assessment methods to find a reasonable method for the Larji Hydropower Dam. The methods for e-flows assessment can be grouped in four classes based on the input data requirements: Hydrological methods, Hydraulics methods, Habitat simulation methods and Holistic methods. A critical review of the methods will be done according to their preferences, impediments and likewise the relevance of the method is finished by reviewing numerous past works completed in international, national and local level. This provides a review of appropriateness methods in the chose ponder area for future work.

EVALUATION OF EXISTING AMBIENT AIR QUALITY STATUS IN SHIMLA CITY

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Industrialization and urbanization has led to increased degradation in environmental quality including a severe rise in air pollution in major cities in India. This is primarily because due to increase in vehicular and industrial sources of pollution. In this context, the reported literature primarily entails the effects of air pollution on human health for Tier-I and metropolitan cities in India but very limited literature exists assessing ambient air quality conditions in Tier-II or other such cities. The present study aims to analyze the existing ambient air quality of Shimla, a tier –II city in state of Himachal Pradesh, India for the year 2017. In particular, both short term and long term trends of pollutants (NOx, SO_2, and RSPM) generated from vehicular pollution are analyzed. Short term effects include study of increase of air pollutant concentrations during Diwali season analyzed over a period of 1, 3, 5 and a week before and after the festival. Long term effects were analyzed considering the ambient average concentrations of the pollutants for the entire year.

ENGINEERING SCIENCES, IT & COMPUTER SCIENCE & INNOVATIONS 06

PROPAGATION THROUGH STEM CUTTINGS IN TOMATO: A NEW INNOVATIVE TECHNIQUE TO DOUBLE FARMERS' INCOME

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Tomato is one of the most popular vegetables cultivated round the year in one or another part of the country from temperate to tropical region. Protected cultivation technology holds special significance for hilly areas of Himachal Pradesh where arable land is scanty and there is a great variation in agro- climatic conditions. Every year, the area under protected cultivation is increasing and farmers are facing problem of quality planting material. Moreover, there are a few identified hybrids or varieties which perform well under protected environment thereby, limiting the choice of the growers to grow the varieties or hybrids available in the market. The exploitation of stem cuttings is a new concept and not common in India but is being practiced in countries like Japan to clone a perfect replica of the original plant. Rooting hormones are being used in commercial horticulture to improve plant growth and yield. In this technology, from a single plant, number of rooted cuttings can be produced and hence will reduce the cost incurred on the purchase of hybrid seed. It is easy to raise a healthy nursery of true to type plants and will save the crucial time of the farmers, thus will increase their profit margins. An experiment was copnducted during 2016-17 in a Randomized Block Design with three replications and data were recorded on root, horticultural and quality parameters in tomato. The results obtained showed that vegetative propagation of tomato plant through stem cuttings has proved to be an efficient method for cheaper multiplication and cultivation of tomato plants throughout the year. The present study revealed that IBA and cow urine significantly enhanced rooting of tomato stem cuttings. Treatment RH1C3G2 (RH1 = IBA, C3 = 150 ppm and G2 = Soil) was found to be best as it recorded maximum number of roots per cutting (27.67), root length (8.57cm) and plant height (240cm). Treatment CUC2G2 (CU = Cow urine, C2 = 10% and G2 = Soil) was observed to be best for days to first flowering (28.67), days to first harvest (69.33), number of marketable fruits per plant (38.67), marketable fruit yield per plant (2.15 kg) and average fruit weight (55.60g). RH2C1G1 (RH2 = NAA, C1 = 250 ppm and G1 = Soilless) recorded highest ascorbic acid content (20.75mg/100g) in tomato fruits. Data indicated that there was no significant effect of different treatments on survival percentage of the stem cuttings, harvest duration (days), fruit firmness (kg/cm^2), pericarp thickness (mm) and TSS (^{o}Brix).

IMPACT OF CRUMB RUBBER ON VARIOUS PARAMETERS OF CONCRETE

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In this present study, crumb rubber is investigated as a fine aggregate for concrete. The work was performed in order to find an application of waste tires in the field of construction giving an alternate of their disposal and providing pollution free environment. On the other hand it also saves the natural resources like sand. Therefore, in this paper focus is made on the work done on the nominal mix design of 1:1.5:3 as per Indian standard code 10262-2009. The main mechanical properties of concrete that is compressive strength along with the slump value are studied after adding 3 different proportions 1%, 3% and 5% of crumb rubber in the conventional concrete. As per the results of the test conducted it is observed that decrease in the compressive strength was seen when the proportion of crumb rubber is increased similarly with the increment in the percentage of crumb rubber the slump value is also decreased as comparative to the conventional concrete.

ORAL- 03

BRIEF NOTE ON BOLMORAM TECHNOLOGY RESOURCE CENTRE CUM KNOWLEDGE & INNOVATION PARK

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The Bolmoram Technology Resource Centre cum Knowledge & Innovation Park is spread over 7 hectares of land given to SCSTE, Meghalaya by the Headman of Bolmoram, East Garo Hills District. Typical visitors to the park include students, farmers, government officials, development practitioners, researchers, and entrepreneurs. The technologies, approaches, and practices showcased in the park can be described as climate friendly, 'green', or low carbon. Technologies propagated by SCSTE as developed by NIF, CIMAP, CBRI, IISC is being show cased in the centre. The Technologies imparted include 1) Housing and Sanitation by used of Stabilized Mud Block and Thatch roof. 2) Water conservation and usage by use of Terafil, Iron Removal Plant and Pedal Pump. 3) Bamboo Technology in making Bamboo trusses, furniture. 4) Livelihood by means of Livestock with the used of Low Cost Hatchery, then Low Cost food processing. 5) Experiential Learning for Children. The program had been initiated by Science Technology and Environment (SCSTE) Meghalaya SCSTE and Consortium of Resource Person (CoRP) a registered Society as partner. This program is being carried out at Bolmoram Village which is under the jurisdiction of the Songsak C&RD Block East Garo Hills, Meghalaya. Which is 15 Km away from the Block Office.

ORAL- 04

IoT BASED SECURE SMART SWITCHBOARDS

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Smart Switch-Boards provide us the capability of controlling every appliance from smart phones or PCs over the internet, beside this it keeps record of every second consumption of every appliance. It has a unique notification and mail service that reports the user if any appliance is taking more electricity or electricity limit is crossed (where limit can be user defined). The app shows the real time electricity consumption. The app shows tips to save electricity and shows in which part of house more electricity is utilized. At the end of the day it shows the daily bill and predicts the total bill so that user can manage his/her expenses accordingly. The switchboards are designed in such a way that if internet in not working, the switch boards can be used as normal switchboards. The app is designed in a user-friendly manner. The user can set limit of usage to each appliance, a notification is sent if limit exceeds. The timing control turns the appliance ON/OFF at a particular timing that is very useful in offices/industries in non-working hours. if any appliance like refrigerator or other dies and started consuming more electricity and user doesn't know from where electricity is wasted and user continue to use the malfunctioned appliances until it consumes huge electricity. So, it is important for the users to know where and how he/she is using electricity.

LANDSLIDE VULNERABILITY MAPPING USING FUZZY LOGIC METHOD – A CASE STUDY ON RAMPUR TEHSIL, HIMACHAL PRADESH

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Landslide is the most common type of natural hazard found in Himachal Pradesh, causing immense risk to life and properties. In India, about 0.42 million sq.kms of the area excluding snow covered areas is prone to landslide hazards. Out of this 0.14 million sq.kms of area falls under North Western Himalayas (Uttarakhand, Himachal Pradesh and Jammu & Kashmir). The present research paper is an attempt to assess the vulnerability of Rampur Tehsil to Landslides. Causative factors such as Land use Land cover, Slope, Geology, Soil and Geomorphology have been used to assess the landslide vulnerability. Survey of India Toposheets, Geological Survey of India Maps, ASTER GDEM and LANDSAT 8 OLI/TIRS sensors are used as data sources. Fuzzy logic method has been used to categorize the Vulnerability Zones of the study area. The causative factors were analyzed and processed in GIS environment. The weight ages were assigned based on Fuzzy logic rule of for Macro Scale Landslide Mapping. These values were then integrated using Fuzzy gamma operator or Fuzzy Algebraic Sum to produce landslide vulnerability zones. The final output was categorized into five types ranging from based on the values. From the results it can be interpreted that most of the study area comes under very high vulnerability class. The fuzzy values for each class vary from (0.6 to 0.8) for high vulnerability and (0.81 to 0.96) for very high vulnerability class. About 57% of the area comes under very high vulnerability class and rest 47% accounts for high vulnerability class. The results show that the proposed model of landslide hazard susceptibility can help to produce more objective and accurate landslide susceptibility maps, which not only take advantage of the information from the original data, but also reflect an expert's knowledge and the opinions of decision-makers.

SOLUTION BLOWING: A NOVEL TECHNIQUE TO EXTRUDE POLYMER FIBERS

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Solution blowing is an industrially scalable approach for mass scale fabrication of polymer fibers with diameters ~0.1-1 m. The process is kindred to melt blowing where a polymer solution is extruded from a coaxial die using high speed air jet to form polymer nano fibers. The best part of this method is its scalability which is at par with melt blowing and ability to fabricate fibers from biopolymers like electro spinning which is not possible using the earlier method. Commercial thermoplastic polymers like polyethylene terephthalate (PET), polystyrene (PS), Nylon-6,polyvinylidene fluoride (PVDF), biocompatible polymers like polyvinylpyrrolidone (PVP) , Polyvinyl alcohol (PVA), polyethylene oxide (PEO), and biopolymers like chitosan, cellulose, lignin etc. are some examples of common polymers which can be extruded into fibers using this method. So far this method hasn't been in practice in India and this is the first time it is introduced here. In this work PVA/Chitosan blended nanofibers were extruded from their polymer solutions fixed at 80/20 ratio in 2% acetic acid with varying overall concentration from 6 to 12 Wt. %. The collected nanofibers were then characterized by SEM, FTIR, and DSC-TGA and later were heat treated at 120oC to allow thermal cross linking and to crystallize the PVA nanofibers. The mechanical strength of the as-blown and treated nanofibers was tested using uniaxial tensile testing machine. Results demonstrate that nanofibers were uniform and appropriately cross linked and FTIR confirmed that there were strong intermolecular hydrogen bonds between the molecules of Chitosan and PVA. These nanofibers have wide range of applications, mainly for tissue engineering, filtration, Biosensors, Solar cells and wound healing.

ORAL- 07

EMPOWERMENT OF RURAL WOMEN TO PARTICIPATE IN TRANSFER OF TECHNOLOGY THROUGH INSTITUTIONAL-VILLAGE LINKAGE PROGRAM

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Major proportion of population in India lives in rural areas and women constitute about 50% of the total population. The main occupation of the people in rural areas is agriculture along with animal husbandry, horticulture etc., as the allied occupations. In rural economy, women play an important role in all these activities. In mountain farming system, male members of the family either migrates from the village to town or outside the home as labourers in different developmental projects to earn some extra income to the family. In their absence, it is the woman who looks after the household work, animal rearing and carry out different agricultural operations. Although women make a significant contribution to our economy, yet their participation is not properly recognized. Less involvement of women in decision making, low female literacy rate, lack of awareness regarding technical knowledge and latest technologies, low status in the agrarian society etc. are some of the basic factors for their remaining in the background, exposure to the improved technology relating to agriculture, horticulture etc. Keeping in view the pivotal role played by the women in the mountain specific agrarian-social system, the farm woman are required to be brought to the main stream of development activities by motivating them to participate effectively in the institutional location specific training programs, demonstrations, on-farm trails and other advisory clinical services etc. offered by the university and development institutions from time to time. A special emphasis should be given the conduct the educational tours of the women to various agricultural institutions and universities to widen their outlook and vision for the adoption of new technologies.

ORAL- 08

MAGNETICALLY REUSABLE Fe3O4@ZnO CORE/SHELL NANOPARTICLES

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During photocatalytic water treatment the homogeneous suspensions of photocatalytic nano particles makes it difficult to collect and recycle them. Magnetic carriers provide a very efficient and convenient method for separating and recycling catalysts by using external magnetic fields. Most magnetic photocatalysts have two functional parts at least: a magnetic component (γ-Fe_2O_3 or Fe_3O_4) with the separation function via an external magnetic field; the second part is the photocatalytic component with a photocatalytic function, such as S_nO_2, Z_nO_2 or T_iO_2 nanoparticles1. Deposition of noble metals can also enhance photocatalytic activity of magnetically reusable photocatalyst but expensive cost of noble metals restricted their application in industry. synthesis of Fe_3O_4@ZnO core/shell MNPs is considered as an economic method. Synthesis of Fe_3O_4@ZnO core/shell MNPs is considered as an economic method in order to decrease the running cost. The magnetic core enhancing the separation properties of suspended particles from solution and the photocatalytic properties of the outer shell zinc oxide are used to destroy organic contaminants in waste waters2-3. This heterogeneous catalyst has been proved to be efficient in both separation and recycle. The combination with the magnetic particles may decrease the surface area of the photocatalyst which gives rise to less sufficient organic molecules adsorption and lowered catalytic activity4. Therefore, the rational design of a robust, high performance and recoverable photocatalyst remains a big challenge.

FEM FORMULATION OF FATIGUE LIFE ESTIMATION OF BIG TURBO-GENERATOR SHAFT DURING ELECTRICAL FAULTS USING RAIN FLOW COUNTING ALGORITHM.

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In this paper finite element formulation to estimate the fatigue life of big turbo-generator shaft is presented. The torque generated by the synchronous generator under loaded condition is analyzed for various types of electrical faults. The dq0 approach is used to model synchronous generator connected to an infinite bus. The torque outcome of loaded synchronous generator under various electrical faults is numerically simulated using MATLAB. The Adams fourth order predictor-corrector method with starter as fourth order Runge-Kutta method is used to simulate the torque developed by synchronous generator connected to infinite load. The turbo-generator shaft is modeled using finite element formulation using different elements i.e. solid cylindrical element, hollow cylindrical element and tapered element. The coupled dynamic MDOF equation is solved using Duhamel integral to estimate the torque variation in shaft. The number of stress cycles is calculated using Rain Flow Counting method using stress at critical nodes of turbo-generator shaft. The Miner's Rule is used to calculate the fatigue life for different electrical faults i.e. single phase to ground fault, line to line fault, three phase fault and phase may-synchronization fault.

