Plant Science Researchers Meet (PSRM) - 2018

National Conference
On
Current Research and Development in Plant Sciences

28th, January, 2018

Abstract and Souvenir

Organized by

Association of Plant Science Researchers – (APSR)

PLANTICA

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उत्तराखण्ड सरकार

Subodh Uniyal
Minister
Agriculture, Horticulture, Sericulture

Government of Uttarakhand

Office:
Vidhan Sabha, Dehradun, Room No. 121,
Mob. 9897200700, 8979338888
Ph.: 0135-2666671 (O),0135-2665855 (F)
E-mail : agricultureministeruk@gmail.com

Letter No. मै.मो

Date 04/01/2018

Message

Dear Dr Badoni

It is matter of immense pleasure that PLANTICA – Journal of Plant Science published by Association of Plant Science Researchers, Dehradun, organizing one day National Conference on **"Current Research and Development in Plant Sciences"** during January, 28th, 2018. It will definitely boost our scientists, researchers and academicians to work in this field.

The organizers have chosen a very interesting topic for deliberation as research and development in plant sciences are important means in day-to-day life for humans, animals as well as environment. It is supported by a large technically sound and talented pool and with tremendous opportunities of growth in Agriculture, Environment and public sector. It has an amazing potential in a developing economy.

On my personal behalf and on behalf of the Ministry of Agriculture, Govt. of Uttarakhand, I wish a grand success to this event.

S Uniyal
(Subodh Uniyal)
4/1/18

Dr. Anoop Badoni
President
Association of Plant Science Researchers
Dehradun

उत्तराखण्ड सरकार

विनोद चमोली
मेयर,
नगर निगम, देहरादून
उत्तराखण्ड (भारत)

Vinod Chamoli
Mayor,
Nagar Nigam, Dehradun
Uttarakhand (India)

कार्यालय : (0135) 2655620, 2650300
निवास : (0135) 2676600
फैक्स : (0135) 2651060

पत्रांक : 636/M:G/2018

दिनांक : 21-01-2018

Message

It gives me immense pleasure that PLANTICA – Journal of Plant Science published by Association of Plant Science Researchers, Dehrdaun, Uttarakhand is organizing National Conference on **"Current Research and Development in Plant Science"** at Dehradun. The main objective of the conference is to encourage the exchange of scientific information on various and interdisciplinary aspects of plant sciences. The interactions would benefit the researcher's community comprehensively and direct their educational efforts towards self-development and towards the development of the state Uttarakhand.

I congratulate the team for their organization and wish them all the best in their endeavor.

On behalf of Nagar Nigam Dehradun and on my personal behalf it is our pleasure to welcome you all in this Conference; I hope you will enjoy your stay in Dehradun, Uttarakhand.

Chamoli

(Vinod Chamoli)
Mayor and MLA

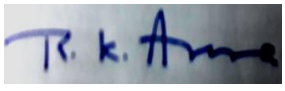
Dr. R. K. Arora
M.Sc., Ph.D., ARS
Ex- Principal Scientist
CPRI – Indian Council of Agricultural Research

Message

It is pleasure to know that PLANTICA – Journal of Plant Science published by Association of Plant Science Researchers, Dehradun, Uttarakhand is organizing a National Conference on **"Current Research and Development of Plant Science"** during 28th January, 2018. I complement the organizers to focus on the central theme of Plant Sciences, so very vital for the survival of our planet earth.

All efforts of developmental planning revolve around the central theme of PSRM how could current research on plant sciences be managed and used for socio- economic development and for conserving and/ or improving the environmental yardsticks in the region. Embedded in the word "management" is the concept of sustainable utilization, well within the carrying capacity of the system for the benefit of the present generation without compromising on the needs of future generations. Introduction of appropriate technology and enhanced cash flows through market economy are the primary concerns of village folks. Priorities in the list of elites may include, for example, income generating sectors like tourism, while industries may figure prominently in the wish list of unemployed youth, adequate availability of food in areas of limited agricultural land (and water), and provision of land stabilization measures in areas prone to natural disasters like floods and landslides, etc. An overarching theme that is likely to influence all above sectors is the potential effects of climate change. There is thus little commonality between the local and national or global priorities, and these may also change with time. The logical unifying principles of inducing sustainable development through proper management of the natural resource capital, it is suggested, can be attempted through appropriate technological interventions and innovations, in parallel with social awakening.

I wish every success to the proposed National conference on Plant Sciences, and hope that the deliberations and considered discussions will lead to a clearer path for action.



(R. K. Arora)

Dr. Anoop Badoni
(M. Sc.-Ag, Ph.D., FAPSR, FMSTC, MSFSN)
Founder President – APSR
Editor – In – Chief: PLANTICA
Convener: PSRM – 2018

Message

It is an immense pleasure that our Association is organizing a National Conference on Current Research and Development in Plant Science under **Plant Science Researchers Meet**, during January 28th 2018.

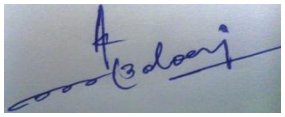
We are happy that the conference has attracted many eminent scientists, scholars and working in the field of science and technology and in the field of Plant Sciences. The topic covers the whole area of Plant Sciences. We are sure that conference will be on excellent opportunities for all the participants to exchange the ideas and provides new research and techniques which will be helpful for development of our state and nation.

Finally on behalf of Organizing Committee of PSRM -2018 and on my personal behalf we would like to welcome all distinguished scientists, researchers and students and thank them for participation in the conference.

With this we would like to express our great thanks to Dr. R. K. Arora, Prof. J. S. Chauhan and Dr. A. C. Mishra for encouraged and support us to conduct this conference.

We also thanks full to Shri Subodh Uniyal JI (Agriculture Minister) to accept our invitation to join this conference and Sri Vinod Chamoli JI (MLA and Mayor - Dehradun) to provide us space to organize the conference.

Thanks to all members of APSR, Editorial and Advisory Board of PLANTICA and all participants to support us by your valuable suggestions, research and time.



(Anoop Badoni)

National Conference
On
Current Research and Development in Plant Sciences

Abstract and Souvenir

National Conference on Current Research and Development in Plant Sciences
28th January, 2018

Convener

Dr. Anoop Badoni
(M.Sc. –Ag, Ph.D., FAPSR, FMSTC, MSFSN)
Founder President – APSR
Editor – in – Chief: PLANTICA

PLANTICA

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Key Note Address – 1

CURRENT RESEARCH AND DEVELOPMENT IN PLANT SCIENCES – A WAY FORWARD FOR SUSTAINABLE DEVELOPMENT IN UTTRAKHAND

Dr. R.K. Arora
M. Sc., Ph.D., ARS
Ex- Principal Scientist, Indian Council Agricultural Research – CPRI
rkacpri@yahoo.com, dr.arora.rk@gmail.com

Plants fix biosphere energy and play a vital role in providing us with food, fiber and oxygen necessary for sustaining life on the planet. They shape our environment and have the potential to reverse the adverse effect of climate change. Plants serve as important tools to understand and enhance our knowledge on the fundamental principles of life that can be applied for betterment of mankind. Many techniques such as growth and multiplication of cells, development of tissues, secretion and function of hormones, signaling and functioning of metabolic networks, genetic codes and their control in development of life of an individual has already provided considerable insight into the mechanisms and principles involved in growth and sustainability of life processes across plant and animal kingdoms. Application of current developments in plant sciences can successfully be employed to meet the challenges posed from time to time in the sustainable development of human life and improving our environment for the betterment of our planet. The advances achieved in the research on plant sciences such as the technologies like molecular markers, tagging, sequencing, cloning etc. have made it possible to isolate and study specific genes or genomic regions conferring resistance to one or more biotic and abiotic stresses in crop plants. These can be applied to meet an increased demand of food necessitated by an ever increasing human population, increased production and consumption of animal products, better utilization of irrigation resources and arable land, preserving of biodiversity and reversing adverse effect of climate change. The advances achieved in plant sciences can be deployed to generate new employment opportunities thus improving purchasing power of rural masses and improving quality of living of our masses. Uttrakhand being a hill state has some inherent constraints such as remoteness and inaccessibility, marginality of its land, moisture stress, poor soil conditions and a short growing season. This coupled with small holdings, low productivity and production, lack of post production management, inadequate marketing, and lack of entrepreneurship have resulted in under utilization of resources, limited generation of surpluses and unemployment. These constraints are resulting in migration of its youth in search of better job prospects. Such developments could be reversed with introduction and utilization of advances made in plant sciences and agriculture technologies followed elsewhere to increase quality and quality of horticulture products such as use of protected cultivation, improved methods of irrigation, development and introduction of disease and pest resistant crop varieties, monitoring and management of pests using space technologies and organic production of vegetables and fruits that can command higher prices. This can result in better utilization of land and resources, higher and high quality production of vegetables and fruits which together with better marketing strategy can result in sufficient generation of surplus income. In addition, the educated unemployed youth need to be equipped with new skill in farming, entrepreneurship and agribusiness. New technologies based on knowledge gained in plant sciences can definitely show the way forward for the sustainable development of agriculture and horticulture in Uttrakhand.

Key Note Address – 2

MIGRATION, NEGATIVE IMPACTS OF FLOODING, EROSION OF BIODIVERSITY, ENVIRONMENT AND FUTURE CHALLENGES IN UTTARAKHAND

Dr. J.S. Chauhan
Professor and HOD
Department of Seed Science & Technology
HNB Garhwal University, Srinagar Garhwal (Uttarakhand) India
js.chauhan@hnbgu.ac.in , js99chauhan@gmail.com

Uttarakhand, the Himalayan state which borders along China, is the sixth richest state in India in terms of per capita income but those living in its hill districts are still struggling with low per capita income, bad access, poor healthcare facilities, unemployment, decline in agricultural output and neglect. Migration of active manpower from Uttarakhand hill areas continued from villages to towns and cities within and outside the state for sustenance. This movement of people has greater impact on socio-cultural and economic conditions and even in physical environment of both the out migration and inmigration areas. This has threatened the very base of the hill economy i.e., agriculture besides a serious threat to the existence of the marginal hill society. A study conducted by the directorate of economics and statistics revealed that nearly 1,100 villages do not have a single person left. It can be said that in the past five years, the number of such 'ghost villages' is bound to have gone up. Government data shows that out of 664 villages with negligible population in the Garhwal region, 341 are in Pauri district alone. Throughout human history, people have been on the move—exploring new places; pursuing work opportunities; fleeing conflict; or involuntarily migrating due to changing political, social, or environmental conditions. The reasons for moving are complex, but over the past decade, as the evidence of global climate change has accumulated, academics, policymakers, and the media have given more attention to migration as a result of environmental change. Environmental change poses risks to societies, including disrupting social and economic systems. Rural populations heavily dependent on rain-fed agriculture. Recent summer rains have consistently been 15-30 percent below the average, and increasing temperatures exacerbate the effect of lower rainfall. Fire is the single most dramatic man mad/natural event in many forest ecosystems. Within minutes it alters the conditions for plants and animals, and the effects are usually evident for many years. The destructive impact of fires on organisms is obvious. Apart from this, immediate impacts of flooding include loss of human life, damage to property, destruction of crops, loss of livestock, non-functioning of infrastructure facilities and deterioration of health condition owing to waterborne diseases. Flash floods, with little or no warning time, cause more deaths than slow-rising riverine floods. As communication links and infrastructure such as power plants, roads and bridges are damaged and disrupted, economic activities come to a standstill, resulting in dislocation and the dysfunction of normal life for a period much beyond the duration of the flooding. Given the rate of projected environmental change for the 21st century, urgent adaptation and mitigation measures are required to slow down the on-going erosion of biodiversity. Present study is based on the information collected from different resources on the impact of migration in the state of Uttarakhand.

Key Note Address – 3

TECHNOLOGICAL INTERVENTIONS FOR INCREASING FARMERS' INCOME IN VEGETABLE PRODUCTION

Dr. A.C. Mishra
Associate Professor, Department of Vegetable Science,
Banda University of Agriculture & Technology, Banda (U.P.)
E-mail: acm24680@gmail.com

Vegetables are important constituents of Indian agriculture and nutritional security due to their short duration, high yield, nutritional richness, economic viability and ability to generate on-farm and off-farm employment. Our country is blessed with diverse agro-climates with distinct seasons, making it possible to grow wide array of vegetables. India is the second largest producer of fruits and vegetables in the world. Total area under horticultural crops is 21.83 million hectares and production is 240.53 million tones. Fruits and vegetables together contribute about 92% to the total horticultural production in the country. India produces 14 % (146.5 million tonnes) of world's vegetables on 15% (8.5 million hectares) of world area under vegetables. Productivity of vegetables in India (17.3t/ha) is less than the world average productivity (18.8t/ha). Potato (28.9%), tomato (11.3%), onion (10.3%) and Brinjal (8.1%) are the 4major vegetables contributing 58.6% of total vegetable production in our country. Other important vegetables are cabbage (5.4%), cauliflower (4.6%), okra (3.9%) and peas (2.4%). India ranks first in the production of okra in the world (73% of world production). The country has witnessed tremendous progress in vegetable production, especially during the post green revolution period. Development of improved vegetable varieties/hybrids/ technologies through systematic research coupled with their adoption by the farmers and developmental policies of the government culminated in tremendous increase in area under vegetables (8.5 million ha), production (146.5 million t) and productivity (17.3 t/ha) in the country. Compared to area (2.84 million ha), production (16.5 million t) and productivity (5.8 t/ha) in 1950-1951, there had been phenomenal increase in area (2.99 folds), production (8.88 folds) and productivity (2.98 folds) of vegetables in our country during the last 6 decades. The per capita availability of vegetables is also on the increasing trend from 147.82 g/capita/day in 1991 to 230.4g/capita/day in 2011. Increasing affordability, health consciousness, urbanization, involvement of women force, market demand for high value vegetables, favourable income elasticity of demand and growth rate for domestic consumption of fruits & vegetables are some of important reasons for vegetable growth in the country (Vanitha *et al.,* 2013). Now a day, increased production and productivity is scanned under the frame of profitability of the enterprise. Being a short duration crop, vegetables are the most suitable for increasing crop intensity and income in subsistence farming. In addition to increasing productivity, off season cultivation, resource conservation, post harvest processing & value addition and integration of animal component are also utmost important for increasing profitability in vegetable cultivation. Some of the researched based findings are discussed her to illustrate the spirit of the subject.

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63.	Smrutishree Sahoo[1], Nitesh[2] , Seema Kasotiya[3] smrutishreesahoo1994@gmail.com	[1]Department of Plant Breeding and Genetics, [2,3]Dept. of Agril. Economics, SKRAU, Bikaner	Molecular breeding in tomato	55 – 56

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64.	Jai Laxmi Rawat, A. K. Agrawal, M.P.S. Parmar, Richa Badhani and Naresh Chauhan jailaxmirawat@gmail.com	Department of Botany, Govt. P. G. College Uttarkashi (Uttarakhand) India	Assessment of river Bhagirathi Ecosystem at Uttarkashi, Uttarakhand with reference to water quality Index	56 – 56
65.	Sukhdev Singh, Sanjay Kumar Sanadya, Hareram Kumar, Upendra kumar Bagri, Atma Ram Meena sukhdev3212@gmail.com, sanjaypbg94@gmail.com	College of Agriculture, SKRAU, Bikaner	Nanobiotechnology	57 – 57
66.	Narendra Singh[1*], Sagar[2], Chetan Kumar Jangir[3] narendrahorti94@gmail.com	[1]Department of Horticulture, [2]Department of Genetics and Plant Breeding, [3]Department Soil Science, CCS HAU, Hisar, Haryana	Unfruitfulness in arid and semi-arid zone fruit crops: causes and remedies	57 – 57
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68.	Vasik Ahamad*,Ashwani rawat and GBS Manikanta chowdhary wasiqnasim@gmail.com	Uttranchal College of Agricultural Sciences, Uttranchal University, Dehradun, Uttarakhand	In vitro evalution of fungicide against *Colletotrichum truncatum* causing anthracnose of soyabean	59 – 59
69.	Jayanth S.[1], Sagar[2] and Narendra Singh[3] jayanth1893@gmail.com	[1]Department of Vegetable Science, [2]Department of Genetics and Plant Breeding, [3]Department of Horticulture, CCS Haryana Agricultural University, Hisar, Haryana	Nanotechnology: To empower protected cultivation of vegetable crops in the future	59 – 59
70.	Shalu[1], Hirdesh Yadav[2] rinki.rinkisingh.singh@gmail.com	[1]Department of Home Science Extension, College of Home Science, [2]Vegetable Science College of Agriculture,G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand	Health and Medicinal plants	60 – 60
71.	[1]G. Chandramohan Reddy, S. S. Hebbar[2] and K.V.Rao[3] reddyhorti96@gmail.com	[1]Department of Spices, Plantation, Medicinal and Aromatic crops, College of Horticulture, UHS Campus, GKVK Post, Bangalore. [2]Division of vegetable crops and [3]Division of biochemistry, Indian Institute of Horticultural Research, Hesaraghatta, Bengalore	Quantitative analysis of capsaicinoids in chilly varieties by high performance liquid chromatograph	60 – 61
72.	Vandana1 and S.P. Chaukiyal2 vandana11211@gmail.com	[1]Plant Physiology Discipline, [2]Plant Physiology Discipline, FRI, Dehradun	Factors Affecting Nitrate Reductase Activity in *Albizia chinenis* Leaves	61 – 61

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74.	Saket Kumar[1], Rajeev Pratap Singh[1] Dan Singh Jakhar[2] Pavan Devesh[2] and Rajesh Singh[2] saketjntradelink@gmail.com	[1]Institute of Environment and Sustainable development, [2]Deptt. of Genetics and Plant Breeding, Institute of Agricultural Sciences, BHU, Varanasi	Screening Different Gene of Rain-fed Maize Hybrids During Flowering Condition	62 – 62
75.	Mucksood Ahmad Ganaie amu.mucksood@gmail.com	Section of Plant Pathology and Nematology Aligarh Muslim University, Aligarh India	Pathogenicity and Host Parasite Relationship of *Meloidogyne incognita* Race-3 on *Pseuderanthemum atropurpureum*	62 – 63
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77.	Jyoti Rani, Meena Bakshi and Heena Khurana jrani0612@gmail.com	Forest Research Institute, Dehradun, Uttarakhand	*In vitro* bud break response of *Plumbago zeylanica* Linn. as affected by different heavy metals	64 – 64
78.	Sangeeta, Daizy R. Batish, H. P. Singh[1] sangeetakvadav@gmail.com	Department of Botany, Panjab University, Chandigarh - 160014 [1]Department of Environment Studies, Panjab University, Chandigarh	Studies on *Pogostemon* essential oil for its possible role as broad spectrum natural herbicide	64 – 65
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80.	G. Rajitha, A. Muneendra Babu and G. Prabhakara Reddy rajirajitha41@gmail.com	Department of Agronomy, S.V. Agricultural College, Tirupati	Reducing crop failure through response farming	65 – 66
81.	Kanika Issar kanika.phd@gmail.com	SGRR University, Dehradun	Utilization of apple pomace fibre for the preparation of fibre enriched acidophilus yoghurt	66 – 66
82.	Afsar Ahmad, Shalendra Singh Gaurav, Anuj kumar, Kausar Ali and Mohd Imran afsarahmad06@gmail.com	Department of Genetics and Plant breeding, Ch. Charan Singh University, Meerut U.P., Department of Genetics and Plant breeding, Sardar Vallabahbhai Patel University of Agriculture & Technology, Modipuram Meerut	Genetic Divergence among Different yield related component of wheat genotypes	67 – 67

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84.	Sobha and J.S chauhan bishtsobha0519@gmail.com	Department of Seed Science and Technology, School of Agriculture & Allied Sciences, HNB Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand	Propagation of *Taxus baccata* through air layering –a simple method of propagation to conserve the high altitude medicinal plant using different concentration of IBA	68 – 68
85.	N. Swathi Rekha and K. Prabhakara Reddy swathikoundinya.1995@gmail.com	Department of Genetics & Plant Breeding, Birsa Agriculture University, Kanke , Ranchi	Single cross hybrid maize	68 – 69
86.	Leela Bhatt,[1] M.K. Nautiyal[2] ,Shivani Dhyani[1] and Pooja [1] leelabhatt1992@gmail.com	[1]Department of Vegetable Science, [2]Department of Genetics and Plant Breeding Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (U. K.)	Therapeutic and Pharmaceutically Importance Of Medicinal Plant Asparagus Racemosus	69 – 69
87.	Leela Bhatt,[1] M.K. Nautiyal [2] and Vikas Mangal [2] leelabhatt1992@gmail.com	[1]Department of Vegetable Science, [2]Department of Genetics and Plant Breeding Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (U. K.)	Biotechnology: A New Tool for Vegetable Improvement	70 – 70
88.	S. K. Singh[1], R. S. Nandanwar[1], P .V. Jadhav[2] ss41035@gmail.com	[1] Department of Agricultural Botany, [2] Biotechnology Centre, Department of Agricultural Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	Assessment of stage specific nutritional quality and yield attributing traits in pigeonpea [*Cajanus cajan* (L.)] genotypes.	70 – 71
89.	Gurwinder Sran, Antul Kumar, Amandeep Paul, Rajni Sharma and Anuj Choudhary gurwindersingh116@gmail.com	Department of Botany, Punjab Agricultural University, Ludhiana	Plant and tree species as tools for phytoremediation in polluted environment: A Review	71 – 72
90.	Portia D Singh*, Nitin Bisht, Pooja Barthwal and Deepti Prabh portia_singh98@yahoo.in	Department of Seed Science and Technology, H.N.B Garhwal Central University, Srinagar	Effect of plant growth promoting rhizobacteria on wheat seed germination and growth supplemented with rosemary extract	72 – 72
91.	Pooja Barthwal*, Portia D Singh and Deepti Prabha poojabarthwal30@gmail.com	Department of Seed Science and Technology,H.N.B Garhwal Central University,Srinagar	Effect of ageing and harmonal priming on different physiological attributes of french bean (*phaseolus vulgaris*)	72 – 73
92.	Vishwa Mohan Dev Chauhan*, Anil K. Singh vmc01411@gmail.com	Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P)	Recent advances in floriculture	73 – 74

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93.	Rahul Chandel[1], Vishwa Mohan Dev Chauhan[2] rahulchandel02@gmail.com	[1]Department of Vegetable Science, College of Horticulture, Bengaluru, UHS, Bagalkot, [2] Department of Horticulture, I. Ag. Sci. , Banaras Hindu University, Varanasi (UP)	Improvement in Tomato	74 – 74
94.	Rohit Kumar[1*], Vishwa Mohan Dev Chauhan[2] dhiman0048@gmail.com	[1]Department of Horticulture, College of Agriculture, JNKVV, Jabalpur(MP) [2] Department of Horticulture, I. Ag. Science, Banaras Hindu University, Varanasi (UP)	Onion hybrid breeding in India	74 – 75
95.	Sunny Sharma[1] , Pankaj Thakur[2] and SPS Solanki[3] sunnsharma141@gmail.com	[1]Department of Fruit Science, [2]Department of Business Management, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh, [3]Department of Fruit Science, Punjab Agricultural University, Ludhiana, Punjab	Trend in Kiwifruit Cultivation in Mid-hills of Himachal Pradesh	75 – 76
96.	Megha, Deepti Shankdhar, Rajani Pant, Shruti budakotimegha1993@gmail.com	Department of plant physiology (C.B.S.H), GBPUAT Pantnagar, Uttrakhand, India	Effect of Increased Levels of Atmospheric CO_2 and High Temperature on Rice Growth and Quality	76 – 76
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99.	Pawan Kumar Bharti [1, 2, 3] gurupawanbharti@gmail.com	[1]Member, 30th Indian Scientific Expedition to Antarctica Bharti Island, Larsemann Hills, Christenson Coast, East Antarctica, [2]Antarctica Laboratory, R & D Division, Shriram Institute for Industrial Research, 19, University Road, Delhi , [3]Society for Environment, Health, Awareness of nutrition & Toxicology (SEHAT-India), 1775, Sohanganj, Near Clock Tower, Delhi-7, India	Preliminary Assessment of Biological diversity at Larsemann Hills, East Antarctica	78 – 78
100.	Gaurav Chand Ramola[1], V.P. Khandur[2], Y.S. Gusain[3] and Surjeet Rawat[4] gauravramola30@gmail.com	[1]Entomology Division, FRI, Dehradun (Uttarakhand) [2,3,4]College of Forestry, Ranichauri Uttrakhand	Changes in the Population Structure and Growing Stock in Different Deodar Forests of Garhwal Himalaya: A Revisitation Study Over 15 Years	79 – 79

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102.	Mahendar Singh Bhinda[1]* and Santosh[2] singhmahen14@gmail.com	[1]Department of Plant Breeding and Genetics, SKRAU, Bikaner [2]Department of Genetics and Plant Breeding, GBPUA&T, Pantnagar, Uttarakhand	Allele Mining and It's Applications in Crop Improvement	80 – 80
103.	Shivani Dhyani, Dhirendra Singh, Leela Bhatt and Pooja shivani1425@gmail.com	Department of Vegetable Science G.B. Pant University of Agriculture and Technology Pantnagar Uttarakhand	Assessment of tomato (*Solanum lycopersicon* l.) hybrids for fruit quality and yield characters in the hill region of utttarkhand	81 – 81
104.	Amit Kumar Yadav amit.cug@gmail.com	School of Environment and Sustainable Development Central University of Gujarat, Gandhinagar, India	Rhizofiltration technologies for heavy metal contaminated ash pond	81 – 81
105.	Pooja Kaintura and Geeta Gaur poojakaintura29005@gmail.com	Uttaranchal University, Dehradun	Neem and camphor based novel agents as an antimicrobial ingredient to extend vase-life of gerbera (*Gerbera jamesonii*) flowers	82 – 82
106.	Shabnam Thakur[1*], Rohit Kumar Nayak[1] and Anita Kumari Ujjwal[2] thakurshabnam995@gmail.com	[1]Department of Entomology Dr. Y S Parmar University of Horticulture & Forestry, Nauni, Solan (H.P.), [2]Department of Nematology Orissa University of Agriculture & Technology, Bhubaneswar, Orissa	Pest management of honey bees through non-chemical methods	82 – 82
107.	Subham Rana, Pooja Kaintura and Geeta Gaur shaktirana10@gmail.com	Uttaranchal University Dehradun	Effect of storage and packaging material on antioxidative capacity, TSS , acidity and sensory quality of juice of *Delinia indica*	83 – 83
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109.	Pooja Bhatt, K.P. Singh, Kumari Surbhi, Tabassum, Mukta nainwal and Aparna bhatt.pooja6493@gmail.com	Department of Plant Pathology, College of Agriculture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, U.S. Nagar, 263145, Uttarakhand, India	PCR based detection of fungicide resistance in plant pathogenic fungi	84 – 84

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111.	Bhawana Bhatt, A.K. Soni, Deepika Sharma bhawna.bhatt1992@gmail.com	Department of Vegetable Science, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (Uttarakhand)	Genetic variability and character association among yield and yield contributing traits in garlic germplasm	85 – 85
112.	[1]Ankita Thakur*, [2] Vishwa Mohan Dev Chauhan, [1]Shalini Thakur ankitath.16@gmail.com	[1]Department of Plant Pathology, Dr. Yashwant Singh Parmar University of Horticulture & Forestry, Solan, 173212, Himachal Pradesh, [2]Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, 221005, Uttar Pradesh.	Plant diseases- problems and solutions	85 – 86
113.	S.R.Rathi and A.R.Khaire mail2sanket.rathi@gmail.com	Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi	GRAIN QUALITY AN IMPORTANT ASPECT FOR BREEDING RICE (*Oryza sativa L.)*	86 – 86
114.	Abhishek Panwar, Shivangi Negi, Cherry Nalwa jackpanwar@gmail.com	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan 173230 (H.P).	Application of Nanotechnology in Seed Science Technology	87 – 87
115.	Vidisha Kandpal[1], P.K. Pande[1] and R.C. Dhiman[2] kandpal.vidisha@gmail.com	[1]Wood Anatomy Discipline, Botany Division Forest Research Institute, Dehradun, [2] ITC-PSPD (Unit: Wimco Seedlings Ltd, Bagwala, Rudrapur, Udham Singh Nagar)	Study of wood trait variations in full-sib progeny-clones of *Populus deltoides*	88 – 88
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133.	Santosh, Jai Prakash Jaiswal and Mahendar Singh Bhinda santosh.8956@gmail.com	Department of Genetics & Plant Breeding, College of Agriculture Govind Ballabh Pant University of Agriculture & Technology Pantnagar, Udham Singh Nagar, Uttarakhand- 263145, India	Germplasm screening for heat tolerance under different sowing conditions in bread wheat (*Triticum aestivum* L. em. Thell.).	98 – 98
134.	[1]Anil Kumar [2]Himanshu Thakur anilarora794@gmail.com	[1]Department of Entomology, Dr. Yashwant Singh Parmar UH&F, Solan,(H.P) [2]Department of Entomology and Agricultural Zoology, GBPUAT, Pantnagar (UK)	Agro-friendly insects in agriculture	98 – 99
135.	Himanshu Thakur[1], Vishwa Mohan Dev Chauhan[2], Anil Kumar[3] himanshumaimor@gmail.com	[1]Department of Entomology, GBPUAT, Pantnagar (UK), [2] Department of Horticulture, I. Ag. Sci. , Banaras Hindu University, Varanasi (UP) [3]Department of Entomology, Dr. Yashwant Singh Parmar UH&F, Solan,(H.P)	RNAi for Insect Control	99 – 99
136.	Garima Bhickta*, Neena Chauhan, Tanzin Ladon and Mamta Thakur gbhickta@gmail.com	Department of Fruit Science, Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan (H.P) 173230	Effect of deferent nitrogen sources and their levels on nutrient status of apple (*Malus X doestica* Borkh) cv. Starking Delicious	100 – 100
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138.	Vinay Chamoli, Piyusha Singh and Arun Bhatt chamolivinay.44@gmail.com	Department of Crop Improvement College of Forestry and Hill Agriculture V.C.S.G. Uttarakhand University of Horticulture and Forestry, Ranichauri, Tehri, India	Studies on correlation and genetic diversity in Faba bean (*Vicia faba* L.)	101 – 101

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141.	Tanzin Ladon and Garima Bhickta tanzinldn92@gmail.com	Department of Fruit Science Dr. YSP, UH&F, SOLAN (H.P.)	Area specific biodiversity conservation of fruit crops	103 – 103
142.	Nishesh Sharma nishesh21@gmail.com	Department of biotechnology, UCALS, Uttaranchal University. Dehradun.	Biotechnological approach for conservation of selected species of genus *Withania*	103 – 103
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144.	Sumira Malik, Amrita Singh, Mushike Sai Sri, Yuvraj Yadav, Changsoo Kim* nandini19835@gmail.com	Tula's Institute, Chakrata road, Dhoolkot, Dehradun, *Schoolof Biological Sciences and Biotechnology, Chonnam National University, Gwangju, South Korea	The proposed methodology to study negative regulation of *Agamous* (AG) in whorl 1 and 2 in *Arabidopsis thaliana* at molecular level.	104 – 104
145.	Amrita Singh and Sumira Malik nandini19835@gmail.com	Department of Agriculture and Forestry , Tula's Institute, Chakrata road, Dhoolkot, Dehradun,	Cultivation and study of growth of oyster mushroom on different agricultural & forest waste substrate and its medicinal properties	105 – 105
146.	Sumira Malik, Amrita Singh, Thota Greeshma* and Kim Changsoo* nandini19835@gmail.com	Tula's Institute, Chakrata road, Dhoolkot, Dehradun, *Schoolof Biological Sciences and Biotechnology, Chonnam National University, Gwangju, South Korea	Molecular characterisation of mechanism of miRNA repression of *TOE1* gene acting as floral state repressor	105 – 106
147.	Sumira Malik, Amrita Singh, Thota Greeshma*, Yuvraj Yadav, Kim Changsoo* nandini19835@gmail.com	Tula's Institute, Chakrata road, Dhoolkot, Dehradun, *Schoolof Biological Sciences and Biotechnology, Chonnam National University, Gwangju, South Korea	The proposed method to study negative regulation of *WUS* in whorl 3 and 4 by *AG* in *Arabidopsis thaliana* at molecular level.	106 – 106
148.	LekhrajJat, S.K.Rai and Rubby Sandhu choudharylucky854@gmail.com	Division of Plant Breeding and Genetics, Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu	Genetic diversity analysis in Indian mustard.(*Brassica juncea* L.) using SSR Markers	106 – 106
149.	Yogita Navani and Awadhesh Kumar Singh yogita.navani@gmail.com	Department of Agriculture and Forestry , Tula's Institute, Chakrata road, Dhoolkot, Dehradun	Fostering second green revolution to achieve self sufficiency in food production in India	107 – 107

Abstract – 01

EFFECT OF MICRONUTRIENTS ON FLORETS YIELD OF BROCCOLI (*BRASSICA OLERACEA* L. VAR. *ITALICA*) IN THE TEMPERATE HIMALAYA OF UTTARAKHAND

A.C. Mishra and Naveen Chandra

Department of Vegetable Science, Uttarakhand University of Horticulture and Forestry, Ranichauri Campus, Tehri-Garhwal-249 199 (Uttarakhand)

The present investigation was conducted in Vegetable Research Block of Uttarakhand University of Horticulture and Forestry, Ranichauri Campus, Tehri-Garhwal (2000 m altitude, 30^0 15'N latitude and $78^0$02'E longitude), the rainfed temperate hills of Uttarakhand during spring-summer (February to June), 2013 in broccoli hybrid Calabrese (F_1). The experiment was laid out in randomized complete block design with three replications. The treatments included three foliar sprays of boric acid @ 100 ppm (T_1), zinc sulphate @ 100 ppm (T_2), ammonium molybdate @ 50 ppm (T_3), copper sulphate @ 100 ppm (T_4), ferrous sulphate @ 100 ppm (T_5), manganese sulphate @ 100 ppm (T_6), combinations of T_1 with T_2 to T_6 (T_7 to $T_{11,}$ respectively), mixture of T_1 to T_6 (T_{12}), a commercial formulation 'Multiplex' @ 100 ppm (T_{13}) and a control with no spray (T_0) as specified in table 1. The schedules of foliar spray were at fortnightly interval from 15 days after transplanting. The results indicated that higher and statistically *at par* head yield was realized with three foliar spray at fortnightly intervals of boric acid @100 ppm + zinc sulphate @ 100 ppm (408.3 q/ha) followed by boric acid @100 ppm + ammonium molybdate @ 50 ppm (383.3 q/ha) and mixture of B, Zn, Mo, Cu, Fe & Mn salt solutions (T_1 to T_6) (362.5 q/ha).

Key words: Broccoli, micronutrients, temperate Himalaya, cole crops

Abstract – 02

ASSESSMENT OF MAIZE INBRED LINES SHOWING VARIABILITY FOR DROUGHT TOLERANCE UNDER TEMPERATE CONDITIONS

Asima Gazal[1], F. A. Nehvi[2], Ajaz Ahmad Lone[3] and Zahoor Ahmed Dar[3]

[1]Division of Genetics & Plant Breeding, SKUAST-K, J&K, [2] Saffron Research Station, Pampore, SKUAST-K, J&K, [3]Dryland Agricultural Research Station, SKUAST-K, Budgam, J&K

A set of hundred homozygous maize inbred lines were analyzed for resilience to moisture stress for twenty-four traits related to maturity, morphological, physiological, yield, quality and root traits. Evaluation confirmed a wide range of variability revealing significant response of main effects (lines, irrigations and years and their respective digenic and trigenic interactions). Fifteen elite identified lines performed well under moisture stress conditions showing inbuilt tolerance towards moisture stress. A set of 32 SSR markers, having genome-wide coverage, was chosen for genotyping the inbred lines. These markers generated a total of 239 polymorphic alleles with an average of 7.47 alleles per locus. The minimum and maximum PIC value was 0.886 and 0.608 with a mean of 0.782. The coefficient of genetic dissimilarity ranged from 0.215 to 0.148. DARwin derived cluster analysis grouped 15 elite maize lines in three major clusters with five lines each in cluster-III and II and four lines in cluster-I with KDM-361A as root. Molecular diversity however, confirmed diverse genetic nature of six lines (KDM-372, KDM-343A, KDM-331, KDM-961, KDM-1051 and KDM-1156) showing resilience to moisture

stress. Exploitation of identified elite lines in a crossing programme involving all possible combinations will help to develop hybrids with inbuilt mechanism against moisture stress. Genotyping data complemented by morpho-physiological parameters were used to identify a number of pair-wise combinations for the development of mapping population segregating for drought tolerance and potential heterotic pairs for the development of drought tolerant hybrids.

Key words: Genetic diversity, SSRs, drought, D^2 analysis.

Abstract – 03

HORTICULTURE CROPS IN PHYTOREMEDIATION

[1]Bichhinna Maitri Rout, [2]Dinesh Nagar and [3]Reshma V.S.

[1]Department of Vegetable Science, CCS Haryana Agricultural University (CCSHAU), Hissar, [2]Division of Horticulture, Rajasthan Agriculture Research Institute (RARI), Durgapura, Jaipur, [3]Department of Floriculture and Landscape Architecture, Horticulture Section, College of Agriculture Nagpur, Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola

Phytoremediation refers to the treatment of environmental problems through the use of plants that mitigate the environmental problem without the need to excavate the contaminant material and dispose of it elsewhere. Plants uptake contaminants through the root system and store them in the root biomass and/or transport them up into the stems and/or leaves thus reducing the concentration of metals in the soil. Horticultural crops are reported to be a good source of phytoremediation according to their abilities to absorb trace elements they are classified as: low accumulation Leguminosae, medium accumulation (Liliaceae, Cucurbitaceae and Umbelliferae) and high accumulation (Chenopodiaceae, Cruciferae, Solanaceae and Compositae). Some important species like Brassica is an effective species in lead remediation, carrot and pumpkin in cadmium, red beet in lead, manganese and zinc .As the problem of heavy metal pollution is increasing and the area under cultivation of horticulture crops also increasing these can be successfully used to detoxify and decontaminate soils.

Key words: Heavy metals, pollution, environment, soil.

Abstract – 04

QUANTITATIVE TRAIT LOCI (QTLs) MAPPING FOR DIVERSE TRAITS IN MAIZE

Dan Singh Jakhar[1], R.P. Srivastava[2] and Vimal Chaudhary[2]

[1]Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, BHU, Varanasi, [2]Department of Agriculture, Quantum University, Roorkee, Uttrakhand

Maize *(Zea mays* L.) is an important cereal crop belongs to the tribe Maydeae, of the grass family, poaceae. It now ranks as the third most important food grain crop in India. QTL mapping is the statistical study of the alleles at a locus and the phenotypes they produce. Because most traits of interest are governed by more than one gene, defining and studying the entire locus of genes related to a trait gives hope of understanding what effect the genotype of an individual might have in the real world. Most agronomical important traits of crop plants have a complex inheritance pattern and are under the control of many genes. The genetic loci associated with complex traits are called quantitative trait loci (QTLs). QTL analyses has certainly aided in greater understanding of the genetic architecture of various traits, including disease resistance and drought tolerance in crops like maize.

QTLs for several important traits have been mapped in maize. The traits include plant height, downy mildew resistance, SCMV resistance, common smut resistance, head smut resistance, *Fusarium moniliforme* ear rot resistance, banded leaf and sheath blight (BLSB) resistance, yield under drought stress at flowering time, high-oil and popping ability.

Key words: Quantitative trait loci, diverse traits**,** *Zea mays* L.

Abstract – 05

BIO-HERBICIDES: A NOVEL APPROACH FOR SUSTAINABLE WEED MANAGEMENT

Deepak Kumar[1], Vinay Kumar Kardam[2], Ajay Kumar Meena[3] and Sheilendra Kumar[4]

[1]Department of Agronomy, Dr.PDKV Akola (MS), [2]Department of Pathology, DR. YSP UH&F, Nauni(HP), [3]Department Of Agronomy, MPUAT, Udaipur (Raj.), [4]Department Of Agronomy, SKRAU, Bikaner(Raj.)

Bio-herbicides are biologically based control agents useful for biological weed control hence, bio-herbicides have been identified as a significant biological control strategy. In the bio-herbicide approach uses indigenous plant pathogens that are isolated from weeds and are cultured to produce large quantity of infective material. Bio-herbicides have many beneficial effects such as clearly defined for targeted weeds, less side effect on beneficial plants or human health, a lack of pesticide residue build-up in the environment, and effectiveness for control of some herbicide resistant weed biotypes. It has been proved that mixtures of some bio-herbicides and synthetic herbicides with ideal ratio can be more effective without loss. Special situations in which bio-herbicides may be most effective include management of weeds that are considered herbicide-resistant, parasitic, and invasive. The bio-herbicide approach has been successfully implemented for a number of important agricultural, invasive and exotic weeds.

