99th Indian Science Congress

3-7 January, 2012 - Bhubaneswar

99th Session of the Indian Science Congress

SECTION OF

PLANT SCIENCES

President

Prof. P C Trivedi

The Indian Science Congress Association

PROCEEDINGS

OF THE

NINETY NINTH SESSION OF THE

INDIAN SCIENCE CONGRESS

Bhubaneswar, 2012

PART II

SECTION OF PLANT SCIENCES

***President*: Prof. P C Trivedi**

CONTENTS

99th Indian Science Congress

January 3-7, 2012, Bhubaneswar

I
PRESIDENTIAL ADDRESS

President: **Professor P. C. Trivedi**

PRESIDENTIAL ADDRESS

Plant Parasitic Nematodes and their Management by Bioagents

President : Professor P. C. Trivedi*

SECTION OF PLANT SCIENCE

Hon'ble chairman, distinguished botanist of the country, delegates, ladies and gentlemen. At the outset, I express my deep sense of gratitude to the members of Plant Science section of the Indian Science Congress Association for electing me as Sectional President unanimously. I feel small for this honour because my predecessors have been stalwarts and eminent botanists of the country. I take this opportunity to pay homage to my teacher and mentor, late Prof. B. Tiagi- who taught men fundamentals of research and introduced me to a group of microbe, called Nematodes, a topic which I have selected to deal, in this address. I dedicate this address to my teachers and students who helped me in various ways during my academic journey.

Tiny creatures with big names and enormous influence are the nematodes. Nematodes are lower invertebrates, highly diversified, perhaps the most numerous multicellular organisms existing on our planet. They are found in almost all types of biotypes and occur in unimaginable numbers, in wide variety of shapes, size and structures. The nematode is probably one of the oldest existing life forms, dating back millions of years. The fossilized nematodes lived approximately 25 million years ago, and resemble those which concern man today in almost every respect. Out of the total nematode population on this earth, 50% are marine, 25% are free living, 15% are animal parasites and only 10% are plant parasitic nematodes. But these plant parasitic nematodes infect almost every plant on this earth causing heavy economic losses.

The plant parasitic nematodes are soil-inhabiting microscopic roundworms that feed on plant roots. All plant parasitic nematodes characteristically have a feeding apparatus known as a stylet. The stylet which resembles a hypodermic needle enable the nematodes to puncture plant cell walls, secrete enzymes into the cell, and withdraw digested cell contents. The feeding activities of these nematodes usually result in stunting and unthrifty plant growth, reduced crop yields and occasionally, plant death. All plants are susceptible to attack by one or more species of plant parasitic nematodes. The major

* Vice Chancellor, Deen Dayal Upadhyay, Gorakhpur University, Gorakhpur-273 009

damage done by nematodes is caused by their feeding activity on plant root systems. Nematode species, however, very in their preference to plant food. Some feed on relatively few kinds of plants, whereas others feed on many different plant species.

Nematodes are triploblastic, bilaterally symmetrical, unsegmented pseudocoelomate organisms with needle like stylet. Respiratory & circulatory systems are absent. Most of the plant parasitic nematodes are obligate parasites. They are small, 300-1000 µm, with some upto 4 mm long, by 15-35 µm wide. Largest reported plant parasitic nematode in *Paralongidorus maximus* (12 mm.) & smallest one is *Paratylenchus nanus* (0.3 mm).

Nematode and crop losses

There are numerous estimates of the economic importance of nematodes in crop production on a worldwide and individual country basis, but precise values cannot be determined. It was because of nematodes 'small size and hidden way of life' and lack of definite information on their occurrence and pathogenicity. The assessment of the society of Nematologists Committee on crop losses indicates annual losses in the United States due to plant parasitic nematodes to the tune of $ 1,038,374.300 in field crops, $ 225,145,900 in fruit and nut crops, $ 266, 989,100 in vegetable crops and $ 59,817,634 in ornamental crops (Anon, 1971).

In a world-wide survey conducted by Sasser (1989), the ten most important genera of plant parasitic nematodes revealed were : *Meloidogyne, Pratlylenchus, Heterodera, Ditylenchus, Globodera, Tylenchus, Xiphinema, Radopholus, Rotylenchulus* and *Helicotylenchus.* This order of importance of the various genera was found to be fairly representative for most regions of the world. The estimated overall annual yield loss of the world's major crops due to damage by plant parasitic nematodes is 12.3 per cent. The 20 crops that represent a miscellenious group important for food or export value were reported to have an estimated yield loss of 14 per cent. Losses for the 40 crops in developed countries average 8.8 per cent compared with 14.6 per cent for developing countries. Global crop losses due to nematode on 21 crop, 15 of which are life-sustaining were estimated at $ 77 billion annually based on 1984 production figures & prices. The United States portion alone is $ 5.8 billion. These figures are staggering and the real figure, when all crops throughout the world are considered, probably exceed $ 100 billion annually. Sasser and Freckman (1987) have indicated an annual crop loss due to plant parasitic nematodes on worldwide basis to the tune of $ 100 billion.

Several workers have attempted to assess crop losses caused by plant parasitic nematodes in India. Van Berkum and Seshadri (1970) were the first to have calculated

these losses in India in terms of money. They estimated the annual losses due to 'ear cockle' disease, caused by *Anguina tritici* on wheat, amounting to $ 10 million, due to *Pratylenchus coffeae* on coffee at $ 3 million and due to 'Molya' disease caused by *Heterodera avenae* in Rajasthan province alone at $ 8 million. Paruthi and Bhati (1981) reported the loss in wheat yield due to *Anguina tritici* ranged from 1 to 9 per cent. The yield of okra, tomato and brinjal suffered 90.9, 46.2, 2.3 per cent losses, respectively, due to *Meloidogyne incognita* infestation at the rate of 3-4 larvae /g soil under field conditions (Bhatti and Jain, 1977). The loss in wheat yield was upto 42.2 per cent in the sandy soil of Rajasthan due to *Heterodera avenae* (Mathur *et al*, 1986), many important nematode pest of importance are potato cyst nematode-*Globodera rostochiensis* in Nilgiris, the citrus nematode, *Tylenchulus semipenetrans* in citrus crops, the burrowing nematode, *Rodopholus similis* in banana, the reniform nematode and *Rotylenchulus reniformis* in cotton, maize, finger millet, cowpea and blackgram, respectively.

In India the loss is predicted at about 14.6% and could as well go as high as 50-80% in some crops (Bhatti, 1992). In economic terms nematodes cause an estimated loss of about $ 157 billion annually to world agriculture (Abad et. al., 2008). The loss of Indian agriculture is estimated at about Rs. 210 crore annually (Jain et. al., 2007).

About 2500 nematode species are known to parasitise the lower as well higher plants at global level. In India, so far, about 600 species belonging to about 85 genera have been either described or reported to be associated with more than 700 plant species growing in diverse agroclimatic zones. Many of them have been proved to be highly pathogenic and cause considerable economic yield losses in cereals, pulses, vegetables, fruits, ornamentals and forest crops. Almost every crop is being parasitized by one or more phytonematode species. Despite this, their role as a limiting factor in agricultural production has not been duly recognized perhaps due to their microscopic size, subterranean habitat, slow rate of multiplication and, above all, the symptoms produced by them are generally not clear-cut and easy to pinpoint. These are often confused with nutritional deficiency or some physiological disorders.

How does nematode feeding affect plant

- Nematodes cause lesions, discolouration, deformity and in some cases, complete devastation in the penetration and feeding areas.
- Plants under attack by nematodes lose vigour and become unthrifty.
- The size and quality of fruits and vegetables are reduced.
- Nematodes cause decline, and in extreme cases, death of the plant.
- The puncture would left by the stylet opens the door for fungal or bacterial invasion, which may do more damage than the nematode.

Pathological effects: Nematode infection in host plant causes mechanical injury and sometimes develops complex host-parasite relationship. These interactions involves physiological changes in host tissue resulting from substances secreted by the nematode and perhaps from substances produced by the plant in reaction to the presence of nematode. Members of the family Heteroderidae incite greatest changes in the host tissues. At the feeding site of females, a group of cells develop into syncytia or giant cell, whose cytoplasm is rich, containing many nuclei and nucleoli. Infection causes extensive changes in host due to hyperplasia and hypertrophy particularly in stelar tissues. *Anguina* stimulates galling in foliar and floral parts of grasses due to hypertrophy and hyperplasia of parenchymatous cells. Many other pathological effects due to nematode infection include suppress cellular division, root pruning and root proliferation. All these effects will very with the nematode, host plant and other organisms present. In general nematode infection result in stunted plant growth, lower yields and reduced quality of most crops and lower returns to the farmer.

Biological Control of Plant Parasitic Nematodes

The objective of nematode control is to improve growth and yield of plants, which can be achieved through a reduction of the nematode population in soil or in plants or through a reduction of their damage. Following methods can be used to control nematodes : 1. Chemical methods, 2. Physical methods, 3. Cultural methods, 4. Biological control, 5. Use of resistant varieties, 6. Integrated management.

The most widely accepted definition of biological control is one given by Baker and cook (1974) which defined biological control "as the reduction of inoculum density or disease producing activities of a pathogen or parasite in its active or dormant state, by one or more organisms, accomplished naturally or through manipulation of the environment, host or antagonist or by mass introduction of one or more antagonist." In this method, living organisms are exploited for reducing pest populations without adversely affecting the environment.

Many natural enemies attack nematodes in soil and reduce their population. Exploitation of these enemies for practical use in the management of plant parasitic nematodes at present seems to be practically demanding and relevant approach in view of the greater awareness for pollution free environment. Several predators like : predacious fungi, predacious nematodes and other predacious organisms such as : tardigrades, turbellerians, enchytraeids,

insects, mites; parasites like : viruses, bacteria, fungi and some other organisms have shown some promise as biological agents. They constitute natural bioresources for management of plant parasitic nematodes. The current status of development in biological nematode control utilizing a number of soil antagonists has been reviewed extensively (Jatala, 1986; Kerry, 1984; Swarup and Gokte, 1986; Trivedi, 1992, 1997, 1998, 2000, 2003, 2005, 2007, 2011).

Attributes of Successful Biocontrol Agents

An ideal biocontrol agent, which would be supposed to possess the following attributes:

a. Mobility and the ability to search out its prey
b. Adaptability to the environment
c. Host specificity
d. Synchronization with the host
e. Ability to survive host-free periods
f. High reproductive potential
g. Biologically competitive
h. Efficient dispersal
i. Genetic stability
j. Long term storage
k. Chemical compatibility

Biocontrol Agents

Biocontrol agents fall in two broad categories-***Predators*** and ***Parasites*****.** Endozonic and opportunistic fungi, bacteria, protozoans, viruses and ricketesial have been recognized as parasites of nematodes; turbellarians, enchytreids, mites, collembolans, tardigrades and protozoans have been recognized as predaceous forms.

Parasites

(A) **Viruses:** A limited information in available on viruses, affecting viability of nematodes. Loewenberg *et al*, (1959) reported a virus disease in *Meloidogyne incognita* causing sluggishness of second stage juveniles of the nematodes. Many workers (Zuckerman *et al*, 1973; Ibrahim and Hollis, 1973; Ibrahim *et al*, (1973) reported virus infection in plant parasitic nematodes. However, conclusive evidence that the virus like particles associated with the nematode can cause a disease that results in a slow death of nematodes in still lacking.

(B) **Rickettsias:** Rickettsias were found in cyst nematode species e.g. *Heterodera goettingiana* and *Globodera rostochiensis* (Shepherd *et al*, 1973) & in *H. glycines* (Endo, 1979). In general only minor pathological effects on host cells were observed and it is questionable if these organisms are parasites or symbiotes?

(C) **Bacteria:** Bacteria antagonists of plant parasitic nematodes are grouped under the following categories:

(a) Obligate parasites
(b) Antagonistic soil bacteria
(c) Rhizospheric bacteria
(d) Other soil bacteria

(a) **Obligate parasites :** The obligate endospore forming bacterial parasites belong to *Pasteuria* spp. and currently three species viz. *P. penetrans*, *P. thornei* and *P. nishizawe* are known to parasitize nematode (Sturhan *et al*, 1994) *P. penetrans* is the most widely prevalent species and has been reported from more than 200 host nematodes belonging to diverse genera (Sayre & Starr, 1988; Sturhan, 1985) from all over the world.

The *P. penetrans* group & other members of the genus are highly host specific & in some instances even population specific. Certain populations of these obligate parasites have a host-range restricted to a small group of nematodes (Stirling, 1985; Bhattacharya & Swarup, 1988; Oostendorp *et al*, 1990; Pandey *et al*, 2003; Singh & Dhawan, 1994; Sayre *et al*, 1991; Sharma & Davies, 1996). The two tropical root-knot nematodes *Meloidogyne incognita* and *M. javanica* are the major hosts, frequently met with. The life cycle of the bacterium is perfectly synchronized with that of its hosts (Mankau & Imbriani, 1975). The bacterium causes sterility in the parasitized nematodes as a result of failure of the reproductive system to develop (Mankau & Imbriani, 1975).

Pasteuria penetrans is multiplied for experimental purposes using the host *Meloidogyne* sp. on a suitable host plant. The nematode-infected roots containing the endospores of the bacterium are powdered, sieved through fine mesh and used as spore powder (Stirling & Wachtel, 1980; Sharma & Stirling, 1991). Attempts to multiply *P. penetrans* in vitro on synthetic media have so far not been successful, eventhough the endospore germinate in some favourable media, they fail to complete the life cycle

(Bishop & Ellar, 1991). The biocontrol potential of *P. penetrans* has been established against *Meloidogyne* spp. by a number of workers in different countries, mostly through pot culture experiments (Mankau, 1973; Bhattacharya & Swarup, 1988; Stirling *et al*, 1990; Walia & Dalal, 1994; Tzortzakakis *et al*, 1997; Sosamma & Koshi, 1997), a limited number if field observations also go to prove its bioefficacy as a biocontrol agent (Brown *et al*, 1985).

The obligate nature of the organism, its lack of mobility & dependence on the dispersal agent and the host's specificity are its major drawbacks.

(b) **Antagonistic Bacteria :** Soil bacteria like *Clostridium butyricum* (Hollis & Rodriguez-Kabana, 1966, 1967); *Desulfovibrio desulficans* (Rodrigues-Kabana *et al*, 1965); *Chromobacterium* sp. and *Bacillus thuringiensis* var *thuringiensis* (Prasad & Tilak, 1972) producing butyric acid, hydrogen sulphide, cyamide and exotoxins, respectively have been demonstrated to be antagonistic to nematode. Compounds like hydrogen sulphate & ammonia produced by bacteria have been found to have deleterious effects on *Hirschmanniella oryzae* in rice fields & root knot nematodes (Jacq & Fortuner, 1979; Mankau & Minteer, 1962; Zavaleta, 1985).

Bacillus thuringiensis, a spore forming aerobic, gram positive bacterium belonging to the genus *Bacillus* is considered a potential biocontrol agent. More than 200 isolates of *B. thuringiensis* have been grouped into more than 12 stereotypes. Many worker evaluated & found *B. thuringiensis* toxic to the eggs & larvae of *Meloidogyne* sp. (Prasad et. al, 1972; Chahal & Chahal, 1991; Sheela 1991, 1992; Oka *et al*, 1993), *Anguina tritici* (Gokte & Swarup, 1986); *Panagrellus* & *Aphelenchus* (Ignoffo & Dropkin, 1977); *Pratylenchus penetrans* (Zuckerman *et al*, 1993)

(c) **Rhizospheric Bacteria :** Rhizospheric bacteria, mainly fluorescent *Pseudomonas* (Oostendrop & Sikora, 1989; Spiegel *et al*, 1991) & certain others like *Bacillus subtilis* and *B. cereus* (Oka *et al*, 1993), *Bacillus sphaericus* (Racke & Sikora, 1992), *Anthrobacter* (Kloepper *et al*, 1988), *Scroratia* (Kloepper *et al*, 1988) and *Agrobacterium* (Racke & Sikora, 1992) are antagonistic to nematodes. Among the rhizobacteria, *P. fluorescence* have been investigated for its antagonism to nematodes more extensively than others and found effective against *Meloidogyne* spp.

(Gokte & Swarup 1988), *Heterodera avenae*, *H. cajani* & *H. zeae* (Gokte & Swarup, 1988; Pandey *et al*, 2003) & *H. schachtii* (Oostendorp & Sikora, 1989). Bare root dip treatment of tomato seedlings in a suspension of *P. fluorescence* was reported effective against *M. incognita* (Shanti & Sivakumar, 1995). Recently biological activity of *Arthrobotrys oligospora* against *M. incognita* infesting okra was studied (Dhawan and Singh, 2011).

Agrobacterium radiobacter and *Bacillus sphaericus* have been found to produce toxic metabolites affecting penetration of *Globodera pallida* & improving yield of potato (Racke & Sikora, 1992). Another bacteria, *Azotobacter*, an aerobic, non-symbiotic gram negative nitrogen fixing bacterium, is gaining importance in controlling phytoparasitic nematodes (Chahal & Chahal, 1986, 1999; Verma & Bansal, 1996; Amalendu Chatterjee, 1995). More research work is required to study this important aspect of *Azotobacter* with especial emphasis on mode or mechanism of action for the control of phytoparasitic nematodes.

(d) Other Soil Bacteria: The effect of phytoparasitic nematodes in rhizobium-legume interactions have been carried out by various workers. The rod-shaped anaerobic bacterium of the genus *Rhizobium* is important for a symbiotic association with legume & its ability to fix free atmospheric nitrogen. Dalal & Bhatti (1989) found that the damage threshold of clusterbean was 1,000 Juveniles/kg soil without rhizobia but 10,000 with rhizobium. Reduction in nematode population in plants inoculated with rhizobium and nematode together on rhizobia a fortnight prior to the nematode has been favoured by various workers (Bopaiah *et al*, 1976; Sharma & Sethi, 1975; Singh & Reddy, 1981; Sharma, 1974; Khan & Hussain, 1990). Barker *et al* (1972) reported the adverse effect of rhizobia on the cyst formation of *Heterodera glycinis* on soybean. Effect of rhizobacteria on hatching & mobility of *Meloidogyne* (Pankaj *et al*, 2011 a) & plant growth (Pankaj *et al*, 2011 b) was observed.

All these groups of bacteria have undoubtedly generated a lot of interest in acting as natural enemies & for their role in biological control of phytoparasitic nematodes. However, the major constraints in the development of effective biocontrol agents has been the mass production, storage & distribution of fresh materials,effects of abiotic factors like temperature, PH, moisture, & soil types influencing the activities of these microbial biopesticides, host range and virulence of the inoculums. More

research work in required to be conducted in order to exploit the important aspects of bacterium-nematode interaction with particular emphasis on the mechanism of action for the control of plant pathogens & nematodes. Along with this, there is a similar need to place the molecular modes of action of biocontrol agents in an ecological context.

(D) **Fungi:** The fungi used for biocontrol of nematodes can be classified into following categories:

(a) Predaceous or trapping fungi
(b) Endozoic or endoparasitic fungi
(c) Parasitic or opportunistic fungi

(a) **Predaceous fungi or trapping fungi :** Predaceous fungi are also known as nematophagous or nematode trapping fungi mostly belonging to the order-Zoopagales (Zygomycetes) and for order Moniliales (Deuteromycetes) capture nematodes by various devices which are grouped into sticky and mechanical traps. Sticky traps are of 3 types viz. (a) sticky branches e.g. *Dactylella lobata* (b) sticky networks e.g. *Arthrobotrys oligospora,* and (c) sticky knobs e.g. *Dactylella ellipsospores.*

Mechanical traps are of two types :

(i) Non-constricting rings e.g. *Dactylaria candida* and

(ii) Constricting rings e.g. *Dactylella bembicodes*

(b) **Endozoic or endoparasitic fungi:** These fungi most commonly invade the nematode host by adhesive spores that first attach to the nematode cuticle or by spores that are ingested to the nematode and lodged in the alimentary canal. The most frequently encountered hyphomycetes genera are *Acrostalagums, Harposporium* and *Meria*; zoosporic forms are *Catenaria, Myzocytium* and *Haploglossa*. These organisms are unable to parasitize the stylet bearing phytonematodes because the spores cannot be ingested (Cook, 1968). Fungi *Catenaria auxiliaries* was observed as parasite of *Heterodera schachtii* and *Nematophthora gynophila* on *H. avenae* and it plays a role of regulating population dynamics in some soils (Crump *et al*, 1983; Kerry, 1980; 1977; Kerry *et al*. 1980). Very few of these fungi have been considered seriously as potentially useful agents for biological control because of their obligate parasitic nature and little known biology.

(c) Parasitic or opportunistic fungi : In recent years, a group of fungi, which are saprophytic deriving their nutrition through decomposition of organic matter, has emerged as promising biocontrol agents for management of endoparasitic nematodes. They are termed as "opportunistic fungi" because they parasitize some stages of nematodes whenever they get an opportunity to come in contact. By adaptation they are not nematode feeders. They infect, colonise and consume reproductive structures of *Globodera, Heterodera, Meloidogyne* and *Rotylenchulus* at sedentary stages of their life cycle.

The opportunistic fungi can survive host free periods and can be grown axenically belong mostly to genera *Cylindrocarpon, Exophila, Fusarium, Gliocladium, Paecilomyces, Phoma* and *Verticillium.*

The efficiency of *Paecilomyces lilacinus* in controlling *M. incognita* and *Globodera pallida* was demonstrated by Franco *et al* (1981) and Jatala *et al*. (1981). Extensive work was carried out for managing root-knot nematode using *P. lilacinus* in our laboratory (Sharma, 1991; Sharma & Trivedi, 1989, 1992; Sharma *et al*., 2004; Pandey and Trivedi, 1992, b, Trivedi, 2004). This fungus can be easily grown on a number of agricultural wastes and organic materials for field dispensing.

Verticillium chlamydosporium is another excellent example parasitizing *M. arenaria* (Morgan *et al*, 1981). *Heterodera glycines* (Gintis *et al*, 1983), *H. avenae* (Sharma & Trivedi, 1995; Bhardwaj & Trivedi, 1996; 2000), *H. cajani* (Bhardwaj & Trivedi, 1998; 2000; Meena *et al*, 2009).

Aspergillus versicolor, A. fumigatus, Cylindrocarpon olidium, Fusarium solani, F. equiseti, F. oxysporum, Acremonium sclerotignum, A. persicium were reported to infect eggs/cysts of *M. incognita* and *H. schachtii* (Qadri & Saleh, 1990; Al Hazmi and Razik, 1991; Khan & Hussain, 1986; Goswami & Uma Rao, 1995). Desai *et al* (1972) found the nematicidal property of *Aspergillus niger* culture filterate on *M. incognita* which was further confirmed by Alam *et al* (1973) and Goswami (1994), who also found inhibitory effect of culture filtrates of *A. niger*, *Trichoderma* sp. & many other fungi. Reduction in *M. incognita* population was noted in Okra plants treated with *Trichoderma viride* & *T. harzianum* (Kumar & Jain, 2010). Similar observations were noted by many workers (Pandey *et al*, 2003; Arya, 2011).

The relationship between the opportunistic fungi and plant parasitic nematodes seems to be variable. The main types of destructive activity are thought to be enzymatic disruption of nematode structural elements, such as egg shells and larval cuticle and

physiological disturbances brought about by biosynthesis of diffusible toxic metabolites (Morgan-Jones *et al*, 1983, 1984). The opportunistic fungi are also not free from weaknesses. The most serious weakness is related to their biology as the control is opportunity dependent. All isolates of these fungi, Particularly of *P. lilacinus* and *V. chlamydosporium* are not equally effective as biocontrol agents or are not parasitic on the nematodes. Some are known to cause allergy in humans.

Commercialization of nematophagous fungi

In a limited attempt for the commercialization of nematophagous fungi, two commercial agents, Royal 300 and Royal 350, were sold for control of *Ditylenchus* m*yceliophagous* on mushrooms and *Meloidogyne* spp. on vegetables in France which being at a very high cost, have not been widely used.

In our laboratory screening of suitable substrate for the mass scale multiplication & application of *P. lilacinus* was done (Sharma & Trivedi, 1987; 2005; Meena, Nehra & Trivedi, 2009). *P. lilacinus* has been produced in the Philippines as 'Biocon' which can be applied for the control of several nematode species including root knot nematode.

The American firm Monsanto is going to launch two commercial products one each of *P. lilacinus* & *V. Chlamydosporium* respectively. Attempts for commercialization of *T. viride* & *P. lilacinus* & other potential fungi is in progress & some products are already available in market.

VAM Fungi

A number of reviews and research papers have appeared on Nematode—VAM interaction using a variety of crop plants as test host in the recent past decades from different parts of the world (Caron, 1989; Trivedi, 1995).

Many workers have demonstrated a reduction in nematode population or disease incidence (Bagyaraj *et al*, 1979; Cooper & Grandison, 1986; Jain & Hasan, 1988; Kasaab & Taha, 1990; Sikora & Schoenbeck, 1975; Sharma, 1992; Sharma & Trivedi, 1994) but in cases where nematode population remain unaffected (O' Bannon *et al*, 1974; Cason *et al*., 1983) or even increase under the influence of mycorrhiza (Atilano *et al*, 1981; Kasaab & Taha, 1990) are not uncommon. The survey of literature reveals that the *Glomus* sp. are most predominant genera of VAM fungi in India and one or other species, especially *G. fasciculatum* has shown great promise in the management of nematodes (Jalali & Chand, 1990; Nehra *et al*, 2003; 2004; Sharma and Trivedi, 2001; Trivedi, 1995, 2003). Potential of VAM fungi as biocontrol-cum-biofertilizer in yet to be fully acknowledged.

Predacious Organisms

A. Protozoans

Under laboratory conditions many protozoans have been known to attack nematodes. An amoeboid organism *Theratomyxa weberi,* attacking *Heterodera trifolii, M. incognita, Aphelenchus avenae, Aphelenchoides rutgerri* and *Rotylenchulus reniformis* was observed (Sayre, 1973). Doncaster and Hooper (1961) noted that *Urostyla* sp. can catch nematodes but sometimes the prey escaped after destroying the protozoan itself. The extent to which these organisms can be efficient and economically useful is not known.

B. Tardigrades

Tardigrades commonly known as the water bear, always made distinct tear in cuticle and remained firmly attached to prey during feedings. Predation of nematodes by tardigrades was observed by several investigators (Doncaster & Hooper, 1961; Hutchinson & Streu, 1960, Sayre & Powers, 1966). Sayre (1973) has recorded considerable reduction in population of *M. incognita* and *Ditylenchus dipsaci* due to *Hypsibius myrops.*

C. Turbellarians

These are carnivorous flatworms that feed on nematodes and other soil organisms. The feeding of *M. incognita* by *Adenoplea* sp. was observed by Sayre and Powers (1966). They concluded that although addition of *Adenoplea* sp. decreased root galling index, it was insufficient to be of any practical value.

D. Collembolans

Collembolans are active predators, found in large numbers on organic matters around roots (Sayre, 1971). Brown (1957) and Murphy and Doncaster (1957) found *Onychiurus armatus* to be the most active collembolans on *Heterodera cruciferae.*

E. Mites

The feeding of mites on nematodes was first observed by Linford and Oliveira 1938. Rodriguez *et al,* (1962) c

ultured *Macrocheles* sp. on *Rhabditis* sp. and found more than 30 species of mites devouring nematodes whole out of the 41 species which were identified as Predators (Muraoka & Ishibashi, 1976). *Lasioseius salpatus* (Imbriani & Mankau, 1983) and *Tyrophagus putrescentiae* fed voraciously on plant and soil nematodes.

F. Enchytraeids

Schaerbtemberg and Tendle (1951) have reported control of *Heterodera schachtii* by enchytraeids worm but it is doubtful if these can be of much use as of biocontrol agents, mainly because of their saprophagous nature.

G. Nematodes

Nematodes in the Mononchida, Dorylaimida and Diplogasteroidea by largely predaceous although, the actual feeding habits of most species is unknown.

(a) ***Mononchiala*—**The interest in using mononchs for controlling plant parasitic nematodes was initiated long back. Small (1979) found a significant reduction in *Globodera rostochiensis* and *M. incognita* in presence of *Prionchalus punctatus,* in pots. Considerable work on mononches has been done on factors influencing predation, foodchoice, strike rate of predation, effect of chemicals on their survival (Bilgrami & Jairajpuri, 1985 a, b; Bilgrami *et al*., 1983, 1986) to establish predator – prey relationship of mononchs.

(b) ***Dorylaimida*—** The *Dorylaims* and *Nygolaims* are one of the ubiquitous group of nematodes occurring in all types of soil and habitats. The detection of *Eudorylaimus obtusicaudatus* feeding on the eggs inside the *H. schachtii* cysts or the increase in the population of predators *(Thormia)* in the presence of citrus nematodes and decrease in absence of them in pot trials (Boosalis and Mankau, 1985) indicate their potential in nematode biocontrol.

(c) ***Diplogasteroidea*—**They possess useful characteristics of an efficient biocontrol agents and thus be exploited in future for managing nematodes.

E. Conclusion and future prospects

Natural enemies of nematodes undoubtly play a significant role in reducing their population densities. Among the bacterial antagonists of plant parasitic nematodes, the obligate parasite *Pasteuria penetrans,* the plant growth promoting bacteria *Pseudomonas fluorescence* and the nematicidal strains of *Bacillus thuringiensis* are considered potential biocontrol agents, against plant parasitic nematodes. *Pasteuria penetrans* has all the desirable qualities of a biocontrol agent except limitation by its host specificity and its non-availability for *in-vitro* mass culturing. The opportunistic fungi *Paecilomyces, Verticillium* and *Trichoderma* seem to be most promising. These fungi spread rapidly, are ubiquitous and are present abundantly in the rhizosphere. They also have the added advantage of being easily grown in axenic culture and can be introduced into soil. In France, two commercial agents 'Royal 300' and 'Royal 350', are available for control of

Ditylenchus myceliophagous on mushrooms and *Meloidogyne* spp. on vegetables. The parasitic fungus, *P. lilacinus* has been produced in Philippines as 'Biocon' which can be used for the control of several nematode species.

The importance of VAM fungi such as *Glomus mosseae* and *G. fasciculatum* in the management of phytonematodes such as root-knot, burrowing and reniform nematodes is well documented on major crops. VAM fungi are obligate parasites, which hinders their effective utilization in integrated nematode management programmes.

Fortunately, the expansion of integrated pest management strategy has encouraged management approach with integrated multiple control practice, one of which may be the biological control. Research workers should pay due attention on the following aspects for the nematode management using potential biocontrol agents in a concerned ecosystem—

(1) Identification and selection of effective strains of natural enemies/antagonists;

(2) To develop standardized and effective rearing, culturing, storage, handling, release and evaluation procedure;

(3) To understand the biology, ecology, physiology, genetic behavior of biocontrol agents;

(4) To identity most efficient host genotypes-symbiont strains;

(5) To develop mass culture technique for field application;

(6) To demonstrate and assess the full benefits of biocontrol agents under field conditions.

(7) To educate public for effective utilization of biocontrol agents.

In future, use of these microorganisms for the management of nematode pests, required extensive studies by dedicated scientists with optimistic approach to work out their practical feasibility.

References

- Anonymous, 1971, Estimated crop losses due to plant parasitic nematodes in the United States suppl. J. Nematol, Special publication No. 1 (USA), P.7
- Abad, P, Gouzy, J. Aury, J.M., Castagnone-sereno, P. Danchin, E.G., Deleury, E., Perfus-Barbeoch, L. Anthouard, V., Artiguenave, f. & Blok, V.C. 2008. Genome sequence of the metazoan plant parasitic nematode *Meloidogyme incognita*. Nature Biotechnology 26 : 909-915.
- Alam, M.M., Khan, M. W. & Saxena, S.K. 1993. Inhibitory effect of culture filtrates of some rhizosphere fungi of okra on mortality & larval hatch of certain plant parasitic nematodes, Indian J. Nematol. 3:94
- Al-Hazmi, A.S., and Abdul Razik, A.T. 1991. Evaluation of some fungal species as biocontrol agents of *Meloidogyne javanica* Pakistan J. Nematol, 91 : 39-47
- Amalendu Chatterjee, 1995, Management of Phytonematodes by bioagents. In : Nematode management in plants (ed.) Trivedi, P.C. Jodhpur : Scientific Publishers, p. 197
- Arya, R. 2011, Effect of culture filtrates of *Trichoderma viride* & *T. roseum* grown on different carbon and nitrogen sources on hatching & mortality of root-knot nematode (*Meloidogyne incognita*). Indian J. Nematol 41 (1) : 62-70.
- Atilano, R.A. Menge, J.A. and Van Gundy, S.D. 1981 Interaction between *Meloidogyne arenaria* and *Glomus fasciculatum* in grape J. Nematol 213 : 52-57.
- Baker, K.F. & Cook, R.J. 1974, Biological control of plant pathogens W.H. Freeman, San Francisco, p. 433.
- Bagyaraj, D.J., Manjunath, A. and Reddy, D.D.R. 1979. Interaction of vesicular-arbuscular mycorrhizac with root-knot nematode in tomato. Plant soil 51 : 397-403.
- Barker, K.R., Haising, D. and Johnston, S.A. 1972. Antagonistic interaction between *Heterodera glycines* and *Rhizobium japonicum* on soybean Phytopathology 62 : 1201-1225.
- Bhattacharya, D. and Swarup, G. 1988. *Pasteuria penetrans*, a pathogen of the genus *Heterodera*, its effect on nematode biology and control. Indian J. Nematol, 18 : 61-70.
- Bharadwaj, P. and Trivedi, P.C. 1996. Biological control of *Heterodera avenae* on wheat using different inoculum levels of *Verticillium chlamydosporium*. Annals pl. protect sci 4(2) : 11-14.
- Bhardwaj, P. and Trivedi, P.C. 1998. Efficacy of *Verticillium chlamydosporium* as a biocontrol agent for the management of cyst nematode *Heterodera cajani* J. Indian Bol. Soc. 77 : 139-145.

- Bhardwaj, P. and Trivedi, P.C. 2000. Assessment of nematophagous fungi, neem cake compatibility against *Heterodera cajani* on cowpea. Indian Phytopath 53(4) : 478-479.
- Bhatti, D.S. 1992. Role of nematodes in crop production—futuristic approaches. In : Nematode pests of crops (Eds D.S. Bhatti & R.K. Walia), CBS publisher & Distributors, Delhi, pp. 344-357.
- Bilgrami, A.L. Ahmad, I. and Jairajpuri, M.S. 1983. Some factors influencing predation by *Mononchus aquaticas*. Revue nematol. 6 : 325-326.
- Bilgrami, A.L., Ahmad, I and Jairajpuri, M.S. 1986. A study of the intestinal contents of some mononchs. Revue nematol 9 : 991-194.
- Bilgrami, A.L. and Jairajpuri, M.S. 1985 a. Cannibalism in *Mononchs aquaticus.* Indian J. Nematol 14 : 202-203.
- Bilgrami, A.L. and Jairajpuri, M.S. 1985 b. The response of *Mononchs aquaticus* to chemicals and pH, Indian J. Nematol. 14 : 171-174.
- Bishop, A.H. and Ellar, D.J. 1991. Attempt to culture *Pasteuria penetrans invivo*. Biocontrol science and Technology 1 : 101-114.
- Bopaiah, B.M., Reddy, D.D.R. and Patel, R.B. 1976. Effect of nematicides on nodulation and nitrogen fixation in mungbean. Indian J. Nematol. 6 :156-160.
- Boosalis, M. G. and Mankau, R. 1965. Parasitism and predation of soil microorganism. *In* Ecology of soil borne plant pathogens ed. K.P. Baker, W.C. Snyder, pp. 374-379, Berkeley, Univer. Calib. Press 571 pp.
- Brown, S.M. Kepner, J.L. and Smart, G.C. 1985. Increased crop yields following application of *Bacillus penetrans* to field plots infested with *Meloidogyne incognita*. Soil Biology and Biochemistry 17 : 483-486.
- Caron, M. 1989. Potential use of mycorrhizae in control of soil borne disease. Can. J. pl. path. 11 : 177-179.
- Caron, T.K.M. Hussey, R.S. and Roncadori, R.W. 1983. Interaction of vesicular arbuscular mycorrhizal fungi and phosphorus with *Meloidogyne incognita* on tomato J. Nematol 15 : 410-417
- Chahal, V.P.S. and Chahal, P.P.K. 1991. Control of *Meloidogyne incognita* with *Bacillus thuringiensis*. In plant soil interaction (eds) (Wright, R.J. *et al* al) pp. 677-680.
- Chahal, V.P.S. and Chahal, P.P.K. 2003. Azotobacter for the control of plant parasitic nematodes and for other benefits. In Nematode management in plants (ed.) Trivedi, P.C., Jodhpur : Scientific publisher, pp. 241-250.
- Chahal, V.P.S. and Chahal, P.P.K. 1999. Final technical report of pl-480 Project. Microbial control of plant parasitic nematodes, USDA.