NAVIGATION AND CONTROL OF MULTIPLE UAV'S FOR AUTONOMOUS FLIGHT IN UNKNOWN ENVIRONMENTS

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The quadrotor, a kind of unmanned aerial vehicle (UAV) has the characteristics of vertical take-off and landing, hovering, high manoeuvr ability and agility. These characteristics of quadrotor are suitable for application like surveillance, rescue mission, traffic monitoring, precision farming and mapping etc. Multiple UAVs cooperating with each other are used to cover large application area. The objective of this paper is to explore new control strategies that will afford swarms of unmanned aerial vehicles the capability to operate and navigate in an unknown environment i.e. where GPS signals are unavailable or unreliable. The performance of autonomous flight control system of quadrotor is highly dependent upon the flight controller. One of the most time-consuming tasks in implementing autonomous flight control systems is related to the tuning of the flight control algorithm parameters. Therefore, development of high performance controller for quadrotor is an interesting research field. Although, there are enormous control techniques to tackle the challenges in the design of flight controller but research is still going on to develop more efficient control techniques so as to improve the performance of the system in more challenging situations. While many of the advance control techniques are highly dependent on the accurate mathematical model of the process (e.g. model predictive control, back stepping and sliding mode control, optimal control), there is a need for the development of intelligent control methods to address the limitations of model-based control techniques. The performance of the model-based control system can even deteriorate in the presence of large uncertainties and disturbances such as unknown environment, system failure. Addressing these issues, computational intelligent control is one of the self-organized methods to allow multiple UAVs to navigate autonomously in an unknown environment more precisely. The model and control of UAV have been simulated in MATLAB and comparative study has been done with respect to recent research papers. The obtained simulation results shown satisfactory performance.

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CFD Analysis of Solar Parabolic Trough Collector

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Electricity consumption in the industries has been increasing at a tremendous rate year after year. This electricity mainly obtained by the coal-thermal plant, nuclear power plant etc. and all these plants use the Non-Renewable Energy Resources to meet this tremendous energy demand. Major portion of this electricity is used in industries for the heating purposes. For heating purposes, temperature varies from 50 to 200°C and depends upon the industry to industry. Solar Concentrating power has enough potential to meet this temperature requirement. Utilization of concentrating solar power (CSP) technologies are increasing day by day in industries owing to its great potential to harness solar energy. Parabolic trough collector (PTC) is one of the best, economical and proven technology among the Concentrating Solar Power (CSP) Technologies and easily obtain the temperature up to 250 °C. As variations in the zenith angle of the sun throughout the day, leads to variations in the heat flux at the surface of the absorber tube. This Non-uniformity of heat flux leads to the variation in the temperature profile on the surface of the absorber tube. These variations are obtained by Monte Carlo Ray Tracing Method (MCRT Method) and FLUENT Software package. Three-dimensional study of heat transfer characteristics on the surface of the receiver tube of solar parabolic trough collector simulated by combining the Monte Carlo Ray Tracing (MCRT) method and FLUENT software has been performed. Andthis study helps us to find out the temperature range in different atmospheric conditions. Three different models (i.e., no radiational model, unabridged model, and no wall model) are modeled in FLUENT to provide a further explanation of heat transfer mechanism from the receiver tube. Solar flux distribution on the absorber surface is obtained by using the MCRT method under different conditions. Temperature distribution on the surface of absorber tube is almost symmetrical to the variation of heat flux. Heat extraction from the receiver tube is highly dependent on the properties of heat transfer fluid, and it increases with an increase in solar irradiance.

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IMPROVEMENT IN THERMAL EFFICIENCY AND EMISSION CONTROL OF DOMESTIC COOK STOVES

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Biomass holds substantial importance to meet day to day energy demands of people in the developing countries. According to global health observatory data from WHO, around three billion people worldwide rely on biomass namely wood, crop residues, dung cakes, etc. to meet their energy requirements. Utilization of biomass as an energy resource takes place through open fires and conventional cook stoves. These cook stoves quite often are inefficient due to the improper design and lead to the emission of harmful pollutants like CO, NOx, unburnt hydrocarbons, PM, SO_2, etc. Females and kids who are engaged to the hearth for longer durations are subjected to their detrimental effects. According to WHO, every year around 4 million people globally die prematurely due to the disorders caused by indoor air pollution. In India, 1.3 million deaths are reported every year due to the indoor air pollution which happens to be more than the emissions from any thermal power plant or any other industrial source. According to UBA report for some villages in Mandi district, use of wood among LPG, kerosene and others to cook food varies from 93.6 to 99.6% and number of smokeless cook stoves users in these villages is less than even 1%. As a solution to the problem, a low-cost smokeless cook stove has been developed with proper primary and secondary air supplies. The near-complete combustion in this cook stove helps to achieve maximum efficiency and better emission control. A standard test facility as per BIS has been set up to test its performance and CFD simulations have been used to optimize the design. Results have shown impressive combustion characteristics including thermal efficiency when compared to the existing cook stoves. This enhances the viability to commercialize this product to combat the problem of indoor air pollution in rural areas.

A FRAME WORK TO DESIGN THE SMART CITY INFRASTRUCTURE FOR CRITICAL SMART SERVICES IN HIMACHAL PRADESH

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In the past decade, due to urbanizationand liberalization, the Indian urban cities attract more and more people from different part of the country. But issues like overpopulation, infrastructure, pollution, traffic jams, health care facilities, education, employment etc. become severe for the administration. All these issues are related to the quality of life.Therefore, an innovative initiative has been taken by the Government of India (GoI)that is development of smart cities as a technological innovationadd on the existing infrastructure. The concept of smart city is able to unleash true potential and uplift the quality of life. The smart cities involve digital information infrastructure, public-private investments and partnership, urban planning etc.This paper introduces asmart cityframework for the hilly state like Himachal Pradesh. Consideration of the life-critical scenarios is an important aspect of this framework.

In particular case of smart cities of Himachal Pradesh needs specific attention because it is situated in the range of Himalayas having earthquake zone IV and cause many natural disasters such as floods, cloud burst etc. The development of these cities is sometime difficult to manage to provide the connectivity and availability of critical smart services over the computer communication network (CCN) such as E-healthcare, E-shopping, E-business etc. In this paper, authors have tried to propose a proactive framework for connectivity and availability of critical smart service. Furthermore, authors have also incorporated the reactive approach to maintain the connectivity and availability of the critical smart services due to the natural disasters.

CLASSIFICATION AND DETECTION OF MOUTH ULCERS USING MOBILE CAMERA

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Oral cancer is one of the most predominant cancers in the developing countries. Among all the cancers, it owes 11.28% to men and 4.3% to women in India. According to a survey, 82% patients survive whose cancer is diagnosed in early stage. While only 27% patients survive with cancer diagnoses in advanced stages. According to government of Himachal Pradesh, new cases of oral cancer registered during financial year 2011-12 were 179. With the advancement of science and technology, various tools have been developed which enables professionals to diagnose and evaluate oral cancer before performing any biopsy. There are various modalities that can be used for diagnosing and evaluating oral cancer like optical coherence tomography that can easily distinguish normal and cancerous tissues efficiently, CT fluoroscopy-guided biopsy where contrast stretching technique is used, THz imaging technique where THz reflection imaging technique is used at room and frozen temperatures, and cone beam computed tomography that has poor assessment but is more accurate than MRI. A self assessment tool to diagnose ulcer in initial stages by taking pictures with the help of mobile phone is proposed. Image captured is enhanced and abnormal patch from the image is segmented using image segmentation method. Texture features extracted from the segmented patch is then given as input to the trained classifier for predicting the class of patch as normal or abnormal.

LOSSLESS COMPRESSION OF MEDICAL IMAGES FOR TELEMEDICINE APPLICATION

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Tele medicine characterized by communication of medical information between users is one of the promising applications in medicine field as bandwidth requirement for the transmission of high resolution medical images over the internet is very large. In today's world of information exchange, biomedical imaging of human body has grown very fast and hence plays an essential role in diagnosis. The use of radiological modalities such as CT scanners, MRI, X-Ray etc. are increasing massively. Likewise, in the field of ophthalmic image processing, retinal image screening has developed as an efficient method for the treatment of eye related disorders like glaucoma and diabetic retinopathy. Ophthalmic image processing acts as the first clinical support for detection of serious hidden health issues like diabetes. Medical images comprising of radiological or ophthalmic modalities are of high resolution consuming large storage space. The demand for handling images in digital form has increased dramatically in recent years for efficient archiving and transmission. Medical image compression has become an important aspect as it helps in effective utilization of bandwidth when transmitting through high speed network resources. Lossy compression techniques are highly efficient in terms of compression but at the cost of degraded quality of recovered image making them unsuitable for compression of quality critical medical images. Predictive coding techniques have high coding efficiency and low complexity among various techniques of lossless compression of medical images. This work comprises of evaluation of predictive coding techniques and a novel lossless predictive coding techniques proposed to perform compression. Comparative analysis of these encoders is also done in terms of compression ratio and elapsed time for medical images of different resolution and modalities.

ANALYSIS OF BUTLER MATRIX WITH ARBITRARY GAINS AND PHASE SHIFTS

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In this paper, a new 4 × 4 Butler matrix with arbitrary gains and flexible phases is presented. To realize the arbitrary gains as well as flexible phase differences at the output ports of 4 × 4 Butler matrix, branch line coupler is modified. The flexible progressive phase shift and arbitrary gains is obtained at the output ports of Butler matrix by controlling the gain and phase difference of the branch line coupler. When the proposed Butler matrix is integrated with the antenna array then the antenna elements are excited with the arbitrary amplitudes and flexible phases. It is shown in the numerical simulation results that the amplitude tapering and variable phases enables to control the parameters of radiation pattern. The parameters are beam steering angle, HPBW, FNBW and SLL.

LOW-COST LANDSLIDE MONITORING AND WARNING SYSTEM FOR SENSING LANDSLIDES

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Landslides cause major disruption to life and infrastructure in the Himalayas, particularly in several areas of the Himachal Pradesh state. Due to the damages caused by landslides at several locations, there is an urgent need to develop landslide monitoring and warning technology, which could be deployed at several locations in the Himachal state. However, the currently available technologies for monitoring landslides are extremely costly. Thus, there is also a need to reduce the cost of sensing landslides. To address these problems, IIT Mandi has recently developed a low-cost landslide monitoring and warning system (LMS). This LMS system is capable of sensing soil and weather properties at deployment locations and generate a warning about soil movements both locally (via hooters and blinkers on the road) and globally (via SMSes). In co-operation with Mandi district, the LMS system has already been deployed at 10-landslide-prone locations in Mandi district. In this talk, we will be discussing the capabilities of the LMS and its different features (including minimal energy requirements). Also, we will be showcasing results from using the LMS, where certain artificial intelligence and machine learning algorithms are able to make hour-scale predictions of soil movements using the data collected from the LMS. The developed LMS holds a great promise for monitoring landslide activity at several places in Himachal state, India, and other countries.

WASTE TO WORTH – CONVERSION OF INDUSTRY SLUDGE CONTAINING CALCIUM CARBONATE TO BRICKS

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Environmental degradation, high energy consumption and financial constraints has forced various organizations in India and abroad to recommend various qualitative guidelines for generation, treatment, handling, transport, disposal and recycling of non-hazardous and hazardous wastes. On the other side due to exponential growth of population in recent years, there is great demand for construction and thus increasing pressure for use of natural resources causing their acute shortage. There is environmental problem due excessive use of topsoil in brick manufacturing. Natural materials being exhaustible in nature, its quantity is declining gradually. Also, cost of extracting good quality of natural material is increasing. Concerned about this, the scientists are looking for alternative materials for construction, and industrial waste product is one such category. If these materials can be suitably utilized in construction, the pollution and disposal problems can be partly reduced. Our industry sector is presently facing the problems of solid waste management for its safe disposal. The very feature of industry waste that it contains CaCo3 in abundance; attracts the attentions of Civil Engineers. The present study intends for utilizing waste from industry containing CaCo3as alternative to virgin materials and building products.

ORAL- 19

ROLE OF ADDITIVE MANUFACTURING DURING WALKING IMPROVEMENT OF FOOT DEFORMITIES PATIENTS

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Lower leg foot or thoses are orthotic gadgets that assist the decrease leg joint and are appropriate for some pathologies, generally those that improve the foot drop circumstance, that is on account of a lower leg joint insufficiency. In the prevailing paintings, a custom designed version of lower leg foot or thosis applied as a part of the human frame has been created. Additive manufacturing systems has been utilized to create the decrease leg foot orthos is (Selective Laser Sintering Technology). Kinematic estimations were obtained in a stride lab from foot drop sufferers, with and without 3-D plastic printed decrease leg foot or thoses on unmarried feet. The outcomes were given demonstrated that with the or thoses, the lower leg joint behavior is type of a right away torsional spring, without a hysteresis. With an goal to test the sufficiency of the AFO, Clinical GAIT Analysis of Foot Drop Patients has been completed. Customized 3-d published Ankle Foot orthos is has been mounted to provide better GAIT cycle execution. The effects of this observe indicated that improvement of gait in foot drop sufferers with three-d published ankle foot orthosis this is measured through Clinical Gait assessment.

ORAL- 20

ECG SIGNAL PROCESSING TECHNIQUE FOR HEART RATE VARIABILITY

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In recent years, sudden heart attack has emerged as one of the leading causes of death, so, early detection of heart-related disturbances is very crucial. Clinicians practices Electrocardiogram (ECG) to monitor the Heart Rate Variability (HRV). ECG is the graphical demonstration of the physiological and electrical activity of myocytes that comprises of P wave, QRS complex and T wave. Among them, QRS complex is of greater importance as it is used to compute the key feature of HRV i.e. Heart Rate (HR) of a person. ECG signal processing comprises of four phases: pre-processing, feature extraction, feature selection and classification. ECG pre-processing is necessary due to the presence of high and low-frequencynoises i.e. Power Line Interference (PLI) and Baseline Wander (BLW) respectively. These unwanted signals lead to the false detection of QRS complex. Elimination of PLI and BLW from the ECG is done using various types of digital filter designs (FIR and IIR) are used. FIR digital filter is chosen due to its low computation complexity and hardware implementable nature. Time and frequency domain features are extracted and spearman's correlation is used for feature selection. Various statistical tests such as t- test or Analysis of Variance (ANOVA) is used for the comparison of different type of heart diseases based on HRV using SPSS tool.