Key words: Bio-herbicide, Weeds, Pathogens

Abstract – 06

INFLUENCE OF INORGANIC AND BIO-FERTILIZERS ON GROWTH AND YIELD OF CAULIFLOWER (*BRASSICA OLERACEA* L. VAR. *BOTRYTIS*) UNDER GARHWAL HIMALAYA CONDITIONS

K.N. Shah, D.K. Rana and Vivek Singh

Department of Horticulture, H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand

The present research work was conducted at the Horticultural Research Centre, H.N.B University, Srinagar Garhwal, Uttarakhand (India) during 2016 in rabi season for estimation of effects of inorganic and bio-fertilizers on various properties of cauliflower cv. Snowball-16. In this research work, four biofertilizers *viz., Azospirillum*, *Azotobacter*, PSB and VAM, two levels of nitrogen and phosphorus *viz.,* 75% and 100% of recommended dose of NPK @ 120:60:60 kg/ha was taken. It was noted that, the application of *Azospirillum* + recommended dose of NPK i.e. 120:60:60 kg/ha through chemical fertilizers significantly increased plant height (cm), number of leaves per plant, gross weight of plant (without root), average weight of curd (g) and yield of cauliflower (kg). The maximum net income and cost benefits ratio was recorded in same treatment.

Key words: Cauliflower, azospirillum, azotobacter, PSB and VAM

Abstract – 07

GREEN LEAFY VEGETABLES: A NUTRIENTS BUNDLE

Kapil Sharma[1], Deepak Kumar[2], S.G. Telkar[3] and Vikas Raghuwanshi[4]

[1]MJRP University, Jaipur, [2]Department of Agronomy, Dr. PDKV, Akola, [3]CPGS, CAU, Ummiyam, Meghalaya, [4]Department of Extension Education, SHUATS, Allahabad

Green leafy vegetables are nutrient-bundle and incredibly healthy. They are vital sources of antioxidants and they are the best which are very beneficial to providing weight loss and maintenance, because it keeps you feeling full and helps control your hunger. Also, leafy vegetables are full of fiber, vitamins; minerals and substances that help protect you from disease. Nutrient analysis various vegetables which are lettuce, cabbage, parsley, spinach and amaranthus to estimate some nutritional values present on them such as: carbohydrate (sucrose, fructose, glucose and starch), protein, amino acids (lysine and phenyl alanine), vitamin C (ascorbic acid) and lipid. And it is helpful for to check nutrient potential of vegetable for developing various health supplement formulas and various value added product in reference to higher nutrient value and also used for fortification of various food product.

Key words: Green Leafy vegetable, Nutrient, Health, Minerals, Fiber

Abstract – 08

INTEGRATED MANAGEMENT OF DISEASES CAUSED BY *FUSARIUM SPP.*

Krishna Kumar[1], Sandeep Kumar[1], Sarvesh Kumar[2] and Ravi Prakash Gupta[2]

[1]Department of Plant Pathology, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad, (U.P.), [1]Department of Plant Pathology, Sardar Vallabh Bhai Patel University of Agriculture & Technology Modipuram Meerut (U. P.), [2]Department of Agricultural Statistics, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad, (U.P.)

Wilt diseases are caused by the *Fusarium spp.,* namely *F. oxysporium f. sp. udum, F. solani f. sp. coeruleum, F. monoliforme* and *F. oxysporum f. sp. roseum,* are the most common and worldwide in distribution. The fungus can survive in soil indefinitely as mycelium, clamydospores, microconidia and macroconidia. Infected plants show tissue discoloration. The grains/pulses become softened, wrinkled and mummified in storage. Despite many attempts to control this disease but the problem is still important worldwide. The management practices generally employed for its control include resistant cultivars, cultural practices, biological, biotechnological approaches and need based chemical applications. However, incorporation of integrated management provides a better opportunity to manage *Fusarium spp.* An Integrated Diseases Management (IDM) approach was carried out to combat pigeon pea, Tomato, Banana and Wheat wilt with a combination of bio agents, organic amendments and adopt different cropping systems for two years. Based on 2-3 years performance of different treatments. Need based application of fungicides are also can be used for IDM programme, for effective management of Fusarium wilt, a combination of carbendazim for seed treatment @2g/kg of seeds + soil application of *P. fluorescens, T. Viride* each @ 2.5kg/ha. in FYM @ 50kg/ha should be applied. These diseases

could be managed effectively and eco-friendly through different cultural practices, seed and soil treatment, resistant varieties and by need based environmental friendly chemicals.

Key Words: Fusarium, IDM and seed and soil treatment

Abstract – 09

HIGH DENSITY PLANTING: A MODERN METHOD OF PLANTING IN APPLE

Kunzang Lamo[1] and Shivendu Pratap Singh Solanki[2]

[1]SKUAST-Jammu, [2]Department of Fruit Science, PAU, Ludhiana

Planting of fruit trees rather at a closer spacing than the recommended one using certain special techniques with the sole objective of obtaining maximum productivity per unit area without sacrificing quality is often referred as 'High density planting' or HDP. High density planting system for efficient use of horizontal and vertical space. This technique was first established in apple in Europe during sixties and now majority of the apple orchards in Europe, America, Australia and New Zealand are grown under this system. In this system, four planting densities are recognized for apples viz., low HDP (< 250 trees/ha), moderate HDP (250-500 tree/ha), high HDP (500 to 1250 trees/ha) and ultra-high HDP (>1250 trees/ha). Advantages of HDP include early cropping, higher yields for a long time, reduced labour costs and improved fruit quality. The average yields observed in apple is about 5.0 t/ha under normal system of planting and 140.0 t/ha under HDP. The trees of HDP should have maximum number of fruiting branches and structural branches. The trees are generally trained with a central leader surrounded by nearly horizontal fruiting branches. These branches should be pruned in such a way that each branch provides minimum amount of shade on other branches. Success of HDP depends upon the control of tree size. This can be achieved by use of dwarfing and intermediate root stocks like MM 106, MM 109, and MM 111 in apple. Use of spur type scions, training and pruning methods can also induce dwarfness. Apple trees trained under spindle bush, dwarf pyramid, cordon systems are suitable for HDP systems. Growth regulators such as diaminozide, ethephon, chlormaquat and paclobutrazal are extensively used to reduce shoot growth by 30 to 0 %. This results in increased flowering in the subsequent years. Tying down the branches to make them grow to an angle of 45° from the main stem are some of the standard practices to control tree size. The success of HDP depends upon the right choice of planting system. Generally, rectangular planting with single, double and three row plantings are followed.

Key words: High density planting, modern technique, apple (*Malus domestica* Borkh.).

Abstract – 10

ISOLATION AND CHARACTERIZATION OF BACTERIAL ISOLATES FROM AGRICULTURE FIELD SOIL OF ROORKEE REGION

Murugalatha N Kannan[1], Sonam Sethi[2], Anoop Badoni[1], Vinay Chamoli[1] and Naveen Chandra[1]

[1]School of Agricultural Studies, Quantum University, Roorkee, [2]Department of Applied Sciences and Humanities, Quantum University, Roorkee

Microorganisms present in soil plays a major role in enhancing the plant growth. In our present study soil sample was collected from the agriculture field of Quantum Global Campus, Roorkee and bacterial organisms were isolated by serial dilution technique. Well defined isolated colonies were selected and pure cultured. The

isolates were named as QAF01, QAF02, QAF03, QAF04 and QAF05. Biochemical characterization of the above mentioned isolates determined that 20% of the isolates were spore formers, 60% were motile in nature, 100% were rod shapers in morphology and 60% were gram positive in reaction. Metabolism of various sugars was done at a maximum rate by the isolates QAF04 and QAF03. Based on their biochemical characterization and carbohydrate fermentation the isolates were identified to be *Bacillus* sp, *Pseudomonas* sp, *Streptomycis* sp, *Azotobacter* sp and *Alcaligenes* sp.

Key Words: Agriculture soil, isolates, bacteria, spore formers, motile

Abstract – 11

NATURAL REGENERATION STATUS OF FOREST COMMUNITY AT DANDACHALI FOREST, TEHRI FOREST DIVISION IN NORTH WEST HIMALAYA UTTRAKHAND

Pankaj Lal, J. S. Butola, and Rathiesh.P.
College of Forestry, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Ranichauri

Studies on forest vegetation pertaining to diversity, natural regeneration status of plant communities. The present investigation was conducted in Dandachali forest of Tehri Forest Division, North-Western part of Himalaya. Surveys and sampling of the vegetation were done using standard ecological assessment methods with an aim to study plant species natural regeneration pattern at community level. nineteen woody species (19) in 6 forest communities *viz*., *Pinus roxburghii- Quercus leucotrichophora* mixed, *Pinus roxburghii, Pinus roxburghii- Rhododendron arboreum* mixed, *Cedrus deodara- Pinus wallichiana* mixed, *Cedrus deodara- Rhododendron arboreum* mixed and *Rhododendron arboreum- Quercus leucotrichophora* mixed, have been recorded in 16 sites between 1482- 2200 m asl. Among the communities, total tree density ranged from 263.34-1493.33 Ind ha^{-1}, TBA 260.2- 310.7 m^2 ha^{-1}. All the communities showed optimum regeneration of dominant species. Total seedlings density ranged from 280-2470.0 Ind ha^{-1} and saplings density 140-446.7 Ind ha^{-1}. *R. arboreum – C. deodara* showed maximum regeneration in terms of higher seedling and sapling density in this community.

Key word: regeneration, recruitment, seedling, sapling, status

Abstract – 12

PRODUCTION OF WILD POMEGRANATE FOR RURAL ECONOMIC DEVELOPMENT OF HIMACHAL PRADESH

Pankaj Thakur[1], Piyush Mehta[1], Rinku Babu[1] and Sunny Sharma[2]
[1]Department of Business Management, [2]Department of Fruit Science Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh -173230, India

Himachal Pradesh is bestowed with enormous diversity of agro-ecological conditions permitting cultivation of diversified vegetables, fruits including wild fruits. The shrinking land holding and declining investment in agriculture is pointing out towards increasing need of crop diversification. Majority of the farmers in the state have small land, the poverty of large numbers can be eradicated by only with the introduction of high value crops combining with the agricultural activities. Wild Pomegranate is one of the important cash crop tree species of the mid hill zone of western Himalayan region. The versatile adaptability, therapeutic values and better

keeping quality are the feature responsible for its cultivation on wide scale. It is distributed in Mandi, Kullu, Solan, Sirmour, Shimla and Chamba districts of Himachal Pradesh. Wild pomegranate fruits are handpicked by rural people directly from the bunds and boundaries of their agricultural fields where it mostly growing naturally. Also the trees growing in their pasture land and nearby forests are harvested by villagers during the month of September and October. They processed it manually through tradition methods in which the seeds of wild pomegranate which are fleshy are just spread on the roofs and sum dried to make *Anardana* which is sell in the market. So dried pomegranate is having an important role in the economy of rural households. Local farmers have long recognized the importance of tree. The grading in the *anardana* is done on the basis of its colour, juicy content and odour. The red quality is defined under the Grade-1 and the black with some good moisture content is under Grade-2. Grade-3 is the poor quality *anardana* seeds having number colour mostly white with less juicy content. *Anardana* is used in making chutney, as a souring agent and for various other medicinal and pharmaceutical uses. The dried rind yields a fast yellow dye, which is used for dying cloth and making a hair dye. The fruit rind contains 30 percent tannis which can be successfully used in combination with synthetic tannis for tanning leather. The root bark contains 22 percent of tannis which could be used for tanning and dying leather and also for making jet dye. The juice of fresh leaves and young fruits is useful in dysentery. The systematic cultivation of wild pomegranate has now started on commercial basis in many parts of the state. The adoption of improved technologies in production and efficient marketing system is a pre-requisite for stable and remunerative prices to the producers which go in a long way to provide necessary incentives to increase production and income of the growers.

Key words: Pomegranate, production and rural development

Abstract – 13

INCREASED SEED QUALITY DUE TO DIFFERENT LEVELS OF NITROGEN AND PHOSPHORUS IN CORIANDER (*Coriandrum sativum* L.)

Pooja and S. K. Maurya

Department of Vegetable Science, G.B. Pant University of Agriculture and Technology Pantnagar-263145, Uttarakhand

Quality of seed crop is utmost important trait which decides its industrial value. High amount of essential oil content, seed viability, good germination % etc are few of the quality parameters that a seed spice crop must have. Good germination percentage reduces the cost of seed. The oleoresin is used in perfume and pharmaceutical industries, in beverages to flavor gin and liqueurs and it is used as food flavoring compound in perfumery and soap making hence, have a great demand and a good venture opportunity for farmers. Keeping this in mind during the winter season of 2014-2015, An investigation was conducted at the Main Garden of Department of Horticulture, Dr.PDKV Akola, Maharashtra to determine the influence of different levels of nitrogen and phosphorus on coriander variety Hisar Anand for achieving better quality of this crop. Four different levels of nitrogen (40, 50, 60 and 70 kg/ha) and three different levels of phosphorus (30, 40 and 50 k/ha) were applied in the plots. The experiment was laid out in FRBD with 3 replications. There was a significant effect of application of these two nutrients on seed quality of coriander. Test weight (14.21 g), germination %

(57.81) and oleoresin content (0.77) was recorded significantly maximum with treatment N_3 (60 kg N/ha).In respect to phosphorus, significantly maximum values for quality traits test weight (12.87), germination % (65.16) and oleoresin content (0.70) was observed with treatment P_3 i.e. 50 kg /ha. Therefore, the fertilizer treatment (N_{60} + P_{50} kg/ha) was observed to be the best for achieving maximum quality of coriander seeds.

Key words: Seed spice, Oleoresin, Germination %, Test weight

Abstract – 14

PROPAGATION OF *LITSEA GLUTINOSA* - AN ENDANGERED AND THREATENED MEDICINAL TREE OF NORTH - WEST HIMALAYA

Ram Gopal and Nawa Bahar

Silviculture and Forest Management Division, Forest Research Institute, Dehradun (U.K.)

Litsea glutinosa is widely distributed throughout India and commonly known as Maida Lakri belonging to the family Lauraceae. It is distributed throughout country ascending upto an altitude of 1400m. It is medium-sized tree species up to the 20 m height with straight bowl. The flowers occur between March and June and fruits appear in September-October and it is black globose. Bark is used for stomach disorder and to treat the diarrhoea and dysentery. Among the veterinary uses, the application of bark paste on the limb fracture and on the wounds of the necks of bullocks is prominent. Decoction of bark applied to sores, scabies and to aches and pains. Young leaves are eaten by livestock. Juice of crushed leaves applied to sore eyes. Seed contains aromatic oil which has been used to make candles and soap. Due to its multipurpose uses in the field of medicine, owing to its high medicinal value, demand of this species is increasing day by day the species is being exploited from its natural pockets illegally. So, population of this species is reducing in their natural zone then made the species as endangered and threatened causing grave concern about the loss of wide germplasm. As per the IUCN category the species was listed in endangered category. As the seeds are unfertile and germination per cent is very low are hinders the natural generation. The priority area of research in this species needs to include conservation and propagation for reintroduction into their natural habitats. The investigation was carried out to propagate the species using seed, branch cutting and root cutting (Thongs) also.

Key words: *Litsea glutinosa*, Maida lakri, Endangered, Threatened, Propagation

Abstract – 15

GENOTYPIC VARIATION IN CARBON ASSIMILATION POTENTIAL OF *DALBERGIA SISSOO* CLONES IN A VEGETATIVE MULTIPLICATION GARDEN (VMG)

Ram Gopal and Meena Bakshi

Plant Physiology Discipline, Forest Research Institute, Dehradun

Sissoo (*Dalbergia sissoo* Roxb.) is an economically important timber species of northern India. Heavy mortality of Shisham has been registered in almost all sissoo growing areas in India. Identification of disease resistant genotypes would be the first step in improvement and breeding. Screening of high Carbon assimilators would be an additional advantage to enhance productivity. Studies in this direction are already on the anvil in FRI. A VMG of selected clones has been raised at FRI representing 96 clones. In present study, we monitored photosynthetic efficiency of 18 geographical diverse clones of India and Nepal. Photosynthetic measurements were made with

LICOR 6400, portable photosynthetic system at peak hours (9 AM) during summer months. There were significant variations (P<0.01) in Pmax among clones. The Photosynthetic rate varied from 30.30 µmol CO2 m^{-2} s^{-1} to 22.60 µmol CO2 m^{-2} s^{-1} which is 34% more in clone 374 (Gonda) than clone 232 (Gonda). The vapour pressure deficit (LAVPD) based on leaf temperature (CT leaf out) to the tune of 2.68 kPa was maximally recorded in clone of Nepal (113) and minimum (1.73 kPa) in 41 (Gonda) while transpiration rate (T_{rm}) was maximum(12.58 m mol H_2O m^{-2} s^{-1}) in clone no. 96 (Hanumangarh) and minimum (9.00 m mol H_2O m^{-2} s^{-1}) in clone. 204 (Gonda). Inspite of high VPD in Nepal clone, there was no indication of high Transpiration losses thus depicting conservative nature of the clone towards water loss. The stomatal conductance to H_2O (Cond $_{out}$) was maximum (0.53) in clone 105 belonging to Hanumangarh and minimum (0.37 mol H_2O m^{-2} s^{-1}) in 239 (Gonda) depicting no relation with intercellular CO_2 (Ci) which was maximum (309.25 µmol CO2 $mol^{-1)}$ and minimum (232.06 µmol CO2 mol^{-1}) in clone 41 (Gonda) and 128 (Nepal) respectively. Inspite of high conductance (0.53 mol H2O m^{-2} s^{-1}), the clone 105 recorded moderate Ci and 27.6 Pmax depicting efficient utilization of Ci whereas clone 41 showed maximum 309.25 µmol CO2 mol^{-1} Ci coupled and high Pmax (28.05 µmol CO2 m^{-2} s^{-1}) inspite of low conductance of 0.50 depicting thus low efficiency. Interestingly with minimum Conductance of 0.37coupled with Ci of 261 µmol CO2 mol^{-1}, clone 239 showed 26. 86 Pmax. In a nutshell, ample genotypic variation in Carbon assimilation of sissoo clones can be potentially used to capture genotypes with high carbon sequestration potential for improvement and breeding, however, a detailed understanding of processes involved with environmental factors is required to be investigated.

Key word: Genotype, *Dalbergia sissoo*, VMG, Photosynthesis

Abstract – 16

DEVELOPMENT OF SIMPLE AND FAST *IN VITRO* SCREENING TECHNIQUE AGAINST SALINITY IN CHICKPEA (*CICER ARIETINUM* L.)

Richa Chauhan
Department of Botany, Chaman Lal Mahavidyalaya, Landhura, Haridwar

Inhibitory effects of NaCl on tracheary element (TE) differentiation in light grown callus of chickpea were investigated to screen salinity tolerant lines. When callus was grown in a MS medium containing no NaCl (control medium) , up to 16% of chickpea plant cell differentiated in to tracheary elements during *in vitro* culture . Among four stains used for staining the tracheary element and nucleus , potassium permanganate and acetocarmine gave the best response. Experimental results indicated That adding 1% NaCl to the control medium reversibly inhibited the formation of tracheary elements in the cells. The rate of tracheary element formation increased accordingly as the rate of cell growth in control medium and nucleus were also taken dark stain . In the presence of high salt, the degree of tracheary element differentiated remained low and nucleus taken light stain through the growth cycle. The result suggest that high salt inhibit both the biosynthesis of secondary wall components and cell elongation chickpea plant *in vitro* culture.

Key words: Salinity, callus, *in vitro* and chickpea

Abstract – 17

ORGANIC MANURE PRODUCTION: AN ECO-FRIENDLY APPROACH

Rinku Babu, Pankaj Thakur and Piyush Mehta

Department of Business Management, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan (H.P)-173230

Chemical fertilizers, though played a significant role in Indian agriculture facilitating green revolution and making the country self reliant in crop production, continuous use of such easily soluble chemical fertilizers in high doses, however, contribute to soil degradation, through a combined effect of acidification, micro nutrient depletion, ground and surface water pollution, and reduced soil microbial activity etc. In the direction of restoring a clean environment and protecting environment from the adverse effect of developmental approach, the Agenda 21 of the United Nations Conference on Environment and development held at Rio de Jeniro during 1992 emphasised ecological security and social equity for the sustainable future. Added to such emphasis the growing concern about the adverse affect of chemical agriculture has led to development of eco-agriculture that encourages the use of organic inputs like biofertilisers, biopesticides etc. to produce better quality organic products. In view of this, vermicomposting offers immense scope to small and marginal farmers in creating their own organic manorial resources and ways to generate alternative income. Vermicompost is considered as the relatively new introduction in the broad group of biofertilisers. Biofertilisers are the preparations containing living cells or latent cells of microorganisms which, when used on seed or soil, benefits the plants by providing nutrients and mineralised the organic matter. Various preparations of biofertilisers such *as Rhizobium, Azatobactrin, Phosphobactrin*, etc. are available in the market. The micro organisms like blue-green algae, Azolla, Azatobacter etc. are also responsible for fixing atmospheric nitrogen directly. Vermicastings largely consists of excreta of burrowing earthworms, cocoons and undecomposed organic matter. From vermiculture, we get well decomposed worm casts, which can be used as manure for crops, vegetables, flowers, gardens, etc. In the process, earthworms also get multiplied and the excess worms can be converted into vermiprotein which can be utilised as feed for poultry, fish, etc. Vermi-wash can also be used as spray on crops. Thus various economic uses can be obtained from organic wastes and garbage and prevent pollution. It has been estimated that organic resources available in the country alone can produce not less than 20 million tonnes of plant nutrients (NPK). Vermicompost technology has promising potential to meet the organic manure requirement in both irrigated and rainfed areas.

Key words: Organic**,** biofertilisers, biopesticides and vermicomposting

Abstract – 18

EFFECT OF ABIOTIC FACTORS ON NECTAR PRODUCING BEE PLANTS

Rohit Kumar Nayak[1], Shabnam Thakur[1] and Anita Kumari Ujjwal[2]

[1]Department of Entomology, Dr. Y S Parmar University of Horticulture & Forestry, Nauni, Solan (H.P.)

[2]Department of Nematology, Orissa University of Agriculture & Technology, Bhubaneswar, Orissa

Bee plants are those plant species that provide food sources in the form of nectar and/ or pollen. But now these plants are not providing the nectar and pollen in proper way. These plants are influencing through various abiotic factors (sunlight, air temp., humidity, soil temp. etc.). Sunlight affects the nectar production more in herbs, shrubs then trees because high sunlight creates drought conditions for bee plants. Low relative humidity also creates water stress condition that increase evaporation and concentration of nectar, which ultimately leads to its crystallization (Corbet *et al*., 1979). Improper soil temperature and moisture affect the root system of bee plants so result into low and poor nectar production. During last few decades, soil fertility and nutrients are highly affected through various abiotic factors as a result bee plants don't receive all essential nutrients and fertile soil.

Key words: Bee plant, abiotic factor, nectar, crystallization, soil fertility

Abstract – 19

ENVIRONMENT SECURITY THROUGH MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE ACT

Santosh Singh and R. S. Negi

Department of Rural Technology, H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand-246174

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has sustained as innovative and renovative the environment all over rural India. MGNREGA aim is enhancing livelihood security at the national level through the proving 100 days employment to the rural household in every household in an ever year. In India, nearly 70 percent population is working in agriculture and its allied activities. The present research paper is trying to look into the various aspects of the MGNREGA and its impact on environment security. Through gram sabha and gram panchayat works have undertaken which are largely improving water resources, land development, soil and water conservation with sustainable protection. As we know that water is very essential to the environment, the act managed the irrigation system, improvement, and renovation of traditional water sources, land development, and drought. This act commenced the work to generate the ground water recharge soil, biodiversity conservation, land degradation and building resilience to current climate risks such as moisture, stress, delayed rainfall, drought, and floods. MGNREGA has been called as a scheme that provides sustainable livelihood or green jobs to crores of workers engaged in restoring the rural environment. This is because the works created under MGNREGA are claimed to have massive potential to improve environmental indicators, for instance, by raising water levels, improving soil quality etc. The present research paper is trying to show the effect of MGNREGA works on environment and sustainable development and employment generation to a household.

Key words: Employment, Environment security, MGNREGA, Sustainable development

Abstract – 20

AN INCH OF LAND AND BUNCH OF CROP

S.G. Telakar[1], A.K. Singh[1], Kamal Kant[1] and S.P.S. Solanki[2]

[1]College of Post-Graduate Studies, Central Agricultural University, Umiam, Meghalaya, [2]Punjab Agriculture University, Ludhiana, Punjab

One of the key challenges of the 21st century is developing country to ways of producing sufficient amounts of food while protecting both environmental quality and the economic. India holds 2nd rank in human population is next to China. The agriculture sector in India is enormously significant in spite of its declining share in GDP. Shares of GDP in agriculture sector were 14.6% during the 2010-11 and at present time 13.9% due to continuously decreasing net sown area (140.8 Mha in 2011-12 and 139.9 Mha in 2015-16). In our country per capita land availability is only 0.1 ha and its continuously decrease due to increase in industrialization and urbanization. The food grain demand of huge population is increase; in future by 2050 India needs up to 333 Mt food grains. So we need to increase agricultural production up to 60%. Consequently attention is now being directed toward the development of crop production systems with improved resource use efficiencies and more benign effects on the environment. So, fulfil the requirement of continuously increase in population and decrease in cultivable land area, then only option to move to words the multiple cropping, mixed cropping, crop rotation and intercropping an approach to cropping system diversification. Multiple cropping increases the crop productivity per unit area. It has cropping intensity is always greater than 200%, and LER is always more than one. So that it possible to meet out the future food grain demand by adopting approach of an inch of land and bunch of crops.

Key words: Crop diversification, multiple cropping, mixed cropping, crop rotation and intercropping.

Abstract – 21

IMPACT OF SOYBEAN CULTIVATION TRAINING PROGRAMME CONDUCTED BY KRISHI VIGYAN KENDRA FOR FARMERS OF GUNA DISTRICT OF MADHYA PRADESH

Vikas Raghuwanshi[1], Shivendu Pratap Singh Solanki[2], Devprakash Gocher[3] and S.G. Telkar[4]

[1]Department of Agriculture Extension, SHUATS, Allahabad, [2]Dr. YS Parmar, UH&F, Solan (H.P.), [3]Department of Nematology, MPUAT, Udaipur(Raj.), [4]CPGS, CAU, Ummiyam, Meghalaya

Soybean is the most important oil seed crop and knows as gold been due to unparalleled productivity among oil seed crops. However, the un-productivity of Soybean in the district is very low. The productivity of Soybean per unit area and time could be increased by adopting feasible scientific and sustainable management practices with a suitable variety. Taking into account the above consideration, training were conducted in a systematic manner to show the worth of a new variety and convincing farmers about potentialities of improved production management practices of Soybean for further adoption. Less productivity of Soybean may be due to lack of knowledge and constraints in the adoption of improved Soybean cultivation practices. The present study entitled 'Impact of Soybean Cultivation Training Programme Conducted by Krishi Vigyan Kendra for Farmers of Guna

District of Madhya Pradesh covering Guna district, six purposively selected villages and 160 randomly selected respondents The sample size comprised of respondents, 80 beneficiaries and non-beneficiaries each. A structured interview schedule to measure the variables was prepared in consultation with experts following standard methodology and administered for the collection of primary data from the organic soybean farmers by using extensive personal interview technique. Thus collected data were classified, tabulated and analyzed with application of suitable statistical tests; interpreted and logical conclusions were drawn in the light of objectives set forth. Majority of beneficiary and non-beneficiary respondents were middle age group, belongs to scheduled tribe, educated above primary level, joint family type, large family size and member of any organization. About 60.75 per cent beneficiary respondents and 18.25 pert non- beneficiary were found to have higher level of knowledge about Soybean production technology. There was rank order correlation and practices wise difference knowledge possessed by beneficiary and non- beneficiary farmers about Soybean cultivation practices. Majority of beneficiary and non-beneficiary respondents were in medium adoption group. There was significant difference in the extent of adoption of Soybean production technology between beneficiary and non-beneficiary respondents. The personal attributes like age, education, caste, size of land holding and social participation except family size of beneficiary and non-beneficiary were significantly associated with knowledge and adoption level regarding Soybean production technology. Among five categories of constraints economic constraints were perceived high followed by ecological constraints, Input supply constraints, Marketing constraints and technical constraints were perceived by beneficiary as well as non-beneficiary respondents about Soybean production technology.

Key words: KVK, Constraint, Adoption, Training

Abstract – 22

GENETIC VARIABILITY AND INTER-RELATIONSHIP AMONG THE BITTER GOURD (*MOMORDICA CHARANTIA* L.) STRAINS UNDER GARHWAL HIMALAYA REGION OF UTTARAKHAND

Vivek Singh, D.K. Rana and K.N. Shah

Department of Horticulture, H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand

Twenty bitter gourd strains were evaluated during summer season, 2014 to estimate the magnitude of genetic variability and the trait relationship among some yield traits. The results revealed vast genetic variability among the strains. The almost all the traits showed the moderate to low genotypic coefficient of variation except fruit yield par vine. The high heritability was recorded in length of vine, number of nodes per vine, leaf area, days to first fruit harvest, number of fruit per vine, length of fruit, weight of fruit, fruit yield per hectare and carbohydrate. Vine length, number of primary branch per vine, number of fruits per vine, fruit length, fruit weight and vitamin A had a significant positive correlation with fruit yield per plant. Path analysis revealed that fruit weight, phosphorus content, number of seeds per fruit, fruit diameter, days to opening of first male flower, percent of fruit setting and vitamin A can be used as selection criteria to increase fruit yield in bitter gourd.

Key words: Genetic variability, heritability, correlation coefficient and genotypic coefficient

Abstract – 23

MOLECULAR CHARACTERIZATION OF PROMISING TEMPERATE MAIZE INBRED LINES

A. Gazal, Z. A. Dar, A. A. Lone., A. B. Shikari., M.A. Wani and I. Abidi

DARS, Budgam, Shere Kashmir University of Agriculture and Technology (SKUAST-K) 190025

A set of twenty four maize lines comprising fifteen drought promising inbred lines, four drought susceptible inbred lines and five drought tolerant checks were analyzed for molecular characterization. These inbred lines belong to AICRP (All India Co-ordinated Research Programme) Maize Srinagar Centre and the checks were selected from CIMMYT (International Maize and Wheat Improvement Centre) material.. Molecular characterization was done using a set of 45 SSR markers having genome wide coverage. The marker data was analyzed using Power Marker Software (Version 3.25). The markers detected a total of 271 alleles with an average of 8.46 alleles per locus in twenty four maize lines. The average polymorphism information content (PIC) ranged from 0.56 and 0.89 with a mean of 0.78. The level of heterozygosity in the inbred panel was significantly low. The mean value of heterozygosity was 0.05 implying that most of the loci attained homozygosity. Dendrogram derived from UPGMA cluster analysis showed presence of two major clusters, one of which had many subgroups. Phenotyping of these inbreds was done by using morphological, maturity, physiological, yield and yield attributing traits. Genotyping data complemented by phenotyping data would be used to identify a number of pair- wise combinations for the development of mapping populations for drought tolerance related traits and potential heterotic pairs for the development of drought tolerant hybrids.

Key words: Maize, molecular characterization and inbred

Abstract – 24

MITIGATION OPTIONS FOR CO_2 EMISSION IN INDIA

Jami Naveen and Pushpa Dulla

Department of Agronomy. Assam Agricultural University, Jorhat, Assam

Combustion of fossil fuel, changing land use pattern, forest fire, deforestation and rice production with the indiscriminate use of irrigation water and fertilizers, and numerous other faulty agricultural practices constantly increasing the greenhouse gases (GHG's) in the atmosphere. The CO_2 concentration in the atmosphere rapidly increasing from an average of 6.3 Pg-C year^{-1} in 1990-99 to 7.8 Pg-C year^{-1} in 2000-09. According to IPCC, atmospheric CO_2 concentration is likely to reach 730–1020 ppm by 2100. To attain food security and agricultural development goals by 2030, acclimatizing to climate change and lowering emissions will be essential because as CGIAR articulated around 41% of GHG come from agriculture. India is the 4th largest CO_2 emitter which emits about 6% of the world's CO_2. As India is a developing nation and it should be noted that while developing nations being liable for increasing levels of emission, they pay more than they contribute to climate change. In 2006, the cost of a 2°C rise in the global temperature was estimated to be equivalent to 1% of the global GDP, but the cost of climate change for India, as assessed by the World Bank in 2006, was found to be 5%. Rational distribution of the cost of climate change is unpractical because the developing nations bear 80% of the world's population and will end up paying the most in spite of skewed consumption patterns. For example, India was contributing about

the one-sixth population of the world, which has only 1.7 MT emission compare to 17 MT in the US in 2011. In Indian perspective, there is need to take some step like improving coal efficiency and shift to natural gases, carbon sequestration, gradual shift to renewable energy, and some changes in rice growing practices such as direct sowing rice (DSR), system of rice intensification (SRI), application of fertilizer on need-based etc. to mitigate emission of CO_2 and other GHGs.

Key words: Climate change, Global warming, mitigation, Carbon dioxide, Renewable energy.

Abstract – 25

EXTENT OF GLOBAL WARMING AND ITS PREVENTION

Jami Naveen and Pushpa Dulla

Department of Agronomy, Assam Agricultural University, Jorhat, Assam

Global warming can be described as the rise in the average surface temperature of Earth. As the Earth is getting hotter, disasters like floods, hurricanes, and droughts are getting more frequent. Nearly 90% of the witnessed temperature upsurge over the last 50 years has been due to the escalation in the greenhouse gas concentrations in the atmosphere. The largest part of greenhouse gas emissions are resulting by the burning of fossil fuels leading to the emission of carbon. Deforestation intensifies the severity of global warming. The ocean acts as a vast carbon sink, holding about 50 times as much carbon as the atmosphere. The climate change would result in an increase in the number of people suffering from death, disease, and injury from heat waves, floods, storms, and droughts. The effects of climate change include higher or lower agricultural yields, further glacial retreat, species extinctions. Floods are high-impact and low probability events that can devastate physical infrastructure and human communities. Major flood and storm disasters have happened in the past two decades. One can help to decrease the demand for fossil fuels, which in turn reduces global warming, by using energy more judiciously.

Key words: Global warming, temperature deforestation and climate change

Abstract – 26

METHODOLOGY FOR IMPROVEMENT OF SUGARCANE SEED

Pusarla Susmitha[1] and Guntamukkala Babu Rao[2]

[1]Department of Seed Science and Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, U.P, [2]Department of Agronomy, Kerala Agricultural University, Thiruvananthapuram, Kerala

Sugarcane is a major source of sugar which contributes to about 70 percent of the global sugar production. In addition to being a source of other products like animal feed, antibiotics and raw material for generating electricity, sugarcane has emerged as the main base material for bioethanol production. Vegetative propagation of sugarcane leads to low (1:6 to 1:8) seed multiplication rate owing to which seed production of recently released varieties is invariably slow. Further, the seed accumulates diseases and pests during several cycles of its cultivation. Major constraints in improving sugarcane productivity are due to the lack of disease-free and true to type planting material. Biotechnology interventions have offered innovative opportunities for crop improvement and propagation through tissue culture methods. The transgenic method where the temporal, spatial and stringent controlled expression of invertase enzyme can intensely influence the level of reducing sugar at the time of sowing of seed which ultimately can lead to enhanced germination and quality.

Key words: Sugarcane, vegetative propagation and biotechnology intervention

Abstract – 27

ROLE OF PSEUDOMONAS AS GROWTH ENHANCER AND BIOCONTROL AGENT ON INDIAN MUSTARD

Pusarla Susmitha[1] and Guntamukkala Babu Rao[2]

[1]Department of Seed Science and Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, U.P, [2]Department of Agronomy, Kerala Agricultural University, Thiruvananthapuram, Kerala

Indian mustard is an important edible oilseed crop in India, which contributes 23.2 percent of total oil seed production. Several abiotic and biotic stresses are major reasons for restriction in the cultivation of Indian mustard. Among the various biotic stresses, Indian mustard is mostly susceptible towards several fungal diseases resulting in adverse yield reduction. Alternaria blight, white rust, powdery mildew, damping-off, are some of the fungal diseases of mustard. Among these, Alternaria blight is a common fungal disease which causes huge damage to crop production in India and at the global level. Seed germination is affected by Alternaria which is also responsible for less cultivation. In this view plant-associated microorganisms are observed as a superior alternative which not only increases crop yield and defends plants from phytopathogens but also significantly increases seed germination percentage and phytochemical content. *Pseudomonas* is considered to be vital rhizosphere organisms, in which considerable research has started globally to exploit its potential. Fluorescent pseudomonas is used as biocontrol agents for phytopathogens as they protect the crop from pathogens, help in the maintenance of soil health and are functionally and metabolically more diverse.

Key words: Indian Mustard, Pseudomonas, biocontrol, crop enhancement, Soil Health

Abstract – 28

PHYTOSOCIOLOGICAL STUDIES, BIODIVERSITY CONSERVATION IN A MOIST DECIDUOUS FOREST OF RAJAJI TIGER RESERVE, INDIA

Akash and Navneet

Gurukula Kangri University, Haridwar, Uttarakhand

The Indian Himalayan region spreads across Jammu & Kashmir, Himachal Pradesh, Uttarakhand, West Bengal and Arunachal Pradesh. It support about 18,440 species of plants, 241 mammalian species and 979 birds species The study assessed vegetation composition, pattern of plant diversity and conservation in Rajaji Tiger Reserve, Haridwar-Pauri forest divison (29°15' to 30°31' N, 77°52' to 78°22' E, altitude 250–1100 m) in Shivalik Hills of outer Himalaya. The site represents the different combination of dominants and co- dominant species. In trees, most of the species showed contagious pattern of distribution but *Listea chinensis, Morus alba Mallotus phillipensis, Cassia fistula* showed random pattern of distribution. On the other hand maximum shrubs species showed contagious pattern but only one species showed regular pattern of distribution. In herbs most of the species showed contagious distribution while four species showed the random pattern of distribution but none of the species showed regular pattern of distribution. The Shannon diversity index for trees was 1.887 and for shrubs and herb it was 1.893 and 2.987 respectively. Plant species with higher number always show high diversity in the forest. The Simpson index for trees was 0.193 and 0.330, for shrubs and herbs it was 0.058. The

Pielou eveness index was 0.68 for trees, 0.86 for shrubs and 0.88 for herbs. The species richness index (Margalef index) was 2.60 for trees, 1.21 for shrubs, and 4.82 for herbs.

Key words: Biodiversity, Herbs, Shrubs, Trees, Rajaji tiger reserve

Abstract – 29

DIVERSITY OF NATURAL & ARTIFICIAL REGENERATED TREE SPECIES OF SEMI ARID REGION AT AGRA, U.P.

Sonam Rajput and P. K. Varshney
Department of Forestry, School of Life Sciences, DBRA University, Agra

The Present study is an attempt to explore the natural and artificial plant species of semi arid area at Agra (U.P.) The study site includes Taj Nature Walk, Shajahan Garden, Paliwal Park, Company Garden and Mau Forest in Agra. The region is also characterized now with settlements of human being of different culture from different places. (According to Family Wise) During the study Period it was found the Percentage of Artificial regeneration was 17% (fabaceae and maximum Percentage of Natural regeneration was 11% (fabaceae).

Key words: Natural and Artificial regeneration tree species, semi arid region, Agra, U.P

Abstract – 30

WAVING TOWARDS FUTURE FOOD; SELENIUM FORTIFIED BROCCOLI FOR REDUCED HEALTH RISK.

Vaibhav Singh and Saurabh Singh
Banaras Hindu University, Varanasi, U. P.