- Cooper, K.M. and Grandison, G.S. 1986. Interaction of VAM fungi and root knot nematode on cultivars of tomato and white clover susceptible to *Meloidogyne hapla*. Annals of applied biology 108 : 555-556.
- Dalal, M.R. and Bhatti, D.S. 1989. Pathogenicity of *Heterodera cajani* in mung bean cluster bean as effected by presence or absence of rhizobium. Indian J. Nematol, 19(2) : 153-158.
- Desai, M.V., Shah, H.M. & Pillai, S.N. 1972. Effect of *Aspergillus niger* on root-knot nematode, *Meloidogyne incognita*. Indian J. Nematol 2:210-214.
- Dhawan, S.C. and Singh, S. 2011. Biological control activity of *Arthrobotrys oligospora* against *Meloidogyne incognita* infesting okra. Indian J. nematol 41 (1) : 70-78.
- Doncaster, C.C. and Hooper, D.J. 1961. Nematodes attacked by protozoa and tardigrades. Nematologica 6 : 333-335.
- Endo, B.Y. 1979. The ultra structure and distribution of an intercellular bacterium like microorganisms in tissues of larvae of the soybean cyst nematode, *Heterodera glycines*. J. Ultrastruct, Res. 67 : 1-4.
- Franco, J., Jatala, P. & Bocangel, M. 1981. Efficiency of *Paecilomyces lilacinus* as a biocontrol agent of *Globodera pallida*. J. of Nematology 13(4) : 338-339
- Gokte, N. and Swarup, G. 1988. On the potential of some bacterial biocides against root-knot nematode and cyst nematodes. Indian J. Nematol. 18 : 152-153.
- Goswami, B.K. and Tripathi, M.N. 1998. Fungi for the Biological control of plant parasitic nematodes. *In* plant nematode management (A Biocontrol, Approach) ed. P.C. Trivedi, CBS Publisher & Distibutor, N. Delhi, pp. 53-59.
- Goswami, B. K. and Uma Rao. 1995. Association of *Fusarium oxysporum* and *Aspergillus flavus* with the eggmasses of *Moloidogyne incognita* infecting egg plants. Abstract in national symposium on nematode management, IARI, N. Delhi.
- Gintis, B.O., Morgan-Jones, G. and Rodriguez-Kabana., R. 1993, Fungi associated with several developmental stages of *Heterodera glycines* from an albama soybean field soil. Nematropica 13 : 187-200.
- Hollis, J. P. and Rodriguez-Kabana, R. 1966. Rapid kill of nematodes in flooded soil. Phytopathology 6 : 1015-1019.
- Hollis, J.P. and Rodriguez-Kabana, R. 1967. Fattyacids in Louisiana rice fields. Phytopathology 57: 841-847.
- Hutchinson, H.T. and Streu, M.T. 1960. Tardigrades attacking nematodes. Nematologica 5 : 149.
- Ibrahim, I.K.A. and Hollis, J.P. 1973. Electron microscope studies on the cuticle of swarming and non-swarming *Tylenchorhynchus martini*. J. Nematol. 5 : 275-281.

- Ibrahim, I.K.A., Joshi, M.M. and Hollis, J.P. 1973. The swarming virus disease of *Tylenchorhynchus martini*. Inter. congs. Plant pathol, Minneapolis minn.
- Jain, R.K. and Hasan, N. 1988. Role of VAM fungi and nematode activities in forage production. Acta Bot. indica 16 : 84-88.
- Jain, R.K., Mathur, K.N. & Singh, R.V. 2007. Estimation of losses due to plant parasitic nematodes on different crops in India. Indian J. Nematol. 37 : 23-25.
- Jacq and Fortuner, 1979. Management of phytonematodes by bioagents In : Nematode management in plants (ed.) Trivedi, P.C. Jodhpur, Scientific Publisher 194-201.
- Jalali, B.L. and Chand, H. 1990. Current trends in mycorrhizel research. Proc of the national conference on Mycorrhiza, HAU, Hisar, pp. 210.
- Jatala, P. 1986. Biological control of plant parasitic nematodes. Annual review of phytopathology 24 : 453-489.
- Jatala, P. Sales, R., Kaltenback, R. & Bocangel, M. 1981. Multiple application and long term effect of *Paecilomyces lilacinus* in controlling *Meloidgyne incognita* under field condition, J. of Nematology 13 (4) : 445.
- Kasaab, A.S. and Taha, A.H.Y. 1990. Interaction between plant parasitic nematodes, VAM, rhizobia and nematicide on Egyptian clover. Ann. Agric. Sci. 35 : 509-520.
- Kerry, B. R. 1977. Observations on fungal parasites of female and eggs of the cereal cyst nematode, *Heterodera avenae* and other cyst nematodes. Nematologica 23 : 193-201.
- Kerry, B.R. 1980. Biocontrol. Fungal parasites of female cyst nematode by parasitic fungi. J. Nematol. 12 : 253-259.
- Kerry, B.R., Crump, D.H., & Mullen, L.A. 1982. Studies on the cereal cyst nematode, *Heterodera avenae* under continuous cereals 1975-1978. II Fungal parasitism of nematode eggs and females. Annals of Applied Biol. 100 : 489-499.
- Khan, T.A. & Husain, S.I. 1990. Studies on the effect of interactions of variable inoculum levels of *Rotylenchulus reniformis*, *M. incognita* and *Rhizoctonia solani* on cowpea. Current Nematol. 1(1) : 49-52.
- Khan, M.W. & Hussain, S.I. 1986. Parasitism of *Meloidogyne incognita* by *Fusarium solani*. International Nem. Network newsletter 3 (2) : 11-13.
- Kumar, V. and Jain, R.K. 2010. Management of root-knot nematode *Meloidogyne incognita* by *Trichoderma viride*, *T. harzianum* & bacterial antagonist *Pseudomonas fluorescens* as seed treatment on okra. Indian J. Nematol. 40 (2) : 226-228.
- Linford, M. B. and oliveire, J.M. 1938. Potential agents of biological control of plant parasitic nematodes Phytopathology 28 : 14.

- Loewenberg, J.R., Sullivan, T. and Schuster, M. L. 1959. A virus disease of *Meloidogyne incognita*, the southern root-knot nematode. Nature 184-186.
- Mankau, R. 1980. Biological control of nematode pests by natural enemies. Ann. Rev. phytopathol. 18 : 415-440.
- Mankau, R. and Imbriani, J.L. 1975. The life cycle of an endoparasite in some Tylenchid nematodes. Nematologica 21 : 89-94.
- Meena, P. Nehra, S. and Trivedi, P.C. 2009. Mass scale multiplication & influence of some biocontrol fungi in the management of *Heterodera cajani* infecting *Cajanus cajan*. Environmental Biology & Conservation 14 : 10-13.
- Morgan-Jones, G., Godoy, G. and Rodriguez-Kabana, R. 1981. *Verticillium chlamydosporium* fungal parasite of *Meloidogyne arenaria* female. Nematropica 11 : 115-120.
- Morgan Jones, G., White, J.F. and Rodriguez-Kabana, R. 1983. Phytonematode pathology : Ultrastructure studies 1. Parasitism of *M. arenaria* eggs by *Verticillium chlamydosporium*. Nematropica 13 : 245-260.
- Morgan-jones, G. and Rodriguez-Kabana, R. 1984. Species of *Verticillium* and *Paecilomyces* as parasites of cysts and root-knot nematodes. Phytopathology, 74 (4) : 831.
- Myrphy, P.W. and Doncaster, C.D. 1957. A cultural method for soil neiofauna & its application to the study of nematodes predators. Nematologica 2 : 202-214.
- Nehra, S., Pandey, S. and Trivedi, P.C. 2003. Interaction of arbuscular mycorrhizal fungi and different levels of root-knot nematode on ginger. Indian phytopath 56 (3) : 297-299.
- Nehra, S. and Trivedi, P.C. 2004. Integration of arbuscular mycorrhizal fungi, neem products, oil cakes & farm yard manure for controlling root-knot nematode, *M. incognita* infecting ginger. Proc. National Aca. Sci., India 74 : 143-152.
- O. Bannon, J.H., Inserra, R.N., Nemic, S. and Vovlas, N. 1979. The influence of *Glomus mosseae* on *Tylenchulus semipenetrans* infected and uninfected citrus limon seedlings. J. nematol. 11 : 247-250.
- Oka, K. Chal, I. and Spiegel, Y. 1993. Control of root-knot nematode *Meloidogyne javanica* by *Bacillus cereus*. Biological science & technology 3:115.
- Oostendorp, M. and Sikora, R.A. 1989. Seed treatment with antagonistic rhizobacteria for suppression of *Heterodera schachtii* early root infection of sugarbeet. Revue de nematologie 12 : 77-83.
- Oostendorp, M. Dickson, D.W. and Mitchell, D.J. 1990. Host-range and ecology of isolates of *Pasteuria* spp. from the southern United States. J. of nematol. 22 : 525-531.

- Pandey, Rohini and Trivedi, P.C. 1992 a. Biological control of *M. incognita* by *Paecilomyces lilacinus* in *Capsicum annuum*. Indian phytopath. 45 (1): 134-135.
- Pandey, Rohini and Trivedi, P.C. 1992 b. Fungus *Paecilomyces lilacinus* in controlling root-knot nematode and their histological interactions in *Capsicum annuum*. Proc. National Acad. Sci 62 (B) : 275-283.
- Pandey, S., Nehra, S. and Trivedi, P.C. 2003. Effect of concomitant inoculums of two nematode species *Heterodera* and *Meloidogyne* and a bacterium *Rhizobium* on cowpea. Indian phytopath 56 (4) : 494-495.
- Pankaj, K. Bansal, R.K. and Dabur, K.R. 2011 a. *In vitro* screening of bacteria free culture supernatants from Rhizobacteria on hatching & mobility of *Meloidogyne graminicola*. Indian J. Nematol. 41(1) : 14-20.
- Pankaj, K. Bansal, R.K. and Dabur, K.R. 2011 b. Effect of rhizobacteria as seedling inoculation on root-knot nematode and plant growth in rice-nursery. Indian J. Nematol 41(1) : 41-46.
- Paruthi, I. J. and Bhatti, D.S. 1981. Estemation of loss in wheat yield due to *Anguina tritici* and seedgall infestation in market grains. Indian J. Nematol. 11 : 15-18.
- Prasad, S.S.V. and Tilak, K.V.B.R. 1992. Aerotic spore forming bacteria from root-knot nematode infested soil. Indian J. Microbiology 11 : 59-60.
- Prasad, S.S.V. and Tilak, K.V.B.R., and Gollakota, K.G. 1972. Role of *Bacillus thuringiensis* var. *thuringiensis* on the larval survivability and egg hatching of *Meloidogyne* spp. the causative agent of root-knot disease. J. of Invertebrate patho. 20 : 377.
- Qadri, A.M. and Saleh, H.M. 1990. Fungi associated with *Heterodera schachtii* in Jordan II. Effect on *H. schachtii* and *M. javanica*. Nematologica 36 : 104-133.
- Rocke, J. and Sikora, R.A. 1992. Isolation formulation and antagonistic activity of rhizosphere bacteria towards the potato cyst nematode *Globodera pallida*. Soil biology & biochemistry, 24 : 511-526.
- Rodriguiz-Kabana, R., Jordan, J.W. and Hollis, J.P. 1965. Nematodes : Biological control in rice fields. Role of hydrogen sulfide. Science 148 : 524-526.
- Rodriguiz-Kabana, R., Morgan-Jones, G., Goday, G. and Gintis, B.O. 1984. Effectiveness of species of *Gliocladium, Paecilomyces* and *Verticillium* for control of *Meloidogyne arenaria* in field soil. Nematropica 14 : 155-170.
- Sasser, J.N. 1989. Plant parasitic nematodes. The farmer's hidden enemy. Dept. pl. pathe. NCSU, Raleigh, USA, p. 115.
- Sasser J.N. & Freckman, D.W. 1987. World perspective on nematology : the role of the society. In vistas on nematology (eds.) Veech, J.A. & Dickson, D.W. Hyattsville, pp. 7-14.

- Sayre, R.M. 1971. Biotic influences in soil environment. *In* plant parasitic nematodes, ed. B.M. Zuckerman, W.F. Mai, R.A. Rohde, I. 235-266, Academic Press, N. York.
- Sayre, R.M. 1973. *Theratromyxa weber* an amoeba predatory on plant parasitic nematodes. J. Nematol 5 : 258-264.
- Sayre, R.M. and Powers, E.M. 1966. A predacious soil turbellarian that feeds on free-living & plant parasitic nematodes. Nematologica 12 : 619-629.
- Sayre, R.M. and Starr, M.P. 1984. *Pasteuria penetrans* a mycelia & endospore forming bacterium parasitic in plant parasitic nematodes. Proc. Heleminthol Soc-wash. 52 : 149-165.
- Sayre, R.M. Wergin, W.P., Schmidt, J.M. and Starr, M..P. 1991. *Pasteuria nishizawal* sp. nov., a mycelia & endospore forming bacterium parasitic on cyst nematode of genera *Heterodera* & *Globodera*. Research in microbiology 142 : 551-564.
- Schaerbfenberg, B. and Tendle, H. 1951. Angew entomol 32 : 476-488.
- Sharma, Archana 1991. Biological control of *M. incognita* using fungus *Paecilomyces lilacinus*. Ph.D. thesis, Univ. of Rajasthan, Jaipur, India.
- Sharma, Amit & Trivedi, P.C. 1989. Control of root-knot nematode on *Trigonella foenum-graecum* by *Paecilomyces lilacinus*. Nematologia mediterr. 17 : 131-133.
- Sharma, A. & Trivedi, P.C. 1987. Screening of suitable substrate for the growth of *Paecilomyces lilacinus*. International nematol newslett (USA) 4 (1) : 24-26.
- Sharma, J.L., Trivedi, P.C., Sharma, M.K. & Tiagi, B. 1988. Fungus *Paecilomyces lilacinus* as a biocontrol agent of root-knot nematode *Meloidogyne*. The Indian zoologist 12 (3&4) : 259-262.
- Sharma, Archana & Trivedi, P.C. 1989. Influence of inoculum levels of fungus *Paecilomyces lilacinus* on the biocontrol of root-knot nematode, *M. incognita*. International nematol Newsl (USA) 6(2) : 27-29.
- Sharma, Widhi & Trivedi, P.C. 1992 Reduction in root-knot severity due to nematophagous fungus *P. lilacinus* in *Abelmoschus esculentus*. J. Indian Bot-Soc 71 : 185-190.
- Sharma, Renu & Trivedi, P.C. 1994. Interaction of root-knot nematode, *M. incognita* and VAM *Glomus fasciculatum* and *G. mosseae* on brinjal (*S. melongena C.*). J. Indian Bot. Soc. 73 : 221-224.
- Sharma, Widhi & Trivedi,P.C. 1997. Concomitant effect of *Paecilomyces lilacinus* & VAM fungi on root-knot nematode infected okra. Annal pl. protect. 5(1) : 70-74.
- Sharma, A. and Trivedi, P.C. 2001. Concomitant effect of VAM & neem products on *Heterodera avenae* infected wheat. J. Indian Bot. Soc. 80 : 9-13.

- Sharma, J. L., Trivedi, P.C., Sharma, M.K. and Tiagi, B. 2004. Control of root-knot nematode *M. incognita* using fungus *P. lilacinus* grown on dung. J. phytol res. 17(2) : 205-206.
- Sharma, N. and Trivedi, P.C. 2005. Microbial bioagents : Economic multiplication & management of fungal-nematode complex on cumin. Indian J. Biotechnology 4 : 419-421.
- Sharma, P. and Trivedi, P.C. 2010. Microbes in the management of plant diseases. *In* plant diseases & its management (ed. P.C. Trivedi), Pointer Publisher, Jaipur, pp. 318-355.
- Sharma, R.D. & Davis, K.G. 1986. Comparison of two sympatric *Pasteuria* populations isolated from a tropical vertisol soil. World J. of microbiology & biotechnology 12 : 361-366.
- Sikora R.A. and Schonbeck, F. 1975. Mycorrhiza (*Endogone mosseae*) on the population dynamics of the root-knot nematode (*M. incognita* & *M. hapla*) 8th Inter gen. pl. protect. 5 : 80-86.
- Sheperd, A.M., Clark, S.A. and Kempton, A. 1973. An intracellular microorganism associated with tissues of *Heterodera* spp. Nematologica 19 : 31-34.
- Small, R.M. 1979. The effect of predatory nematodes on populations of plant parasitic nematodes in pots. Nematologica 25 : 94-103.
- Sosamma, V.K. and Koshy, P.K. 1997. Biological control of *M. incognita* on black pepper by *Pasteuria penetrans* and *P. lilacinus*. J. of plantation crops. 25 : 75-76.
- Stirling, G.R. 1985. Host specificity of *Pasteuria penetrans* within the genus *Meloidogyne.* Nematologica 31 : 203.
- Stirling, G. R., Sharma, R.D. & Perry, J. 1990. Attachment of *Pasteuria penetrans* spores to the root-knot nematode *M. javanica* in soil and its effect on infectivity. Nematologica 36 : 246-252.
- Stirling, G. R., and Wachtel, M. F. 1980. Mass production of *Bacillus penetrans* for the biological control of root-knot nematode. Nematologica 26 : 308-312.
- Sturban, d., Winkelheide, R., Sayre, R.M. and Wergin W.P. 1994. Light & electron microscopic studies of the life cycle and development stages of *Pasteuria* isolate parasitizing the pea cyst nematode, *Heterodera goettingiana*. Fundamental & applied nematology 17 : 29-42.
- Singh, B. and Dhawan, S.C. 1994. Effect of soil texture on attachment of bacterial spores of *Pasteuria penetrans* to the second stage juveniles of *Heterodera cajani*. Indian J. Nematol. 22 : 72-74.

- Swarup, G. and Gokte, N. 1986. Biological control. *In* plant parasitic nematodes of India-problems & progress. Ed. G. Swarup & D.R. Das Gupta, IARI, N. Delhi, pp. 476-489.
- Spiegel, Y., Cohn, E., Galper, S., Sharon, E. and Chet, I. 1991. Evaluation of a newly isolated bacterium *Pseudomonas chitinolytica* sp.for controlling the root-knot nematode, *M. javanica*. Biocontrol science & techno. 1 : 115-125.
- Shanti, A. and Sivakumar, C.V. 1995. Biological potential of *Pseudomonas fluorescens* against root-knot nematode, *M. incognita* on tomato. J. of biological control 9 : 113-115.
- Singh, D.B. and Reddy, P.P. 1981. Influence of *Meloidogyne incognita* infestation on *Rhizobium* nodule formation in soybean. Nematol. Medit. 2 : 1-5.
- Sharma, S. and Trivedi, P.C. 2011. *In vitro* studies of *Meloidogyne incognita* on callus of *Vigna radiata.* Indian J. Nematol. 41 : 21-25.
- Trivedi, P.C. 1998. Nematode diseases in plants. C.B.S. Publisher & Distributors, N. Delhi, pp. 414.
- Trivedi, P.C. 1998. Recent advances in plant nematology, C.B.S. Publisher & Distributors, N. Delh, pp. 277
- Trivedi, P.C. 1998. Phytonematology in India, C.B.S. Publisher & Distributors, N. Delh, pp. 205.
- Trivedi, P.C. 1998. Plant nematode management (A biocontrol approach), C.B.S. Publisher & Distributors, N. Delh, pp. 280.
- Trivedi, P.C. 2000. Plant diseases, Pointer Publisher Jaipur, pp. 452.
- Trivedi, P.C. 2001. Plant pathology, Pointer Publisher Jaipur, pp. 422.
- Trivedi, P.C. 2002. Plant pest management. Aavishkar Publisher & Distributor, Jaipur, pp. 416.
- Trivedi, P.C. 2003. Nematode management in plants, Scientific Publisher (India), Jodhpur, pp. 332.
- Trivedi, P.C. 2003. Advances in nematology, Scientific Publisher (India), Jodhpur, pp. 317.
- Trivedi, P.C. 2003. Plant protection-A biocontrol approach, Aavishkar Publisher & Distributor, Jaipur, pp. 384.
- Trivedi, P.C. 2007. Biological control of plant diseases, Aavishkar Publisher & Distributor, Jaipur, pp. 438.
- Trivedi, P.C. 2010. Plant diseases & its management, Pointer Publisher, Jaipur.

- Trivedi, P.C. 2011. Plant health and their management. Agrobios (India) publisher, Jodhpur.
- Trivedi, P.C. 2011. Bioagents in Plant diseases management, Pointer Publisher, Jaipur, pp. 290.
- Trivedi, P.C. and Barker, K.R. 1986. Management of nematodes by cultural practices. Nematropica (U.S.A.), 16 : 213-236.
- Trivedi, P.C. 1990. Evaluation of fungus *Paecilomyces lilacinus* for the biological control of root-knot nematode *M. incognita* on *Solanum melongena.* Proc. 3rd International conf. on plant protection in Tropics, Malaysia, pp. 29-30.
- Trivedi, P.C. 1992. Biocontol agents in nematode management : A review *In* recent advances in nematology Dr. Siddiqui commemoration vol. pp. 101-120, Bioved research society, Allahabad.
- Trivedi, P.C. 1995. Biocontrol potential of VAM fungi in the management of plant parasitic nematodes. Platinum jubilee volume. J. Indian Bot. Soc. 74A : 165-171.
- Trivedi, P.C. 1999. Advances in plant nematology-an overview. J. Indian Bot. Soc. 78 : 219-230.
- Trivedi, P.C. 2003. Microbes in the management of plant parasitic nematodes. *In* advances in microbiology, pp. 341-355 (ed.) P.C. Trivedi, Scientific Publishers, Jodhpur.
- Tzorzakakis, E.A., Channer, A.G.R. De and Gowen, S.R. 1997 Studies on the potential use of *Pasteuria penetrans* as biocontrol agent of root-knot nematodes (*Meloidogyne* spp.) Plant pathology. 46 : 44-45.
- Verma, V.K. and Bansal, R.K. 1996. Antagonistic effect of culture supernant of *Azotabacter chroococcum* on larval hatching and mortality of *Meloidogyne javanica* under *in vitro* conditions. *In* Natural resource management (eds.) R.C. Dogra et al., pp. 158-163.
- Walia, R.K. & Dalal, M.R. 1994. Efficacy of bacterial parasite *Pasteuria penetrans* application as nursery soil treatment in controlling root-knot nematode, *M. javanica* on tomato. Pest management and economic zoology. 2 : 19-21.
- Zuckerman, B.M. Dicklow, M.D. and Acosta, N. 1993. A strain of *Bacillus thuriengiensis* for the control of plant parasitic nematodes. Biocontrol science & technology 3 : 41-46.

99th Indian Science Congress

January 3-7, 2012, Bhubaneswar

II

ABSTRACT OF PLATINUM JUBILEE LECTURE

“Emerging Role of Plant Growth Promoting Rhizobacteria (PGPR) in suppression of Phytopathogens”

D.K. Maheshwari

Department of Botany and Microbiology,

Gurukul kangri University ,Haridwar -249404

Uttarakhand , India

Email: maheshwaridk@gmail.com

Plants provide an excellent ecosystem for microorganisms that interact with plant cells and tissues with different degrees of dependence. Investigations on the relationship between roots and microbiota are essential to achieve innovations in agro-biology. One of the most remarkable developments in the twentieth century vis-à-vis microorganisms is the discovery of Plant growth promoting rhizobacteria (PGPR) that offers a vast array of beneficial attributes to plants and thereby facilitating enhancement of crop productivity in a sustainable manner. This group of bacteria is as effective as pure chemical on plant growth enhancement and their disease control besides managing abiotic and other stresses in plants. Such microbes are now alternative paradigms for commercialization, visualizing the significance of PGPR in the protection of plant health, new biotechnological approaches are employed regulating to develop newer and much better microbial agents for the management of phytopathogens. In biocontrol mechanisms, they are involved in production of antibiotics, lytic enzymes, surfactants etc. and also detoxify virulence factors. The mechanism of disease reduction also involves root colonization, and siderophores mediated competition, which results in the exclusion of fungal pathogens in the rhizosphere by reduction in the availability of iron required for survival of pathogens. Carrier materials may act to enhance the survival of inoculants by providing microorganism with a protective environment in order to escape unfavorable conditions during storage and introduction in to soil. In relation to plant health, the exploitation of such beneficial bacteria may improve crop ecosystem with economically sound production of human food and animal feed. Efforts have been made in this scenario

for the selection of PGPR genera and biocontrol of phytopathogens as suitable alternatives to agrochemicals for sustainable crop production and protection will be duly addressed.

PROF ARCHANA SHARMA MEMORIAL AWARD

Functional Characterization of the Heat Stress Induced Transcriptome in Wheat

Paramjit Khurana

Department of Plant Molecular Biology, University of Delhi South Campus, Dhaula Kuan, New Delhi-110021, India.

Wheat is one of the most important crops of our country and India is the second largest producer globally. Wheat is a temperate crop and prone to heat stress during the grain filling stages (seed maturation/embryogenesis) in the northern regions of India, while heat stress during seedling stages is more prevalent in the mid-western regions of India. High temperatures reduce both yield and quality of wheat by decreasing the duration of developmental phases, leading to fewer and smaller organs, and changes in the assimilation processes. Despite its importance, genomic information in wheat is inadequate for functional analysis. Hence, a program has been initiated to understand the gene expression profile of the sensitive and tolerant cultivars of wheat under heat stress by substractive hybridization, both at the seedling, flowering and the embryogenic stages of grain filling. To elucidate the effect of high temperature, wheat plants (*Triticum aestivum* cv. CPAN 1676) were given heat shock at 37°C and 42°C for two hrs, and responsive genes were identified through PCR-Select Subtraction technology. Four subtractive cDNA libraries, including three forward and one reverse subtraction, were constructed from three different developmental stages. A total of 5500 ESTs were generated and 3516 high quality ESTs were submitted to Genbank. More than one third of the ESTs generated fall in unknown/no hit category upon homology search through

BLAST analysis. A large number of high temperature responsive genes were identified and characterized. Differential expression was confirmed by cDNA macroarray and by northern/RT-PCR analysis. Selected genes were analyzed in further detail by quantitative real-time PCR in an array of 35 different wheat tissues representing major developmental stages as well as different abiotic stresses. Tissue specificity was examined along with cross talk with other abiotic stresses and putative signaling molecules. Results obtained contribute towards understanding the regulation of genes at different developmental stages in wheat crucial to withstanding and recovery from heat stress. Some of these genes are being functionally validated in transgenics for functional analysis. Apart from many novel genes, a large number of transcription factors that were found to be up-regulated by high temperature. Such genes have wider ramifications in improvement of wheat (and other cereals) tolerant to high temperature stress.

DR V PURI MEMORIAL AWARD

From Floral Morphology to Genes Governing Flower Development

Satish C Maheshwari
Honorary Adviser, Jaipur National University
Jagatpura, Jaipur

This lecture, to be given in honour of the late Professor Vishwambhar Puri, will begin with a reference to his work on floral morphology, in 1950s and 1960s which received international recognition. In the intervening period of nearly half-a-century, many scientific and technological advances have taken place in science. Following the discovery of the Double Helix of DNA and the rise of molecular biology, “Differentiation” and “Development” of organisms and their body parts are now beginning to be understood in terms of genes and their products.

The lecture will highlight the discovery of homeotic genes in animals and cover in greater detail the work on the model plant Arabidopsis. Pioneering work, first done in Drosophila, showed homeotic genes to be master controllers of organ development. Similar genes were later isolated from Antirrhinum and Arabidopsis in 1990s employing chromosome walking and newer recombinant techniques.

Work on Arabidopsis by Meyerowitz and colleagues has led to the discovery of master genes like LEAFY (controlling the initiation of floral development), APETALA, PISTILLATA, AGAMOUS, and SEPALLATA (controlling development of sepals, petals, stamens, and carpels). In recent years the analysis has gone further. The product of one master homeotic genes often switches on another homeotic gene downstream. Examples will be given of genes such as AINTEGUMENTA, BEL, , SUPERMAN controlling development of ovules or stamens, or their parts. Master genes such as SPOROCYTELESS have also been isolated that control programmes such as onset of meiosis.

Typically, homeotic genes code for transcription factors. In plants, most of the genes contain a MADS box motif and the lecture will end with an overview of progress made generally with the identification of such genes in angiosperms.

PROFESSOR HIRA LAL CHAKRAVARTY MEMORIAL AWARD

Characterization of Pongamia pinnata - a versatile legume

Latha Rangan

Department of Biotechnology, Indian Institute of Technology Guwahati, North Guwahati, Assam, India 781 039

Keywords: Biofuel plant; Candidate plus tree; North Guwahati;

Pongamia pinnata ongamiapinnata, oleaginous versatile nitrogen fixing forest tree has many traditional uses and has primarily come to public attention because of the high oil content of the seeds. Although, these species are well adapted to harsh weather conditions, there is a need to domesticate them for cultivation under different production systems on degraded lands and community wastelands. In addition, information on seed characters such as seeds morphology, storage reserves and its composition is infancy. The research is being carried out in naturally occurring P. pinnata from North Guwahati, Assam that covers a broad range of topic such as candidate plus trees (CPTs) identification based on morphometric markers, macro and micropropagation, genetic diversity studies, biochemical characterization of seed oil, seed developmental biology and root nodule symbiosis. The above works were achieved using tools of biotechnology by understanding the basic developmental and molecular aspects of P. pinnata that can be used to tease out for the traits of significance. Some of the salient findings will be discussed during the presentation.

YOUNG SCIENTIST AWARD LECTURES

Th-1432 m, a mutant of *Trichoderma harzianum* with enhanced enzymatic activity and high competitive saprophytic ability used for the management of collar rot of chickpea

Rashmi Singh

Deptt. of Botany, K.N. Govt. PG College, Gyanpur, SRN, Bhadohi, U.P, India

Abstract

The antagonistic potential of *Trichoderma* strains were assayed by studying the effect of their culture filtrate on the radial growth of *Sclerotium rolfsii*, the causal agent of collar rot of chickpea. *Trichoderma harzianum*-1432 (42.2%) and *Trichoderma atroviride*

(40.3%) were found as strong antagonist. In order to enhance their antagonistic potential, mutagenesis of these two selected strains were done. Two mutants, *Th*-1432 m and *T. atroviride* m_1 were found more effective than their parent strains. The enzymatic activities of the selected parent and mutant strains were assayed and it was found that both mutants showed enhanced enzymatic activities in comparison to their respective parent strains, but it was *Th*-1432 m that possessed maximum cellulase (5.69 U/ml) and β-1, 3 glucanase activity (61.9 U/ml). *Th*-1432 m also showed high competitive saprophytic ability (CSA) among all the selected parent and mutant strains and during field experiment it was found successful as it possessed enhanced % disease control (82.9%)

Waterlilies (*Nymphaea*) of India revisited: a comprehensive reappraisal of both morphological and molecular data

Jeremy Dkhar, Suman Kumaria and Pramod Tandon

Plant Biotechnology Laboratory, Department of Botany, North-Eastern Hill University, Shillong 793022

Abstract

A comprehensive reassessment of seven Indian representatives of the genus *Nymphaea* viz. *N. alba* var. *rubra*, *N. caerulea*, *N.* × *marliacea*, *N. nouchali*, *N. pubescens*, *N. rubra* and *N. tetragona* based on morphology, RAPD, PCR-RFLP and sequence data of the ITS region, chloroplast *trnK* intron, *matK* and *rbcL* gene was conducted. Morphological examinations revealed considerable variation among the species investigated. Of significant interest, from the context of evolutionary genetic studies, are two sympatric races of *N. nouchali* viz. *N. nouchali* JD 06 and *N. nouchali* JD 07, resembling each other in all aspects but showed flower color polymorphism with blue and white colored flowers respectively. Furthermore, members of subg. *Lotos* namely *N.*

pubescens and *N. rubra* showed white colored pollen in contrast to yellow pollen of the remaining species. Interestingly, the white colored petals of *N. pubescens* exhibited a tinge of pink at the apex, resembling the petals color of *N. rubra*. Barring *N. caerulea* and *N. nouchali*, RAPD analysis of randomly selected individuals from each species showed low genetic variation. The variability detected for *N. caerulea* may be attributed to the breeding system followed, suggesting it to be an outcrossing species. Surprisingly, no genetic variation was recorded among individuals of *N. tetragona*, a critically rare and endangered plant of India, necessitating its immediate conservation plan. PCR-RFLP of the ITS region revealed additional fragments, exceeding the expected size of the ITS region when totaled, in *N. alba* var. *rubra*, *N.* × *marliacea*, *N. rubra* and *N. pubescens*. Sequencing of the ITS region indicated that the extra fragments, manifested as additional signals in the sequencing chromatogram, in *N. pubescens* may be due to random mutations occurring in some of the ITS paralogues. However, recent hybridization and introgression may be the reason for the additional signals depicted in the chromatograms of *N. alba* var. *rubra* and *N. rubra*. Interestingly, *matK* gene of *N. tetragona* revealed higher number of nonsynonymous substitutions. Molecular evolutionary analysis indicated that three of these sites may be under mild selective pressures. Such adaptive changes at the DNA and protein sequence level of *matK* gene may have been associated with the colonization of *N. tetragona*, suggesting that it could have migrated from China. Based on neighbor joining, maximum parsimony, maximum likelihood and Bayesian inference, phylogenetic relationship among the investigated species is presented and discussed.

99th Indian Science Congress

January 3-7, 2012, Bhubaneswar

III

ABSTRACT OF ORAL / POSTER PRESENTATION

PROCEEDINGS
OF THE
NINETY NINTH SESSION OF THE
INDIAN SCIENCE CONGRESS

BHUBANESWAR, 2012

PART II

SECTION OF
PLANT SCIENCES

President: Prof. P. C. Trivedi

CONTENTS

Sub Sections

Algae, Bryophytes, Pteridophytes and Gymnosperms

Algal Physiology and Medicine

Chinmoy Ranjan Das
D-26/CS-343 Kalitala,
Laskarpur,24 Parganas-743515
West Bengal

Keyword: *balanced chloroplast, dry ecology, filament, growth habitat, Lichen Mountain, Isotonic.*

Knop's nutrient balanced solution is essentially needed for growth development and divisions for algal culture. Chloroplast cells contain chlorophyll-a, chlorophyll-b, carotene and xanthophylls have been studied.

Cyanophyta is the blue green algae contains chlorophyll-a and this group evolves no oxygen to the atmosphere in contrast to chlorophyceae, the grass green algae containing chlorophyll-a, -b, carotin and xanthophylls. Algal interesting physiology has been studied. Medicine has been obtained from algae also. Ecology of algae has been studied. Algae is one of the best material for physiological experiments. Depending upon the habitat the algae may show various aspects of dry situation moist and supersaturated water content of home and abode. Marine algae may attain huge structures 3X or more than a great banyan tree.

An Intensive Survey Of Algal Flora In The Fresh Water Bodies Of Sadar Block Chaibasa, West Singhbhum, Jharkhand, India

Sushant Ram, And Vishnu Shankar Sinha

PG Dept. of Botany,

Tata College,

Chaibasa – 833202

Keywords: *Algal flora,Chlorophyceae,Fresh water bodies*

The Area under Survey, Sadar Block Chaibasa is Situated in the West Singhbhum of Jharkhand state (22^0-$25^0$15' N latitude and 83^0-$87^0$35' E longitude), which is characterized by gentle to moderately steep slopes. The survey area lies in the tropical region with hot summer and cold winter with 1168mm annual rainfall. The present survey deal with algal flora in the fresh water bodies of Seven Pound, one river and three ditches of Sadar Block Chaibasa i.e. Kchaharhi. Dhobi, Siva, Rani, Martin Kalyanpur Pound, Roro river, and ditches of Mahulsai. The sample of different pounds and river collected in sample Bottles and fetch to the laboratory of Tata college chaibasa there the samples where examined with the help of Microscopes and taxa is identified with the help of compound microscope and diagram is drown in the sheet of papers.

The sample of algae is taken by all the above pound and river and collected in glass bottles brought to laboratory preserved in 4% formalin solution and temporary slide are prepared with the help of iodine and glassine with the help of which taxa are identified.

Our result revealed that there are large number of fresh water algae are present in the pounds and river of Sadar Block Chaibasa they are - : ***Chlamydomonas, Volvox, Chlorella, Hydrodictyon, Ulothrix***, ***Cladophora, Coleochaete, Oedogonium, Spirogyra, Chara, Oscillatoria, Nostoc*** etc. thus it is clear that algae that are found in Sadar Block Chaibasa are the members of green algae class Chlorophyceae and Cyanohpyceae.

Biodiversity of Chrysophytes from Freshwater Aquatic of West Champaran(Bihar)

[1]A.Wasi and [2]S.S.Hussain

[1]*Department of Botany,*

Al-Hafeez College, Ara Bihar-802301

[2] *Principal, H.R.College,*

Amnour, J.P.University, Chhapra, Bihar

E-mail: azharwasi786@gmail.com

Keywords: *Chrysophyceae, Oigotrophic*.

Chrysophycean flora of thirty localities from West Champaran covering three different habitats River, Ponds and Wetlands were completed. Altogether sixty our taxa of Chrysophyceae and allied groups were studied, of which sixteen taxa of Synuraceal and six other Chrysophyceae are new investigation.

All the certain species of Chrysophyceae are studied in detail by using light microscope and Transmission Electron Microscope (TEM). Occurrence and distribution pattern is discussed in relation to the some environmental factors. Observations suggest that tropical water of India are rich in scaled Chrysophyceae and Chrysophyceal should not longer be regarded as basically cold water organism. Occurrence of Chrysophyceae also not be considered oligotrophic in nature.

Contribution to the Desmid Flora of India- II, Genus *Cylindrocystis meneghini* from West Bengal

Prasanta Mallick * and Jai Prakash Keshri**

*Raja Rammahun Roy Mahavidyalaya, Radhanagar -712406,
Hooghly, West Bengal.
**Department of Botany,
The University of Burdwan (CAS)
Burdwan , Golapbag -713104, West Bengal

***Keywords**: Cylindrocystis,Desmid, India, West Bengal*

The present communication deals with nine taxa of *Cylindrocystis meneghini.* Seven taxa viz. *C. brebissonii meneghini var. brebissonii, C. crassa* de Bary var. *crassa, C. brebissonii* var. *jenneri* (Ralfs) Reinsch & Kirchner , *C. brebissonii* var. *turgida* Schmidle , *C. crassa* var. *elliptica* West & West , *C. cyanosperma* Lagerh. , *C. obesa* West & West are reported for the first time from West Bengal, the last two being recorded probably for the first time from India. Two taxa viz. *C. brebissonii var. turgida F. indica F. nov*. and *C. crassa* var. *crassa F.* minor *F. nov*. are proposed as new to science.

Dynamics of Diatoms in Relation to Physico-chemical Factors

Meenakshi Singh, Payal Lodha and Gajendra Pal Singh

Algal Biotech Lab, Department of Botany,
University of Rajasthan, Jaipur (Rajasthan)
meenakshisingh_24@yahoo.co.in

***Keywords:** Diatoms, Physico-chemical parameters, SPSS, SEM.*

The present investigation deals with diatomological status of the Mansagar & Mawatha lakes, Jaipur, Rajasthan from March, 2009 to April, 2011. From the data it was apparent that correlations between the physico-chemical factors and dynamics of diatoms could be seen. Systematic sampling was done and four sampling stations were selected respectively. The main objective of this research was to evaluate the correlation of diatom diversity with the physico-chemical factors. The SPSS version 14.0 analysis of data showed a positive correlation of total diatom density with electrical conductivity and total dissolved solids ($p<0.01$) and significant positive correlation with chemical oxygen demand ($p<0.05$). Shannon-Weiner diversity index (H') value (1.372) and Evenness (J') value (0.903) were found to be highest during winter while Berger-Parker index of dominance (0.147) was highest in monsoon. SEM and LM microscopy revealed presence of total 61 diatom species of which 20 were common at both locations. *Navicula cuspidata, Nitzschia palea, Amphora ovalis, Pinnularia borealis, Synedra ulna* and *Gomphonema parvulum* were some of the pollution tolerant species.