STATUS OF COMMUNITY RESILIENCE IN DISASTER PRONE DISTRICTS OF HIMACHAL PRADESH, INDIA

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Increasing community resilience is an effective way to increase the effectiveness of disaster management and vulnerability reduction. The resilience to hazards and disasters depends upon the community level, since all communities are different in terms of their hazard risk, institutional capacity, social and political makeup, economic condition and financial capacity. Community resilienceis the key to disaster management at the local levels. The objective of the paperis to assess the community resilience of the districts of Himachal Pradesh, India. A sampleof 399 households within the state of Himachal Pradesh is selected using stratified sampling with proportional allocation method. The community resilience has been measured in form of questionnaire indicating social resilience, Economic resilience, institutional resilience, Physical resilience, and Human resilience and also the awareness and perception about the building codes. The resilience of the District where urban population is more in comparison to the rural population is observed to be better. On the basis of the results, recommendations for enhancing the community resilience of the districts prone to disasters with lower resilience are proposed.

FUNCTIONALIZATION OF PECTIN IN DENDRIMER STRUCTURE VIA INNOVATIVE METHOD FOR WATER APPLICATION

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The contamination of drinking water particularly in rural areas through geogenic contaminants is a serious global health concern. Therefore, it is necessary to develop a new economical alternative to more expensive treatments which is capable for the removal of ions from aqueous system. Herein, we synthesized a new pectin-based-oximein dendrimer structure via grafting reaction with acrylonitrile functionality. The beads were synthesized via ionic gelation reaction. The synthesized dendrimer with protrudedarms with oxime groups on its surface was characterized by various techniques such as FTIR, NMR and SEM-EDX. The synthesized oxime-based dendrimer was evaluated for the removal of ions (fluoride, iron etc.)from aqueous system. The results supported the successful synthesis of dendrimer and also confirmed the exceptional capability for ion sorption. In conclusion, the protocol utilized for synthesis is simple, green and less energy intensive. Furthermore, the resultant product is an economical alternative; hence, its potential can be constructively explored for industrial applications.

ORAL - 23

NETWORKED CONTROL SYSTEM: AN INNOVATION TO ENHANCE THE QUALITY OF AGRICULTURE IN THE STATE OF HIMACHAL PRADESH

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In the recent years, technologies have grown up to Control over Network (CON)to avail different resources across the boundaries. Networked Control System (NCS) have become backbone to Control over Network and Control of Network. Being a next step of innovation to the Internet of Things (IoT), the Networked Control System as a black box is used to reconfigure devices from single point as well as multipoint users, where different services, instructions and manipulation are performed by the command user on individual and multiple devices. The true representation is available to the central controller and real time feedback is continuously accessed by the central controller through the sensors over the network. In this paper the aim is to implement the application of NCS to improve the quality agricultural production in the state of Himachal Pradesh. As it is well known that the state of Himachal Pradesh is a giant producer of apple crop which is even exported to different parts of the country as well as the world. To improve the quality of the fruit and to maintain its nutritional value, it is important to monitor the characteristics of the trees on the real time basis and the individual producer get its information continuously from the sensors being used for monitoring purposes. The use of Networked Control System can be advanced to other areas also so as to increase the overall agricultural productivity of the state which will improve the farming techniques and in-turn will improve the life standard of the farmers of the state.

ORAL - 24

A STUDY ON WIRELESS SENSOR NETWORKS FOR FOREST FIRE DETECTION

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The merging of economical sensing, computational and wireless technique has produced a new making of smart devices. Utilizing few numbers of sensors to thousand of sensors in self organizing network has generated a modern technique introduced as Wireless Sensor Networks. This article gives an overview of emerging Wireless Sensor Network technique and its applications specifically for Forest Fire Detection along with its future scope. WSN has wide range of future scope like if we take a simple example of weather monitoring. The system predicts weather well before it actually starts raining and displays the message on roads or other systems and also for roadside assistance, people receive information from road authority about the state of road including traffic jams and accidents. The car also transmits the information to the road authority about speed, distance travelled, etc. Wireless Sensor Networks are widely applicable and it is emerging technology. However its application limit depends upon the type of sensor used and the interpretation of data obtained but with the advancement in the technologies WSN are becoming smaller and faster which in terms increasing their potential for various residential, commercial and industrial environments.

MINIMIZING THE DISCONNECTION PROBABILITIES IN OPTICAL BACKBONE NETWORK

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Optical networks suffer from different types of failures in case of disasters. In optical communication network the failure of a network caused by disasters (e.g. predictable disaster, unpredictable disaster, Intentional attacks) leads to the failure of several optical communication channels and results in huge data loss. In the proposed paper, we propose an algorithm to make our network survivable to ensure connectivity in the events of failures caused by these disasters. The predictions of tornados, hurricane, flood and landslides (e.g. kotRoopi in Sep, 2017) or forest fire in the state of Himachal Pradesh have become more accurate by using some early warning systems.
A small interruption could result in huge data loss. Many problems have been associated with disaster management schemes proposed in the past as increase in cost of recovery of fibres. A long recovery time is another issue. Also large number of network packets could be lost during the recovery processes. To address these problems, we aim to design a low risk failure optical mesh network for India by the relocation of the nodes. For this we consider the seismic hazard map of India. New links are added to the network and their corresponding geographical routes keeping the cost constraint under consideration to minimize the disconnection probabilities.
We use integer linear programming (ILP) to investigate risk aware provisioning scheme in the case of disaster. Results show that the proposed scheme minimizes the loss from the disaster and reduces risk of disconnection in optical communication network.

STUDY ON WIRELESS SENSOR NETWORKS & ITS APPLICATIONS

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In modern era wireless sensor networks widely used in many applications like military, agriculture, habitat monitoring, educations, health care, and industrial applications and much more. The prime objective of this paper to identifying the number of applications related to wireless sensor networks. After reviewing some papers identified the strength and weakness of the applications for the wireless sensor networks. IoT totally depends on wireless sensors. Backscatter device able to transfer the information without the need for the traditional transceiver. But the limitation of backscatter devices is it can transfer only one bit per symbol period [1].Wireless sensor networks widely used in many applications network layouts like mesh, ad hoc, hierarchical layouts etc. some issues may arise like an energy hole in the network due to node placement. Their work based on monitoring the platform oil and gas pipelines with the help of wireless sensors [2]. Wireless sensor networks build the bridge between the real world and the virtual environment. There are some issues like the hotspot problem, coverage problem, and load balancing etc. these issues degrade the network performance. Above issues may be overcome by using soft computing in wireless sensor networks [3].Wireless sensor networks also used in healthcare in many diseases. Sensors are used in both ways in the body means sensor may be deployed inside the body and as well as outside the body [4].Several points are isolated from sensing like fault acceptance, sensing reliability, adaptability etc. multi-functionality makes less expensive of sensor nodes in terms of low power and small in size [5].

ORAL - 27

EMPOWERING "PERSONS WITH DISABILITIES (PWDs)" IN RURAL AREA THROUGH EFFECTIVE INNOVATIONS IN NEED-BASED TECHNOLOGY IN THE AREA OF ASSISTIVE DEVICES/AIDS AND APPLIANCES

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In 2001 Census, PWDs were counted for the first time. As per 2011 Census, India has 2.2% of total population asPWDs. Now with the Rights of Persons with Disabilities (RPD) Act 2016, the umbrella of disabilities is expanded to 21 types comparative to earlier seven. PWDs inhabiting in 70% of rural Indiahave basic challenges and issues of poor awareness, education, employment, accessibility, advocacy and inclusion in spite of best advances in the area of modern science and technology advancement and Constitutional provisions. Potential of innovation through principles and application of technology is huge for effective inclusion of PWDs in the mainstream as productive citizens in a dignified manner beyond a mere issue of charity and welfare. CORD is working in with 1850 persons with disabilities in 100 Panchayats (covering 300 villages) through its Community Based Inclusion and Rehabilitation program (CBIR) in District Kangra, H.P. CORD has designed, developed adaptive and assistive devices for rural persons with diverse disabilities. These include Cerebral Palsy Chair, Corner Chair, adaptive toilet design and assistive devices. CORD has provided over 500devices/aids for the PWDs. An impact study conducted found that the need and adoption rate of these cost-effective devices is very high. Devices areenabling PWDs perform quality work and life functions inclusively. Larger replication and scaling are possible with some modifications, financial and technical supports of governments, institutions like IITs, NITs and related agencies including their enhanced and therapeutic use as per the need and context of PWDs across rural India.

ORAL- 28

IMPLEMENTATION OF SOCIAL NETWORKS AS A TOOL OF RURAL UPLIFTMENT

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This paper is an effort to elevate and uplift that stratum of the population which falls at the base of the economic pyramid. Rural economy is the most important pillar on which the growth of our country depends. The key to empowerment of rural India is information dissemination and knowledge creation. This paper emphasizes the way in which social media plays a crucial role in creating awareness in any sector which concerns the rural population. The most crucial and contributing input of social network analysis is that provides real time information from the masses. It enables a two way process in which relevant information from the people can be extracted and knowledge of any specific are can also be imparted. There are numerous domains about which the rural population can be educated spanning from best practices in agriculture, empowerment of women, education of children, financial schemes, epidemic prediction to disaster management and many more. Network analysis enables to coordinate, assemble and analyze the data efficiently. It provides in sights which are instrumental in recognition of the bottlenecks and gaps which hinder growth. The availability of a transparent medium penetrating to the grass root level helps in attacking vices of the society like corruption dowry etc.

Mapping the rural community to a network considering the populace as nodes can help us identify the source and sink nodes. Identification of cohesion and closeness centrality of the social networks provides crucial information about the community. The network metrics like between centrality and eigen value centrality help in identifying the critical points of information dispersal and flow among the people.

UTILIZATION OF WASTED TILES AND MARBLE POWDER IN THE CONSTRUCTION OF VILLAGE ROADS: A REVIEW STUDY

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Fast and improper development in rural areas is remarkably expanding because of the factors to fulfill human needs. Without realizing, this process involves the mitigation of energy balance of the Earth. Therefore, improper development or development without planning will create many problems which is going to effect the health, quality and comfort of surrounding communities. The everyday intimation of such environmental issues is the Heat Island event. Building structures and pavements in rural areas are made up of low reflective power materials which ultimately can captivate great amount of heat from solar radiations and then deliver it back to the surroundings at nighttime. There are many studies that have been carried out to look for a new technology that can help in lessening the heat island effect.Reduction in heat island effect can be attained by (1) increasing permeability to actuate cooling effect through evaporation; (2) reducing uproar by composite structure; (3) increasing the surface reflectance of pavement to reduce heat tapping and accumulation.Due to the effect of heat island in addition to the global climatic change increases the urban temperature and hence increases the temperature of heat waves. Thus the building materials plays very important role in balancing and maintaining the urban environment.

SENSING PERFORMANCE OF COGNITIVE RADIO AT LOW SNR UNDER FADING CHANNELS

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In the next generation of communication systems, we required new frequency band for providing different services to mobile users such as internet on things, machine to machine (M2M) communication etc, hence facing the problem of spectrum scarcity. According to the FEDERAL COMMUNICATION COMMITTEE report, the allotted spectrum has not been properly utilized. To identify and for efficient utilization of the unused/underutilized frequency spectrum, cognitive radio has been described as one of the suitable solution. Cognitive radio is a device which allows cognitive users (unlicensed users) to access the unused frequency channel without affecting the communication of primary user (licensed users) and maintain the quality of services. In this article, we have considered the energy detector approach for spectrum sensing in cognitive radio and have analyzed the practical communication scenario. Since the sensing performance of cognitive radio is affected under fading channel due to multipath and shadowing effect, therefore the closed-form expressions for different sensing parameters at low SNR region for nonfading (AWGN) and various fading channel scenario (Rayleigh, Rician, lognormal, Nakagammi) are computed mathematically and simulated results are obtained through MATLAB. Further, we formulated the optimized value of the threshold by differentiating the error probability with respect to threshold to minimize the sensing error. In addition to this we compare the sensing performance of cognitive radio under different fading channels.

POSTER - 03

SMART AND PRECISION FARMING USING INTERNET OF THINGS

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The technological advancements and latest development in the field of agriculture help to increase the crop growth and productivity. The global population has been increasing continuously and to feed such a large population, the farming community must embrace Internet of Things (IoT). IoT has been emerged out as a smart, low cost, easy to implement, and efficient solution to increased crop production and farmer income. This is accomplished by collecting real-time monitoring and status of crops, information collection and analysis, designing an efficient irrigation management, and simultaneously exchanging the real-time information with the farmers. Such that the farmers can check on the requirements of the crops and precisely predict their behavior and growth, thus result in smart and precision farming. Smart and precision farming are gaining popularity and creating potential for small as well as large farmers with increased competitiveness and sustainability in their productions. This will provide a solution against the challenges, for instance, rising climate change and extreme weather conditions. This promises24/7 monitoring of farms for changing in climate condition, soil condition, irrigation requirement, and crop health. In this proposed work, we will design an IoT- based smart farming system which will uninterruptedly monitor the crop status by virtue of sensors such as light, ultrasonic, humidity, soil, moisture, and temperature. This system will adopt drip irrigation technique for an efficient water management while aiming at minimizing the power consumption using solar renewable energy. The soil sensors will check the pH value of soil and if it is more acidic then can alert the farmers to balance/reconcile the issue by adding organic matters like compost. Thus, the smart and precision farming system will result inefficient water management, low power consumption, and better crop productivity.