Micronutrient deficiency is one of the bottleneck affecting both industrial as well as developing countries. To ensure food security and sustainable growth, bio-fortification proved to be an effective strategy to nullify micronutrient malnutrition. Selenium is one of the micronutrient with profound health benefits. It is an essential nutrient for humans and animals to form selenoproteins such as glutathione peroxidase (GPx) and thioredoxin. These Selenoproteins play critical roles in reproduction, thyroid hormone metabolism, DNA synthesis, and protection from oxidative damage and infection. Epidemiological studies have suggested dietary intake of selenium can minimise risk of colorectal, prostate, lung, bladder, skin, esophageal, and gastric cancers. Broccoli (*Brassica oleracea*) is a cruciferous vegetable rich in noteworthy nutrients *viz.,* vitamin C, vitamin A (mostly as beta-carotene), folic acid, calcium, fiber and precursor of anticancer compound, glucoraphane. Although there is reciprocal relationship between accumulation of Se and glucosinolates in mature Brassica plants, Se supply generally did not affect glucosinolate accumulation in Brassica sprouts. Thus, Brassica vegetable sprouts can be biofortified with Se for the accumulation of SeMSCys (Selenium-Methylselenocysteine) without negative effects on chemo-preventive glucosinolate contents. Various strategies have been incorporated for production of biofortified broccoli sprouts from conventional to molecular advances. The inoculation of soil with specific microbes might be beneficial for enhancing Se biofortification strategy for crops. Either foliar or soil application of Se fertilizer is a popular practical way for producing Se-enriched foods. The transgenic technology in combination with functional genomics is gaining importance in production of Se fortified broccoli sprouts. Understanding the regulation and expression of genes involved in Se homeostasis will benefit the development of variants with enhanced Se utilization to improve broccoli output and quality.

Key words: Bio-fortification, Chemo-preventive, Homeostasis, Malnutrition, SeMSCys

Abstract – 31

MORPHOLOGICAL AND CULTURAL STUDY OF *Collectotrichum capsici* CAUSES CHILLI ANTHRACNOSE

Ashwani Rawat, Hema Adhikari and GBS Manikanta chowdhary

Uttranchal College of Agricultural Sciences, Uttranchal University, Dehradun, Uttarakhand, 248007, India

Anthracnose of chilli (*Capsicum annum L.*) is major fungal diseases caused by *Collectotrichum capsici* all over the world that lead to huge economic loss world widely. Present experiment work is aimed to morphological and cultural study of *Collectotrichum capsici*. The fungal pathogen was ordered from ITCC, IARI New Delhi. The isolated was sub-cultured on different medium like - PDA, OMA, SDA and then determine their various growth on different medium and study about their characteristics like, size and shape of conidia, size of setae, shape of acervuli, colour of colonies ranged between white to grey, growth rate of sub cultured on different medium.

Key Words: Chilli anthracnose, *Collectotrichum capsici.*

Abstract – 32

THE EFFECT OF SEED TREATMENT BY *Rhizobium* FOLLOWED BY PSB ON PLANT GROWTH AND SEED YIELD PARAMETERS IN CHICKPEA

Hema Adhikari, Ashwani Rawat and GBS Manikanta Chowdhary

Uttaranchal College of Agricultural Sciences, Uttranchal University, Dehradun, Uttarakhand, 248007, India

"The effect of seed treatment by *Rhizobium* followed by Phosphate Solubilizing Bacteria (PSB) on plant growth, seed yield parameters and quality was evaluated in chickpea variety Pant G-186" during rabi season of 2016-17 at Agricultural Research field, UttaranchalCollege of Agricultural Sciences, Uttaranchal University, Dehradun. The study revealed that seeds treats with *Rhizobium* followed by PSB resulted in higher number of branches(9.70 branches plant^{-1}), pods per plant(49), test weight(18.15gm),nodule number(24.66 nodules plant^{-1}), nodule fresh weight(269.45 mg plant^{-1}), nodule dry weight(157.30 mg plant^{-1}), grain yield plant^{-1}(13.76 g), and also showed its positive effect in enhancing all the yield attributing parameters, grain and straw yields.

Key Words: *Rhizobium*, Phosphate Solubilizing Bacteria, Chickpea.

Abstract – 33

PRE-SOWING SEED TREATMENT—A SHOTGUN APPROACH TO IMPROVE GERMINATION AND PLANT GROWTH PARAMETERS IN FINGER MILLET THROUGH FLUORESCENT PSEUDOMONAS UNDER DROUGHT CONDITION

Akshit Kukreti[1], Neelam Kurmanchali[2] and Laxmi Rawat[3]

[1]Silviculture Division, Forest Research Institute,Dehradun-248195, [2]Department of Seed Science & Technology,[3]Division of Plant Pathology, College of Forestry, Ranichauri-249199, Uttarakhand, India.

Rapid seed germination and stand establishment are critical factors to crop production under drought condition. In many crop species, seed germination and early seedling growth are the most sensitive stages to drought stress. Droght may delay the onset, reduce the rate, and increase the dispersion of germination events, leading to reductions in plant growth and final crop yield. The adverse effects of drought-stress can be alleviated by various measures, including seed bio-priming. In view of this, a total of 42 fluorescent Pseudomonads isolates were isolated

by using serial soil dilution technique from rhizospheric soil of finger millet grown in different farming situations of Garhwal hills (viz.,Dehradun, New Tehri and Rudraprayag) of Uttarakhand. They were characterized morphologically and biochemically. Out of 42, 21 isolates were HCN producers, 28 were phosphorous solubilizers and 23 were able to produce siderophores. *In vitro* dual culture assay revealed that out of 42 bacterial isolates, 27 isolates were antagonistic to *Sclerotium rolfsii* (ranged from 22.50% to 83.50%), 30 to *Rhizoctonia solani* (ranged from 21.20% to 85.00%), 26 to *Pyricularia grisea* (18.46% to 80.00%) and 25 isolates were antagonistic to *Helminthosporium nodulosum* (ranged from 36.20% to 78.50%), the four major pathogens causing foot rot, sheath/banded blight, blast and leaf spot diseases in finger millet respectively. On the basis of their performance, five isolates *viz.,* UUHF *Psf*- 4, 11, 12, 15 and 41 were selected for plant growth promotion and delaying drought stress in finger millet. A pot experiment was conducted at College of Forestry, Ranichauri, to assess the effects of seed bio-priming with five selected isolates of fluorescent *Pseudomonas* to reduce the drought effect on physiological and biochemical parameters in finger millet. The results indicated that the untreated plants were more sensitive to drought stress. With or without exposure to drought, seed bio-priming with *Pseudomonas* isolates promoted seedling growth, the most consistent effect being an increase in shoot and root growth. Drought stress from 6 to 15 days of withholding water induced an increase in the concentration of many stress induced metabolites in finger millet leaves. *Pseudomonas* colonization caused a decrease in malondialdehyde content and an increase in phenolics concentration, proline and membrane stability index. Whereas maximum accumulation of malondialdehyde content was noticed in untreated control. The higher proline content, membrane stability index and lower malondialdehyde accumulation might have imparted drought tolerance in *Pseudomonas* treated plants. Among all the tested isolates, UUHF *Psf*- 4 resulted in enhancing root and shoot growth of plants as well as provided the plants insight potential to adapt to drought stress by altering biochemical parameters within the host plants.

Key words: Drought stress, Finger millet, *Pseudomonas*, PGPR, Seed bio-priming

Abstract – 34

UTILIZATION OF BULK SEGREGANT ANALYSIS FOR IDENTIFYING MARKERS ASSOCIATED WITH CAROTENE GENE IN TOMATO

Saurabh Singh, Vaibhavsingh and Kumari Shikha
Banaras Hindu University, Varanasi, U. P.

Tomato (*Solanum lycopersicum*) is a protective vegetable crop and a model system for fruit development. With perspective of human diet, rich source of carotenoid pigments and vitamin A and C. Carotenoids being economical trait in horticulture is centre of attraction for breeders due to their nutritional and visual appealing importance. Carotenoids such as β-carotene serve as precursors of vitamin A, some are potent antioxidants and many carotenoids are believed to provide protection against certain cancers, heart diseases, and age-related eye disease. Although its metabolic pathway of accumulation in fruit pericarp reviewed by many scientist. Over whelming evidence from several molecular and genomic studies reported use of bulk segregant analysis (BSA) for identification of marker linked with quantitative trait locus (QTLs) with major effects governing carotenoid synthesis and accumulation in tomato fruit and trait mapping. In tomato, pooled DNA analysis can be done in segregating population derived from crossing between contrasting parents i.e. one with orange fruit flesh and

other green fruit flesh for sequencing and genome-wide association study (GWAS). Segregating lines were distributed into two pools, each consisting of the high carotene and of the low carotene individuals, respectively. Both pools were screened using large random primers. Those markers which found to be linked to QTLs responsible for the cellular and metabolic pathway of pigment accumulation and synthesis are localized in the same linkage for mapping. This technique can be readily used for identifying markers linked to any specific gene or genomic region as it is easy and economical to carry out and also require less generation of backcrossing compare to NIL and RILs development for identifying candidate gene and mapping. Even extension of BSA like bulk segregant RNA sequencing (BSR-Seq) and pooled mapping, approach can be used for identifying metabolic and cellular processes that are associated with the carotene allelic variation.

Key words: Antioxidants, Bulk Segregant RNA sequencing, Carotenoids, GWAS, QTLs

Abstract – 35

MOLECULAR MAPPING AND IDENTIFICATION OF QTLS RESPONSIBLE FOR CHARCOAL ROT RESISTANCE IN CASTOR (*RICINUS COMMUNIS* L.)

Lakesh Muduli and Rukam S. Tomar

Department of Genetics and Plant Breeding Junagadh Agricultural University, Junagadh, 362001, Gujarat, India

Charcoal rot caused by *Macrophomina phaseolina* in castor is one of the major pathogenic determinants for extreme yield loss. The charcoal rot resistance trait is complex and controlled by quantitative trait loci (QTLs). This study was aimed to develop linkage map and to identify novel QTLs associated with charcoal rot resistance in castor. A mapping population (F2:3) derived from the cross between two castor inbred lines JI 357 (Resistant genotype) and SKI 338 (Susceptible genotype) was developed and screened in the sick plot using randomized block design. After screening 920 (520 RAPD, 100 ISSR, 300 SSR) primers among the parental lines, 336 polymorphic markers were identified to be used for genotyping the map-ping population to develop genetic linkage map. The genetic map consisting of 10 linkage group covering a total map length of 1833.4 centimorgan (cM) with average marker interval of 6.93 cM was developed. The length of linkage groups varied from 121.5 cM for linkage group 10 (C10) to 278.7 cM for linkage group9 (C9). The average marker interval was maximum in C3 (8.23 cM) while it was lowest in C10 (5.78 cM). Analyzing genotypic data along with phenotypic data collected from mapping population against char-coal rot in sick plot, identified three novel QTLs explaining 11.3–71.2% of phenotypic variation. One major QTL with LOD score of 6.5 was identified on linkage group 2 explaining 71.2% of phenotypic variation, is a most promising QTL for molecular breeding. This is the first study reporting novel QTLs for charcoal rot resistance in castor and thus future studies will be conducted to refine these QTLs.

Key words: Quantitative trait locus (QTLs), Linkage mapping, *Macrophomina phaseolina*, SSR

Abstract – 36

DEVELOPMENT OF LINKAGE MAP AND IDENTIFICATION OF QTLS RESPONSIBLE FOR *FUSARIUM* WILT RESISTANCE IN CASTOR (*RICINUS COMMUNIS* L.)

Raju Shyadambi[1] and Tomar Rukam S.[2]

[1]Department of Genetics and Plant Breeding, [2]Department of Biotechnology, Junagadh Agricultural University, Junagadh, Gujarat

Fusarium oxysporum f. sp. ricini is a soil-borne fungal that causes wilt in castor which causes yield loss up to the extent of 85%. Through the screening of about 35 different genotypes of castor for *fusarium wilt* in the sick plot, two genotypes namely RG 2800 and JC-18 were identified as the most resistant and susceptible genotype respectively. The mapping population of 190 F2 was generated using the selected parents. The parental lines were screened against 786 primers set (520 RAPD, 100 ISSR and 166 SSR) and about 141 polymorphic markers were identified. The mapping population of 190 F2 was screened against pre-identified polymorphic markers for the development of linkage map and the same population was phenotyped for disease reaction on the scale of 1-5. The linkage map and QTL's were identified using onemap and R/QTL package of R software. The linkage map developed by using onemap software resulted in ten linkage groups with total map length of 1,551cM. The map length of individual linkage group ranged from a minimum of 78.1 cM to a maximum 261.3 cM. QTL on linkage group 6 and a putative QTL on linkage group 8 at threshold value of 90% were identified to be responsible for resistance against the wilt in castor**.** However at threshold value of 95%, only one QTL at linkage group 6 was identified with a LOD score of 13.5. Confidence interval at linkage group 6 indicated QTL location between 12-16 cM nearer to marker CST 73 and R 83. The results are of major importance for understanding the molecular background of wilt resistance in castor. These QTLs identified for wilt resistance have potential use in marker-assisted selection.

Key words: *Fusarium oxysporum,* Molecular markers, QTL mapping, *Ricinus communis,* Wilt

Abstract – 37

ENTOMOPATHOGENIC NEMATODE FOR BIOLOGICAL CONTROL OF INSECT PESTS

Saroj Yadav[1] and Jaydeep Patil[2]

[1]Department of Nematology, College of Agriculture, CCS HAU, Hisar, [2]Department of Plant Protection, SOA, LPU, Phagwara, Punjab

Entomopathogenic nematodes (EPNs) belonging to the families Steinernematidae and Heterorhabditidae (Rhabditida) have been used as effective biological control agents against a wide spectrum of insect pests. Steinernematids are symbiotically associated with entomopathogenic bacteria (EPBs) from the genus *Xenorhabdus,* and heterorhabditid nematodes are symbiotically associated with EPBs from the genus *Photorhabdus.* The bacterial symbionts produce wide range of toxins, hydrolytic exoenzymes, and antibacterial compounds. These compounds not only kill and bioconvert infected larvae, but also preserve the cadavers from being consumed by other soil organisms. There have been recent advances in the technology of mass producing and formulating nematodes. These recent advances, together with the need to reduce pesticide use, have

resulted in a surge of scientific and commercial interest in EPNs and their symbiotic bacteria. Many species and strains of potential control organisms have to be evaluated to elaborate a new biological control technique.

Key words: Biological control agents, entomopathogenic nematodes, strain collection etc.

Abstract – 38

RESISTANT MECHANISM AGAINST PLANT PARASITIC NEMATODES OF THE AGRICULTURE CROPS

Jaydeep Patil[1], Saroj Yadav[2], Ravinder Nath[1] and Brajesh Dwivedi[1]

[1]Department of Plant Protection, SOA, LPU, Phagwara, Punjab, [2]Department of Nematology, College of Agriculture, CCS HAU Hisar 125004 Haryana, India

A major global challenge in the coming years will be to ensure food security and to feed the increasing human population. Plant-parasitic nematodes are one of the major pests of agricultural crops causing an annual loss of about $173 billion annually to the world agriculture. Resistant crops provide an effective and economical method for managing nematodes in both high- and low-cash value cropping systems. In annual cropping systems, resistant crops can reduce nematode populations to levels that are non-damaging to subsequent crops, thereby enabling shortening and modification of rotations. Resistant crops are environmentally compatible and do not require specialized applications, as opposed to most chemicals. Resistance genes cause local or systemic reactions in rapid, localized necrosis; increases in peroxidase activity and lignin deposition. The most evolutionary advanced adaptations for plant parasitism by nematodes are the products of parasitism genes expressed in their esophageal gland cells and secreted through their stylet into host tissue to control the complex process of parasitism. Plant defense against nematode by the genetic resistance and hypersensitive reaction. Protein inhibitors are non-toxic, they can be expressed in each cell, leading to control of a broad range of nematode species. Resistance to root-knot nematodes, the Mi gene also confers resistance to some isolates of the potato aphid (*Macrosiphum euphorbiae*) and the sweet potato whitefly (*Bemisia tabaci*). The constitutive expression of a dorsal gland protein from *M. incognita* (Mi-7E12) rendered the tobacco plants susceptible with significantly higher numbers of gall formation than control un-transformed tobacco plants. Similar results were reported for *M. javanica* effector (Mj-NULG1a) where in planta RNAi resulted in attenuation of parasitic ability and the ectopic expression rendered *Arabidopsis* plants susceptible to nematode infection.

Key words: Resistance, Root knot nematode, *Meloidogyne incognita*

Abstract – 39

STUDY OF SEED PROTEIN PROFILING OF RIDGE GOURD (*Luffa acutangula* (L. ROXB.) GENOTYPES USING SDS-PAGE FOR DETERMINATION OF GENETIC DIVERSITY

Hirdesh Yadav, S. K. Maurya and Pooja

Department of Vegetable Science, G.B. Pant University of Agriculture and Technology, Pantnagar-263145, U.S. Nagar, Uttarakhand, India

The experiment was conducted to assess genetic diversity in ridge gourd (*Luffa acutangula* (L.) ROXB) at Pantnagar Centre for Plant Genetic Resources (PCPGR) of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India during summer season of 2013. Study includes 28 monoecious and 14 hermaphrodite lines of ridge gourd, collected from different parts of the

country. A total of 14 protein bands could be resolved which distributed in 3 zones namely zone A (6 bands) with Rf value from 0.13 to 0.31, Zone B (5 bands) with Rf value from 0.54 to 0.78, and zone C (3 bands) with Rf value from 0.82 to 0.92. Most of the protein bands were found in all the genotypes but a specific protein band C2 with 0.85 Rf value was absent in genotype PCPGR-7267 (monoecious) and another specifi c protein band B5 with 0.78 Rf value was absent in genotype PCPGR-7247 (hermaphrodite). Unweighted pair group method with arithmetic mean (UPGMA) analysis generated by SDS-PAGE based on genetic distance of genotypes displayed dendogram grouped the genotypes initially into one major cluster I and one independent genotype PCPGR-7267 with 65% similarity and further major cluster divided into sub-cluster to super small sub-sub clusters. The genotypes are grouped irrespective of their morphological distinctiveness indicating similarity between monoecious and hermaphrodite lines of ridge gourd at genotypic level in contrary that one monoecious genotype namely PCPGR-7267 and one hermaphrodite genotype namely PCPGR-7247 grouped into different cluster. Thus, genotypes which were found diverse may be included in ridge gourd future breeding programme to develop high yielding cultivars.

Keywords: Ridge gourd, protein band and SDS-PAGE

Abstract – 40

PROTECTIVE ROLE OF NATURAL AND SYNTHETIC ASCORBIC ACID ON SOYBEAN (GLYCINE MAX L.) CULTIVARS UNDER OZONE STRESS

Indra Jeet Chaudhary and Dheeraj Rathore

School of Environment & Sustainable Development, Central University of Gujarat, Gandhinagar Sector-30, Gujarat -382030

Phytoextracts are being widely used these days as a source of bioactive compounds for mitigating the harmful effects of abiotic stresses including ozone stress. Present study was conducted to compare the effects of pure synthetic ascorbic acid (AsA) and orange juice (OJ) on soybean cultivars under ozone stress conditions. Various levels of ascorbic acid (100 ppm AsA, 25% OJ) and same amount of water were applied as a foliar spray. The results showed that under ozone stress cultivars reduced growth, photosynthetic & non-photosynthetic pigments and leaf metabolites, while it increased membrane permeability. Foliar-applied pure ascorbic acid and 25% Orange Juice were found to be very effective in improving plant growth, membrane permeability, photosynthetic & non-photosynthetic pigments, proline, ascorbic acid, MDA, SOD, POD, amino acids, carbohydrate, Reducing sugar, total soluble sugar, protein content and yield. It was observed that 25% OJ enriched with AsA and other essential nutrients and biomolecules was as efficient as 100 ppm AsA in reducing the adverse effects of ozone stress on soybean cultivars. So, it was concluded that OJ, a cheaper source of ascorbic acid, can be used as a mitigating agent for improving ozone tolerance in plants under ozone-prone environments.

Key words: Soybean; ascorbic acid; orange juice; Ozone; Yield

Abstract – 41

IMPACT ASSESSMENT OF ULTRAVIOLET-B (UV-B) RADIATION ON DIFFERENT CROPS CULTIVARS OF GUJARAT

Asha Humbal and Dheeraj Rathore

School of Environment & Sustainable Development, Central University of Gujarat, Gandhinagar Sector-30, Gujarat -382030

Depletion of stratospheric ozone layer which result in significant increase in UV-B radiation at the earth's surface. Plants use sunlight as primary energy sources, therefore the small increase in UV-B radiation is recognized as harmful for plants. Study demonstrates that effect of UV-B radiation on various physiological, morphological and biochemical characteristic of different crops cultivars of Gujarat. There are several visible and micro morphological effects of enhanced UV-B radiation was also observed including visible injury and stomatal characteristics. UV B radiation increases the leaf thickness and cause alteration in canopy morphology, which indirectly affects whole plant photosynthesis. Photosynthetic efficiency also reduces due to ROS (reactive oxygen species) generation which stimulate by UV-B radiation. Increasing ultraviolet radiation has become one of the most important issues affecting photosynthesis and ultimately reduces the yield of crop plants. Studies of UV exclusion have opened up a new area of research towards increasing agricultural yield by protecting plant from solar UV-B radiation. In the absence of UV radiation enhance the photosynthetic efficiency and enhanced rapid fixation of atmospheric carbon dioxide that can reduce global warming.

Key words: UV-B radiation; physiology; morphology; visible injury; crops

Abstract – 42

BIOCHEMICAL BASIS OF ROOTSTOCK AND SCION RELATIONSHIP IN FRUIT CROPS

Rajani Pant, Vipin Rawat, Megha Budakoti, and D.C. Dimri

Department of Horticulture, College of Agriculture, GBPUAT, Pantnagar (U.S. Nagar) Uttarakhand - 263145

Grafting is the method of purposively combining the branches of one plant with the roots and base of another plant. The upper component is the 'scion', and the lower is the 'rootstock' or 'stock'. 'Autografting' is grafting between the same plants of the same species, 'homografting' is grafting between different plants of same species and 'heterografting' is grafting between plants of different species. The grafting combinations used in agricultural production are commonly compatible, as both scion and rootstock survive after grafting and grow normally until flowering. Most heterografting combinations are incompatible as either scion or rootstock, and both may die after grafting. Fruit trees are formed by a combination of the rootstock that provides root system and the scion that produces the crop. In order for that combination to be successful, a good union between scion and rootstock is necessary. Grafting is a necessary practice in fruit-tree management to assure high orchard yield efficiency and high yield quality. But, the problem of incompatibility between rootstock and scion in pomology has existed ever since grafting were first employed. The term "incompatibility" with respect to grafted fruit trees is defined as a phenomenon of premature senescence caused by physiological and biochemical process. A graft union is considered to be successful when several functional phloem and xylem connections cross the graft

surface. However, incompatible grafts can grow several years without any external symptom of incompability, indicating the presence of functional vascular connections. Generally, a successful grafting includes the formation of necrotic layer, callus production, first cohesion of stock and scion by the callus junction, subsequent reduction or elimination of necrotic layer in callus, differentiation of some cells to the cambial cells, bridging of cambium tissues of stock and scion, and finally formation and strong connection of vascular tissues. In fact, these processes are independent events. While necrotic layer formation and cohesion common to grafts in all treatments, one or more of the process of callus formation, necrotic layer removal, and vascular differentiation can be absent.

Key words: Grafting, rootstock and incompability

Abstract – 43

COMPARATIVE STUDY OF DIFFERENT ISOLATES OF *TRICHODERMA* ON GROWTH PROMOTION AND MORTALITY IN *FUSARIUM OXYSPORUM* F. SP. *CICERIS* CHALLENGED CHICKPEA PLANT

Shweta Meshram and Birinchi Kumar Sarma
Department of Mycology and Plant Pathology, BHU, Varanasi, U.P.

In recent time integrated plant disease management is a burning challenge. Completely dependence on chemical is not promising because it is extremely harmful for animal and plant health as well as environment. Biological control of plant disease provides a promising way for plant disease management along with safe guarding environment. *Trichoderma* spp. of fungus has emerged as a powerful biocontrol agent against broad range of plant diseases, especially against soil born plant pathogens. Soil born pathogen *Fusarium* spp. Affects various economically important plants, among them wilt disease is so prominent that is capable of causing 100% yield loss. *Trichoderma* has been reported to successful biocontrol agent in controlling wilt diseases in effective manner. In our study we wanted to know whether the all isolates of *Trichoderma* species are effective against *Fusarium* pathogen in similar way or having different effect. We treated chickpea seeds with 10 different isolates T-42, DFL, RO, OR, MV-41, P3B, NS-1, NSP-6, PPP6-G1 and MD4 of *Trichoderma* spp., later seeds were sown in the pot. Data were recorded for germination and shoot length of the plants. Plants were inoculated on 21st day after sowing and after 15th day of post inoculation and plant mortality were studied. Interestingly we found results that all *Trichoderma* are capable of supporting plant growth but in varied manner. However there was no significant difference noted in germination of seed. Isolate MV-41 observed for high growth promotion whereas least observed for control which was not given any seed treatment. In case of plant mortality highest plant mortality recorded for the control plant, least plant mortality among treated plant shown for isolate T-42. These results indicate that different isolates of *Trichderma* spp. has varied potential to promote plant growth. It also demonstrates that different isolates have varied capacity to interact with vascular pathogen. It establishes the fact that proper screening and selection of *Trichoderma* isolates are required prior to field application to achieve optimum and successful disease management.

Key words: Biological control, *trichoderma* and *fusarium*

Abstract – 44

INTRODUCTION OF HIGH DENSITY APPLE ORCHARDS AT BHATWARI BLOCK OF UTTARKASHI DISTRICT

Mahendra Pal Singh Parmar, A.K.Agrawal, J.L Rawat, Richa Badhani and Naresh Singh Chauhan
Department of Botany, Govt. P.G College Uttarkashi, Uttarakhand

Uttarkashi is as much known for its sylvan, serene and mundane environment, as for amazingly diverse natural grandeur and vividly varied and colorful cultural landscape. Owing to its strategic location in the mightiest mountain range of the planet earth, marked contrast in the biotic, geo-morphological as well as meteorological aspects are obviously inherent here. The proposed area falls under Bhatwari development block of Uttarkashi district covering four villages namely Mukhwa, Dharali, Harsil & Bagori. This proposed area traditional horticulture is going on since last 50 years and they grow only Apple and still they are planting apple seedlings 120 plants per acre whereas nearby state i.e Himanchal is growing 600 plants per acre. It means to increase the production and double the income of farmers, by implementing the High Density plantation in Harsil Area of Uttarkashi. The proposed area has limited land so through high density Apple production maximum production could be get minimum land. About 80% of the total population of the target area is dependent on the Horticulture for their livelihood. Terraced slopes cover about 80% of the hill agricultural land, which is completely dependent on the climate, whereas remaining 20% area lies in the V shape valleys, which is fairly irrigated. Horticulture of this region is very common of suitable as due to favorable climatic condition like temperature, chilling etc. Presently farmers of the area growing apple traditionally i.e 120 trees per acre where as in this proposed techniques 600-800 trees can be planted at one acre. High density apple orchards offer many advantages small, closely planted trees facilitate cultural operations, and they may increase early production and produce better Fruit. The systems that put the trees closest together (such as the super spindle) cost more per acre to begin with since you have to buy a lot more trees and trellising, industry analysts suggest super spindle orchards also bring in the most profit by the eighth year because apple yields are higher. Those of us growing trees in the backyard are probably less concerned about economics and more concerned with cramming as many varieties as possible into a small space without committing to an excessive amount of maintenance. The techniques will be unique in the area as no apple grower farmers are using this technology in their fields. It is only demonstrated by some of the Horticulture Universities in the State but so far it is not being practiced in the proposed area of Harsil Valley. Even this practice has not been adopted by the farmers of Uttarkashi district. The total population of the target area is dependent on the Horticulture for their livelihood and they are growing apple in old technology. By adopting of new technology for apple orchard i.e high density plantation, not only increase the production of apple but also double the income of farmers in that area by 2022. Consequently remaining farmers will adopt this technology in new as well as in old orchards.

Key words: Apple, orchards and high density planting

Abstract – 45

PNRSV- A THREATENING VIRUS FOR THE TEMPERATE FRUITS

Shelly Kapoor[1] and Anil Handa[2]

[1]Department of Biotechnology, [2]Department of Plant Pathology, Dr. Y S Parmar University of Horticulture and Forestry, Nauni- 173230, Solan, Himachal Pradesh, India

Temperate fruits of Himachal Pradesh like Apple, Peach, Pear, Plum, Apricot, Cherry, Almond, and Nectarine were visually indexed over a period of three years between 2015, 2016 and 2017 consecutively in different orchards of Shimla, Solan, Sirmour, Kullu and Kinnaur districts of the state on the basis of symptoms exhibited by leaves and fruits. Samples were collected and brought to the laboratory for confirming the virus status. Since *Prunus necrotic ringspot virus* (*PNRSV*) a latent virus and cannot be assessed by symptoms alone, DAS-ELISA proved to be a quick and reliable method to confirm the presence of the virus. Among all these temperate fruits Apple, Peach, Cherry and Almond were found to be at the higher risk and others like Plum, Nectarine and Apricot showed lesser vulnerability to *PNRSV* and Pear was found to be free from this virus.

Key words: Virus, PNRSV and DAS-ELISA

Abstract – 46

IMPLEMENTATION OF ORGANIC AMENDMENTS TO ENHANCE SOIL PROPERTIES USING CAPSICUM (*CAPSICUM ANNUUM* L.)

Perminder Singh Brar[1] and Shelly Kapoor[2]

[1]Department of Soil Sciences and Water management, Department of Biotechnology, Dr. Y S Parmar University of Horticulture and Forestry, Nauni- 173230, Solan, Himachal Pradesh

Bell pepper is among the important vegetable crop of Western Himalayas offering a great potential for boosting economy of hilly regions which brings handsome monetary return to the small and marginal farmers and what could be better than organic farming to increase it. Studies were conducted at the research farm of the Department of Soil Science and Water management, Nauni, Solan during the period of two years between 2016 – 2017. Different treatments were designed to test the effect of organic amendments using RDN through Vermicompost and Poultry manure, PGPR and jeevamrut individually or in combinations at different concentrations and replicated three times in Randomized Block Design. Application of PGPR + 90% RDN+ jeevamrut was found to be the best among all the treatments as it leads to significant increase in the plant growth parameters, fruit set and yields as compared to the control and it was also found to improve the available soil physico-chemical, available nutrients and microbiological status of soil.

Key words: Vegetables, organic amendments, plant growth and yield

Abstract – 47

EFFECT OF EXPLANT AND GENOTYPE ON *IN VITRO* REGENERATION OF GALIC (*ALLIUM SATIVUM* L.)

Manpreet Kaur, Madhu Sharma and A. S. Dhatt
Department of Vegetable Science, Punjab Agricultural University, Ludhiana, India

Garlic (*Allium sativum* L.), a hardy liliaceous sterile plant lacks viable seed production and thus needs to be propagated asexually via vegetative parts. This phenomenon of clonal propagation though commercial but leads to degeneration of the seed cloves over the generations through build up of virus complexes. Consequently, to develop vigorous and virus free plants, *in vitro* multiplication of garlic via tissue culture techniques *viz*., shoot tip and stem disc dome were exploited. Shoot tips and basal plates of three genotypes (G-282, PG-20, AC-102) excised from surface-sterilized cloves were cultured and sub cultured on nutrient media for the multiple shoot regeneration and redifferentiated into shoots and roots. Among the two, Stem disc (undeveloped stem of the garlic clove under the basement of immature leaves) showed vigorous root development whereas, shoot tip resulted in more number of shoots. Genotypic differences in regeneration and bulblet formation were present among the cultivars used. G-282 responded to both shoot tip and stem disc with maximum shoot production capacity while, AC-102 responded only to shoot tip culture. No response was observed in PG-20. Best plant regeneration was observed in MS Medium.

Key words: Garlic, liliaceous sterile plant, clonal propagation and MS medium

Abstract – 48

BRIEF REVIEW ON QUANTITATIVE GENETICS

Sanjay Kumar Sanadya, Bajrang Lal Jakhar, Smrutishree Sahoo, Sukhdev Singh
College of Agriculture, SKRAU, Bikaner

Quantitative genetics in conjunction with statistics has provided much of the scientific framework for modern plant breeding. Although there has been no specific review of the contributions of quantitative genetics and statistics to plant breeding, the contributions have been undoubtedly profound and lasting. Quantitative genetic theory in many ways is robust to and naive of modern genetic principles. Little is known about the biology or the genetic architecture of quantitative traits. Five major areas of quantitative genetics: number of loci controlling quantitative traits, nature of quantitative trait loci, gene action and effects, epistasis, and genotype and environment interaction relevant to plant improvement and to molecular marker applications. The relevance of quantitative genetics to plant breeding in the fact that manipulation of genetic variability of quantitative traits through inbreeding, crossbreeding and selection are essential features of any plant breeding program. A primary objective of quantitative genetic research is an understanding of genetic consequences of such manipulations. A basic premise of quantitative genetics is that the genes that affect quantitative traits follow the same lows of transmission as genes that affect qualitative traits. Beyond generalities, the conclusion is that quantitative genetics has provided little specific information on the biology or the architecture of quantitative traits. To maintain the quality of life on earth, agriculture has to colonize marginal areas and decrease its dependence on pesticides, herbicides, fertilizers and water. Plant breeding should integrate the latest innovations in biology and

genetics to better face this challenge. Quantitative trait loci (QTL) analysis allows the location and effect-estimation of the genetic elements controlling any trait by the joint study of segregation of marker genotypes and of phenotypic values of individuals or lines. QTL analysis is now seen as a procedure to fill the gap between "omics" and the field. Molecular markers may complement plant breeding in three broad areas. Molecular markers provide reliable estimates of genetic diversity, may improve screening efficiency for many traits through their linkage with alleles with small (quantitative traits) and with large (qualitative traits) effects, and will provide the first understanding of biology and architecture of quantitative traits at the DNA level. Generalities about the usefulness of molecular markers in plant improvement are difficult to make.

Key words: Quantitative genetics, modern genetics, genetic consequences and QTL

Abstract – 49

GENE PYRAMIDING

Bajrang Lal Jakhar, Sanjay Kumar Sanadya and Smrutishree Sahoo
College of Agriculture, SKRAU, Bikaner

The development of molecular genetics and associated technology like MAS has led to the emergence of a new field in plant breeding namely gene pyramiding. Pyramiding entails stacking multiple genes leading to the simultaneous expression of more than one gene in a genotype to develop durable resistance expression. Gene pyramiding holds greater prospects to attain durable resistance against biotic and abiotic stresses in crops. Gene pyramiding can be done by conventional and molecular techniques. Tomatoes represent a major contribution to nutrition worldwide and are a reservoir of diverse antioxidant molecules, in addition, tomato also represents an excellent model system for both basic and applied research for many reasons, including ease of growth in a wide range of environment, a short life-cycle, and well- developed genetic and genomic tools. Tomato (yellow) leaf curl disease is a very destructive disease on tomato caused by whitefly transmitted begomoviruses. In many geographical regions, several species of begomovirrus infect tomato and cause TYLCD/ToLCD, leading up to 100% yield loss. Resistance to tomato-infecting begomoviruses has been successfully introgressed from *solanum pimpinellifolium, solanum peruvianum, solanum chilense* and *solanum habrochaites*. Pyramiding multiple Ty resistance gene may improve the spectrum, durability and level of resistance, thereby providing resistance to diverse tomato-infecting begomoviruses. Gene pyramiding in tomato is mainly done for TyLCV, drought and quality characters. Marker-assisted selection for TyLCV resistance gene offers many advantages, including the possibility of eliminating susceptible plants in a segregating population before transplanting, and the identification of plants homozygous for Ty-2 and Ty-3 or other combination in early generation so that selection in later generations could focus on horticultural, fruit quality or nutritional traits. The combination of multiple wild introgressions is likely to bring negative horticulture traits caused by linked gene. Therefore it would be useful to generate and use minimal introgression lines for pyramiding of different specific genes.

Key words: Pyramiding, TyLCV, marker and introgression lines

Abstract – 50

CHEMICAL CONSTITUENTS, THERAPEUTIC USES, BENEFITS AND SIDE EFFECTS OF *BISTORTA VIVIPARA*: A REVIEW

Amandeep Paul, Antul Kumar and Nirmaljit Kaur

Department of Botany, Punjab Agricultural University, Ludhiana-141004, India

Bistorta vivipara is a perennial herb, belongs to the family *Polygonaceae*. It is highly distributed in Iceland, high elevation mountains regions and also grown in Alpine meadows, fields and Tibetan plateaus. It is commonly known as Alpine bistort, Serpent grass, *Polygonum viviparam* and viviparous knotweed. It originates from short, thickened rhizomes which is the rich source of starch. The best time to study this plant lasts from late June to early September. This herb contains a lot of medicinal values to treat dysentery, gastric problems, urinary tract disorders as well as pharyngitis. The root parts are highly used to cure piles, wounds, ulcers, vomiting and biliousness. It is a rich source of chemical constituents like volatile oils, flavonoids, gallic acid, tannins and saponins. It also has many bioactive effects viz; antibacterial, antioxidant, antitumor and antiarthritic properties. In this review paper the medicinal properties, side effects, chemical constituents of *Bistorta vivipara* has been explored. The whole plant parts are used to cure diseases including roots too.

Key words: *Polygonum viviparam*, flavonoids, dysentery, pharyngitis, biliousnous, gallic acid, antibacterial, antitumor

Abstract – 51

POST HARVEST MANAGEMENT OF FRUITS AND VEGETABLES

Geeta Gaur[1] and Mukesh Topwal[2]

[1]Department of Agriculture, Uttaranchal University, Premnagr, 248001, Dehradun, Uttarakand, [2]Department of Vegetable Science, College of Agriculture, G. B. Pant University of Agriculture and Technology, Pantnagar, 263 145, U. S. Nagar, Uttarakhand

Improper harvesting, handling transportation and distribution of fruits and vegetables result in the significant losses which cause ultimately economic loss. The reduction of post-harvest losses reduces the dependence on imports of commodity fertilizers pesticides and other chemicals save a substantial amount of foreign exchange. It is estimated that total loss of vegetable and fruits in India due to inadequate post-harvest handling transportation of storage at less 20-25%. World production of vegetables amounted to 486 million tonnes, while that of fruits reached 392 million tonnes. India is the second major producer of fruits and vegetables and ranks next to Brazil and China respectively, in the world. It contributes to 10 percent and 14 percent respectively of world's fruits and vegetables production. The country actually produces respectively about 50 million tonnes and 85 million tonnes of fruits and vegetables per year, but just about 2% of this goes for processing, while over 25% is spoiled due to improper handling and storage, and the rest is consumed in fresh form. India produces 41% of world's mangoes, 23% bananas, 36 % green peas and 10% onion. Mangoes, grapes, mushrooms are exported to United Kingdom, Middle East, Singapore and Hong Kong. Onion potatoes and green vegetables like okra, bitter gourd, green chillies also have good export potential. Reducing the post harvest losses is very

important; ensuring that sufficient food, both in quantity and in quality is available to every inhabitant in our planet. It is projected that, the world population will grow to 8.3 billion inhabitants in 2025. Reduction of post-harvest losses also reduces the cost of production, trade and distribution, lowers the price for the consumer and increases the farmer's income.

Key words: Post harvest, economy, fruits and vegetables

Abstract – 52

TRANSGENICS: PRESENT STATUS IN INDIA

Smrutishree Sahoo, Sanjay Kumar Sanadya, Bajrang Lal Jakhar
Department of Plant Breeding and Genetics, SKRAU, Bikaner-334006

A transgenic crop is a crop which contains a gene or genes of a different species such as algae, bacteria, viruses or animals artificially inserted in its genome, which may come from an unrelated plant or from a completed different species. Target traits for transgenics are insect disease resistance, protein, vitamin content, stress tolerance, herbicide resistance etc. Some transgenic varieties like DMH-11,*Varuna* in MUSTARD and PAU Bt 1, F1861 and RS 2013 COTTON etc. have been released. The only genetically modified cash crop under commercial cultivation in India is BT cotton approved since 2002. The problems BT cotton is facing such as expensive seeds, seeds cannot be reused, yield stagnation along with licencing agreements with local seed companies, has given Monsanto a near monopoly on cotton seeds in India that has been the biggest worry. Diffusion of illegal Bt hybrids that hadn't been cleared for biosafety standards, leading to fears of environmental toxicity. As it provides protection only against one type of cotton pest, use of insecticides has risen again close to the levels of the pre-Bt years. The government cut royalty by more than 70% on March 9, 2017 and followed that up by capping the price of seeds at Rs 800 which earlier sold at between Rs 830 and Rs 1,000. Monsanto faces a big challenge from the CICR, which has introduced Bt genes into 21 cotton seed varieties and is offering to provide these seeds to farmers at 10% the cost of Monsanto's products. In case of BT Brinjal, The GEAC in 2007, recommended the commercial release developed by Mahyco (Maharashtra Hybrid Seeds Company) in collaboration with the UAS, Dharward and TNAU overturned in February 2010 by the then Environment Minister who assumed the role of regulator and ordered a suspension on the transgenic vegetable's cultivation. The year, 2016 was the turning point for GM crops in India as it transcended from the shadows of the moratorium on Bt brinjal imposed in 2010 towards commercial release of GM mustard. India has completed the process of inviting public comments on the biosafety dossier of GM mustard, seeking permission for environmental release of transgenic mustard hybrid DMH-11 and parental lines expressing barnase, barstar and bar genes. India does not currently allow the growing of GM food crops but the government of Prime Minister Narendra Modi, keen to improve farms' productivity, has encouraged open field trials after a five-year *de facto ban*.