First Report of the Moss *Rhynchostegiella divaricatifolia* (Renauld & Cardot) Broth. from Western Himalayan Region of India

Dinesh K. Saxena, Saurabh Kumar and Soniya Saxena

Bryology Laboratory, Department of Botany,

Bareilly College, Bareilly (U.P.) India.

E-mail: saurabh_k02@rediffmail.com

Keywords: *Bryophyta, distribution, Taxonomy*

Study of the bryoflora of the Western Himalayas revealed for the first time the presence of the moss taxon *Rhynchostegiella divaricatifolia* from the Kumaon region. Earlier this moss was known from the eastern part of the country, i.e. Darjeeling (Sikkim), and was considered unique to that region. The present study describes the

extended range of distribution from the Eastern Himalayan to the Kumaon hills of India in an area of 21,035 km2. *Rhynchostegiella divaricatifolia* is characterised by a twisted half turn leaf apex, leaf cells showing irregular primordial utricle, linear, irregularly rhomboid. The moss plants are soft, large, glossy, and yellow–green in lax tufts.

Morpho-Taxonomy of the genus *Scytonema* agardh ex Bornet *et* Flahault: a sub-Aerial *Cyanobacterium*

Rama Kant

Department of Botany, Ramkrishna Mahavidyalaya, Kailashahar

North Tripura -799 277

E-mail: rkojha_1@rediffmail.com; ramakant.algae @gmail.com

Keywords: *Morphology, Taxonomy, Sub-aerial, Cyanobacteria*

Cyanobacteria / Blue-green Algae are kwon to grow in most all types of kwon habitats ranging from polar region to thermal springs. They exhibit a wide range of morphological diversity ranging from unicellular, colonial to heterocystous true branched forms. Present paper deals with morpho-taxomic observation of *Scytonema* Agardh ex Bornet *et* Flahault. The genus *Scytonema* is well known and common terrestrial genus of Cyanobacteria. Ten strains of *Scytonema* of different habitats were isolated and studied under various culture conditions. Patterns of thallus formation, branch formation and perennation have been studied in detail under different conditions. Taxonomic affinities of the genus *Scytonema* with *Tolypothrix*, *Camptylonemopsis*, *Petalonema* and *Symphyonemopsis* have been discussed in detail.

Phytoplanktonic Index With Reference to Bhalwahi Pond, Gaya

M.Shamsul Islam[1] & Md. Muzafar Imam Ilyasi[2]

[1]SMSG College, Sherghati, Gaya (M.U. Bodh Gaya)

[2]K. V. NO.-3, Bokaro Steel City, Bokaro.

Keywords: *Diversity Index, Phytoplankton, Physico-Chemical.*

The number of species in community increases with the complexity of food webs and with the extent of niche overlap or species packing. Diversity index reflects changes in overall information content rather than enumeration upon an individual species composition changes. Replacement of one genera by another would not hamper the diversity index, it would remain constant. However the change in genera may be indicative of significant environmental modification. Shannon's & Weaver's diversity index for different algal classes witnessed in Bhalwahi Pond, Gaya have been documented which reflects the pollution stress upon the pond ecosystem. The values lie between 2.00-3.56 which reflected a mild pollution in pond.

Preliminary Investigation on Haemolytic Activity of Green Algae *Caulerpa scallpelliformis* (C. Agardh, 1817) from Southeast Coast of India

P. Seedevi*, S. Sudharsan, P. Ramasamy, N. Subhapradha,

S. Vairamani, K. Jayalakshmi and A. Shanmugam

CAS in Marine Biology, Faculty of Marine Sciences

Annamalai University, Parangipettai-608502, Tamil Nadu-India.

Keywords*: Caulerpa scallpelliformis; DEAE cellulose; Chicken and Human blood.*

Many bioactive and pharmacologically active substances have been isolated from marine algae with useful applications. In the present study, the haemolytic activity of the

methanolic extract of marine algae *Caulerpa scallpelliformis* collected from Thiruchendur, Southeast coast of India. The crude methanolic extract was purified in DEAE-cellulose column chromatography and fractions were collected viz F1, F2, F3. Both the crude and fractions exhibited haemolytic activity of 159.5, 73.73, 43.47, and 37.73 on chicken blood respectively. Whereas it reported 73.73, 43.47 and 37.73 in crude, F1 and F2 on human blood respectively. F3 fraction didn't show any hemolytic activity on human blood.

Studies on Plankton Diversity and Their Thermotolerance Limit at Hot Spring of Atri, Khurda, Odisha

Dash, A.[1], Palita, S.K.[2] and Patra, H.K.[1]

[1] P.G. Department of Botany,
Utkal University, Bhubaneswar-751004, Odisha
[2] Dept. of Zoology,
Kendrapara Autonomous College,
Kendrapara-754211, Odisha

Keywords: *Hot spring, plankton, thermal tolerance*

The study on plankton diversity and their thermal tolerance limit was undertaken at a natural, hot water sulphur spring of Atri (20^0 20 N and 85^0 51 E), in the district of Khurda, Odisha from July 2009 to May, 2011. The hot water comes out of the circular main tank (artificially constructed) and is collected in three overflows. The temperature of the main tank is 55^0C where thermotolerant phytoplanktons like *Navicula, Anabaena* and *Chlamydomonas* are found. While *Anabaena,* a Cyanophytic alga is the dominant species in the main tank, zooplanktons are totally absent in it. Both phyto and zooplanktons are found in all these three overflows having temperature of 49.4^0C, 48.3^0C and 25.4^0C respectively. The phytoplanktons of the overflows are distributed under Cyanophyta, Chlorophyta and Bacillariophyta with maximum number of species under Chlorophyta. The zooplanktons of the overflows are distributed under Rotifera, Copepoda and

Cladocera with maximum number of species represented under Copepoda. The species of planktons increases with gradual decrease in temperature in overflows.

Studies On Species Diversity Of Chroococcaceae Of Lakes Of North Maharashtra [INDIA]

S. R. Mahajan

Depaetment of Botany Bhusawal Arts, Science and P. O. Nahata Commerce College,
Bhusawal. 425201 Dist- Jalgaon. (M. S.)
E-maill:dr.srmahajan@rediffmail.com

Keywords: *Algae, Chroococcaceae, Lake, North Maharashtra.*

During the study of algae of polluted lakes situated in North Maharashtra, the authors come across several members of blue green algae. Among these blue green algae, members of family Chroococcaceae predominates. The present papers deals with the systematic account of 30 taxa of family Chroococcaceae. Among these *Aphanocapsa* was dominant and represented by 6 species.

Mycology, Plant Pathlogy, Microbiology & Nanoscience

Antagonistic Behavior of Two Different Species of *Trichoderma* Against *Fusarium pallidoroseum*, Pathogenic to *Capsicum frutescens*

[1]Adarsh Pandey and [2]Atul Namdeo

[1]Department of Botany, S.S. (P.G.) College, shahjahanpur-242001(up), India
[2]Department of Botany, Khusro Memorial Degree College, Bareilly-242001(up), India
adarshspn@yahoo.co.in

Keywords: *Capsicum frutescens, Trichoderma, Biocontrol, Fusarium pallidoroseum, Antagonism*

Biological management of plant disease is a much popular method of disease control now-a-days. Being ecofriendly safe and effective disease control agents, biocontrol agents are being used widely by farmers for controlling fungal diseases and pests. The present investigation deals with comparative antagonistic behavior of two different species of *Trichoderma* viz. *Trichoderma harzianum* and *Trichoderma viride* against *Fusarium pallidoroseum*, a common and destructive pathogen of *Capsicum frutescens* in this region. To find out the comparative antagonistic properties of both the species of *Trichoderma* against *Fusarium pallidoroseum*, culture plate technique was used and the experiment was allowed to run for 10 days. Results indicated that *Trichoderma viride* that reduced the growth of *Fusarium pallidoroseum* by 66.67% is more effective in controlling the growth of test pathogen than *Trichoderma harzianum*, which caused a reduction of 65.43%.

Antibacterial Activity of Methanol and Chloroform Extracts of Himalayan Gymnosperms Plant *Cedrus deodara* Roxb.

Savita Joshi and S.C. Sati

Department of Botany, D.S.B. Campus, Kumaun University,
Nainital-263002 (UK)

Keywords: *Cedrus deodara, Antibacterial, Gymnosperms, Kumaun Himalaya.*

The antibacterial activity of methanol and chloroform extracts of Himalayan gymnosperms plant *Cedrus deodara* Roxb. was assessed against one plant pathogenic and two animal pathogenic bacterial strains (*Agrobacterium tumefaciens, Bacillus subtilis* and *Escherichia coli*) employing Disc-diffusion method. Methanol extract showed the highest activity (zone of inhibition, 14-15mm) followed by chloroform (ZOI, 12-15mm) at 1000 µg/ml concentration. The inhibitory activity of both extracts was found very promising as compared to ampicillin (10mcg) and erythromycin (15 mcg), standard antibiotics, which were used as positive control against these, tested microorganisms. These results indicate their broad-spectrum activity for the management of the most common human and plant bacterial diseases.

Antibacterial Activity of Woodfordia fruticosa Leaf Extrac

P. Gopal Reddy and Prajakta Tathe

Department of Botany, Padmashri Vikhe Patil College, Pravaranagar-Loni,
Dist: Ahmednagar – 413 713, Maharashtra (India).
E-mail: r_ pgopal @ yahoo.com

Keyword*: Bacteria, Concentration, Inhibition, Leaf extract, Woodfordia fruticosa*

Different concentrations ranging from 1 to 5mg/ml of aqueous as well as alcohol leaf extracts of W. fruticosa were evaluated for their effect on growth of five bacteria viz., Staphylococcus aureus , Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa and Salmonella typhimurium. Both aqueous and ethanol extracts inhibited the bacterial growth however leaves extracted in alcohol exhibited greater antibacterial activity. Comparatively K. pneumoniae is inhibited more while S. typhimurium and P. aeruginosa *less.*

Antifungal Activities of Leaf Extract of *Calotropis procera (Ait)* R.Br. (asclepiadaceae)

Kaptain K. Bajpayaee & Amrita Bajpai

Department of Botany, Dr.R.M.L. degree college (C.S.J.M. University)
Allipur, Hardoi U.P. 241001

***Keyword**: Calotropis procera, Follicle, Dermatophytes, Medicobacterial.*

The present study deals with the antifungal activities of leaf extract of *Calotropis procera* (Ait) R.Br., a significant member of family ascleiadceae. The plant is weed having erect, solid, branched and cylindrical stem with white latex. The leaves simple, opposite, exstipulate, entire and glabrous and having reticulate venation. The fruit is characterstic follicle type. The leaf extract and latex is applied as folk-medicines over ringworm infection, rotting nails and other fungal disease of skin as revealed out by the concerned authors during medico botanical survey of Hardoi and Shajahanpur district in between December 2006 to June 2009. Therefore, the present investigation was carried out to confirm its antifungal activities experimentally.

Four dermatophytes namely *Candida albicans* (ATTC # 10231). *Tricophyton rubum* (RV # 58125), *Epidermatophyta flocosum* (RV # 71625) and *Microsporum canis* (RV # 66973) were cultured in the laboratory. The plant leaves were extracted at room

temperature and crude extract was prepared. The sterile Whatman filter paper disks (6mm) were saturated with the extract and applied over the culture media. The zone of inhibition were recorded to find out the efficacy of leaf extract against *Tricophyton. Epidermatophyton and Microsproum* were diminished by the leaf extract whereas it revealed moderate activity against C*andida albicans.* In present investigation Ketoconazole was used as control.

Antifungal Potential of Some Natural Plant Extracts Against Storage Fungi for the Management of Aflatoxin Production in Sunflower Seeds

Vikas V Pate*l, and U.S. Mishra

PHYTOPATHOLOGICAL LAB

Department of Botany, Bareilly College, Bareilly

M.J.P.Rohilkhand University,Bareilly - 243001, India

E mail: vikasbotany@gmail.com

Keywords: *aflatoxin, natural plants, sunflower seeds, management.*

The antifungal activities of ethanolic extracts of some selected natural plants were evaluated against aflatoxin producing strains of *Aspergillus* in stored seeds of sunflower. On screening, the ethanolic extracts of different parts of 10 herbal plants were evaluated by adopted a poisoned food techniques to assess the inhibitory effect of extracts for their antifungal activity against growth of test fungi. Among the tested plants, *Allium sativum, Azadiracta indica, Allium cepa, Vinca rosea, Curcuma longa* and *Eucalyptus globulus* gave significant results against *Aspergillus flavus*. Observations of present study suggest the possible use of selected plant extracts as potential fungitoxicant in ecofriendly management of biodeterioration of storage seeds against storage fungi.

Antimicrobial Activity of the Crude Leaves Extracts of *Bryonia lacinosa* Against Some Common Micro-organisms

Ujjwala Supe, Priya mazumdar, M. G. Roymon

Plant tissue culture Laboratory, Department of Microbiology and Biotechnology, ST. Thomas College, Ruabanda, Bhilai, Dist- Durg. Chhattisgarh India. 490006.

E- mail- umnarkhede@indiatimes.com

Keywords: *micro-organisms, anti-microbial, bryonia leaves.*

Medicinal plants represent a rich source of day Iraq used plants such as holly back, these plants are antimicrobial agents. Plants are used medicinally instill widely used in ethnomedicine around the world different countries and are a source of many potent and powerful drugs. A wide range of medicinal plant parts is used for extract as raw drugs and they possess varied medicinal properties. The different parts used include root, stem, flower, fruit, twigs exudates and modified plant

Concern about the rising prevalence of antibiotics resistant strains pathogenic micro-organisms has been expressed in the last three decades. However, intensive studies on extracts and biologically active compounds isolated from medicinal plants have also doubled in the last decade. Ethanolic and aqueous extracts of *Bryonia lacinosa* leaves were studied for *in-vitro* antimicrobial activity using agar diffusion method. The ethanolic extract mildly inhibited the growth of *Streptococcus pneumoniae* and *Micrococcus luteus*, while there was no inhibitory effect on *Staphylococcus aureus*, *Pseudomonas aurogenosa* and *Escherichia coli*. However, aqueous extract exhibited no inhibitory effect on all the five tested micro-organisms.

Antimicrobial Efficacy in Crude Extracts of Two Species of *Cenchrus* Grass Against Some Pathogens

Dr. Premlata Singariya*[1], Dr. Krishan Kumar Mourya[2] and

Dr. Padma Kumar[3]

1. Dr. D.S. Kothari Post doctoral fellow, Laboratory of Tissue Culture and Secondary Metabolites, Department of Botany, University of Rajasthan, Jaipur- 302004.
Mail I.D. – premlatasingariya@gmail.com
2. Nodal Officer, Animal Husbandry Department, Pahari (Bharatpur) Rajasthan.
Mail I.D. – mourya07@gmail.com
3. Professor, Department of Botany, University of Rajasthan, Jaipur-302004

Keywords: *Cenchrus grass, Antibacterial, Escherichia coli and Candida albicans.*

Crude extracts of different parts of *Cenchrus ciliaris* (CAZRI-358) and *Cenchrus setigerus* (CAZRI-76) were evaluated against three medically important bacteria viz. *Escherichia coli* (Gram-ve), *Raoultella planticola* (Gram-ve), *Staphylococcus aureus* (Gram +ve) and one yeast *Candida albicans*. The dried and powdered parts (root, stem, leaf and seed) were successively extracted with petroleum ether, ethyl acetate and glacial acetic acid using soxhlet assembly. The antimicrobial activity assay was done by both disc diffusion and serial dilution methods. Glacial acetic acid extract of leaves showed highest activity against all tested bacteria. The inhibitory effect is very identical in magnitude and comparable with that of standard antibiotics used.

Antimicrobial Potential of Some Plant Extracts of Charanmal Ghat, Dist-Dhule (M. S.).

Shaikh, M. H. and Patole, S. S. *

Department of Botany, S. G. Patil, ASC College, Sakri. Dist- Dhule (M.S.).
* Department of Zoology, S. G. Patil, ASC College, Sakri. Dist- Dhule (M.S.).
SAKRI - 424 304.
sspatole63@gmail.com

Keywords: *Medicinal plants, methanolic extract, antimicrobial, pathogenic strains, standard antibiotics.*

The aqueous and methanolic extracts of some medicinal plants of Charanmal ghat, Sakri (M. S.) were used by disc diffusion techniques to assess *in vitro* antimicrobial potential against two gram positive (*Bacillus subtilis* and *Staphylococcus aureus*), two gram negative (*Escherichia coli* and *Pseudomonas aeraginosa*) bacteria and two fungi (*Aspergillus niger* and *Penicillium chrysogenum*) species. The aqueous extract exhibited prominent zone of inhibition than methanolic extracts against most of pathogen strains. Among the tested plants, extracts of *Adhatoda vasica* and *Tridex procumbense* were found to be highly potent activity; other plants viz., *Alternanthera sessilis, Phyllanthus niruri, Plumbago zeylanica* and *Withania somnifera* showed moderate activirt whereas the remaining plants showed least activity. Further the activity of plants extracts were compared with standard antibiotics like Oxytetracyline (antibacterial) and Gentamicin (antifungal). The standard revealed three folds higher activity than plant extracts.

Assesment of Losses in Improved Pearl Millet Hybrids and Varieties Due to Ergot *(Claviceps fusiformis)*

Rita Sharma[1] R. K. Pandya[2]

Dept. of Plant Pathology, College of Agriculture Gwalior (M. P.)

Keyword: *Ergot, Pearl millet*

Pearl millet is an important staple food and fodder crop of Bhind, Morena and Gwalior disteicts of Madhya Pradesh. Ergot disease of Pearl millet causes grain yield loss by replacing grains with toxic alkaloid containing sclerotia, making the produce unfit for consumpstion.

Studies on losses under artificial inoculation condition indicate that maximum ergot severity (54.20%) was recorded in the variety 7686 with the yield loss of 52.20%, while the severity was minimum in the variety JBV2 (12.15%) with the yield loss of 14.91%. The ergot severity ranged from 12.15 to 54.20% and the yield loss ranged from 14.91 to 52.20%.

The results of losses under natural condition clearly indicate that maximum ergot severity was recorded in the variety local (6.85%) with the yield loss of 6.98%, while the ergot severity was minimum (3.43%) in proagro 9444 with the yield loss of 5.52%. The ergot severity ranged from 3.43 to 6.85% and yield loss ranged from 3.96 to 7.31%.

Basidiocarp of Judas ear on Indian Oleander

Vishnupriya Sharma
Department of Botany,
University of Allahabad,
Allahabad

During the survey of wood rotting fungi in the monsoon months of August-September, authors observed the cup shaped fruiting bodies of mushroom growing on the stem of the Nerium plant in the residential area at Allahabad district. Basidiocarp of fungus was identified as *Auricularia polytricha* (Mont.) Sacc.

Nerium indicum L. is an easy growing plant in moist condition which belongs to the family Apocynaceae. It is also known as Indian Oleander or Kaner in Hindi. This plant is used as hedges or border in the garden and for ornamental purpose also.

Auricularia polytricha (Mont.) Sacc. is also called as Judas ear, cloud ear, wood ear, tree ear, muk neg and black fungus. Ear shaped mushroom is of dark brown in colour and is native of Asia This is an edible fungus and used for its crisp texture for culinary purposes in Chinese dishes. Recent studies also revealed its medicinal effects and identified the chemicals present in the cup which inhibit blood clotting.

Biological Control of Coconut Black Headed Caterpillar (*Opisina arenosella,* Walker.)

R.D. Borse

PG-Department of Botany, Padmashri Vikhe Patil College of Arts, Science and Commerce, Pravaranagar, At/P: Loni, Tal: Rahata, Dist: Ahmednagar, Maharashtra, PIN 413 713.(India)

rdborse@gmail.com

Keywords: *Coconut, Biological control. Black headed Caterpillar.*

The present investigation employing the biological control method of coconut Black Headed caterpillar *Opisina arenosella*, Walker, on pravaranagar area. Field study was evaluated the pest by using Parasitoids and predators effect significant suppression of *O. arenosella*. The larval parasitoid *Goniozus nephantidis* (Mues.)and *Bracon brevicornis* is successfuly control by using as biological control agent. The insect parasitoids are released on palm the pest population reduce larvae and pupil. They are smaller than the host and the larvae develop inside each individual host insect. The parasitoids are specific to the stage of the insect on larval parasitoids, pupal parasitoids and egg parasitoids.

Characterization of Newly Isolated *Bacillus* spp. and their Effect on *Fusarium oxysporum*

Shobha G and Kumudini BS

Department of Biotechnology, Jain University, Bangalore – 560011

Keywords: *PGPR, Bacillus, antagonistic effect, Fusarium Oxysporum.*

Seven isolates of *Bacillus megaterium* spp. JUMB1, JUMB2, JUMB3, JUMB4, JUMB5, JUMB6 and JUMB7 obtained from Nelamangala. They were characterized for

their physical and biochemical properties. The results showed that all of the isolates were gram positive for rods and formed endospores. They have also been positive for catalase, starch hydrolysis, oxidase, casein, gelatin liquefaction, urea hydrolysis, methyl red test and citrate utilization test. They were able to ferment mannitol, dextrose and lactose. They were capable of producing hydrogen cyanide and ammonia as anti pathogenic agents. *Bacillus* isolates were also positive for indole acetic acid and siderophores for growth promotion.

Cinnamomum zeylanicum: A Potential Antibacterial Agent Against Water Borne Bacterial Pathogens.

Awadhesh Kumar[1], Rohit K. Mishra[2], Amit K. Tiwari[2], Anand Pandey[2], Amritesh C. Shukla[1] and Anupam Dikshit[2]

[1]*Department of Horticulture, Aromatic and Medicinal Plants,*
Mizoram University, Tanhril, Aizawl-796 004, India
[2]*Biological Product Laboratory, Department of Botany,*
University of Allahabad Allahabad-211002, India

Keywords: *Synthetic drugs, spices, CLSI and water borne bacterial pathogens.*

A number of multidrug resistant bacterial strains and the manifestation of these strains with reduced susceptibility to antibiotics are continuously increasing. In developing countries, the synthetic drugs are not only expensive and inadequate for the treatment of diseases but also often with adulterations and side effects. Therefore, there is a need to find new herbal drugs to control microbial infections. The medicinal plants especially spices plays important role against bacterial diseases, mainly spreading through contaminated water as well as food. The richness of spices in India is known at global level from its very ancient period. The aims of the present investigation are to explore the bioefficacy of the essential oil of *Cinnamomum zeylanicum.* Hence, the *in vitro*

investigation was carried out against *Escherichia coli, Vibrio cholerae, Shigella dysenteriae* and *Salmonella typhimurium* by using the broth microdilution method (NCCLS- 2003). The minimum inhibitory concentration (MIC) was recorded 1.25 mg/ml against *E. coli* (MTCC723); 1.05 mg/ml against *V. cholerae* (MTCC3906); 1.30 mg/ml against *S. dysenteriae* (ATCC23513), and 0.351mg/ml against *S. typhimurium,* respectively. Besides this, toxicity of the oil contains heavy inoculum density, quick killing activity, broad antimicrobial spectrum, thermostable and long shelf life. Moreover, the detailed *in vivo* and clinical investigations are still in progress, so that, the herbal treatment of the drinking water can be made ecofriendly.

Control of *Meloidogyne incognita* using Fungus *Paecilomyces lilacinus* Grown on Rice

J.L. Sharma*, M.K. Sharma and P.C. Trivedi*****

* P.G. Department of Botany, Govt. college Kota (Raj.)

** Retd. prof. Department of Botany, University of Rajasthan, Jaipur

*** Vice chancellor, Gorakhpur university, Gorakhpur (U.P.)

Keywords: *Paecilomyces lilacinus,* brinjal, R+N+F, Root knot index (R.K.I)

Under Indian agro climatic condition the fungus *Paecilomyces lilacinus* (Thorn). Samson was used to control root-knot nematode *Meloidogyne incognita* for the first time. Randomized complete block design experiment was set up using1 Kg. Soil per pot. Four levels of rice were used viz. 5, 10, 20, and 40 gm. It was observed that root-shoot length, fresh and dry weight of the shoot were more in rice (R) + Nematode(N) + fungus (F) treated brinjal plants compared to rice (R) + Nematode(N) or Nematode(N) alone treated plants. The root knot index (R.K.I) and final nematode population was lesser in R+N+F treatment compared to R+N or N alone treatment one. Forty gram level of rice was most effective which showed maximum control.

Dynamics of Fungal Population Associated With Decomposing Sugarcane Trash Under Different Environmental Conditions

Pooja Rani and M.U. Charaya***

Department of Botany, Bareilly College,Bareilly
*Department of Botany, C.C.S University, Meerut
**hipooji@yahoo.co.in

Keywords: *Decomposition, Sugarcane trash, Fungal population.*

The present communication deals with the quantitative variations in the fungal population associated with decomposing sugarcane trash under different environmental conditions. The experiments were performed in two cities viz.,Delhi and Meerut, having different climatic conditions. As the decomposition progressed, changes in the number of species colonizing the trash exhibited some degrees of variations. The number of species isolated at the terminal stages of decay was lower than that in the beginning. In general, the number of species remained constant in early stages of decomposition and, thereafter, showed an increase but finally decreased during the last stages of decomposition. There was an increase in the fungal population per gm dry litter on 30th day as compared to that in the beginning. At Delhi, the population was found to be decreased substantially on 90th day and steeply by 150th day. Thereafter, the population first increased by 210th day but later on came to the level of 150th day. Thus, overall, there was an increase in the beginning but a decrease was observed in the later phases of decomposition. At Meerut, however a regular increase was observed from 0 to 30th day and 30th to 90th day, perhaps due to more suitable environmental conditions since this part of the experiment was performed during rainy season. Fungi require a minimum water activity 'a_w' for growth .Thus, the residues are initially colonized by those fungi which are capable of growing at low moisture contents. As a result of decomposition, the water activity 'a_w' of residues is increased, which is suitable for the growth of many fungi. Moisture and moisture flow are now widely recognized as key factors in the biodegradation of waste refuses. Therefore, increase in fungal colonization takes place at least in the initial phases of decomposition.

The sharp fall in the fungal population in the late phases is understandable because of rapid rate of decomposition and obvious decrease in nutrients availability.

Effect of AM Fungi and Flyash on Gladiolus

Avinash Pratap Singh and Harbans Kaur Kehri

Sadasivan Mycopathology Laboratory,
Department of Botany, University of Allahabad,
Allahabad – 211002

***Keywords**: Gladiolus, AM fungi, Fly ash*

Gladiolus occupies prime position in the floriculture industry and becoming popular day by day for cut flower trade. However, many of the imported varieties require a heavy input of cultivation reduce the margin of profit. Development of any technology which may curtail the cost of cultivation of such varieties may go a long way to help the farmers. In the present investigation efforts were made to study the synergistic effects of AM fungi and different concentrations of fly ash was used on Gladiolus cultivar Tambree. 45% fly ash and AM fungi treated gladiolus showed the best result.

Effect of Different Vitamins on Four Plant Pathogenic Fungi

Vijay P. Mane and Arun Arya

Department of Botany, Faculty of Science,
The Maharaja Sayajirao University of Baroda, Vadodara-390002,
e-mail: aryaarunarya@rediffmail.com

***Keywords:** Vitamins, Pestalotiopsis disseminata, Phomopsis tectonae, Pestlotiopsis maculans and Lasiodiplodia theobromae.*

Vitamins are organic molecules required in small amount and not used as a source of either energy or structure materials of protoplasm. Fungi like other organisms require minute amounts of these specific organic compounds for their normal development. It is believed that they are needed for metabolic reactions and functions as coenzymes or constituent parts of coenzymes. Our current knowledge of vitamin requirements of fungi indicates that they generally need only water soluble vitamins .

In the present study an attempt has been made to study the effect of 10 different vitamins on the growth and sporulation of Phomopsis *tectonae* and *Lasiodiplodia theobromae* from the leaves of *Tectona grandis*, *Pestalotiopsis disseminata* from *Terminalia arjuna*, *P. maculans* from the leaves of *Bambusa arundinacae.* The growth of these fungi was recoded after 15 days of incubation. It was observed that all the four organisms showed lesser growth as compared to control sets. In *P. disseminata* the growth decreased with increase in concentration of thiamine. At 200µm the growth of *P. disseminata* was lowest. In *P. maculans* and *L. theobromae* the growth remained almost constant even with varied concentration of thiamine. In *P. tectonae* highest growth was observed at 50 µm. Growth of *P. maculans* was highest among the four organisms, in pyredoxine, however, the growth of this organism was less at 200 µm compared to mycelia weight obtained at 50 µm. The growth of *L. theobromae* remained same at all concentrations. In case of riboflavin *L. theobromae* exhibited highest growth at 100µm followed by *P. disseminata.* In case of nicotinic acid it was observed that this vitamin accelerated the growth of *P. disseminata*, *P. maculans* and *L. theobromae,* contrary to this the increasing concentrations from 25µm to 100µm reduced the growth of *P. tectonae.* Ascorbic acid inhibited the growth of all the four organisms with increase in concentration.

Effect of Urban Environment on Leaf Spot Disease of Medicinal Plants

Rudranil De*, Debapriya Ghatak, Shreya Kar, Martha Sinha and Mahashweta Mitra Ghosh

Postgraduation Department of Microbiology, St. Xavier's College (Autonomous),
30 Mother Teresa Sarani, Kolkata-700016
Email id: rudieules @gmail.com

***Keywords**: Suspended particulate matter (SPM), leaf sport disease, roadside medicinal plants, metals present.*

In a present day, medicinal plant grown by different nurseries but because of high amount of suspended particulate matter (SPM), they get mechanically damaged paving the pathway of different airborne fungal pathogens. Three such medicinal plants were collected from a nursery in Batanagar, south 24 pgs; Weat Bengal (in the vicinity of mega construction area) and they were all suffering leaf sport disease. The respective pathogens are isolated from these plants namely, *Adhatoda vasica, Ocimum sanctum and Asteracantha longifolia* and the fungal pathogens *Rhizoctonia spp, Fusarium oxysporium, Sclerotinia spp* and *Fusarium spp* along with the protozoan cysts found adjacent to the spores-Monocystis, respectively. The infective structures of these organisms were observed. For *Rhizoctonia* spp subterminal or apically positioned spores which are oval or round in outline. For *Fusarium oxysporium* branched mycelia with distinct spores were observed. Microconida distinct but sickle shaped structure could not be identified. Whereas a thick walled scelocium was observed for Sclerotinia spp. *Adhatoda vasica* seems to be worstly affected and the SPM level has increased from 1.53 mg to 3.5 mg or by 56.28%. Whereas, *Ocimum sanctum* and *Asteracantha longifolia* are accounted for an increase in infection by 55% (from 2.16 mg to 4.8 mg) and 63.88% (from 1.3 mg to 3.6 mg) respectively. On analysis of this particulate matter deposited on the infected leaves, it was found that metals chromium and lead were present with the content of 0.3ppm and 0.9ppm respectively. Hence it can be correlated that Chromium and lead particulate

emitted from the constitutional area in vicinity has resulted in the increase incidence of Leaf sport disease in *Adhatoda vasica, Ocimum sanctum and Astercantha longifolia.* So, this definitely suggests that increased air-bone pollutants are possible predisposition factors of fungal leaf-sport disease.

Effects of Flower Extracts on Different Microbial Infection of Skin

Mukesh Kumer and Usha Singh

Department of Botany,

Nalanda Open University, Patna.

Ancient scriptures like Abhijana Shakuntalam and Meghadootam of Kalidasa and many mythological epics encompares the references of cosmetics like :- Tilak, Kajal, Alkant Agaru that were used as body decorative and to create beauty sport on the chin and cheeks in the era ruled by gods and theirs deities . In fact the concept of beauty and consmetics is as old as mankind and civilization. The famous depictions in the Ajanta and Elora caves, Khajurao prove that only women but only men also adorned themselves by jewelry. Scents and cosmetics Enscripted in history in the Aryan period witnessed the use of turmeric, Haridra, Saffron, Alkant, Agaru, chlorophyll green from plants and indigo for body decorations from using Raktachandan, chandan, for beautification, using Mehendhi for dying hair in different colours and conditioning also practiced in older time.

Efficacy of Some Triazoles and Pyrimidine-2-one Compounds Against Few Species of *Chaetomium, Cunninghamella* and *Memnoniella* Deteriorating Jute Fibres in Storage

Shalu Mishra* and N. Misra **

Department of Botany

D.D.U. Gorakhpur University, Gorakhpur – 273009, India

Keywords: *Jute fibres, Fungitoxicity, Physico-chemical properties.*

Six organic chemical compounds of triazole and pyrimidine-2-one were tested for fungitoxicity for the first time against *Chaetomium globosum* Kunza, *C. indicum* Corda, *Cunninghamella echinulata* Thaxter, *Memnoniella echinata* (Riv.) Gallowayand *M. subsimplex* (Cooke) Dieghton, which were found frequently associated anddeteriorating the jute fibres during storage. The pyrimidine-2-one compoundsexhibited lowest minimum inhibitory concentration and fungicidal nature against allthe test fungi. These chemicals also checked the appearance of test fungi on the surface of treated jute fibre and showed broad fungitoxic spectrum. Compounds were characterized by their physico-chemical properties and spectrum analysis.

Evaluation of Antibacterial activity of Callistemon *lanceolatus* DC. against human and phytopathogenic bacteria

K.S. Kavitha and S.Satish

Department of Studies in Microbiology, University of Mysore

Manasagangotri, Mysore- 570 006, Karnataka, India.

Keywords: *Bioactive compounds, Minimum inhibitory concentration, Antibacterial activity, Phytochemical analysis.*

Plants are the reservoir of biological active compounds to combat pathogens. The increased use of natural product in the pharmaceutical industry has led to an increase in demand for screening for cost effective, non-toxic bioactive compounds from medicinal plants. The antibacterial activity of aqueous, methanol and chloroform extracts of *Callistemon lanceolatus* DC. leaves (Myrtaceae) was evaluated for antibacterial activity by well-diffusion method against some human pathogenic bacteria (*E.coli* MTCC7410, *Staphylococcus aureus* MTCC7443, *Bacillus subtilis* MTCC121, *Pseudomonas aeruginosa* MTCC7903, *Salmonella typhi* MTCC733, *Shigella flexneri* MTCC1457, *Listeria monocytogenes* MTCC839) and phytopathogenic bacteria (*Xanthomonas campestris, X. oryzae, X. axonopodis, Ralstonia solanacearum*). Leaves were extracted using different solvents such as methanol and chloroform. All the test bacteria showed

significant antibacterial activity except *Salomnella typhi, Shigella flexneri, Listeria monocytogenes and Ralstonia solanacearum*. The antibacterial activity was significant in the methanol, chloroform extracts than the aqueous extract of *Callistemon lanceolatus*. Minimum inhibitory concentration of chloroform extracts varied between 4-50µg/ml against tested bacteria. Solvent extracts were analysed for the detection of various bioactive compounds. Phytochemical analysis revealed the presence of carbohydrates, amino-acids, terpenoids, phytosterols and saponin. Results indicate the potential exploitation of this plant as a therapeutic agent for further work on isolation and characterization of the active component responsible for antibacterial activity.

Evaluation of Antibactirial Activity of Different Parts of *Tagetes erecta*

Preeti Verma & Archana Verma

Department Of Botany, Govt. Girls Degree College

Sagar 470003 (M.P)

Keywords*: *Tagetes erecta, Antibacterial activity, Disc diffusion method.

Tagetus erecta is a common ornamental herbaceous plant with long history of traditional medicinal use in many countries. The present study was aimed to investigate the antibacterial activity of this common locally available plant. Antibacterial activity of different part of ethenolic extract of Tagetus erecta was evaluated using disc diffusion method against gram positive and gram negative bacterial strains. Gressiofluvin (Standard) was used antibacterial activity. The aim of this study was to evaluate the antibacterial activity of extract from this plant parts against 5 bacterial strains by using disc diffusion method. The result indicates that the leaf and flower of this plant part showed a broad spectrum of antibacterial activity.

Evaluation of Antibacterial Activity of *Callistemon lanceolatus* DC. Against Human and Pytopathogenic Bacteria

K.S.Kavitha and S.Satish

Department of Studies in Microbiology,
University of Mysore Manasagangotri,
Mysore – 570006, Karnataka, India

Keywords: *Bioactive compounds, Minimum inhibitory concentration, Antibacterial activity, Phytochemical analysis.*

Plants are the reservoir of biological active compounds to combat pathogens. The increase use of natural product in the pharmaceutical industry has led to an increase in demand for screening for cost effective, non toxic bioactive compounds from medicinal plants. The antibacterial activity of aqueous, methanol and choloroform extracts of *Callistemon lanceolatus* DC. Leaves (Myrtaceae) was evaluated for antibacterial activity for well diffusion method against some human pathogenic bacteria (*E.coli* MTCC7410, *Staphyloccocus aureus* MTCC7443, *Bacillus subtilis* MTCC121, *Pseudomonas aeruginosa* MTCC7903, *Solmonella typhi* MTCC733, *Shigella flexneri* MTCC1457, *Listeria monocytogenes* MTCC839) and phytopathogenic bacteria (*Xanthomonas compestris, X. oryzae, X. axonopodis, Ralstonia solanacearum).* Leaves were extracted using different solvents such as methanol and choloroform. All the text bacteria showed significant antibacterial activity except *Solmonella typhi, Shigella flexneri, Listeria monocytogenes* and *Ralstonia solanacearum.* The antibacterial activity was significant in the methanol, choloroform extract than the aqueous extract of Callistemon lanceolatus. Minimum inhibitory concentration of chloroform extracts varied between 4-50µg/ml against tested bacteria. Solvent extract were analysed for the detection of various bioactive compounds. Phytochemical analysis revealed the presence of carbohydrates, amino-acids, terpenoids, phytosterols and saponin. Results indicate the potential

exploitation of this plant as a therapeutic agent for further work on isolation and characterization of the active component responsible for antibacterial actibity.