POSTER - 04

SMART DOMESTIC REFUSE MANAGEMENT IN VILLAGES USING IoT

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Smart villages are required more than smart cities as approximate 70% of the Indian population lives in villages. There isa lack of health care facilities, insufficient transportation, poor road connectivity, and many more problems in villages. The vision of Internet of Things (IoT) incorporates everyday objects, which extends the internet into the real world. The IoT concept is being used, which mainly deals with sensing, driving, data assembling, storing and proceeding by interconnecting physical and virtual devices over the network. The IoT allows objects to be sensed or controlled remotely over the wireless network which creates opportunities for villagers. Basically, it aims to bring smartness in any village through its various applications viz. smart garbage management, intensity-based street light monitoring, solar energy monitoring system, smart healthcare monitoring, smart irrigation and farming, and water monitoring and control system. In this research work, we are proposing IoT based garbage management system for remote villages. Due to the rapid increase in the population, the domestic refuse is also rising in rural areas and waste management has become a universal concern. IoT Based waste management system using smart dustbin is the pre-eminent solution to reduce domestic waste. Basically, the system consists of a centralized IoT module interfaced with various sensors for making the village cleaner and smarter. The ultrasonic sensors will be used to sense the level of garbage in the storage bin, whereas to sense the fire, flame/smoke sensor will bed eployed. We will also make use of the moisture sensor to separate out the wet and dry garbage. So that the separated dry garbage can be recycled and thus help us to reduce the consumption of fresh raw materials.

BENEFITS OF DIGITAL RESOURCE CENTER AT REMOTE LOCATIONS OF DISTRICT SIRMAUR: FACTS AND FIGURES

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Digital resource center are the centers where all the digital services are provided under one platform. Digital resource centers are established at very remote areas of Sirmaur district where internet and computers facilities are not available or very limited, due to its geographical nature, companies are not interested to setup any facilities at very remote areas. People are not highly educated. Cloud computing is an innovation that can be utilized as a part of a remote regions to decrease the gigantic diverse between the urban areas and rural. In this paper we are discussing the digital resource centers using cloud computing, which are established at very remote sites, it will work with Eternal university different department/ expertise. The model joints farmer's student's school teachers, and ladies with the experts available at the university. The problem will be solved by generating the request token, in which issues can be shared by the sms, images telephonic and audio clip. Door step solution is provided using Web based portal designed in the form of application in Android or through digital resource center established in village clusters. The various services are available at these centers like printing, internet surfing m-governance online services and computer training etc. The result is very encouraging and beneficiaries are increasing day by day and society is coming up to use technology to find quick solutions.

ANALYSIS OF THE FREQUENCY SELECTIVE SURFACES FOR PRACTICAL APPLICATIONS

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In this article, the brief discussion of the frequency selective surface (FSS) and its applications are discussed. FSS is well known for its electromagnetic shielding effect andit is useful in the application such as microwave ovens, useful element in the RADAR and satellite systems etc. FSS when used as a superstrate or substrate helps in the enhancement of the gain of the given antenna system. Therefore, the idea is to implement FSS based antenna system which can improve the gain and efficiency of the antenna. Here rather than taking the conventional micro strip patch antenna, the dielectric resonator antenna is considered due to the low losses associated with it. The proposed Ku communication band antenna is integrated with FSS, where FSS acts as a superstrate.

POSTER - 07

ONEDOC: A MEDICAL FRAMEWORK

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One doc is a progressive web application platform which implements a framework to bring the field of healthcare & wellness online. Core features include instant chat with medical support staff (including video support), centralized medical history management & availability, online booking of appointments, with specialists across hospitals & clinics, medical prescription management & enforcement and multi platform support. It is an attempt to bring the entire medical system of the country together for the common cause of healthcare for the poor and the rich alike. India lacks a centralized medical framework which could be implemented uniformly across all healthcare providers, this leads to decrease in efficiency, usage of more resources than required and an increase in the time taken to process medical records & tend to patients.

The interface to the setup primarily consists of a patient front end, a medical professional front end and a prescriptions front end. When a medical professional logs in, the session is added to a pool of available medical professionals, which is used to connect patients to medical professionals based on availability. Medical professionals can study patient history and records both on and off platform. They can administer prescriptions to them. These prescriptions are validated at the prescriptions end and dealt accordingly.

POSTER - 08

RURAL ROAD CONSTRUCTION BY USING WASTE MATERIAL IN FLEXIBLE PAVEMENT

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In the present scenario road plays an important role by connecting different cities, rural areas to the main national highways or state highways. However, the construction cost of road is quite high. It is the need of the situation to propose an alternative material as the replacement of conventional ones in order to reduce the total cost without compromising with its actual specifications. India has the second largest road network after China while secured the 12thplace in producing of the waste also. Therefore, utilization of the waste materials in the construction of flexible pavement that will prove as a cost-effective method as well as eco-friendly. Various studies were conducted across the world by focusing on the utilization of different waste materials like plastic waste (i.e. polythene, plastic bottles, plastic bags, wrappers), waste tire rubber, granite sludge etc. Based on the findings of these studies it was concluded that these waste materials could be used in the flexible pavements. According to previous studies, it was examined that the utilization of waste material up to 30% has been done without compromising its properties and utilization of waste material in rural areas for development of connectivity of roads is good option and by using waste materials overall construction cost could reduce and rural areas can develop in better way.

RURAL ELECTRIFICATION USING SOLAR POWER

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Rural development is the process of improving the quality of life and economic well being of people living in rural areas often relative isolated areas. Rural development basically centered on exploitation of land intensive natural resources such as agriculture and forestay. Rural development actions are intended to further the social and economic development of rural communities. Rural electrification was not considered as a basic human need like water and food in the past. A number of recent studies provide insight into how rural electrification helps in the betterment of rural society in various ways. Around 25,000 villages are located in remote and inaccessible areas and hence could not be electrified through conventional grid extension in India. The Ministry of New and Renewable Energy (MNRE) is implementing the 'Remote Village Electrification Programme' (RVEP) to electrify such remote villages by installing solar photovoltaic (PV) home lighting systems in all the states. An evaluation study was carried out by National Council of Applied Economic Research (NCAER) in six states, viz. Assam, Meghalaya, Jharkhand, Odisha, Madhya Pradesh, and Chhattisgarh. The functionality of the system varies across the states and across the seasons. During rainy season on an average one luminaire works 2 to 3 hours. During winter and summer on an average one luminaire works 4 to 5 hours. However, performance declines over the years. Use of kerosene is reducing in rural areas. Nearly 53 to 69 per cent reported that there is significant improvement in their children's education, and 37 to 78 per cent reported that there is improvement in the standard of living after the installation of solar lighting. Beneficiaries now spend more time on income generating activities. Crime rate has also declined due to availability of solar street lights in the village.

STUNLOCK

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Stun lock is two-wheeler anti-theft locking device which can be attached separately or be permanently integrated onto the vehicle. When a thief attempts to break the handle lock, a harmless dense fog is released into the vicinity of the vehicle which deters the intruders, the fog will keep emanating from the vehicle for a defined period of time(thereby alerting the nearby and distant people). We have attached a gas sensor that will sense the gas and trigger an in-built alarm in the Stun lock. We are also devising a key locking mechanism that will not allow any key to enter the locking device until and unless it gets a wireless signal from the vehicle's key to open the cover on the key area, the pressure sensors attached on the key area will be able to detect any forceful intentions of breaking the key slot cover and the wherein attached GSM module alerts the user via a text message, simultaneously sending the exact coordinates of the vehicle.

POSTER - 11

INTELLIGENT SHOES FOR THE BLIND

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The increasing number of visually impaired people requires the development of assistive devices around the world. The problem can be solved by using a device that would serve as a smart guide to them. This device for visually impaired people would help them to travel and be self dependent. This is to ensure that impaired humans with disabilities have the tools necessary to fully access and participate in the curriculum, with the greatest level of independence. The proposed system can detect pits in the ground as well as the obstacle present in the path of visually impaired is informed through vibrator or a buzzer carefully placed inside the sole of the shoe. The device has ultrasonic sensors at the front(facing forward) and at the sole of the shoe(facing downwards) that will detect obstacles and elevations/sink in the ground respectively. The piezo - electric battery charging system will make sure that the whole system never runs out of charge as long as the subject is on the move.

POSTER - 12

SCOPE OF TECHNOLOGICAL ADVANCEMENTS IN THE INDIAN EDUCATIONAL SYSTEM

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Modern age is the age of technology and its omni present in every scope of daily life, education is the basis of human civilization and the scope of integrating it with technology is huge, concepts like cloud computing, efficient DBMS, smart classes have brought revolutionary changes in the way things work . The induction of campus managers (cloud-based student performance database) has brought in immense relief to parents in monitoring the performance of their wards, it could also be used by universities to keep track of the performance of students which would also bring transparency in maintaining the student records by the college administration. Every student could be provided an account in a possible application/website initiated by the government to bring all students and staff involved in specific fields under one roof, and based of their performance and collaborated work on some possible projects we might be able to reach out to students in the most remote and far flung areas of the country (which are connected with internet) , it would open up doors for opportunities to those students and staff members like never before and bring both rural and urban students/staff at par, a fair and competent education system would result in a robust growth in any country's economy for decades to come. It would be really beneficial to the country's technology sector, if it's extended to the staff working in various universities, the collaborated work of professors and research assistants of various far flung universities and would greatly contribute to India's not up to the mark Research & Development sector.

BIOGAS GENERATION FROM CO- DIGESTION OF LIGNOCELLULOSIC AND KITCHEN WASTE

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Generation of municipal solid waste (MSW) increased drastically in the last few decades. This has become a nuisance across all the states including Himachal Pradesh. MSW consists of 40-45% biodegradable fraction which can be harnessed as feedstock in anaerobic digestion (AD). Biogas yielded from anaerobic digestion predominantly consists of methane (50-60%), a source of energy having applications in cooking and heating.The anaerobic digestion reduces the quantum of MSW and minimizesthe amount of leachate produced from it which further contaminants the soil and groundwater. This paper primarily focuses on utilization and optimization of process of co digestion of lignocellulosic biomass and kitchen waste in a single stage reactor in Himachal Pradesh.The modeling analysis of data has been done with the help of statistical tools.

POSTER - 13

WAY TO PLC BASED AUTOMATION; ECONOMIC ASPECTS ON PLANT REFORMATION AND MARKET ANALYSIS (CASE STUDY: BANGLADESH)

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This study may represent the economical view to transform or set the company automated and also clarify the different stages where the cost-cutting can be settled up. This study also goes through the scopes and limitations for supplier and manufacturer companies of automation components in developing countries like Bangladesh. From these tasks the recent market of PLC proving companies as well as the manufacturer will be revealed in very shorted way. It can be considered as a supervision for the PLC manufacturer or the components distributer and also who wants to set or reform the industry into PLC controlled.As the total survey and experiment organizes the scopes, existing market condition, engineering behave, task management, engineers demand, so this may have effect not only in engineering aspects but also may reveal the business scopes.

POSTER - 14

POSTER - 15

ENERGY HARVESTING MODULE FOR UTILIZING HOUSEHOLD WASTE HEAT

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Harvesting energy stands alone as one of the most promising techniques for approaching the global energy problem due to population growth, industrialization, and depletion of natural resources and environmental concerns.

In recent years, there has been a lot of active research on energy recovery from waste heat obtained from various sources. A remarkable potential for harvesting the energy lies in the heat obtained from households wasted during daily chores for providing a minimum amount of energy required for medical electronic devices, lighting and other basic needs. Waste heat obtained from household chulhas has been utilized to generate energy with the help of thermoelectric energy system, coupled with suitable heat sink, interfaced with DC-DC converter, and booster circuits. A thermoelectric generator integrated biomass cook stove, helps in generating energy that can be utilized for electricity generation. By design modification of various key parameters &component values, the performance of energy harvesting system has been enhanced. The theoretical results showed good agreement with the simulation results obtained using LTSPICE. By using DC-DC converter, and booster circuits along with chulhas we are able to generate 5V that is sufficient enough to charge a battery.

POSTER - 16

CORRECTIONS INVOLVED IN CHANGE DETECTION ANALYSIS USING REMOTELY SENSED DATA

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Exposure of Lan surface is very important to monitor and forecast regional climatic change, avalanche analysis and climate study that arises due to air temperature. Remote sensing allows such research activities to be carried out using change detection analysis. Researches in the past has shown that different change detection methods have been designed and summarized using different satellite sensors. Among the different change detection algorithms, Change Vector Analysis (CVA) has realistic choice of extracting tremendous information in terms of overall change in magnitude and direction. This paper summarizes the essential preprocessing (geometric, atmospheric, radiometric and topographic corrections) techniques needed for rugged terrain to correct the estimated spectral reflectance value. It is expected that this study on topographically corrected CVA gives an effective guidance to algorithm designers for modifying and developing CVA based change detection algorithms that resourcefully use the diverse and complex remotely sensed data for recognition of flat as well as undulating surface variations.

EFFECT OF NANO SILICA AND NANO ALUMINA IN PACKING DENSITY MODEL

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The main purpose of this study is improving the strength, rehology and packing density of cement past by adding nano silica and nano alumina. The nano silica and nano alumina is superfine filler materials. The superfine nano elements is higher fineness then OPC. To optimize the particle packing density of concrete, the particles should be selected to fill up the voids between large particles with smaller particles and in order to obtain a dense and stiff particle structure. The effect of superfine elements on packing of cement is directly measure by wet pecking method and the water film thickness of cement paste. Packing density of cementitious materials which determine the amount of voids filled with water. Higher the packing density would demand lass water to fill the void. The whole work is divide into three parts. In first part adding silica , second parts adding nano alumina and in third part adding combination of both materials. The co-relation curves are plotting for packing density results alone and also combining the results of packing density and IS code methods. The co-relation curves are plotting between compressive strength vs water cement ratio at 7 and 28 days curing age and compressive strength vs paste content at 7 and 28 days curing age.

AN IMPROVED RECEPTACLE AND PLUG ASSEMBLY

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A safe receptacle and plug assembly is disclosed. The assembly comprises a receptacle having a set of holes to accommodate a set of prongs of a plug, at least one shield operatively coupled with the receptacle, wherein the at least one shield is configured to move between a first position and a second position and at least one rotary device operatively coupled with the at least one shield, wherein the rotary device is adapted to rotate selectively in different directions such that rotation of the rotary device in a first direction enables the at least one shield to move from the first position to the second position, and wherein rotation of the rotary device in a second direction enables the least one shield to move from the second position to the first position. When the at least one shield is at the first position, the at least one shield restrict insertion of the set of prongs into the set of holes, and when the at least one shield is at the second position, the at least one shield allow insertion of the set of prongs of the plug to accommodate the set of prongs.