Key words: Transgenic, commercial cultivation and GM food crops

Abstract – 53

EFFECT OF HYDRO AND HALO PRIMING ON GROWTH AND DEVELOPMENT OF RICE

Mahesh Kumar and Bandana Bose

Department of Plant Physiology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi- 221005, India.

In the present investigation HUBR 10-9 genotype was selected to see the effect of hydro and halo priming on growth and development of rice during vegetative growth of rice. Priming of seeds has been done with distilled water (hydro) and Mg $(NO3)_2$ (halo) and different growth parameters, such as plant height, number of tillers $hill^{-1}$, number of green leaves $hill^{-1}$, leaf area index, leaf area $hill^{-1}$ and relative growth rate were studied at different study periods. Primed seeds increased all the growth parameters in respect to non-primed (control) sets.

Key words: Priming, plant growth and yield

Abstract – 54

EFFECTS OF ROOT-KNOT NEMATODE INFECTION ON PHENOL AND PROLINE CONTENTS OF RESISTANT AND SUSCEPTIBLE CUCUMBER CULTIVARS/GERMPLASM

Ritu kumari Pandey, Saroj Kumar Mallik, Dhirendra Kumar Nayak & Anita Kumari Ujjwal

[1]Department of Nematology, College of Agriculture, Orissa University of Agriculture & Tecnology, Bhubaneswar

The variation in total phenolic substances in six cucumber cultivars i.e Greenstar(Resistant),Greenlong(ModeratelyResistant),Malavi(Susceptible),Hiramoti(Susceptible), 12 Patra(Highly susceptible) and Kulak(Highly susceptible) were studied 45 days after inoculation of *Meloidogyne incognita.* Proline was quantified (from leaf tissue) by acid-ninhydrin method. The total proline content in the shoots of both healthy and resistant cultivars was higher compared to the susceptible cultivars. The proline content of healthy plants of cucumber cultivars were 0.151, 0.171, 0.142, 0.131,0.141 and 0.141μg/g in ,Greenstar, Greenlong, Malavi , Hiramoti , 12Patra, and Kulak respectively. But due to infection of root knot nematode the proline contents of these varieties increased by 65.56, 63.74, 40.14, 25.19, 22.60 and 15.60 per cent respectively .An increasing trend was also observed in the proline contents in the shoots of inoculated susceptible and resistant cultivars. Some selective changes occur in the metabolism either as a consequence of the establishment of a compatible (susceptible) host-pathogen interaction or as a result of incompatibility (resistant) between host and parasite. . The root-knot nematode develops a sophisticated interrelationship with the roots of their host where they induce specific types of nurse cell system. The phenolic content of healthy plants of cucumber cultivars were 0.163, 0.158, 0.144, 0.153, 0.150 and 0.168μg/g in Greenstar, Greenlong, Malavi, Hiramoti, 12 Patra and Kulak respectively. But due to infection of root knot nematode the phenolic contents of these varieties increased by 74.23, 65.18, 56.94, 51.63, 41.33 and 31.54 per cent respectively An increasing trend was also observed in the phenolic contents in the roots of inoculated susceptible and resistant cultivars. It was also observed that the phenol content ranged from 0.144 to 0.168μ g/g in healthy gladiolus varieties and 0.212 to 0.284μ g/g in infected cucumber varieties. A greater percentage in phenol content was observed as 74.23 % in the variety Greenstar and lowest 31.54% in the variety Kulak .The

total phenol content in roots of healthy plants increased but in the infected plants phenols are reduced in shoots because the nematode infection interfere in the phenol metabolism and the basipetal translocation of free phenols contributed to the reduction of phenols in the shoots. The phenolic compounds are the best known factors responses and there is distinct correlation between the degree of plant resistance and the phenolic compounds in nematode inoculated samples possibly due to rapid liberation of conjugated phenols from the glycosidic compounds produced by the action of hydrolytic enzymes during feeding process. The increase in phenolic compounds during the infection period might be attributed to the rapid break down of bound phenols or switching over of phenols to different pathways leading to the formation of various compounds like lignin which plays significant role in resistant reaction.

Key words: Phenolic substances, proline, incompatibility and resistant

Abstract – 55

CRISPR/ CAS SYSTEM IN CROP PLANTS

Aarti Sharma

Genetics and Plant Breeding Department, BHU, Varanasi, UP.

CRISPR/Cas (Clustered Regularly Inter-spaced Short Pallindromic Repeats/ CRISPR associated) is a genome editing technology, like, TALEN (Transcription Activator like Effector Nucleases) and ZFN (Zinc Finger Nucleases). CRISPR/Cas system is different from TALEN and ZFN, in being facile, potentially better and ability to target DNA and RNA differently. For example, Type III B CRISPR/Cas system is specific for RNA silencing based on homology, and is applicable both *in vivo* and *in vitro*. It facilitates both forward and reverse genetics. CRISPR/Cas system is an adaptive immune system in bacteria and archaea against invading virus. There are three types CRISPR/Cas systems namely CRISPR/Cas I, II and III, being classified according to the protein associated with them i.e. Cas3, 9 and 10 respectively. CRISPR was identified in 1987(Ishino et.al. 1987) but their biological function was not understood till 2005. CRISPR/Cas system as a gene editing tool was developed in 2013. This system yields transgene free plants as it facilitates heritable targeted mutation. CRISPR/Cas system has potential to accelerate plant breeding by allowing precise and predictable modifications directly in an elite background thus saving time over conventional breeding schemes, multiple traits can be modified simultaneously in CRISPR/Cas system which thus can be used as a handy tool in pyramid breeding in plants, NHEJ (Non-homologous End Joining) mediated gene knockout can help in getting disease free pants, and genes can be also modified to improve yield via NHEJ method of CRISPR/Cas system. CRISPR/Cas is an essential technology with remarkable features of simple manipulation, high efficiency and wide applicability. Using this novel technology can promote research on biosynthetic pathways and regulatory mechanisms. Other than genome editing CRISPR/Cas system is also useful in finding gene function by ectopic regulation of gene expression, epigenome study with the help of dCas9 fused with a fluorescent protein, which can unravel role of histone modification and DNA methylation, transcriptional repression or activation, CRISPRi for gene silencing and multiple gRNAs cleavage. This technique provides an alternative approaches for delivering target genes into crop with no transgenic footprints such as by agroinfiltration, viral infection or pre-assembled Cas9 protein. CRISPR/Cas is a progressive and affordable technology but still some problems remain to be solved like off

target effects, influence of chromatin structure, side effects on nearby genes, mechanism underlying the different effects of sgRNA on mutation efficiency and methods for efficient delivery in polyploidy plants. Despite of the challenges this technique is rapidly evolving and its application is constantly expanding and it can be widely applied to enhance performance of crop plants.

Key words: CRISPR/Cas, TALEN, ZFN, NHEJ

Abstract – 56

IN VITRO ANTAGONISTIC EFFECT OF THREE *TRICHODERMA* SPP. AGAINST *FUSARIUM VERTICILLIOIDES*

Goli Bhaskara, Sai Manikantha Chowdary, Rajendra Prasad and J.P. Mishra

Uttaranchal College of Agricultural Sciences, Uttaranchal University, Arcadia Grant, Premnagar, Dehradun-248007, Uttarakhand (INDIA)

Fusarium verticillioides (Sacc.) is a common pathogen of maize which causes post flowering stalk rot and reduces its yield and economic value. Maize is a major crop of India after rice and wheat which is cultivated in Kharif season. Stalk rot is considered as one of the important diseases of maize in India. In present study three species of *Trichoderma i.e., T. asperellum, T. harzianum* and *T. viride* were examined in *in-vitro* conditions against *F. verticillioides* by dual culture method on potato dextrose agar medium in Petri plates. The antagonistic efficacy of each biocontrol agent was determined in percentage of inhibition of growth of plant pathogen. *Trichoderma harzianum* exhibited maximum inhibition of test pathogen i.e., 52.88% followed by *T. viride* (45.55%) and *T. asperellum* (44%). The results obtained clearly indicated that the efficacy of *Trichoderma* spp. against test pathogen was quite variable. *T. harzianum* which showed good antagonistic effect can further be used in integrated management of stalk rot disease of maize.

Key words: Antagonistic effect, Dual Culture method, Inhibition percentage, *Fusarium verticillioides*, *Trichoderma* spp.

Abstract – 57

EFFECT OF ORGANIC, INRGANIC & BIOFERTILIZERS ON GROWTH ATTRIBUTES OF CABBAGE (*Brassica oleracea* var. *capitata*). UNDER C.G. PLAIN ZONE

Madan Kumar Jha[1], Pashyanti Urraiya[2], Bharti Jha[3], and Manju Rani Sahu[4]

[1]Dept. of Vegetable science, BTC CARS, Bilaspur (C.G.), [2]Dept. of Soil of soil science, BTC CARS, Bilaspur (C.G.), [3]Dept. of Horticulture OUAT, Bhubneshwar (Odisha), [4]Dept. of Vegetable science, BTC CARS, Bilaspur (C.G.)

The field experiment was conducted during *Rabi* season of 2016-17 at the Horticulture Research cum Instructional farm, BTC CARS, Bilaspur (C.G.). The treatments consisted of eleven combination of different agro input management practices viz., treatments 100 % RDF (Control) (T_1), 75 % RDF + 25 % N through FYM (T_2), 75 % RDF + 25 % N through VC (T_3), 50 % RDF + 50 % N through FYM (T_4), 50 % RDF + 50 % N through VC (T_5), 125% RDF (T_6), 100 % RDF + 25% N through FYM (T_7), 100 % RDF + 25% N through VC (T_8), 100 % RDF + 25% N through FYM + *Azotobacter* @ 2 kg ha^{-1}+PSB @ 2 kg ha^{-1} (T_9), 100 % RDF + 25% N through VC+ *Azotobacter* @ 2 kg ha^{-1}+PSB @ 2 kg ha^{-1} (T_{10}), 100 % from organic FYM+VC+AZ+PSB (T_{11}). The significantly maximum and minimum head Formation was recorded 95.01(%) T_2 and 78.41 (%) T_{11} at harvest. Maximum head height was recorded 60 DAT and time of harvest are 16.91cm and 20.79 cm under treatment T_2 minimum head height was

recorded 12.43 cm and 14.71cm under treatment T_3 and T_7. Maximum head diameter was recorded 60 DAT and time of harvest are 42.65 cm and 46.37 cm under treatment T_2 minimum head diameter was recorded 24.90 cm and 32.69 cm under treatment T_8 and T_4.

Key words: *Organic, Inorganic, Biofertilizer Combination, Azotobacter and Cabbage*

Abstract – 58

FFECT OF DIFFERENT WEED MANAGEMENT PRACTICES ON GROWTH ATTRIBUTES OF ONION (*Allium cepa* L.)

Manju Rani Sahu[1], Madan Kumar Jha[2], Bhartii Jha[3], and Pashyanti Urraiya[4]

[1]Dept. of Vegetable science, BTC CARS, Bilaspur (C.G.), [2]Dept. of Vegetable science, BTC CARS, Bilaspur (C.G.), [3]Dept. of Horticulture OUA &T, Bhubneshwar (Odisha), [4]Dept. of Vegetable science, JNKVV, Jabalpur (M.P.)

The field experiment was conducted during *Rabi* season of 2016-17 at the Horticulture Research cum Instructional farm, BTC CARS, Bilaspur (C.G.). The treatments consisted of ten combination of different agro input management practices viz., T_1 (control weedy check),T_2 (weed free),T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)),T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)), T_5 (Quizalofop-ethyl @1 kg/ha (Post-emergence)), T_6 (Pendimethalin @ 1.750 kg/ha (Pre emergence) + Quizalofop-ethyl @ 1 kg/ha (Post-emergence)), T_7 (Oxyfluorfen @ 1 kg/ha (Pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (Post-emergence)), T_8 (Two hand weeding at 25 and 45 DAT), T_9 (Black polythene mulch), T_{10} (Organic mulch with paddy straw @ 20 q/ha).The significantly maximum plant height (cm) was recorded 34.44 cm (T_2), 65.89 cm (T_2), 68.58 cm (T_2), and 67.38 cm (T_2) and minimum plant height (cm) was recorded 26.33 cm (T_1), 50.80 cm (T_1), 51.71 cm (T_1), and 50.70 cm (T_1) Was recorded 30, 60, 90 DAT and at harvest. The significantly maximum number of leaves was recorded 5.60 (T_7), 8.30 (T_2), 10.00 (T_2), and 9.80 (T_2) and minimum number of leaves was recorded 4.67 (T_1), 5.47 (T_1), 6.48 (T_2), and 6.13 (T_2) Was recorded 30, 60, 90 DAT and at harvest.

Key words: *Pendimethalin, Oxyfluorfen, Quizalofop-ethyl, and onion.*

Abstract – 59

TILLING: A REVERSE GENETICS TOOL FOR CROP IMPROVEMENT

Ayushi Srivastava, Omprakash and Aarti Sharma

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005

Reverse genetic is an important complement to forward genetics in which functional study of gene starts with gene sequence rather than a mutant phenotype. Gene regions are targeted for mutation discovery using PCR and standard SNP discovery methods. Nucleotide sequence variation is a major determinant of heritable phenotypic difference and has been exploited by humans for crop improvement since the dawn of domestication. TILLING and EcoTILLING are high-throughput and low-cost non transgenic approach for the discovery of induced mutations and natural polymorphisms. The advent of TILLING and EcoTILLING technologies has provided a powerful tool in carrying out reverse genetics research for any plant because TILLING can provide allelic series of mutations, including knock-outs. Successful applications of the TILLING technique for functional genomics have been established in Arabidopsis, *Drosophila* and zebra-fish. A vast majority of genes has not yet been

mutated in most plants and TILLING provides a way ahead to explore these genes in a comprehensive manner and reverse genetics allows their study .The application and current status of TILLING and EcoTILLING technologies in various plants and crops including Arabidopsis, *Lotus*, wheat, maize, rice, barley, soybean, tomato, and sugar-cane has been reviewed in this article.

Key words*:* Reverse genetics, SNP discovery, TIILING, Eco-TILLING and Drosophila

Abstract – 60

WEED MANAGEMENT STUDIES IN KHARIF ONION (*Allium cepa* L.) ON YIELD & QUALITY ATTRIBUTES

Pashyanti Urraiya[1], Madan Kumar Jha [2] and Bharti Jha[3]

[1]Dept. of Vegetable science, JNKVV, Jabalpur (M.P.), [2]Dept. of Vegetable science, BTC CARS, Bilaspur (C.G.), [3]Dept. of Horticulture OUAT, Bhubneshwar (Odisha)

The present investigation entitled "Weed management studies in kharif Onion (*Allium cepa* L.)" was conducted at Horticulture Complex, Dept. of Horticulture, Maharajpur, Jawaharlal Nehru Krishi Vishwa vidyalaya, Jabalpur (M.P.) during the year 2016-17. The treatments consisted of Ten combination of different agro input management practices viz., Oxyflurofen 23.5% EC + one hand weeding at 40-60 DAT (T_1), Oxyflurofen 23.5% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT (T_2), Pendimethalin 30% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT (T_3), Black Plastic Mulch (T_4), Organic Mulch- 6 t/ha (T_5), Weedy check (T_6), Silver Plastic Mulch (T_7), Organic Mulch- 9 t/ha (T_8), Organic Mulch- 12 t/ha (T_9), Weed free check (T_{10}), Significantly The highest average bulb weight 86.00g was recorded under the T_{10}.. However, the lowest (38.43 g) average bulb weight was recorded in the treatment T_6. The maximum total soluble solids (11.83%) was recorded under the treatment T_{10}. However, the minimum TSS (9.83%) was recorded in the treatment T_5 and significantly the maximum bulb neck thickness, equatorial diameter and polar diameter were recorded in the treatment T_{10} while it was noted minimum in the treatment T_6. (0.62, 4.10 and 4.23 cm).

Key words: Oxyflurofen*,* Quizalofop Ethyl*,* Pendimethalin *and Onion*

Abstract – 61

SEED COLLECTION METHODS FOR *SEMECARPUS ANACARDIUM* IN GARHWAL HIMALAYA

Rathiesh P.[1], A.K.Negi[1], Dinesh Singh[1], N. Kanagaraj[2] and A. Mohan[3]

[1]HNB Garhwal University (A Central University), Srinagar, Uttarakhand, India, [2]Forest College and Research Institute, Tamil Nadu Agricultural University, Mettupalayam, Tamil Nadu, India, [3]Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand 248001, India.

Semecarpus anacardium Linn is one of the best, versatile and most commonly used tree as a household remedy, distributed in sub-Himalayan region, Tropical region, Bihar, Bengal, Orissa and central parts of India. It has been freely used all over India since centuries. The word *Semecarpus* is derived from Greek word simeion meaning marking or tracing and carpus meaning nut. *Anacardium* means like cardium; - "Heart shaped marking nut". It is commonly known as Marking nut or Dhobi nut or Oriental Cashew nut. It is a medium sized deciduous tree, growing up to 10-15 metres in height. The plant grows naturally in tropical and dry climate. Fruits are ripe between December to March and are 2-3 cm broad, ovoid and smooth with a lustrous black. Seed collection plays important role in raising a crop for nursery and plantations. Garhwal is the north-western region and

administrative division of the northern Indian state of Uttarakhand which is home to the Garhwali people. Lying in the Himalayas, it is bounded on the north by Tibet, on the east by Kumaon region, on the south by Uttar Pradesh state, and on the north-west by Himachal Pradesh state. The region consists almost entirely of rugged mountain ranges running in all directions, and separated by narrow valleys which in some cases become deep gorges or ravines because of this locality condition, Seed collection can be done by seed collection directly from tree with climbing or Lopping because of rugged hilly terrain and ground collection wherever plain terrain.

Keywords: Seed collection, *Semecarpus anacardium*, Garhwal Himalaya.

Abstract – 62

MORPHOLOGICAL CHARACTERIZATION IN ELITE LINES OF CHECKPEA (*Cicer arietinum* L.)

Sadhna Saha[1], Srishti Singh[2] and Vishal Kumar Gupta[3]

[1]Dept. of Plant Breeding and Genetics, [2]Dept. of Plant Breeding and Genetics, JNKVV, Jabalpur (M.P.), [3]Dept. of Plant Breeding and Genetics, IGKVV, RAIPUR (C.G.)

Characterizations of visual traits are those morphological characters which can be assumed by seeing touch and some traits can be measured. The field experiment was conducted at the Seed Breeding Farm, College of Agriculture, Jabalpur, during *Rabi (*2016-17) in RCBD. The experimental materials were obtained 70 genotypes of elite lines. Each lines were grown in one row of 4 meter length. Row to row and plant to plant spacing 30 cm and 8 cm, respectively. According to DUS guidelines seventy genotypes characterization for morphological traits showed variation for Anthocynin colouration, Time of flowering, plant: growth habit, plant: color of foliage, leaflet size, leaf pattern, flower number per peduncle, flower color, peduncle length, plant height, pod size, pod: number of seeds, leaf and plant pubescence, seed color, seed size, and seed testa texture. Morphological-visual traits considering for characterization showed overlapping of expression in various combination traits. This information has great utility for identification of genotypes. Screening of genotypes against prevailing soil borne diseases *viz.,* collar rot, *Fusarium* wilt and dry rot under field condition, out of seventy genotypes thirty nine genotypes viz., IPC 2014-48, IPC 2015-120, IPC 2012-31, IPC 2010-14, IPC 2008-11, IPC 2006-127, IPC 2010-216, Phule G 0805-17-5, Phule G 0919-4-8, N BeG 873, SAGL 152278, SAGL 152317, SAGL 152402, SAGL 152404, SAGL 152405, JG 2016-111, JG 2016-141611, JG 2016-634958, JG 2016-921814, JG 2016-96054958, JG 2016-960506301, ICCX-080026-P4, ICCX-080062-P1, ICCX-080062-P3, ICCX-080065-P2, ICCX-090020-P5, ICCX-090026-P11, ICCX-090036-P17, ICCX-090042-P5 JAKI 9218 and JG 14 found resistance to *Fusarium* wilt. During this crop season symptoms of collar rot and dry rot not occurred in the genotypes.

Key words: Chickpea, DUS

Abstract – 63

MOLECULAR BREEDING IN TOMATO

Smrutishree Sahoo[1], Nitesh[2] and Seema Kasotiya[3]

[1]Department of Plant Breeding and Genetics, [2,3]Dept. of Agril. Economics, SKRAU, Bikaner

Tomato *(Lycopersicon esculentum)* is a model species for genetic analyses since a long time.The genetic linkage map was constructed, and currently there are several molecular maps based on crosses between the cultivated and various wild species of tomato. Most of these genes that have been mapped, are involved in fruit colour

and shape, in plant growth and architecture and in disease resistances. The high-density molecular map, developed based on an *L. esculentum* × *L. pennellii* cross, includes more than 2200 markers with an average marker distance of less than 1 cM and an average of 750 kbp per cM. Different types of molecular markers such as RFLPs, AFLPs, SSRs, CAPS, RGAs, ESTs, and COSs have been developed and mapped onto the 12 tomato chromosomes. Markers have been used extensively for identification and mapping of genes and QTLs for many biologically and agriculturally important traits and occasionally for germplasm screening, fingerprinting, and marker-assisted breeding. MAS has been employed mainly for improving simply-inherited traits. FlavrSavr a genetically modified tomato, was the first commercially grown genetically engineered food by slowing down the ripening process of the tomato.

Key words: Molecular map, genes and tomato

Abstract – 64

ASSESSMENT OF RIVER BHAGIRATHI ECOSYSTEM AT UTTARKASHI, UTTARAKHAND WITH REFERENCE TO WATER QUALITY INDEX

Jai Laxmi Rawat, A. K. Agrawal, M.P.S. Parmar, Richa Badhani and Naresh Chauhan
Department of Botany, Govt. P. G. College Uttarkashi (Uttarakhand) India

The river Bhagirathi originates from Gaumukh and largest tributaries of river Ganga. The river Ganga is regarded as one of the most holy and sacred river of the world from time immemorial yet it is being polluted by many sources. The evaluation of river water quality is a critical element in the assessment of water resources. The quality of water that is consumed defines the baseline of protection against many diseases and infections. The present study was intended to calculate water quality index for Bhagirathi at Uttarkashi for drinking, recreation and other purposes by using fifteen parameters like BOD, Temperature, P^H, Total hardness as $CaCO_3$, Calcium as $CaCO_3$, Magnesium, Nitrate, Sulphate, Alkalinity as $CaCO_3$, Iron, Turbidity, Arsenic, Total Coliform, E. coli and Fluoride .The physiochemical characteristics were studied and analyzed during February-2016-January 2017. The five different sites are site 1 (Maneri), Site 2 (Gangori), Site 3 (Laksheshwar), Site 4 (Tiloth) and Site 5 (Joshiyara Bairaj). The physiochemical parameter of river Bhagirathi indicates that the water of river Bhagirathi is not suitable for drinking by human directly and pollution load is comparatively high during rainy and summer season. The site 5 (Joshiyara Bairaj) is higher polluted as compared to other 4 sites and Site 2 (Gangori) is lowest polluted. So highest priority should be given to water quality monitoring and there indigenous technologies should be adopted to make fit domestic and drinking after treatment. It is advised not to consume water without proper treatment.

Key words: Physiochemical Assessment, Bhagirathi

Abstract – 65

Nanobiotechnology

Sukhdev Singh, Sanjay Kumar Sanadya, Hareram Kumar, Upendra kumar Bagri, Atma Ram Meena
College of Agriculture, SKRAU, Bikaner

This article reviews some of the potential application of nanotechnology in the field of agriculture, cosmetics, medicinal, pharmaceutical and recommends many strategies for the advancement of scientific and technological knowledge currently being examined. Plant physiology and nanotechnology create new tools for studying how plants function and enhance plant productivity. Effective nanoengineering of plant function requires targeted and controlled delivery of nanoparticles with their cargoes to organelles and tissues of interest. To date the effect of nanoparticle structure and composition on the absorption, transport and distribution of nanomaterials in plant is poorly understood. Small biomolecules such as synthetic elicitors, drug-like compound that are induce natural immune responses in plant contributing to efficient regulation of plant protection against pathogens. Ultimately, integrate plant nanobiotechnology approach with precision agriculture to enhance crop yields. Article has demonstrated that nanosensors can detect change in analyte concentration in living plants and report them to a commercially available near infrared camera. Implementation of this plant nanobiotechnology approach will transform the field of plant physiology research and enable new nanotechnologies for crop yield enhancement in precision agriculture.

Abstract – 66

UNFRUITFULNESS IN ARID AND SEMI-ARID ZONE FRUIT CROPS: CAUSES AND REMEDIES

Narendra Singh[1], Sagar[2] and Chetan Kumar Jangir[3]
[1]Department of Horticulture, [2]Department of Genetics and Plant Breeding, [3]Department Soil Science, CCS HAU, Hisar, Haryana, India

Fruit crops are indispensable part of agriculture in arid and semi-arid region of India; they are potential source of income and dietary nutrients in these areas. The unfruitfulness is one of the serious problems of many orchards and its causes need to be understood properly for obtaining economically acceptable production level. Unfruitfulness is a state in which a plant is unable to bloom, set fruit or carry them to maturity. The causes of unfruitfulness can be either internal or external factors. External factors include various adapho-climatic factors *i.e.* temperature, rainfall, cloudy weather, wind, frost, rootstock, disturbed soil and water relation, nutrient supply, pruning, insects-pests and diseases. Internal factors are evolutionary tendencies *viz.* monoecy, dioecy and pseudo-hermaphroditism; structural diversity (floral structure); heterostyly, self-incompatibility, dichogamy, abortion of ovules, pollen impotence, genetic sterility and C/N ratio of the plant. For getting optimum production and higher return in crops like ber and aonla, planting of self-fruitful varieties or inclusion of compatible varieties to ensure cross pollination can be done. Mechanical and hand pollination can be practiced in date palm. Spraying with GA_3, NAA and boron increases the fruit set and reduces the physiological fruit drop in these crops.

Key words- arid zone, pollination, production unfruitfulness

Abstract – 67

COMBINING ABILITY STUDIES FOR YIELD AND QUALITY PARAMETERS IN SOME BASMATI RICE (*ORYZA SATIVA* L.) LINES AND THEIR HYBRIDS

Akanksha and Jaiswal H.K.

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi 221 005, India

Effect of general and specific combining ability of six basmati rice varieties and their fifteen hybrids made through diallel mating without reciprocals for different yield and quality parameters were studied in order to facilitate the selection of parental varieties for future domestic breeding programs. The present investigation was undertaken to determine the extent of variability, combined ability effects, and heterosis for different quantitative and qualitative characters in scented Basmati rice (Oryza sativa L.) accessions collected from diverse sources. The experimental material consisted of 6 parents and 15 crosses which were planted in Randomized Block Design with two replications during kharif 2015 at Research Farm, Institute of Agricultural Sciences, B.H.U, Varanasi. The observations were recorded on eight yield traits viz., days to 50% flowering, days to maturity, plant height, main panicle length, effective tillers per plant, number of seeds per panicle, 100 seed weight, and grain yield per plant. Furthermore, the observations on seven quality parameters viz., kernel length, kernel breadth, kernel length after cooking, kernel breadth after cooking, Alkali Spread Value (ASV), and amylose content were also made. Data generated from the method (i) of diallel mating design were subjected to the statistical analysis in order to estimate the general and specific combining ability (GCA and SCA) variances and effects, as described by Griffing (1956). The ANOVA for combining ability showed that the mean squares due to general and specific combining were highly significant for all the traits indicating that both additive and non additive gene actions were involved in the inheritances of these traits. SCA variances were higher than the GCA variances for all the characters indicating preponderance of non additive gene actions in the inheritance of the characters under study. Different lines and hybrids were found best general and specific combiners for different traits respectively. Based on GCA effects, for days to 50 % flowering, panicle length, 100 grain weight, kernel length, kernel length after cooking and for days to maturity, HUBR16 (mean 88 days) was the best general combiner followed by Sanowal Basmati. Similarly, based on SCA effects, HUBR10-9 x B 370 was the best specific cross with mean value of 92 days for days to maturity, seeds per panicle, grain yield, amylase content and days to 50% flowering. Most interesting thing found under this study was the direct relation between heterosis and SCA effects. Crosses having higher positive significant value of SCA effect showed higher heterosis value for all characters and vice versa. Thus, important heterotic crosses can be used effectively in crop improvement programs and for further fine mapping and validation of specific genes to develop gene-based perfect markers in rice breeding and for mining of better alleles of these genes in rice collections reflect India as a major producer of quality rice all over the world.

Key words: rice, general combining ability, specific combining ability, diallel analysis, heterosis.

Abstract – 68

IN VITRO EVALUTION OF FUNGICIDE AGAINST *COLLETOTRICHUM TRUNCATUM* CAUSING ANTHRACNOSE OF SOYABEAN

Vasik ahamad, Ashwani Rawat and GBS Manikanta Chowdhary

Uttranchal College of Agricultural Sciences, Uttranchal University, Dehradun, Uttarakhand

The efficacy of three different fungicides was evaluated against pod blight of soybean caused by *Colletotrichum truncatum* (Andrus and Moore) employing poisoned food technique, with three different concentrations. Efficacy of three fungicides with three different concentrations (150, 200,and 250, ppm), were studied in vitro on suppression of radial growth and the most effective fungicide was evaluated for its interference in infective morphogenetic pathway of the against *Colletortricum truncatum* . Results revealed that carbendazim was significantly superior to all other fungicides by inhibiting no radial growth followed by Hexaconazole (9.8 mm) mean and chlorothionil (3.88mm) mean over control after 7 days of incubation. Among the fungicides, carbendazim was found most effective in suppressing radial growth and inhibited appressorium formation at 150, 200 and 250 ppm, which is most important for the penetration of the pathogen on host surface.

Key words: Soyabean ANTHRACNOSE, *Collectotrichum truncatum.*

Abstract – 69

NANOTECHNOLOGY: TO EMPOWER PROTECTED CULTIVATION OF VEGETABLE CROPS IN THE FUTURE

Jayanth S.[1], Sagar[2] and Narendra Singh[3]

[1]Department of Vegetable Science, [2]Department of Genetics and Plant Breeding, [3]Department of Horticulture, CCS Haryana Agricultural University, Hisar, Haryana

Adoption of protected cultivation in the present scenario of limited land holdings and increased global food needs isan efficient technology for increased production and sustainableuse of resources. Protected cultivation when empowered with nanotechnology can boost the production of high value vegetable crops under greenhouses. Nano-technology *viz.,* nano-coated corrugation free steel pipes, nano-coated films, nano-sensors, nano-catalysts, encapsulated nano-agrochemicals and nano-fertilizers can be successfully incorporated in greenhouse production system. Nano-coated corrugation free steel pipes and nano-particle (titanium di-oxide) coated films which are U.V stabilized helps in prolonging the life and maintenance of polyhouse. Nano-sensors allow the detection of contaminants, pests, nutrient content and plant stress. Encapsulated nano-agrochemicals (SNP, chitosan of different molecular weight *etc.*) and nano-fertilizers provide an advantage of timely release and efficient utilization of nutrients and chemicals. Smart or intelligent packaging plays a major role in storage and export of high value vegetable crops. Nano-technology is in the dawn of its emergence and is being unknown to many.The economics of nanotechnology application in the horticultural supply chain is no different to the application of other technologies. Hence, with the increase in popularity and large scale applications of nanotechnology; its costs will decrease significantly making it affordable and highly reliable for efficient protected cultivation of high value vegetables in in the future days.

Key words- nanotechnology, efficient utilization, greenhouse, vegetables

Abstract – 70

HEALTH AND MEDICINAL PLANTS

Shalu[1] and Hirdesh Yadav[2]

[1]Department of Home Science Extension, College of Home Science, G. B. Pant University of Agriculture and Technology, Pantnagar 263145, Uttarakhand, India, [2]Vegetable Science College of Agriculture,G. B. Pant University of Agriculture and Technology, Pantnagar 263145, Uttarakhand, India

Uttarakhand, also known as 'Devbhumi' is well known for its rich medicinal plant resources. A large number of workers have given a detailed account of the important species of medicinal plants occurring in different parts of the state. Medicinal plants have played an important role of primary health care system among the local people of Uttarakhand state. The present study of the traditional knowledge of medicinal plants and its use by local people of Uttarakhand region. The human needs on medicinal plants are discussed. Drug therapy and drug discovery should be focused more than before on medicinal plants. A lot of medicinal plants such as Garlic, Ginseng, Ginger, Ginkgo, and Mucuna have gained popularity for the treatment or prevention of a lot of disorders. Medicinal plants are the principal health care resources among the most of people in India. Local people of this region are basically depends upon medicinal plants for their primary health care system. Their primary cure of diseases is based upon deep observation of nature and their understanding of traditional knowledge of medical practices. Local people in this region, especially tribal people and women heavily use these traditionally available medicinal plants for health and believe that these are easily available, less expensive and have no side effects as compare to modern medicine. The plants used for medicinal purposes in the primary health traditions are slowly becoming extinct due to development activities, population explosion, impact of tourism, deforestation and many more. The present study focuses about the indigenous knowledge of different medicinal plants used in the Uttarakhand region.

Key words: medicinal plant, Uttarakhand , health.

Abstract – 71

QUANTITATIVE ANALYSIS OF CAPSAICINOIDS IN CHILLY VARIETIES BY HIGH PERFORMANCE LIQUID CHROMATOGRAPH

G. Chandramohan Reddy[1], S.S. Hebbar[2] and K.V.Rao[3]

[1]Department of Spices, Plantation, Medicinal and Aromatic crops, College of Horticulture, UHS Campus, GKVK Post, Bangalore, [2]Division of vegetable crops and [3]Division of biochemistry, Indian Institute of Horticultural Research, Hesaraghatta, Bengalore

In India two species of chilly viz., *Capsicum annuum* and *Capsicum frutescens* are widely cultivated and most of the varieties belong to *Capsicum annuum* species. Capsaicinoids are the compounds responsible for the pungency and are also credited with the pharmacological properties. The Chilly cultivars Angar, Donna, Rati, Tejaswini, Trikas, and Veda are commonly available in Karnataka. However, these varieties have not been analyzed for their capsaicinoid content. Hence, an attempt was made to analyze the green form of chillies for their total capsaicinoids and the pungency level which are expressed in terms of Scoville Heat Unit (SHU).

The present research compares the variations in these varieties and reports that among all the chilly varieties analyzed, Tejaswini showed a very high pungency level. All the varieties studied showed a pungency level greater than 3000-4500 SHU, which may serve as a potential source of capsaicin.

Key words: Chilly, capsaicinoid and pungency

Abstract – 72

FACTORS AFFECTING NITRATE REDUCTASE ACTIVITY IN *ALBIZIA CHINENIS* LEAVES

Vandana and S.P. Chaukiyal

Plant Physiology Discipline, Forest Research Institute, Dehradun, Uttarakhand

Nitrate is one of the major sources of nitrogen, taken up by roots of higher plants. The enzyme nitrate reductase (NR) catalyses the first committed step of nitrate assimilation. Its activity is affected by various internal and external factors. All such factors that affect the enzyme activity must be studied to know the conditions in which the activity is optimum. In the present study, an effort has been made to assess the optimum leaf NR activity with respect to buffer pH, substrate concentration, ambient temperature and leaf age. The study was conducted in leaves of *Albizia chinensis* seedlings which were grown in pots under natural conditions. Results revealed that NR showed maximum activity with 0.10M substrate concentration in combination with 7.6 buffer pH. Further, the activity increased with increasing leaf age from young to mature and then, it further decreased being minimum in oldest leaf. Study of variation in NR activity with changing temperature during day time showed that the activity increased from morning to afternoon with increasing ambient temperature and then it started decreasing as temperature falls. Therefore above conditions for buffer pH, substrate concentration, leaf age and temperature must be considered for nitrate reductase assay in leaves of *A. chinensis* for optimum activity.

Key words: Nitrate, enzyme, pH and leaves

Abstract – 73

MITIGATING CLIMATE CHANGE AND ADAPTATION TOWARDS CLIMATE SMART AGRICULTURE (CSA)

Meghna Gogoi[1], Kamal Kant[1], R. S. Bochalya[2]

[1]College of Postgraduate Studies, CPGS (CAU), Barapani, Meghalaya, [2]Institute of Agricultural Science, University of Calcutta, Kolkata, West Bengal

In the present scenario it is a challenging task to address the impact of climate change. Some of the major impacts on agriculture due to climate change include changes in crop cultivation and agricultural biodiversity, decrease in input use efficiency, prevalence of pests and diseases and reduced yield potential. In order to combat these effects we need strategies which ensure a sustainable and climate resilient agriculture. One such approach for developing agricultural strategies includes Climate Smart Agriculture (CSA) which is an approach to secure sustainable food security under climate change. The FAO has formulated three pillars of CSA technologies and practices namely increasing the productivity enhance resilience to climatic stresses and reduce the emission of green house gases. Hence, any practice or technology can be considered as climate smart if it can help to achieve at least one of the three pillars of CSA. The CSA technologies include simple adaptation measures such as changes in the crop sowing dates, adoption of irrigation technologies, minimum tillage, different methods of crop

establishment, residue management, nutrition and irrigation management that can improve the crop yields and reduce Greenhouse gas emissions from agricultural activities.

Key words: Climate Smart Agriculture (CSA); input use efficiency; sustainable food security

Abstract – 74

SCREENING DIFFERENT GENE OF RAIN-FED MAIZE HYBRIDS DURING FLOWERING CONDITION

Saket Kumar[1], Rajeev Pratap Singh[1] Dan Singh Jakhar[2] Pavan Devesh[2] and Rajesh Singh[2]

[1]Institute of Environment and Sustainable development, BHU, Varanasi, [2]Dept. of Genetics and Plant Breeding, Institute of Agricultural Sciences, BHU, Varanasi

Maize is continually improved natural and artificial variety to adapt different environmental conditions. We integrate 5 maize hybrids from Karnal and Vivekanand Parvatiya Anusandhan Sansthan for analysis of genetic differentiation and genomic variation in different environmental conditions. Five hybrids (HM-9, HM-11, Vivek QPM-9, HQPM-1, HQPM-5) were observe in 4 environments (2 environment irrigated and 2 environment rain-fed) with 3 replication split plot design during the *Rabi* (winter) season 2016 and *Kharif* (rainy) season 2017. Under the sowing supplement 75% different doses of fertilizers (F0=No fertilizers, F1=60N, 30P, 30K, F2=Recommended Fertilizers Dose (120N, 60P, 60K), F3= Recommended Fertilizers Dose+5Kg Fe, F4= Recommended Fertilizers Dose+5Kg Zn, F5=175N, 75P, 75K+5KgFe+5KgZn). These hybrids were better performance in favourable environmental condition, after interaction some of them hybrids were better survive after supplement of remaining 25 % fertilizers during tasseling condition. These hybrids were express potential sources for grain yield in rain-fed environment as well as in irrigated environment but some of them could not better perform plant height, silking during *Rabi* (winter) season 2016 and *Kharif* (rainy) season 2017. In the rain-fed environment, these hybrids delay silking, but after dissection express cob formation condition in whole 5 hybrids crop. The gene expression of silks in different stages before and after pollination was analyzed. The expression profiles of immature silks, mature silks, and silks after pollination were compared. The potential genomic materials were highly differentiated and associated with putative function understood in maize. We were identified different expressed genes in both stages, who flowering time regulate in maize crop. There were analyzed the correlation between flowering time and drought stress using RNA-sequence and bioinformatics tools.