Evaluation of fungicides for the control of *Alternaria* leaf blight of Sunflower

K.N.Mishra and Ragini Gupta,

Department of Botany, T.D.College, Jaunpur-222002 (U.P.), India

E-mail:mishraknjnp06@rediffmail.com

Alternaria leaf blight of Sunflower is an important fungal disease known to cause heavy yield losses in many sunflower growing countries. The efficacy of two fungicides were tested in vitro and in vivo against *Alternaria helianthi,* inciting sunflower leaf blight. Mancozeb @ 0.3% inhibited the maximum mycelia growth (87.3%) of *Alternaria helianthi* in vitro. Carbendazim also inhibited the fungal growth (49.1%). In vivo evaluation , Mancozeb @ 0.2% was effective in controlling *Alternaria* blight. Due to a minimum disease intensity, the maximum grain yield of (10.7 q ha^{-1}) was recorded with spray application to Mancozeb (0.2%). Further, maximum oil yield (347 kg ha^{-1}) was obtained in Mancozeb treatment. The and pot experiments were conducted continuously in crop seasons of two years-2010 and 2011. A mixture of (12%+63% w/p) of Carbendazim and Mancozeb has given better effect in inhibiting the mycelia growth.

Evaluation of Pearl Millet Varieties and Hybrids against Ergot Disease under Natural and Artificially Inoculated Conditions

Rita Sharma and R.K. Pandya

Department of Plant Pathology

College of Agriculture,

Gwalior

Ergot of pearl millet caused by *Clayiceps fusiformis* Loveless is a wide spread disease in Northern region of Madhya Pradesh. In order to find out some resistance linesof pearl millet through natural and artificial inoculated conditions, the present

investigation of evaluating of varieties and hybrids was carried out by adopting standard field screening technique.On the basis of two years mean, the minimum ergot severity under natural condition was recorded in Raj171(1.76%) followed by Local (2.77%), JBV-2(2.82%), ICTP8205(3.15%), ICMV221(3.55%) and JBV-3(3.98%),while under artificial inoculation the minimum severity was recorded in Raj 171(6.79%) followed by JBV-2(7.43%), ICMV221(8.09%), Local(9.25%) and JBV-3(9.89%) and these six entries were placed in the categories of resistant.

Evaluation of potential biocontrol agents for the management of *Macrophomina phaseolina* (Tassi) Goid in *Coleus forskholii* Briq.

Lily Trivedi and P.C. Trivedi*,

Department of Botany, University of Rajasthan, Jaipur-302004

*DDU Gorakhpur University, Gorakhpur

***Keywords*:** *Macrophomina phaseolina* (Tassi) Goid, *Coleus forskohlii* Briq, biocontrol fungi, dual culture

Macrophomina phaseolina (Tassi) Goid isolated from diseased plants of *Coleus forskohlii* Briq *in vivo* was evaluated against antagonist fungal sp., isolated from the rhizosphere of native fields of Rajasthan. 11 biocontrol fungi consisting of 9 *Trichoderma* sp. and *Gliocladium virens and Paecilomyces* significantly inhibited growth of *Macrophomina phaseolina* in dual culture experiments. The inhibition ranged from 70-77% whereas other biocontrol fungi also showed good efficacy. Different isolates showed varying degrees of antagonism. Maximum growth inhibition was caused by *Trichoderma harzianum* (T-2) and *Trichoderma hamatum* (T-8) followed by *Trichoderma aureoviride* (T-7) and *Trichoderma viride*(commercial) (T-11). The growth inhibition in presence of *Trichoderma sp.* could be attributed to all the three modes of antagonism *in vitro* viz. competition, antibiosis and mycoparasitism.

Field Application of Mycoherbicides against *Parthenium hysterophorus* L. at Different Sites of Jabalpur Division

Mithilesh Jaiswal, A.K. Pandey [1] and Jamaluddin

Department of Biological Sciences, R. D. University, Jabalpur-482001(M.P.)

[1] Chairman, MP Private University Regulatory Commission,

VLMI road, Gyan Vatika, Bhopal (M.P.)

E.mail: Mkjaiswal.05@gmail.com

Keywords: *Mycoherbicides, Parthenium hysterophorus, biological control.*

Mycoherbicides are biotechnological products which contain fungi or fungal metabolites as nonchemical alternatives thereby reducing the input of harmful chemicals to control noxious weeds like *Parthenium hysterophorus L*. The present communication emphasizes on the evaluation of potential of indigenous isolates of *Sclerotium rolfsii* (FGCC#08), *Alternaria alternata* (FGCC#11), *Trichoderma viride* (FGCC#71), *Fusarium roseum* (FGCC#16) and *Phoma herbarum* (FGCC#18) as mycoherbicide for the biological control of *Parthenium hysterophorus* through various field trials at different sites of Jabalpur (M.P.), like Mandla (Kalpi), Narshingpur, Seoni, Bargi and Katni. The layout plan was designed and the treatment given through randomized block design method. A variation of 20-25% was found in the pathogenicty of mycoherbicides. Selected fungal isolates not only showed served damaged to the host but also they were badly affected the Chlorophyll content, protein content and other morphological parameters of the host like root length, shoot length, no. of seeds and their germination and viability etc.. These indicated that these fungal pathogens would be used as mycoherbicdes for the biological control of the *Parthenium hysterophorus.* Data were analyzed statistically and it was found that Maximum damaged caused by *Sclerotium rolfsii (90-95%)* and *Trichoderma viride (*85-90%) followed by the *Fusarium roseum* (75-80%) and *Phoma herbarum* (70-78%) and *Alternaria alternata* (70-75%) after 10-15 days application of mycoherbicdec. $1x10^6$ spore/ml Spore concentrations was taken for in case of all the selected strains except *S.rolfsii* in which 80 sclerotia/5ml was taken.

Tween 80, Sodium alginate, Vegetable oil, sucrose and distilled water were used as formulants.

Fungal Diversity in The Reparian Soil of Ganga River Near Banka Ghat of Bihar.

Chandan kumar, Gazala Tabassum and

Choudhary Sharfuddin.

Plant Pathology and Microbiology Laboratory,

Department of Botany, PatnaUniversity, Patna-800005.

Keywords: *Riparian, Mycoflora, Culture medium, fungal taxa, Physic-* Chemical.

Microscopic fungi are distributed worldwide. They are important components of the ecosystems and play important biological roles such as nutrient cycling, soil formation, providing nutrition to plants through their roots, and transformation of waste material into useful products. Soil samples were collected in sterilized small plastic containers from six different spots in Banka ghat of Bihar during January 2009 to December 2010. The fungi were isolated using soil dilution plate technique on different medium supplemented with suitable antibiotics. The isolated fungi were identified with the color, texture and growth pattern of the colony and their microscopic photographs. Around twenty one fungi of different groups were identified.

Histopathological Studies on Black Mould Infected Lime (*Citrus aurantifolia*)

P.M. Kuriachen,

Associate Professor, Department of Botany,

Union Christian college, Aluva- 683102, Kerala, India

Kuriachen_puthooru@yahoo.com

Keywords: *Aspergillus niger, Aspergillus rot, Black mould rot, Endocarp, Epicarp, Mesocarp, Percentage of Tissue damage*

Black mould rot (*Aspergillus* rot) is a severe disease affected to lime after harvest. The disease is caused by *Aspergillus niger V. Teigh.* The infection starts when the fruits were handled and transported without care. The extent of damage to the fruit after inoculation was studied for five consecutive days. The infection spread fast to the inner tissues and to the region near the vascular bundles from the third day onwards. By fifth day most of the cells disintegrate absorbed by the growing fungus. The fruit become a black mass of disintegarated tissue, fungul mycelium, sporogonium and spores after five days.

Histopathology of Chickpea Roots Infected with *Aschochyta rabei* and *Fusarium oxysporum*

Tripti Agarwal and P.C Trivedi

University of Rajasthan, Jaipur

Keywords: *Cicer arietinum L., Fusarium oxysporum,* Ascochyta rabiae, *Histopathology.*

Diseases are the most serious constraints to chickpea (*Cicer arietinum* L.) productivity causing up to 100% losses. Though many diseases are reported, only a few

such as Wilt (*Fusarium oxysporum* f.sp.*ciceri)* and Ascochyta blight (*Ascochyta rabiae),* may cause major losses and prevent farmers from realizing the potential yield of chickpea. The fungus *Ascochyta rabiae* is genetically diverse and dynamic and may be developing new virulent forms that can overcome the blight resistance available in current chickpea varieties. Early infection in seedlings causes wilting of the upper foliage and development of small water-soaked spots. Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceris* (FOC) is another most destructive disease in India can be described as a "classic" vascular wilt disease. It invades the vascular tissue (xylem) through the roots causing discolouration and wilting. In the present study an attempt was made to examine histopathology of infected chickpea roots infected with *Ascochyta rabiei*, and *Fusarium oxysporum.* The major changes observed in host tissues were the abnormal xylem, hyperplastic parenchyma, hypertrophy and fissuring of conducting tissues. The hyphae of the pathogen were inter and intra cellular in pith, xylem and cortex .Inside the xylem and cortical sells a mucilage-like substance was present.

In Vitro & *In Vivo* Antibacterial Comparitive Study in *Acacia nilotica* L.

Kshipra Dhabhai*, Shipra Bhargav and Amla Batra

Plant Tissue culture laboratory

Department of Botany, University of Rajasthan, Jaipur,

Rajasthan, 302004, India

kshipramicrobiology@gmail.com*

***Keywords**: antimicrobial activity, microorganisms, callus, broth dilution, cotyledanary node*

Present investigation was the first attempt which deals with the *in vivo* and *in vitro* comparative study of antimicrobial activity in *Acacia nilotica* L., a nitrogen fixing tree. The antimicrobial activity of callus as *in vitro* sample and naturally grown plant sample of *Acacia nilotica* L. were determined against four pathogenic microbes through

broth dilution method. For obtaining the callus, the seeds were cultured on ½ MS medium under the *in vitro* condition. The cotyledonary nodal explants were taken from the *in vitro* seedlings and cultured in the MS medium supplemented in combination of 2,4-D (0.4 mg/l) with BAP (0.25 mg/l).The data proof antimicrobial activity of callus methanol extract showed great potential as source of antimicrobial agent. Results suggest that *in vitro* developed sample posses highest antimicrobial activity, least MIC range (1.9±0.02 mg/ml).Hence, developed *in vitro* cultivation technology would provide quality plant material for medicine.

In Vitro Efficacy of *Acacia nilotica* Against Some Common Water Borne Bacterial Pathogens

Amritesh C. Shukla[1], Awadhesh Kumar[1], Rohit K. Mishra[2], Amit K. Tiwari[2], Anand Pandey[2] and Anupam Dikshit[2]

[1]*Department of Horticulture, Aromatic and Medicinal Plants, Mizoram University, Aizawl-796 004, India*

[2]*Biological Product Laboratory, Department of Botany, University of Allahabad Allahabad-211002, India*

Keywords: *Herbal treatment, traditional medicinal plant, water- borne pathogens, NCCLS.*

Water is in use for several purposes by humans but the level of purity of water was always a matter of discussion. Although, there are numbers of synthetic purification systems are available in the market but they have several side effects. Plants are the richest source of natural therapeuticants and can also be a potential water purifier against the water borne bacterial pathogens- which are responsible for diarrhoea, cholera, typhoid dysentery and other intestinal infections, in human beings. During *in vitro* antibacterial screening of some traditional medicinal plants, the essential oil from the leaves of *Acacia nilotica* was found as the most effective toxicant against *Escherichia coli, Vibrio cholerae, Salmonella typhimurium* and *Shigella dysenteriae.* The minimum inhibitory concentration of the oil was 2.48 mg/ml against *E. coli* (MTCC723); 0.34 mg/ml against

V. cholerae (MTCC3906), and 2.18 mg/ml against *S. dysenteriae* (ATCC23513), but it was not much effective against *S. typhimurium* (MTCC98). The toxicity of the oil was cidal in nature and persisted heavy inoculum density, quick killing activity, broad antimicrobial spectrum, thermostable, and long shelf life. The experiment was conducted by using the broth microdilution method (NCCLS-2003) with a slight modification of Shukla (2010). Further, the fruitful preliminary *in vivo* investigations prompted us for detailed *in vivo* and clinical investigations too; which is still in progress at the Biological Product Laboratory, University of Allahabad. Only after that, the formulations for the herbal treatment of the drinking water can be made ecofriendly.

Induced Systemic Protection in Hybrid Rice Variety Against Rice Blight Pathogen by Hypersensitivity Reaction Elicited by *Mucor*

Subhoshree Ghose, Ssnjana Mukhetjee, Soma Poddar,Pritha Choudhury,

Soumik Ray,Anindita Banerjee*

Department of Microbiology,
St.Xavier's College (Autonomous),
30 Mother Teresa Sarani,
Kolkata-700 016
E-mail:anni79in@gmail.com

The South Indian Varieties are enriched in different types of phenolic glycoside like compounds can induce systemic resistance in plants to disease.One such variety is the TMK-9 variety collected from thirur, Tamilnadu.Unfornutely the degree of resistance induced is highly variable and the basis for this effect is poorly understood.In this investigation, the antagonistic action of bacterium and a fungus in the above mentioned variety was observed ,but the fungal component was an air borne saprophyte and was found to be *Mucor* sp.,that suppressed the severity of the bacterial late blight disease in rice caused by *Xanthomonas oryzae*.The mold was isolated from the lesion in almost 83% cases. But the cross protection was remarkably variable indicating the variability of the

strain. The localized infection of *Mucor* induces a hypersensitive reaction that helps to protect the plant from bacterial infection. The bacteria exhibited moderate to low sensitivity to ampicillin and streptomycin. But the maximum disease control was brought about by a mixture of mancozeb and carbendazim and thiodon separately, indicating non-target effect. So it can concluded though the bacteria was inhibited by the mold in absence of any external chemical agent, but in presence of fungicide/pesticide,the blight symptom was effectively reduced due to reduction of the fungal and bacterial concentration.

Influence of Temperature on the Growth of Some Dermatophytes.

Namita Kumari, Surendra Kr. Prasad & Pushpanjali Khare

Department of Botany,

Magadh Mahila College, Patna University, Patna

e-mail-dr.namitakumari@gmail.com

Keywords: *dermatophytes, pathogenic, temperature, growth Behavior*

The dermatophytes are fungi which are potentially pathogenic to human beings and animals causing so many skin diseases. These fungi are soil dwellers. Geography and prevailing climatic conditions of a particular region greatly influence the distribution of such fungi. Temperature is also one of the important factor for their growth. The growth behavior of such fungi on various range of temperature is also very important with respect to the survival of dermatophytis, severity of skin diseases caused by them and epidemiology. Growth behavior of some dermatophytic fungi as *Microsporum gypseum* and *Trichophyton tonsurans* had been investigated on different temperature- 20ºC, 25ºC, 30ºC, 35ºC and 40ºC.

.

Inhibition of Wood Rotting Fungi by Prokaryotic Consortium Under Saline Stress Gourab Halder, Rusha Pal, Sambita Modak, Aniketh Bishnu, Dimpi

Mukhopadhyay, Shreosi Chatterjee and Madhumita Maitra*

Department of Microbiology,

St. Xavier's College,

30 Mother Teresa Sarani,

Kolkata-700016.

West Bengal

***E-mail:msirkar_70@hotmail.co.in**

Keywords: *wood rotting fungi, reduction in rate of lignolysis, actinomycetes, saline stress, prokaryotic consortium, antagonism, Basidiomycetes fungi.*

The advancing sea water under high tide condition damages the *Casuarina* plantation under saline stress due to tidal waves. The fragments of wood displaced often shows wood rotting activity by terrestrial wood rotting basidiomycetes fungi. In the given investigation, such infected wood infested with *Coriolus spp*. Was isolated but in one of the samples, the growth of prokaryotic consortium including actinomycetes spp.(Isolate1) and gram negative spp(Isolate2) was also obserbed. All these organism were grown in vitro in and were found to be saline tolerant to 25%. These organism were characterized and it was observed that the fungi could not produce a rhizo in presence of prokaryotic competitors. This antagonism was clearly observed when grown in tryptic soy agar. The wood degradation activity was reduced by 10% of previous decay in presence of *Proteus spp.* And the actinomycetes. So these potential organisms can be utilized in protecting *Casuarina* plantation in the sea beaches.

Interaction Studies of Rhizobium *and* Heterodera cajani *on Pigeonpea.*

Poonam Meena, Sampat Nehra and P.C. Trivedi

L.B.S. Govt. College,,Kotputli

E-mail : rspunam@gmail.com

Keywords: *Heterodera cajani, Cajanus cajan, Rhizobium, Pigeonpea .*

Studies were undertaken for the interaction studies of *Rhizobium* and *Heterodera cajani* infecting *Cajanus cajan*. An intensive survey of pigeonpea field revealed the wide occurrence of *H. cajani* and which causes reduction in quality and quantity of pulse crop due to reduction in number of nodules and poor nitrogen fixation. *Rhizobium* strain (R-1) were evaluated against *H. cajani* in different combination viz. *Rhizobium(R)* alone, *Heterodera cajani(H)* alone, *(H+R), Rhizobium inoculated 15 days prior to H. cajani (R15→H), H. cajani* inoculated 15 days prior to *Rhizobium(H15→R)* and control(un-inoculated plant) to study their effect on plant growth parameters (weight and length of shoot, root and nodules number) and nematode population. Application of all these interactions of *Rhizobium* and *H. cajani* exhibit *Rhizobium* alone followed by *(R15→H)* inoculated plants increased plant growth parameters (weight and length of shoot, root, and nodules number) and reduced nematode population. However, prior nematode inoculation reduced colonization of *Rhizobium* leading to poor plant growth and fruiting in the inoculated plants.

Investigation of Biofungicidal Control of leaf blight of Sunflower

K.N.Mishra and Ragini Gupta
Department of botany, T.D.College, Jaunpur-222002
(U.P.), India
E-mail: mishraknjnp06@rediffmail.com

The leaf blight of Sunflower incited by *Alternaria hellianthi*, rendering great economic loss, is one of the most important diseases of sunflower. The efficacy of three chemical fungicides and one of plant origin were tested in vitro and in vivo against *Alternaria hellianthi*, for the crop season of 2009. In vitro evaluation of fungicides, mancozeb is found to be the most effective and showed maximum inhibition of mycelial growth (69.0%) than Carbendazim (48.3%). Leaf extract of *Sida cordifolia* (8.6%) was the least effective. In vivo evaluation, mancozeb (0.2%) was effective in controlling Alternaria leaf blight. Maximum grain yield (10.5q/ha) was recorded in mancozeb treatment. Further, maximum oil yield (345kg/ha) was obtained in mancozeb. *Sida cordifolia* leaf extract (8.6q/ha and 232kg/ha) was the least effective in controlling *Alternaria* blight. A mixture of (12%+63% w/p) of Carbendazim and Mancozeb has given better effect in inhibiting the mycelia growth.

Investigation of Immunomodulatory Potential of *Artemisia pallens*

Jitin Ahuja* and J Suresh
Department of Pharmacognosy,JSS College of Pharmacy,JSS University
Mysore,Karnataka-570015,India.
*E-mail:jitin.jssmpharma@gmail.com

Keywords: *Artemisia pallens, cell mediated immunity Haemagglutination, titer immunomodulation.*

Artemisia pallens (Asteraceae) commonly known as Davana is a south Indian annual herb and traditionally considered as anthelminthic, tonic, antipyretic and antihyperglycemic.Ethanolic extract of *A. pallens* was administered orally at doses of 100 and 200mg/kg/day to healthy mice (Albino) divided into three groups of six animals each with an objective to investigate immunomodulatory activity of *A. pallens* by testing humoral (antibody titer) and cellular (foot and swelling) and neutrophil adhesion test.Oral administration of ethanolic extract of A pallens (APE) showed a significant decrease in delayed type hypersensitivity responses and the humoral responses to sheep RBCs. Dose of 200mg/kg/day showed highly significant reduction in secondary antibody titer,foot pad thickness and neutrophil's adhesion to nylon fibers when compared to their respective controls. The study demonstrated that APE shows immunosuppressant effect by cellular and humoral immunity.

Isolation and Characterization of *Mycorrhiza* From Soil and Their Application for Seedlings growth of *Triticum spp.*

Rohit Ashok Joshi and G.D.Sartale

Keywords: *Isolation, Characterization, Seedlings*

In this study we have isolated three different types of *Mycorrhiza* by using soil and root nodules (*Glycin max, Arachis hypogaea, Cajanus cajan, Cicer arietinum plants*). The morphological and biochemical characteristic of these isolated *Mycorrhiza* were systematically investigated. Among these Arbuscular *Mycorrhiza* was observed in major proportion in soil as well as on the surface of root nodule. The optimization of culture conditions for these *Mycorrhiza* were studied in detail. Finally application of Arbuscular-Vesicular mycorrhiza(Ectomycorrhiza, Endomycorrhiza & Ericoid Mycorrhiza) *Mycorrhiza* were applied for seed germination as well as on the growth (Root and Shoot) length of *Triticum* species were studied .The results suggest that supplementation of

Arbuscular *Mycorrhiza* induces the plant growth and this type of study will be useful for the development of Biofertiliser for production of wheat which is needed in India.

Management of Root Knot Nematode on Tomato and Okra Through Sustainable Components, Oil Seed Cake, Fungal Bioagents and VA Mycorrhiza.

B.K. Goswami and *Chaitali Bhattacharya

Amity Centre for Bio Control and Plant Disease Management

AMITY UNIVERSITY, Sec-125, NOIDA-201303, U.P.

E-mail: bgoswami@amity.edu

Keywords: *Root Knot Nematode, Sustainable Components*

Extensive survey of vegetable growing areas in around district Ghaziabad shoed patchy growth of both tomato and okra crops. On uprooting of stunted/affected plants, they were found to be heavily galled, on closer examination of which they were identified to be *Meloidogyne incognita*. The farmers of the above "Hot spots" on closer interaction expressed disappointment for the heavy loss in yield they are facing due to root knot nematode infection. The soil collected from majority of the vegetable growers on planting showed heavy infestation of root rot fungus, *Rhizoctonia bataticola*. Since the farmers, out of ignorance, were cultivating the susceptible tomato and okra crops year after year without growing the non host crops in between the soil population was built up extremely high with *Meloidogyne incognita* (approx between 15-20 larvae/gm soil), the minimum threshold or inoculums potential level being 2 larvae/gm soil only. For the management of the extremely high population of the M. incognita and other fungal and pest problems the farmers were reported to be mostly using chemical pesticides like carbofuran, phosrate etc. which not only deteriorated soil health but also affected the farmers health because of the toxic properties of the chemical they are using.

As an alternative, therefore, safe and eco friendly management components like neem oil seed cake, potential fungal bioagents, *Trichoderma harzianum, Beauveria bassiana* and also a bio fertilizer, VA mycorrhiza were undertaken. The integrated approach with oil seed cake, fungal bioagents and VA mycorrhiza in three phases i.e. a) at nursery level with seed and soil treatment b) bare root dip treatment with three components mixed in jaggery prior to transplantation in main infested field and lastly c) deep ploughing followed by spot treatment of the seedlings at transplantation in main infested field. In this integrated pest management approach, reduction of disease incidence was initiated from the nursery level, the healthier seedlings being subjected to bare root dip treatment followed by transplantation. The substantially healther i.e. non galled seedlings to the main field resulting in improvement in both quality and yield of the tomato. In this IPM package, besides having used *Trichoderma* at the time of spot treatment and also nursery level, spraying was done with aqueous extract of neem oil seed cake/leaves mixed (insect repellent) with *Beauvaria bassiana*, the insect parasitic fungal bioagent.

In the present package thus the entire crop would be treated, soil-seed cake and fungal bioagents *(Trichoderma harzianum*) being potential against root-knot nematode and root-rot fungus respectively while VA mycorrhiza, *Glomus intraradices* act as protectant against both nematode and fungi. The fungal bioagents *B. bassiana* would manage pests with neem extract helping in repelling the insect pests.

Morphological Study of Endophytic Fungi Isolated From Leaves of *Melia azedarach* L.

Kaushal Kanwer Shekhawat*, D.V Rao and Amla Batra

Plant Biotechnology lab. No.5, Department of Botany

University of Rajasthan, Jaipur.

E-mail: kaushal.botany@gmail.com

Keywords: *Endophytic fungi, morphological study, Melia azedarach L.*

Endophytic fungi are found on all kinds of plants, i.e. trees, grasses, algae and herbaceous plants. Endophytic fungi live within a plant's tissue without causing any symptoms or apparent injury to the host. Recently Endophytic fungi were isolate from leaves of Melia azedarach L. (Meliaceae), which is an exotic tree with a widespread distribution and often cultivated. In Brazil Melia azedarach L. widely used medicinal plant in Indian sub-continent, was Investigated for endophytic mycoflora. Single mycelium method was used to isolate endophytic fungi from surface sterilized of medicinal plant. Seven hundred twenty segments of leaves of *Melia azedarach* L., collected from "Botanical garden of University of Rajasthan during 2009-2010 were processed for the presence of endophytic fungi. According to morphological charatersities, 3 fungal species of *Aspergillus* viz., *Aspergillus flavus, Aspergillus niger, Aspergillus sp.* and one species of *Nigrospora* sp. were isolate and identified. Interestingly all the fungi were isolate only from leaves and overall colonization frequency from surface sterilized leaves was found to be 10.8% in response to plant samples.

Multifactorial Incidence of Early Blight and its Control

Sanjana Mukherjee, Alakendu Mandal,Ria Saha,PallabiBhattacharyya,PriyankaBarmanSoma Poddar,Olympia Das Atrindrila De and Arup Kumar Mitra*

Postgraduation Department of Microbiology,
St. Xavier's College (Autonomous),
30 Mother Teresa Sarani
Kolkata-700016
Email:drakmitra@hotmail.com

Keywords: *Fusarium solani, conidia, chlamydospore, temperature, humidity, Fungicide, Pesticide*

The infected potato plant (about two months old) was collected from a field of village Kamarhati, approximately 1 km away from the Saithia-Rampurhat state highway, west Bengal. The disease intensity was measured on the basis of leaf area infected and the average infection was approximately about 30%-90%. The blight symptoms were apparent through there was a confusion that whether it was early blight or late blite of potato but after isolation, the pathogen was found to be Fusarium solani, causinh the early blight disease. The microscope examination of the pathogen showed the presence of appresoria and bulbous haustoria, with an average size of 3.5μ and 2.225μ respectively. When grow in potato dextrose ager slants, mycelial ramifiaction occurred after 24hours but after 48hours clear zonation with central core black and light white and margin. Both chlamydospore and conidia were observed after staining, the former had a diameter of 2.4μ, while the latter was sickle shaped with an average length of 4.2 μ and breadth of 1.2μ. The reproductive structure also prove that the pathogen was Fusarium solani.the Koch's postulates was completed with an average inoculums 2 X 10^5 spores. Upon testing the effect of a fungicide (carbendazim+mancozeb) and a pesticide (thiodon) for the purpose of disease control. It was observed that the first symptoms in the potato tuber appear after 24 hours in the control set, but no infection was observed in case both the treated sets. After 48 hours of infection, there was 96% reduction in infection while complete reduction of disease occurred in case of thiodon. Furthermore it was also observed that ideal infectious condition was observed due to mechanical injury, presence of chlamydospore and high temperature (above 30^0C) and humidity above 90%. So it can be concluded that the early blight of potato is a muntifactorial disease, which can be controlled when all these factors are absent.

Occurrence of mycotoxin and mycotoxigenic fungi in Sorghum [*Sorghum bicolor* (L.) Moench] across India

Divakara, S. T., Mohammed Aiyaz and Niranjana, S. R

Department of Studies in Biotechnology,

University of Mysore, Mysore-570006, India

Email: orchids3804@gmail.com

Keywords: *Aflatoxins, Fumonisins, PGPR's, Trichoderma Spp.*

In the present study, total 56 sorghum seed samples were collected from different agro climatic regions of India and were analyzed for the presence of seed-borne fungi, storage moulds and mycotoxins. Of the 56 samples collected, maximum incidence of *Aspergillus flavus* was recorded in the cultivar M-35 (58%) which was collected from Andhra Pradesh followed by 48% in the cultivar K-8 of Tamil Nadu and the least incidence was recorded in the cultivar SPV-1430 (1%) collected from Rajasthan. No incidence was recorded in the seed samples of local cultivars of Karnataka state. Maximum incidence of *Fusarium verticilliodes* (92%) was recorded in the cultivar SH-5 collected from Karnataka state and the least incidence was also recorded in the local cultivars of Karnataka state, whereas no incidence was observed in the seed samples collected from Rajasthan, Tamil Nadu and Maharashtra. The aflatoxins and fumonisins were quantified by CD-ELISA in the collected sorghum seed samples. Further biological management strategies were developed for minimizing mycotoxigenic fungi in seed samples by using Plant Growth Promoting Rhizobacteria (PGPR's), *Trichoderma* spp. and botanicals under laboratory, greenhouse and field conditions.

Phosphate Solubilisation by the Isolates of Fluorescent Pseudomonads

Sujatha N. and Ammani K*.

Dept. of Botany and Microbiology, Acharya Nagarjuna University, Guntur

ammani1960@gmail.com

***Keywords**: Rhizosphere soil- Fluorescent pseudomonads,- phosphate solubilisation*

Field soils possess considerable accumulation of phosphorous due to regular application of chemical phosphate fertilisers and a large proportion of the applied fertilisers are converted into insoluble form and become unavailable to plants. Interest has been focused on the inoculation of phosphate solubilising microorganisms into the soil so as to increase the availability of native, fixed phosphorous and to reduce the use of fertilisers. Fluorescent pseudomonads solubilise di-calcium phosphate and tricalcium phosphate. These also proved to act as bioagents in disease managemen in our study. However, the present study focuses on the phosphate solubilising ability of the 22 strains of fluorescent pseudomonads isolated from rhizosphere soils of crop plants of coastal districts of Andhra Pradesh. All the 22 isolates were reported to solubilse phosphates.

Phytochemicals and Antibacterial Activity of *Pedilanthus tithymaloides* L.

Patil S.D. [1] *, Raulkar U.R. [2], Manik S.R. [3]

[1]Deptt. of Microbiology and Biotechnology,

Shri Shivaji Science College, Amravati - 444603 (MS)

[2]The English Junior College of Science and Arts,

Ner (P.) District-Yavatmal

[3]Deptt. of Botany,

Sant Gadge Baba Amravati University, Amravati- 444603 (MS)

E-mail: sdpatil20957@yahoo.co.in

***Keywords:** Medicinal plant, bioactivity, pathogenic bacteria.*

Acetone, benzene, chloroform, ethanol, petroleum ether and aqueous extracts of *Pedilanthus tithymaloides* leaves were tested for antibacterial activity against Gram positive and Gram negative bacterial species. All extracts exhibited the moderate inhibitory activity against *Bacillus subtilis* and were totally ineffective towards *Bacillus thuringiensis* and *Proteus mirabilis.* Benzene extract exhibited highest activity against *Bacillus cereus* followed by *E. coli*. Phytochemical studies revealed the presence of flavonoids, steroids, saponins, phenolic acids, but alkaloids and tannins were absent.

Phytochemicals and antimicrobial activity of *Moringa oleifera* against otitis media pathogens

Jane R. R.* and Patil S. D.

Deptt. of Microbiology,

Shri Shivaji Science College, Amravati - 444603 (MS)

Keywords: *Medicinal plants, antimicrobial activity, otitis media.*

The antibacterial activity of roots of *Moringa oleifera* was determined in acetone, methanol and chloroform extract by agar disc diffusion method against otitis media pathogens (*E.coli, K. pneumoniae, S. aureus, S. pneumoniae* and *P. aeruginosa*). The acetone extract was more potent than methanol and chloroform extract. Acetonic extract of *Moringa oleifera* roots showed highest activity against *S. pneumoniae* and *P. aeruginosa* followed by *E.coli, S. aureus* and *K. pneumoniae.* Methanolic extract showed less activity against *S. pneumoniae* and *P. aeruginosa*. Least antibacterial activity was shown by chloroform extract which was effective only against *E. coli*. Phytochemical studies revealed the presence of alkaloids, tannins, saponins and flavonoids.

Powdery Mildew Disease on Coriandum of Bihar

M.K.Pandey
P.G. Department of Botany,
Maharaja College, Ara,
Bhojpur Bihar

Keywords: *Powdery Mildew, Host, Disease incidence, Population*

Powdery Mildews the Fungi with white superficial (hyaline) hyphae on the aerial parts of living plants are recognized by the morphological details and the presence of the casual agents, rarely if ever by respons. Powdery Mildews cause no symptoms other than a decline killing of plant parts and decrease in productivity of their hosts. The present study has been confirmed to Bhojpur (Bihar). The authors report about the Disease Incidence in the population of Bhojpur. The severity of disease in a particular population has also been established. The disease incidence (I) has been studied in ten populations and its variable number in terms percentage has been calculated which varied from 81.1% to 88.9% an average of 85.56%. on the basis of weight loss in pods the population number six was found to worst affected in terms of severty assessment of the disease, which was 27.2% and an average of 25.47.

Role of Hypovirulence in biological Control Against *Sclerotium rolfsi*

Nidhi Didwania
Department of Biotechnology, FET,
Manav Rachna International University ,Faridabad.

Keywords*: Sclerotium rolfsi ,variability, biocontrol, hypovirulence*

Hypovirulence in fungal plant pathogens refers to the reduced ability of selected isolates within a population of a pathogen to infect, colonize, kill and or reproduce on susceptible host tissues and is often associated with double stranded RNA elements which

have been reported as mycoviruses. In an attempt to study vegetative compatibility in *Sclerotium rolfsi* ten field isolates were collected from different host/ location and based on the basis of interaction zones developed in the pairing, the isolates were assigned to three mycelia compatibility groups (MCGs).The incompatible reaction between SR-5 and SR-7 isolates resulted in reduced and scanty growth and less sclerotia formation.SR 5-7 Hv was isolated from the mycelium of intermingling zone and was further investigated for hypovirulence.The isolate (SR 5-7)Hv was not able to develop characterstic symptoms of the disease on its respective host in greenhouse rather this isolate and its cell free culture filtrate showed biological activity against other pathogenic isolates of *S rolfsi*. In glasshouse studies, with the use of SR 5-7 Hv isolate,the disease suppression percent varies from 80-100%.

Screening of Toxin Producing Potentials of Some Toxigenic Fungal Species Isolated From Maize in Culture Medium.

Chandra Shekhar Varma and Rama Shankar Prasad*

University Department of Botany,

V.K.S.U., Ara; *Dept. of Botany, J. J. College, Ara

***Keywords**: Toxigenic species, Aspergillus, Penicillium, Fusarium, aflatoxin, ochratoxin, citrinin, zearalenone, culture medium.*

Altogether 271 isolates belonging to 6 fungal species (*Aspergillus flavus, A. parasiticus, A. ochraceous, Penicillium viridicatum, P. citrinum and Fusarium graminearum)* obtained from different samples of maize were screened for their toxin producing potentials in respective culture media. Qualitative examination revealed high incidence (38%) of toxigenicity (35 out of 92) in *A. flavus / parasiticus.* Next in order was *Fusarium graminearum* (28.21 %). Incidence of toxigenic strains of *Penicillium viridicatum* producing ochratoxin was 26.47 % and producing citrinin was 24.24 %. Incidence of toxigenic strains of *Penicillium citrinum* was recorded to be 25 %.

Aflatoxin B_1 was produced in the range of 10 - 5150 µg/kg with an average of 960.35 µg/kg of all the toxigenic strains. The production of ochratoxin by *A. ochraceous* and citrinin by *P. viridicatum* was in the range of 150 - 2200 µg/kg and 220 – 830 µg/kg respectively. While *A. ochraceous* produced only ochratoxin and *P. citrinum* produced only citrinin, *P. viridicatum* was recorded to produce ochratoxin and citrinin both. Average production of ochratoxin by A. ochraceous was recorded to be 732.56 µg/kg. Average production of ochratoxin by *P. viridicatum* was found to be 925.56 µg/kg. *F. graminearum* produced zearalenone in the range of 360 - 3150 µg/kg. with mean value as 850.53 µg/kg.

Seasional variation in VAM in *Lygodium flexuosum*(L.)Sw. and *Ampelopteris prolifera*(Retz)Copel. Of Ranchi and Latehar Distt. Of Jharkhand,India.

Malay Bharti and Ram Pravesh
Department of Botany
Doranda College, Ranchi, Jharkhand, India- 834 002
Email- malay_bharti@rediffmail.com

Keywords: Vesicles, *Lygodium flexuosum, Ampelopteris prolifera*,VAM colonization, Mycorrhizae, Arbuscles, Seasonal variation.

The present study deals with the seasonal variation in vesicular arbuscular mycorrhizae of *Lygodium flexuosum* (L.) Sw. and *Ampelopteris prolifera* (Retz.) Copel. Out of these two fern species studied, frequency of infection by vesicular arbuscular mycorrhizae is maximum in rainy season. Vesicles are more frequently found during winter season. VAM colonization showed a variable response to different seasons. Different climatic and soil factor (temperature, pH of soil, season, rainfall and age of the plant) affects colonization. Soil pH has a marked effect on root colonization of the species studied.

Studies on Antifungal Action of Some Plant Essential Oils Against *Malassezia* Causing Pityriasis Versicolor in Humans

Rohit Kumar Mishra[1], Amit Kumar Tiwari[1], Awadhesh Kumar[1], Anand Pandey[1], A. K. Bajaj[2] and Anupam Dikshit[1]

[1]*Biological Product Laboratory,*

Department of Botany,

University of Allahabad, Allahabad-211002, India

[2]*Department of Dermatology and Veneral Diseases,*

M.L.N. Medical College, Allahabad, India

Keywords: Antifungal, Essential oils, *Malassezia* spp., *Pityriasis versicolar etc.*

Pityriasis versicolor is one of the most common infections in India commonly known as Sehuwa (Hypopigmentation) in human skin. It is caused by unicellular yeast like fungus known as *Malassezia*. The incidence increases in summers and monsoon. The present study is carried out at Allahabad in India. More than 200 skin isolates were collected from different age group peoples and identified with the help of molecular (*i.e.* Real Time PCR) as well as cultural morphology as compared with standard strains such as *M. furfur*- 1878; *M. restricta*- 7877; *M. globosa*- 7966; *M. slooffiae*- 7956; *M. dermatis*- 9169; *M. sympodalis*- 9974; *M. obtusa*- 7876; *M. yamatoensis*- 9725; *M. nana*- 9558 and *M. japonica*- 9432 obtained from CBS, Netherland. The secondary metabolites obtained from aromatic and non-aromatic indian plants were subjected to antifungal testing using broth micro dilution method recommended by CLSI. The present research work reveled that essential oil of *Eucalyptus globulus* Labil and *Cedrus deodara* L. have strong antifungal activity against *Malassezia* causing Pityriasis versicolor in humans.