POSTER - 19

OVERVIEW OF HARWARE SECURITY: FAULTS, THREATS AND THEIR COUNTERMEASURES

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Hardware security is a young field, which challenges a hardware designer to build an efficient design. Hardware engineers needs to build a secure system and meets demands with stringent area, power and energy budget. There are various levels of embedded design ranging from lower hardware level to higher abstraction level. It is not possible to secure the design at every level. Therefore, there is another constraint for hardware designer that design should be resistant against all attacks. This paper gives an insight into the field of hardware security and various types of fault attacks. Countermeasure against various attacks is also discussed. This paper is a guide for selecting set of countermeasures, which will help a designer to build an embedded system by meeting the above-mentioned constraints.

POSTER - 20

COPPER METAL MATRIX COMPOSITES: A REVIEW

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In the last few decades, man have become more innovative in discovering new materials in order to make his life more enjoyable, comfortable. Copper metal matrix composite is the most promising material for many engineering applications where the higher temperature resistance and good micro structural stability is required. The development of Cu-MMC has based on the use of ceramics as reinforcements. Most commonly used reinforcements are Alumina, Silicon carbide, titanium carbide and graphite. The choice of reinforcement material is highly influenced by their mechanical properties such as wear resistance, hardness, cost advantage, availability in market and refractory nature. In the present time copper and its alloy are gaining popularity due to their high conductivity, high melting point and good corrosion resistance. However, the relatively low wear resistance and high temperature strength restrict the use of copper in many applications. Recent developments in metal matrix composites have provided new means to produce high wear resistance and high strength materials. It has been found that the wear resistance and strength of materials can be improved by adding hard ceramic particles such as Al_2O_3, SiC, TiC and Z_rO_2 into the metal matrix. The aim of present review is to summarizes the research work carried out in the field of copper metal matrix composites (Cu-MMCs).

RURAL UPLIFTMENT BY ADOPTION OF SCIENCE AND TECHNOLOGY: AN INDIAN CONTEXT

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The challenges of improvement in life standards of rural areas people are often faced by the developing countries. A large number of developing countries are agrarian economies which are characterized by low productivity functioning on small holdings with insufficient and poor infrastructure. Many suitable ways for the development are there and among them a potential key is the application of technology in rural areas which intends the transformation of rural areas towards progress and development for profitable and sustainable livelihood. The efficiency of production can be sufficiently increased by the adoption of technologies.. In addition of this productivity and the market phases of rural areas also get improved. The main concern should be to point out the obstacles in the path of technology adoption in rural areas. In the present paper the status and other relevant issues on technology adoption in rural sectors are discussed. There are many developing countries in the world who continuously struggle to transform its rural areas. Even if they have well-articulated policies of science and technology but instead of it much progress does not come into observation due to the slow development on social basis and economic basis. This review paper summarizes different characteristics of the application of technology in various rural areas.

IMPACT OF TO POGRAPHIC CORRECTIONS ON CHANGE DETECTION USING MODIS DATA

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The monitoring of Indian Himalayas is essential to avoid or forecast natural hazards. During past decades, different change detection algorithms have been designed to monitor or seasonal variations that occur at variable rates at different locations using remotely sensed data. Change detection technique must have to meets the certain requirements or perform correction (radiometric, geometric corrections) before its implementation. Moreover, when we are working on rugged terrain imagery, topographic correction also plays a significant role to remove the topographic effects that occur remotely sensed data. However, in practical, each topographic correction algorithms have their own qualities and no one is appropriate in all the areas. In present work, multi-temporal Moderate Resolution Imaging Spectroradio meter (MODIS) satellite dataset is used to study the impact of topographic correction over rugged terrain area. The results shown that in rugged terrain image, there is note worthy improvement is observed in topography on change detection analysis accuracy assessment. It is expected that current work on topographic correction and change detection analysis helps in accurate measurement of snow cover area over mountainous region satellite imagery.

POSTER - 23

TIME DELAY IN ROAD CONSTRUCTION PROJECT IN RURAL AREAS: A REVIEW STUDY

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Road construction delays are a challenge for rural areas, and specifically for hill road construction in Himachal Pradesh, where great economic costs result from difficulties in identifying and reducing the factors that cause delay. This study addresses the key delay factors faced by the road construction industry in Himachal Pradesh, and it proposes a management framework that has the potential to reduce this delay. The methodology used first critically reviewed relevant published studies, reports, policy documents and management steps used in different countries. Relative importance index has to be measured based on the individual responses towards delay factors in road construction projects, and then, the correlation between delay factors and the effects of delay will be evaluated. Moreover, the initial findings were analysed and the factors were combined into six groups. The finance competence factors group was found to be the main contributor towards delays in road construction projects in Himachal Pradesh. Some effective ways were proposed to overcome delays due to financing via use of strategic public and private partnerships for large-scale projects, introduction of bank financing schemes for medium-scale projects, and community-based partnership for small-scale projects. The study details the way a proposed management framework will work to design a construction project in an effective manner especially in Himachal Pradesh.

POSTER - 24

OPTIMIZATION OF REDUCED GRAPHENE OXIDE SYNTHESIS BY CHEMICAL EXFOLIATION ROUTE

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Reduced graphene oxide (rGO), a derivative of graphene has attracted much attention owing to its large specific surface area, high electrical & thermal properties, cost effective synthesis and mass production. In this work, rGOwas synthesized from graphite flakes by chemical exfoliation method. Three samples were prepared and named as rGO1, rGO2 and rGO3. The oxidative treatment of graphite flakes was done initially by adding H2SO4 to the graphite flakes with constant stirring for 5 minutes (in case of rGO1 & rGO3), and 30 minutes for rGO2. Subsequently KMnO4was added (under stirring condition) and the temperature was maintained at 15°C for rGO1 and 12°C for rGO2& rGO3. The KMnO4was added slowly to the mixture in order to control the exothermic reaction. Thereafter distilled water and H_2O_2were slowly added consecutively to the samples, and the solution temperature increased to 90oC due to exothermic nature of reactions. This graphene oxide (GO) colloidal solution was filtered, and further GO colloidal solution was made with dried residue and distilled water. For reduction (in case of rGO1), hydrazine hydrate was added to GO1 colloid. For rGO2 and rGO3, the GO colloids in distilled water was stirred at 35° C for 30 minutes, followed by the addition of hydrazine hydrate, and kept under stirring condition for 3 hrs. The UV-Vis absorption peak at 274 nm confirms the complete reduction of GO to rGO. Thus the results reveal that rGO2 have undergone relatively better reduction in comparison with rGO1 and rGO3.

CALCULATION OF MEAN COORDINATION NUMBER AND LONE PAIR OF ELECTRON OF QUATERNARY GE-TE-SE-GA CHALCOGENIDE GLASSES

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Gallium (Ga) based chalcogenide glasses show an adequate and unique properties for the up to electronic applications. With the addition of Ga different physical parameters of the quaternary Ge-Te-Se-Gaglassy system has been theoretically investigated. The impact of variation of Ga (replacing Selenium(Se)) on the system has been discussed in terms of a mean coordination number (Z), average counts of total constraints (Nc), number of floppy modes, number of lone pair (L) electron of the system. The value of Z and Nc has been determined according to the constraints theory. In the system under investigation Z value is increasing from 2.2 to 2.3 and Nc value from 2.5 to 2.75), but is still less than 3. Thus, the system behaves as it is in a floppy mode. Lone pair electrons are calculated using a mean coordination number (Z) and the number of valence electrons, and are found to decrease with an addition of Ga. The floppy modes has decreased with the increase of mean coordination number. This results that the system will posses more rigidity with the enhancement of Ga content. Calculated L value is greater than 3, it indicates that the investigated composition may be considered as good glass former.

ANALYZETHE IOT ENABLED FENCING SYSTEM FOR THE SMART SECURITY

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The electric fence dwells with the customary barbed wires insulated from ground which are empower from a controller device. The main concern with the electric fence system is to restraint the animals by whipping them to an energetic shock when they are in the connection with fence wire. The shock intensity must be controlled so that for both man and beast it would be innocuous. Behind this project the main idea is to present a new design method for a livestock electric fence energizer circuit. Energizer equipment is intricate with many parameters, such as safety standard, data performance and monitoring with the help of wireless sensor network (WSN) which results to virtual fencing. By the integration process of Internet of Things (IoT) million of devices systems and services would be interconnected. This process enabled the high capabilities for sensing. For the better detecting signal Iot enabled modules communicate through internet and receive better signal from nearby sensor. The sensor is also incorporated with GSM/GPRS module which enabled the remote control system for the electric fence to switch energizer on or off from anywhere when the fence is powered. Through this the fence is also able to trigger and send the SMS on the admin number to alert the admin. Electric fencing is an economically viable solution and has a potential of tremendously reducing cost of securing various premises and controlling animals on ranches, parks, agriculture lands and commercial areas. We have implemented the fencing system to control the monkey menaces in our campus. Testing is going on, however the results in term of controlling the monkey moment are acceptable within in the fence covered area.

POSTER - 27

EFFECT OF POST TREATMENT ON CHEMICALLY EXFOLIATED REDUCED GRAPHENE OXIDE WITH AMMONIA SOLUTION

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Nitrogen-doped graphene enhances the electronic, structural and chemical properties by tailoring its surface area and functional sites. Research is being carried out in the field of graphene oxide (GO) rather than graphene in its pure form as epoxy and hydroxyl groups increase the carrier mobility by destroying the π-electrons. In this study reduced graphene oxide (rGO) was prepared by chemical exfoliation method using graphite flakes as the starting material. For synthesis, a solution of graphite flakes and H2SO4was subjected to magnetic stirring maintaining a temperature of 5°C for 5 minutes. This was followed by the addition of KMnO4, by carefully maintaining the solution temperature at ~15°C as the reaction of KMnO4 with H2SO4 is exothermic in nature. The reaction mixture was allowed to oxidize under continuous stirring for 3 hours at 35°C. The colloidal GO obtained was mixed with distilled water and H2O2 and subsequently filtered. Thereafter reduction was carried out by filtration of obtained GO in the presence of hydrazine hydrate to get rGO. Powdered rGOwas obtained after drying it at 35°C. Ammonia solution (0.04%) in varying quantities (5 ml, 11 ml, and 13 ml) was mixed with 0.10 gm of rGO at 100°C for nitrogen doping. The 5 ml was insufficient as the solution evaporated completely. The remaining samples were analyzed with the help of UV-Vis spectroscopy. The shift (219 nm to 198 nm and 204 nm for 11 ml and 13 ml respectively) in the peak after doping confirms the synthesis of nitrogen doped rGO.

POSTER - 28

ABSTRACT OF PRESENTATION ON RURAL UPLIFTMENT THROUGH SCIENCE AND TECHNOLOGIES

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The imminent need of rural upliftment cannot be overemphasised. In fact it is long overdue. Science and technology would play a major role in the whole exercise. The need of the hour is to plan and schedule a structured approach so that important elements are not missed out. The laboratories and research bodies will do their part of innovation. Our country has a pool of eminent scientists and technocrats who are consistently working towards inventing relevant rural development specific technologies. The challenge would be the implementation and efficacy of implementation of these technologies with existing resources that the country has as mobilisation of additional resources is always tediuos. The presentation of PEC will touch upon Govt. of India's program and role of eminent institutions for enabling villages to imbibe technologies already developed and also under development. Hence the management of innovation and its implementation towards management of technology are of high importance. Ministry of Human Resources Development (MHRD), Government of India has launched the program of Unnat Bharat Abhiyan (UBA), a National Program with the vision to involve professional and other higher educational institution of the country in the development process of Gram Panchayats so as to enable village cluster to achieve sustainable development and better quality of life. Indian Institute of Technology, HauzK has, New Delhi 110016 has been designated to be the National Coordinating Institute (CI) by Ministry of Human Resources Development (MHRD) for UBA and represented by National Coordinator, UBA, at IITD. Punjab Engineering College (Deemed to be University) located at Chandigarh, UT, Chandigarh, India, represented through Dr. Sharda Kaushik, Nodal Officer , has been duly authorised in this regard to carry on the activities of UBA in our organization and PEC has agreed to participate in UBA as a Participating Institute (PI).The presentation will bring about salient features of the plan, role of educational institutes and way ahead.

FACE RECOGNITION ATTENDANCE SYSTEM

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Now a day's attendance marking involves manual attendance on a paper sheet but it is a very time-consuming process, and chances of proxy are also a problem that arises in such type of attendance marking. The automatic attendance system replaces the manual method, which takes much time and is difficult to maintain. There are many automation methods, from which face recognition is the best method. In this, attendance without human interference is discussed. In this project, the camera captures the images, it detects faces and creates the dataset of that images in grayscale. After that, the trainer trains the dataset, the recognizer recognize faces in real-time. After successful identification, it marks present in the attendance sheet. There are various methods for comparing the faces out of which two kinds of methods are currently popular in advanced face recognition; namely, Eigen face method and Fisher face method. This project is developed in python having LBP Eigen face algorithm which is one of the most thoroughly investigated approaches to face recognition. It is also known as KarhunenLoève expansion, Eigen picture, eigenvector, and principal component. Eigen facesis set of Eigenvectors which are used in computer vision problem of face recognition. The Eigen faces form a basis set of captured images used to construct the covariance matrix. Classification of faces can be achieved by comparing how faces are represented by the basis set. The eigenvectors represent different amounts of the variation, respectively, among the faces. It is easy to implement in rural areas as it is a low-cost project and doesn't require any technical knowledge to use.Automatic Attendance Management System has the following functions:Learning Phase: Detection and creation of dataset of captured images in grayscale.
Trainer: It trains the captured dataset of faces.
Recognizing Phase: Recognizes the faces in real-time and marks the attendance accordingly.

PRIVACY PRESERVATION WITH MACHINE LEARNING FOR HEALTHCARE APPLICATIONS

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The issue of data privacy is increasing with the increasing use of a powerful analytical tool as the data from these tools is generating more rapidly. This leads to the development of various privacy-preserving machine learning algorithms for healthcare applications. Machine learning is a particular type of artificial intelligence which teaches the machine to be smarter. Machine learning can make the biggest impact where there is a lot of data to look through. The objective of this work is to minimize the privacy loss and maximizing the utility. There are many schemes for the data preservation; among all comprehensive privacy is a better framework that employs preserving scheme for the protection of the data and also kernel-based machine learning for data predictors are studied in this manuscript. Using Machine Learning, one can provide doctors with much useful information which can help in patient care and determine many diseases at an initial stage. This early detection will, no doubt lead to early medication. Imagine how much more useful it would be if a doctor was shown patient's risk for stroke, coronary artery disease, and kidney failure based on the last 50 blood pressure readings, lab test results, race, gender, family history, socioeconomic status, and latest clinical trial data. The challenges for data privacy in the context of healthcare application are discussed.