Key words: Fertilizers, gene expression, RNA sequences, non QPM and QPM hybrids.

Abstract – 75

PATHOGENICITY AND HOST PARASITE RELATIONSHIP OF *MELOIDOGYNE INCOGNITA* RACE-3 ON *PSEUDERANTHEMUM ATROPURPUREUM*

Mucksood Ahmad Ganaie

Section of Plant Pathology and Nematology Aligarh Muslim University, Aligarh India

Effect of different inoculum levels of *Meloidogyne incognita* Race-3 was studied under green house conditions on an ornamental plant *Pseuderanthemum atropurpureum*. The significant reduction in plant growth and physiological parameters was recorded at and above the inoculum level of 2000 J_2 per kg soil. The characteristic symptoms caused by root-knot nematode appeared on the above ground as well as underground parts of the *P.*

atropurpureum plant, particularly which received the higher inoculum levels of *M. incognita* Race-3. The severity of the symptoms caused by test pathogen on *P. atropurpureum* plants was directly proportional to the density of nematode. It was further observed that with an increase in the inoculum level, there was a progressive increase in host infestation by *M. incognita* Race-3 as indicated by the number of galls as well as the population of nematodes. However, the rate of nematode multiplication (reproduction factor) was reduced with increase in the inoculum density. The literature available revealed that *P. atropurpureum* is a new host for root-knot nematode *M. incognita* from India and elsewhere and damaging threshold level of this nematode on *P. atropurpureum* was 2000 J_2/ kg soil.

Key words: *P. atropurpureum*, *M. Incognita* Race-3, New Host, Threshold level, Pathogenicity.

Abstract – 76

POLLINATION MANAGEMENT FOR HIGHER PRODUCTIVITY AND QUALITY PRODUCTION OF TEMPERATE FRUITS IN HIMACHAL PRADESH

Abhay Chauhan[1], Pankaj Thakur[2] and Ramakant Sharma[3]

[1]Department of Fruit Science, [2]Department of Business Management, [3]Department of Plant Pathology, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni-Solan, H. P.

Pollination refers to the transfer of pollen grains from anthers to the stigma, successful completion of the pollination results in optimum yield while failure / deficiency at any stage results in crop yield reduction or complete loss. An adequate source of viable, compatible pollen and effective transfer of pollen grains on receptive stigmas are prerequisites and can be completed by the presence of a suitable pollinizer and an effective pollinator. In research findings it has been indicated that pollination enhance the yield and improve the seed number, shape size and weight of fruits. The major issues in the pollination of temperate fruits include absence of a suitable pollinizer, irregular flowering behaviour, incompatibility, absence of efficient pollinating agent has resulted in marked yield losses and in quality. To overcome these losses there is an urgent need to find suitable pollinizers for new as well as established cultivars and an efficient and effective pollinator. From management point of view most of the temperate fruits are obligately outcrossing, require compatible pollinizers and pollinators for effective pollination to enhance both yield and quality fruit production. Placement of a widely compatible pollinizer in the orchard in adequate number enhance the fruit set and quality of fruits produced. Pollinizers were recommended for the earlier introduced varieties, with the climate change the flowering period of these pollinizers does not overlap with the commercial cultivars, also there is a need to identify appropriate pollinizers for newly introduced cultivars. Placement of bee hives in the temperate fruit orchards have been recommended and has marketedely increased the yield potential. Effectiveness of a pollinator depend on its foraging behaviour and its adaptability to the environment. Recent findings indicated the appearance of side working tendency among the honeybees, which affects the pollination and there is a need to supplement pollination by other pollinators. Supplementing pollination with other pollinators like Bumble Bees, Stingless Bees yielded better results since they have top working behaviour which enhance pollination.

Key words: Pollination, pollen and pollinizer

Abstract – 77

IN VITRO BUD BREAK RESPONSE OF *PLUMBAGO ZEYLANICA* LINN. AS AFFECTED BY DIFFERENT HEAVY METALS

Jyoti Rani, Meena Bakshi and Heena Khurana

Forest Research Institute, Dehradun-248006, Uttarakhand, India

Plants are unique organisms equipped with remarkable metabolic and absorption capabilities, as well as transport systems that can take up nutrients or contaminants selectively from the growth matrix, soil or water. Phytoremediation involves growing plants in a contaminated matrix, for a required growth period, to remove contaminants from the matrix, or facilitate immobilisation (binding/containment) or degradation (detoxification) of the pollutants. The plants can be subsequently harvested, processed and disposed. The plant is becoming scarce due to increasing demand for its use in ethnobotanical practice. These factors necessitate the study of micropropagation of *P. zeylanica* via tissue culture to ensure sustainability. *Plumbago zeylanica*, being a medicinal plant has been found to be very effective in treating many ailments. This experiment was conducted to study the efficiency of the plant in the reclamation of the soil degraded by heavy metal pollutants produced by industries through uptake of the metal for its own growth and development. The heavy metals taken for the study were zinc, cobalt and manganese. From the experiment conducted, it was found that maximum bud break percentage was observed in 5X zinc and 3X zinc followed by 5X cobalt. However maximum number of leaves were produced in the media containing 5X zinc concentration followed by its 3 times concentration. 5X cobalt concentration produced maximum number of leaves while minimum number of leaves was produced in 3X cobalt concentration. 2X manganese concentration are helpful in producing maximum leaves among all other different concentration of manganese while very little growth was observed in 7X manganese. Hence, it was found that among the three heavy metals taken (Zn, Co, Mn), *Plumbago zeylanica* produced maximum leaves in the media treated with different concentrations of zinc, while minimum was observed in manganese.

Key words: *Plumbago zeylanica*, Phytoremediation, Micropropagation and Heavy metals

Abstract – 78

STUDIES ON *POGOSTEMON* ESSENTIAL OIL FOR ITS POSSIBLE ROLE AS BROAD SPECTRUM NATURAL HERBICIDE

Sangeeta[1], Daizy R. Batish[1], H. P. Singh[2]

[1]Department of Botany, [2]Department of Environment Studies, Panjab University, Chandigarh

Since antiquity, aromatic plants and their volatile oils have been used for fungicidal, insecticidal, medicinal and cosmetic purposes. Of late, these aromatic plants have been evaluated for their herbicidal potential. Herbicides based on plants are environment-friendly and possess novel target sites. They have a shorter half-life and are biodegradable in nature unlike synthetic chemicals. In fact, selective phytotoxicity of essential oils forms the basis for their use in sustainable weed management. With this background, we conducted a series of experiments under laboratory and dome condition to evaluate the herbicidal potential of essential oil extracted from *Pogostemon benghalensis* (Lamiaceae). The Pre-emergent activity of essential oil was determined under

laboratory condition by using oil emulsion (0.25-2.5 mg ml^{-1}) on the selected test weeds (*Avena fatua, Parthenium hysterophorus*and *Echinochloa crus-galli*). The oil significantly retarded the seeding growth of the test plants and also reduced the chlorophyll content and cellular respiration. The post-emergent activity of essential oil was also determined in term of seedling length, chlorophyll loss and energy metabolism towards the 4-week old plants of test weeds under dome condition. The results indicated that the oil significantly retard the growth of the test weeds. During the deliberations of symposium, it is proposed to discuss the various aspects of the herbicidal nature of *P. benghalensis* oil.

Key words: Weeds, Aromatic plants, Essential oils, Natural herbicides, Seedling growth.

Abstract – 79

WATERPROOFING CROPS

N. Swathi Rekha and V. Krishnaveni

Department of Genetics & Plant Breeding, Birsa Agriculture University, Kanke , Ranchi

In farming regions all over the world, in past 50 years, the extremes in water availability like drought and flood had increased its frequency. These two abiotic stresses are accounting to a loss of many US billion dollars all over the world. The crops which are mostly affected by these abiotic stresses include Rice, Maize, Soybean, Wheat and Cotton. Among these, the most flood-threatened crop is Rice. At present, over 35% of world's rice acreage is flood prone and much of this is in regions of Asia and Africa which are characterized as food insecure continents. This problem is considered as a major one and became a major international goal for the rice breeders to meet the anticipated needs of growing hunger mouths. To achieve this, adopting and developing a germplasm that can bear these abiotic assaults is essential. For this, development of rice varieties that survive transient submergence and their non-commercial dissemination to farmers cultivating flood prone paddies is important. For this content, through the initiatives of IRRI, robust submergence tolerance was transferred by MAS from farmer's landrace to modern varieties. For translation of flooding survival strategies to additional crops for stabilizing yields of food, feed, fiber and fuel, an entire knowledge on developmental, morphological, physiological and molecular mechanisms that underlie flood tolerance should be known.

Key words: Abiotic stress, germplasm and flood tolerance

Abstract – 80

REDUCING CROP FAILURE THROUGH RESPONSE FARMING

G. Rajitha, A. Muneendra Babu and G. Prabhakara Reddy

Department of Agronomy, S.V. Agricultural College, Tirupati-517502

Response farming can be defined as a set of strategic and tactical adjustments in cropping based on the amount of rainfall expected to be received and actual amount that will be received in the year. Response farming relies on forecasting amount of moisture from early rain occurrences. From this forecasts, farmers are able to choose the crops and agronomic practices that suit the forecast. Response farming is a multilayered decision system incorporating timing seasonal rainfall onset dates, close monitoring of actual rainfall, being able to adjust plant numbers and deciding whether or not to add fertilizer as a base for pending season. A portable rain-guage and soil moisture measuring devices were used to narrow down to the dates when the approaching season starts.

The rain guage also measures the amount of rainfall from the onset up to seedling season. These tools facilitates decision making in terms of choice of crop and amounts of variable inputs and second level decisions on whether the original crop should be maintained and whether or not additional fertilizer should be added. The agronomic forecast of rainfall based on the date of onset and subsequent actual rainfall following onset, could become a handy tool for farmers to make strategic and tactical decisions, compared to the conventional large scale forecasts issued by meteorological departments. The agronomic forecast facilitates choice of crops and choice of input levels, land preparation practices including spacing and plant populations. Response farming is a kind of Plan A/Plan B system, with Plan A geared for the higher yield potential and Plan B meant to minimise failures and reaping some reasonable yield. Response farming can be a useful approach for improving traditional adaptation strategies, and in making farming ecologically sustainable and economically feasible as climate change unfolds.

Key words: Close monitoring, Decision making, Economically feasible, Response farming.

Abstract – 81

UTILIZATION OF APPLE POMACE FIBRE FOR THE PREPARATION OF FIBRE ENRICHED ACIDOPHILUS YOGHURT

Kanika Issar
SGRR University, Dehradun, Uttarakhand

The suitability of utilization of apple pomace fibre for the preparation of fibre enriched acidophilus yoghurt was studied. Appropriate quantity of apple pomace fibre in different proportions (0, 2.5, 5, 7.5 and 10%) after rehydration in water was added to the pre-pasteurised milk, heated and cooled prior to aseptic inoculation with mixed cultures of *Lactobacillus acidophilus* and *Bifido longum* @1%. After inoculation, milk was poured into plastic cups (200 ml) and kept under incubation at 43^0C to allow setting of yoghurt. The optimized method consisting of addition of 5% apple pomace fibre in the whole milk followed by inoculation with *Lactobacillus acidophilus* and *Bifido longum* @1% and incubation at 43^0C resulted in a fibre enriched yoghurt with desirable physico-chemical and sensory attributes. The yoghurt was found to contain total soluble solids ranging from 6.50 to 7.00^0 Brix. The moisture content in yoghurt was recorded to be 81.74%. pH in the yoghurt did not experience any change with the addition of fibre. Ash content of the fibre enriched yoghurt ranged between 1.08 to 1.10%. The fat content ranged between 1.59 to 1.65%. On the basis of sensory evaluation, the yoghurt prepared by using 5% apple pomace fibre was found to be most appropriate with respect to appearance, body/consistency, flavor and overall acceptability. Thus, addition of fibre to the milk brought about significant improvement in the quality of fibre in the finished product and can successfully be used for preparation of fibre enriched acidophilus yoghurt. The addition of apple pomace fibre in the yoghurt, because of its nutritional and therapeutic attributes adds palatability to the yoghurt.

Key words: Apple pomace fibre, milk and yoghurt

Abstract – 82

GENETIC DIVERGENCE AMONG DIFFERENT YIELD RELATED COMPONENT OF WHEAT GENOTYPES

Afsar Ahmad, Shalendra Singh Gaurav, Anuj kumar, Kausar Ali and Mohd Imran

Department of Genetics and Plant breeding, Ch. Charan Singh University, Meerut U.P Department of Genetics and Plant breeding, Sardar Vallabahbhai Patel University of Agriculture & Technology, Modipuram Meerut

The study of morphological traits can be successfully used for estimation of genetic diversity and cultivars development because they providing a straightforward way of quantifying genetic variation. In the present investigation genetic divergence among thirty wheat genotypes work out on the basis of fourteen characters by Mahalanobis D^2 analysis using Non – Hierarchical Euclidean distance through Ward method. All the thirty genotypes were grouped into six clusters and their random distribution was based on different agro-ecological regions. Highest number of genotypes are presented in clusters IV which contained ten genotypes followed by clusters II and clusters I which contained eight and seven genotypes. Cluster V contained three genotypes while cluster II and VI contained only one genotype in each cluster. Pattern of distribution of genotypes in different clusters exhibited that geographical diversity /place of release was not related to genetic diversity as genotypes same geographical region were grouped into different clusters. The maximum inter cluster distance value observed between cluster I and VI which indicated that the genotypes included in these clusters on hybridization may give rise to high heterotic response and desired better segregates in F_2 Population. The minimum inter cluster distance found between cluster II and IV. This indicated a close relationship among the genotypes contained. So, the most desirable cluster was identified as cluster I &VI. Highly divergence and better performing genotypes viz; HPW-251,101HP-1633, GW-322,46GW-120,105-42, HPW-155 were identified on the basis of Mahalanobis Euclidean Distance. These genotypes may be recommending for their exploitation in breeding for the evolution of high yielding varieties of wheat.

Key words: Genetic diversity, cultivar and genotype

Abstract – 83

TRADITIONAL FARMING PRACTICES IN HILLY AREAS OF INDIA

Kamal Kant[1], Meghna Gogoi[1], S. G. Telkar[1], G. N. Gurjar[2] and R. S. Bochalya[3]

[1, 2] College of Postgraduate Studies, CPGS (CAU), Barapani-793103, Meghalaya, [3]Institute of Agricultural Science, University of Calcutta, Kolkata- 700019, West Bengal

Traditional farming is a type of farming that uses the techniques developed over decades or centuries to ensure good, sustainable yield over time in specific area or region. This system helps in maintaining soil fertility through decomposition of plants materials left on soil. Traditional farming system approach is not practical for mass food production but account for a substantial amount of food production in the hilly regions. In recent years, documenting traditional wisdom has gained significant attention world over due to its importance in developing a high potential environment and sustainable management. Farmers make use of locally available resource and so, there is need to study them to know there secret of success. In different regions different type of traditional farming practices are followed which are mostly results of economical, geographical, technological, social and

cultural condition prevailing in an area, so get confined to specific area. Lack of proper study, documentation and other means of dissemination can be blamed for current confinement. It results in depriving the farmers from taking benefit of its age old, simple, economical techniques. So by proper study, modification and dissemination livelihood and sustainability can be maintained. Some common practices are - Apatani rice-cum fish culture, Zabo system, Bamboo drip irrigation system, Nur-bun method of cultivation has been developed due to ingenuity and skill of tribal people.

Key words: Traditional farming practices, sustainable management, Apatani rice-cum fish culture, Zabo system, Bamboo drip irrigation system and Nur-bun method

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PROPAGATION OF *TAXUS BACCATA* THROUGH AIR LAYERING –A SIMPLE METHOD OF PROPAGATION TO CONSERVE THE HIGH ALTITUDE MEDICINAL PLANT USING DIFFERENT CONCENTRATION OF IBA

Sobha and J. S. Chauhan

Department of Seed Science and Technology, School of Agriculture & Allied Sciences, HNB Garhwal University (A Central University), Srinagar Garhwal-246174, Uttarakhand, India)

Taxus baccta is commonly known as thunar in Uttarakhand Himalaya. It is an evergreen tree found in Uttarakhand with an altitude ranging between 1500m to 3200m, in high slop of mountain. Taxus is a small to medium sized slow growing evergreen tree with red 'berries' (seed covered by arils). Seed coat colour is dark brown with hard woody structure. It is overexploited due to plant extraction used in the preparation of anti-cancer drugs to cure breast cancer and ovarian cancer and it is also used in many other treatments like bronchitis, asthma, poisonous insect bites and also as an aphrodisiac. Vegetative propagation and tissue culture methods are time taking and as well as too costly methods as compaired to air layering. Air layering is a method to overcome with a lengthy seed germination period caused due to a long dormancy phage (1-2 years). To overcome with this problem of seed dormancy, air layering is a quick and appropriate method to develop roots in short time period to propagate a new plant population. Auxins play an important role in root development, in case of our study different concentration of IBA was used (100, 250, 500, 750 and 1000ppm). Sphagnum moss is used as a rooting media. Moss was pretreated with different concentration of IBA solutions for half an hour. Excess moisture was removed from moss before rapping the moss with polythin sheets. IBA1000ppm shows best rooting responses with longest root length and survival percentage as compared to all other concentration. And no rooting responses were found in control conditions.

Key words: *Taxus baccata*, Taxol, Air- layering, IBA

Abstract – 85

SINGLE CROSS HYBRID MAIZE

N. Swathi Rekha, K. Prabhakara Reddy

Department of Genetics & Plant Breeding, Birsa Agriculture University, Kanke , Ranchi

Maize is the most versatile food crop of global importance and is one of the viable solutions for addressing changing climate. The crop, maize is the one which we all knew as a C4 plant. Besides this it helps in diversifying thee crop ecosystem by means of which a new trend of raising the crops can be achieved. Moreover, the

development of high yielding single cross hybrid maize varieties helped us a lot to achieve this. If the peri-urban culture is taken into count sweet corn and baby corn are providing a secured livelihood for the farmers. The single cross hybrids of quality protein maize (QPM) enriched with tryptophan and lysine provide a nutritious feed not only to poultry and cattle but also to the poor people who consume maize as their staple food. Thus it helps in maintaining food and nutritional security in the country. Besides this, maize had a great potential in seed and exporting sectors.

Key words: Maize, C4 plant, hybrid and single cross

Abstract – 86

THERAPEUTIC AND PHARMACEUTICALLY IMPORTANCE OF MEDICINAL PLANT ASPARAGUS RACEMOSUS

Leela Bhatt, M.K. Nautiyal , Shivani Dhyani and Pooja

[1]Department of Vegetable Science, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (Uttarakhand), [2]Department of Genetics and Plant Breeding Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (Uttarakhand)

The use of medicinal plants is as old as human civilization. About 1,100 plants species are frequently used in Indian system of healthcare and medicines for preparation of ayurvedic, unani and homeopathic drug. Asparagus racemosus Wild. (family Asparagaceae; Liliaceae), is commonly called Satavari, Sataw. The plant grows throughout the tropical and subtropical parts of India up to an altitude of 1500m. The plant is a spinous under-shrub, with tuberous, short rootstock bearing numerous succulent tuberous roots (30–100 cm long and 1–2 cm thick) that are silvery white or ash colored externally and white internally. These roots are the part that finds use in various medicinal preparations. The stem is woody, climbing, whitish grey or brown colored with small spines. The plant flowers during February–March leaving a mild fragrance in its surrounding and by the end of April, fruits can be seen with attractive red berries. Asparagus racemosus is a plant used in traditional Indian medicine (Ayurveda). The root is used to make medicine. The plant is a source of a nutritious starch that can be used. Asparagus is low in calories and is very low in sodium. The shoots are prepared and served in a number of ways around the world, typically as an appetizer. The part of the plant that is used is not specified but is mostly to be the root. Steroidal glycosides are identified in tuberous roots. Active compounds present in asparagus are well known for their multiple health benefits. The powdered dried root exhibits galactogogic properties. It is reported to be useful against diarrhoea, dysentery and in general debility. It's loaded with nutrients: Asparagus is a very good source of fiber, folate, vitamins A, C, E and K, as well as chromium, a trace mineral that enhances the ability of insulin to transport glucose from the bloodstream into cells. It contains high levels of the amino acid asparagine, which serves as a natural diuretic, and increased urination not only releases fluid but helps rid the body of excess salts. This is especially beneficial for people who suffer from edema (an accumulation of fluids in the body's tissues) and those who have high blood pressure or other heart-related diseases. Nowdays, the demand of such medicinally important plants has increased all over the world. However, indiscriminate use of such vital natural resources overtime and fragmentation of habitats may pose serious threat to their survival. Therefore, keeping in view the significance of Asparagus, efforts must be made to it protect it in its natural population.

Abstract – 87

BIOTECHNOLOGY: A NEW TOOL FOR VEGETABLE IMPROVEMENT

Leela Bhatt,[1] M.K. Nautiyal [2] and Vikas Mangal [2]

[1]Department of Vegetable Science, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (Uttarakhand), [2]Department of Genetics and Plant Breeding Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (Uttarakhand)

Biotechnology is a rapidly developing area of contemporary science. It can bring new ideas, improved tools and novel approaches to the solution of some persistent, seemingly intractable problems in food crop production. It is comprised of a continuum of technologies, ranging from traditional biotechnology such as plant tissue culture to modern biotechnology such as genetic engineering of plants and animals and represents the latest front in the ongoing scientific progress of this century. Revolutionary discoveries in biology in the 1970's and 1980's fueled predictions of dramatic changes in agriculture and stimulated entrepreneurial excitement and investment Beginning in 1994, the first wave of products from biotechnological applications to vegetables were introduced in pilot test markets. Vine-ripe tomatoes with extended shelf life, processing tomatoes with superior quality and deep red color, squash with novel virus resistance, and potatoes genetically modified to produce an insect-killing protein are examples of the traits introduced into commercial vegetable varieties with the tools of biotechnology. These first products, such as the Flavr Savr tomato which promised superior vine-ripened flavor, received both public visibility and regulatory scrutiny. Less visible to the public is the astounding behind-the-scenes impact of biotechnology in vegetable breeding, production, processing, and marketing. While not replacing traditional crop breeding and horticultural expertise, biotechnology has dramatically expanded the tools available for the genetic improvement and production of vegetables. The revolutionary advances that have resulted from public and private investments in basic and applied research are now entering commercial application, to the benefit of both producers and consumers.

Abstract – 88

ASSESSMENT OF STAGE SPECIFIC NUTRITIONAL QUALITY AND YIELD ATTRIBUTING TRAITS IN PIGEONPEA [*CAJANUS CAJAN* (L.)] GENOTYPES.

S. K. Singh [1], R. S. Nandanwar [1], P .V. Jadhav [2]

[1]Department of Agricultural Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, [2]Biotechnology Centre, Department of Agricultural Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra.

An investigation was carried out in the experimental field of Department of Agricultural Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra state during *Kharif* of 2016-2017 to elucidate the stage-specific nutritional quality and yield attributing traits in pigeonpea [*Cajanus cajan* (L.)] genotypes as well as to assessing genetic analysis for morpho-physiological, nutritional quality and yield attributing traits. Six nutritional traits viz. carbohydrate, protein, calcium, iron, manganese, and zinc revealed that the green stage pigeonpea had higher amounts of minerals viz., iron and zinc. However the grain stage legumes had a higher

amount of protein, starch, manganese and calcium. A wide range of variability was observed among fifteen agronomical traits. The most important correlations corresponded to two plant traits. Considering these traits, Principal component analysis (PCA) could explain 71.50% of the total diversity on the basis of the first four principal components. Based on cluster analysis, the sixteen genotypes were grouped into four clusters for nutritional data, five clusters for yield attributing characters and three clusters were generated for morpho-physiological traits, which indicated the presence of an appreciable amount of genetic diversity. The estimates of phenotypic coefficients of variation were higher than that of genotypic coefficients of variation for all characters under study. The estimates of genotypic correlation coefficient were higher than phenotypic correlation coefficient, indicating little masking effect environment on the expression of the characters. BDN-716 was found to be the best genotype for green pod yield. High heritability accompanied with high genetic advance was observed for the trait 100 fresh pod weights. Molecular characterization of promising vegetable type pigeonpea genotypes showed highest similarity (0.762) between AMAR and AKTM-11-06, whereas the lowest similarity coefficient was observed between SKN-0632 and AKTM-11-06 with a similarity coefficient value of (0.056). UPGMA dendrogram constructed using Jaccard's similarity coefficient gave the clustering of pigeonpea genotypes. The genotypes were clustered into two super clusters viz. super cluster-I and super cluster-II. The cluster analysis revealed that high diversity was observed in PKV-TARA and AKTM-1644. These diverse genotypes may be used as valuable sources for breeding programmes.

Key words: Pigeonpea, Principal component analysis (PCA), morpho-physiological traits, Cluster diagram, Dendrogram.

Abstract – 89

PLANT AND TREE SPECIES AS TOOLS FOR PHYTOREMEDIATION IN POLLUTED ENVIRONMENT: A REVIEW.

Gurwinder sran, Antul kumar, Amandeep Paul, Rajni sharma and Anuj choudhary
Department of Botany, Punjab Agricultural University, Ludhiana-141004, India

Plants act as a tool or green blanket to protect the environment from the effect of heavy metals, increasing day by day. Toxic metal pollution in water and soil is a major problem. Plants possess some important features which enable them to absorb heavy metals viz; Fe, Mn, Cu, Mo, Ni from soil and water. Plants also accumulate some toxic metals such as Silver (Ag), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Mercury (Hg), Lead (Pb) and Selenium (Se) etc. There are approximately 45 families have been identified which are responsible for absorbing heavy metals from the soil; some of the families are *Brassicaceae*, *Fabaceae*, *Euphorbiaceae*, *Asteraceae*, *Lamiaceae*, *Scrophulariaceae*. Among the best-known hyperaccumulators plant is *Thlaspi caerulescens* also known as alpine pennycress. It accumulates upto 26,000 $mgkg^{-1}$ Zn and 22% Cadmium from contaminated site observed by some researchers. The other plant species like *Brassica juncea* has a good ability to transport lead (Pb) from root to the shoots. In comparison to *Brassica juncea* the other three plants *Ipomea carnea, Datura innoxia* and *Phragmytes karka* also shows best results for accumulator heavy metals like Cadmium (Cd), Calcium (Ca) and Lead (Pb) from the soil. Alongwith these plant species some agroforestry tree species also shows best results for accumulating heavy metals. Eucalyptus (*Eucalyptus hybrid*) and Poplar (*Populus deltoids*) trees are very suitable for phytoremediation due to its fast growth and having a large tissue. The highest concentration of

Selenium was also observed in Dek (*Melia azedarach*) while in mulberry (*Morus alba*) tree species showed less amount of selenium. Poplar trees can breakdown atrazine from soil by using enzyme dehalogenase and laccase. Phytoremediation is highly cost effective and user-friendly method to remove the toxicity of heavy metals from the soil and water resources. Phytoremediation is the best method than the traditional methods. By using this technique we can protect soil, water as well as air resources in a single attempt. In this review article the ability of different plants to absorb the heavy metals from contaminated resources has been highlighted.

Key words: *Brassica juncea*, hyperaccumulators, agroforestry, cadmium, Selenium, phytoremediation, *Morus alba*, atrazine.

Abstract – 90

EFFECT OF PLANT GROWTH PROMOTING RHIZOBACTERIA ON WHEAT SEED GERMINATION AND GROWTH SUPPLEMENTED WITH ROSEMARY EXTRACT

Portia D Singh, Nitin Bisht, Pooja Barthwal and Deepti Prabh

Department of Seed Science and Technology, H.N.B Garhwal Central University, Srinagar

The investigation were carried out with an objective of to reduce the allelopathic effect of Rosemary on Wheat(variety VL 616) seeds by using bioagents (*Bacillus* &*Pseudomonas* strains) and estimation of catalase and peroxidase activity in it . The experiment was conducted at the Seed Science laboratory of H.N.B Garhwal University during 2015-2016, on pots at 25-30C temperature respectively. For each treatment 45 seeds (2gm) were weight with the help of electric balance. All seeds were treated with 0.02gm bacterial strain (*Pseudomonas* and *Bacillus)* in different pattern. Each treatment was replicated three times with 15 seeds per replication and seeds were sown in pots. Thereafter 10% rosemary extract (30 ml in 250gm of soil) were placed on each pots except control. In bioagents treatment all the parameters were significantly higher than negative control. In which T5 rated best and contain highest germination percentage (71.10%), speed of germination (1.50). Highest accumulated speed of germination (7.47) was found in T6, highest root length (14.85 cm), shoot length (17.54 cm), and seedling length (32.48cm) was found in T5. Maximum fresh weight (0.48gm), dry weight (0.13gm) found in T6. Highest vigour index 1(2316.56) found in T5 and highest vigour index 2 (8.56) found in T6 and highest Catalase activity was found in T5. On the basis of result of experiment we concluded that wheat seeds treated with bioagents gave us positive effect on all the parameters. The results shows all the treatments reduces the allelopathic effect of rosemary on wheat seeds but T5 treatment shows the best result and it can be used to enhance the planting value of wheat seed under allelopathic effect of Rosemary.

Abstract – 91

EFFECT OF AGEING AND HARMONAL PRIMING ON DIFFERENT PHYSIOLOGICAL ATTRIBUTES OF FRENCH BEAN (*Phaseolus vulgaris*)

Pooja Barthwal, Portia D Singh and Deepti Prabha

Department of Seed Science and Technology,H.N.B Garhwal Central University,Srinagar

The experiments were carried out with an objective of studying the effect of hormonal priming treatments on germination and seedling growth on aged seed of *Phaseolus vulgaris* variety Pant -anupama. The laboratory experiments were conducted on blotter at 25^0C and 30^0C temperature respectively. Three hormones regulator

i.e., IAA, kinetin and GA_3 with three concentration 5ppm, 10ppm, and 15ppm were taken. The planting value parameters assessed were germination percentage, speed of germination, germination value, root length, shoot length, seedling length, seedling fresh weight, seedling dry weight, seedling vigor index -1 and seedling vigor index-2. For accelerated ageing seeds were treated and in the towel paper experiment the seeds were treated with hormones regulator IAA, kinetin and GA_3 with different concentration i.e., 5, 10 &15ppm, then placed in incubator at 25^0c for 7 days. For towel paper experiment all the parameters were significantly more in $GA_3$5ppm than IAA, kinetin & control. In which aged Seeds primed with GA_3 rated best and contain highest germination percentage 28.33% speed of germination 0.80, germination value 505.27, root length 8.46 cm, shoot length 9.26cm, seedling length 17.73cm and seedling vigor index-1 503.75, vigor index-2 5.78.Thus present study showed that growth regulator in higher concentrations inhibits the seed germination. It can be concluded that significant variation was found in GA_3 5 ppm.

Abstract – 92

RECENT ADVANCES IN FLORICULTURE

Vishwa Mohan Dev Chauhan, Anil K. Singh

Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P);

The whole Floriculture industry is based upon novelty. Domestication of wild forms and classical breeding techniques have played a significant role in evolving of some outstanding novel genotypes which went on to became very popular and ended up becoming part of several famous literature works in past two centuries. However, classical breeding techniques could not succeed much because of its several limitations; for example, no one has succeeded in breeding a blue rose or an orange petunia. Floriculture industry cannot be imagined without novelty in different traits. Traits such as flower colour, form and fragrance along with long vase life are primary novelty markers as they are key determinants in consumer preference. Genetic engineering offers a great scope for improvement in flower crops. Although several methods like embryo and haploid cultures, soma clonal variations, hybridization, selection and mutation breeding have been utilized in improvement but they are yet to give results and to release some outstanding cultivars those will have an impact on world flower market. Genetic Engineering, more than any other technique, offers most potential because it is possible to transfer a new gene responsible for known character to an existing cultivar. Commercialization of genetically engineered flowers is currently confined to novel coloured carnations. The biosynthesis of floral pigments, particularly anthocyanins, has been studied in great detail in flowers such as petunia. This knowledge is now being applied to an understanding of a wide range of other flowers and providing a means of targeting colour modification in these species. This is best demonstrated in the 'Moon' series transgenic carnations marketed in North America, Australia and Japan. Carnation flowers are typically available in three forms, spray, midi and standard. The Florigene Moondust and Florigene Moonshadow carnations are of the midi type. Florigene Moonlite, Florigene Moonvista, Florigene Monacqua, Florigene Moonshade are standard type carnations. Similarly Chrysanthemums occurs in nature in red, white, yellow, pink, purple etc. colours but with use of genetic engineering scientists have succeeded in developing 'Blue Chrysanthemum'. Researchers found that adding a gene from a naturally blue coloured Canterbury bells flower (*Campanula medium*) into DNA of chrysanthemums (*Chrysanthemum*

morifolium) produced a violet hued bloom. The feasibility of trait engineering rests not only on the identification of appropriate genes but also the fact that some traits, flower colour being one of them, involve manipulation of metabolic pathways which frequently require the introduction of multiple genes. However, due to very high capital and high end technology required in research and development of these genetic engineered flowers, their cultivation is presently limited in developed nations. But, with successful introduction and developments of the genetic engineered flower crops they can be exported in world markets ensuring high returns to growers and traders.

Key words: Floriculture, Genetic Engineering, Blue Carnation, Blue Chrysanthemum.

Abstract – 93

IMPROVEMENT IN TOMATO

Rahul Chandel[1], Vishwa Mohan Dev Chauhan[2]

[1]Department of Vegetable Science, College of Horticulture, Bengaluru, UHS, Bagalkot), [2]Department of Horticulture, I. Ag. Sci. , Banaras Hindu University, Varanasi (UP)

Tomato is one of the most remunerative crop as it fetches a better price in market and also present itself as a protective food due to its nutritive value and antioxidant properties contributed by presence of the lycopene and flavonoid compounds. The advent of genomics has brought a real boost to the generation of data, knowledge and tools that can be applied in breeding, which has transformed breeding from a rather indivisually based activity to a multidisciplinary work that is most suited to exploit genes from tomato (***Solanum lycopersicum***) germplasm in an efficient way. As a result, it is expected that the improvement in tomato cultivars will continue with increased pace in the future. The goals of public and private tomato breeding programmes vary widely depending upon the location, need and resources. In general, breeding goals in tomato have gone through four phases: breeding for yield in 1970s, for shelf life in 1980's, for taste in 1990s and for nutritional security in present scenario. Through domestication, research and breeding activities that were implemented by scientists and breeders worldwide, modern tomato cultivars which are mostly hybrids have been bred for characters like better shape, colours, sizes, long shelf life, high Vitamin C content and resistance to diseases. After several generations of testing at breeders site and different agroclimatic zones, the best hybrids are selected for commercial cultivation. Nature has bestowed great wealth of disease and pest resistances that exists with wild forms.

Key words: Breeding, Tomato, Hybrids, Disease, Resistance.

Abstract – 94

ONION HYBRID BREEDING IN INDIA

Rohit Kumar[1], Vishwa Mohan Dev Chauhan[2]*

[1]Department of Horticulture, College of Agriculture, JNKVV, Jabalpur(MP) [2]Department of Horticulture, I. Ag. Science, Banaras Hindu University, Varanasi (UP

Onion (*Allium cepa var. cepa L.*), 2n = 16 is the most important species of the Allium group belonging to family Alliaceae. It can be regarded as the single important vegetable species in the world after tomatoes. In the world, India ranks first in total area and second in production after China and third after Netherlands and Spain in

export. Onion is one of the pioneer crops in which heterosis has been commercially exploited for the past four decades. Although India is one of the leading onion producers, not much emphasis was given to heterosis breeding in the past. Very few workers attempted to test different hybrid combinations for heterosis and combining ability. One of the main components required for the exploitation of heterosis in onion is the availability of male sterility. Exotic male-sterile lines were found unsuitable in the short photoperiodic environments of India. Male sterility from indigenous source was found in cultivar Nasik White Globe at the IIHR, Bengaluru. It was later found that a strong cytoplasmic factor was responsible for male sterility in this cultivar. The male sterility has been successfully transferred to different genotypes which are now being used for exploiting heterosis. The F1 hybrids are high yielding (40-45t/ha) with uniformity in bulb size which are the two most desired characters. Male sterile lines have also been isolated in cv. Pusa Red at IARI New Delhi. Few hybrids have also been developed at IARI, IIHR Bengaluru and VPKAS, Almora. Not much hybrids are in commercial cultivation yet. However, work is in progress to isolate best combiner lines. In heterosis breeding programme, large number of hybrids produced and evaluated to exploit hybrid vigour, which usually requires more resources and manpower. It is possible to select parents/inbreds based on morphological diversity with good combining ability for economic traits and producing superior hybrids. The onion breeders must develop more sophisticated and efficient approaches in selecting and testing the parents, which will produce superior hybrids or varieties. Genetic diversity plays an important role in plant breeding either to exploit heterosis or to generate productive recombinants. The choice of parents is of paramount importance in breeding programme. Assessment of a large number of genotypes for a genetic diversity is the first step in this direction. The analysis of general combining ability (GCA) and specific combining ability (SCA) helps in identifying potential line or inbreds for the production of superior hybrids for yield and yield attributing characters.

Keywords: Hybrid, Male Sterlity, Onion, GCA, SCA

Abstract – 95

TREND IN KIWIFRUIT CULTIVATION IN MIDHILLS OF HIMACHAL PRADESH

Sunny Sharma[1], Pankaj Thakur[2] and SPS Solanki[3]

[1]Department of Fruit Science, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni-Solan, India, [2]Department of Business Management, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh-173230, India, [3]Department of Fruit Science, Punjab Agricultural University, Ludhiana, Punjab-141004

Kiwifruit (*Actinidia deliciosa* Chev.) or Chinese gooseberry, a member of family Actinidiaceae and native of China, is the most recent among the fruit crops brought under domestication. The crop got its most widely accepted name i.e. kiwifruit only in 1959 and its commercial cultivation dates back no longer to 1970's. The kiwifruit is perhaps the best known nutritious fruit amongst the berries. Fruit has refreshing and delicate flavour, pleasing aroma and high nutritive and medicinal value. It is a rich source of vitamin C and minerals like potassium, calcium, phosphorus and low in calories. In India, it was first introduced in 1960's at Lal Bagh Garden, Banglore, but it did not fruit there due to lack of chilling temperature. Later on, it was introduced at NBPGR, Phagli, Shimla, where it gave a successful crop in 1969. Himachal Pradesh is the first state to demonstrate its commercial

cultivation. As the apple has revolutionized the economy of farmers in high hills, kiwifruit is a boon to the farmers in the mid hills. Kiwifruit is a crop of the 20th century, as is evident from its world production statistics.Starting with only 2000 MT world production in 1970 it has reached the level of 4274870 MT in 2016 covering 277527 ha of land. However, the area under this fruit in India is less, but the average experimental farm productivity of kiwifruit in our country is about 25 tonnes/ha as compare to New Zealand's national productivity of 28.63 tonnes/ha. Kiwifruit has wide climatic adaptability and grows well between elevations of 900 to 1800m above mean sea level mid hills of entire Himalayan region. The economic importance of kiwifruit has recently increased due to its export potential. Mid-hills and valley areas of Himachal Pradesh representing Solan, Shimla, Sirmour, Mandi and Kullu districts are ideally suited for kiwifruit cultivation. It is commercial cultivation has been extended to Jammu and Kashmir, Arunachal Pradesh, Sikkim, Meghalaya and Manipur. It occupied an area of 123 ha in Himachal Pradesh with annual production of 344 MT during the year 2016. Day by day the trend of kiwifruit cultivation has been increased Growing of Kiwi was started almost 12 years back on experimental basis, but at that time there were hardly any buyers. Farmers did not loose their patience and the process continued which resulted in tremendous profit. But now its demand have risen in fruit markets of Delhi, Punjab, Mumbai etc. Even in local markets people are earning good as tourists gets attracted towards them.