Studies on the Distribution of *Fusarium moniliforme* Var. *Subglutinans* in the Sugarcane Fields of Darbhanga Division (Bihar)

Ram Sagar Singh and Birendra Kumar*

J.N.College ,Madhubani -84721

Bihar

Sugarcane fields spreading over 15 Blocks and 321 plots situated in three bistricts of Darbhanga Division (Bihar) were surveyed for the presence of *Fusarium moniliforme* var. *subglutinans* because it attacks various economically important plants including sugarcane.It was recorded the highest in Madhubani district and lowest in samastipur.In generali *moniliforme* var. *subglutinans* was found highest in the month of july to October and lowest in March to June. Among the 15 blocks of different district, Madhepur (Madhubani), Biroul (Darbhanga) and Bithan (Samastipur) were recorded most vulnerable than other blocks because these blocks are most flood affected part of Darbhanga Division.This confirms to the findings of earlier scientist that soil moisture and water stress favour the growth and infection of *F. moniliforme* var. *subglutinans* in sugarcane.

Studies on the Diversity of Edible Species of Mushrooms in the Forests of Gwalior Division of Madhya Pradesh.

Hariom S.Chaubey, R.K.S.Chauhan and Shashi Chauhan

School of Studies in Botany,

Jiwaji University, Gwalior (M.P.)

hs.chaubey@gmail.com

Keywords: *Mushroom, diversity, edible, forest, Gwalior*

Mushrooms have existed for millions of years and the mankind has regarded them as a valuable food flavour and nutrition. The diversity of mushrooms differs with the type of climate, vegetation and topography. The Gwalior division is also a division of varied topography,climate and vegetation. It is situated in the northern part of Madhya Pradesh province of India and known for its vast emporium of mycofloral wealth in the tropical forest. In the present communication an attempt has been made to catalogue the five most eminent edible species of mushroom from the forest of Gwalior division i.e. *Agaricus bisporus Agaricus bitorquis Calocybe indica Coprinus comatus* and *Volvariella volvacea.*

Study of Eco-friendly Management of Fungal Bioagents Against Selected Phytopathogens

Shahnaz Jamil and Ranjeet Kr. Gupta

M.L.S.M. College,Darbhanga

Keywords: *Fungal bioagents, Phytopathogen, Antagonism*

The use of herbicides, insecticides, synthetic fertilizer and pesticides often leaves residues with levels above maximum tolerance limits in food/horticulture products. They also contaminate the soil and give the opportunity of soil borne pathogens, which cause severe hazards in the surroundings of root system and surface of the root of the plants. The present study was aimed to identify rhizosphere pathogen s of selected vegetable plants and develop appropriate eco-friendly disease management strategy. The fungal bioagents like *Trichoderma, Gliocladium* and AM-fungi control soil borne pathogens like *Rhizoctonia solani, Phytophthora capsici* and *Fusarium oxysporum.* The present investigation is also an extension of plant disease management using eco-friendly method known as “Allelopathy ” or “Biological control.”

The antifungal and antioxidant activity of lichen *Cladia aggregata* (Swartz) Nyl. against unicellular yeast like fungus *Malassezia* spp.

Anand Pandey, Rohit Kumar Mishra, Amit Kumar Tiwari, Awadhesh Kumar and Anupam Dikshit

Biological Product Lab., Department of Botany,
University of Allahabad, Allahabad- 211002

***Keywords**: Lichens; Ethanolic extract; Anti-oxidant; Cladia aggregata; Malassezia spp. etc.*

The world of lichen is a rarely explored group in the plant kingdom. Also its rarity is not only in its presence but also in its bioprospective properties. Lichen *Cladia aggregata* (Swartz) Nyl., known from the temperate regions of the Himalayas was studied for its bioprospection. The lichens have a wide variety of unique secondary metabolites and 90% of which are found nowhere else in the plant kingdom. This macro lichen genera belong to the Family- Cladoniaceae. The lichen was collected from the Eastern Himalayas. The lichen's secondary metabolite was tested for its antifungal efficacy by NCCLS recommended Broth microdilution method against 4 spp. of unicellular yeast like fungus *Malassezia globosa, Malassezia furfur, Malassezia sympodialis* and *Malassezia restricta*. The fungus is responsible for causing dandruff and hair disorders. The lichen was tested for its 50 % ethanolic extract and aqueous extract. The extraction of the secondary metabolite was done accordingly by Rota evaporation apparatus followed by an overnight incubation of the thalli in the solvent for extraction. The chemical characterization showed Barbatic acid as its major constituents. The 50 % ethanolic extract showed significant results against the fungus while aqueous extract was found less significant as compared to standard synthetic antifungals such as Ketoconazole. The antioxidant activity of the lichen secondary metabolite was also obtained in addition using the DPPH micro assay method with Tocopherol as standard.

Varietal Screening of Some Chilli Cultivars Against *Meloidogyne incognita*.

Abhiniti Malhotra

Department of Botany,

University of Rajasthan,

Jaipur

Email: abhinitimalhotra@gmail.com

***Keywords**: Capsicum annuum ,Meloidogyne incognita , Varietal resistance*

Five cultivars of chilli, *Capsicum annuum,* were screened for resistance against *Meloidogyne incognita* in pot experiments. Three-week-old seedlings were inoculated with 1000 freshly hatched juveniles of *M. incognita*. Ninety days after inoculation the plants were uprooted and examined for galls, root and shoot lengths, fresh/dry root and shoot weights. The cultivar Pusa Jwala was assessed as moderately resistant with the minimum number of galls and variety PC-1 was highly susceptible developing the maximum number of galls. All the other varieties exhibited variable degree of susceptibility between Pusa Jwala and PC-1.

Angiosperm-Biodiversity & Anatomy

Anatomical Structural Specialization in Vascular System of Internode of the Genus *Dioscorea* Linn.

Elsamma Joseph Arackal* and A.G Pandurangan

*Department of Botany, Maharajas College, Ernakulam

Plant Systematics and Evolutionary Science Division,

Tropical Botanical Garden and Research Institute,

Thiruvananthapuram-695562

***Keywords**: Dioscorea, Internodal vasculature, Stelar system, Taxonomic Diagnosis.*

The genus *Dioscorea* is a unique taxon among monocotyledons. It deviates from the typical monocotyledonous characters and share certain prominent dicot features. Therefore, it is often subject of debate with regard to the circumscription of genera and species included in this family (Ayensu, 1972). The studies of Burkill (1960), Ayensu(1972), Elsamma and Pandurangan (2006, 2008, 2009), and Elsamma (2010) have brought to light many morphological and anatomical characters of *Dioscorea* which are of systematic and phylogenetic bearings. The presentation is an attempt towards analyzing the internodal anatomy of 17 species of *Dioscorea* collected from Western Ghats. Certain anatomical traits, unnoticed by erstwhile investigators, were recorded. These new observations were found to be of high diagnostic values in identification of *Dioscorea* species.

Plant materials were collected during different seasons in different localities of Western Ghats. The internodal segments were fixed in FAA, processed for paraffin embedded serial sections through customary procedure(Sass,1940) and stained with Toluidene blue O (O' Brien et al., 1964). Photomicrographs, prepared with NIKON photographic unit were used for description of tissues in the stem. Two aspects of the internode, namely, cross sectional outline and vascular systems, were taken into

consideration .Transactional outline varied from circular, angular, winged and wingless conditions were also used for analysis.

The vascular systems of the internode is typically two stacked comprising outer ring smaller **common bundles** and inner ring of larger **cauline bundles**. The structure and disposition of the vascular strands are unique for *Dioscorea* and not similar to atactostele of monocotyledon or to eustele of dicotyledons. Hence, a new terminology is proposed here as **"Dioscorean Stelar System"** to this unique type. The outer common bundles are triangular or U-shaped in sectional view and are partially or totally ensheated by sclerenchymatous endodermoid layers. The number and relative position of the phloem and xylem strands is definite and specific for the species. The inner ring of cauline bundles exhibit highly specific structure. The number of phloem units and xylem strands fall under the following categories: Two obliquely placed phloem units, one on either side of the protoxylem strand; two outer units with protophloem points juxtaposed a common, more prevalent type in various species of *Dioscorea.* In other species, the number of phloem units varies from two to six. The metaphloem elements are unusually wide and measuring up to 100 micro meter in diameter, a feature not shared by any angiosperm taxa including plants of twining habit. Since the wide sieve elements coupled with specific relative position of phloem and xylem strands are characteristic for *Dioscorea*, a new term coined as "**Dioscorea phloem pattern**" to designate this phloem type. The functional significance and physiological adaptations of wide phloem elements and equally wide vessels are discussed in detail. A dichotomous key based on internodal anatomy to identify the different species of *Dioscorea* is presented. Giving accent to the unique profile of the vascular system of the internode as well as other organs, it is suggested that *Dioscorea* may be deemed as an independent taxon and justified the treatment of unigeneric family- Dioscoreaceae .

Floral Symmetry and Extrafloral Nectaries of Genus *Cassia* L. Land Senna mill. of Patna District.

Ameetha Sinha, Kumari Nutan Sinha and Meenakshi Singh*

Plant biosystematics and Molecular biology lab.,

Department of Botany,

Patana Science college, P.U., Patana-800005.

E-mail:ameethasinha@gmail.com

***Keywords**: Cassia species, floral symmetry, extrafloral nectarines, Patana District, Senna species.*

A total of four species of *Cassia* L. viz., *C. fistula* Linn., *C. Javanica* Linn., *C. marginata* Roxb. And *C. nudosa* Ham. And six species *Senna* Mill. Viz., *S. alata* Linn., *S.occidentalis* Linn., *S. siaamea* Lam.,*S. sophera* Linn., *S. surattensis* (Burm.F.) Irwin and Barneby subsp. *Sulfuria and S.tora* Linn. Have been reported. The genus is widespread and diverse characterized by a distinctive floral morphology. Floral symmetry among species is highly variable. The flowers are monosymmetric, or strongly zygomorphic, dorsiventrally heteromorphic and heterantherous. Furthermore the flowers are asymmetric due to the gynoecium deflecting either to the left or to the right within the same inflorescence. Glands or extrafloral nectries are common in species of *Senna* Mill. They are structurally diverse, secret nectar which attract ants. Ants feed on nectar and inturn protect the plants from being eaten by herbivores, thus exhibiting mutualism.

Histochemical Analysis on the Insect Induced Leaf Galls and Normal Counterparts of *Alstonia scholaris*(L).

Shilpi Rajput and Payal Lodha

Plant Pathology, Tissue culture and Biotechnology Laboratory,

Department of Botany,

University of Rajasthan, Jaipur-302004.

***Keywords**: Alstonia scholaris, starch, cellulose, carbohydrates.*

Alstonia scholaris(L)a is medicinally important tree, belonging to family Apocynaceae. The present study deals with leaf galls caused by *Pauropsylla tuberculata* Crawf. On *Alstonia scholaris.* Leaf galls of *Alstonia scholaris* are sub-globoes, ovoid or fusiform. Histochemical studies of normal and gall tissue have been done. Various metabolites localised were starch, cellulose and carbohydrate. The gall has brought about various structural and physiological changes in host tissue. The gall tissue showed histochemically differential behaviour in terms of these metabolites. By using histochemical technique, an alteration in localization of metabolites due to insect attack was observed. These studies may be helpful to surpass the hurdle in understanding the tumour biology, crop improvement, view of environment issues and climate changes.

Histo-Pharmacognostical Study of *Solanum xanthocarpum*chrad.&wendl. a Dashmool Plant Under the Impact of Mohan Meakins ltd Industry Effluent

Sandhya Sharma and Kavita Tyagi*

Department of Home Science,

V.M.L.G. College, Ghaziabad – 201001, India.

*National Medicinal Plants Board, Deptt. Of AYUSH,

Ministry of Health & Family Welfare, Govt.of India,

36- Janpath, Chandralok Building,

New Delhi- 110001

Email: kr_325@yahoo.co.in, sanidhya1234@gmail.com,

Keywords: *Histo-pharmacognosy, Solanum xanthocarpum,Effluent analysis.*

Solanum xanthocarpum Schrad. & Wendl. (*Solanum surattense* Burm. f.) belongs to family Solanaceae, is a prickly diffuse bright - green perennial herb commonly known as Kantakari. Plant root is an expectorant, forming an ingredient of Ayurvedic medicine, Dasamula. The root is appetiser, laxative and useful in bronchitis and asthma. Fruit yields carpesteral, 1.3% gluco-alkaloid solanocarpine and solanine-S, which on hydrolysis yields alkaloid solanidine-S. The Pragati Paper Mill industry is selected as polluted area for present study. The effluent has great posing impact of pollution on the nearby growing plants. The effluent was analysed for colour, pH, TS, TDS, TSS, BOD, COD *etc.* Histo-pharmacognostic studies showed morphological characters and parameters of surface layer (stomata; stomatal index, palisade ratio etc.) got decreased in plant collected from the polluted area. The shape and size of cells in anatomical study (trichomes, stomata, collenchyma, chlorenchyma and parenchyma, endodermis, pericycle, phloem, cambium, xylem etc.) were decreased in the plants collected from polluted areas. Preliminary colour reaction tests showed degree of change in both the cases non-polluted as well as polluted samples. TLC results showed more number of spots. Extractive values were lower and ash values were higher in the plants grown in polluted areas.

Orchid Diversity of Assam: Conservation and Future Prospects

N.Basumatary,R.K. Bora and C.M. Sarma

Department of Botany,B.N.College,Dhubri

Dhubri-783324, Assam (India)

***Keywords**: Orchid, diversity, Assam, conservation, hybrids, employment.*

Through previously, different workers reported variable numbers of orchid flora of Assam at different times, the present investigation accounts for as many as 352 species and 10 verities under 90 genera. These natural resources of the state Assam should be conserved at war footing as they are decreasing alarmingly in nature, and their potentialities for commercial exploration for ornamental and medicinal purposes are yet to be properly evaluated. The major threats for existence of orchid diversity were recorded as the destruction of forest covers for human habitat (encroachment) and extraction of timbers (tree felling). No prominent steps were taken to stop the destruction of forest. Native species of orchids can be used as the stock material for hybridization program to develop floriculture industry in the state. Large scale culture and cultivation of native species having beautiful flowers can be developed as cottage industry where the villagers and small farmers will be involved for raising of pot plant either individually or cooperative basis. Out of the six most traded orchid genera in world market of floriculture, Assam represented 5 genera of which *Cymbidium* with about 6 species, *Dendrobium* with about 40, *Paphiopedilum* with 3, *Phaenopsis* with 3 and *Vanda* with 7 species. By exploiting the national and domestic market only, there is every possibility to earn millions of rupees per annum along with generation of employment to hundreds of youths of the state. As most of the highly demanded hybrids in international market are the products some native tropical species, the native orchid species, the native orchid species of the state can also be used as the stock material for hybridization program for production of commercial viable hybrids.

Ethnobotany and Human Welfare

Antimicrobial Studies of Wheatgrass (*Triticum aestivum)* Extract

Anand Rajoria*, Archana Mehta, Pradeep Mehta and Supriya Gupta

Department of Botany,

Dr. H.S. Gour University,

Sagar (M.P.) India

E-mail : anandrajoria@refidffmail.com

Keywords: *Phytochemical, Antimicrobial, Protein*

Wheatgrass (*Triticum aestivum)* is the common cereal-crop that has been a staple food of man from many centuries and its juice has been used as a health tonic for several years. Wheatgrass is also a complete protein plant with about 30 enzymes, contains 13 vitamins, several antioxidants, minerals and all 20 amino acids. Apart from the several essential nutrients it also contains some phytochemicals having medicinal values, while performing biochemical test to detect phytochemicals, alkaloids, were found which are responsible for antimicrobial activity. In this present antimicrobial study, methanolic extract of wheatgrass harvested after 9 days of seedling was been used. In cases of antibacterial activity, methanol extract showed potent antibacterial activity against *Micrococcus* and *Bacillus subtills* respectively at the concentration of 200 mg/ml.

Are Mangrove Fruits Edible?

R.Ray and T.K.Jana

Department of marine science,

University of Calcutta, 35, Road, kolkata-700019, India.

E-mail:raghab.ray@gmail.com

Keywords: *Chemical composition, mangrove forest, antioxidant, Edible, India.*

Attempt has been made to assess the chemical composition of five main types of mangrove fruits namely *Heriteira fomesfrom* (local name Sundari), *Aegiceras corniculatam* (local name khalsi) and *Brugueira parviflora* (local name bokul), from Sundarbans mangrove forest, NE coast of bay of Bengal, India. Results revealed that they contain high percentage of carbohydrates (27.25-62.95%), protein (1.2-8.9 %), ascorbic acid (0.013-0.032%), phenol (1.41-12.35%), reflecting higher antioxidant capacity, and fruits are edible.

Bioprospection of Traditional Medicine Brahmi Booti : *Centella asiatica* L.

Vaibhav S Pandey

Department of Botany

DDU Gorakhpur University, Gorakhpur-273009 (U.P.)

E-mail: vpvspandey@gmail.com

Keywords*: *Bioprospection, Traditional Medicine. Brahmi Booti, Centella asiatica L.

Centella asiatica is a small herbaceous annual plant of family Apiaceae. It is native to India and other parts of Asia and commonly knowm as **Brahmi Booti, vallaarai,** , Brahma manduki **Indian Pennywort and Asiatic Pennywort.** . It is used as a medicinal herb in traditional medicine grows along ditches and in low wet areas. The stems are slender, creeping stolons, green to reddish green in color, interconnecting one plant to another. It has long-stalked, green, reniform leaves with rounded apices which have smooth texture with palmately netted veins. The rootstock consists of rhizomes, growing vertically down. They are creamish in color and covered with root hairs. The stems are slender, creeping stolons, green to reddish green in color, interconnecting one plant to another. It has long-stalked, green, reniform leaves with rounded apices which have smooth texture with palmately netted veins. The rootstock consists of rhizomes, growing vertically down. They are creamish in color and covered with root hairs. The flowers are pinkish to red in color, born in small, rounded bunches (umbels) near the surface of the soil. Each flower is hermaphrodite ,minute in size (less than 3 mm), with 5-

6 corolla lobes per flower. Each flower bears five stamens and two styles. The fruit are densely reticulate which have smooth, ribbed or warty.The whole plant including the roots is harvested manually.Centella is used in **Culinary.** It is a mild adaptogen, antibacterial, anti-viral, anti-inflammatory, anti-ulcerogenic, anxiolytic, a 1%%cerebral tonic, a circulatory stimulant, a diuretic, nervine and vulnerary.Centella asiatica may be useful in the treatment of anxiety and may be used as a promising anxiolytic agent in the future. A decoction of juice from the leaves is thought to relieve hypertension. A poultice of the leaves is also used to treat open sores.

Centella asiatica is traditionally used in leprosy. It is used to re-vitalize the brain and nervous system, increase attention span and concentration, and combat aging. *Centella asiatica* also has anti-oxidant properties. Its bioprospection, scientific urilization and conservation is essential for nature and the society.

Bioprospection of Underutilized Green Leafy Vegetables for Prevention of Protein-Folate Malnutrition

K. Srivastava, Nidhi Gupta and V.N. Pandey*

Experimental Botany Laboratory

Department of Botany

DDU Gorakhpur University

Gorakhpur-273009

**E-mail:* vnpgu@yahoo.co.in

***Keywords**: Bioprospection, GLVs, Protein-Folate malnutrition (PFM).*

Plants green have been important food in traditional system of diet. The beneficial value of underutilized green leafy vegetables is regarded world wide as an important area of research. Protein-Folate malnutrition (PFM) arises due to imbalanced diet in children and women especially during perinatal period, resulting in serious health

problems. In this study thirty one underutilized green leafy vegetables (GLVs) sample have been collected from different localities of Gorakhpur district and adjoining area which are regularly consumed by local inhabitants. GLV samples were analysed for crude protein and folate (free and total) content. Besides, contents of moisture, total N, protein N, ash, and LPC extractability were also analysed. Categorization of GLVs were done on the basis of extractabilities of protein N and content of total N in LPC. Results showed that folate concentration ranges from 31mcg/100g to 392 mcg/100g while the content of protein ranges from 11.12 g/100g to 28.87 g/100g on dry weight basis. The contents of protein and folate indicate that GLVs could be exploited as potential and easily available source of dietary protein and folate.

Chemistry and Pharmacological Activity of *Nerium oleander* L.

Garima Zibbu and Amla Batra

Plant Biotechnology Lab No: 5,
Department of Botany,
University of Rajasthan, Jaipur.

Keywords: *Nerium oleander, Phytochemistry, Pharmacological activity, antinociceptive andsecondary metabolites.*

Nerium oleander L. is an important Chinese folk medicine. It is commonly known as kaner and is a spontaneous plant widely distributed throughout the Mediterranean region. It is a vegetatively propagated ornamental plant, valued for its evergreen foliage and show terminal flower clusters that are available in different colors. Oleander is cultivated recently as a flowering pot plant and therefore propagation of plant material at mass scale for commercial use is of great importance. This species also produces secondary metabolites, some of which are of pharmacological interests. The important pharmacological activities are anti-inflammatory, antibacterial, anticancer,

antinociceptive, and CNS depressant activity. It has been used for treatment of heart diseases, respiratory problems, aids and cancer. This explains the evidence-based information regarding the phytochemistry and pharmacological activity of this plant.

Distribution, Utilization and Ethnobotany of Nuts and Pseudonuts in North- Eastern Terai Region of Uttar Pradesh

Anil Kumar and V N Pandey

Experimental Botany Laboratory, Department of Botany,

D D U Gorakhpur University, Gorakhpur-270009, India.

E-mail: vnpgu@yahoo.co.in/anildwivedi0212@gmail.com

***Keywords**: Nuts, Pseudonuts, Distribution, Utilization*

North Eastern Terai Region of U P is situated in the foot hill of the Himalayas. Several Nuts and Pseudonuts are growing in forests, aquatic systems and agricultural lands. They are intimately associated with the inhabitants of the region for their health, environment and nutritional benefits since ancient times. Distribution of Nuts and Pseudonuts are not in regular pattern in the region but they are distributed according to their landscape, soil conditions, vegetation types and agro-climatic condition of the region. Several Nuts viz. water chestnut (*Trapa bispinosa* Roxb.), Litchi (*Litchi chinensis*(Gaertn.)Sonn),Kusum (*Schleichera oleosa*(Lour.)Oken, Jangali Badam (*Terminalia catappa* Linn.), Nuxvomica (*Strychnos nuxvomica* Linn.), Pecan nut (*Carya illinoensis* (Wang.) Koch. and Pseudonuts viz. Groundnuts (*Arachis hypogaea* Linn.), Physic nut/Purging nut (*Jatropha curcus* Linn.), Malabar nut(*Adhatoda vascica* Nees.), Gorgun nut/Fox nut (*Euryale ferox* Salisb.),and Pongum nut (*Ponga mia pinnata* (Linn.) Pierre; were recorded from different localties of terai region with their distribution, polyvalent utilization and ethnobotanical characterization and their association.

Diversity, Indegenous uses and Conservation Status of Some Important Medicinal Plants Around the Rural Areas of Jaipur District (Rajasthan).

Aparna pareek and PC Trivedi

Department of Botany

University of Rajasthan, Jaipur-302055

E-mail- aparna992000@yahoo.com

Keywords: *Ethnomedicinal plants, Plant resources, Habitat Protection.*

A floristic survey of ethno medicinal plants occurring in the tribal area around the rural areas of Jaipur District Rajasthan was conducted to assess the potentiality of plant resources for modern treatments. The information on medicinal uses of plants is based on the exhaustive interviews with local physicians practicing indigenous system of medicine, village headmen, priests and tribal folks Identification of active ingradients and mass multiplication of the potential species have been suggested in view of economic lmportance. Regular monitoring of populations and habitats of threatened medicinal plants, restricted harvesting and habitat protection are suggested.

Energy Dynamics of *Glycine max* L.

S.M.Kumar and A.K.Simba*

Department of Botany, Ramesh Jha Mahila College, Saharsa , Bihar

* Department of Botany,

P.M.S. College, Paharpura, Biharsharif, Nalanda, Bihar

Keywords: *Calorific value, Soybean*

The study deals with Calorific value of two varieties of Soybean i.e. BS-1 and BSS-2 growing in the vicinity of Sasaram, Rohtas, Bihar. The mean Calorific value of variety BS-1 was maximum compared to variety BSS-2 in different components of soybean.

Ethnobotanical and Phytochemical Studies of *Selaginella bryopteris* "The Sanjeevni"

Subhajit Mondal[1], Soma Sukul nee Chunari[1] and Mrinmoy Ghosh[2]

[1&2]Department of Botany,

Visya –Bharti (a central university), Shantiniketan, West Bengal

E-mail:sc_vbharti@rediffmail.com

Keywords: *Selaginella bryopteris, ex-situ conservation, Sanjeevni, Phytochemical analysis.*

Selaginella bryopteris is one of the plant, listed as "Sanjeevni" ,as described in the Ramayan. It is a non flowering vascular plant. Traditionally the plant has certain medicinal properties and is used by the local people for centuries. It has very high drought resistance capacity also. The indigenous knowledge of this plant was gathered and phytochemical screening for active compounds along with some phytochemical analysis was done. Attempts are to be taken for, ex-situ preservation of this plant inside the departmental medicinal garden.

Ethno-Botanical Status of Plants for Eladi Gutika of an Indian Classical Medicine (Charak-1000 B.C.) Commonly Prescribed in Modern Era Too: Needs Intensive Exploration.

R.K. Goel, Rajesh Kumar Singh and B.N. Pandey

Environmental Biology Laboratory,

Department of Botany, Magadh University,

Bodh-Gaya- 824234 (Bihar) India.

Keywords: *Indian Classical Medicine, Eladi Gutika, Eco Taxonomy.*

Obtaining drugs from plants has been a traditional way in the Indian system of medicine (Ayurveda). It is rightly said that ancient wisdom has been and will remain the basis of moder medicine. The ayurvedic system which is very well documented in ancient scriptures such as Atharvaveda (5000 B.C.) Charak Samhita and Sushrut Samhita (1000-800 B.C.) is being still practices in India. Ayurvedic system is of great significance due to the rich biodiversity obtained in our country. There is wide variation in climatic conditions when one travels from Kashmir to kanyakumari and from deserts of Rajsthan to NEFA (North-Eastern frontier area- the rain forest of Sikkim, Assam, Meghalaya, Arunanchal Pradesh, Manipur, Mizoram, Nagaland).

Ayurvedic formulation plays an important role in testing various diseases. Eladi Gutika is one of these formulations, which has been using for testing various chronic diseases like cough (kasa) respiratory and tuberculosis problems etc. It was first describe in Chrack Samhita (1000B.C.) and later in subsequent Classics. Eladi Gutika consists of Tej Patta (*Cinnamomum tamala* (Buch-Hem) T.Ness. & Ebram). Twak (*Cinnamomum zeylanicum* B1), Pippli (Piper longum L), Madhuayashti (*Glycyrrhiza glabra* L.), Khajura (*Phoenix sylvestris* (L.) Roxb.), Draksha(Vitis vinifera L.), Sugarcandey (Saccarum officinarum L.) all the ingredients powered and mixed with honey to prepare the pills of 12gms each, according to Charak and other available literatures. Plant species of the Eladi Gutika belong to 8 species of 7 genera under 7 families (Dicot=4, monocot=3). These also include wide range of habit (Tree=02, Shrub=02, Herb=04), Habitat (Merophytes=07, Xerophytes=01) and life forms (Phanerophytes=04, Therophytes=03, Hemicryptophytes=01). Eladi Gutika consists of leaves, stem, bark, flowers, fruits, seeds powder, mixed with honey. Increasing popularity of herbal perperation in management of chronic disorders at global level may be attributed to lesser side effects and now estimated that some of diseases where these products have found wide application are: liver diseases, asthma and rheumatological disorders.

Ethnobotanical Studies of Some Medicinally Important Plants of Karauli District of Rajasthan.

Vikram Meena, Aparna Pareek and LKPareek

Department of Botany,

University of Rajasthan, Jaipur-302055

E-mail: lkpareek@yahoo.com

Keywords: *Naturalwealth,Ethnomedicinal,Tribals.*

In the recent years there has been a reawakening among the ethnobotanists and other related people for getting knowledge about the medicinal uses of plants in one or the other way. This interest is developing in order to obtain different types of drugs and medicines of therapeutic value important for mankind. An attempt has been made to unveil some of the ailments common in human using household remedies by the tribals of karauli district of Rajasthan for which a wide survey was undertaken and knowledge in this respect has been well documented in the present study.

The medicobotanical natural wealth is used by the tribal people to overcome disorders and keep them fit. In the district a large number of ailments are successfully cured with the help of plant materials. About 212 plant species are used in treatment of various diseases like diarrhea, dysentery, cough and cold, fever and malaria, jaundice, cuts and burns, leucorrhoea, gonorrhea, asthma, birth control, impotency, sexual vigour etc. *Abrus precatorious*, *Acacia nilotica* susp. *indica,* Achyranthus aspera, *Asparagus racemosus*, *Azadirachta indica*. *Balanites aegyptiaca*, *Boerrhavia diffusa*, *Calotropis procera*, *Citrullus colocynthis, Ocimum sanctum, Phyllanthus niruri, Tribulus terrestris, Withania somnifera,* are important plants of ethnomedicinal value which are commonly used by the tribals and nomadic tribes of the area.

Ethnobotanical Survey and Biofunctional Utilization of Some Aquatic Plants in North Eastern Terai Region of Uttar Pradesh

A.K. Dwivedi*, Bobby Srivastava and V.N. Pandey

Experimental Botany Laboratory,

Department of Botany,

DDU Gorakhpur University, Gorakhpur-273009

E-mail- anup_airgkp@rediffmail.com

***Keywords**: Ethno botany, Nutraceutical, Biofunctional Utilization, Aquatic Plants.*

Forty three aquatic plant species belonging to 22 families from the flora of North-Eastern Terai Region of Uttar Pradesh, India have been surveyed and documented for plant diversity, their medicinal, traditional and edible uses through collecting information/ knowledge gathered by means of questionnaire surveys, observation and field visit. Out of these 43 plant species 5 species were used as leafy vegetable, 9 species as vegetable, 12 species as fodder, 10 species as medicine and 7 species were used commonly as food, fodder and medicine. The use of above ground parts like leaves (51.16%), young stem and shoots (16.27%), seeds and fruits (20.9%), flowers and petioles (20.9%) and underground parts like tuber, bulb and root (37.2%). The survey reveals that aquatic plants have been used traditionally since ancient time as a remarkable nutritional and medicinal source and could be exploited as potent source of dietary food protein and reservoir of many bio functional secondary metabolites, which can be used as preventive drugs, nutraceuticals, pharmaceuticals and other industrial uses.

Ethnomedical Value of Family Liliaceae with Special Reference to *Asparagus Officinalis*

Santosh Kumar Jha[1]* Ranveer kumar singh[2] and Usha Singh[3]

1. PG Department of Plant Science. J.N.R.M.PORT BLAIR
2. Research Scholar Nalanda Open University, Patna,
3. Ex Pro V.C. Nalanda Open University, Patna,

*E-mail: - yesbotany@gmail.com

***Keywords**: Aphrodisiac, antispasmodic, antiulcerous, hyperdipsia, neuropathy, immunostimulant*

Asparagus (*Asparagus Officinalis*) is a member of the Lily family, also known as sparrow grass, is a vegetable which has been grown from early times in ancient Egypt and in the Roman Empire. Because it is rare and pretentious to both growing and cooking conditions, the plant is considered to be a delicacy.Asparagus has been used from early times as a vegetable and medicine, owing to its delicate flavour and diuretic properties. Asparagus is low in calories and is very low in sodium. It is a good source of 6%6%%%%6%vitamin B_6, calcium, magnesium and zinc, and a very good source of dietary fiber, protein, vitamin A, vitamin C, vitamin E, vitamin K, thiamin, riboflavin, rutin, niacin, folic acid, iron, phosphorus, potassium, copper, manganese and selenium, as well as chromium, a trace mineral that enhances the ability of insulin to transport glucose from the bloodstream into cells. The amino acid asparagine gets its name from asparagus, the asparagus plant being rich in this compound.

It is used to control some stomach affections, clean the liver, lungs and intestines of their wastes and toxins. Apart from its depurative effects, the vegetable also has a protecting action on the arteries. Consumed regularly, it prevents the development of arteriosclerosis and cleans the blood. For cases of physical or intellectual asthenia, anemia and convalescence, the asparagus diet is recommended, consumed in its raw state. Also, for treating cardio-vascular erythrism, the raw asparagus diet is recommended. Consuming

this vegetable stimulates the decrease of glycosuria and increases diuresis, a reason why it is recommended to diabetics. The asparagus stem has the property of eliminating toxins from the digestive trap. The pulp of the asparagus stem is used, its exterior side being first cleaned. The **asparagus root**, boiled in vinegar, is used in treating paradontosis. The asparagus tea is used for its diuretic actions.

The dried v1root of asparagus is used in Chinese and Indian medicines as a tonic, galactogogue, and aphrodisiac, rejuvenator, antispasmodic, antiulcerous and antiinflammatory. The medicinal/pharmacological value of asparagus root is attributed to the presence of steroidal saponins and sapogenins. The root of asaparagus is also used in the treatment of nervous disorders, dyspepsia, diarrohea, dysentery, tumours, hyperdipsia, neuropathy and hepatopathy. This plant is reported to have immunostimulant, antihepatotoxic and antioxytocic activities. Recent reports on asparagus indicate that the root extracts have antioxidant and antidiarrhoeal activities in laboratory animals.Regorus scintific studies are require to authenticiate the medicinal/pharmacological value of asparagus species.

Ethno-medicinal plants from kandhar fort of Nanded district of Marathwada, Maharashtra State.India.

V.B, Chavan, and O.S. Rathor

Research lab .& P.G. Department of botany, N .E .S. Science College. NANDED

E-mail:drchavanbotany@yahoo.com

Keywords: *Folk medicine, Kandhar Fort,Conservation,Maharashtra*

Forts are the historical and cultural heritage of a particular geographical region. Forts were built from the protection point by the owner now they are conserving some of our flowering plants the present study deals with floristic and ethno-medico-botanical aspects of Kandhar fort situated in Nanded district of Maharashtra. About 13 medicinal plants which are well conserved in this fort are listed here with along with their known

medicinal uses described by local people.This study is important from bio-prospecting point of view.

Ethnonutraceutical Value of Coffee Plum (*Flacourtia jangomas*): An Endemic Plant of North Eastern Terai region of U.P.

Neeharika Dubey and V.N. Pandey

Experimental Botany Laboratory, Department of Botany

DDU Gorakhpur University, Gorakhpur-273009.

***Keywords**: Nutraceutical value, coffee plume, endemic plant, Terai region.*

Flacourtia jangomas (Lour.) Raeusch belong to family Flacourtiaceae is very important underutilized vegetable plant of Gorakhpur and indigenous to North Eastern region of U.P. *Flacourtia jangomas* is medicinally very important plant. The leaves and young shoots are astringent and stomachic. Fruits overcome biliousness, nausea and diarrhea. Leaves and bark are applied in bleeding gum aching teeth. Ripe fruit contain good amount of potassium which has definite role in regulation of blood pressure. Followed by phosphorus and Mg having their role in controlling osteoporosis. A paste of roots is applied to sores, ulcers and to soothe an anflamed throat. Therefore, the plant should be conserved for sustainable utilization and their nutraceutical potential through agriculture, Industry and pharmacology.

Ethnonutramedicinal Plants of Gorakhpur Region

V.N.Pandey and J.N. Singh

Experimental Botany Laboratory, Department of Botany,

DDU Gorakhpur University, Gorakhpur -273009

E-mail: vnpgu@yahoo.co.in

***Keywords:** Ethnonutramedicinal plants, Documentation, Gorakhpur Region.*

The medicinal plants play very important role from times immemorial among the illiterate and highly civilized men and women in the folklore, superstition, traditions, various rituals wearing of amulets, witchcraft and chanting of mantra connecting with healing of disease, warding off influence of evils sprits, and changing of fortune in one's all of which still practiced by human being. The tribals of this region are generally called Tharus. They are using several plants and their parts, for cure of various diseases. The real information of medicinal uses of various herbaceous flora were found in their villages and adjacent forest areas of Gorakhpur. The herbaceous flora available in the Gorakhpur region were surveyed and identified their properties for cure of several diseases has been recorded and documented.