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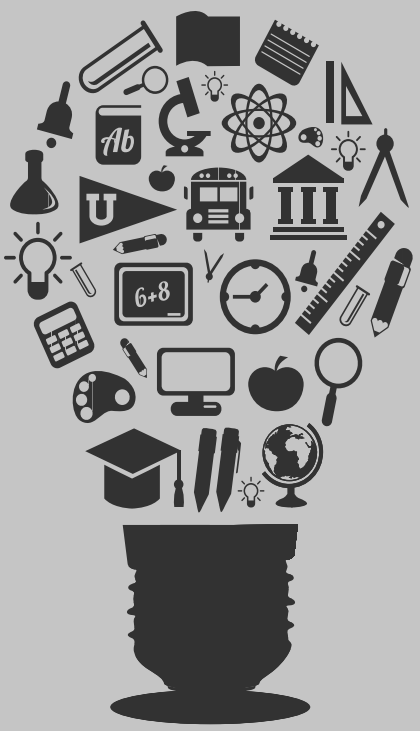

NANOPATTERNING OF BINARY MIXTURE BY ION BEAM- IV CHARACTERISTIC STUDY AND EFFECT OF SWINGING

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Nanoscale patterns can be generated using ion beam sputtering (IBS) technique in materials like semiconductors, metals, and insulators in a cost effective way. Most observed patterns are nanoripples and nanodots. These nanoripples have numerous defects which according to theoretical studies [1] can be minimized by considering binary materials [2, 3] in place of elemental ones. The topographical features also alter when ion irradiation is done under angular rocking conditions.

In the present study, we get highly ordered ripples over Co_xSi_{1-x} binary mixtures using low energy oblique incident Ar ion. These ripples were obtained even at low fluence. Threshold value of fluence to be considered here is in between 1.68-3.35x10^{18} ions/cm^2. The higher order rippled surface is less rough than the other fluences. Current-voltage (I-V) characteristic curve measurement shows diode type characteristics which can be used for electronic applications. In the second part, we report the formation of nano-cauliflower like structures for azimuthal-rocking of the binary mixture surfaces at oblique incidence IBS. Size of these structures steadily decreases for higher angle of rocking. Root mean square (rms) roughness increment shows an exponential growth behavior with increasing in the angle of rocking.

OPTIMIZATION OF POLYMER ELECTROLYTES WITH THE EFFECT OF CONCENTRATION OF ADDITIVES IN PEO-NH_4HF_2 BASED POLYMER ELECTROLYTES

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Nanocomposite polymer electrolytes were prepared by adding nano-sized fumed silica in different proportions upto 3 wt% to polyethylene oxide (PEO) based polymer electrolytes containing 10 wt% ammonium bifluoride (NH_4HF_2). Since the increase in conductivity depends upon the concentration and particle size of the nano filler, therefore in the present case, optimum ionic conductivity of 1.19x10^{-5} S/cm has been observed at room temperature for 3 wt% fumed silica addition in PEO-NH_4HF_2 polymer electrolytes after which the conductivity is observed to decrease. Further, addition of different concentrations of high dielectric constant propylene carbonate (PC) as a plasticizer in the optimized composition of PEO-NH_4HF_2-fumed silica nanocomposite polymer electrolytes has increased the number of free ions due to dissociation of salt/ion aggregates and hence the ionic conductivity and dielectric properties. Maximum conductivity value of 1.55×10^{-4} S/cm has been obtained at room temperature for PEO-10wt% NH_4HF_2-3wt% fumed silica polymer electrolytes containing 0.3 (ml) PC with low activation energy value of 0.35 eV. Temperature dependence of ionic conductivity of polymer electrolytes having different concentrations of PC has been studied and observed to obey Vogel-Tamann-Fulcher (VTF) behavior. The reduction in melting temperature, % crystallinity and % weight loss has been observed in nanocomposite polymer electrolytes containing different concentrations of PC as studied by DSC and TGA respectively. Although, mechanical property of polymer electrolytes deteriorates with the addition of plasticizer, yet special attention has been taken to optimize the concentration of PC to achieve maximum ionic conductivity values, free standing ability without any deterioration. The change in mechanical properties with PC concentrations (tensile strength and % elongation break) has also been studied by UTM.

PREDICTION OF SEXUAL ASSAULT CASES FROM SOCIO-ECONOMIC PARAMETERS FOR THE POPULATION OF HIMACHAL PRADESH

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A retrospective study of a total of 391 sexual assault cases received in the Regional Forensic Science Laboratory, Mandi for the five year period of 2011-15 for the five districts Mandi, Kullu, Hamirpur, Bilaspur and Lahaul Spiti was performed. The normalized cases (number of cases per lakh population per year) were compared with the social indicators for these districts according to the 2011 census data. The study revealed that the cases per year per lakh population depend on many factors like the population density, the distribution of the urban and rural population and literacy rates of the males and females. But the strongest correlation was observed with the Sex Ratio (number of females per thousand males) in each district. There was a high negative correlation of these case figures with the sex ratio of the districts. In Hamirpur district the average number of cases per year per lakh population is lowest as the sex ratio is highest at 1096. A statistical model based on these trends was successful in estimating the number of sexual assault cases in all the districts of Himachal Pradesh and compared well with the figures previously reported. This stresses that in a society in addition to other factors, when the females are more in number and educated, the incidences of sexual will see a decline – a firm scientific basis for the *Beti Bachao, Beti Padhao* movement. Guidelines regarding the reporting and investigation of sexual offences are also discussed.

EFFECTS OF PADDDY RESIDUE BURNING ON AEROSOL PROPERTIES OVER NORTHWESTERN PART OF INDIA

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ORAL- 04

Biomass burning is a common source of atmospheric pollution and poor air quality that has adverse impacts at local, regional, and global scales with short and long term climate implications and serious risk to human health. The present study examines the impact of paddy residue burning emissions on aerosol properties over Patiala (30.33°N, 76.40°E, 250 m a.s.l.), situated in the north-west part of India during the post-monsoon (Autumn; October–November, 2015). Every year, during autumn, extensive paddy residue burning takes place in the Indo-Gangetic Plains (IGP), mainly in the northwestern Indian states of Punjab, Haryana, and western Uttar Pradesh. The emissions from the burning locations travels hundreds of kilometers got Internal or external mix with other anthropogenic and natural aerosols results in solar dimming, atmospheric heating etc. Biomass burning injected enormous amount of black carbon (BC) aerosols which is one of the climate forcing agent after CO_2. During study period, the daily average BC mass concentration ranging between 3.0 to 13.0 μg m^{-3}. Aerosol optical depth (AOD) shows the high values (AOD_{500nm} > 0.6) and strong wavelength dependence with Ångström exponent ($\alpha_{380–870nm}$ > 1.0). This attributed to the presence of large amount of fine mode particles (BC aerosols) due to extensive biomass burning activities around the study region. SBDART model is used to compute aerosol radiative forcing (ARF). The strong and positive atmospheric forcing (+32.5 Wm^{-2}) due to agriculture waste burning indicate warming state of the atmosphere due to aerosols and has potential to perturb the regional climate.

INVESTIGATION ON STABLE LACTATION OF HOLSTEIN FRIESIAN CROSS BREED

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Milk yield data of 4 Holstein Friesian cross cows were taken from Dairy Farm of Department of Silviculture and Agroforestry, Dr. Y S Parmar University of Horticulture and Forestry Nauni- Solan, Himachal Pradesh from 1978-2014. Data were used on stability analysis of milk yield of Holstein Friesian cross cows to find out stable lactation. Wricke proposed 'Ecovalence' based on means. Study on Wricke ecovalence indicates a generalized estimate of study of performance based on means under more than two months. Ecovalence is generally expressed in percentage. As percentage of covalence (W_i) is inversely associated with lactation stability, a low percentage of W_i indicates high stability of performance. Therefore, lactation 7was found to be high stable lactation.

NITRO SUBSTITUTED HYDROXAMATE LIGANDS DERIVED OXIDOZIRCONIUM(IV) COMPLEXES AS PROSPECTIVE ANTIMICROBIAL AGENTS : SYNTHESIS AND SPECTROSCOPIC CHARACTERIZATION

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The coordination chemistry of zirconium has drawn much interest because of the biomedical applications of zirconium complexes with suitable bioligands especially in nuclear medicine. Hydroxamic acids are known to bind strongly to zirconium(IV) offering new perspectives for the safe and effective use of zirconium in nuclear imaging. Compared to well studied zirconium(IV) complexes reports on oxidozirconium (IV) complexes are rather scarce. Hence, new oxidozirconium (IV) complexes of composition $[ZrO(3\text{-}NO_2C_6H_4CONHO)_2]$ (I) and $[ZrO(3,5\text{-}(NO_2)_2C_6H_3(OH)CONHO)_2]$(II) have been synthesized by the reactions of $ZrOCl_2.8H_2O$ with nitro substituted hydroxamic ligands viz. potassium 3-nitrobenzohydroxamate and 3,5-dinitrosalicylhydroxamate in 1:2 molar ratio in MeOH + C_6H_6 solvent medium and characterized by physicochemical and spectroscopic techniques (IR, ^{1}H NMR and mass spectrometry). The bidentate nature of hydroxamate ligands involving bonding through carbonyl and hydroxamic oxygen atoms (O,O coordination) and five coordinate geometry around zirconium has tentatively been proposed from spectral studies. The electrochemical behavior of ligands as well as I and II studied by cyclic voltammetric technique has shown ligand-centered two irreversible reductions and one oxidative wave corresponding to R-NO/R-NHOH couple. The *in vitro* antibacterial activity assay against pathogenic gram -ve bacteria viz. *Salmonella typhi*, *Escherichia coli*; gram +ve *Bacillus cereus* and *Staphylococcus aureus* and fungi *Aspergillus niger* and *Alternaria alternate* by MIC method has shown enhanced antimicrobial potential compared to the respective standard Chloramphenicol and Nystatin drugs.

SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL EVOLUTION OF TITANIUM(IV) COMPLEXES OF HYDROXAMIC ACIDS

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ORAL- 07

The coordination chemistry of titanium(IV) with biological ligands has been the subject of considerable research interest owing to its biocompatible nature and affording complexes with interesting properties. The titanium(IV) hydroxamate complexes in particular have shown rich biological potential. Hence, new titanium(IV) complexes ofcomposition $[Cl_2Ti(C_6H_5CH_2CONHO)_2]$ (I) and $[Cl_2Ti(C_6H_5OCH_2CONHO)_2]$ (II) have been synthesized by the reactions of $TiCl_4$ with potassium phenylacetohydroxamate (PhAHK) and potassium phenoxyaceto hydroxamate (PhOAHK) respectively in 1:2 molar ratio in MeOH and characterized by physicochemical and spectroscopic techniques (IR, ^1H and ^{13}C NMR and mass spectrometry). A distorted-octahedral geometry around titanium has tentatively been proposed involving bonding through carbonyl and hydroxamic oxygen atoms (O, O coordination). The electrochemical behavior of ligands as well as I and II studied by cyclic voltammetric technique has shown ligand-centered quasi-reversible redox couple. Thermal behavior of complexes studied by thermogravimetric technique in N_2 atmosphere has shown these to undergo two step decomposition. The *in vitro* antibacterial and antifungal activity assay against pathogenic gram -ve bacteria viz. *Salmonella typhi*, *Escherichia coli*; gram +ve *Bacillus cereus* and *Staphylococcus aureus* and fungi *Aspergillus niger* and *Alternaria alternata* by MIC method has shown these to be promising antimicrobial agents relative to the respective standard Chloramphenicol and Nystatin drugs.

THE EFFECT OF CARBON NANOTUBES ADDITION ON THE THERMITE REACTION OF ALUMINUM BASED ENERGETIC NANOMATERIALS

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ORAL- 08

Energetic nanomaterials (or Nano thermites) consists of metal as fuel and metal oxide as an oxidizer, intimately mixed with each other at nanoscale. The Aluminum (Al) based iron oxide (Fe_2O_3) and copper oxide (CuO) nanothermites have been explored extensively for applications in nanoenergetic heat sources, microelectronics, propallents, pyrotechnics and explosives. The thermite reaction is diffusion controlled process and to improve the thermite reaction characteristics, there should be more intimate fuel to oxidant contacts. The addition of energetic additive as an additional fuel to nanothermites can improve the reaction characteristics of the nanothermites. CNTs due to high thermal conductivity, high aspect ratio and high energy release during oxidation at around 600 °C (thermite reaction temperature of Al based thermites) can tailor the reduction-oxidation in thermite reaction and eventually will enhance the reaction performance of nanothermites.

In the present study, the Al/CNT/metal oxide nanothermites have been synthesized by the physical mixing method with ultrasonication. The structure of the Al/CNT/metal oxide nanothermites is analyzed using XRD, SEM, TEM and FTIR characterization techniques. The morphological studies have revealed the intimate mixing of the fuels (Al and CNT) and oxidizer (Fe_2O_3/CuO) constituents. TGA/DSC of nanothermites has been performed to observe the effect of CNT addition on the enthalpy of thermite reaction. The heat of thermite reaction is found to increase with the CNT weight percent in the nanothermites.