Abstract – 96

EFFECT OF INCREASED LEVELS OF ATMOSPHERIC CO_2 AND HIGH TEMPERATURE ON RICE GROWTH AND QUALITY

Megha, Deepti Shankdhar, Rajani Pant, Shruti

Department of plant physiology (C.B.S.H), GBPUAT Pantnagar Udham singh nagar (263145)Uttrakhand, India

Rice is a globally important cereal crop and primary source of food. In future the new challenge will be the rise in global average surface temperature and climate change. India serves second largest producer of rice. Therefore, exploring the effect of simultaneous rising levels of atmospheric CO_2 and temperature on rice growth and quality in the future is very important. The present study involved measurement of variation in important rice physiological, ecological, and rice quality in different growing periods under a simultaneous increase in CO_2 and temperature using a climatic chambers experiment. Study employed three treatments: control(C), moderate (M) and intensive (H) levels of both CO_2 and temperature. Therefore the temperature of control set to be historic temperature (24-29 ºC) and CO_2 in manual control chamber was average (400 micro mol.).for medium temperature increased by 2ºC compared with control and CO_2 was set to 550 micro.mol.for the high treatment temperature increased by 4ºC and CO_2 in chamber was set to 650micro.mol.The results indicated that the ecological indices, rice phenology,and leaf area would decrease under a simultaneous increase of CO_2 and temperature. For the physiological indices, malondialdehyde levels increased significantly in the seedling period and decreased in heading and filing period. In addition accumulation of soluble protein and soluble sugars increased in filing stage. Amylose content did not vary significantly under control, moderate, high treatments. Rice gel consistency increased as CO_2 and temperature increased, which improved the quality of rice.

Abstract – 97

HERBICIDAL POTENTIAL OF *VITEX NEGUNDO* ESSENTIAL OIL

Mohd Issa[1], Harminder Pal Singh[1], Daizy R. Batish[2],

[1*]Department of Environment Studies, [2]Department of Botany Panjab University, Chandigarh

Weeds are unwanted plants which compete with the agricultural crops for light, nutrients, water and space, thus, reducing the quality as well as quantity of the agricultural crops. Weeds hold special traits to colonize various ecosystems and therefore, are difficult to control. Even though, chemical herbicides pose threat to the ecosystem as well as human health, these are being indiscreetly used to control the weeds. Keeping this in mind, the present study was conducted to determine the herbicidal potential of *Vitex negundo* essential oil. For this, *Avena fatua* and *Cassia occidentalis* were selected as the test weed and the effect of different concentrations of *Vitex* negundo essential oil (ranging from 0.1% to 2.0%) was studied on its germination and early growth under laboratory conditions. The results showed that essential oil significantly inhibits the seed germination, growth and development of the test weed. Based on the observations, it could be concluded that essential oil of *Vitex negundo* possesses phytotoxic properties that may be useful as a potential bioherbicide.

Abstract – 98

DISTRIBUTION, SPREAD AND IMPACT OF NOVEL ALIEN WEED *CALYPTOCARPUS VIALIS* LESS. IN LOWER SHIVALIKS

Roop Lal[1], Daizy R. Batish[1], Shalinder Kaur[1], Harminder Pal Singh[2]

[1]Department of Botany, Panjab University, Chandigarh-160014 [2]Department of Environment Studies, Panjab University, Chandigarh-160014

Calyptocarpus vialis Less. (= Synedrella vialis, family Asteraceae) is a noxious weed native to South America, Mexico and West Indies. It is reported to be invasive in central and southern parts of India and is now encroaching towards the hilly tracts. Recently its patchy distribution is observed in lower Shivaliks and its adjoining areas. On this basis, a survey was therefore conducted to study the spread, distribution and impact of *C. vialis* on the associated floristic diversity. Quadrats (size $1m^2$) were laid in the selected sites to evaluate its density and impact on associated vegetation. Data showed significant decrease in the species richness of the invaded plots. Simpson's index of diversity, Shannon's index and Evenness index were also reduced in the invaded areas depending on the type of habitat. The study suggests that the weed is establishing in the Shivaliks due to the presence of favourable habitats. Moreover, it can be suggested that the weed possesses certain beneficial adaptive characters that enhance its invasive potential thereby, facilitating its rapid spread in the Shivalik region. Analysing the distribution and impact of this novel invasive alien weed will provide a clue about its potentialities and help in devising better management strategies.

Abstract – 99

PRELIMINARY ASSESSMENT OF BIOLOGICAL DIVERSITY AT LARSEMANN HILLS, EAST ANTARCTICA

Pawan Kumar Bharti [1, 2, 3]

[1]Member, 30th Indian Scientific Expedition to Antarctica Bharti Island, Larsemann Hills, Christenson Coast, East Antarctica [2]Antarctica Laboratory, R & D Division, [3]Shriram Institute for Industrial Research, Delhi-110 007

Antarctica is the most precious asset on the earth and is the last heritage of human kind. Antarctica is the only area on earth planet which is strictly devoted to scientific research and the continents of extremes come to be known as the "Continent of Science". It is the nature biggest laboratory on earth where no outside anthropogenic activities/interference has taken place over the centuries till recent times. Being at a unique geographic location, it offers unique opportunities for Scientists to conduct number scientific research experiments. Antarctica is attracting world attention because of tremendous biological species in surrounding seas and likelihood of vast hydrocarbons. Even though it is difficult to survive at Antarctica, still Scientists all around the worlds have been engaged in pursing the exciting scientific research investigations. The investigations are essential not for the exploitation of natural resources buried under the region but for the preservation of environment and ecology on earth; especially in the light of climate change. Antarctica provides a unique, unpolluted and stable pure environment for carrying out scientific observation. It is far away from all sources of environmental contamination and thus remains an unpolluted datum point from which global changes due to pollution could be monitored and is suitable for a wide range of scientific research. India has conducted scientific studies, both at Dakshin Gangotri and Maitri stations in Antarctica in various disciplines. It now intends to broaden the scope of its scientific research by complementing the existing studies from an additional location. The new location for the new research base is at Larsemann Hills, Prydz Bay area, East Antarctica, which is about seven days away by ship from Maitri. The Larsemann Hills (69°20′–69°30′S lat: 75°55′–76°30′E long.), named after Larsemann Christensen, is an ice-free coastal oasis with exposed rock and low rolling hills. However, it is mandatory to have some background ecological information prior to the initiation of station activity in the proposed area. Hence, the lichens, one of the major biological elements of Antarctica and highly privileged environmental indicators in addition to Moss communities, are studied to generate baseline information for future biomonitoring studies in the area to assess anthropogenic activities in the area after the construction of the third Indian research station in Larsemann Hills. Rock is the major substratum in the island accommodating many lichen species followed by moss species. True soil is virtually absent in the studied area, but a thin soil may be accumulated in rocks crevices, base of the rocks or in moss beds. The closely packed soil grains form a hard crust, a suitable habitat for lichens, as different species have been collected from such habitats. Organic matter comprising dead birds was frequent in the island and *Caloplaca citrina* was found growing luxuriantly in such habitats. Most of the lichens are substrate-specific, while some were found growing on all available substrate. *Buellia frigida*, *Candeleriella flava* and *Rhizoplaca melanophthalma* were found the most abundant and dominant lichen species in various islands/peninsulas of Larsemann Hills especially at Bharti Promontory and Fisher Island.

Key words: Antarctica, Biodiversity, Antarctic environment, South Pole, pollution assessment

Abstract – 100

CHANGES IN THE POPULATION STRUCTURE AND GROWING STOCK IN DIFFERENT DEODAR FORESTS OF GARHWAL HIMALAYA: A REVISITATION STUDY OVER 15 YEARS

Gaurav Chand Ramola[1], V.P. Khandur[2], Y.S. Gusain[3] and Surjeet Rawat[4]

[1]Entomology Division, FRI, Dehradun (Uttarakhand), [2,3,4]College of Forestry, Ranichauri (Uttrakhand)

In 2000, Bhatt *et al*. studied the deodar forest at five different sites i.e. Ghimtoli, Dhanolti, Dewarkhal, Devidhar and Jhandidhar. Same sites were evaluated in order to know the growing stock changes over the 15 years in forest. The present study was also conducted on the same sites mentioned above by recognizing GPS location of the earlier study as the re-visitation study, which was aimed to understand the changes in population structure and growing stock of *Cedrus deodara* forests of Garhwal Himalayas over a period of 15 years. The changes in population structure and growing stock over 15 years was assessed by laying out five 0.1 ha sample plots randomly on each location. Thus, a total of 25 sample plots (five on each site) were laid out to observe the changes in structure of growing stock under different sets of environment conditions. Enumeration of trees for volume, population structure and growing stock variation was done by measuring girth and height individually for all the tress in the sample plots. The results have shown that the highest total growing stock value (1132.8±35.58 m^3/ha) among all the diameter classes was recorded in Dewarkhal area (2300 m amsl) in Uttarkashi district with the highest total basal cover (TBC) (79.61±1.78 m^2/ha) of *C.deodara*. There was a net increment in growing stock of 218.08 m^3/ha at Ghimtoli, 302.8 m^3/ha at Dhanolti, 371.15 m^3/ha at Dewarkhal, 216.57 m^3/ha at Devidhar and 484.32 m^3/ha at Jhandidhar in a re-visitation study over 15 years.

Key words: Growing stock, Increment, Population structure, Randomly, Volume

Abstract – 101

STANDARDIZATION OF THE OPTIMUM IRRIGATION, NUTRIENT MANAGEMENT PRACTICES IN CAPSICUM FOR PROTECTED CULTIVATION

Naveen Chandra and A. C. Mishra

Department of Vegetable Science, College of Forestry and Hill Agriculture, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Ranichauri, Tehri, U.K., India

The Present investigation was conducted during summer-rainy season, 2013 at Vegetable Research Block of Uttarakhand University of Horticulture and Forestry, Ranichauri Campus, Tehri-Garhwal in polyhouse equipped with thermo censored exhaust fans and drip irrigation system. The experiment was laid out in two factors RBD with five replications. The treatments in first factor included two methods of application of NPK *viz*., soil dressing (A1) and drip fertigation (A2) whereas second factor included four nutrient packages viz., N:P:K @ 160:80:40 kg/ha + FYM @ 20 t/ha (F1), N: P: K @ 160:80:40 kg/ha + FYM @ 20 t/ha + lime @ 3.0 q/ha + PSB + *Azotobacter* (F2), Observations were recorded on plant growth and fruit yield characteristics *viz*. number of fruits per plant, fruit yield per plant (g), The results indicated that the drip fertigation of NPK (A2) appeared to be the most promising treatment in polyhouse grown capsicum for fruit yield (per plant as well as per m2) (870.0 g and

(6.80 kg, respectively), number of fruits per plant (31.31), intervals starting from 45 days after transplanting would result in 990.0 g fruits per plant or 7.71 kg/m2 area or 77.0 q/ha in temperate hills of Uttarakhand.

Key words: Capsicum plant, drip fertigation, soil dressing, nutrient packages, polyhouse

Abstract – 102

ALLELE MINING AND IT'S APPLICATIONS IN CROP IMPROVEMENT

Mahendar Singh Bhinda[1] and Santosh[2]

[1]Department of Plant Breeding and Genetics, SKRAU, Bikaner-334006 [2]Department of Genetics and Plant Breeding, GBPUA&T, Pantnagar-263145

Plant variety development process required identification and access of allelic variation that ultimately affects the plant phenotype is of the utmost importance for the utilization of genetic resources. To unlock this undisclosed allelic variation there is a need of rapid, precise and cost-effective strategy. Allele mining is a promising approach aimed at dissecting allelic variation of relevant traits within genetic resources collections. Allele mining has potential applications in the field of agriculture specifically in crop improvement which helps in tracing the evolution of alleles, development of new haplotypes, characterization of genetic diversity and in marker-assisted selection by developing allele-specific markers for precise introgression of novel alleles into suitable genetic background. There are two major approaches of allele mining viz. TILLING based allele mining and sequence based allele mining. TILLING (Targetting Induced Local Lesions In Genomes) is a poweful reverse genetic strategy for functional genomics that works with a mismatch-specific endonuclease to detect induced or natural DNA polymorphisms in genes of interest. It combines chemical mutagenesis and PCR based screening to identify mutation in one or more target gene. High-throughput TILLING allows the rapid and cost-effective detection of induced point mutations in populations of chemically mutagenized individuals. Its advantages over other reverse genetic techniques include its applicability to virtually any organism, its facility for high-throughput and its independence of genome size, reproductive system or generation time. TILLING is currently being used for the detection of both induced and natural variation in several plant species. Sequence based allele mining is a strategy of amplification of alleles in diverse population through PCR and identification of nucleotide variations through DNA sequencing process. Thus, Allele mining can be effectively utilized for discovery of superior alleles, through 'mining' the gene of interest from diverse genetic resources. It also provides insight into molecular basis of novel trait variation and identify the nucleotide sequence changes associated with superior alleles.

Abstract – 103

ASSESSMENT OF TOMATO (*Solanum lycopersicon* L.) HYBRIDS FOR FRUIT QUALITY AND YIELD CHARACTERS IN THE HILL REGION OF UTTTARKHAND

Shivani Dhyani, Dhirendra Singh, Leela Bhatt and Pooja

Department of Vegetable Science, G.B. Pant University of Agriculture and Technology Pantnagar-263145, Uttarakhand

Twenty two hybrids of tomato were assessed for quality and yield characters at Vegetable Research Block College of Forestry, Ranichauri during summer- rainy season of 2014. In the analysis of variance, a high significant difference was found for almost all the quality characters suggesting a greater chance to explore variability mainly for the charcters *viz.,* dry matter content, ascorbic acid and total soluble solid. Hybrid 'Azad T-6 x NDT-7' has obtained highest mean for dry matter content (12.33%) followed by ascorbic acid content (34.36 mg/100 g) and TSS (10.23^0 Brix) content. Maximum pH was found in hybrid 'CO-3 x Pusa Sadabahar' (6.16) which was significantly superior to the other hybrids. Highest titratable acidity (7.03%) was found in hybrid 'Punjab Chuhara x Pusa Uphar'. Hybrids under study, shows the fruit juice content ranged from 49.22 to 76.72 % with highest percentage recorded by hybrid 'Utkal Kumari x Utkal Uphar' (76.72 ml/100 g). Based on present investigation it may be suggested that hybrids *viz.* 'Utkal Urwasi x Gujrat Tomato-3', 'CO-3 x Pusa Sadabahar', 'Utkal Urwasi x Palam Pink', 'Azad T-6 x NDT-7' and 'Marglobe x Pusa Sadabahar' were the promising hybrids for producing desirable hybrids in future breeding programmes.

Key Words: Tomato, *Solanum lycopersicon* L, variability, fruit quality and yield characters

Abstract – 104

Rhizofiltration technologies for heavy metal contaminated ash pond

Amit Kumar Yadav

School of Environment and Sustainable Development, Central University of Gujarat, Gandhinagar -382030, India

Fly ash is contaminated with toxic metals. The indiscriminate disposal of fly ash in a slurry form, from coal-fired thermal power station in to an ash pond might lead to environmental degradation by leaching of heavy metals which could be considered as a potential source of contamination of ground water, soil and stress to biotic community. There are different methods for removal of heavy metals from contaminated water and many of them can be costly and also consume a lot of resources. Rhizofiltration technology is the use of aquatic macrophyte plants as a filter for removal of unwanted elements from contaminated water. There are many study shows that several species like Brassica juncea, Pistia stratiotes, Helianthus annuus L. and Phaseolus vulgaris L. var. vulgaris, Eleocharis acicularis, Lemna minor L., Phragmites australis and Eichhornia Crassipes can be used for effective removal of heavy metals. The high removal efficiencies of heavy metal without toxic effect by this aquatic macrophyte plants. These species are selected based on a review on various studies on rhizofiltration. Hence rhizofiltration can be an eco-friendly and innovative method of removal of heavy metals and can be recommended for the actual treatment of heavy metals in ash pond and clean up the aquatic environment.

Keywords: Rhizofiltration, Fly Ash, Ash Pond, Aquatic Macrophyte Plants, Heavy Metals.

Abstract – 105

NEEM AND CAMPHOR BASED NOVEL AGENTS AS AN ANTIMICROBIAL INGREDIENT TO EXTEND VASE-LIFE OF GERBERA (*GERBERA JAMESONII*) FLOWERS

Pooja Kaintura and Geeta Gaur
Uttaranchal University, Dehradun

The present investigation was carried out on *Gerbera jamesonii* to study the potential of Neem and camphor leaf extract as a source of Silver and use of it as novel agents supplemented with other chemicals and their combinations as enhancer of vase life and keeping quality of Gerbera. The experiment was laid out with 12 treatments comprising of various combination of Neem and camphor based novel agents , $AgNO_3$ and sucrose along with distilled water as control, replicated thrice under Completely Randomized Design. Uniform gerbera flower at one outer whorl unfurl stage were cut and pre-cooled at 4°C for 24 hrs before kept in holding solutions, to study their post-harvest behavior, the results revealed that Neem and camphor based novel agents supplemented with sucrose (5%) maintained better water relations in terms of water uptake, water loss, water balance and loss in fresh weight which resulted in maximum vase life as compared to control. Decreased microbial count in vase solution resulted in full opening of the bloom and bent neck free flowers

Abstract – 106

PEST MANAGEMENT OF HONEY BEES THROUGH NON-CHEMICAL METHODS

Shabnam Thakur[1], Rohit Kumar Nayak[1] and Anita Kumari Ujjwal[2]
[1]Department of Entomology, Dr. Y S Parmar University of Horticulture & Forestry, Nauni, Solan (H.P.) 173230,
[2]Department of Nematology, Orissa University of Agriculture & Technology, Bhubaneswar, Orissa 751003.

The honey bee is a eusocial insect which provides valuable products like honey, bee-collected pollen, propolis, royal jelly and bee venom. Honey bees also play a vital role in agriculture by assisting in the pollination of a wide variety of crops and help in maintaining biological diversity (Johannesmeier and Mostert, 2001). Like all forms of life, honey bees are also attacked by different types of diseases and pests. Mainly predatory wasps, wax moth, mites, bee louse, birds, mammals and ants attack the larval and adult stages of honey bees. Continuity of pest attack cause severe loss to the colonies like hindrance in brood rearing, absconding, swarming and bees stop field work. These pests can be managed by using such methods which are less harmful to honey bees. Management of predatory wasps can be mainly done by burning the nests during night time and by killing the wasps in the apiary by flapping. Wax moth can be controlled by closing cracks and crevices in the hive reduce hive entrance and remove the combs which are not covered by bees. Birds and mammals can be controlled by scaring them away.

Keywords: Honey bees, pollination, biological diversity, pest management, non-chemical methods.

Abstract – 107

EFFECT OF STORAGE AND PACKAGING MATERIAL ON ANTIOXIDATIVE CAPACITY, TSS , ACIDITY AND SENSORY QUALITY OF JUICE OF *DELINIA INDICA"*

Subham Rana, Dr Pooja Kaintura and Dr Geeta Gaur
Uttaranchal University Dehradun

Antioxidative capacity, nutrient content and sensory quality of *Dellinia indica* juice product were assessed after storage in different packaging material (glass, and polypropylene bottle under refrigerated condition for storage up to 21 days. It was observed that there was significant change in vit C content, Acidity and TSS on storage. Sensory quality parameters of juice products changed with storage time, while overall quality of juices was less altered.

Abstract – 108

End Replication Problem

Sneha Adhikari and Anjali Joshi
Department of Genetics and Plant Breeding, G. B. P. U. A. & T. Pantnagar, U. S. Nagar, Uttarakhand 263145, India

Telomeres, the complex nucleoprotein structures at the ends of linear eukaryotic chromosomes, along with telomerase, the enzyme that synthesizes telomeric DNA, are required for genomic stability across the generations. The enzyme and substrate together protect chromosomes from exonucleolytic degradation and end to end fusions and by compensating for the inability of conventional DNA replication machinery to completely duplicate the ends of linear chromosomes. The requirement for an RNA primer to initiate all new DNA synthesis creates a dilemma for the replication of the ends of linear chromosomes. This is called the end replication problem . Greider and Black Burn discovered telomerase enzyme for the solution of end replication problem, for which they got Nobel Prize in 2009. Telomerase is a novel DNA polymerase that does not require an exogenous template. It includes both protein and RNA components in its composition.Telomerase solves the end replication problem by extending the 3' end of the chromosome by following inchworm model. This enzyme plays an important role in the diagnosis of cancer and Aging. Progeria, bone marrow failure, immune senescence, acquired aplastic anemia, chemotherapy intolerance, pulmonary fibrosis, liver disease are some of the defects associated with reduced telomerase.It can escape this fate by up-regulating telomerase, which can prevent telomeres from getting shorter and even elongate them. Telomeric DNA is coated with specialized proteins that work in concert with the t-loop to protect the chromosome terminus and guard against recognition of the chromosome terminus as a double-strand break. Although many studies have not been carried out in case of plants, several potential telomere binding proteins have been identified in higher plants, but their *in vivo* functions are still unknown. In rice, *rtbp1* displayed progressive and severe developmental abnormalities in both germination and post germination growth of vegetative organs over four generations (G1 to G4). Reproductive organs like panicles, stamens, and spikelet's were also gradually and severely impaired in G1 to G4 mutants. There is still much to be learned about how telomerase gene mutations cause disease, why they only affect certain organs, and how telomeres can be targeted for therapies. Both the genetic regulation of telomerase

expression and the effect of an organism's environment on telomere attrition are poorly understood. Drugs or hormones that might modulate telomerase expression and maintain or elongate telomeres would be appealing in the treatment of the telomeropathies and in conditions in which telomere shortening has known medical consequences. Role of telomere shortening / elongation in human aging or in cancer development are still controversial issues. Despite recent advances in plant telomere biology, many fundamental aspects of genome maintenance remain unclear.

Abstract – 109

PCR based detection of fungicide resistance in plant pathogenic fungi

Pooja Bhatt, K.P. Singh, Kumari Surbhi, Tabassum, Mukta nainwal and Aparna

Department of Plant Pathology, College of Agriculture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, U.S. Nagar, 263145, Uttarakhand, India.

Fungi are one of the main causes of crop loss worldwide. Although fungicide treatments are a key component in the integrated management of many plant diseases, the appearance of resistance in fungus has become an important factor in limiting the efficacy and useful lifetime of fungicides. Resistance is a genetic adjustment by a fungus that results in reduced sensitivity to a fungicide. Conventional methods for detecting fungicide resistance require isolation of pathogen and subsequent plating on medium containing fungicide. These are labor-intensive and time-consuming. Advances in molecular biology have provided new opportunities for rapid detection of fungicide resistance. These are highly sensitive methods and can improve our ability in studying the evolution of fungicide resistance. Techniques such as PCR-restriction fragment length polymorphism (PCR-RFLP), allele specific PCR, and allele-specific real-time PCR, digital PCR, loop mediated isothermal amplification (LAMP) have been used successfully to detect fungicide-resistant genotypes of several plant pathogenic fungi. These PCR based detection techniques depends upon the ability of the reaction to selectively amplify specific regions of DNA and usually require several post-PCR steps. Most of these techniques involved monitoring of PCR products by fluorescent or chemiluminescent dyes that bind non-specifically to double-stranded DNA or by fluorescence-labeled probes that bind to specific sequences.

Abstract – 110

Potential role of *Origanum vulgare* in pharmaceutical industry

Monika Choudhary, Sunanda Joshi, Gauri Singhal, Nidhi Srivastava

Department of Bioscience and Biotechnology, Banasthali Vidyapith, India.

Origanum vulgare also called as Oregano or Jangli Tulsi is an oil yielding, economically significant aromatic flowering plant with medicinal and culinary properties, belongs to the mint family lamiaceae (labiatae). Oregano has been used to enhance the flavor in spices and to treat health disorder since last couple of years. Oregano leaves are rich in volatile organic compound and secondary metabolites like limonene, pinene, ocimene and caryophyllene, polyphenoles. These compounds contributed flavor to its leaves. Oregano contains an essential oil with characteristic monoterpenes and sesquiterpenes that account for its aromatic qualities. This essential oil presents great potential as antimicrobial agents and their use of remedies has been recognized for a long time. Its oil contains highly fungicidal and bactericidal compounds i.e. Thymol and Carvacrol that are beneficial for

human health and act as highly effective purifier. Botanica (fermented oregano) has also shown antioxidant and antimicrobial properties against a series of gram positive and gram negative bacteria. The aim of this present review is to focus on the comprehensive medicinal importance of genus *Origanum* that could support further research because very few species of this genus have been reported till now. Further awareness about this Indian specie is to make it popular for maximum utilization not for its essential oil but also for its chemical compounds as the safe medicinal herbal products.

Abstract – 111

Genetic variability and character association among yield and yield contributing traits in garlic germplasm

Bhawana Bhatt, A.K. Soni, Deepika Sharma

Department of Vegetable Science, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (Uttarakhand)

A field experiment was conducted during Rabi season of 2014-15 at SKNAU, Jobner (Rajasthan) to study the genetic variability and character association among yield and yield contributing traits in sixteen genotypes of garlic. Analysis of variance revealed significant variability for all of the traits. High estimates of PCV along with GCV were observed for volume of bulb and weight of ten uniform cloves. High estimates of broad sense heritability and genetic advance as per cent of mean were observed for volume of bulb and bulb yield. On the basis of mean performance, the genotype G-1 was the highest yielder. Correlation and path analysis revealed that selection programme based on number of cloves per bulb, ascorbic acid, dry weight of bulb, circumference of bulb and number of leaves per plant might prove effective in enhancing productivity level in garlic.

Abstract – 112

PLANT DISEASES- PROBLEMS AND SOLUTIONS

[1]Ankita Thakur, [2] Vishwa Mohan Dev Chauhan, [1]Shalini Thakur

[1]Department of Plant Pathology, Dr. Yashwant Singh Parmar University of Horticulture & Forestry, Solan, 173212, Himachal Pradesh. [2]Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, 221005, Uttar Pradesh.

Diseases caused by fungi, bacteria, virus, virioids, mycoplasmas, are a major threat to the world agriculture. Plant diseases can cause immense damage to crops by reducing plant vigor, yield, and quality of the produce. Huge losses in billions are reported every year in case of fruits and vegetables worldwide. Globalization of agriculture has left the present day cultivars with narrow genetic base. Growing these crops far from their centers of origin have deprived them from getting evolved against those pathogens which arise at their origin place. Several problems are faced by pathologists to identify different strains, species, formae speciales, pathovars, biovars and races. In tropical countries where the crop seasons are continuous cause buildup of disease inoculum, however, in temperate countries this is significantly reduced as land is covered with snow and is left uncultivated for months. Primarily, exclusion of the pathogen through plant quarantine is the first line of defense. Other solutions include the exclusion, elimination or reduction of the pathogen's inoculum and by following by good cultural practices and making intercropping and crop rotation integral part of cultivation cycle. The judicious use of

pesticides is another important step for avoiding the resistance development in pathogens like fungi and bacteria. Exploiting the wild forms for disease resistance and disease tolerance characters. Pathologists must understand etiology and epidemiology of the disease causing pathogens upto micro levels, so that they can identify the weakest point in the life cycle of pathogen and identifies a stage when it is most vulnerable. The virulence mechanisms should be properly understood in order to control them. Biological control can also be implemented against disease causing pathogens. Post-harvest protection is another step to secure harvested produce from storage pathogens. Improvement of plant performance through biotechnology is another tool in current scenario. Current public opinions about biotechnology or genetically modified crops should not inhibit its potential towards the challenging demands of food security, especially in developing countries.

Keywords: Plant diseases, pathogens, genetic base, quarantine, biotechnology.

Abstract – 113

GRAIN QUALITY AN IMPORTANT ASPECT FOR BREEDING RICE (*Oryza sativa L.)*

S.R.Rathi[1] and A.R.Khaire[2]

[1]Department of Genetics and Plant Breeding, [2]Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. 221005

Rice (*Oryza sativa* L.) is recognized as one of the most important food crops in the world as it provides over 21% of the calorific needs of the world's population and up to 76% of the calorific intake of the population of South East (SE) Asia. Every year, a number of new and improved rice varieties are developed and released which have higher yield levels and better resistance to various biotic and abiotic stresses but the grain quality of such varieties is often ignored. A better understanding of the factors that contribute to the overall grain quality of rice will lay the foundation for developing new breeding and selection strategies for combining high quality with high yield. This is necessary to meet the growing demand for high quality rice around the world. Grain quality is a complex traits encompass physical appearance, cooking and eating properties and nutritional value. Many genes/quantitative trait loci (QTLs) for the various quality traits have been identified. This has enabled the development of functional markers to facilitate the selection for this complex trait. Functional markers those targeting mutations in the BADH2, waxy, alk and GS3 genes are highly associated with aroma, AAC/RVA, GT and grain size, respectively; and thus effective for marker-assisted breeding. Different alleles can be combined through gene pyramiding to improve rice grain quality for various consumers. To be able to meet future needs, rice breeders must exploit modern marker technologies such as genomic selection (GS) to take care of the effects of both major and minor genes for grain quality as well as high yield, abiotic and biotic stress tolerance.

Keywords: Rice, grain quality, molecular markers, waxy gene, alk gene, GS3 gene.

Abstract – 114

APPLICATION OF MODERN BIOTECH AND BIOLOGICAL SCIENCES IN SEED TECHNOLOGY

Abhishek Panwar, Shivangi Negi and Cherry Nalwa

Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan 173230 (H.P).

Nanotechnology, a new emerging and interesting field of science is currently applied in the field of biotechnology and agriculture sector. Its significance in field of fertilizer and herbicide application is well reported. Seed, being the basic input in crop raising plays a vital role in crop stand, growth and yield as well as the productivity of the other inputs used in crop production. It opened a new area of research in field of seed science and technology by enhancing the seed germination of plant. Plant growth and development is very much responsible for proper yield of crop plant. If plants are vigorous and growth and development of plant is excellent then the seeds produced will be of superior quality and yield will be more .The initial stage of plant growth and development depends upon seed germination if seed germination is poor, plant growth will be hindered and it will affect the seed production and crop yield. Conventionally, seeds are tested for germination and distributed to farmers for sowing. In spite of the fact that seed testing is done in well equipped laboratories, it is hardly reproduced in the field due to the inadequate moisture under rainfed conditions. In India, more than 60% of the net area sown is rainfed; hence, it is quite appropriate to develop technologies for rainfed agriculture. A group of research workers is currently working on metal oxide nano-particles and carbon nanotube to improve the germination of rainfed crops. Carbon nanotube is used for improving the germination of tomato seeds through better permeation of moisture. Carbon nanotubes (CNTs) serve as new pores for water permeation by penetration of seed coat and act as a passage to channelize the water from the substrate into the seeds. These processes facilitate germination which can be exploited in rainfed agricultural system. It has been reported that nano particle applications on seed have positive effect on the seed germination. It has been examined that lower concentration of SiO_2 has improved the seed germination in tomato crop and it also increases the nutrient availability of various crops. It has been observed that under saline stress condition seed germination was enhanced on treating it with SiO_2. Nutrient management with nanotechnology must rely on two important parameters, i.e, ions availability in the soil system, and since nutrient transport in soil-plant systems relies on ion exchange (eg. NH_4^+ $H_2PO_4^-$, HPO_4^{2-}, PO_4^{3-}, Zn^{2+}), adsorption-desorption (eg. phosphorus nutrients) and solubility-precipitation (eg, iron) reactions, nanomaterials must facilitate processes that would ensure availability of nutrients to plants in the rate and manner that plants demand. The appearances of nanotechnology open up potential novel applications in different field of agriculture and biotechnology. Creation of nanoparticals and their application in scientific field cause a tremendous positive change, particularly in Agriculture.

Abstract – 115

Study of wood trait variations in full-sib progeny-clones of *Populus deltoides*

Vidisha Kandpal[1], P.K. Pande[1] and R.C. Dhiman[2]

1. Wood Anatomy Discipline, Botany Division, Forest Research Institute, Dehradun, 2. ITC-PSPD (Unit: Wimco Seedlings Ltd, Bagwala, Rudrapur, Udham Singh Nagar

Populus deltoides is extensively planted important tree species among the different introduced *Populus* species in India. It is a well apt forest tree species owing to its short rotation cycle, better growth and quality, ease of cloning and biomass productivity. It is grown as clonal plantations under different commercial forestry programs. The *P. deltoides* trees are commonly used in the manufacturing of plywood, match sticks, paper and wood composites on industrial scale. Quantitative wood anatomical properties are of key importance to reflect on the suitability of wood to various end uses. The important anatomical parameters to be examined for wood quality assessment are fibre length, fibre diameter, fibre wall thickness, vessel element's length, vessel element's diameter and specific gravity. In the present study intra-ramet radial, intra-individual, inter-individual and inter-progeny clonal variations were analysed in wood traits of selected full-sib seedling progeny-clones of *P. deltoides* collected from Gadaribagh, Kichha (Udham Singh Nagar, Uttarakhand) India. Progeny-clones showed significant variations for all the parameters investigated. In general, the increasing trend of fibre morphological parameters and vessel element length was found from pith to periphery denoting the impact of cambial age on wood properties. All the progeny clones were clustered into five clusters at 6 rescaled distance cluster combine. Two individuals of these progeny-clones were found divergent. Moreover, 11 individuals clustered together showed better wood traits, may well be used in tree improvement programs of the species. Categorization of these progeny-clones on the basis of different wood trait results may help in deployment of them to different end uses.

Abstract – 116

INSECT GROWTH REGULATOR (IGR) EFFECT OF SOME PLANT EXTRACTS AGAINST CABBAGE BUTERFLY, *Pieris brassicae (Linn.)*

Shikha Rohila, C. P. Singh

Deparment of Agriculture, Tula's Institute, Dhoolkot, Dehradun

During the past six decades, the chemical preparation was dominated in pest control. This has brought about the pollution of the environment, danger to humans, developing resistance against toxicants, forcing use to develop new types of pest control measures. Secondary plant compound have been the subject of investigation. Treatment with aqueous extracts of different plants namely Goat weed *(Ageratum conyzoides* L.), Congress grass (*Parthenium hysterophorus* L.), Wild-sage (*Lantana camera* L.), Makoi (*Solanum nigrum)*, Bhang (*Cannabis sativa*), Madar (*Calotropis gigantean*), Senna (*Cassea angustifolia*) leaves and seed against cabbage butterfly, *Pieris brassicae (Linn.)* on mustard in laboratory conditions in the Department of Entomology caused IGR effect such as supernumerary moults, larval-pupal and pupal-adult intermediates and deformed winged adult. This indicate the presence of IGR activity in plant extracts and their application produces the same type of effects that

are produced by the exogenous application of IGR analogs. The insect growth regulators from plants mimic the IGR action and could be exploited for insect pest management.

Abstract – 117

Assessment of Antimicrobial and Phyto-chemical activities of Different Plant Extracts of *Tinospora cordifolia* (*Thunb.*) *Miers* and *Gynocardia odorata (Roxb.*)

Sourav Panigrahi, Yaswant Kumar Pankaj and Rajeev Kumar
Department of Agricultural Biotechnology and Molecular Biology, Dr. Rajendra Prasad Central Agricultural University, Pusa (Samastipur) - 848125, Bihar, India.

In this study we have reported the antimicrobial and phyto-chemical potential of the crude extracts of *Tinospora cordifolia* and *Gynocordia odorata* belonging to two different species. Three different strains of bacteria were used for this study viz. *Escherichia coli* (MTCC 46), *Staphylococcus aureus* (MTCC 9886) and *Bacillus subtilis* (MTCC 441). The plants has shown the significant antimicrobial activity against these above harmful pathogens which are the causal organism for various human diseases. In case of *Tinospora cordifolia* stem, *E.coli* has shown the greater zone of inhibition with the value of 17.3±1.12mm at maximum concentration of 500mg/ml and the smallest zone of inhibition was noted against *E. coli* again among other microbes with the value of 1.1±0.3mm at minimum concentration of 50mg/ml. Similarly, *E.coli* accounted for greater zone of inhibition in case of *Gynocardia odorata* seeds as well with the value of 19.1±1.0mm at maximum concentration of 500mg/ml and the smallest zone of inhibition was found to be against *Bacillus subtilis* with the value of 1.21±0.39mm at minimum concentration of 50mg/ml. The inhibitory concentration activity (IC50) was found to be unparallel in case of *G.odorata* seed extract with the value of 6.05±0.98µg/ml among all the plant extracts. The antioxidant activity was determined by in-vitro methods such as DPPH (2, 2-diphenyl-1-picrylhydrazyl) scavenging assay. The result validate that *Tinospora cordifolia* and *Gynocardia odorata* crudes are better candidate of phyto-chemical and antimicrobial potential.

Key Words: *E. coli, S. aureus, B. subtilis*, Phenol, Antibacterial, Phyto-chemical and Antimicrobial

Abstract – 118

INTEGRATED PEST AND DISEASE MANGEMENT UNDER ORGANIC FARMING

Mohit kumar, Vijay Shree, Ramji Lal, Praladh Poonia
Department of Plant Pathology, College of Agriculture, Bikaner, Swami Keshwanand Rajasthan Agricultural University, Bikaner (Rajasthan)

The goal of Integrated Pest Management (IPM) is to control populations of pests below levels that result in economic damage. Ideally, this is achieved through the integration of all suitable control techniques in a compatible manner. Organic farming systems rely on ecologically-based practices such as cultural and biological pest management, and virtually exclude the use of synthetic chemicals in crop production. Genetically modified crops are not allowed. Under organic farming systems, the fundamental components and natural processes of ecosystems, such as soil organism activities, nutrient cycling, and species distribution and competition, are used directly and indirectly as farm management tools and to prevent pest populations from reaching economically-damaging levels. For example, crops are rotated, planting and harvesting dates are carefully planned, and

habitats that supply resources for beneficial organisms are provided. Soil fertility and crop nutrients are managed through tillage and cultivation practices, crop rotations, cover crops, and supplemented with manure, composts, crop waste material, and other allowed substances. In organic systems, the pests and pathogens are controlled by biological agents, or their damage is kept to a minimum.It helps to promote sustainability by establishing an ecological balance. If organic farming techniques are used for long time, the farms tend to conserve energy and protect the environment by maintaining ecological harmony. Organic farming also helps to reduce the greenhouse effect and global warming because it has the ability to impound carbon in the soil.

Abstract – 119

First full-length genome sequence of *Narcissus yellow stripe virus* from Narcissus tazetta in India

Rashmi Raj, Lalit Agrawal, Puneet S. Chauhan, S.K. Raj

Plant Molecular Virology Laboratory, CPMB Division, CSIR-National Botanical Research Institute, Rana Pratap marg, Lucknow-226001, U.P., India

Narcissus (*Narcissus tazetta*, family *Amaryllidaceae*) is a bulbous ornamental plant popular for its notable fragrant flowers in gardens, which makes it a plant of commercial importance for the floriculture and perfumery industry. In India, narcissus is popular for beautiful flowers in the garden beds, as cut flower for bouquets and vases and also for fragrant oil. However, the quality and quantity of narcissus flowers have been greatly reduced due to virus infections which affect the floriculture trade in India. Various viruses reported on narcissus but mainly affected by number of potyviruses infect plants exhibiting symptoms of leaf chlorotic stripes and plant stunting. Briefly, total RNA isolated from 25 mg of purified virus preparation was subjected to Reverse Transcription-PCR in two steps using RNA LA PCR Kit with three set of primer pairs: Pot-I/Pot –II, CI-F /NIb-Pot-3, HP-F /CI-R specific for potyvirus. These pair of primers amplified ~1.6 kb, ~3.0 kb, ~3.0 kb size respectively. The remaining 5` end was amplified with 5'RACE and HP-R primers using FirstChoice RLM-RACE kit which yielded ~2.0 kb DNA fragment. The obtained expected size positive amplicon was cloned and sequenced and deposited in GenBank under accession number KU516386. The full-length genomic sequence of *Narcissus yellow stripe virus* (isolate NAR-2) associated with leaf chlorotic stripe disease of *Narcissus tazetta* cv. Paperwhite has been determined. It shares highest 90% nucleotide sequence identity and closest phylogenetic relationship with sequences of NYSV AM158908 Zhangzhou-1 and NYSV NC_011541 Zhangzhou-1, reported from China on narcissus host. This is the first full-length genomic sequence of NYSV from the India.

Keywords:, *Narcissus yellow stripe virus,* Potyvirus, sequence identity, *Narcissus tazetta*

Abstract – 120

Comparative study of anthraquinone glycosides in *Cassia* species and their antimicrobial activity

Veenita Tomar and Manjoosha Srivastava

Phytochemistry Division, Academy of Scientific and Innovative Research, CSIR-National Botanical Research Institute, Lucknow 226001, India.

Cassia fistula L. and *Cassia javanica* L. are rich in anthraquinone glycosides. Leaves of these species are traditionally known to combat skin problems i.e. cuts, burns, wounds and are purgative. The present study deals with comparative qualitative and quantitative estimation of anthraquinone glycosides in different extracts of

leaves and antimicrobial activity of their extracts. Methanolic extract of their leaves was found to have maximum anthraquinone glycosides in *C. javanica* leaves as compared with *C. fistula* leaves. Aloe-emodin was major identified marker on the basis of Thin Layer Chromatography. Thus anthraquinone glycosides maximum in methanolic extract of *C. javanica* leaves as compared with *C. fistula* leaves. The potential extract of *C. fistula* leaves having significant activity against bacterial and fungal strains may be utilized for its prospection as antimicrobials for therapeutics.