Evaluation of *Sida glutinosa,* Comm. ex Cav for Prelimimary Physico-chemical, Phyto-Chemical Properties, Antimicrobial activity and Antioxidant activity

Ravishanker H.G. Divya,R., Mamatharani,D.R., Deepak R. Chandra and G.Panduranga Murthy

Centre For Shridevi Research Foundation

Shridevi Institute of Engineering and Technology

Sira Road, Tumkur-572 106

Keywords: *Ethno-medicinal plants,Sida glutinosa Physico- chemical, Phyto-Chemical Properties, Antimicrobial activity and Antioxidant activity*

'Ethnomedicine' is a medical system based on cultural beliefs and practices of specific ethnic groups and are the most exclusive sources of life saving drugs for the majority of both rural and tribal population.In the present study, *Sida glutinosa,*comm. ex cav practicedby Soliga community at B.R. Hills of Chamarajnagar district, Karnataka. The plant belongs to family *Malvaceae,* commonly called as *'Sticky Fanpetals'* and is sub-shrub which available in the forest at shady areas along Ravines. The extract of *Sida glutinosa cures* diarrhea and is invigorating and invigorating and nutritive. It is

invigorative and nutritive. It is also cafficacious in diseases caused by deranged kapha. The rejuvenating action of this extends to the nervous, circulatory and urinary systems. It has a diuretic and is useful in urinary problems, including cystitis, Being cooling and astringent, it is used inflammations, infections and bleeding disorders. The present paper deals with the pharmacognostic evaluation through preliminary physicochemical, phyto-chemical analysis, antimicrobial, and antioxidant activity of leaf of *Sida glutinosa,* in order to establish authenticity and possibly to distinguish drug form other species. The result reveals, Fluorescence analysis of different successive extracts and powder were noted under UV light and normal ordinary light, which signifies these characteristics. The physico-chemical parameters such as, *total ash, Acid in-soluble Ash, Water soluble Ash,* and proximate analysis i.e., foreign organic matter were carried out as per WHO procedures. The Methanolic extracts of the above plant, contained many bioactive constituents including *carbohydrates, proteins, Lipids, flavonoids, Saponin, Alkalosids, Terpenosids, Steroids,* and Phenols respectively. The extract was found to possess antimicrobial activity of E *coil, Pseudomonas aeruginosa,* Citrobacter, Enterococcus species, Staphylococcus aureus isolated from infected patients. The antioxidant activity was tested using DPPH Radical scavenging assay the activity was increased in concentration. This study helps in understanding the nature of the active constituents in the ethno-medicinal plant, *Sida glutinosa* will be significantly helpful for further detailed analysis to substantiate and authenticate the herbal/tribal drug.

Food Value and Medicinal Uses of *Carica papaya* Linn. (Caricaceae)

***Pummy Kumari, [1]S.S.Hussain and [2]A.Wasi**

[1] *Principal, H.R.College, Amnour, J.P.University, Chhapra, Bihar*

[2]*Department of Botany, Al-Hafeez College, Ara Bihar-802301*

E-mail: azharwasi786@gmail.com

Carica papaya Linn. is an unbranched, perennial, unisexual, dioecious, herb, 3-6 metre tall, with crown at the end of trunk. Leaves: long-petioled, palmately - lobed; lobes : again lobed once or twice, with peltate base and milky latex. Male flowers : 2.5-3 cm

across white, in axillary panicles of cyme. Corolla of male : gamopetalous. Stamens : 5+5 diplostemonous. Female flower : unisexual, pistillate, actinomorphic, pale-white, with milky latex in solitary or short axillary cymes. Ovaries : 5-carpellary and unilocular, superior ; style : short; stigma : 5-lobed. Berry : Cylindrical, ovoid or pyriform, with small seeds. Seeds : black, with an outer sappy and an inner hard testa. (H.H. Haines, 1921-25; C.R. Babu, 1977: Pandit 1996; Bailey, 1949).

Indigenous Medicinal Plants Used in Animal Therapy by the Tribes of Dumka District of Santal Pargana, Jharkhand

Anuradha Das and Sutanu Lal Bondya

P.G. Department of Botany

Sido Kanhu Murmu University,Dumka, Jharkhand

Keywords: *ethno-veterinary, horopaths, ethno-botanical, phyto- therapy.*

The present paper deals with the documentation of 22 plant species used as ethno-veterinary medicine for the treatment of various ailments prevailing in the domestic animals by the ethnic-people, both tribes & the non-tribes in Dumka district of Jharkhand. During the ethno-botanical field survey in different blocks of Dumka district, some plants used as veterinary- medicines by indigenous people were recorded. The indigenous folk populaces are well acquainted with these plants and are in practice to use them in the treatment of various diseases of their domestic animals. The therapeutic informations, method of drug preparation, application, doses, duration & other related informations were recorded through interview conducted with tribal herbal medicine practitioners (Horopaths), Kaviraj, Vaids & other knowledgeable persons of the locality.

Indigenous Plant Medicine for Fertility Regulation: A Study on the Bhumija Tribe of Odisha

Bijayalaxmi Dash

FM Autonomous College, Baleswar 756 001,

Orissa, India

Keywords: *Indigenous plant medicine, Traditional healer, Fertility regulation*

The present paper makes an attempt to focus on the use of Indigenous plant medicine for fertility regulation among the Bhumija tribe of Odisha . The study reveals that eighteen plant species belonging to fifteen plant families are being used as traditional medicines for the cure of different fertility related problems. The village medicine men, who have a good source of knowledge about the herbal medicines usually diagnose and prescribe medicines for treating the patients. Many elderly persons of the village and the experienced women who attend the deliveries are also aware of the importance and use of such plant medicines. Various plants and plant-parts are being used for the preparation of medicines. It is found from the present study that even though the traditional reproductive health service is generally affordable and easy to access yet most of the younger generation respondents are being attracted by the modern medicines. Further, due to the process of urbanization and culture contact, there is always a threat to this indigenous knowledge of treatment. Hence, there is an urgent need to execute a revitalization strategy for protecting such rich indigenous medical knowledge from complete desertion.

Lantana camara L.: a Healer in Disguise

***Khushbu Goel and ** Shweta Goel**

*District Institute of Education and Training, Muzaffarnagar-251001 Uttar Pradesh, India

**Pushpanjali Crosslay Hospital, Ghaziabad-201012 UttarPradesh, India

*goelkhusboo@gmail.com

Lantana camara is considered as a weed since it is highly invasive. But despite this evil it has excellent pharmacological properties which can be exploited to use against many incurable diseases. It is in use as a herbal medicine since time immemorial around the globe. Its extracts exhibit antimicrobial, fungicidal, insecticidal, and nematicidal and many more properties. Extensive research work is needed to explore its healing qualities.

Medicinally Important Some Euphorbian Plants of Satpuda Region, Maharashtra State

Raghunath T. Mahajan[1*], Shamkant B. Badgujar[2] and Ashok P. Manekar[3]

[1]Department of Biotechnology, KCE Society's, Moolji Jaitha College, Jalgaon: 425001, Maharashtra, India

[2] Department of Nutrition, Food and Exercise Science, Florida State University, P.O. Box 3061493, Tallahassee, FL 32306-1493, USA.

[3]Department of Zoology, Institute of Science, Mumbai 400 032, Maharashtra, India.

rt_mahajan@rediffmail.com

Keywords: *Ethnomedicine, Tribals, Satpuda region, Medicinal plant.*

Plants have always been the source of food, medicine and other necessities of life since the origin of human being. Plant containing ethnomedicinal properties have been known and used in some forms or other tribal communities of satpuda region. These tribal have

their own system of ethnomedicine for the treatment of different ailments. In the course of survey useful euphorbian plants of satpuda, 33 medicinal plants belonging to 18 genus well documented. This manuscript reports their botanical identity, family name, local language name, part used preparations and doses, if any. In this study, whole plant was most frequently used ethnomedicinal home made recipe for the treatment of various diseases and *Euphorbia* was most commonly used genus. Interestingly, we noted 6 and 4 candidates were used in the treatment of skin and digestive system related problems respectively. Additionally, 2 members of this family involve in the treatment of respiratory, excretory and reproductive system. It was observed that tribe of this region uses various euphorbian plant in the form of decoction, infusion, extract, paste, powder etc. Thus the knowledge area of this region with respect to ethnomedicine shall be useful for pharmacologist and phytochemist for further explorations.

Natural Products as Lead for Development of Anti-Chikungunya Drugs

Patel Hiren, Manik Ghosh, B. N. Sinha, Debarati Sengupta

Department of Pharmaceutical sciences,
Birla Institute of Technology,
Mesra, Ranchi – 835215

Keywords: *Anti-chikungunya Drugs, alphavirus nSP2, Phytoconstituents*

Chikungunya virus is regarded as a potential worldwide public health problem, with no preventive or therapeutic means available. Outbreak in December 2005 more than 3, 80,000 reported cases of chikungunya in India. The alphavirus nSP2 protease is essential for correct processing and replication of the viral genome. In our study phytoconstituents present in the convention plants used for treating chikungunya were taken and docked into nSP2 to discover the main phytoconstituent responsible for anti-chikungunya activity and thus identify the lead. Flavonoid phytoconstituents like Quercetin & Leucocyanidin

gave good interactions with chikungunya protease. These natural products can be used as a lead for development of anti-chikungunya drugs.

Natural Products as Lead for Development of Anti-Dengue Drugs

Debarati Sengupta, Manik Ghosh,

B. N. Sinha, Patel Hiren

Department of Pharmaceutical sciences,

Birla Institute of Technology,

Mesra, Ranchi – 835215

Keywords: *Anti-dengue Drugs, Natural Product, NS2B-NS3*

Dengue virus alone poses a public health threat to 2.5 billion worldwide, leading to 50-100 million human infections each year. Neither effective therapeutics nor vaccine is currently available for it. In our study phytoconstituents present in the convention plants used for treating dengue were docked into dengue virus protease (NS2B-NS3) to check anti-dengue activity. Docking programs like Glide and FlexX were used for the study. Phytoconstituents like Flavonoids (Quercetin & Myricitrin) and anthracene (Cascarosides) gave good interaction with the catalytic triad (HIS51, ASP75 and SER135) of dengue virus protease NS2B-NS3. These phytoconstituents can act as lead for development of anti-dengue drugs.

Nutraceutical Potential of *Moringa oleifera* Lam.

Vandana Chauhan, V. N. Pandey and P. P. Upadhyay

Experimental Botany Laboratory

Department of Botany

D.D.U.Gorakhpur University Gorakhpur-273009

The *Moringa* tree is a multifunctional plant. *Moring.oleifera* Lam. is one of the widely distributed and naturalized plant of a monogeneric family Moringaceae. *Moringa oleifera* Lam. has been cultivated in tropical regions all over the worlds for use as food

and medicine. The utilization and their bioprospection has been documented which shows- high protein, Vitamins, Minerals and carbohydrates contents in the plant. Seed is edible and have biotic medicinal value. In addition, *Moringa.oleifera* was recorded and referred to as the "drumstick tree" or the "horseradish tree". Therefore, conservation of *Moringa.oleifera* is essential for biotic and sustainable utilization.

Nutraceutical Potential of Some Aquatic Plants of North Eastern Terai Region of U.P.

Alka Gupta and V. N. Pandey

Experimental Botany Laboratory, Department Of Botany,

D. D. U. Gorakhpur University, Gorakhpur, 273009

E-mail- vnpgu@yahoo.co.in

Keywords: *Nutraceutical value, Food, Medicine, Aquatic plants.*

North Eastern Terai Region of U.P. is low lying area and highly congenial for growth of aquatic plants. The soil type is mostly gangetic alluvial and clayey alluvial and contain sufficient amount of carbonic material. The annual rain fall of this region is approximately1150 mm. About half of the aquatic plants species of the world are found in India and North Eastern Terai region of U.P. harbours green lush vegetation of Aquatic plants. Aquatic plants should be considered separately as a potential crop because each reservoirs of water are tends to be dominated by a single species and the water often contains nutrients such as N, P, and K sufficient to encourage luxuriant growth. The present study was designed to assess the food and medicinal value of aquatic plants viz. *Nymphaea nauchali* Burm. (Berrha), *Euryale ferox* Salisb. (Talmakhana), *Alternanthera paranychioides* St. (Girni). and *Enhydra fluctuans* Lour. (Pamparnhua). These plants play important roles in the maintenance of health and cure of diseases. So the attempt has been made to show that these aquatic plants have the potential to be used as Nutraceutical i.e. as food and medicine.

Pharmacognostic Studies of *Ampelocissus latifolia* (Roxb.) planch. – an Important Ethnomedicinal Plant

Sutapa Choudhury, Chowdhury Habibur Rahaman & Sudhendu Mandal[1]

Department of Botany, Visva-Bharati, Santiniketan-731235, India

E-mail: smandalbot@gmail.com [1]

Keywords: *Ampelocissus latifolia, pharmacognostic features, stomata, palisade ratio, ash value, moisture content, antimicrobial activity.*

The evaluation of quality and purity of crude drugs by means of various parameters is the most important aspects of pharmacognosy. The present study deals with different pharmacognostic parameters of *Ampelocissus latifolia* (Roxb.) Planch., an ethnomedicinally important plant of the family Vitaceae. The common name of the plant is 'Jungli angur'. Juice of tender leaves used in dental problems and as a detergent for indolent ulcers. The plant bears hypostomatic leaves and stomata are mainly anomocytic with few anisocytic types. Palisade ratio is 4 and stomatal index is 9. Needle shaped Ca-oxalate crystals are present on both epidermal surfaces of the leaf. In the methanolic extract of the leaf, the detected phytochemical groups are alkaloids, reducing sugars, gums, tannins and anthraquinones, etc. Ash value and moisture content of the leaf are 31.23% and 77.09 % respectively. The drug powder treated with different chemical reagents gives characteristic colourations when seen under UV light. This plant seems to be very potent against different Gm +Ve and Gm –Ve bacteria. This study will throw new data regarding the uses of ethnomedicine to the state as well as national level inventory of the medicinal plant resources of our country.

Phenological Observation of Medicinal Plant Species in Sagar M.P.

Kaushlesh Pathak, S.P.Bajpai & C.D. Athaya

Department of Botany, Govt P.G.College Tikamgarh (M.P.)

E-mail-pkaushlesh@yahoo.in

Keywords: *Phenological, Medicinal Plant, Leafing, Temperature and Climate.*

Phenological studies of five medicinal plant species namely *Asparagus racemosus, Andrographis paniculata, Helicteres isora, Mucuna prurita* and *Gloriosa superba* have been undertaken. The timining of phenophases is clearly correlated with air temperature, soil temperature, photoperiod, soil moisture but vary from species to species. Phenological changes in response to climate change have a wide range of consequences for ecology, agriculture or forestry and human health.

Phytoplanktonik Index with Reference to Bhalwahi Pond, Gaya

M.Shamsul Islam[1] & Md. Muzafar Imam Ilyasi[2]

[1]SMSG College, Sherghati, Gaya (M.U.Bodhgaya)

[2]K. V.No.-3, Bokaro Steel city, Bokaro.

Keywords: *Diversity Index, Phytoplankton, Physico-Chemical.*

The number of species in a community increases with the complexity of food webs and with the extent of niche overlap or species packing. Diversity Index reflects changes in overall information content rather than enumeration upon an individual species composition changes. Replacement of one genera by another would not hamper the diversity index, it would remain constant. However the changes in genera may be indicative of significant environmental modification Shannon's & Weaver's diversity index for different algal classes witnessed in Bhalwahi Pond, Gaya have been documented which reflects the pollution stress upon the pond ecosystem. The value lies between 2.00-3.56 which reflected a mild pollution in pond.

Preparation of Value Added Products Utilizing Unutilized Flora Through Dehydration Technique

S.K. Datta and Supriya Roy

Achrya J.C Bose Biotechnology Innovation Centre, Madhyamgram Experimental Farm, Bose Institute, Jessore Road, Madhyamgram, 24-Parganas (N), Kolkata 700129, India

subodhskdatta@rediffmail.com

***Keywords**: Unutilized flora, dehydration, floral craft*

There are wide range of wild/unutilized plant species which have the potential for commercial exploitation in different forms. Rural and hilly areas are covered with different types of colourful flowers and foliage at different seasons round the year and all these are wasted under natural process. The entire seasonal colourful vegetations can be converted into value added products by using simple dehydration technique. Dry flower market has grown exponentially as consumers become “eco-conscious” and dried flowers as the environmentally friendly and biodegradable alternative to fresh flowers Dehydration techniques have been standardized under room temperature, sun drying, hot oven drying, microwave oven and solar cooker, Dried flowers and foliage have multipurpose use : bouquets, gift boxes, will hanging, pot pourries, artistic greeting cards, getwell cards, calendar, pictures, flower basket, refrigerator magnets, mirror decoration, hats, embedding in gold/silver or resin to uses as jewelry, landscape, table mats, three dimensional arrangements of flowers for interior decoration etc. Floral album may be prepared for identification of plants of taxonomic studies, Dehydrated flowers may be used as botanical specimens for demonstration and for teaching studies. A cottage-scale industry based on floral craft can come up for slef-employment of unemployed youths and for earning money to the housewives as well as rural women through this creative through this creative occupation.

Productivity and Nutrient Composition of Four Popular Varieties Of Fodder Jowar

***K. B. Bendre and M. M. Rathod**

*Nanasaheb Y. N. Chavan ASC College, Chalisgaon 424 101

SSMM ASC College, Pachora 424 201

Keywords: *Sorghum, fodder, cultivation, cultivar,productivity, nutrient Composition*

Plant cultivars of *Sorghum* viz. Hara sona, Sweet sorghum (local), Ruchira and Phule yashodha were cultivated during 1999- 2000, for the measurement of yield and to evaluate nutrient status. The overall results indicated that Hara sona cultivar of *Sorghum* was more productive and could yield 64.60 t green fodder per hectare in 83 days and also found suitable in nutrient composition.

Recent Strategies for Biofuel Production for India

Nitesh Kumar Mund, Nihar Ranjan Nayak,

Pratap Chandra Panda andAjaya Kumar Mohapatra

Regional Plant Resource Centre, Nayapalli,

Bhubaneswar, Odisha, 751015, India

Substitute/supplement of petro-based fuel is essential for India's energy security. Significant advancement in the technology of biofuel production happened in recent years and can be used efficiently to meet the fuel demand particularly for transportation sector in India. This study analysed all the possible routes for biofuel production, such as sugar based ethanol, biodiesel and hydrocarbon fuels, the efficiencies of each route and the possibilities of using biotechnology and chemical engineering for upgrading each step involved in the process. Involvement of government, private industries and farmers towards achieving the goal are thoroughly analyzed. Effect of adopting biofuel production on rural economy, agriculture and environment are also discussed.

Some Medicinal Plants from Verbenaeceae in Ayurveda and their Identification on Basis of Foliar Trichomes

Shubhangi Ingole, O. S. Deshmukh*

Bar. R.D.I.K. and N.K.D. College Badnera-Amravati, Maharashtra (India)

*M. F. College, Warud, Dist. Amravati, Maharashtra (India)

E-mail: shubhaingole@gmail.com

Keywords: *Ayurveda, trichomes, Verbenaceae*

Quality control of crude drug and its pharmaceuticals be attempted by microscopial studies as anatomical characters are constant and fixed, hence reliable. Trichomes are reliable taxonomic markers as they are of diverse types and are diagnostic character not only helpful in identification of particular plant species but also of crude drugs and detection of adulterants. In present attempt, foliar trichomes of four important medicinal plants of Verbenaceae viz., *Volkameria inermis* L. (Vanajai, Garden quinine), *Rotheca serrata* (L.) Steane & Mabb. (Bharangi), *Gmelina arborea* Roxb. (Shivan) and *Vitex negundo* L. (Nirgudi) which are used in Ayurveda with their known medicinal values, are studied. Main types of trichomes are found as non-glandular and glandular which are further classified on basis of structure, shape, number of cells, wall and surface characteristics, contents, types of bases and apices etc. These are found species specific and can be the best source of identification. In present work the therapeutic uses of all these four medicinal plants belonging to family Verbenaceae are given and key for their separation based on foliar trichomes is presented.

Some Poaceous Grasses in Ethnic of Mithila (North Bihar), India

Vidyanath Jha' A.B. Verma[2] and Rajeev Kumar[1]

Department of Botany, L.N. Mithila University, Darbhanga.

1. M.L.S.M. College, Darbhanga-846004 (Bihar), India

3. Marwari College, Darbhanga-846004 (Bihar), India

Keywords: *Poaceae, North Bihar, Ethnic, Vetiver, Sikkiart*

The humid and sub-humid regions of this Gangetic plants are the site of grass cover mainly consisting of coarse species which are utilized as fodder and also for rope making and thatching purposes. They also play a role in containing the ferocity of floods and as such constitute a living wall against natural disasters. This is more true in case of vetiver grass which with stands high floods due to its extensive aerenchymatous roots. This grass basis of the famous *sikki* handicraft and the same has proved a means to the economic emancipation of rural women in north Bihar.

The paper takes into account the utilization pattern of four poaceous grass species viz, *Vetiveria zizanioides* (Linn.) Nash, *Erianthus munja Je*sw. *Saccharum spontaneum L*inn. and *Desmostachya bipinnata* Stapf in the ethnic life of Mithila (north Bihar), India.

Status of Some Traditional Rice Varieties Cultivated in Odisha,India

T.Panda[1] and R.B.Mohanty[2]

1. Department of Botany, S.N. College, Rajkanika, 754220 , Odisha, India

2. Depar tment of Botany, N.C. College, Jajpur-755001, Odisha, India

E-mail: taranisenpanda@yahoo.co.in

Keywords: *Local landrace; Rice germplasm; Kendrapara district*

Results of ethnobotanical investigation of traditional rice varieties cultivated in the interior localities of Kendrapara district, Odisha, India are presented. Data were collected during 2009-11 of field study. A total of 69 varieties of paddy befitting the geo-climatic

conditions of the place were identified. Seventeen varieties have already extinct and the remaining is in threatened state. Majority of them are disease and pest resistant varieties suitable for lowland cultivation. They are also resistant to water logging and flooding. These traditional varieties are being gradually replaced by the high yielding hybrid germplasms, thereby threatening the existence of many invaluable traits present in such local landraces.

Study of Phytochemical Properties, Pharmacological Activities of Triphala Along with its' Standardisation Using Marketed Samples

Bhattacharya Sarthak *[a], Gupta Ved Prakash [a], Mishra Vijay [a], Fanuel Hagos [b], Sultan Suleiman [b], Zeleke Mekonen [b], Chaudhary Amar Singh [c], Kohli Seema [d], Dixit Ankit [e] and Singh Meenakshi [e]

a. GRKIST (Pharmacy), Jabalpur, India (*Presenting author).

b. Dept. of Pharmacy Practice, School Of Pharmacy, Jimma University, Ethiopia, Jimma, Ethiopia.

c. Dept .of Pharmacognosy, PDM Collage of Pharmacy, Bahadurgarh, Haryana, India, Bahadurgarh Haryana, India.

d. Dept. of Pharmacy, Kolaniketan Polytechnic, Jabalpur, India.

e. Dept. of Herbal Drug Technology, College of Pharmacy-GRD(PG)IMT , Dehradun, India

***Keywords**: Triphala, Amalaki, Bibhitaki, Haritaki, phytochemical constituents, pharmacological activities*

Triphala ("three fruits") - Amalaki (Emblica officinalis), Bibhitaki (Terminalia belerica), Haritaki (Terminalia chebula) originating in India, help to detoxify and cleanse the colon, purifies the blood and removes toxins from the liver, reduce some forms of Cholesterol (serum cholesterol), and reduces high blood pressure. Triphala is as a purgative form of laxative. Aim of the work was to study the phytochemical constituents, pharmacological activities and standardization of Triphala with marketed preparations. Main

phytochemical constituents include glycoside, proteins, tannin and phenolic compounds, Ascorbic acid. The standardization was done based on following parameters: TLC-Rf value :- (D) 0.73 (V) 0.71 (C) 0.73,PH Profile- (D) 2.8 (V) 3.4 (C) 3.1,Angle of repose: - (D) 41.02 (V) 42.6 (C) 33.42,Moisture content: - (D) 4.33% (V) 6.66% (C) 3.66%,Absorbance analysis:-At 450nm (D) 0.698 (V) 0.614 (C) 0.754,Ash value: (D) 13.33% (V) 6.66% (C) 64%,Extractive value: (D) 55.2% (V) 33.6 (C) 64%.D= Dabur India Ltd., V= Vaidyanath Pharma Ltd, C= Lab Mix. From the above experimental findings it is being proved that the mixture being prepared in our laboratory is competent enough to compete with the marketed preparation manufactured by two Dabur based on standardisation protocols. Our mixture is assumed to have the same therapeutics effects compare to existing formulations but still it demands further study for achieving the goal related to standardisation of Triphala.

Study on Ethnobotanical Plants: A Wide Survey, Traditional Conservation and Their Scientific Documentation.

Vikram Meena,Aparna Pareek and LK Pareek

Department of Botany,

University of Rajasthan,

Jaipur-302055

E-mail : lkpareek@yahoo.com

***Keywords**: Tribals,Traditional Knowledge,documented.*

The tribals and the rural population of India are highly dependent on medicinal plant therapy for meeting their healthcare needs on one hand and for their various domestic needs on the other hand. This attracted the attention of several researchers to obtain the knowledge of ethno-botanically important plants. In view of this wide and comprehensive survey was undertaken to procure interesting findings and traditional knowledge of the tribal people of karauli district which includes the knowledge pertaining to plants used in medicine, edibles, timber, fiber, fodder, shelter, musical instruments, famine and

ceremonies. All such plants of the district have been systematically identified and scientifically documented. Attempts have also been made to study some of these important plants including medico-ethno-botanically important plants.

Traditional Knowledge System on Medicinal Plants *vis a vis* Biodiversity Conservation in the Sacred Groves of Meghalaya: Threat Analysis Through Case Study

B.P. Mishra

Department of Environmental Science,

Mizoram University,

Aizawl- 796 004, Mizoram India

Keywords: *Biodiversity conservation, eco-restoration, sacred grove, traditional health care system.*

The state of Meghalaya in the north east India has been recognized for the sacred groves with regards to conservation of biodiversity with particular reference to the medicinal plants. These groves are the forest patches scattered throughout the state and managed by local indigenous tribal community mainly for herbal medicines, and about 80 percent population depends on traditional herbal medicines. The ethno-medicinal knowledge is inherent in some elderly aged people who are entirely engaged to find out medicinal value of a species. The management of the sacred groves is based on religious beliefs associated with grove and size of grove ranges from 0.1 to 900 ha. A detailed survey of 80 sacred groves in different districts of the state depicts that majority of groves are facing different degree of disturbance indicating ongoing struggle between human needs and resource availability. This could be attributed to the tremendous increase in human population. The present study was conducted in the sacred grove along disturbance gradient and findings depict alteration in the plant community organisation and other attributes. With increased level of disturbance the tree species are replaced by shrubs and finally by herbs. The disturbance in the grove may also lead to loss of soil fertility and

finally resulting into unstable system. The aim of biodiversity conservation in degraded groves may be achieved through eco-restoration practices, mainly plantation in gaps created through disturbance. There is ample scope of mass awareness programme to conserve such groves, as many medicinal plants are confined to these groves only. For proper conservation of grove vegetation, integrated management approach involving government, NGOs and local indigenous community, needs to be implemented by the government, and the people having ethno-medicinal knowledge should be encouraged through award. The indigenous knowledge may also be documented.

Usage of Medicinal Weeds as Income Source for Poor Farmers in Rajasthan

Hans Dinesh

Department of Botany,

Government College,

Jalore-343001 (Rajasthan), INDIA

*drdineshhans@hotmail.com

Keywords: *weeds, medicinally important, agrarian Citrullus colocolusynthis, onvolvulus microphyllus, Corchorus depressus, Solanum nigrun and Tephrosia purpurea, income, economy and tribal.*

In the present communication very preliminary attempt has been made to evaluate the economical aspect of those medicinally lmportant weed plants which are generally considered to be of no use by poor agrarian farmers. The comparative study of control and treated plots which were made in randomized block design showed the anticipated result of significant increase in seed yield for all the three crop plants Viz., Bajara 3.5 (±1.325), Maize 4.0(±1.113) and winter crop plant wheat 3.03 (±1.222) and the treated plants showed the significant decrease in the seed yield Viz., Bajara 3.0 (±0.136), Maize 3.5 (±0.115) and winter crop plant wheat 2.8 (±0.042) for all the three crop plants. The brief account of traditional herbal remedies which are not known by the poor agrarian formers, but are known only by the local rural and tribal people Viz., Rabarii,

Bhils Nayak and Garasia and other minor communities of the district is collected and documented as a ready reckoner for all the scientist, researchers and also for the local poor agrarian fopmers. Finally the very important and applied aspect of the study which implies to the selling of these medicinally important weed plant/parts *Citrullus colocolysynthis* (9-12/-), *Convolvulus microphyllus* (11-14/-), *Corchorus depressus* (10-15/-), *Solanum nigrum* (12-45/-) and *Tephrosia purpurea* (12-45/-) to increase their economy. Thus the triple utilization of the medicinally important weeds were achieved i.e. 1) removing of weeds to increase the seed yield 2) medicinal use of the weeds and3) to increase the economy by selling the whole weed plant and parts.

Use of *Prosopis juliphlora* as a Fuel for Generation of Renewable Energy

***Shikha Mehra and Ajay Gupta**

Conservator of Forests,Medicinal plants

Deputy Chief Wildlife Warden,Jaipur Zoo

Energy being a critical input for socio-economic development, the energy policy of Rajasthan aims at efficiency and security and to provide access which being environment friendly and achievement of an optimum mix of renewable and non-renewable resources. Renewable energy sources having an edge over the non- renewable ones because of being indigenous, non –polluting and virtually inexhaustible .A case study conducted in Pali District shows that grasslands which had become futile could be regerated after eradication of *P.juliphlora* and revenue be earned by usage of *P.juliphlora* for production of coal .Further the launch of the policy for generating electricity from Bio-mass 2010 has paved the way for production of electricity from *P.juliphlora* occurring abundantly in government wastelands.

Plant Cytogenetics & Molecular Biology

A Study of Parental Species of Bauhinia *blakeana* Dunn. using Morphological, Cytological and Phytochemical Data

Kumari Nutan Sinha, Ammeetha Sinha and Meenakshi Singh*

Plant Biosystematics and Molecular Biology Laboratory

Patna Science College P.U.,

Patna

Keywords: *Bauhinia* species, Phytochemicals, Chromatography,Flavonoids, Meiosis

Bauhinia blakeana Dunn. is a hybrid belonging to Family Caesalpiniaceae, tribe Cercideae. Studies of Morphological, Cytological characters and Phytochemical screening of leaf materials of *B. blakeana* and its parental species have been carried out. The putative parental species shared many morphological similarities with *B. blakeana*. Average chiasmata per bivalent was intermediate between *B. purpurea* and *B. variegata*. Two common flavonols viz. kaempferol, quercetin (Quercetin-3-rhamnosides) were detected in all the species while isorhamnetin was detected in *B. blakeana* and *B. purpurea*. Apigenin was present in all the species. Results of the present study showed complementation of their putative parental species.

Advances in Development of New Varieties for Flower Crops

S.K. Datta

Achrya J C Bose Biotechnology Innovation Centre, Madhyamgram Experimentatl Farm,

Bose Institute, Jessore Road, Madhyamgaram, 24-Parganas (N), Kolkata 700129, India

E-mail: subodhskatta@rediffmail.com

Keywords: *Flower crops, induced mutagenesis, mutation, new Variety.*

Ornamental crops include a large variety of plants. In commercial floriculture there is always demand and necessity for new and novel varieties, Bud sports, conventional breeding and induced mutagenesis have played very important role in development of majority of present day ornamental varieties, techniques for classical breeding (natural cross, open pollinated seedling selection and selective breeding) for development of new varieties have been standardized in different popular heterozygous and polyploidy ornamentals. Mutation breeding in now an established method for crop improvement and has played a major role in the development of many new flower colour/shape mutant varieties in ornamentals. The main bottleneck with vegetatively propagated plants is that the mutation appears as a chimera whether developed through bud sport or though classical mutation breeding after treatment with physical and/or chemical mutagens. A novel technique has been standardized for the management of such chimeric tissues through direct shoot regeneration from flower petals. This direct novel regeneration protocol has been successfully used not only of new flower colour/shape mutant chimeric tissues developed through mutagenesis. The paper will highlight the technological advancement and cultural practices for development of new and novel ornamental varieties.

Advances in Development of New Varieties for Flower Crops

S.K. Datta

Achrya J C Bose Biotechnology Innovation Centre, Madhyamgram Experimentatl Farm, Bose Institute, Jessore Road, Madhyamgaram, 24-Parganas (N), Kolkata 700129, India

Email : subodhskatta@rediffmail.com

Keywords: *Flower crops, induced mutagenesis, mutation, new Variety.*

Ornamental crops include a large variety of plants. In commercial floriculture there is always demand and necessity for new and novel varieties, Bud sports, conventional breeding and induced mutagenesis have played very important role in development of majority of present day ornamental varieties, techniques for classical

breeding (natural cross, open pollinated seedling selection and selective breeding) for development of new varieties have been standardized in different popular heterozygous and polyploidy ornamentals. Mutation breeding in now an established method for crop improvement and has played a major role in the development of many new flower colour/shape mutant varieties in ornamentals. The main bottleneck with vegetatively propagated plants is that the mutation appears as a chimera whether developed through bud sport or though classical mutation breeding after treatment with physical and/or chemical mutagens. A novel technique has been standardized for the management of such chimeric tissues through direct shoot regeneration from flower petals. This direct novel regeneration protocol has been successfully used not only of new flower colour/shape mutant chimeric tissues developed through mutagenesis. The paper will highlight the technological advancement and cultural practices for development of new and novel ornamental varieties.

An Assessment of Genetic Diversity of three Sugarcane Varieties by RAPD Markers

Kalpana Sengar[1], and Sanjay Kumar Garg[2]

[1]Tissue culture Lab, College of Biotechnology,

Sarda Vallabh Bhai Patel University of Agriculture & Technology, Meerut-250110.

[2]Department of Plant Sciences, M.J.P. Roheilkhand University, Bareilly.

Email: *kalpana.sengar19@gmail.com; rakesh.sengar 77@gmail.com*

Keywords: *Callus culture, sugarcane, shoots regeneration, light intensity photoperiod, in vitro micropropagation.*

Assessing variability and identification of available germplasm are essential components of crop improvement programs. Knowledge of the genetic distances among different varieties is very useful for genetic improvement. The RAPD-PCR technique has been used successfully in this regard. RAPD-PCR amplification patterns resolved varying degrees of polymorphisms between the three sugarcane genotypes considered in this

study. The RAPD-derived genetic similarity indices ranged from 9% between coS 96258 share 22% of their genomes. These results suggested a relatively wide genetic diversity among these genotypes.

Chromosomal Changes In Root Explants During In Vitro Growth In Jute *(Corchorus olitorius* L. variety JRO-632)

A. Chatterjee and P.K. Ghosh

1. CSB, CSR and TI, Berhampore-742101, Murshidabad, West Bengal

Centre of Advanced Study in Cell and Chromosome Research,

Department of Botany, University of Calcutta, 35

Ballygung Circular Road, Calcutta-700047

E-mail: paritush.ghosh@rediffmial.com

Keywords: *Root, Chromosome, Corchorus olitorius, Auxins, Cytokines.*

The root of jute plants *(Corchorus olitorius* L. variety JRO-632) were grown in vitro cultured aseptically on 20 ml solid nutrient medium Murashige and Skoog's (1962) (MS) and Schenk and Hildebrandt's (1972) (SH) media were tried with various combinations and concentrations of different auxins (NAA, IAA, IBA and 2,4-D used separately o,o170 mg/L to 0.3500 mg/L) and cytokines (BAP, Kn used separately 0.1400 mg/L to 3.3000 mg/L, coconut milk 10-35% (V/V). It has been observed that the callus growing in medium containing NAA revealed different degree of ploidy and mitotic abnoramlities such as stickiness, clumping, diplochromatids and spindle disturbances from the early stage and the mitotic index was also recorded. The frequency of chromosomal abnoramlities gradually increases with the age of the callus tissues increases. A comparison of the cytology of the callus growing in NAA and the regenerating callus growing in IBA revealed differences in the rate of division and mitotic abnormalities, while that growing in IBA exhibited just and higher rate of mitotic abnormalities, while that growing in IBA exhibited just the opposite effect. It appears that NAA has a distinct role to play in influencing Karyological instabilities and mitotic rate of cells and also

observed the role different hormones in inducing karyological changes during in vitro growth. The object of the present investigation was that to find out the role of different constituents of the medium in controlling in vitro growth and the karyological changes which they induce during organogenesis and callus formation of jute root explants (*Corhorus olitorius* L.Variety JRO-632).

Combining Ability Analysis in Varietal Crosses of Maize

Prem Kumar and Yugeshwar Singh

All India Co-ordinated Maize Improvement Project

N.D. University of agriculture & Technology

Crop Research Station, Bahraich- 271801, up.

*Dept. of Botany, S.M.D. College, Punpun, Patna

Keywords : *Combining, varietal dialed, maize, heterosis*

Eight varieties of maize were evaluated following diallel mating design for determining their utility as parents in the development of hybrids and/or high yielding composites. For days to 50% tasselling and silking, and 1000-grain weight, variety (vi) effects; for plant and earlenght and diameter, both vi and specific heterosis (sij) effects; and for grain yield, sij effects were the most important contributors to the total entries sum of squares. Average heterosis (h) and variety heterosis (sij) effects were not so important for any trait. Cross between cvs. Navin and Population 26 showed significant and positive sij effects for grain yield, plant height, ear height and ear length. These two varieties represented a good choice to initiate inter population improvement.

The first attempt to utilize varietal hybrids in maize for increasing yield was made by Beal. Interest in the heterotic patterns of varietal crosses was limited during the early stages of commercial use for double crosses and single crosses, but dramatically increased after 1950 with the understanding of the theoretical background of recurrent selection. Lonnquist and Gardner and Moll *et at.* used a fixed set of random mating parental varieties and their diallel crosses in their experiments. Later on, the variety of

population diallel has been used to evaluate crops for several traits with the primary emphasis on yield. In the present experiment, we have attempted to examine the combining ability of parent varieties and their crosses.

Cytotoxic effects of *Raphanus sativus* root extract on root meristem of *Allium cepa.*

Amit Vaish and Roopam Saxena

Botany Department, N.M.S.N. Dass (P.G.) College, BUDAUN-243601 (U.P.), India

***Keywords* :** *Cytotoxic, Raphanus sativus, chromosomal abnormalities*

The cytotoxic effects of radish root were investigated on meristematice cells of *A. cepa* roots. Actively growing root tips of *A. cepa* were treated with five concentrations (100%, 75%, 50%, 25% and 10%) of the root extract for 2,4 and 6 hours respectively. The results showed that the root extract induced various types of nuclear and chromosomal abnormalities such as binucleate cells, nuclear disintegration, scattered metaphases, chromatid separation, stickness of chromosomes, bridge formation chromosomal condensation and polarity abolition. It was recorded that radish root extract not only disturbed mitotic activity but also showed considerable impact on chromosomal behavior.