DESIGN, DEVELOPMENT AND EVALUATION OF IN SITU FORMING ELASTIC NIOSOMAL GEL OF NEOMYCIN SULFATE FOR OCULAR DELIVERY

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The conventional ophthalmic formulations are associated with many complications such as extensive precorneal drug loss by high tear fluid turnover, non-productive absorption, drainage through nasolacrimal duct, impermeability of the corneal epithelium, transient precorneal residence time and metabolism of the drug by anterior segment enzymes. These factors lead to loss of more than 95% of administered dose. Vesicular ultra-deformable drug delivery systems such as elastic niosomes can be employed as carriers to improve corneal permeability and ocular bioavailability. Elastic niosomes can squeeze through small pores and exhibit deeper penetration in the corneal tissue. Incorporation of elasicniosomes in in situ forming gel would enhance precorneal residence and corneal permeability. The present study involves development of elastic niosomal in situ forming gel system of neomycin sulphate. The formulations were prepared by using experimental design and final formulation was obtained by optimization technique. The prepared elastic niosomes were characterized for entrapment efficiency, vesicle size, elasticity measurement and vesicle morphology by FE-SEM. The optimized elastic niosomal formulation was dispersed in Poloxamer based in situ forming gel that was evaluated for gelling capacity, gelling time, rheology, texture analysis and ex vivo corneal studies. The results indicated successful formulation of elastic niosomal gel of neomycin sulphate with improved corneal permeation compared to plain neomycin gel.

ELECTRONIC AND MAGNETIC PROPERTIES OF NITROGEN-BORON DOPED C_{60} DIMER

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The structural, electronic and magnetic properties of nitrogen (N) and boron (B) doped C_{60} fullerene dimers with gold contacts have been studied using spin polarized density functional theory. C_{60} dimers were optimized for four different modes ([1+1], [2+2], [5+5] and [6+6]) and [2+2] mode is the more stable one. In $C_{120-2n}N_nB_n$ dimers, the number of N and B dopants varies from n = 1, 2, 3, 6 and 12. The stability of these dimer structures increase with increase in no. of doped atoms. The two cages are connected through C – C bonds having bond length ~1.58 Å. The average C – C bond lengths of doped dimers is almost similar to C_{60} pure dimer, however there is slight variation in the average diameters of doped dimers. The substitution of N and B atoms introduce magnetization in pure dimer and it may occur due to charge transfer between the two cages. The magnetic dimers have different HOMO-LUMO gaps for spin up and down electronic states, whereas non-magnetic dimers have same HOMO-LUMO gaps for spin up and spin down states. The magnetic moments are mainly localized on C atoms which are near to doped atoms. Muliken charge analysis show charge transfer from nitrogen to boron atoms for all dimer structures.

STRUCTURAL AND PHYSICAL PROPERTIES OF MNO-K_2O-ER_2O_3-B_2O_3 GLASSES

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Study on structural and optical properties have been carried out with different compositions in the glass system (1-x)MnO: $29K_2O$: $70B_2O_3$: xEr_2O_3 (where x=0, 0.2, 0.4, 0.6, 0.8 and 1), in order to understand the effect of erbium ions on the properties of manganese borate glasses. The amorphous nature of the prepared glasses has been confirmed through XRD measurement and Fourier transform infrared (FT-IR) studies on the glass system have been done in the spectral range 400–4000 cm^{-1} at room temperature in order to understand the structural changes occurring in these glasses. The conversion of BO_3 to BO_4 structural units takes place and formation of non- bridging oxygen is observed with increase in modifier concentration. The glass density is found to gradually increase and the molar volume is reduced with the increase of Er^{3+} ions concentration. This variation in density and molar volume has been correlated with structural changes in the glass samples. Some physical parameters such as polaron radius, ion concentration and field strength of the glasses were also evaluated with respect to change in the composition.

T-SPHERICAL FUZZY SETS WITH APPLICATIONS IN PATTERN RECOGNITION AND MEDICAL DIAGNOSIS

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Spherical fuzzy sets and T-spherical fuzzy set are the most recent generalized version of Picture fuzzy sets (extension of Intuitionistic Fuzzy Sets) available in literature with a capability to depict the uncertainty, fuzziness and vagueness in the sense of four parameters: membership (yes), neutral (abstain), non-membership (no) and refusal (non-participation). Correlation and Correlation coefficients are most utilized statistical tools and important measures in engineering, intelligence sciences, data analysis, decision making, biological sciences etc. In the present communication, we have proposed a new correlation coefficient and a weighted correlation coefficient of two T-spherical fuzzy sets based on the newly defined information energy measure under the perception of the four parameters of impreciseness as stated above. Further, by implementing the Principle of Maximum Correlation Coefficient in view of the proposed correlation, the methodologies for solving the problems of pattern recognition and medical diagnosis have been provided with the help of an example for each.

NEUTRINO: A POTENTIAL CANDIDATE FOR DARK MATTER

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In the standard model of particles, neutrinos are tiny, feebly interacting and neutral particles, which hardly interact with rest of the world. They appear in three types of flavors namely electronic, muonic and tauonic neutrinos. Neutrinos can be produced in the accelerators (laboratory based neutrinos), nuclear reactors (reactor neutrinos), astrophysical and cosmological sites such as solar core, cores of Supernova stars, the atmosphere and even some violent processes of particle acceleration in cosmos such as Gamma Ray Bursts (GRBs). It is believed that the neutrinos play a major role in dynamics of universe and act as a potential candidate for dark matter. Recent findings from WMAP have revealed that about 95% of the universe is dark! The visible universe that we could see is just about 5%, and 68% is dark energy and 27% of the universe is composed of dark matter. The search for this dark side of universe is continuously going on for decades. There are signatures for existence of a new class of heavy and light sterile neutrinos and possibility of their mixing with active ones. In this work, we investigated potential possibilities of neutrino particles as dark matter candidate.

THYMOQUINONE LOADED POLYMERIC NANOSTRUCTURES FOR DRUG DELIVERY APPLICATION

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Nanomaterials based on chitosan have emerged as promising carriers of therapeutic agents for drug delivery due to good biocompatibility, biodegradability, and low toxicity. Thymoquinone (TQ),which is an active phytoconstituent from the plant Nigella sativa, suffers from drug delivery challenges. The present study designs the polymeric micelles based on a novel copolymer derived from chitosan and soya lecithin. The co-block polymer of chitosan, soya lecithin was prepared by dialysis method and the polymer conjugate was characterized. Different TQ loaded polymeric micelles were prepared employing various drug: copolymer ratios, to obtain the best optimized formulation. The micellar systems were characterized with respect to particle size, percent entrapment efficiency (%EE) and percent drug loading (DL).The percent drug release of the formulation was also determined employing the dialysis method. The TQ-loaded polymeric micelles exhibited the requisite small particle size (< 100 nm), narrow size distribution, high entrapment efficiency and high drug loading capacity. The optimized micellar composition exhibited better drug release *vis-a-vis* plain drug. The current study demonstrated polymeric micelles to be a potential delivery system for TQ and can used for various other biomedical applications also.

ENHANCEMENT IN ANTIMICROBIAL ACTIVITIES OF *MURRAYA KOIENGII* USING GREEN SYNTHESIZED ZINC OXIDE NANOPARTICLES

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The current era of nanotechnology is a raging field for the researchers. Among all the multifunctional nanoparticles, zinc oxide nanoparticles (Zno NPs) is one of the best nanoparticles in the biological applications. Green nanotechnology using plants is an eco-friendly alternative to conventional physical and chemical method for the synthesizing nanoparticles. In the present study the plant extract of *Murraya koiengii* was used for the synthesis of nanoparticles. The concentration of plant extract plays an important role in regulating the morphology and size of nanoparticles. The different concentrations of plant extracts (leaves) ranging from 5% -50% using zinc acetate used as precursor materials and the synthesized nanoparticles were characterized by FTIR and UV-vis spectroscopy, FESEM, EDS and DLS. The formations of nanoparticles from the extracts were identified first by observing the colour change. The average particle size was coming to be between 20-50 nm. These results were also supported by SEM analysis. FTIR shows the characteristics peaks which showed that the presence of various functional groups. FESEM showed that the particles were almost hexagonal in nature. The synthesized nanoparticles were tested against the pathogenic cultures which showed a very good zone of inhibition compared with plant extract which indicates the antimicrobial properties of ZnO NPs. The study fruitfully reveals simple, fast, economical and eco-friendly method of synthesis of multifunctional ZnO nanoparticles (Nps).

APPLICATIONS OF NANOTECHNOLOGY IN FORENSIC SCIENCE

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ORAL- 16

Nanotechnology deals with study and applications of particles in the range of 1-100 nm. These nanoparticles have unique properties, which make them ideal for applications in different fields such as healthcare, biomedical, life sciences, etc. However, in forensic science, nanotechnology is less explored as compared to others. Nanoparticles can be of metallic, polymeric and lipophilic in nature. Of these, metallic nanoparticles have been explored much more as compared to latter. Nanoparticles can be synthesized by physical, chemical and biological methods. Owing to toxic, environmental and economic concerns, physical and chemical methods are not much preferred. On the other hand, biological methods, being economical and ecofriendly, have several advantages over others. It includes the synthesis of nanoparticles from plants, bacteria, fungi, yeasts, etc. The nanoparticles, which are most commonly used in forensic science, include silver, gold, zinc oxide, etc. These nanoparticles help in the development of latent fingerprints, identifications of blood stains and ink used in writing at the crime scene. Other applications of nanotechnology in forensic science are DNA analysis, DNA typing, explosive detection, post blast explosive residue analysis, gun shot residue analysis and toxicological analysis. There are different techniques to study the characteristic features of nanoparticles, which are also used in forensic science. Some of them are: Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM), Dynamic light scattering (DLS), etc. There is less work reported in the literature about the applications of nanotechnology in the forensic science, hence there is much scope in this field.

STATURE ESTIMATION AND SEX PREDICTION FROM SKELETAL REMAINS: A MACHINE LEARNING APPROACH

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A study was conducted in the Mandi region of Himachal Pradesh to develop regression equations for the estimation of height and classification scheme for prediction of sex from the length of *humerus* bone and foot-length. A total of 127 volunteers participated in the study. 66 were females and 61 were males. A strong correlation was obtained between the height of the person and the length of *humerus* bone (0.73) and foot-length (0.74). This correlation increased to 0.80 when these two variables were considered together and increased to 0.82 when sex information was also included. Regression equations were developed between the dependent variable height and the independent variables viz. length of *humerus* bone and foot-length. Lowest value of RMS error i.e. 4.9 cm was obtained in the regression equation involving all the three variables viz. *humerus* bone length, foot-length and sex information. The WEKA data mining software was used and Linear Regression classifier function with 10 fold cross validation test scheme was used. In estimating sex from *humerus* bone length using the Bayesian Network classifier gave a true positive rate of 0.97 for females and 0.52 for males, the weighted average being 0.75, the average ROC area was 0.68. The true positive rate for females was 0.80 and that for males as 0.77 and the ROC area was 0.77. 53 females and 47 males were correctly classified. The average true positive rate slightly improved to 0.80 and ROC to 0.83 when both the *humerus* length and foot-length were considered for classification. 51 female and 50 males were correctly classified. This is a very good classification rate showing the efficacy of the proposed classifiers and height estimation and sex prediction methods.

POSTER - 01

SYNTHESIS AND CHARACTERIZATION OF COBALT DOPED COPPER OXIDE NANOPARTICLES

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Cobalt-doped copper oxide nanoparticles have been prepared by microwave assisted method. The structure and morphology of synthesized Cobalt doped CuO nanoparticles were investigated by X-ray powder diffraction (XRD), Field emission scanning electron microscopy (FESEM) analysis. The crystallinity of the as prepared nanoparticles was confirmed using the X-ray diffraction patterns. From XRD, it is revealed that the synthesized nanoparticles are of single phase monoclinic structure and the average crystallite size of synthesized nanoparticles has been obtained 30.01 nm by Debye Scherrer's formula. Scanning electron microscopy (SEM) confirms the flower like structure of Cobalt-doped CuO nanoparticles and obtained the particles size 40 nm. The functional groups and chemical interactions of prepared nanoparticles were also determined using FTIR data. The antibacterial activity of Cobalt-doped CuO nanoparticles were studied against different pathogenic bacteria viz. both Gram-positive (B. subtilis and S. aureus) and Gram-negative (E. coli and P. aeruginosa).

POSTER - 02

THERMOLUMINESCENCE STUDY OF SODIUM STRONTIUM BORATE GLASS DOPED WITH DY^{3+} ION

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Sodium strontium borate glasses doped with different concentration of Dy_2O_3 were prepared by the conventional melt quenching technique. For each glass sample the experimental conditions (melting temperature, annealing temperature and annealing time) were kept similar. The prepared glass samples were exposed to gamma ray dose of 15 Gy and thermoluminescence (TL)spectrumwas measured from room temperature to 400 $^{\circ}$C with the heating rate of 5°C/s. The glow curves posses second order kinetics and have the maximum intensity peak in the temperature range 390-393 K. Further the TL kinetic parameters were calculated using the Chen's peak shape method. The activation energy (E_{av}) and the frequency factor lie in the range 0.57-0.94 eV and 4.87×10^{6}-4.16×10^{11} s^{-1} respectively. The glass with 0.4 mol% concentration of Dy_2O_3 is best suited for TL dosimetry.

EFFECT OF ANNEALING TEMPERATURE OF CORE ON CORE@SHELL NANOSTRUCTURES OPTICAL AND MAGNETIC PROPERTIES

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We reported optical and magnetic properties of multifunctional "magnet-in the semiconductor" "core@shell" nanostructure composed of Ni-Zn ferrite core and CdS shell prepared via aqueous route.Studied the effect of annealing temperature of core ferrite on "core@shell" nanostructure's optical and magnetic properties. We have synthesized Ni-Zn ferrite@CdS"core@shell" nanostructure where core being annealed at 900^{0}C and 1100^{0}C respectively, and demonstrate the corresponding changes in structural, optical, magnetic and chemical properties.Successful synthesis of the bare core, shell and "core@shell" structures has been evidenced from the X-ray diffraction, optical spectroscopy and VSM results. From optical spectroscopy it is clearly seen that the "core@shell" structure synthesized with core being annealed at 1100^{0}C form more intact system as compared tocore annealed at 900^{0}C. VSM results are found in support of opticalstudies, which show the magneto-optical behaviour of prepared nanostructures. The as-grown "core@shell" structures have been shown to be strongly photoluminescent while retaining the room temperature magnetic behaviour of the Ni-Zn ferrite core. From VSM studies we also find that the system formed using 1100^{0}C annealed core is much stable as compared to "core@ shell" structure formed of 900^{0}C annealed core. Developing a room temperature, wet synthesis route for such hybrid nanostructures will prove to be technologically more advantageous because of multifunctionality of these "core@shell" nanoparticles. These nanostructures have potential applications that make use of their novel functionality.