Keywords- Anthraquinone glycosides, antimicrobial activity, *C. fistula, C. javanica,* Thin Layer Chromatography.

Abstract – 121

IDENTIFICATION OF CHEMICAL MARKERS FROM LICHEN SPECIES FOR MEDICINAL USES

Muhammad Arif , D.K. Upreti & Manjoosha Srivastava

Phytochemistry Division, [1]Lichenology Lab, CSIR-National Botanical Research Institute, Lucknow-226 001

Keywords: Bioprospection, Chemical markers, Chromatographic method, Lichens, secondary metabolites.

Lichens are symbiotic association of algae and fungi. They produce enormous secondary metabolites of chemically diversified class viz. depsides, depsones, depsidones, and dibenzofurans. They are mainly distributed in the Himalayan and Jammu-Kashmir region. Some species of lichens are medicinally useful which posses antimicrobial, anti inflammatory cytotoxic and anti cancerous activity and act as curatives of many diseases such as atherosclerosis, Alzheimer's disease, Parkinson's disease and many forms of cancer. They are environmental indicators and known to be used in many products like perfumeries, dyes, spices, condiments deodorants, suns-cream products and also as food which make them significantly important among wealth of cryptogams. Although some species are studied earlier, but still many species remains to be unexplored & prospected to its real potential. Hence, different lichens viz. *Usnea longissima* and *Cladonia furcata* were extracted in different non polar to polar solvents and identified, separated many secondary chemical markers for its bioprospection. Alkaloid, Flavanoids, phenolics, lichen acids, fatty acid, tri-terpene were identified using chromatographic methods. Studies reveal that extract yield varied from 5.92% -14.44% in acetone and 4.90%- 13.20% in 50% ethanaol. The secondary marker isolated from these species are usnic acid (1.94%), fumarprotocetraric acid(1.88%) respectively. The studies leads to metabolite profiling of lichen species, establish standard protocols of extraction & determine to select specific major bioactive markers for isolation, large scale production & utilization for food and pharma industries.

Abstract – 122

A BRIEF REVIEW ON QUALITY PROTEIN MAIZE

Sonam Rani Agrahari, DS Jakhar and Rajesh Singh

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005

Maize (*Zea mays* L.) plays a very important role in human and animal nutrition in a number of developed and developing countries, worldwide. Breeding for improved protein quality in maize began in the mid-1960s with the discovery of mutants, such as opaque-2, that produce enhanced levels of lysine and tryptophan, the two amino acids deficient in maize endosperm proteins. Additionally, nutritional evaluation of QPM in various

locations has proved the stability of lysine and tryptophan content within the prescribed range for QPM, in spite of quite diverse types of environmental conditions. The nutritional quality of the protein in QPM grain approaches that of protein derived from cow's milk. The adoption of QPM can contribute immensely to alleviation of malnutrition in maize-based economies in developing countries. For instance, it has been found to be of economic value to substitute normal maize in stock feeds as it requires small amounts or no supplementary protein sources to balance the diet. Research on QPM has been ongoing for several decades. Opaque-2 (o2) is a natural recessive mutation in the transcriptional activator conditioning negative expression of zein protein. However, the lower yields of QPM versus non-QPM varieties, as well as the susceptibility of QPM varieties to stresses, such as ear rot, resulting in less tryptophan and lysine produced per unit area of land have been the focus of researchers over a number of years. Nowadays, despite the nutritional differences, some QPM varieties are as productive as non-QPM and sometimes it is difficult to visually distinguish between the two types of maize by the physical appearance of the plants or the ears.

Key words: Quality Protein Maize, Lysine and Tryptophan

Abstract – 123

INTRA-SPECIFIC VARIATIONS IN THE MICROSTRUCTURE OF SECONDARY XYLEM OF *QUERCUS LINEATA* BLUME

Prachi Gupta and Sangeeta Gupta
Wood Anatomy Discipline, Botany Division, Forest Research Institute, Dehradun, India

Q. lineata is an evergreen tree indigenous to Malaysia and Indonesia. It is distributed in North-eastern Himalayas in India. In the present study, four samples of *Q. lineata* collected from three different provenances, Kurseong (West Bengal), Rangbul forest (West Bengal) and Mishmi Hills (Assam) were studied for microstructure of secondary xylem. Permanent slides were prepared for microscopic examination of microstructure. The terminology given by the International Association of Wood Anatomists was followed to study the microstructure. For determination of quantitative dimensional features related to wood elements, small radial chips were macerated following Schultz's method. Photomicrographs were captured for the diagnostic features. Wood anatomy is considered as highly conservative feature based on which wood identification is carried out across the globe. Secondary xylem of *Q. lineata* is characterised by radial or diagonal to dendritic pattern of vessels, axial parenchyma diffuse to diffuse in aggregates, homogenous broad and compound rays. Although the qualitative features of all samples from 3 provenances were found to be conservative, significant variations were observed in their quantitative features. The results of ANOVA reflected significant differences in all quantitative parameters except ray height and vessel length. These differences can be attributed to different environmental conditions from where the samples belong. The present study permits insights into the certain genetic variations within the gene pool of these three provenances of *Q. lineata,* which should be further investigated using biotechnological tools.

Abstract – 124

Use of *Jeevamrit* for Better Soil Health in brahmi crop under Organic Nutrient Management

Ardeep , Sunita T. Pandey, M.S. Negi and Ajit Kumar

Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, US Nagar.

The present investigation was conducted during *Kharif* season of 2016 at Medicinal Plants Research and Development Centre (MRDC) of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, District Udham Singh Nagar, India, to study the effect of *Jeevamrit* on soil health and herbage yield of brahmi crop (var. CIM-Jagriti) and to optimize its rate of application. The treatments were: Recommended dose of fertilizer (100:60:40) kg ha^{-1}**,** different rates of *Jeevamrit***,** Vermicompost 10 tonnes ha^{-1}**,** farmyard manure 20 tonnes ha^{-1} and Vermicompost 5 tonnes ha^{-1} + Farmyard manure 10 tonnes ha^{-1}.The results of the investigation revealed that the application of *Jeevamrit* had significant effect on microbial population of the soil while there was no significant effect on soil bulk density. *Jeevamrit* contains significant amount of essential macro as well as micro nutrients, vitamins, essential amino acids. Besides this, it also contains plant growth promoting substances like Indole acetic acid (IAA) and Gibberllic acid (GA) which helps in better plant growth and development. Hence, *Jeevamrit* 4000 ltr ha^{-1} can be used as a nutrient source in place of chemical fertilizers and expensiveas bulky organic manures to get profitable yield with soil enrichment.

Key words: Farmyard manure, Vermicompost, *Jeevamrit*, Indole acetic acid and Gibberllic acid

Abstract – 125

ANTIOXIDANT POTENTIAL OF DIFFERENT SOLVENT EXTRACTS OF RHIZOMES OF *BERGENIA STRACHEYI*

Sandeep Kumar[1], Abhishek Mathur[2], Reena Purohit[3]

[1]Dept. of Chemistry, Himalayan University, Arunachal university, Arunachal Pradesh, India; [2]EBEC-NCFT, New Delhi, India; [3]Dept. of Chemistry, HNB Garhwal University, Srinagar, Garhwal, India

Antioxidants help organisms deal with oxidative stress, caused by free radical damage. Free radicals are chemical species, which contains one or more unpaired electrons due to which they are highly unstable and cause damage to other molecules by extracting electrons from them in order to attain stability. Phenolic antioxidants, a specific group of secondary metabolites, play the very important role of protecting organisms against harmful effects of oxygen radicals and other highly reactive oxygen species. Numerous antioxidants are plant-based and play a fundamental role in protecting plants that are open to the elements such as sunlight and severe oxygen stress. In the present investigation, *in vitro* antioxidant activity of solvent extracts of *Bergenia stracheyi* was determined by total phenolic content, DPPH radical scavenging method, superoxide anion radical scavenging assay and total antioxidant activity. The results confirmed that, polar extracts possessed higher antioxidant activity followed by non polar extracts. It was found that, TPC in ethyl acetate, aqueous and methanol were found to be 246, 235 and 232 µg/g gallic acid equivalents followed by petroleum ether and hexane extracts viz. 187 and 134 µg/ml. IC_{50} values of ethyl acetate, aqueous and methanol extracts were found to be 22.5, 25.56 and 35.23 µg/ml followed by 52.57 and 85.56 µg/ml of petroleum ether and hexane extracts respectively. With reference to superoxide anion radical scavenging method polar extracts showed 78-82 % inhibition of

superoxide followed by non polar extracts having 54-63 % inhibition. Total antioxidant activity also followed the same order. Ascorbic acid was used as the standard antioxidant having IC_{50} value 55.45µg/ml in DPPH radical scavenging method and 87.80 % inhibition of superoxide. Different conventional methods were followed to determine qualitatively the presence of phytochemical constituents present in the solvent extracts. The ethyl acetate extracts possessed tannin, steroids, saponin and glycosides, alkaloids and flavanoids while aqueous and methanol extracts showed the absence of saponin and glycosides. Petroleum ether extracts possessed only steroids and saponin while hexane extracts showed the presence of saponin only.

KEYWORDS: Antioxidant activity, solvent extracts, *Bergenia stracheyi*, phytochemical screening.

Abstract – 126

ANTIMICROBIAL POTENTIAL OF DIFFERENT SOLVENT EXTRACTS OF RHIZOMES OF *RHEUM WEBIANNUM*

Sanjay Sharma[1], Abhishek Mathur[2], Reena Purohit[3]

[1]Dept. of Chemistry, Himalayan University, Arunachal university, Arunachal Pradesh, India; [2]EBEC-NCFT, New Delhi, India; [3]Dept. of Chemistry, Himalayan University, Arunachal Pradesh, India

Plants have been a valuable source of natural products for maintaining human health, especially in the last decade, with more intensive studies for natural therapies. Medicinal plants would be the best source to obtain a variety of drugs. Many plants have been used because of their antimicrobial traits, which are due to compounds synthesized in the secondary metabolism of the plant. The active compounds having pharmacological importance can have synergistic/antagonistic effect. There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action for new and re-emerging infectious diseases. In the present investigation, the different solvent extracts viz. Ethyl acetate (ETA), Methanol (MET), Distilled water (AQ), Petroleum ether (PET) and Hexane (HEX) of rhizomes of Rheum webiannum were screened for antimicrobial potential against *Bacillus subtilis*, *Micrococcus luteus*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Aspergillus niger* and *Candida albicans* at 250 µg/ml. The potent antibacterial extracts viz. ethyl acetate, methanol and aqueous extracts showed least MIC values against the bacterial cultures. The potent ethyl acetate of the rhizomes of the plant showed the presence of alkaloids, flavanoids, tannins, steroids, glycosides and reducing sugars while saponin were absent. The study thus confirms the presence of antimicrobial compounds in the rhizomes of Revandchini.

KEYWORDS: Antimicrobial activity, solvent extracts, Rheum webiannum, rhizomes, phytochemicals.

Abstract – 127

QTLs mapping for drought resistance in Maize (*Zea mays* L.)

Sanchari Chakravorty, Dan Singh Jakhar and Rajesh Singh

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005

Maize (*Zea mays* L.) is a major food crop in the world and can serve as a major component of sustainable food production. Productivity of maize fluctuates significantly from region to region, season to season due to various abiotic and biotic stresses. Abiotic stresses, such as drought, salt and aluminum (Al) toxicity are environmental factors that can cause a great loss of crop productivity. High-yield crops have been the uppermost breeding

objective pursued by all the crop breeders. The QTLs controlling stress tolerance have been found in maize. In crops, grain yield and stress tolerance are all determined by chromosomal segments, called quantitative trait loci, which are very important for formulation of breeding programs of the crops. However, the QTL-based breeding practice has been hampered in part because it is usually empirical, highly time consuming, costly and labor-intensive. Drought stress, more than any other environmental factor, impairs plant growth and development, including photosynthesis, plant height, dry matter production, leaf area, grain yield and productivity. A number of quantitative traits have been extensively investigated using conventional biometrical approaches. Development in plant molecular genetics has given new opportunities for drought tolerance improvement. Quantitative genetics, with wide range of molecular markers available, provide identification of the genetic factors (QTLs) responsible for expression of traits. Studies have indicated that genes for specific traits such as drought tolerance can be reliably identified using these newly developed molecular mapping techniques. Mapping quantitative trait loci (QTLs) that control the yield and associate agronomic traits is one way of understanding drought genetics.

Key words: Drought tolerance, QTL mapping, *Zea mays* L.

Abstract – 128

QTLs mapping for bio-fortified maize (*Zea mays* L.) with reference to iron and zinc content

Aparna, Dan Singh Jakhar and Rajesh Singh

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005

Bio-fortification is the process of enriching the nutrient content of staple crops. It provides a sustainable solution to iron and zinc deficiency in food around the world. Reports have highlighted the current strategies for the bio-fortification of crops, including mineral fertilization, conventional breeding and transgenic approaches. Any approach which could increase root growth and result in a high transfer of Fe and Zn from the soil to the plant is crucial for bio-fortification. Micronutrient deficiencies also termed as hidden hunger, especially those arising from zinc (Zn) and iron (Fe) pose serious human health problem for more than 2 billion people worldwide, especially pregnant women and children below five years of age. In order to alleviate nutrient deficiency previous efforts to supply extra minerals through supplementation or food fortification are still in practice but difficult because of high cost, especially in developing countries. Bio-fortification aims at either increasing accumulation of these minerals in edible parts, endosperm, or to increase their bioavailability. Therefore, to increase the concentration of Zn and Fe in maize kernel and cob is an important way to alleviate the deficiency of Zn and Fe. To create the variety with high concentration of Zn and Fe, it is pre-requisite to identify germplasm with high concentrations of both elements and understand their genetic mechanism. As bioinformatics and large scale genetic tool develop, the quantitative trait loci (QTLs) analysis provides a powerful genetic approach in identifying novel genes affecting a certain traits. Although lots of researchers have been taken about micronutrients variation in bean, rice, wheat, maize, only a few were related to QTL analysis for the micronutrient concentration. Furthermore, micronutrient accumulation in maize cob and its genetic mechanism

have not been explored. Therefore it is of great importance to study molecular mechanism of Zn and Fe accumulation in maize kernel and cob.

Key words: QTLs mapping, Iron, Zinc and *Zea mays* L.

Abstract – 129

ANTIMICROBIAL POTENTIAL OF SOLVENT EXTRACTS OF LEAVES OF LANTANA CAMARA

Sonia Ruhela[1], Abhishek Mathur[2], Vandana Shrivastava[3]

[1]Dept. of Chemistry, Himalayan University, Arunachal university, Arunachal Pradesh, India; [2]EBEC-NCFT, New Delhi, India; [3]Dept. of Microbiology, ITS Dental College, Ghaziabad (U.P), India

Antimicrobial plant extracts have been recognized as a future source of new antimicrobials in the event of the current downturn in the pace at which these are being derived from micro-organisms. The public is also becoming more aware of problems with over prescription and misuse of traditional antibiotics. Resistance to anti-microbial agents is recognized at present as a major global public health problem. Infective diseases account for approximately one-half of all deaths in countries in tropical regions. In industrialized nations, despite the progress made in the understanding of microorganisms and their control, incidents of epidemics due to drug resistant microorganisms and the emergence of hitherto unknown disease-causing microbes, pose enormous public health concerns. In the present investigation, different polar (aqueous and methanolic) and non polar (hexane) solvent extracts of leaves of *Lantana camara* at 250 µg/ml were investigated for antimicrobial potential against different microbial strains viz. *Staphylococcus aureus*, *Bacillus subtilis* and *Bacillus licheniformis*. The results showed that methanolic and aqueous extracts have significant antimicrobial activity in comparison to that of hexane extracts. Amongst all these extracts, methanolic extract had significant antibacterial activity against *Bacillus subtilis* (45 mm) and *Bacillus licheniformis* (50 mm) while aqueous extract was found to have antibacterial activity against *Staphylococcus aureus* (43 mm) while hexane extract was found to have no antibacterial activity against all the microbes studied. The Phytochemical screening results of the aqueous and methanolic extracts of the leaves of the plant showed the presence of tannins, steroids, saponin, glycosides and reducing sugars while alkaloids and flavanoids were found to be absent.

KEYWORDS: Antimicrobial activity, solvent extracts, Lantana camara, phytochemicals

Abstract – 130

CHARACTERIZATION OF ANTIMICROBIAL PRINCIPLE PURIFIED FROM ENDOPHYTIC ISOLATE (TRICHODERMA VIRIDE) OF MENTHA PIPERITA

Preeti Juyal[1], Abhishek Mathur[2], Vandana Shrivastava[3]

[1]Dept. of Microbiology, Himalayan University, Arunachal Pradesh, India; [2]EBEC-NCFT, New Delhi, India; [3]Dept. of Microbiology, [3]ITS Dental College, Ghaziabad (U.P), India.

Endophytes are the microbes that live within the host plant tissues without causing any visible disease symptoms. Depending on their nutritional requirements they can live as biotrophic parasites or saprotrophs. They also represent a huge reservoir of microbes that are explored very poorly. It is believed that plants which are able to survive in harsh environment, plants that are used for special purpose such as herbal medicine and plants which show an unusual longevity contains endophytes which produces novel bioactive compounds. The

antimicrobial principle (s) of the endophyte (Trichoderma viride) was determined by GC-MS. The product with highest peak (95%) was found to be Kojic acid. The physical analysis of Kojic acid was confirmed with respect to UV, IR and melting point. Further, the antimicrobial activity of the molecule was determined against other pathogenic strains.

KEYWORDS: Endophytic isolate, Trichoderma viride, antimicrobial principle, Kojic acid

Abstract – 131

EFFECT OF PROTEOLYTIC ENZYMES ON THE ANTIMICROBIAL AND ANTIOXIDANT POTENTIAL OF THE PROTEIN ISOLATED FROM DIFFERENT PULSES

Shahana Jabi[1], Abhishek Mathur[2]

[1]Dept. of Biotechnology, Himalayan University, Arunachal Pradesh, India; [2]EBEC-NCFT, New Delhi, India

Plants have been a precious source of natural products for sustaining human health. According to World Health Organization, more than 80 % of the world's population relies on traditional medicine for their primary healthcare needs. Therefore medicinal plants need to be investigated for better understanding in respect to their properties, safety and efficiency. One of such properties like antimicrobial activity can be of great significance in therapeutic treatments. Especially with the emergence of antibiotic resistant microbes which have become a major health threat over the past decades. The continuous use of analogous antibiotics has resulted in multi-resistant bacterial strains all over the world. Presently it is being broadly predictable that in the very near future antibiotic resistance will make healthcare professionals helpless toward effective therapies for bacterial infections. In the present study, proteins were extracted and purified from germinated seeds viz. *Vigna radiata* (mung bean), *Cicer arietinum* (gram white and gram black). The protein extracted was evaluated for any antimicrobial effects against the different pathogens and to determine antioxidant potential. The studies were performed to assess the effect of pH, temperature and proteolytic enzymes on the antimicrobial nature of the protein extracted. It was found that the extracted antimicrobial protein had prominent antimicrobial effect on the different microbial pathogens at the range of pH 4-7. The studies also showed the strong antioxidant potential of the different seeds protein isolated and purified. It was also observed that the temperature from 25^0C-30^0C has no adverse effect on the antimicrobial action of the proteins extracted. The results of the present study thus help to explore and formulate the potent antimicrobial agent against different variety of pathogens and to formulate strong antioxidant agent.

KEYWORDS: Proteolytic enzymes, antimicrobial, antioxidant potential, protein,Vigna radiata

Abstract – 132

REVIEWS OF HERBAL AND THEIR PHYTOCOMPOUND FOR THE TREATMENT OF COLITIS

Prabhat and Sanjeev Kumar

Department of Microbiology , Department of Chemistry , ChamanLal Mahavidhyalya Landhaura, Roorkee Haridwar

Colitis is a idiopathic inflammatory disorder in the colon, has become a clinical challenge, owing to the increasing incidence and poor prognosis inflammatory process that affects many parts of the body. Sometimes these associated extra-intestinal symptoms are the initial signs of the disease, such as painful arthritic knees in a

teenager and may be seen in adults also. A widespread search has been launched to identify new anti-ulcer therapies from natural sources to replace currently used drugs of doubtful efficacy and safety. Herbs, medicinal plants, spices, vegetables and crude drug substances are considered to be a potential source to control various diseases including gastric ulcer and ulcerative colitis. In the scientific literature, a large number of medicinal plants and their secondary metabolites with anti-ulcer potential have been reported. As the gastro protective effect can be linked to different mechanisms, once demonstrated the activity, the extracts and more appropriately the active compounds should be assessed for action mechanisms to Elucidate their mode of action. Medicinal plants have curative properties due to the presence of various complex chemical substance of different composition, which are found as secondary plant metabolites in one or more parts of these plants.

Abstract – 133

GERMPLASM SCREENING FOR HEAT TOLERANCE UNDER DIFFERENT SOWING CONDITIONS IN BREAD WHEAT (*Triticum aestivum* L. em. Thell.).

Santosh, Jai Prakash Jaiswal and Mahendar Singh Bhinda

Department of Genetics & Plant Breeding, College of Agriculture, Govind Ballabh Pant University of Agriculture & Technology Pantnagar, Udham Singh Nagar, Uttarakhand- 263145, India

The present investigation was carried out with 32 diverse genotypes of bread wheat in completely randomized block design with three replications at NEBCRC, GBPUAT Pantnagar for the screening of wheat genotypes for heat tolerance under three environments viz. timely sown (stress free), late sown (stress) & very late sown (stress) conditions. Analysis of variance indicated the significant variation among the treatments for different characters in all the sowings. Among the morphological characters, plot yield exhibited highest range of variation while among physiological traits, relative water content exhibited the highest range of variation. On the basis of heat susceptibility index under late sown condition, the nineteen genotypes were found heat tolerant & rest genotypes were found moderately heat tolerant. Under very late sown condition, the five genotypes were found heat tolerant while rest genotypes were found to be moderately heat tolerant & moderately heat susceptible. The five genotypes HD-2967, IC-118737, CHIRYA-3, CUS/79/PRULLA & BWL-0814 were found tolerant to heat stress under both stress conditions. These five genotypes performed very well in all the three sowing conditions. These findings may be helpful in exploiting these heat stress tolerant genotypes in the future breeding programme for developing the stable genotypes for heat tolerance as donor parents.

Abstract – 134

AGRO-FRIENDLY INSECTS IN AGRICULTURE

[1]Anil Kumar, [2]Himanshu Thakur

[1]Department of Entomology, Dr. Yashwant Singh Parmar UH&F, Solan,(H.P), [2]Department of Entomology and Agricultural Zoology, GBPUAT, Pantnagar (UK)

Agro-friendly insects are those insects which perform beneficial work in production of crops like pollination, controlling pests, improving soil health, habitat integration and natural vitality. Agro-friendly insects are predators (ladybird beetle) of pests, parasitoids (*Trichogramma spp.*, who live on the body of another species and feed upon them leading to death of host), pollinators (bees, which are integral part of growth cycle and

pollination in many plant species), and nematodes (worms useful in controlling the larvae of pest). Microbes include fungi, bacteria, viruses etc., are responsible for nutrient recycling, decomposition of plant residues and playing a very important role in soil health management. Microorganisms such *as Lactobacillus* and *Saccharomyces sp.* are helpful in increasing soil fertility and plant productivity. In agriculture where the main concern is to grow selected crops, insects that inhibit the production process are classified as pests. In farming, there is a huge loss of crops and their product due to these insects. The chemical control of pests poses many environmental issues and creating several health issues. To reduce the side effect of these agrochemicals based farming, we have to turn over towards organic cultivation of crops and encouraging beneficial insects, by providing suitable living conditions & used in organic farming integrated pest management .

Keywords: Agro-friendly insects, Pollinators, Microbes, Environment issues

Abstract – 135

RNAi for Insect Control

Himanshu Thakur[1], Vishwa Mohan Dev Chauhan[2], Anil Kumar[3]

[1]Department of Entomology, GBPUAT, Pantnagar (UK), [2] Department of Horticulture, I. Ag. Sci. , Banaras Hindu University, Varanasi (UP), [3]Department of Entomology, Dr. Yashwant Singh Parmar UH&F, Solan,(H.P)

RNAi as a sequence specific gene silencing tool has a broad potential for plant protection. This can be effectively used against those insects that are insensitive to the present Bt crops most of which are some lepidopteron, leafhoppers and coleopteran members. RNA interface (RNAi), is the sequence specific suppression of gene expression which offers great opportunities in insect science, especially in managing gene function, and pest populations. Commercial biotechnology solutions for controlling lepidopteron and coleopteran insect pests on crops depend on the expression of *Bacillus thuringiensis* insecticidal proteins , most of which permeabilize the membranes of gut epithelial cells of susceptible insects. The ingestion of double-stranded (ds) RNAs supplied in an artificial diet triggers RNA interference in several insects. This may result in larval stunting and mortality. A significant reduction in feeding damage is also seen, suggesting that the RNAi pathway can be exploited to control insect pests via plants through expression of dsRNA. RNAi as a promising statergy for insect pest control and has been explored in past few years. But also there are some limitations associated with it like plant mediated insect RNAi do not kill pests immediately like Bt, rather it prevents crop damage by significantly decreasing it. Risk of appearance of RNAi-resistant insects due to protein variations involved in dsRNA uptake and RNA interface in different insects cannot be completely excluded, but we expect it to be on a longer time scale. A deep and clear understanding of RNAi mechanisms and plant-insect interactions will greatly help us taking this technology to its next level. Continuous effort is required towards gene silencing effectiveness and specificity, undoubtly RNA interface will be a tool of immense potential in coming future.

Keywords: RNAi, Insects, Bt, dsRNA.

Abstract – 136

EFFECT OF DIFFERENT NITROGEN SOURCES AND THEIR LEVELS ON NUTRIENT STATUS OF APPLE (*MALUS × DOMESTICA* BORKH.) CV. STARKING DELICIOUS

Garima Bhickta, Neena Chauhan, Tanzin Ladon and Mamta Thakur

Department of Fruit Science, Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan (H.P) 173230

Apple (*Malus* × *domestica* Borkh.) native to Asia Minor, Caucasus and Central Asia, is one of the economically important and widely grown fruit crop in temperate region of the world. Nitrogenous fertilizers in addition to phosphorus and potassium fertilizers have paramount importance in plant growth and fruit quality production. The present studies investigate the effect of different nitrogen sources and their levels on nutrient status of apple (*Malus X domestica* Borkh) cv. Starking Delicious was conducting during the year 2016-17 at private orchard, Sandhu, Theog (H.P). The study consisted of ten treatments viz; T_1:100% RD of N, 60% through A + 40% through B; T_2: 100% RD of N, 40% through A + 60% through B, T_3:100% RD of N, 50% through A + 50% through B; T_4: 75% RD of N, 60% through A + 40% through B; T_5: 75% RD of N, 40% through A + 60% through B; T_6: 75% RD of N, 50% through A + 50% through B; T_7: 50% RD of N, 60% through A + 40% through B; T_8: 50% RD of N, 40% through A + 60% through B; T_9: 50% RD of N, 50% through A + 50% through B; T_{10}: 100% of RD through Calcium Nitrate. These treatments were given from two sources (Mila complex: 12:11:18 and Nitrobor: 14.5%), replicated three times and experiment was laid out in Randomized Block Design. The results revealed that fertilization with 100% RD of N, 40% through A + 60% through B (T_2) significantly enhanced leaf nitrogen, phosphorus, calcium and soil potassium, whereas, maximum leaf potassium, magnesium, soil nitrogen and soil phosphorus was recorded in T_1 (100% RD of N, 60% through A + 40% through B). The apple trees subjected to lower level of nitrogen i.e. 50% of recommended dose of nitrogen resulted in lowest nutrient status and high pH of apple plant. Hence, 100% recommended dose of N through Mila complex and Nitrobor, gave better results as compared to 100% of recommended dose of nitrogen through $CaNO_3$.

Keywords: Nitrogenous fertilizers, Plant growth, Nutrient Status

Abstract – 137

Dasagavya: A natural way to enhance vegetable health

Stuti Pathak and S.P.S Solanki

Department of Vegetable Science, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.)

Dasagavya, is an organic liquid manure made from ten products in the form of panchagavya and certain plant extracts. Mixture of cow's products comprising of cow dung, cow urine, cow's milk, curd and ghee, which have miraculous effects on plant growth when properly mixed. Prepare plant extracts separately by soaking the foliage in cow urine at a 1:1 ratio (1kg chopped plant leaves and 1 liter cow urine) for 14 days. Filter the plant extracts. Add 1 liter of each to panchagavya (cow product) solution. Stir well, with continuous stirring, the mixture can be kept for 25 days. Dasagavya rich in various plant growth regulators (PGRs) and micronutrients. Use of 4-5% dasagavya in various vegetable crops enhance growth and development.

Keywords: Dasagavya, Liquid manures, Panchagavya, PGRs, Cow products

Abstract – 138

STUDIES ON CORRELATION AND GENETIC DIVERSITY IN FABA BEAN (*VICIA FABA* L.)

Vinay Chamoli, Piyusha Singh and Arun Bhatt

Department of Crop Improvement, College of Forestry and Hill Agriculture, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Ranichauri, Tehri, India

This work presents the results of variability, correlation, path analysis and genetic divergence in the 73 diverse genotypes of faba bean. The 73 genotypes including three checks *viz*., Vikrant, PRT-7 and PRT-12 were planted in an augmented design during. The evaluated characters were field emergence, days to 50% flowering, days to maturity, plant height (cm), number of pods per plant, pod length (cm), number of seeds per pod, 100- seed weight (g) and seed yield per plant (g). Analysis of variance revealed among the checks were significant for six characters *viz.,* significant for days to maturity, field emergence, plant height (cm), number of pods per plant, pod length (cm) and seed yield per plant (g). Results for correlation revealed that Seed yield per plant showed positive correlation with pod length, while days to maturity exhibited highly significant and positive correlation with days to 50% flowering, number of pods per plant showed significant positive correlation with field emergence and highly significant and positive correlation with plant height, number of seeds per pod showed significant and positive correlation with plant height and 100- seed weight also showed highly significant and positive correlation with number of pods per plant . The results of path coefficient analysis using simple correlation coefficient also showed that highest positive direct contribution towards seed yield per plant was exhibited by pod length followed by number of pods per plant and days to maturity. In genetic divergence, all seventy-three genotypes were grouped into 6 clusters irrespective of geographical and genetic diversity. The highest inter cluster distance was observed between cluster II and cluster VIII followed by cluster IV and cluster VIII, cluster I and cluster VIII suggesting wide diversity among these groups. Considering cluster mean and genetic distance the crossing between HB-69, EC- 331564, HB-76, HB- 87 and HB-10, HB- 16, HB-18 genotypes suggested to recombine the gene for high seed yield.

Key words: *Vicia faba*, Augumented design, correlation, path analysis, Genetic divergence

Abstract – 139

BIOTECHNOLOGICAL APPROACHES IN PLANT DISEASE MANAGEMENT

Vijayshree Gahlot, keshav kumar, Surbhi Garg

College of agriculture, SKRAU, Bikaner **(**RAJ.)

Traditional plant breeding methods have been used to develop cultivars resistant to various disease but this process is time consuming and limited availability of genetic resources for most of the crops available has left little room to continued improvement by this means . Despite substantial advances in plant disease management strategies , our global food supply is still threatened by a multitude of pathogen and pest. This change scenario warrants us to response more efficiently and effectively to this problem. As the agricultural production increases to meet the demands of a growing world population, so biotechnology research to combat plant diseases. Biotechnological procedures can be used to determine the type and sources of host resistance.

Biotechnology is the genetic manipulation and multiplication of any living organism through novel techniques and technologies such as tissue culture and genetic engineering in order to produce new organism or products that can be used in variety of way. The development of recombinant DNA technology makes it possible to isolate individual genes and incorporate resistance genes into otherwise agronomically acceptable cultivars. Gene pyramiding was made easier with molecular markers. ELISA and polymerase chain reaction (PCR) techniques are used in the identification of viral and bacterial disease and also formats using antibody based detection for very rapid presumptive on site diagnosis have become available. Protoplast fusion is one of the method that can be use to circumvent problem in introgression gene for resistance. Using genetic engineering in plants Ti plasmid vector of agrobacterium tumefasians, the gene encoding the insecticidal protein has been transferred to tobacco, potato , rice and corn. By RNA interference a double standred RNAi (dsDNA) as a trigger that targets homologous mRNAs for degradation or inhibiting its transcription and translation . genes coding for several pathogenesis - related (PR) proteins, such as chitinase and some glucanases, have been isolated cloned and expressed in plants, there by interfering with the development of certain groups of pathogens and providing resistance to affected plants. Plant lack of antibody-making machinery , but DNA technology made it possible to transform plant with additional genes that make possible to production of functional recombinant antibodies.

Abstract – 140

FUNGICIDAL BIOASSAY OF *FUSARIUM* CULM ROT IN *DENDROCALAMUS STRICTUS* (ROXB.) NEES

Charul Kainthola[1], N. S. K. Harsh[2], H. S. Ginwal[3], Anugrah Tripathi[4] and Amit Pandey[5]

1, 2 & 5. Forest Pathology Division, Forest Research Institute, Dehradun., 3 & 4. Division of Genetics and Tree Propagation, Forest Research Institute, Dehradun.

Bamboos are fast - growing, versatile plant species with multiple end-uses but their productive potential in most of the countries in Asia is affected by various biotic and abiotic factors. Diseases affecting emerging and growing culms are much more serious as they cause extensive damage to bamboo stands appearing to be one reason for the large – scale reduction in culm production. A severe culm rot disease was observed in emerging culms of *Dendrocalamus strictus* germplasm bank in the New Forest Campus, Forest Research Institute, Dehradun. About 30 – 40% disease incidence was recorded with medium to high severity in emerging culms of 15 – 30 cm heights. The causal organism was isolated and confirmed to be *Fusarium flocciferum* by testing its pathogenicity in the live clumps. Poison Food Technique was adopted using systemic (curatives) and contact (protectants) fungicides namely Carbendazim, Sulfex, Thiophanate methyl and Mancozeb against the test pathogen in three concentrations (0.10%, 0.20% and 0.30%). Linear growth of the pathogen was recorded for two weeks. Maximum growth was inhibited by Mancozeb (100%) followed by Thiophanate methyl (90%), Carbendazim (88%) and minimum inhibition was shown by Sulfex (46%). Fungistatic activity of the fungicide against the pathogen was also tested confirming Mancozeb to be completely fungicidal against *Fusarium flocciferum*. 0.20% and 0.30% of Mancozeb (contact fungicide) and Thiophanate methyl (systemic fungicide) are recommended in drenching the soil of bamboo plantation area as well as in bamboo nurseries prior planting hence helping the cultivators and bamboo growers to prevent the culm rot disease enhancing the quality and quantity of the culm production.

Keywords: Bamboos, *Dendrocalamus strictus, Fusarium flocciferum*, Thiophanate methyl, Mancozeb.

Abstract – 141

AREA SPECIFIC BIODIVERSITY CONSERVATION OF FRUIT CROPS

Tanzin Ladon and Garima Bhickta
Department of Fruit Science, Dr. YSP, UH&F, SOLAN (H.P.)-173230

Fruit species are under threat due to overgrazing, deforestation, logging and industrialization. The fruits are used unsustainably by local people, thus contributing to genetic erosion. In addition, the best-quality products are selected to ensure better marketing opportunities. This engenders a human-driven natural selection, which leaves only those varieties that are not immediately marketable to reproduce. The result is loss of wild and cultivated fruit species, and reduction of intra-specific diversity in natural forests and reserves. The consequent degradation of natural habitats and biodiversity loss leads also to loss of a wide range of valuable ecosystem services (e.g., carbon storage, protection of hydrological functions, soil erosion), an instable environment, and, ultimately, natural calamities such as floods, drought, and landslides. It's need to be conserve particular fruit species and wild species in natural habitat (Area specific biodiversity conservation) with acclimatize environment.

Abstract – 142

BIOTECHNOLOGICAL APPROACH FOR CONSERVATION OF SELECTED SPECIES OF GENUS *WITHANIA*

Nishesh Sharma
Department of Biotechnology, UCALS, Uttaranchal University. Dehradun.

Twenty three known species of *Withania* are known to be distributed in drier parts of tropical and subtropical zones ranging from Canary Islands, Mediterranean region and northern Africa to South west Asia. *Withania somnifera* and *W. coagulans* are two species specifically known for their economic and medicinal value. *Withania somnifera* and *W. coagulans* are two such plants which have become endangered owing to poor germination rate, over harvesting, utilization of roots of *W. somnifera* and dioceous nature of *W. coagulans.* Hence, the present study was undertaken to develop micropropagation protocol for mass propagation and conservation of both the species. Pre-treating seeds with acidic solution (pH<3) enhanced the germination rate of both the plants. However, treatment with acids resulted in loss of nutrients as even after germination seedlings failed to exhibit further growth unless transferred to culture medium. Multiple shoot induction from cultured nodal segments of both the species is possible in media fortified with either Kn or BAP. The nodal segments of *W. coagulans* exhibited better response as compared to that of *W. somnifera*. ½ strength MS medium is more superior to full strength MS media for *in vitro* rooting in both the species. IBA supplemented ½ MS media is the most suitable media that yields better rooting response (% cultures developing roots, average number of roots and root length) as compared to IAA in both the species. About 68% plants of *W. somnifera* and 65% plants of *W. coagulans* survived during acclimatization. Hence, whether criticised or appreciated plant tissue culture remains as indispensible technique for conservation of endangered plants such as *W. somnifera* and *W. coagulans.*

Abstract – 143

MOLECULAR CHARACTERISATION OF MECHANISM OF *HEN1* REPRESSION OF *AP2* MRNA CLASS A GENE IN WHORL 3 AND 4.

Sumira Malik, Amrita Singh, Mushike Sai Sri, Yuvraj Yadav, Changsoo Kim

Tula's institute, Chakrata road, Dhoolkot, Dehradun, School of biological sciences and biotechnology, chonnam national university, Gwangju, South Korea

Arabidopsis thaliana is one of the study model for dissection of the molecular mechanisms of floral development in dicots. The different interactions among floral identity genes of class A, B, C and E explain floral patterning mechanisms. The plant switches from vegetative phase to reproductive phase from under various signalling from the enviornment as well as endogeneous cells. The whorl 1 and 2 expresses class A genes AP1 and AP2. Furthermore AP2 found to be expressed functionally in whorl 1 and 2 but its transcripts are located in whorl 3 and 4. The inhibited expression of AP2 at whorl 3 and 4 is subjected to microRNA 172 produced by HEN1 gene. The other unknown factors are also required for repression of AP2 gene at whorl 3 and 4. The mechanism of these interactions at molecular level is still unknown. The future studies could be performed and analysed using protein protein interactions in yeast, HEK cells, plant cells and mRNA repression studies through luciferase reporter assays in meristematic plant cells and HEK cells.

Abstract – 144

THE PROPOSED METHODOLOGY TO STUDY NEGATIVE REGULATION OF *AGAMOUS* (AG) IN WHORL 1 AND 2 IN *ARABIDOPSIS THALIANA* AT MOLECULAR LEVEL.

Sumira Malik, Amrita Singh, Mushike SaiSri, Yuvraj Yadav, Kim Changsoo

Tula's institute, Chakrata road, Dhoolkot, Dehradun, School of biological sciences and biotechnology, chonnam national university, Gwangju, South Korea

The floral patterning in Arabidopsis thaliana is under regulation of Class A,B,C, E genes. The class C genes *Agamous (AG)*, is expressed in whorl 3 and 4 to form stamens and carpel in flower. The expression of *AG* is repressed in whorl 1 and 2. The previous studies showed the repression of *AG* mRNA through protein complex of *LG, SEU, SAP* and *ANT* genes. However, the mechanism is not known. Here, the proposed methodology could highlight direct and indirect interactions using protein-protein interactions of the responsible various factors. The unknown bridging factors and orientation of these factors will be tested through protein-protein interactions, protein-RNA interactions and pull doen assays in yeast, HEK cells and plant meristematic cells. The mehanism of repression of *AG* mRNA through protein complex is unknown. The methodology could screen the responsible regulatory sites in AG mRNA through luciferase reporter assays in HEK and Plant cells.