Diversity of *Capsicum* germplasm in North East India: Its Conservation and Pharmaceutical Exploitation of Capsaicin

Geetashree Bora[1*], Jubilee Purkayastha[1], Hemanta Kumar Gogoi[1] and Pratap Jyoti Handique[2]

Division of Bioenergy, Defence Research Laboratory, Tezpur-784001, Assam, India

[2]Department of Biotechnology, Gauhati University, Guwahati-781014

Keywords: *Capsicum chinense, Capsicum frutescens, Bhotjolokia,* Germplasm Conservation, Micropropagation, Capsaicin, Medicinal Properties.

North Eastern region of India, one of the biodiversity hotspots has given birth to many cultivars of *Capsicum* species so far. However, there appears to have no report on various *Capsicum* germplasm, in the form of local cultivars, so as to include in various regional and national conservation programme. Recently, Defence Research Laboratory, Tezpur has taken initiatives for both *ex-vitro* and *in-vitro* conservation of locally available *Capsicum* species like *chinense*, *frutescens* and *Bhot Jolokia.* This communication highlights the diversity and maintenance of *Capsicum* germplasm, their traditional practices, importance of capsaicin and possible commercial exploitation in capsaicin based pharmaceutical industries.

Electrophoretic Distinction between Sexes of *Hodgsonia macrocarpa*

Kanika Karmakar, Rabindra Kumar Sinha and Sangram Sinha*

Department of Botany, Tripura University,

Suryamaninagar – 799 022, Tripura, India.

Keywords: *Hodgsonia macrocarpa, dioecious, reducing and non- reducing SDS - PAGE*

Soluble protein profiles, fractionated by reducing and non-reducing SDS- PAGE, were carried out in dioecious *Hodgsonia macrocarpa* Cogn. Though the reducing SDS-PAGE protein profiles from the tuberous roots of the male and female plants did not show any qualitative distinction, the protein profile in non-reducing SDS-PAGE reveals a clear distinction when compared on a single gel. The difference is marked by the presence of two disulphide linked tertiary or folded protein at 17 KD and 35 KD regions detected in male sex. However, at the level of primary structure the qualitative expression is similar indicating a common ancestry.

Estimates of Heritability and Genetic Advance in Roses

L. Singh, Preeti Pandey, Rajeev Kumar and L.K. Mishra

D.A.V. College Civil Lines, Kanpur,

[1-]Nehru Mahavidyalya, Lalitpur, (U.P.) India

Keywords: *Rose, Genotypic, Heritability, Genetic Advance.*

Fifty rose varieties were selected for present investigation in D.A-V. college, Kanpur and trials were laid out during 2007-08 and 2008-09. Genetic aspects like heritability and genetic advance were found to indicate the useful information for planning out improvement programmes. Heritability varied from 49.91078 to 93.50635 in the aspects of branch length to number of petals production per flower during 2008-09. Next important aspect genetic advance was also found variable during both years of investigations. Results were found variable from 0.08603 to 5.09967 in diameter of the branch to number of flower production per plant in first of the trial. In next year it was found to range from 0.30119 to 12.12174 in the trait stem diameter to diameter of branch. Similarly genotypic covariance was also recorded ranging from 0.06232 to 00.23432 in length of branch to length of pedicel in genotypic (Vr. Mean) during 2007-08.

Genetic Divergence in Commercial Genotypes of Gladiolus

R. Kumar, L. Singh[1], M. Bihari[2] and A.K. Kaushik[3]

N.B.R.I., Lucknow, [1-]D.A-V. College, Kanpur,

[2-]K.A.P.G. College, Allahabad, [3-]C.S.A.U.A.T., Kanpur, (U.P.) India

Keywords**:** *Genetic Divergence, Gladiolus, Genotypes, Cluster.*

Gladiolus (*Gladiolus hybrids*) commercial genotypes gained a great popularity in national and international markets. It has economic viability for national earnings for wealth. In present investigations conducted at C.S.A.U.A.T., D.A-V. College, Kanpur during 2004-05, promising results were observed. Finding of genetic D^2 on fifty genotypes revealed all

in size clusters, cluster I, clusters II, III, IV, V and VI were found to have 4, 5, 3, 7 and 5 genotypes respectively. Which indicated the maximum similarity of the economic traits in clusterI. Results should a great possibility for using the facts of grouping/selecting the genotypes for breeding experiments.

Genetic Modification of Lignin Biosynthetic Pathway in *Populus deltoides* Marsh. For Quality Paper Production Using Antisense Gene Technology

A.K. Thakur & D.K. Srivastava

Department of Biotechnology, Dr. Yashwant Singh Parmar University of Horticulture & Forestry, Solan, H.P., 173230, INDIA

Keywords: *A grobacterium tumefaciens, genetic transformation, lignin, petiole explant, Populus deloides, regeneration.*

A protocol for high frequency plant regeneration and Agrobacterium-mediated antisense cinnamyl alcohol dehydrogenase (CAD) gene transfer in *Populus deltoides* clone G48 has been developed for genetic modification of lignin biosynthetic pathway. In plant regeneration experiment, the highest frequency of shoot regeneration (74.75 per cent) was obtained on MS medium supplemented with 0.50 mg/l BAP and 0.20 mg/l IAA using petiole explant. The presence of 0.10 mg/l IAA in MS basal medium promoted the earliest root regeneration and the highest root regeneration frequency in *in vitro* developed shoots. *Agrobacterium tumefaciens* strain C582C1 (pMP90) containing antisense *CAD* and npt-II genes in a binary vector p35SASCAD was used for genetic transformation studies. By combining the best treatments of 48 hrs pre-culturing and 48 hrs co-cultivation time periods, an average transformation frequency of 14 hrs pre-culturing time periods, an average transformation frequency of 14 per cent was obtained in petiole explant of P. *deltoides.* The *in vitro* developed putative transgenic shoots regenerated roots on the selective root regeneration medium after 15-20 days in culture. Out of total 10 randomly selected putative transgenic plantlets of P. *deltoids* clone G48, 5 were found to show the presence and integration of npt-II gene in poplar genome as

confirmed by PCR using npt-II gene specific primers. The npt-II gene which is transferred along with antisense *CAD* gene (in the same gene construct), got amplified with gene specific primers at 0.7 kb which the non-transformed plants lacked. The lignin content of transgenic plants of P. *deltoides* was found to be reduced by a fraction of 2-3 per cent as compared to the control plants after 2 months.

Genetic Variation of *Suaeda nudiflora* (Willd.) Moq. as Evident by Chromosome *and* RAPD markers.

Chinmay Pradhan[1] and Anath Bandhu Das[2]

[1]P.G. Department of Botany, Utkal University, Vani Vihar, Bhubaneswas 751004, Orissa, India.

[2]Dept. of Agricultural Biotechnology, Orissa University of Agriculture and Technology, Bhubaneswas-751003, Orissa, India

E-mail;a_b_das@hotmail.com/chinmay_pr@yahoo.com

***Keywords*: *DNA polymorphism, RAPD markers, somatic chromosome Suaeda nudiflora*.**

Genetic variation of different ecotypes of mangrove associate *Suaeda nudiflora* was investigated through RAPD and chromosome analysis obtained from Bhitarkanika mangrove forest of Orissa. Somatic chromosome varied from 2n=36, 40 and 54 in different ecotypes. OPA-11, OPD-08 and OPN-04 primers showed marker bands ranged from 330bp to 2400bp that differentiate five ecotypes genetically. RAPD analysis showed two broad groups with Ecotype-I (Chandbali) and II (Rannagar) forming a single sub cluster while ecotypes III (Dangmal), IV (Khla) obtained from comparatively high saline area grouped together into another sub cluster. The probable mechanism of overcoming high salinity stress by maintaining polyploidy is suggested.

Growth and flowering Behaviour of Bougainvilea varieties

R. Kumar[1], A. Singh[2], A.K. Kushik[3] and S. Verma[4]

[1,4-]N.B.R.I., Lucknow, 2-G.H.S.S.S Pawarkhera,

3-C.S.A.U.A.T., Kanpur, (U.P.) India

Keywords: *Growth, Flowering, Behaviour, Varieties,*

Floriculture industry has become most economic in Horticulture. Different varieties of Bougainvillea were found in top ranking position in growth and flower performance under beautification. It was found most hardy, profuse flowering with various colours of bracts. Multinational varieties has gained top ranking position in modern age. Its variegated varieties with multibracted genotypes developed in recent years were observed outstanding. Therefore, present studies were conducted without standing varieties in Chandra Shekhar Azad University & Technology, Kanpur to have informations on different aspects of Bougainvilleas at the micro-climatic conditions of central region of Uttar Pradesh. Results revealed that Golden Glow. Mrs. Buck, Arjun Lady, Marry Baring, H.B. Singh, Happiness, Hawain white, Joiy Laxmi, Mahara, Mrs. Butt, Paleker, Partha, Meera varieties have been found best which were recommend for planting. Length of main branch was found the maximum 59.06 cm. Similarly length of bract recorded 4.667 cm. All aspects gave good performance for various characters. Length of Sub branches was also found variable and it was ranging from 4.033 to 27.00 and 4.633 to 26.800 cm in 2004-05, and 2005-06, respectively. The maximum number of braches was recorded in Mrs. H.C.Buck and Partha varieties in 2004-05 and. 2005-06.

Hydrazine Hydrate Induced Rosette Leaf Mutant in Jute (*Corchorus olitorius* L. Variety JRO-632)

P.K. Gosh[1] and A.Chatterjee

1. CSB, CSR & TI, Berhampore-742101, Murshidabad, West Bengal

Centre of Advanced Study in Cell and Chromosome Research, Department of Botany, University of Calcutta, 35, Ballygunge Circular Road, Calcutta-700019

E-mail: paritush.ghosh@rediffmail.com

Keywords: *Corchorus olitorius L,. chromosome, Rosette leaf, Hydrazine Hydrate, 6 hours*

Presoaked seeds of jute (*Corchorus olitorius* L. Variety JRO-632) were treated with 0.5% Hydrazine Hydrate (HH) for 6 hours. Rosette leaf mutants were screened in M3 in contrast to the normal looking fruit plants. A number of yield component parameters were recorded including plant height, basal diameter, plant spread, root length, pod per plant, seeds per pod, pod length/breadth ratio, number of primary branches, number of secondary branches, leaf angle, branching angle, first flowing date, 100% flowing date, total duration, percentage of pollen sterility, and weight of 100 seeds which were found to vary from the control plant. Chromosome analysis revealed aberrations like stickiness, fragmentation, polyploidy, clumping, laggard and bridge formation etc.

Role of Indole Acetic Acid on Chromosome During *In Vitro* Growth in Jute *(Corchorus olitorius* L. variety JRO-632*)*

A.Chatterjee and P.K. Ghosh

CSB, CST & TI, Berhampore-742101, Murshidabad, West Bengal,

Centre of Advanced Study in Cell and Chromosome Research,

Department of Botany, University of Calcutta,

35, Ballygunge Circular Road, Calcutta-700047

Email: parituish.ghosh@rediffmail.com

Keywords: *Root Tip, Chromosome, Corchorus olitorious,Auxins, Cytokinins, Indole Acetic Acid*

The root tips of jute (Corchorus olitorius L. variety JRO-632) were grown in vitro cultured aseptically on 20 ml solid nutrient medium Murashige and Skoog's (1962) (MS) and Schenk and Hildebrand's (1972) (SH) media were tried with various combinations and concentration of different auxins (NAA, IAA, IBA and 2,4-D used separately 0,0170 mg/L to 0.3500 mg/L) and cytokines (BAP, Kn used separately 0.1400 mg/L to 3.3000 mg/L, coconut Milk 10-35% (V/V). It has been observed that the callus growing in medium containing NAA revealed different degrees of ploidy and mitotic abnormalities such as stickiness, clumping, diplo-chromatids and spindle disturbances from the early stage and the index was also recorded. The frequency of chromosomal abnormalities gradually increases with the age of the callus tissues increases. A comparison of the cytology of the callus growing in IAA and the regenerating callus growing in IBA revealed differences in the rate of division and mitotic abnormalitiesd. Callus growing in IAA showed a comparatively lower rate of division and higher rate of mitotic abnoramlities, while that growing in IBA exhibited just the opposite effect. It appears that IAA has a distinct role to play in influencing Karyological instabilities and mitotic rate of cells and also observed the role of different hormones in inducing karyological changes during in vitro growth. The object of the present investigation was that to find out the role of IAA along with different constituents of the medium in controlling in vitro growth and

the karyological changes which they induce during organogenesis and callus formation of jute root explants (*Corchorus olitorius* L. Variety JRO-632).

Studies on Genetic Variation on Chickpea (Cicer arietinum L.)

Jadhaẏ R. S., Mohrir M. N.*, Ghodke M. K.

Oilseeds Research Station, Marathwada Agriculture University, Latur (M.S.)

* Pratishthan Mahavidyalaya, Paithan Dist.

Keywords: *chickpea, heritability and genetic advance. Aurangabad (M. S.)*

The analysis of variance revealed significant difference for all the eleven characters studied. The wide range of variability observed for all characters except number of primary branches per plant and number of seed per pod. Days to maturity exhibited highest range of variability followed by number of seed per plant, number of pod per plan, days to 50 percent flowering, harvest index, seed yield per plant, 100 seed weight, plant height and number of secondary branches per plant. Nearly equal value of GCV and PCV observed for characters 100 seed weight, harvest index, seed yield per plant , number of seed per plant, number of pod per plant, days to maturity, days to 50 percent flowering indicating characters least affected by environmental, while characters number of primary branches per plant, secondary branches per plant were most affected. High heritability with genetic advance as percent of mean was observed for characters viz. seed yield per plant, secondary branches per plant, 100 seed weight, number of seed per plant indicating that heritability is due to additive gene effect and selection be effective highest GCV, h^2 and GA as percent of mean for characters viz. number of pod per plant, number of secondary branches per plant, 100 seed weight and seed yield per plant and can be improved effectively by selection.

Study of the Effect of Environmental Conditions on Some Sugarcane Varieties for Micropropagation

Kalpana Sengar[1], R.S. Sengar[1] and Sanjay Kumar Garg[2]

[1]Tissue culture Lab, College of Biotechnology,
Sardar Vallabh Bhai Patel University of Agriculture & Technology,
Meerut-250110.
[2]Depatement of Plant Sciences,
M.J.P. Roheilkhand University, Bareilly,
Email: kalpana.sengar19@gmail.com.,
rakesh.sengar77@gmail.com

Keywords: *Callus culture, sugarcane, shoots regeneration, light intensity, photoperiod, in vitro Micropropagation.*

Micropropagation is *in vitro* method for clonal multiplication of plants using meristematic or non-meristematic cells/tissues as the explants can be regenerated directly (adventitiously) from the explant or indirectly (de novo) through the callus derived the explants. In sugarcane, plants have been produced by direct regeneration from both apical and axillary meristems and from immature leaf tissues. The present paper deals with the effect of light intensity, Photoperiod and growth room temperature on *in-virto* morphogenetic responses of leaf sheath explants of sugarcane varieties CoS 96258 and 99259. High frequency callus initiation was recorded in leaf sheath explants incubated in dark for 10-15 days and then transferred in light. Maximum shoot regeneration and number of shoots per culture could be recorded under 16 h photoperiod of 4000 lux light intensity at a growth room temperature of 25 ± 2^0C in both varieties of sugarcane.

Plantphysiology, Biochemistry and Tissue Culture

Golden Leaf' Phenomena of Durantas Photosynthetic Perspective.

R. Singh*, M. Mishra* and A.N. Mishra*

Department of Biosciences & Biotechnology,

School of Biotechnology, Fakir Mohan University,

Vyasa Vihar, Balasore-756019, India.

E-mail: misraan@yahoo.co.uk

Keywords: *Chl a fluorescence, Duranta repens, High light, Golden leaf*

Duranta repens L. growing in high light conditions under direct sun light of tropics show a natural phenomenon of 'Golden leaf'. In this paper the phenomics of leaf goldening is studied. This is due to chl bleaching and a reduction in photosynthetic performance of PS II measured by the fast Chl fluorescence measurement and OJIP analysis. The numbers of active reaction centres are reduced resulting in a severe reduction in the PS II activity in 'Golden leaf'. This is due to a lesion in the PS II electron transfer at the acceptor side. In spite of this, the gregarious plant growth along with a 'golden leaf' growth at par with the 'green leaf' could be due to a significant increase in the dissipation of the absorbed quanta as heat.

A Probable Method for Early Diagnostic of Flowering in Mango by Photosynthetic Measurements.

Palki Das, M. Misra*, R. Singh* and A. N. Misra*

Department of Biosciences & Biotechnology,
School of Biotechnology, Fakir Mohan University,
Vyasa Vihar, Balasore-756019,
India.

*Present address and address for correspondence:
Central University of Jharkhand, School of Natural Sciences,
Ratu-Lohardaga Road, P.O. Brambe-835205,
Ranchi, Jharkhand State, India
E-mail: misraan@yahoo.co.uk

Keywords: *Mangifera indica, flowering, SPAD value, quantum Efficiency of PSII*

The differences between the flowering initiated and regularly flowering plants are studied. The changes in the pigment content, measured with SPAD values, in flowering initiated plants were lower than the regularly flowering plants. A comparison of the apical, middle and lower leaves of a single twig showed that although there is differences in the SPAD value with leaf position, there was constant lowering of the value for all the leaves in flowering initiated leaves compared to that of the regularly flowering leaves. The changes in Fv/Fm ratio in the flowering initiated were higher than the regularly flowering plants. A comparison of the apical, middle and lower leaves of a single twig showed a gradual increase in the Fv/Fm ratio, but there was increase of Fv/Fm ratio in flowering initiated leaves compared to that regularly flowering.To the best of our knowledge it this study utilized the characteristics of SPAD value and Fv/Fm ratio to characterize flowering behavior of plants. The increase in Fv/Fm ratio and / or decrease in SPAD value in any leaf of a flowering induced plant can be taken as a diagnostic criteria for flowering induction in plants.

Adaptive Deffense System in Black Gram and Maize Plants Exposed to Different Light Intensity

Ram Kumar, Indu Chaudhary, Saumya Srivastava and Yogesh Kumar Sharma*

Department of Botany, University of Lucknow,
Lucknow-226007
E-mail: ramkumar320031@gmail.com

Keywords: *Maize, Catalase, Peroxidase, Superoxide dismutase Light*

Plants of maize (*Zea mays* cv. 4212) and black gram (*Vigna mungo* cv. PU 35) were grown in earthen pots filled with mixture of soil and compost (3:1)under different intensities of light viz.18500, 10000, 4200, 2500, 2300 lux. Significant etiolation effect on stem and yellowing of leaves were observed in the plants exposed to 2500 and 2300 lux of sun light. The results indicated that the activity of catalase (CAT), peroxidase (POX) and superoxide dismutase (SOD) were different in both plants under different intensity of light. CAT activity decreased in both plants with decrease in light intensity. Peroxidase activity was increased gradually in black gram with decrease in light intensity while in maize peroxidase was decreased with decrease in light intensity. SOD activity was increased in both plants with increase in light intensity.

Allelopathic potential of *Thuidium tamariscellum* on the germination and seedling growth performance of two wheat variety

Neerja Pandey

Department of Botany, DSB Campus,

Kumaun University, Nainital

Keywords: *Thuidium tamarescellum, Triticum vulgare, germination, seediling growth, treatment, water extract, soil+moss mixture, moss layer*

The present study was carried out to investigate the effects of moss extract and the moss plant on the germination behaviour and seedling growth performance on two wheat(*Triticum vulgare*) varieties, namely PBW-502 and UP-2584 by designing two types of simple biotests. In first set of experiments, the effect of *Thuidium* extract (water)was studied in unsoaked and presoaked (seeds were kept in bryophyte extract for 24 h)seeds. Under controlled conditions, in unsoaked seeds, germination was 100 and 96.6 percent ,respectively in PBW-502 and UP-2584 variety. In comparison to control, for PBW-502 germination was reduced both in unsoaked and presoaked seeds on treatment with moss extract, however, in UP-2584 variety, it was reduced only in presoaked seeds. Completion of germination was delayed in presoaked seeds of PBW-502variety, but in UP-2584 variety, it was completed earlier than the control in treatment with moss extract. In comparison to control, the effect of moss extract in unsoaked seeds of PBW-502, but a decline in radicle length was found in presoaked seeds of this variety.ForUP-2584 variety, in presoaked seeds, length of radicle and plumule together with biomass was promoted in comparison to control.

In pot experiments, in treatment, soil+moss mixture, germination of seeds was significantly reduced in both the varieties in comparison to control, while under bryophyte layer; germination was reduced in PBW-502 and promoted inUP-2584 variety. Seedling growth performance, in both the treatments, indicated an inhibitory effect in PBW-502 variety. In soil+moss mixture treatment, the radicle length was highly reduced

in comparison to bryophyte layer treatment in 7 days old seedlings however; biomass was increased in both the treatments. For UP-2584 variety, an inhibitory effect on the length of radicle and plumule and biomass was found in soil+moss treatments but the bryophyte layer had a growth promoting effect. In 15 days old seedlings, radicle length was decreased significantly in PBW-502 variety in soil+moss treatment but the effect of moss layer was promoting. Contrary to this, for UP-2584 .the effect of both the treatments was growth promoting with respect to radicle length whereas, biomass was declined in soil+moss treatment, indicating the utilization of dry mater in the growth of seedlings.

Allelopathic potential of *Thuidium tamariscellum* on the germination and seedling growth performance of two wheat variety

Neerja Pandey

Department of Botany, DSB Campus,

Kumaun University, Nainital

Keywords: *Thuidium tamarescellum, Triticum vulgare, germination, seediling growth, treatment, water extract, soil+moss mixture, moss layer*

The present study was carried out to investigate the effects of moss extract and the moss plant on the germination behaviour and seedling growth performance on two wheat(*Triticum vulgare*) varieties, namely PBW-502 and UP-2584 by designing two types of simple biotests. In first set of experiments, the effect of *Thuidium* extract (water)was studied in unsoaked and presoaked (seeds were kept in bryophyte extract for 24 h)seeds. Under controlled conditions, in unsoaked seeds, germination was 100 and 96.6 percent ,respectively in PBW-502 and UP-2584 variety. In comparison to control, for PBW-502 germination was reduced both in unsoaked and presoaked seeds on treatment with moss extract, however, in UP-2584 variety, it was reduced only in presoaked seeds. Completion of germination was delayed in presoaked seeds of PBW-502variety, but in UP-2584 variety, it was completed earlier than the control in treatment with moss extract. In comparison to control, the effect of moss extract in unsoaked seeds of PBW-502, but a

decline in radicle length was found in presoaked seeds of this variety.ForUP-2584 variety, in presoaked seeds, length of radicle and plumule together with biomass was promoted in comparison to control.

In pot experiments, in treatment, soil+moss mixture, germination of seeds was significantly reduced in both the varieties in comparison to control, while under bryophyte layer; germination was reduced in PBW-502 and promoted inUP-2584 variety. Seedling growth performance, in both the treatments, indicated an inhibitory effect in PBW-502 variety. In soil+moss mixture treatment, the radicle length was highly reduced in comparison to bryophyte layer treatment in 7 days old seedlings however; biomass was increased in both the treatments. For UP-2584 variety, an inhibitory effect on the length of radicle and plumule and biomass was found in soil+moss treatments but the bryophyte layer had a growth promoting effect. In 15 days old seedlings, radicle length was decreased significantly in PBW-502 variety in soil+moss treatment but the effect of moss layer was promoting. Contrary to this, for UP-2584 .the effect of both the treatments was growth promoting with respect to radicle length whereas, biomass was declined in soil+moss treatment, indicating the utilization of dry mater in the growth of seedlings.

Ameliorative effect of exogenously applied zinc through rooting medium on oxidative metabolism in cadmium treated pea plants

Gaurav Kumar Singh,* Archana and N. Pandey

Plant nutrition and stress physiology laboratory,

Department of Botany,

University of Lucknow, Lucknow-226007

E-mail: dr.gauravsingh@gmail.com

Keywords: *Cadmium, zinc, pea, oxidative stress*

An experiment was conducted to assess whether exogenously applied zinc through the rooting medium could mitigate the adverse effect of cadmium stress on plant growth, photosynthesis and oxidative stress status of pea plants. For this purpose control, 200 μM

cadmium, and with this 100 and 200 µM zinc was applied. Cadmium treatment reduced the shoot length, dry biomass and total chlorophyll content followed by high cadmium accumulation in pea plants. Interaction of zinc resulted in partial protection against cadmium, as observed by enhanced biomass and total chlorophyll. Zinc treatment resulted in low cadmium accumulation in pea plants. Enhanced thiobarbituric acid reactive substances (TBARS), hydrogen peroxide (H_2O_2) were seen when cadmium was supplied alone. While under zinc interaction, the extent of TBARS and H_2O_2 were significantly low, suggesting zinc regulated protection against oxidative stress. The activity of ascorbate and proline increased under zinc free condition. Zinc supply showed gradual increase in these non-enzymatic antioxidants. The antioxidant enzymes like catalase (CAT), peroxidase (POD), and superoxide dismutase (SOD) showed varied activity under cadmium alone. SOD and POD activity increased after cadmium treatment followed by decline in CAT activity. Under zinc supplied condition, the efficiency of the antioxidant enzymes was significantly elevated. CAT activity showed significant increase. Our results are compatible with the hypothesis that zinc protects plants from cadmium toxicity by improving plant defense against cadmium-induced oxidative stress and by competing with cadmium for binding to critical cell constituents such as enzymes and membrane protein and lipids.

Bioactive Constituents of fruit extract of *Xeromphis uliginosa* Retz. Maheshwari

Richa Srivastava, V.N.Pandey & A.K.Srivastava

Experimental Botany Lab,

Department of Botany,

DDU Gorakhpur University, Gorakhpur-273009

E-mail: vnpgu@yahoo.co.in/ richasriva00@gmail.com

Keywords: *Xeromphis uliginosa, Bioactive constituents, fruit extracts*

Ethnonutraceutical plants are of great importance to the health of individuals and communities. The medicinal value of these plant lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plant are alkaloid, flavonoids, tannins, saponin and phenolics compounds. The present study carried out to examine fruit extract of *Xeromphis uliginosa* an ethnonutraceutical plant of north-eastern terai region of Uttar Pradesh .The Biochemical constituents of the fruit extract of the plant were investigated qualitatively and quantitatively. The quantitative estimation of the percent crude chemical constituents revealed crude yield of alkaloid 0.009 %, Saponin 3.24 %, Polyphenols 0.84 % , Flavonoids 2.1 % and Tannins 0.028 %.

The significance of the plant in traditional medicine and the importance of these chemical constituent may further discoursed with respect to their biofunctional utilization for agriculture, nutraceutical and pharmaceutical industries.

Biochemical Studies of Entomogenous Galls of *Salvadora persica* L.

Swati. Joshi, Suman Lata Sharma and U.Kant

Plant Pathology, Tissue Culture and Biotechnology Laboratory,
Department of Botany,
University, Rajasthan, Jaipur-302004, (Rajasthan); India

Keywords: *Salvadora perisica, galls*, *quantitative*, *enzymes*, *isozymes*.

Galls are the abnormal outgrowth produced by the host organism usually in response to the presence of another living organism. *Savadora perisica* L. is a tree of grat economic importance. Tender twigs are used for making toothpastes, coomonly known as Miswak. The objective of the present study was estimation of some enzymes and isozymes in insect induced leaf galls, stem galls, flower galls and the normal counterparts of *Savadora persica.* By using biochemical technique, alteration in localization and quantity of enzymes due to insect attack was observed. The enzymes assayed were polyphenol oxidase, peroxidase, a-amylase and invertase compared to normal tissues, Galls showed

significantly higher amounts of polyphenol oxidase, peroxidase, alpha-amylase and invertase enzyme activity as compared to the normal counterpaerts. A differential banding pattern of isozymes was visible in normal and gall samples.

Changes in Growth, Pigments and Antioxidative Defence System in Chilli (g-4) in Response to Salinity

Indu Chaudhary,Ram Kumar,Saumya Srivastava and Yogesh kumar Sharma*

Department of Botany,
University of Lucknow,
Lucknow-226007, India
E-mail: yogesh_s26@yahoo.com

***Keywords**: Chilli, Chlorophyll, Malondialdehyde content, catalase, Superoxide dismutase.*

To assess the salinity induced changes in growth, pigments, antioxidative system and proline contents, an experiment was conducted in Chilli (***Capsicum annuum* var.G-4**) in earthen pots in wire house. Plants were subjected to five different level of salinity viz. 0, 2, 4, 6 and 8 dS/m by mixing NaCl, $MgCl_2$, $CaCl_2$ and Na_2S0_4 in equimolar ratio. The observations were recorded in 90 days old plants. Plants treated with saline water showed reduction in fresh and dry weight of shoot and root. Total chlorophyll, chl a and chl b were enhanced at lower dose (2 dS/m) while they were declined at higher dose (8dS/m).The level of antioxidative enzymes viz. catalase, peroxidase and superoxide dismutase (SOD) in leaves of chilli increased in salinity level of 8dS/m in comparison to control plant. On highest dose maximum enhancement was recorded in electrolyte leakage percent and malondialdehyde level (MDA content) which was the indication of oxidative damage. Proline acts as an osmoregulator that's why synthesis of proline was increased with increasing level of salinity.

Chemical composition and effect of processing on Free Radical Scavenging Activity of *Fagopyrum esculentum* Moench.

Nidhi Gupta, A. K. Srivastava and V.N. Pandey*

Experimental Botany Laboratory

Department of Botany

DDU Gorakhpur University

Gorakhpur-273009.

E-mail: vnpgu@yahoo.co.in

***Keywords**: Chemical composition, free radical, seed extract, seed protein concentrate, buckwheat.*

Fagopyrum esculentum Moench. (Buckwheat) is an underutilized crop which holds tremendous health and medicinal benefits. Buckwheat is native of East Asia and has proven itself to be widely adapted around the world. The proximate chemical composition and effect of processing of seed extract on free radical scavenging activity were evaluated. The result shows that contents of dry matter (88.7%), total N(3.87%), protein N (1.64%), Protein (10.3%), ash (2.3%), carbohydrate (65.0%) and calorific value of seeds (3.89 Kcal/g dry weight) were found in dry seeds. The Free radical scavenging activities of seed extracts and seed protein concentrates (SPC) were assayed by using DPPH radical scavenging assay. The methanolic extracts of seed and seed protein concentrate (SPC) were assayed for free radical scavenging activities and found 78% and 73% free radical inhibition at 100µg/ml, respectively. This study revealed that processing will reduce the free radical scavenging activity. Therefore, seeds of the plant can serve as good source of nutrients with high free radical scavenging activity and comparable to other food supplements in their nutritional quality. The nutritional and free radical scavenging activity of the seeds place them as a biofunctional potential underutilized crop for new biodynamics as a nutraceutical, industrial and agricultural system and providing new avenues for advanced utilization of natural power packs.

Combating Heavy Metals Toxicity from Sludges and Soils by Harnessing Scavenging Activity of Some Vegetable Plants

Prasann kumar*, Biswapati Mandal[1], Padmanabh Dwivedi

Department of Plant Physiology

Institute of Agricultural Sciences

Banaras Hindu University, Varanasi 221005

[1] Directorate of Research, BCKV, West Bengal

Email: prasann0659@gmail.com

Keywords: *Amaranthus viridis, Basella spp., Cucumis sativus, Heavy metals, Phytoremediation, Scavenging activity*

Degradation of natural resources is perhaps one of the gravest lapses mankind has ever made in its journey of progress and civilization. Land and water resources are worst affected due to anthropogenic interventions. Heavy metal contamination is of special concern due to widespread reports emanating both from India and abroad about various diseases and disorders observed both in human and livestock due to metal toxicity. The use of specially selected and engineered metal accumulating plants genotype for environmental clean up is an emerging frontline technology called 'phytoremediation' which describes a system wherein plants alone or in association with soil organisms can remove or transform contaminants into harmless and often valuable forms. Excessive heavy metal accumulation can be toxic to most plants leading to reduction in seed germination, root elongation and biomass production, inhibition of chlorophyll biosynthesis as well as disturbance in cellular metabolism and chromosome distortion. For studying the heavy metals load of sewage sludge and their effect on crop quality in relation to non applied sites, solid sludge and vegetable plants such as *Momordica charantia* (Bitter gourd), *Cucumis sativus* (Cucumber), *Capsicum annuum* (Chilli), *Luffa cylindrical* (Smooth gourd), *Amaranthus viridis* (Red Saag) and *Basella spp.* (Pui) were collected from seven sewage treatment plants (STPs) from West Bengal, India viz. Howrah, Garulia, Bhatpara, Nabadwip, Srirampur, Kona, Chandannager, and from the

Periurban areas viz. Nadia / Chakdaha / Ektapur (N/C/E), Nadia / Chakdaha / Pumlia (N/C/P), Nadia / Chakdaha / Sikarpur (N/C/S), Nadia / Chakdaha / Tatla (N/C/T) and their heavy metal concentration was measured using AAS. The overall results from all the sites of sampling suggest that *Amaranthu*s has more scavenging capacity for Cd and Pb, while *Spinacia oleracea* for Cr among the different heavy metals detected. Therefore, if these plant genotypes are cultivated in sites abundant with above heavy metals, these would scavenge the heavy metal toxicity from the soil.

Differential Protein Profiling during in Ductive Photoperiod in *Arabidopsis thaliana*

Aaram A. Kumar, Kishore Panigrahi

School of Biological Sciences,

National Institute of Science Education and Research,

Bhubaneswar -751005, Orissa, India

Keywords: *Flowering time control, Inductive photoperiod, Arabidopsis thaliana flowering.*

Photoperiod is one of the most important factors regulating flowering time. *Arabidopsis*, a facultative long-day plant, flowers earlier under long days but takes longer time to flower under short day conditions. This delay could be eliminated and flowering can be induced by transferring *Arabidopsis* from short day to long day conditions. The transfer of *Arabidopsis thaliana* from suboptimal (14 h photoperiod) to optimal (16 h photoperiod) light conditions was observed to induce flowering. It occurs 3-5 days from the transfer depending on the ecotype. This induction of flowering when the photoperiod exceeds the critical day length is caused as the result of a number of signaling pathways mediated by various proteins which control the circadian rhythm and flowering time in *Arabidopsis*. Tissue sampling was performed at different circadian times of the day during inductive as well as short day photoperiod conditions and stored for further

analyses which include 2-D DIGE and characterization of differentially accumulated proteins, using MALDI-MS.

The characterization of these proteins differentially accumulated during inductive photoperiod conditions can lead to the identification of novel molecular players and thus the modification of existing flowering control pathways. This study aims to shed light into the role of different proteins regulating the flowering time in response to inductive photoperiod.

Effect of Aqueous Extract of Marine Algae *Acanthophora delilei* on Seedling Growth of Test Plant *Raphanus sativus* L. var 'Japani'

Gaikwad, Sunita[1]; Pingle, S.D[2]. and Khose, R. G[3].

1& 3 : Department of Botany New Arts, Commerce and Science College

Ahmednagar - 41003.

2 : K.J. Somayya College, Kopergaon, Dist. Ahmednagar

E-mail: sunita_Gaikawad@yahoo.co.in

***Keywords**: Acanthophora delilei, Promotory effect, algal Biofertilizer, radish*

Continuous use of synthetic fertilizers and excessive irrigation has created problems like soil deterioration, underground water pollution and decrease in agricultural production. Algal Biofertilizers are cost effective supplement to synthetic fertilizers. Biofertilizers will help solve such problems as increased salinity of soil and chemical run – offs from the agricultural fields. Biofertilizers are important if we are to ensure a healthy future for the generations to come. *Acanthophora delilei*, a common rodophycean member of algae was collected from seashore of Alibag (Maharashtra, India).Fresh aqueous extracts of different concentration of *Acanthophora delilei* viz. 10^{-1} to 10^{-4} % were prepared and used to find their effect on germination and seedling growth of a test crop plant radish (*Raphanus sativus* L. var. 'Japani'). All extracts showed promotory effect on growth of the test plant.

Effect of carboxymethyl cellulose and carrageenan on the quality of carambola fruit during storage

Manu L. Chaudhari, T.V. Ramana Rao* and Neeta B. Gol

B. R. Doshi School of Biosciences, Sardar Patel University

Vallabh Vidyanagar 388 120, Gujarat, India

E-mail: tadapanenirao@yahoo.com

Keywords: *Carambola, edible coatings, enzymes, shelf life*

The effect of carboxymethyl cellulose (CMC) and carrageenan coatings on the physicochemical characteristics, softening and antioxidative enzyme activities of carambola fruit stored at 28°C ± 2°C were evaluated at 0, 5, 10 and 15 days of storage period. Fruits coated with edible coatings showed significant delay in the change of weight loss and decay percentage, compared to uncoated control fruit. The data of the present study may be an indicative that the lower enzyme activities of PG, PME, cellulase, β-galactosidase in the treated carambola might have been associated with a high integrity of the cell membrane and few changes in the cell wall constituents, which contributed to high levels of firmness in the carambola during storage. The higher activities of scavenger antioxidant enzymes, including POD and SOD in the treated carambola at the 15 days storage period are probably due to the effect of CMC and carrageenan. These findings suggest that 1% CMC and 1% carrageenan coating extend the shelf life of carambola fruits while maintaining valuable quality attributes, can be used commercially for prolonging the storage life of carambola fruits.

Effect of Fly Ash Application on Growth and Yield of Cow Pea (*Vigna sinensis var kanchan*) A Leguminous Crop Plant

Pallavi Rai* and H.K. Kehri

Department of Botany,

University of Allahabad,

Allahabad-211002

E-mail: pallavigoodan@gamil.com

Keywords: *Cow pea, fly ash, PSM, psf, vam, psb, plant growth Yield.*

In the present study, the effect of different fly ash levels in soil (0%, 10%, 20% and 30%) and fly ash, Phosphate solubilising microorganism combination were observed on growth performances any yield of cow pea plant. For the experiment four kg of soil was filled in pots and the pots containing only soil served as control. The plant growth (length of shoot and root; fresh wt. and dry wt. of shoot and root) at fruiting stages of plant growth and yield (flower size, flower weight, fruit size, fruit weight) parameters were taken, plant growth and yield were significantly increased from 10 to 30% level in fly ash amended soil however most significant growth and yield obtained in fly ash and different form of phosphate solubilising microorganism (psf+vam+psb) combination. The perusal of the data revealed that 20% level of fly ash and PSM combination amendments in soil were found to be ideal level for the better plant growth and yield of cow pea plant.