GREEN MEDIATED SYNTHESIS AND CHARACTERIZATION OF ZINC OXIDE NANOPARTICLES USING *CARICA PAPAYA* LEAF EXTRACT AS REDUCING AGENT

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Green synthesis of metal oxide nanoparticles using plant extract is a promising alternative to traditional method of chemical synthesis. The present study states a green approach for the synthesis of zinc oxide nanoparticles employing aqueous leaf extract of *Carica papaya*. Leaf extract was used as the biological reduction agent for synthesizing zinc oxide nanoparticles from zinc acetate dihydrate. Synthesis conditions were optimized for maximal and narrow size range synthesis of zinc oxide nanoparticles. The resultant nanopowder was characterized using various analytical techniques, such as UV–Visible spectroscopy, Fourier Transform Infrared Spectroscopy, X-ray diffraction, Transmission Electron Microscopy and Scanning Electron Microscope with the Energy Dispersive X-ray studies (EDX).X-ray diffraction studies confirmed the crystalline nature of the nanoparticles. Morphology studies indicates the formation offlower like cluster of the ZnO NPs and EDX shows the highly pure ZnO nanoparticles. Further, the present investigation suggests that ZnO NPs has the potential applications for various medical and industrial fields so, that the investigation is so useful and helpful to the scientific communities.

POSTER - 05

A REVIEW ON INDOOR RADON

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Radon is a chemical element with symbol Rn, atomic number 86 and half life of about 3.8 days. It is a radioactive, colorless, odorless, noble gas and not detected by human senses. It occurs naturally in small quantities at an intermediate step of radioactive decay chains of thorium and uranium slowly decay into lead. Radon itself is the direct decay product of radium. Literature reports that radon concentration is higherin winter and lower in summer. Radon is the second main cause of lung cancer.

POSTER - 06

APPLICATION OF INTERVAL ANALYSIS IN MULTI OBJECTIVE OPTIMIZATION

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In a real world problem, it is very unlikely that we will meet the situation of single objective and multiple constraints more often than not. Solving optimization problem with multiple, often conflicting objectives is, generally a very difficult goal. During the past decade, variety of multi objective techniques have been proposed and applied to many scientific and engineering applications. Among many types of methodologies usually used to solve multi objective optimization problems, the interval-valued multi objective optimization problems have been of much interest in recent years. In this paper we proposed an interval analysis method to compute the global maximum of the multi objective function. Using the concept of interval analysis and weighted sum method we can obtain an exact estimate of the global maximum or minimum of unitary objective functions, including the rigorous error bounds. In the last, numerical examples are given to illustrate the execution of the proposed method.

SENSING MECHANISM OF RESISTIVE PALLADIUM NANOPARTICLE BASED HYDROGEN SENSORS

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The adsorption-desorption of hydrogen in palladium (Pd) nanoparticles (NPs) is accompanied by change in material resistivity and volumetric lattice expansion. The manifestation of these phenomenon in a resistive device is dependent on stabilizing agent polyvinylepyrollidone (PVP), which caps the NP surface and modulates the overall device resistance. To evaluate this sensing mechanism, Pd NPs were synthesized by polyol reduction method, and PVP (Mw 40,000) was used as the capping agent in the synthesis. HRTEM studies revealed polycrystalline particles (size range 10-13 nm). The device sensing performance at room temperature was corroborated by a mechanism in which the increase and subsequent decrease of resistance was due to the electronic and geometrical effects. In electronic effect resistance of the device increased due to the formation of Pd-hydride (α-phase); immediately hydrogen adsorbed Pd NPs expand in size (via geometric effect), which reduces the interparticle gap. This stops the increase in resistance and reduces the device resistance to a large extent. The geometric effect is relatively more prominent in devices made with NPs synthesized with high PVP concentration, while it is insignificant in NPs synthesized with low PVP concentration. Basically, in low PVP coated Pd, the NPs are already in contact to each other with negligible gap; therefore, the swelled Pd NPs induces negligible change in device resistance via geometric effect, and only electronic effect is manifested.

Thus, the study reveals the potential of Pd NPs for hydrogen sensing applications. However, the slow performance of the devices (response time ~ 55 s) require further optimization.

EFFECT OF Sm_2O_3 ON PHYSICAL PROPERTIES OF BOROSILICATE GLASSES

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Glasses having composition $40SiO_2$-$40B_2O_3$-$10V_2O_5$-$(10-x)Fe_2O_3$-xSm_2O_3 (x=0,2,4,6) are synthesized by melt quenching technique at 1450˚C. For the removal of thermal strains, the glass samples were annealed at 400˚C for 15 hour. Density and molar volume of the prepared glass samples were investigated. XRD diffraction pattern confirm the amorphous nature of the glass samples. The density of the glasses increases with increase in concentration of Sm_2O_3, which is due to the substitution of lighter Fe_2O_3 (159.69g mol^{-1}) groups by heavier Sm_2O_3 (348.7 g mol^{-1}). This high density of glasses indicates the enhancement of a degree of structural compactness. The molar volume of glass samples decrease with increase in Sm^{3+} ions which may be due to the decrease in the inter-atomic spacing and increase in the stretching force constant.

SYNTHESIS OF ALTERED SHAPED ZnO NPs AND THEIR EFFECT ON BACTERIAL GROWTH AND DYE DEGRADATION: GREEN APPROACH (ALOE-VERA)

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POSTER - 09

Zinc nanoparticles (NPs) are known for their wide range of applications. Different methods have been employed for the synthesis of zinc NPs. However, nowadays the development of an ecofriendly method with use of inexpensive chemicals are at developing stage. In this work, we have reported the synthesis of ZnO NPs by using Aloe-Vera plant leaf extract. The synthesized NPs have been characterized by UV-visible, X-ray diffraction (XRD), Scanning electron microscopy (SEM), Energy dispersive X-ray spectroscopy (EDS) and Transmission electron microscopy (TEM) techniques to examine their optical property, crystallinity nature and phase purity, surface morphology, elemental analysis, size and shape. The outcomes confirmed the synthesis of ZnO NPs with hexagonal, spherical, rod and cuboidal shapes decorated under different concentrations of the precursor. The synthesized ZnO NPs found to be very effective for the photocatalytic degradation of methyl orange dye. ZnO NPs also show antibacterial activity against the pathogenic bacteria *Bacillus subtilis*, *Staphylococcus aureus* and *Escherichia coli*.

NANO TECHNOLOGY: GREEN NANO TECHNOLOGY

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POSTER - 10

Nano technology is the manipulation of matter on an atomic, molecular and supramolecular scale. Green nano technology refers to the use of nano technology to enhance the environmental sustain ability of processes producing negative externalities. It includes making green nano products and using nano products in support of sustain ability. Green nanotechnology has been described as the development of clean nano technologies to minimize potential environment and human health risks associated with the manufacture and use of nanotechnology products, and to encourage replacement of existing products with new nano-products that are more environmentally friendly throughout their life cycle.
Green nanotechnology plays two important roles that is producing nanomaterials and producing them with less negative effects to the environment. Apart from this green nanotechnology is also used to make current manufacturing processes for non-nano materials more environmentally friendly. Although green nanotechnology poses many advantages over traditional methods, there is still debate about the concerns brought by nanotechnology.

ONE STEP FORMATION OF ZNO THIN FILMS ON THE SURFACE OF PRECURSOR SOLUTION USING AMMONIA VAPORS IN SIMPLE LIQUID-VAPOUR METHOD

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In this work we report an innovative and simple method for thin film formation of zinc oxide (ZnO) particles on the surface of precursor solution. This study reports first time use of NH_3 vapours with precursor solution of Zinc Chloride to form ZnO thin film. Firstly, the ZnO thin films were formed at the liquid-vapour interface and were transferred to the glass substrate. The transferred ZnO films were annealed in horizontal tube furnace at 300°C for 1 hour with a heating rate of 100°C per hour. Then the fabricated films were characterized by Scanning Electron Microscopy (SEM), X-ray diffraction (XRD) and UV-vis absorption spectroscopy. SEM reveals the surface morphology of films, and showed the sheet like structure of ZnO. XRD study was carried out to confirm the crystallinity of ZnO films, which shows its hexagonal wurtzite structure. The crystalline size is found to vary with the concentration of NH_3 in the reaction. The calculated crystalline size is found increasing with the increase in NH_3 concentration. Also, in the optical studies estimated by using UV-Vis spectroscopy, the band gap of the film is found to increase with the concentration of NH_3 concentration. The observed band gap varied from 3.0 eV to 3.7 eV. Using this method, the optical properties can be easily tuned by controlling the process parameters.

DATA ANALYSIS OF ALCOHOL AND POISONING CASES: A RETROSPECTIVE STUDY

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A retrospective study on the cases received in the toxicology section for the period 2009-2016 was conducted. An innovative aspect of the study was that text analysis of case result files stored in computer was carried out using some sophisticated text and statistical analysis software tools. Trends were available from a huge record of 4766 result files pertaining to alcohol, drug and poison cases from the five districts of the central police range Mandi. Alcohol was positive in 37.3% cases and the 24% were positive for poisons and other miscellaneous toxins like drugs. In cases of accidents, drunken driving, and suspicious deaths, blood and urine samples are analysed for alcohol detection and quantification of the alcohol level. Accidental or suicidal consumption of fumigant (phosphide) and insecticides (organophosphorus and Organochloro) was the mode of death in most cases of poisoning. Regarding the alcohol content, the average level of alcohol content was 141 mg%. This means significant impairment of reflexes and judgement. Only one fourth of the samples had alcohol content below 75 mg% meaning slight impairment in reasoning, perception and vision, but one fourth above 190.8 mg% that could lead to severe impairment and loss of consciousness and probably death. Normalizing the poisoning trends revealed that there is a very strong positive correlation of the number of poisoning cases in a year with the literacy rate of a district. The alcohol trends show that this is more of an urban phenomenon and a major reason for road side accidents and death due to fall.

POSTER - 13

SOLAR FLARES AND RADIO WAVE PROPAGATION DISTURBANCES

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Solar flare disturbances affect ionospheric HF radio propagation conditions for communications and radio broadcasting. Solar flares, the enormous explosions are intense blooms of radiation that come from Sun with release of the magnetic energy associated with sunspots. A geomagnetic storm is caused by the solar phenomenon like solar flares, CMEs and SEPs, which typically strikes the earth magnetic field and ionosphere within 24 to 36 hours after the event. Current study focuses on solar flares only and selected the data of year 2012 – 2017 for analysis. In same duration 30 events of disturbances due to solar flares were observed. All 30 events are categorized as severe, moderate and minor as X- class flare (severe) , M- class flares (Moderate), and C – class flare (Minor). Firstsevere event observed on 7 March, 2012 class X5.4 having start time 00:13 UTC, peak time 00:24 UTC, radio flux 136 and time difference 00:11 UTC created the equatorial ring current disturbance on same day after 10 hours with Disturb Storm Time Index -88nT.Second category of solar flare i.e moderate were observed on 23 January, 2012 class M8.7 having start time 03:38 UTC , peak time 03:59 UTC, radio flux 144 and time difference 00:21 UTCgenerated equatorial ring current disturbances on same day after 6 hours with Disturb Storm Time Index -71nT. 2nd event of same category selected on 20th February, 2014 of class M3.0 having start time 07:26 UTC, peak time at 07:56 UTC, radio flux 156 and time difference 00.3 UTC created equatorial ring current disturbances on same day after 13 hours with Disturb Storm Time Index -91nT. The minor class flare was observed on 17thJuly 2012 of class C9.9/1F having start time 13:19 UTC, peak time 15:59 UTC, radio flux 128 and time difference2:4 UTC created equatorial ring current disturbances on same day after 7 hours with Disturb Storm Time Index - 80nT.It is observed that every solar flare creates ionospheric disturbances after 4-18 hours in terms of equatorial ring current. The effects of solar flares can cause major changes to ionospheric radio propagation, often disrupting them for hours or sometimes days.

POSTER - 14

ANALYSIS OF THERMAL STABILITY ON ADDITION OF RARE EARTH ELEMENTS TO GE-SB-TE COMPOUNDS

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The effect of addition of rare earth on the thermal stability of Ge Sb-Te(GST)phase change material (PCM) has been investigated theoretically. Rare earth elements exhibit the excellent capability of scaling the electrical and structural properties of phase change materials that enable the good thermal stability of the PCM for data storage. Rare earth elements show the metallic character on addition to semiconducting materials. They also increase the band gap of materials and make the GST rigid and increase the glass transition temperature. The enhancement of glass transition temperature is the requisite condition for high refractive index and large thermal stability. Higher transition temperature and lower melting temperature enhances the cyclability of the PCM device. The increases in metalicity highlight the increase in rigidity of network. The phase change ability of these materials depends on the stability of amorphous state for data storage to longer time and is dependent on the stability of structural units on different temperature. Increase in the possibility of obtaining various structural configurations during phase transition is an important factor. The value of threshold switching voltage will also move to the higher values on incorporation of rare earth elements.

ONE POT GREEN SYNTHESIS OF ZINC OXIDE NANOPARTICLES AND ITS CYTOTOXICITY STUDIES

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The size and the surface chemistry of thenanoparticles(NPs) are found to play crucial roles in their biological activity.1,2To tailor the physical and chemical properties of the nanoparticles, various chemicals are used in the synthesis process. Toxic nature of the chemicals used during synthesis restricts the application of these NPs in biological systems. In the present work, one pot biogenic root of zinc oxide nanoparticles (ZnNPs) synthesis using Catharanthusroseusas reducing as well as capping agenthas been demonstrated. The synthesized ZnNPs have been characterized by dynamic light scattering, UV−vis spectroscopy, TEM, and powder X-ray diffraction to establish the size and surfacemorphology. Furthermore, the adsorption and binding affinities ofbovine serum albumin (BSA) onto these nanoparticles along with the interaction of NPs with cancerous cells has also been investigated. The cytotoxicity of the synthesized ZnNPshas been investigated on the cancer cell line (MDA-MB231). These studies will provide a gateway to understand the protein–nanoparticle and cancerous cell – nanoparticle interaction, this interaction are extremelyimportant which will allow the rational design for target specificdrug delivery and tissue engineering.

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