Abstract – 145

CULTIVATION AND STUDY OF GROWTH OF OYSTER MUSHROOM ON DIFFERENT AGRICULTURAL & FOREST WASTE SUBSTRATE AND ITS MEDICINAL PROPERTIES

Amrita Singh and Sumira Malik

Department of Agriculture and Forestry, Tula's institute, Chakrata road, Dhoolkot, Dehradun.

Oyster mushroom commonly referred as 'Dhingri' in India, is a Basidiomycetes and belongs to the genus 'Pleurotus' . It is lignocellulolytic fungus, the oyster mushroom is one of the most suitable fungal organism for producing protein rich food from various agrowastes without composting. Oyster mushroom is a very popular mushroom for its excellent stability of cap and stem and its longer shelf life (24-48 h) even at room temperature, highest productivity, good biological efficiency. The Mushrooms are good cash crop. The previous studies shows development of Grey and pink Oyster mushroom on agricultural or forest wastes. The current findings shows that Grey, Pink and White oyster mushroom utilises Jackfruit leaves, lemongrass leaves, mango leaves, sugarcane leaves, wheat straw and paddy straw as the substrates. The yield from the utlisation of the newly used substrates showed enhanced yield as well as the elevated nutritional content of carbohydrate, protein, ash, calcium, magnesium, crude fibers, vitamins and minerals.This inturn depicts the elevated therapeutic properties like anticancerous, anticholesteral, and antitumorous of cultivated mushrooms. The another advantage of this novel process of cultivation also supports the economic aspect of cultivation processes of oyster mushroom. In this methodology, substrate does not require costly processing method and enrichment material which helps in supporting the growth. The utilization of the different substrates in the current studies has given a faster mycelium growth and high yield. Thus, this developed methodology proves to be a profitable method for the growth of oyster mushrooms.

Abstract – 146

MOLECULAR CHARACTERISATION OF MECHANISM OF MIRNA REPRESSION OF *TOE1* GENE ACTING AS FLORAL STATE REPRESSOR.

Sumira Malik, Amrita Singh, Thota Greeshma, Kim Changsoo.

Tula's institute, Chakrata road, Dhoolkot, Dehradun, School of biological sciences and biotechnology, chonnam national university, Gwangju, South Korea

The angiosperm *Arabidopsis thaliana* is well known model for the molecular studies undrlying mechanisms of floral development in plants. The floral identity genes of class A,B,C,D,E interacts at various levels and determines floral patterning. The plant requires short distance signalling from the endogenous cells and long distance from the enviornment to get switched from vegetative phase to reproductive phase, Furthermore, signals from different flowering pathways intergrate and activate meristem identity genes which gives floral identity at specific regions only. These genes leads to final activation of floral organ genes located at downstream and mediates flower organ genesis. *TOE1* is responsible for repression of the vegetative phase to floral state in dicots. TOE1 is the target of miRNA172 and AP2 a class A gene for the repression of *TOE1* in meristematic tissues. *TOE1* contains microRNA binding putative sites. This mechanism of the repression of *TOE1* mRNA at

molecular level through microRNA and different floral identity genes factors invites future research. The further studies could be performed using protein RNA interactions in yeast 2/3 Hybrid assays, Plant fragment complementation assays for studies other factors HEK cells, plant cells.The putative sites could be explored using wild and mtant analysis of *TOE1* mRNA at different regions close to putative and conserved sites with luciferase reporter binding assays in meristematic plant cells and HEK cells.

Abstract – 147

THE PROPOSED METHOD TO STUDY NEGATIVE REGULATION OF *WUS* IN WHORL 3 AND 4 BY *AG* IN *ARABIDOPSIS THALIANA* AT MOLECULAR LEVEL.

Sumira Malik, Amrita Singh, Thota Greeshma, Yuvraj Yadav, Kim Changsoo,

Tula's institute, Chakrata road, Dhoolkot, Dehradun, School of biological sciences and biotechnology, chonnam national university, Gwangju, South Korea

The stamen and carpel in Arabidopsis thaliana is under regulation of Class B, C, E genes. The class C genes *Agamous (AG)*, is expressed in whorl 3 and 4 to form stamens and carpel in flower. WUS is expressed in whorl 1 and 2 before expression of *AG* in whorl 3 and 4. The second intron of *AG* has 2 binding regulatory sites that get activated upon interaction of *LFY* and *WUS* like activators and positively regulate AG in whorl 3 and 4. *LFY and WUS* activates *AG* in whorl 3 and 4 but once the activation of AG occurs in whorl 3 and 4, AG itself downregulates *WUS* in whorl 3 and 4. Previous studies shows no mechanism of this negative regulation of *WUS* in whorl 3 and 4. Currently, the proposed methodology of biochemicals interactions and reporter assays could explore interactions among factors using protein-protein interactions. The unknown factors and their orientation of *LFY, AP3, AG* could be explored. The *WUS* mRNA and *LFY, AG* protein binding assays in yeast, HEK cells and plant meristamatic cells may highlight upon the sequences and region which be responsible for *WUS* mRNA repression through *AG* or other unknown proteins in HEK and plant tissues.

Abstract – 148

GENETIC DIVERSITY ANALYSIS IN INDIAN MUSTARD.(*BRASSICA JUNCEA* L.) USING SSR MARKERS

LekhrajJat, S.K.Rai and Rubby Sandhu.

Division of Plant Breeding and Genetics, Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu(J&K).

Indian mustard [*Brassica juncea* (L.) Czern & Coss.] is the major economically important oilseed crop contributing about 80 per cent of the total rapeseed-mustard acreage in India. India is the second largest rapeseed-mustard growing country after China, occupying 20.23% area and contributing 11.7% share to the global production (Kumar, 2014). The present study is aimed at finding Genetic diversity of 20 *Brassica juncea* genotypes using morphological and molecular markers. 10 SSR Markers and12 morphological traits will be used for genetic diversity analysis .The present study would help us in identifying the highly polymorphic SSR, and in order to explore the diversity among huge number of genotypes, these informative primers can be of great help. The study will help in identification of parental lines that can be used in future breeding programs for yield improvement and helpful in better understanding of plant genetics including the molecular and physiological aspects that have emerged via evolution.

Keywords: Genetic diversity, *Brassica juncea,* SSR markers.

Abstract – 149

FOSTERING SECOND GREEN REVOLUTION TO ACHIEVE SELF SUFFICIENCY IN FOOD PRODUCTION IN INDIA

Yogita Navani and Awadhesh Kumar Singh
Tula's Institute, Dhoolkot, Dehradun.

The decades of 60 and 70s witnessed Green Revolution, whose key parameters were hybrid seeds of wheat and rice, improved farming technologies and better use of fertilizers. It was a master stroke in solving the problem of starvation which the country was facing at that time. But the areas who have seen Green Revolution suffered from environmental degradation and farm productivity had since gone down.. Govind Ballabh Pant University of Agriculture and Technology is the harbinger of Green Revolution in India. India needs second green revolution to bring food security to its billion plus population, to remove distress of farming community and to make its agriculture globally competitive. To achieve these goals, yield rates of foodgrains, pulses, oil seeds, dairying and poultry, horticultural crops, and vegetables need to be enhanced; and forward-backward linkages of agriculture with technology, food processing industry needs to be strengthened to match soil to seed and product to market. High productivity and better value addition by agro-processing are its key parameters.

Abstract – 150

PROTEOMICS BASED DISEASE RESPONSE INVESTIGATION FOR EFFICIENT SCREENING

Priyanka Jaiswal[1], Banshidhar[2], Sivendra Joshi[2]
[1]BHU; [2,3] GBPUAT, Pantnagar

Agriculture has played significant role in breaking fences of hunger and poverty in India. It has provided stage for social upliftment and economic boom. However, time to time it itself faces several obstructions, most significant of which is crop devastation due to various diseases. This problem has been continually tackled through resistance breeding encompassing conventional and modern molecular technologies. Though, use of molecular technologies especially marker technology has provided for quick and easy identification of resistance gene even in recessive state and in absence of disease incidence thus favoring efficient and independent screening. There are incidents reported where the resistance gene is unable to express due to post transcriptional modification. In such situations screening based on marker may mislead the selection progress. Thus to overcome such problem Proteomics based disease surveillance preceded by marker based screening qualifies as a novel approach for efficient screening of diseases. This approach is based on identification and quantification of two different types of proteins viz. resistant one and susceptible one. Signal perception and Signal transduction along with protein turnover dynamics are important tool in investigating the disease response by the genotypes, thus ensuring selection of desired genotypes with greater reliance and credibility. In a nutshell, this worthy technology proves to be a more reliable approach in disease response investigation for efficient screening of diseases to select desirable genotypes.

Keywords :- Disease surveillance, marker technology, Signal perception, Signal transduction, protein turnover dynamics.

Abstract – 151

POTENTIAL STRATEGIES FOR PLANT DISEASE MANAGEMENT UNDER A CHANGING *CLIMATE*

Prahlad, Mohit kumar, Mukesh kumar sheshma, Dinesh kumar

Department of plant pathology,College of agriculture, Bikaner, Swami keshwanand Rajasthan Agricultural University, Bikaner (Rajasthan)

Climate change will probably influence the occurrence, prevalence and severity of plant diseases. This will also affect disease management with regard to timing, preference and efficacy of chemical, physical and biological measures of control and their utilization within integrated disease management (IDM) strategies. Prediction of future requirements in disease management is of great interest for agroindustries, extension services and practical farmers. A comprehensive analysis of potential climate-change effects on disease control is difficult because current knowledge is limited and fragmented. Certain existing preventive plant protection measures, such as use of a diversity of crop species in cropping systems, adjustment of sowing or planting dates, use of crop cultivars with superior resistance and/or tolerance to diseases and abiotic stress, use of reliable tools to forecast disease epidemics, application of IDM strategies, and effective quarantine systems, may become particularly important in the future. Effective crop protection technologies are available and will provide appropriate tools to adapt to altered climatic conditions, although the complexity of future risks for plant disease management may be considerable, particularly if new crops are introduced in an area. Overall, the challenge of adapting disease control measures to climate change is not likely to be fundamentally different from the adjustments to technological innovations or changes in the economic framework already required in current crop protection. Potential beneficial effects of climate change, such as longer growing seasons, fewer frosts and shifted precipitation patterns, must not be neglected, as they could counteract the presumed enhancement of particular diseases.

Abstract – 152

MORPHOLOGICAL AND PHENOLOGICAL STUDIES IN *VALERIANA JATAMANSI* – MEDICINALLY IMPORTANT GYNODIOECIOUS HERB

Pancy Thakur, Y.P Sharma, Seema Sharma and Aruna Mehta

Department of Forest Products, Dr. Y. S. Parmar University of Horticulture and Forestry, Solan- 173230, Himachal Pradesh

Valeriana jatamansi Jones Syn. *Valeriana wallichi DC* (family Valerianaceae) popularly known as Indian Valerian, and in Hindi as Mushkbala or Sugandhawala is an important medicinal and aromatic plant distributed between Kashmir to Bhutan at an altitude of 1200 to 4000 m and in Khasi hills at an altitude of 1200 to 2000 m. It is a slightly hairy perennial herb with thick rootstock bearing rhizomes and descending fibrous adventitious roots. The plant is valued for its sedative and tranquilizing properties and useful in treating insomnia, nervous unrest, epilepsy, hysteria and skin diseases. The therapeutic properties of the plant are due to valepotriates and essential oil present in its rootstock. The species is gynodioecious in nature with coexistence of female and hermaphrodite plants growing separately in a population which do not differ much in vegetative characters but

show variation in floral characters. The plants of this species are protoandrous, self and cross compatible favouring anemophily and entomophily. Morphological studies showed that large morphological variation was observed in radical leaves of the plants. The female flowers were smaller in size than hermaphrodite flowers and presence of sterile staminodes were seen. Hermaphrodite flowers consist of 3 stamens with unifid or trifid stigma and unilocular inferior ovary. Plant height varies between 25.12 to 80.30 cm. Asynchronous flowering and fruiting occurred between Feb-April. In depth results obtained shall be discussed in the deliberations.

Key words: *Valeriana jatamansi*, medicinal, gynodioecious herb, morphology and phenology.

Abstract – 153

REVIEW ON RAPID IN VITRO CLONAL PROPAGATION OF HERBAL SPICE, MENTHA PIPERITA L. USING SHOOT TIP AND NODAL EXPLANTS

Pawan Kumar and Rajendra Kumar
Department of Entomology, COA, SKRAU, Bikaner-334006

A high frequency efficient protocol for rapid propagation of the herbal spice Mentha piperita L. from shoot tip and nodal explants was established by using full and half strength of Murashige and Skoog (MS) medium supplemented with various concentrations of 6-benzyl amino purine (BAP; 1.0-5.0 mg/L) and kinetin (Kn; 1.0-5.0 mg/L). The highest number of shoots (42.0) with 100% frequency was obtained from nodal explants in the full strength of medium containing 3.0 mg/L BAP. For further elongation, microshoots were transferred to MS medium containing different concentrations of gibberellic acid (GA3; 0.5- 2.0 mg/L). The highest shoot length (13.1 cm) with 100% frequency was achieved on medium containing 1.0 mg/L GA3. In vitro proliferated shoots were then excised from the shoot clumps and transferred to the rooting medium containing different concentrations of indole butyric acid (IBA; 0.5-2.0 mg/L) and indole acetic acid (IAA; 0.5-2.0 mg/L) alone. Among these, the highest root proliferation was obtained in the medium containing 1.5 mg/L IBA. The rooted plantlets were hardened on MS basal liquid medium and subsequently in polycups containing sterile soil and vermiculite (1:1) and finally transferred to the field. The survival rate was 100% after 25 days.

Keywords: in vitro, clonal propagation, Mentha piperita L., shoot tip, node, medicinal plant

Abstract – 154

EFFECT OF SPACING AND PINCHING ON BIOMASS AND ESSENTIAL OIL YIELD OF *TAGETES MINUTA*

Yash Pal Sharma, Aruna Mehta, Seema Sharma and Pancy Thakur
Department of Forest Products, University of Horticulture & Forestry, Nauni, Solan (HP)-173230, India

Tagetes minuta (Family Asteraceae) is an important known drug, used in the Indian systems of medicine for the treatment of cold, respiratory inflammation, stomach problem and antiparasitic etc. Native to South America, *Tagetus minuta* has neutralized itself in Himalayan and sub Himalayan regions upto altitude of 2000m in waste places, roadside, rocky hill slopes and cultivated fields of Uttar Pradesh, Himachal Pradesh, Sikkim, Arunachal Pradesh, Nagaland and Meghalaya. It occurs naturally mainly in Himachal Pradesh, Jammu & Kashmir and hills of Uttar Pradesh. Prime importance of *Tagetus minuta* is its essential oil (Tagetes oil) which possesses phytotoxic, antibacterial/antiviral/antifungal/ insecticidal, nematicidal activities and also finds use in perfume/flavour. Growth and yield of this crop is influenced by agro techniques, among them, spacing and pinching played an

important role for manipulating plant growth, flowering behavior and seed as well as essential oil yield. The present study was carried out to assess the effect of spacing and pinching on biomass and essential oil yield of *Tagetes minuta* and results revealed that pinching at 50cm & 75cm had significant effect on plant height, number of branches/plant, fresh inflorescence, yield/plant, fresh stem yield/plant, fresh leaf yield, fresh aerial biomass, and essential oil yield/plant compared to control (without pinching). Among different spacing levels, 45x60cm gave better performance for all above characters contributing towards higher essential oil/plant. Thus it has been recommended that for obtaining higher biomass and essential oil yield, *Tagetus minuta* should be planted at a spacing of 45x60cm and pinching done at 50 cm height.

Keywords: *Tagetes minuta,* pinching, spacing, biomass, essential oil yield.

Abstract – 155

NANOTECHNOLOGY IN AGRICULTURE

Madhu Choudhary, Arsode Pandurang and Namrata

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University Varanasi, Uttar Pradesh-221005, India

Breeding varieties to suite the growing needs are done through conventional breeding and biotechnical means. Recently scientists have started using nanotechnology to deliver the genes to specific sites at cellular levels and rearrange the atoms in the DNA of the same organism to get expression of desired character, thus skipping the time consuming process of transferring the gene from the foreign organisms. In the controlled environment agriculture and precision farming input requirement of crops are diagnosed based on needs and delivered the required quantities in right time at right place with the help of nanobiosensor and satellite system. Remediation of environmental contamination of the industrial waste and agricultural chemicals like pesticides and herbicide residues are possible through metal nanoparticles. Despite their beneficial role in agriculture, pesticides can be hazardous to humans and other non-targeted organisms, depending upon their toxicity, the degree of contamination, and the duration of exposure. An estimated 2.5 million tons of pesticides are used on crops each year. Moreover, it has been estimated that more than 90% of the applied pesticides are being lost to the air during the application stage itself and also as run-off, affecting both the environment and application costs to the farmers. Therefore, safe and efficient pesticide applications methods are essential for preventing the adverse effects of pesticides. In this direction, nanotechnology offers great promises and can be used as an innovative tool for delivering agrochemicals safely. Nanotechnology is still at initial stage of research and we do not yet have any specific regulation for assessing the toxicity or environmental impact of nanoparticles. It is a boosting boon to Agriculture and ailed sector.

Key words: Nanotechnology, nanobiosensor, nanoparticles.

Abstract – 156

BIOINFORMATICS APPROACH TOWARD IDENTIFICATION OF QTLS FOR IRON AND ZINC IN MAIZE (*Zea mays* L.)

Pavan Devesh, Dan Singh Jakhar and Rajesh Singh

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University Varanasi, Uttar Pradesh-221005, India

Bio-fortification of crop plants requires the identification of Quantitative Traits Loci (QTLs) involved in micronutrient accumulation. Screening of available maize genome sequence resulted in the identification of 33 genes predicted to be involved in iron and zinc transport in maize. Fifteen genes belong to the *YS* family, nine to *ZIP* family, six to *Nramp* family, two to ferritin family and one to *FRO* family. Members of each gene family possessed characteristic signature sequences and trans-membrane domains of functionally characterized genes. Simple sequence repeats (SSRs) as well as single nucleotide polymorphisms (SNPs) were identified in the candidate genes. The current study has provided a useful resource of QTLs for zinc and iron transport in maize from the available genome sequence data. A major advancement in molecular cyto-genetics of maize has been recently published wherein it has been demonstrated that there is only one functional centromere per chromosome, despite the presence of duplicate centromere sequences. In recent years, important insights have been gained into the extent of gene order conservation at the DNA-sequence level, particularly for grass genomes. Identification of SSRs and SNPs was done in the above mentioned candidate gene sequences. Simple sequence repeats are the most versatile markers and have been useful for integrating the genetic, physical and sequence maps in plant species, and simultaneously have provided researchers with an efficient tool to link phenotypic and genotypic variation. Interestingly, tri-nucleotide repeats were predominantly present in the exons of the candidate genes of the *ZIP* family, contrary to other gene families wherein SSRs were distributed either in the introns or 5'- untranslated regions (5'-UTRs). Whether the occurrence of tri-nucleotide repeats in the exons of *ZIP* family members is a random coincidence or provides some selective functional advantage to the genes, remains to be seen.

Key words: Bio-fortification, QTLs, *Zea mays* L.

Abstract – 157

EFFECT OF DIFFERENT GROWING MEDIA ON GROWTH AND FRUIT QUALITY OF STRAWBERRY (*FRAGARIA × ANANASSA* DUCH.) CV. CHANDLER UNDER PROTECTED CONDITIONS

Mamta Thakur, Bunty Shylla, Chahat Thakur, Garima Bhickta

Department of Fruit Science, Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan (H.P) 173230

Strawberry (*Fragaria × ananassa* Duch.) is a soft fruited, herbaceous perennial plant belonging to the family Rosaceae. Over the years, strawberry has gained the status of being one of the most important soft fruits of the world after grapes. Among the fruits, it gives the quickest returns in a shortest possible time. Soilless media are relatively light in weight, are readily available and are more uniform than mineral soils. The role of soilless substrates in producing healthy planting material apparently free from soil-borne diseases and insect pests

thereby leading to better vegetative growth and fruit quality of strawberry. The present investigations entitled "Effect of different growing media on growth and fruit quality of strawberry (*Fragaria* × *ananassa* Duch.) cv. Chandler under protected conditions" was carried out at the Horticultural Research & Training Station and Krishi Vigyan Kendra, (HRTS & KVK) Kandaghat, Solan (H.P.) during the cropping seasons of 2015-16 and 2016-17. The plants under study were subjected to 6 treatments viz. Perlite, Perlite + FYM (1:1), Cocopeat, Cocopeat +FYM (1:1), Perlite + Cocopeat + FYM (1:1:1) and control (Soil + FYM). The experiment was laid out in a Completely Randomized Block Design with four replications. The results revealed that the plants grown in Perlite + FYM (1:1) medium recorded the maximum plant height, leaf area, number of runners, berry set, , berry size, total soluble solids and sugars as compared to control. Perlite + FYM was however found to be statistically at par with perlite in terms of number of runners, berry set, berry length, total soluble solids, total sugars, reducing sugars and non-reducing sugars. Based on the results obtained, perlite in combination with FYM can be successfully used for the production of good quality strawberry under polyhouse.

Keywords: Soilless media, Plant growth, Fruit quality

Abstract – 158

CHARACTERIZATION OF CELLULOLYTIC ENZYME BY *ASPERGILLUS NIGER* USING AGRICULTURAL WASTE

Pushpanjali and Vishal Srivastava
Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005

Cellulases are enzyme complex of hydrolytic enzymes such as endoglucanase (CMCase), exoglucanase, β-glucosidase (BGL) and FPase that are responsible for the bioconversion of the cellulosic biomass into valuable products. *Aspergillus niger* were isolated from various agriculture fields by growing on Czapek's Dox agar medium. Plate screening was done by using carboxy methyl cellulose as carbon source. By using DNSA method, cellulase activity was observed. Optimization of nitrogen source, temperature, pH and fermentation time were studied under submerged culture condition for cellulolytic enzyme production. Genomic identification of the selected *Aspergillus niger* was done using 18S rDNA technique. Maximum cellulolytic activity was observed in 4.3 pH media at 28°C after 95 hours in submerge condition. Wheat straw showed maximum activity of CMCase, exoglucanase, β-glucosidase and FPase.

Key words: Cellulases, Agricultural Waste, *Aspergillus niger*

Abstract – 159

BREEDING APPROACHES FOR IMPROVING RICE BLAST RESISTANCE

Vikash Maurya, Bapsila Loitongbam and Suman
Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005

Rice (*Oryza sativa* L.) is a major cereal crop that contributes significantly to global food security. Biotic stresses, including the rice blast fungus *Magnaporthe oryzae*, is one of the most destructive disease causing huge losses to rice yield in different parts of the world. Therefore, resistance breeding requires continuous efforts of enriching

the reservoir of resistance genes to effectively tackle the disease. There are major blast resistance gene (*R*) in rice viz *Pib*, *Piz*, *Piz-t*, *Pik*, *Pik-p*, *Pikm Pik-h*, *Pita/Pita*-2, *Pi2*, *Pi9*, *Pi1* and *Pi5.* These resistance genes can be utilized in rice cultivars which are susceptible to rice blast. The concept of marker-assisted breeding and gene pyramiding can be exploited to develop a variety by introgression of any two or more of above genes for durable blast resistance. Diversity assessment is very essential tool in finding the responsible gene for blast disease in the germplasms. This study would help to formulate strategies for improving rice blast resistance through genetic studies, plant-pathogen interaction, identification of novel *R* genes, development of new resistant varieties through marker-assisted breeding for improving rice blast resistance in India and worldwide.

Key words: Marker Assisted Breeding, Gene Pyramiding, *Oryza sativa* L.

Abstract – 160

MEASUREMENT OF ZINC DEFICIENCY IN INDIAN AGRICULTURAL SOIL

Suman Meena, S.R. Rathi and Vikash Maurya

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005

The number of factors including increased human population, pollution and decreased agricultural areas along with varied biotic and abiotic stresses have affected the production and negatively impacted global agriculture, which has cumulatively elicited the global food crisis, bequeathing many human populations hungry and nutrient deficient. Proper plant nutrition is important for significantly improving the quality and quantity of plant products. Zinc is one of the micronutrient involved in all metabolic and cellular functions in plants and thus essential for normal plant growth and development processes. In India, up to 50% of the agricultural land has been reported to be zinc-deficient. Hence, plant nutrients have become essential components of sustainable agriculture. For an optimum plant growth and production, the essential nutrients must be readily available in sufficient and balanced quantities. However, the high intensity cropping through the production technology and use of high analysis fertilizers have rendered the soils prone to deficiencies of single or multiple micronutrients.

Key words: Zinc deficiency, Stresses and Soil

Abstract – 161

MYCORRHIZAL ASSOCIATION OVERCOMES Pb-TOXICITY IN SPINACH

Madhusmita Samal, Padmanabh Dwivedi and Bansh Narayan Singh

Department of Plant Physiology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi- 221005, India

Lead (Pb) is a toxic contaminant and long-time persists in soil causing serious problem not only in human beingsbut also affects plants. Although Pb is not an essential element for plants but it is easily taken up by plant root and accumulated in different parts of plant. Excess Pb accumulation affects several physiological parameters like stunted root and shoot growth, chlorosis as well as blackening of root. In the present investigation, we found that exposure of Pb to Spinach (*Spinacia oleracea*) plants affected the morphological parameters like root growth, shoot growth, number of leaves and leaf area as compared to control. Apart from that, Pb toxicity

elevated the membrane injury leading to loss of chlorophyll and sugar level. However, seed coating with mycorrhiza before the seed sowing mitigated the effects of Pb toxicity. These findings suggested that mycorrhiza is an important phytostabilizer which prevents the translocation of Pbin different parts and helps in keeping it in fungal hyphae in the root. Therefore,remediation of soil contamination with Pb using mycorhiza seemsto have great approaches in agricultural field.

Key words: Chlorosis, Mycorrhiza, PbToxicity, Phytostabilizer, Root Growth

Abstract – 162

G-PROTEIN SIGNALING IN PLANTS

J. Pradhan and B.R. Yashu

Department of Plant Physiology, Institute of Agricultural Sciences, B.H.U, Varanasi, 221005

Signal transduction in plant cells is a complex process, which include three major steps i.e. signal perception, signal transduction and response to that particular signal. A large number of signaling pathways are there for various ligands or signals. One of them is G-protien, which mediates a variety of cellular responses to a range of stimuli. Although plant cells have most of the core elements found in animal G signaling, differences in network architecture and intrinsic properties of plant G protein elements make G signaling in plant cells distinct from the animal paradigm. It is activated by GTP (Guanosine tri-phosphate) and inactivated by GDP (Guanosine di-phosphate) and also found to controlled by RGS (Regulator of G-protein signaling). It is found to mediate PKA (Protein kinase A) and PKC (protein kinase C) signaling cascade, which causes not only the cellular changes but also the molecular changes inside nucleus. A number of physiological processes have been found to mediate G-protein for its action. This protein is also known to be the referee of many processes dealing to fight against biotic and abiotic stresses. The detailed study can disclose many of the mystery from this topic.

Key words: Signal, G-protein, GTP, GDP, Signaling cascade.

Abstract – 163

EVALUATION OF SUBSTRATES FOR QUALITY SPAWN PRODUCTION OF MUSHROOMS

Sardar Singh Kakraliya, Lekhraj Jat,

Sher-e- Kashmir University of Agricultural Sciences & Technology of Jammu (J&K)

Six different grains viz. wheat, maize, bajra, sorghum, barley and oat alone and in combination with the supplements viz. gram husk, paddy husk and wheat bran in the 1:1 ratio (v/v) were studied to see their impact on spawn growth and yield of three species of mushroom viz. *Agaricus bisporus*, *Pleurotus florida* and *Calocybe indica*.. All the grain substrates with and without supplements favoured the mycelial growth in spawn of different mushrooms except when the grains were supplemented with wheat bran. However yield and quality related parameters varied with different spawn substrates. Sorghum grains took the minimum time for mycelial run in spawn bottles followed by maize while bajra grains took the maximum time for mycelia run. In case of *A. bisporus* maximum time for spawn run was 19.00 days in bags spawned by sorghum grains supplemented with gram husk. In *Pleurotus florida*, wheat straw spawned with sorghum grains took the minimum time for spawn run. For cultivation of C. indica, sorghum grain spawn took the minimum time for spawn run. However, maximum days for spawn run was taken by spawn prepared with maize supplemented with gram husk. For

pinhead formation, bags spawned with sorghum grain spawn took the minimum number of days. Highest biological efficiency was obtained in *A.bisporus, P. florida* and *C.indica* by using spawn prepared by sorghum grains, while minimum biological efficiency in *A.bisporus*, *P.florida* and *C.indica* was obtained by using maize added gram husk. Maximum B:C ratio of 1.91, 2.98, and 3.91 was obtained in *A.bisporus*, *P. florida* and *C. indica* respectively by using spawn prepared by sorghum grains. Four major types of contaminants were observed which included three fungal *viz. Aspergillus spp., Penicillium spp*. and Trichoderma spp. and one bacterial viz. Bacillus spp. These contaminants were found individually as well as in combination in all the grain substrates. The incidence of bacterial contamination was maximum in bajra grain spawn and least in sorghum grain spawn. The treatment comprising of three boiling as well as three autoclavings showed maximum efficiency in management of fungal and bacterial contaminants. Tetracycline (50µg/kg) was found best for managing bacterial contamination of spawn which resulted in the reduction up to 98.33% of bacterial contamination.

Abstract – 164

EXTRACTION: AN IMPORTANT STEP FOR EVALUATION OF ACTIVE CONSTITUENTS IN MEDICINAL PLANTS

Seema Sharma, Yash Pal Sharma, Pancy Thakur and Aruna Mehta

Department of Forest Products, DR.Y.S. Parmar University of Horticulture and Forestry Nauni, Solan-173230, (H.P)

Medicinal plants are currently of high value due to their characteristic feature as abundant source of therapeutic agents which play an important role in the development of novel drugs. In the study of medicinal plants, extraction is an important step for processing of these plants for different purposes like research, pharmaceutical, isolation and purification of bioactive components *etc*. Extraction involves the separation of medicinally active portions of plant tissues from the inactive components by using selective solvents. Various extraction methods such as maceration, soxhlet extraction, heating under reflux and cold extraction are commonly used extraction methods. Sonication assisted extraction and microwave assisted extraction, supercritical-fluid extractions are some advanced methods used for the plant samples extraction. In the present study prerequisites for extraction, factors affecting extraction: choice of solvent, duration of extraction *etc*., different extraction methods and their strength and limitations are described with few examples.

Abstract – 165

MICROPROPAGATION STUDIES OF MEDICINAL PLANT *RAUWOLFIA SERPENTINA*

Varnika[1], Shalini[1]and Nishesh Sharma[2]

Dolphin (PG) Institute of Biomedical and Natural Science, Dehradun, Department of Biotechnology, UCALS Uttaranchal University. Dehradun

Rauwolfia serpentina L. Benth is commonly known as sarpaganda, is a woody shrub belonging to family Apocynaceae. The herb is recognized by different local names such as Chandrabhaga or sarpaganda (Hindi), Chevanamalpodi (Tamil), Keramaddinagaddi (Kannada), Patalaguni or Patalaganda (Telgu), Suvapavalporiyam or Amalpori (Malayalam),Harkaya or Harki (Marathi), Arachoritita (Assamese), Chandra (Bengali), Sutranabh-i (Kannada) and Lu fu mu (Chinese). *Rauwolfia serpentina* is known to be distributed in sub Himalayan tract. *Rauwolfia serpentina* is inhabits India, Pakistan, Shri Lanka,Burma, Thailand, Sikkim and Bhutan. Beside this the

plant is also found in lower hills of Gangetic plains, eastern and western Ghats and Andaman. The plant has become endangered due to over exploitation for traditional as well as medicinal purposes. Hence there is requirement for development of techniques and practices for conservation of the plant. In present study micropropagation technique was utilized for conservation as well as mass propagation of the plant. Nodal and leaf segments obtained from mature plant of *R. serpentina* were utilized as explant for the present study. Explnts were surface sterilized and innoculated onto MS medium fortified with different hormones in varying concentration. When nodal segment of *R. serpetine* were cultured onto kinetic containing MS medium, multiple shooting was obtained onto medium having 2 mg/l kn, 44.4% explant bud break, and a maximum of 07 shoots were obtained. When 12 mg/l kn, 90.2% explant showed bud break, with maximum of 9 shoots. Callus formation was achieved when leaves of the plant were cultured onto MS medium fortified with higher concentration of 2,4-D (MS+10-12µm 2,4-D). no direct regeneration was reported. Regeneration and elongation of shoot bud from callus was achieved onto MS+2,4-D (8-10µm) + Kn (4-8µm). When shoots were cultured on MS media contained 10 mg/l IBA, 44.4% cultured to *in vitro* root development with average no. 04 roots was achieved. About 68.4 % plants were successfully acclimatized. Invitro regenerated plants also exhibited production of higher number of phytocompounds as compared to mother plant exhibited by result obtained from GC-MS analysis of methanolic extract of mother and invitro regenerated plants.

Abstract – 166

HORMONAL CROSSTALK IN PLANT DISEASE AND DEFENSE

Sujata Singh Yadav and Vishal Singh

Department of Plant Pathology, College of Agriculture, G. B. Pant University of Agriculture & Technology, Pantnagar- 263 145 (India)

Hormonal crosstalk between the different plant defense pathways has often been hypothesized to be a cost-saving strategy that has evolved as a means of the plant to reduce allocation cost by repression of unnecessary defenses, thereby, minimizing trade-offs between plant defense and growth. Hormonal crosstalk in plants during multi-attacker interactions allows plants to prioritize their defenses, while limiting the fitness costs associated with induction of defenses. The plant hormones playing important role in crosstalk are small signal molecules synthesized in low concentrations. Among them, salicylic acid (SA), jasmonic acid (JA), and ethylene (ET) are the major defense players in the regulation of signaling networks of basal resistance against multiple pathogens. Salicylic acid signaling triggers resistance against biotrophs and hemibiotrophs pathogen, whereas, a combination of jasmonic acid and ethylene signaling activates resistance against necrotrophs. These two pathways are mostly antagonistic to each other. Phytohormone, Auxin (IAA), Gibberellin (GA) Abscisic acid (ABA), Cytokinins (CKs) and Ethylene (ET) crosstalk is crucial for plant defense against pathogens and these phyohormones interfere with SA, JA and ET signaling and provide resistance to plants. These signaling networks can act alone or may interact with one another, or with other hormones, through crosstalk among signaling pathways. The balance of hormone crosstalk strongly influences the outcome of plant-pathogen interactions, including establishment of effective systemic immunity. The crosstalk between two signaling pathways can be either negative or positive regulators. GA causes degradation of the DELLA protein growth repressors, elevating

accumulation of SA and attenuating JA signaling. Cytokinins (CKs) promote resistance against biotrophs by enhancing the SA response gene. Auxin and SA signaling pathway also interact antagonistically. Activation of ABA biosynthesis and signaling pathways promotes susceptibility to several plant pathogens. It is clear that pathogen-induced modulation of signaling via other hormones contribute to virulence. The outcomes of complex crosstalk and induced hormonal changes modulating disease and resistance depend on pathogen's lifestyle and the genetic constitution of the host. These disparate hormone signaling pathways are crucial regulatory targets of hormonal crosstalk in disease and defense.

Abstract – 167

OMICS APPROACHES IN CROP IMPROVEMENT

Arsode Pandurang, Pavan Devesh and Madhu Choudhary

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University Varanasi, Uttar Pradesh-221005, India

In 2018, the world population exceeded 7 billion people and is expected to continue growing. To feed this growing population and meet rising expectations regarding food quality, food production must increase by an estimated 70% by 2050. Recent abrupt climatic changes make stable food production even more difficult and put pressure on fragile environments. There is, therefore, an urgent need to accelerate crop breeding improvements and to implement new management strategies that together can achieve sustainable yield increases without further expanding farmland or damaging the environment. The genomic tools especially molecular markers have been extensively used for understanding genome dynamics as well for applied aspects in crop breeding. Several new genomics technologies such as next generation sequencing (NGS), high throughput marker genotyping, omics technologies have emerged as powerful tools for understanding genome variation in crop species at DNA, RNA as well as protein level. The most obvious application for genomic technologies has been in the area of gene discovery through the forward genetics or positional cloning approach which is greatly facilitated by access to a full genome sequence. The whole genome sequencing of chickpea (CDC Frontier, a *kabuli* chickpea variety) adds to the genomic resources available for legume research demonstrated that quantitative trait modification which includes phenotypic and compositional changes cannot be achieved by mutagenesis or transgenic but can be introgressed through wide genetic variation studies using molecular marker assisted breeding. Transcriptomics based analysis study have reveals one of the intriguing although poorly described metabolic pathways. These approaches together with omics approaches such as transcriptomics, genetical genomics, metabolomics and proteomics can be used to identify the genomic regions or genes involved in expression of trait(s) that are of interest to the breeding community.

Key words: Omics, Next Generation Sequencing, Transcriptomics

Abstract – 168

A CASE STUDY OF MADHOPURA VILLAGE IN ARID REGION: RAJASTHAN

Rathod Digvijaysinh[1], Ram Gopal[2], Neha[3], Akshit Kukreti[4], Pravin Rawat[5], Ambalal Nagar[6]

[1,2,3,4,5] Forest Research Institute, Dehradun, [6]VC.S.G. Uttarakhand University of Horticulture and Forestry, Bharsar

In arid regions very harsh and unfavourable climatic conditions coupled with poor soils, make agricultural production system a gamble with high risk and uncertainties. Livestock rearing is also a very challenging task in arid ecosystems instead of it is an integral part of social, economic and environmental system in Rajasthan due to scarcity of fodder and feeding sources.The data pertaining to study was collected using extensive field visit, observations and interacting with farmers and villagers. On the basis of field observation it is concluded that most prevalent agroforestry systems in study areas were Agrisilviculture system, Silvo-pastoral system and Home garden with various common trees *i.e., Citrus limon (L.), Carica papaya (L.), Moringa oleifera* including common grown vegetable crops. *Prosopis cineraria* and *Ailanthus excelsa* were most dominant multipurpose tree species extensively lopped for fodder as well as fuelwood. The selling of the pods of *Prosopis cineraria* were one of the important source of income generation for local people worth about 600 to 700 ₹ per kilograms. Due to poor condition of soil and water scarcity people are adopting the sprinkler irrigation system in the village. Finally, it is concluded that there is an urgent need of introducing good quality fodder and fruit yielding tree species to reduce pressure of lopping on regional species. Also, developing new agroforestry models will be regional specific and considering the demand of local people using native and suitable exotic species.

Keywords: Agroforestry systems, Arid region, Livestock, Lopping, Multipurpose trees

Abstract – 169

EVALUATION OF SUITABLE PLANT EXTRACTS FOR RETAINING STORAGE QUALITY OF APPLE THROUGH POST HARVEST APPLICATION

Sanjay Singh Negi, Shweta Uniyal, Naveen Chandra and A. C. Mishra

Department of Fruit science, College of Forestry and Hill Agriculture, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Ranichauri, Tehri, U.K., India

The experiment was laid out in a Factorial Completly Randomized Design (FCRD) with three replications and 5 treatments namely; T1 (bael leaves extract @ 15%), T2 (bael leaves extract @ 25%), T3 (turmeric powder @ 15%), T4 (turmeric powder @ 25%), and T5 (control). After harvesting of fruits were treated with different botanical extracts treatments and stored in room temperature from 0 days to 120 days and physico-chemical analysis was done at an interval of 30 days *viz*., initial day, 30 days of storage, 60 days of storage, 90 days of storage and 120 days of storage. The present investigation clearly revealed that post harvest treatments of apple fruits with different botanical extracts was effective in increasing the shelf life of fruit as it helps in decreasing the PLW and rotting percentage of fruits and also helps in increasing the physico-chemical characteristics of the fruits. Among the treatments highest (7.36%) PLW and decay rotting (45.55%) was observed in T5 (control) and lowest (3.09%) PLW was recorded in T1 (bael leaves extracts @ 15%). After 120 days of storage maximum total sugar (11.76%) were observed in T3 (turmeric leaves extract @ 15%) and maximum reducing sugar (9.90) was found in T5 treatment (control) was at par with the treatments having lowest physiological loss in weight, rotting percent and highest total sugars.

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