Effect of Herbicides on Seed Germination and Seedling Growth of *Euphorbia geniculata*

U.D. Bharti*, S.K. Yadav and D.C. Atri

Department of Botany,

Dr. Hari Singh Gour University, Sagar-470003 (M.P.), India

E-mail: urmi25@gmail.com

Keywords: *Herbicides, Pursuit, Euphorbia geniculata*

The present paper enumerates the effect of two herbicides namely. Aramo and Pursuit herbicides on seed germination and seedling growth of *Euphorbia geniculata,* Both of these herbicides inhibited the seed germination and seedling growth. It was found that as we increases the concentration of herbicides, proportionally effect of herbicides was observed. Armo was found to be most effective herbicides followed by Pursuit.

Effect of Indole acetic acid on wheat (*Triticum aestivum* L.) irrigated with sewage water.

Chandra Shekhar Kumar [a], Alka Singh[b] and J.N Maurya [*a]

a Department of Plant Science, M.J.P. Rohilkhand University,

Bareilly-243006, U.P. India.

b U. P. Pollution Control Board, Bareilly, Uttar Pradesh.

dr.mauryajn@gmail.com

Keywords*: Sewage water, Heavy metals, Indole acetic acid, Wheat.*

A field experiment was conducted to study the accumulation of heavy metals by winter wheat (*Triticum aestivum* L.) variety PBW-343 grown under sewage water of two different concentrations (50% and 100%) irrigation by Harun Nagla channel of Bareilly city, U.P., India. Effects of indole acetic acid (IAA) of two different concentrations (10ppm and 20ppm) were applied after 25, 50, 75 and 100days of wheat germination. Heavy metals like Pb, Cr, Zn, Cu and Fe were determined at physiological maturity in wheat plant. Indole acetic acid treatment alleviated the adverse effect of toxic heavy metals contents of sewage water due to production of enzymatic and non-enzymatic antioxidants like superoxide dismutase (SOD), catalase (CAT), glutathione reductase (GR) and carotenoids & proline respectively, thus enhancing the plant growth and yield of wheat. Sewage water concentration of 100% and Indole acetic acid at 20ppm showed increase in no. of tillers, shoot height, no. of ears and seed yield / plant as compared to Indole acetic acid at 10ppm under 50% sewage water concentration and Control. SOD,

CAT, GR carotenoid and proline content were found to be more in 100 % and 50% sewage water irrigation as compared to 100% and 50% sewage water with IAA. However, decrease in uptake of toxic heavy metals by wheat grains of100% sewage water with 20ppm IAA & 50% sewage water with 20ppm IAA were examined as compared to sewage water with 10ppm IAA and sewage water without hormone.

Effect of *Lyngbya* spp. & *Chara zeylanica* Liquid Extract on Seed Germination & Seedling Growth in Chilli.

[1]Aher A.A. and [2]S.D.Pingle

[1]Dept. of Botany, Padmashree Vikhe Patil College,
Pravaranagar-413713,Tal-Rahata,
Dist- Ahmednagar, (MS)
[2]Dept. of Botany, K.J.Somaiya College,
Kopergaon. Ahmednagar, MS.

Keywords: *Lyngbya spp., Chara zeylanica, Seed germination, seedling growth*

The Investigation was carried out to study the effect of fresh water algal extract of two species i.e. *Lyngbya* spp. & C*hara zeylanica* on seed germination & seedling growth of chilli. Experiment carried out by soaking the seeds overnight in different concentrations (1%, 5%, 10%, 15%, 20%, 25%, & control) of algal extract. The maximum growth of the chilli plant was recorded at the concentration 15 % and 20 % for *Lyngbya* spp. and *Chara zeylanica* respetively. However, *Chara zeylanica* extracts reported maximum growth of chilli as compared to *Lyngbya* spp. extract.

Effect of Temperature on Growth of *Polyporus shoreae* Wakef.

Tapan Kumar Maitra,
Department of Botany,
Ananda Mohan College,
Kolkata- 700009.

Keywords: *Polyporus shoreae Wakef. Temperature, Growth, Primary and Secondary mycdia.*

The production of fungal metabolites and the growth of fungus are caused due to numerous enzymic controlled processes and these are also controlled by different temperature coefficient. There is no universal temperature which can be regarded as an optimum temperature for growth of all fungi. Even the same temperature has not been found to be optimum for the different phase of growth of a particular fungus or of different isolates of the same species. Generally the activity of a fungus starts at minimum temperature, gradually increases to an optimum and then declines to stop at a maximum temperature. This cardial temperatures are dependent on several external and internal factors. It has been visulised in most cases, the minimum temperature for growth of fungi is about 5°C while the maximum and optimum being 27°C to 45°C and 30°C respectively.

Effects of Phytohormones on Secondary Metabolite Production in Hairy Root Cultures of *Withania Somnifera*.

Manish Kumar Jain

Department of Biotechnology, School of Biological & Chemical Sciences

Dr. H.S. Gour University, Sagar, MP, India

E-mail: sunny9jan@gmail.com

***Keywords**: W. somnifera, A. Rhizogenes, Root culture, Phytohormone, Secondary metabolite.*

The in vitro addition of plant growth regulators (i.e. phytohormones) to *Agrobacterium rhizogenes* transformed hairy root cultures affects morphological and biochemical changes, resulting in altered growth and secondary metabolite accumulation rates in root tissues. Significant increases in both growth and secondary product accumulation have been observed, upon incubation with phytohormones, in some species. Consequently, the use of phytohormones in vitro has received increasing attention as a potential means for increasing those plant secondary products notoriously produced in small quantities.

Demonstrated herein is the effect of exogenous combination hormone application on *W. somnifera* hairy roots. Furthermore, analysis of biomass accumulation in *W. somnifera* hairy roots in the presence of phytohormones has revealed effective individual as well as combinatorial phytohormone concentrations suitable for increasing single and bulk root growth, and secondary metabolite production. The effectiveness of an optimal phytohormone combination, with respect to time of addition, its relationship to inoculum size, and its combination with the provision of fresh nutrients and or mechanical stress to the roots is also described.

Enhancement of Insulin Sensitivity in Diabetes Mellitus Using Phytochemicals

Nithyakala, *Sindhu Anoop

C.M.. Department of Molecular biology, Bangalore University

*Mount Carmel College,

Bangalore India

***Keywords**: Diabetes Mellitus, Insulin Receptor, Antidiavetic agents, phytochemicals*

Diabetes mellitus is a chronic disease that causes serous health complications and it is now one of the most non-communicable diseases globally. The antidiabetic agents have been focused on plants used in traditional medicine because that may be a better treatment than currently used synthetic drugs due to its affordability and minimum side effects. Our is focussed on the antidiabetic effect of some common Indian plants (Piper species, Coriandrum species and Anethum species) on streptozotocin induced diabetes in rats. Besides investigating the glucose level, insulin receptors were also monitored in liver and muscle tissues. Treatment of diabetic animals with crude extract of all the three plant species for 30 days lowered the glucose level and elevated the hepatic glycogen content and body weight was also stabilised. Further it was also noted that there was a increase in the total insulin receptors expressed in liver cells and muscle cells when the diabetic rats were treated with high concentrations of the aqueous extract of piper species and anethum species in comparison with coriandrum species. It is possible that the compounds from the aqueous extract of the plants enhanced the auto phosphorylation of insulin receptors thereby increasing the GLUT in the cells or the aqueous extract inhibited the cellular protein tyrosine phosphatase activity. Impaired insulin signalling leads to hyperglycemias and therefore pharmacological agents that enhance the insulin receptor activity could be useful in the treatment of type 2 diabetes. This study will provide an opportunity to develop a novel class of anti diabetic agent from phytochemicals which is less toxic than the currently available drugs.

Ethyl Methanesulphonate Induced Crupmled Leaf Mutant In Jute (*Corchorus olitorius* L.Variety JRO-632)

P.K. Gosh[1] and A. Chatterjee

CSB, CSR & TI, Berhampore-742101, Murshidabad, West Bengal

Centre of Advanced Study in Cell and Chromosome, Research, Department of Botany, University of Calcutta, 35, Ballygunge, Circular Road, Calcutta-700019

Keywords: *Corchorus olitorius L., Chromosome, Crumpled leaf mutant, Ethy, Methanesulphonate, 6 hours.*

Presoaked seeds of Jute (*Corchours olitorius* L. Variety JRO-632) were treated with 0.5% Ethyl methanesulphonate (EMS) for 6 hours. Crumpled leaf mutants were screened in M3 in contrast to the normal looking fruit plants. A number of yield component parameters were recorded including plant height, basal diameter, plant spread, root length, pod per plant, seeds per pod, length/breadth ratio, number of primary branches, number of secondary branches, leaf angle, branching angle, first flowering date, 100% flowering date, total duration, percentage of pollen sterility, and weight of 100 seeds which were found to vary from the control plant. Chromosome analysis revealed aberrations like stickiness, fragmentation, polyploidy, clumping, laggard and bridge formation etc.

Expression of Lipoxygenase Enzyme in Response to *Xanthomonas campestris pv Campestris* in *Brassica oleracea var Capitata*.

Kaunain Roohie, R and Umesha, S.

Department of studies in Biotechnology,

University of Mysore, Manasagangothri, Mysore-570006,

Karnataka, India.

Keywords: *Lipoxygenase, Expression studies, Temporal pattern*

Cabbage (*Brassica oleracea var. capitata*) is an important vegetable of cole group. A rich source ofvitamin A, B and C, it also contains minerals. Black rot caused by *Xanthomonas campestris pv campestris* occurs on many cultivated and wild crucifers, including broccoli, Brussels sprouts, cabbage, cauliflower, Chinese cabbage, collards, kale, mustard, radish, turnip, and winter cress. The first signs of the disease appear at the margins of leaves where infections most often occur. Infected leaf tissue turns yellow, usually in a V-shaped area with the base of the V toward the midrib. These induced responses due to biotic stress are mediated by signal transduction that links the damage with the changed phenotype. There are three main signal-transduction pathways that underlie induced defenses (i.e., the jasmonate, shikimate, and ethylene pathways). Of these pathways, the jasmonate pathway seems to play a dominant role. A key enzyme in the biosynthetic pathway toward jasmonic acid (JA) is lipoxygenase (LOX) that uses linolenic acid as a substrate. The present study focusses on using the degenerate primers for lox designed on the conserved sequence of the related brassica species and their amplification at various intervals of attack by *Xanthomonas campestris pv. Campestr is* followed by the expression studies of the Lox gene. The study gives an insight into the temporal pattern of the LOX enzyme and its relation to the quantitative expression of the gene.

Fatty acid –An Antioxidant compound from *Ganoderma lucidum*

Ritu Panjwani

Mycology Research Lab, Dept. of Biological Sciences, R.D.University,
Jabalpur (M.P.)
AVS Presidency International College, Raipur (CG)
Email: ritu.mushroom@gmail.com

Keywords*: Ganoderma lucidum, Antioxidant activity, Antioxidant compound, Fatty Acid, TLC, HPLC, FTIR, NMR, GC- MS.*

Mushrooms have been used as an antioxidant supplements by man from time immemorial to reduce the Oxidative Damage. Now a days, *Ganoderma lucidum* are of great interest in an active area of drug discovery and design because in addition to their nutritional value, they also have been drawn to various therapeutic properties including **antioxidants**, anti-hypertensive, cholesterol-lowering, liver protection, anti-fibrotic, inflammatory, anti-diabetic, anti-viral, anti-microbial etc.

In the present study, the crude extract of *G. lucidum* were screened for their possible antioxidant activities using three different tests: 2, 2-diphenyl-1-picrylhydrazyl (DPPH), chelating activity on Fe^{2+} and Reducing Power (FRAP) Assays. Detailed chemical investigations of antioxidant compound were undertaken by using Thin layer chromatography (TLC) and High Performance Liquid Chromatography (HPLC), while characterization through Fourier transform infra-red (FTIR) can be followed to determine its active chemical constituent. The results revealed that *G. lucidum* possess scavenging ability of 85% by DPPH, 79% by chelating activity on Fe^{2+} and 3.5 absorbance by FRAP which has been shown to possess higher antioxidant activity with no side effects. TLC, HPLC and FTIR investigations indicated the presence of one major compound having an end hydroxyl and carboxylic group structure may be due to the presence of fatty acid. These results finally concluded that fatty acid components of *G. lucidum* may have been proposed to be responsible for antioxidant effect, so it may play an important role as natural antioxidants in food industry and pharmaceuticals.

Fracture-healing compound identified through flame photometry and HPTLC in *Cissus quadrangularis*

Raghunandan Singh Nathawat, Kavi Gour and Vidya Patni

Plant Pathology, Tissue Culture and Biotechnology laboratory,

Department of Botany,

University of Rajasthan, Jaipur-302004

Email:kavigour1985@gmail.com,

Keywords: *Cissus quadrangularis Linn., fracture healing, Flame photometry, HPTLC.*

Cissus quadrangularis Linn (Syn: *Vitis quadrangularis* Wall; Family: Vitaceae) is an indigenous medicinal plant of India. The use of this plant by the common folk for promoting fracture healing process is an old practice. The plant contains a high amount of vitamin C, carotene A, anabolic steroidal substance, phytoestrogens and calcium which play an important role in curing osteoporosis and also implicated as therapeutic agent for enhancing bone-healing. Flame photometric determination of calcium in various *in vitro* and *in vivo* parts revealed 1.418 mg/g , 4.624 mg/g , 4.402 mg/g , 0.682 mg/g for root, stem, leaf and callus respectively. In the second part of the experiment, the fingerprint of high-performance thin-layer chromatography (HPTLC) combining digital scanning profiling was developed to identify phytoestrogen using linear ascending development through CAMAG twin chamber saturated with mobile phase consisting of Toluene: Ethyl acetate: Acetone: Formic acid (20:4:2:1). Spectrodensitometric scanning was performed by TLC scanner III in absorbance mode. The assay combines the isolation and separation of phytoestrogen (daidzein) on silica gel 60 F_{254} HPTLC plates with spot visualization and scanning at 254 nm. The system found spot of daidzein (Rf = 0.26 ± 0.01). Methanol was found to be the most appropriate solvent for the extraction of phytoestrogen. Furthermore, the HPTLC fingerprint is also suitable for rapid and simple authentication and comparison of the subtle difference among samples.

High Resolution-Magic Angle Spinning (HR-MAS) NMR spectroscopy for proficient metabolite profiling of medicinal plants.

O.P. Sidhu[1], S.K. Bharti[2], Anil Bhatia[1] and Raja Roy[2]

[1]National Botanical Research Institute, Rana Pratap Marg,
Lucknow-226 001, India
[2]Centre of Biomedical Magnetic Resonance,
SGPGIMS campus, Raebareli Road, Lucknow-226 014, India.
opsidhu@rediffmail.com

Keywords: HR-MAS NMR, *Withania somnifera*, Chemotypes

Withania somnifera (L.) Dunal (Solanaceae), is commonly known as *Ashwagandha* is one of the most valued Indian medicinal plant with a number of pharmaceutical and nutraceutical applications. Metabolic profiling was performed by HR-MAS NMR spectroscopy on fresh leaf and root tissue specimens from four chemotypes of *W. somnifera*. NMR spectra of all the chemotypes were acquired in D_2O and extensively analyzed by the combined used of one-and two-dimensional NMR experiments. HR-MAS NMR spectroscopy based metabolite profiling approach covers a large variety of metabolites, mainly those involved in primary metabolism, including amino acids, sugars, sugar alcohols and other intermediates in the fresh leaf and root tissues. For biologically active secondary metabolites such as withanolides (withaferin A and withanone) a separate HR-MAS experiments were conducted on defatted lyophilized leaf tissues. HR-MAS NMR spectroscopy was found to be a quick and an efficient technique to discriminate different chemotypes of *W. somnifera*. A total of forty one metabolites were identified from both the leaf and root tissue of the chemotypes. Presence of methanol in leaf and root tissue of *W. somnifera* was detected by HR-MAS NMR spectroscopy. Principal components analysis, performed on the ^{1}H HR-MAS NMR spectra revealed a clear separation among chemotypes even with respect to primary metabolites. Metabolomic fingerprinting of herbal extracts is desirable to standardize drugs and to establish the scientific basis of their pharmacological action. This study recruited HR-

MAS NMR technique for rapid metabolomic analysis of leaf and root tissues of different chemotypes of *W. somnifera*. Such knowledge will evolve directions for genetic improvement of medicinal plants for the enhancement of pathways leading to the biosynthesis of bioactive molecules. The study supports the distinction of chemotypes in *W. somnifera*.

Impact of Heavy Metals on the Growth and Photosynthetic Activity in Tomato Plant

K.Raghava Reddy
PVKN.Govt .College,
Chittoor
(Affiliated to S.V.University,Tirupathi. A.P)

Keywords*: *Heavy Metals,Photosynthetic Activity,Growth,Tomato Plant

For the past five decades over all development has been occurred in India in the field of industry and agriculture. Because of various industries and unlimited usage of pesticides, insecticides, fungicides and inorganic fertilizers the air, water and soil are getting polluted. Some heavy metals are also getting into the plant body and affecting some biochemical activities / reactions of the plant physiology.

Hence an attempt was made to know the effect of heavy metals like Hg and Cd and their salts on the growth and photosynthetic activity of Tomato .

The tomato *(Lycopersicum esculantum*) - Gowri & PKN-1 variety seeds were collected and germinated in PVKN.Govt . College, Chittoor and grown in pots. After 20 days of its growth the plants were evenly divided into four groups.1. Group I Normal Control (NC). 2. Group II Treated with 1 % HgCl 2. 3.Grpop III Teated with 1 % CdCl 2 . 4.Group IV Treated with 1 % HgCl2 + CdCl2.They were allowed to grow for 1 month after treatment. Immediately after completion of 1 month of treatment, height of the plant and no. of leaves were measured .1 gr of leaf tissue was taken for the estimation of the

chlorophyll using Spectrophotometer. Less no. leaves and less amount of chlorophyll was observed in Cd treated plants when compared to Hg treated plants . A very little no. of leaves and minute chlorophyll was observed in the plant treated with both HgCl2 + CdCl2. Hence we can conclude that Hg & Cd salts have abnormal and greater impact on growth and photosynthetic activity of tomato plant.

Impact of Organic Farming on Photosynthetic Efficiency of *Oryza sativa* L. in Rice-Rice Agroecosystem

Debsamita Chhoraray' C.S.K. Mishra[2] and P.K. Mohapatra[1]

1. Department of Botany, Ravenshaw University, Cuttack-753003

2.Department of Zoology and Biotechnology, OUAT, Bhubaneswar-751003

Keywords: *Organic Farming, photosynthetic efficiency, oryza sativa l., agroecosystem*

Organic farming has gained importance in recent years due to its environment sateness and stability in maintaining the productivity of soil. The impact of farming system on crop Production was studies by evaluating the photosynthetic efficiency of Oryza Sativa L. ina rice-rice agroecosystem through conventional and organic farm practices, No significant different in the chlorophy II of the crop was observed up to 75 days whereas in organic condition th photosynthetic of the crop was significantly higher of conventional system, same trend was observed with respect to the physiological parameters, viz., Pn/Chl ratio, internal ci concentration and E/pn ratio, Transpiration and stomatal conductance did not vary significantly as there was same irrigation in both the farm systems.

The bacterial fungal population in two farming systems showed same trend during 120 days of observation. In both the system there is continuous and significant decrease in the microbial population after 75 days of transplantation. However, in almost all observation days the population of microbes was significantly lower the soil of conventional farms than of the organic one.

The fluorescence parameters. viz., variable fluorescence (Fv). 2 ms fluorescence change (V.i). net rate of primary photochemistry ($P0). net rate of electrone transport ($E0) and absorption of light energy was more in plants of organic system than of conventional system. The opposite trend was observed with respect to the stress indicating parameters like net rate of PS.II closure (M0). Rate of PS II energy dissipation ($D0), the dissipation flux (DFRC) and dissipation per photosystem reaction centre II (D10/RC). This indicated a high stress reception of the crop in conventional system that in the organic system.

In vitro Culture of Two Different Explants of Bacopa monnieri (l.) Penn. In Presence of Kinetin and 2, 4-d

Papori Devi* and C. M. Sharma**

*Department of Botany, Arya Vidyapeeth College, Guwahati, Assam

** Tissue Culture Laboratory, Department of Botany,Guwahati University, Guwahati, Assam

Keywords: *Micropropagation, Explants, Casein hudrolysate (CH), Kinetin (Kn) and 2,4-Dichlorophenoxy acetic acid (2,4-D.*

2,4-D is known as callusing hormone. But this PGR along with Kinetin resulted in direct regeneration of plantlets in in vitro culture of both leaf and stem explants of *Bacopa monnieri*(L.) Penn. Multiple shoots developed on medium containing 0.1µg/ml of both Kinetin and 2,4-D, while other combinations showed little or no growth response.

In vivo Evaluations of Hepatoprotective and Antioxidant Activity of Ethanolic Extract of *Ruta graveolens* (L.) Leaves

Pinkee Pandey*, Archana Mehta, Subhadip Harjara and Pradeep Mehta

Lab of Plant Biotechnology.

Dept. of Botany, School of Biological and Chemical Sciences,

Dr. H.S. Gour Central University,

Sagar 470003 (M.P.) India

Keywords: *Ruta graveolens leaves, carbon tetrachloride, serum, hepato-cellular and Phytochemicals.*

Ruta graveolens is an herb belongs to family Rutaceae. In the present study the effect of leaves extracts on carbon tetrachloride (CCI_4) induced acute liver damage was evaluated by various *in vivo* experimental models. The increased serum enzymes levels and decreased level of total protein by CCI_4-induction were significantly restored when compared to control and standard drug silymarin treated group due to pretreatment with the extract, Decreased activities of liver tissue enzymes were found reversed by the extract in a dose-responsive way, Results revealed the significant alleviation of CCI_4-induced hepatocellular injury by extract.

Isolation and Characterization of Sulfated Polysaccharides from *Gracilaria corticata* (J.Agardh) from Kovalam Southeast Coast of India

S. Sudharsan*, P. Seedevi, P. Ramasamy, N. Subhapradha, K.Jayalakshmi, S. Vairamani and A. Shanmugam

Faculty of Marine Sciences, CAS in Marine Biology

Annamalai University, Parangipettai-608502

Tamil Nadu-India.

Keywords: *Gracilaria corticata*; Amberlite IRA-900; sephadex G-50, FIR, ^{1}H NMR.

Seaweeds have been used widely for centuries traditionally only in Asia and marginally in the rest of the world mostly as food. In recent years, various polysaccharides have been isolated from marine organisms, characterized and evaluated for various biological activities. In the present study sulfated polysaccharides isolated from *Gracilaria corticata* through Amberlite IRA-900 column and purified through sephadex G-50 were tested for potent anticoagulant activity. Their anticoagulant activity was determined for human plasma with respect to activated partial thromboplastin time (APTT) and prothrombin time (PT).The structural characterization of polysaccharide was analyzed by FT-IR and ^{1}H NMR spectroscopy.

Kinetics Study of α-amylase Extracted from Germinating Wheat (var. Malviya 234) Endosperm of Primed and Non- Primed Seeds

Sananda Mondal* and Bandana Bose

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

In the present investigation the α-amylase enzyme was extracted from the endosperm of the 24-144 h germinating primed and non-primed wheat seeds in which the optimum activity was observed on day 3rd. It was well correlated with the increment of soluble sugar, which was indirectly proportionate to insoluble sugar. The 3rd day old germinating endosperm was used for kinetic studies of α-amylase. Kinetic studies established that the optimum enzyme concentration, pH, time period and temperature for α-amylase activities were 1.5-2 g, 6.9, 25 min and 20 ^{o}C respectively for primed and non-primed seeds. However the substrate concentration optima were 7.5, 1.0 and 1.25 mg for non-primed, hydro and $Ca(NO_3)_2$ primed sets respectively. Result of the present investigation has been discussed on the basis of synthesis of α-amylase activity of germinating wheat seeds.

Krebs cycle Plant

C.R. Das

Kolkata-700153

Life Member L3477

Keywords: *Adaotation, Benthos, Climate, Depression, Geographical, Height, Habitat, Intrinsic, Kelp, Maritime.*

Krebs La (b.1900 Hildesheim/Germany) has obtained Nobel Prize (1955) and has presented Krebs Cycle: the major pathway of oxidation in animal, bacterial and plant cells. Chlorella green algal cells may be an ideal material under anaerobic condition. Chlorella 211/8k (a high temperature strain of Sorokin) has been studied to represent Celvia cycle in photosynthetic reaction norms (Pirson A). The strain has also been examined to represent the material fox Krebs Cycle under anaerobic condition of the habitat.

Laboratory adaptation in highly essential for any physiological investigation latrines is the sedentary physiology of plant and animal occurs on the bottom of lakes, ponds and the sea, Climate has been studied with the factors : Rainfall, temperature, light and wind, these are the controlling factors of a plant, an animal and a man. Geographical position, altitude, height, depression and soil of edaphic factors of the environment have been studied to determine the living object concerning the physiology and medicinal utility of an individual, Vitami-312, the intrinsic under stressed condition on 10 temperature has been determined to have a miraculous effect on the production of DNA normalising the over production of RNA morphological enlargement of cells low temperature condition. This has been established (Das, CR 1966) using chlorella 211/35 strain (Sorokin) with synchrorn culture (Tamiya) and a pure culture.

Micropropagation of *Cocculus Hirutus* L. Diels and Assessment of Genetic Fidelity of Micopropagated Plants Using RAPD) Analysis

Mukesh Kumar Meena, Neelam Signg and Vidya Patni

Plant Pathology, Tissue Culture and Biotechnology Laboratory

Department of Botany, University of Rajasthan Jaipur-302004, India.

Keywords: *Micropropagation Cocculus Hirutus organogenesis, cotyledonarynode, RAPD.*

Cocculus hirsutus (L.) Diels in a important climber mainly found in tropical and subtropical climates. Traditionally the plant was patronized for its unique property of healing all types of cuts. Wounds and boils, the roots and leaves of C. hirsutus have great medical value and are used as alterative emollient demulcent, tonic antiperiodic in fever, in malaria, in arthritis, in treatment of skin diseases, constipation and kidney problems. An efficient in vitro propagation system has been developed for rapid miropropagation of *Cocculus hirsutus,* a medicinally important plant using cotyledonary node from in *viro* grown seedlings, Maximum shoot bud developed (48#0.451) was achieved on MS medium supplemented with BAP (0.5-2.5mg/1). The shoot best elongated on medium containing 0.25 mg/BAP. Excised shoots were transferred on medium containing 0.25-2.5 m/g I IBA for rooting. Best rooting was observed $^{1}/_{4}$ MS medium supplemented with 0.5 mg/I IBA and Number of roots per shoot was 5.4#0.219. these rooted plants were successfully acclimatized in pots containing vermicompost and sterilized soil. Genetic stability of the regenerated plants was assessed using random amplified poly morphic DNA (RAPD). The amplification products were monomorpic in micropropagated plants and similar to those of mother plant. No polymorphism was detected revealing the genetic integrity of micropropagated plants. This is first report of an efficient protocol for regeneration of *Cocculus hirsutus* through organogenesis, which can be applied for further genetic transformation assays and pharmaceutical purposes.

Nitrogen Status of Rice Seedlings at Variable Ages and their effect on Submergence.

B.P. Das*[1] and P.Dash[2],

Department Botany, S.C.S. Autonomous College, Puri[1]

Central of Biotecnology, Siksha 'O' Anusandhan University,Bhubneshwar[2]

Keywords: *Submergence , Total nitrogen , Susceptible*

The experiment was intended to investigate the impact of complete submergence on total nitrogen content of two flood susceptible and two flood resistant rice cultivars at the seedling stages of variable ages. Total nitrogen content of the submerged seedlings was found to be higher at all growth stages. Rate of enhancement of total nitrogen content during submergence was found to be remarkably higher in flood susceptible cultivars than tolerant. This was more pronounced with increased duration of submergence. Lower total nitrogen content in rice plants before submergence could be considered as an indicator of flood tolerance.

Photochemical analysis and screening for active compounds in *Lycopodium cernuum*

Subhajit Mondal[1], Soma Sukul *nee* Chunari[1] and Mrinmoy Ghosh[2]

[1&2]Department of Botany, Visva-Bharati (a central University),

Santiniketan, West Bengal

Email: Sc _vbharati@rediffmail.com

Keywords : *Lycopodium cernum, active compounds, Phytochemical study.*

Lycopodium cernuum Linn. has been observed lately to grow profusely on the sides of banks of river Kopai, Santiniketan, west Bengal, Phytochemicals of this lyciopisd were analyzed as well as were screened for the presence of the chemically active compounds by the standard method. The results revealed the presence of a good amount

of phenol, protein, carbohydrate, reducing sugar and chlorophyll. It also revealed the presence of alkaloids, steroids, saponins, flavonoids, cardiac glycosides. Tannin and antyroquinone were not detected from the plant extracts under study. further experiments for possible and characterization of the plant extract were needed.

Physico-chemical analysis of salt affected wheat cropped areas in parts of South –West Punjab

Avadhesh Kumar Koshal

Dept. of Biotechnology

S.V.P.U. A. &T. Modipuram,

Meerut, U.P. 250110

Keywords: *GPS, GIS, FCC, IRS, Salinity and IGP*

Using IRS 1D images of March 2000 studies were conducted to assess the effects of secondary salinization on cereal crops. Plant samples collected consisted of roots, shoots, spikelets and grain of wheat *(Triticum aestivum)*. Physico- chemical analysis that included chlorophyll estimation, leaf extract pH and ascorbic acid proved that 51 samples were normal, 44 samples of crop were affected by moderate salinity and 25 samples to severe salinity. The fresh weight and dry weight of plant was also affected by salinity. It was found that an increase in salinity inhibits the growth of the plant and the plant appears burnt and stunted in growth. Maximum reduction in *chlorophyll a* was observed in crop affected by severe salinity (0.27 mg/g) and chlorophyll b was observed at 0.51 mg/g. Chlorophyll contents, leaf extract pH and ascorbic acid contents in the leaves showed inhibitory effects in wheat crop due to salinity. Ascorbic acid was found decreased in leaves of high salt affected plant. It is important to take into consideration that remote sensing and GIS are an efficient and accurate source of information especially in the study of salt affected and waterlogged areas.

The present study has utilized satellite remote sensing data and GIS in characterization and mapping of salt affected and waterlogged area, the GIS (Geographic

Information System) for generating the digital database (spatial and non- spatial) and in identifying and mapping the crop area affected by salinity and waterlogging. The image data and the GPS enabled accurate collection of soil and plant samples for the study of influences of salinity on plant parameters (physiological and chemical).

Phytoestrogen-The active ingredient identified through HPTLC from a bone-healing plant – *Cissus repanda*

Kavi Gour, Nidhi Sharma and Uma Kant

Plant Pathology, Tissue Culture and Biotechnology laboratory,

Department of Botany, University of Rajasthan, Jaipur-302004

Keywords: *Cissus repanda, Phytoestrogen, HPTLC, daidzein.*

Phytoestrogens, plant-derived compounds with estrogenic activity possesses a wide range of biological activities and are used for the treatment of osteoporosis, bone disorder, arthritis etc. Popular consumer uses for phytoestrogen-rich foods and dietary supplements include menopausal symptom relief, such as hot flushes, bone health, cardiovascular risk reduction, and breast and prostate preventive health. Despite widespread consumer use of phytoestrogens, the body of research literature examining the effects of phytoestrogens on human bone health is limited, but growing rapidly. Evidence that phytoestrogens may provide some positive bone-altering effects are promising, but the full understanding of their efficacy and safety is not yet completely investigated. A simple HPTLC method has been developed for the identification of daidzein (Phytoestrogen). The samples were dissolved in methanol and linear ascending development was carried out in CAMAG twin through glass chamber saturated with mobile phase consisting of toluene: ethyl acetate: acetone: formic acid (20:4:2:1, v/v/v/v) and TLC Al sheets silica gel 60F precoated were used as a stationary phase. Spectrodensitometric scanning was performed by TLC scanner III (CAMAG) in absorbance mode at wavelength of 254 nm. The system was found to give compact spot for daidzein (Rf value of 0.24 ± 0.03). We report the standardization and utility of

daidzein extraction and detection by HPTLC in the various samples (callus, stem & leaf). The HPTLC method was found to be high throughput, sensitive, reproducible and cost-effective compared to commercial kits.

Pomegranate Juice Inhibits Oxidized LDL Uptake and Cholesterol Biosynthesis in Macrophages

Amit Parashar
Department of Chemistry,
Hardayal Technical Campus,
Farah , Mathura, India
Parashar.amit1@gmail.com

Keywords: Pomegranate juice; Oxidized LDL; LDL; HDL; Cholesterol; Macrophage; Foam cells; Atherosclerosis

Macrophage cholesterol accumulation and foam cell formation are the hallmarks of early atherogenesis. Pomegranate juice (PJ) was shown to inhibit macrophage foam cell formation and development of atherosclerotic lesions. The aim of this study was to elucidate possible mechanisms by which PJ reduces cholesterol accumulation in macrophages. Macrophages were preincubated with PJ followed by analysis of cholesterol influx [evaluated as LDL or as oxidized LDL (Ox-LDL) cellular degradation], cholesterol efflux and cholesterol biosynthesis. Preincubation of macrophages with PJ resulted in a significant reduction in Ox-LDL degradation by 40%. On the contrary, PJ had no effect on macrophage degradation of native LDL or on macrophage cholesterol efflux. Macrophage cholesterol biosynthesis was inhibited by 50% after cell incubation with PJ. This inhibition, however, was not mediated at the 3-hydroxy-3 methylglutaryl coenzyme A reductase level along the biosynthetic pathway. We conclude that PJ-mediated suppression of Ox-LDL degradation and of cholesterol biosynthesis in macrophages can lead to reduced cellular cholesterol accumulation and foam cell formation.

Protective Effect of *Curcuma longa* and vitamin E on Oxidative Stress, Protein Profile and DNA Fragmentation Against Paracetamol-Induced Liver Damage

Soumendra Darbar* and Tapan Kumar Pal

Bioequivalence Study centre, Department of Pharmaceutical Technology,

Jadavpur University, Kolkata-700032, India

E-mail-darbarsoumendra@gmail.com

Keywords: *Antioxidant, Free radicals, Liver damage, Paracetamol, Zingiber officinale, Vitamin C.*

Drug-induced liver injury is a potential complication of virtually every prescribed medication throughout the world. Free radicals cause extensive damage to DNA, proteins, lipids and carbohydrates, which leads to various acute and chronic liver injuries.

The present study was conducted to evaluate the protective action of *Curcuma longa* in combination with Vit. E in an animal model of hepatotoxicity induced by Paracetamol (PARA).

Paracetamol intoxication caused a reduction of serum total protein and increase levels of serum alkaline phosphatase (ALP), aspartate aminotranferase (AST) and serum alanine aminotranferase (ALT) at higher extent in the toxic group. This phenomenon was paralleled by an impaired liver redox status i.e. decrease the level of reduced glutathione (GSH), superoxide dismutase (SOD), glutathione peroxidase (GPx) and catalase (CAT) and increased MDA in the PARA-administered groups. Animals pretreated with CL along with Vit. E showed a marked mitigation of the severity of liver enzymes and of the impaired redox status of the liver. Moreover, CL and Vit. E jointly prevented serum and tissue protein alteration and DNA fragmentation and elevated the liver tissue ATPase and protein thiol assay as compared with the groups treated with PARA alone.

In conclusion, the results of this study demonstrate that *Curcuma longa* in combination with Vitamin E has a potent and better hepatoprotective action in comparison to *Curcuma longa* alone against Paracetamol-induced hepatic damage in rats.

Quantitative Estimation of Some Metabolites and Enzymes in *Trioza jambolanae* induced leaf galls of *Syzygium cumini* Linn.

Kiran Choudhary and Indu Rani Sharma

Department of Botany, Govt. P.G. College, Kota, Kota-324001, (Raj.), India.

E-mail-kiru_ray@rediffmail.com

Keywords:*Cecidogenesis, Neoplastic, Polyphenol oxidase.*

In order to test the hypothesis that cecidozoa induced neoplastic formations on trees affect biochemical characteristics of both, the new formed galls and host plant tissues. Biochemical characteristics with a possible adaptive role were determined during *Trioza jambolanae* (a psyllid) induced cecidogenesis on the host tree *Syzygium cumini* Linn. (Family- Myrtaceae). Photosynthetic pigments chl.a and b, extractable protein, total sugars, amino acids, phenols, prolines and oxidative enzyme activities were determined and compared in galled and ungalled leaf tissues. Results of biochemical estimation at different stages of cecidogenesis showed variations in the amount of these biochemicals. Gradual decrease in photosynthetic pigments and protein content were observed whereas low content of total sugars, extractable amino acids and prolins were evident during the initial stage of cecidogenesis which showed an increase in 30 days old gall, whereas decrease in amount of these were observed at gall maturity. Besides these quantification of oxidative enzymes activity of IAA and Polyphenol oxidase was also done. An increase in oxidative activities of both the enzymes was evident in 30 days old galls. The present data reflect long term systemic effects of gall formation on host tree physiology, suggesting that gall inducer affects adaptive responses of host plants.

Rapid micropropagation of *Woodfordia fruticosa (*Linn). Kurz and screening and isolation of bioactive principls

Neha Grover and Vidya Patni

Plant Pathology, Tissue Culture and Biotechnology Laboratory

Department of Botany,

University of Rajasthan Jaipur-302055, India.

Keywords: *High frequency, Regeneration; Woodfordia fruticosa : Tissue culture; Screening Bioactive principles*

An efficient high frequency in *vitro* regeneration protocol was developed for *Woodfordia fruticosa* (Linn.) Kurz., a wild threatened medicinal ornamental shrub, which is in need to be conserved, by tissue culture techniques. The plants were regenerated from young nodel segments and shoot tips. Shoot tips were the best explants for direct organogenesis and nodal segments were used as explants for indirect organogenesis. Maximum number of multiple shoots was obtained from nodal segment explants on MS medium supplemented with BAP (0.2-2.5 mg/I.) 95% shoot regeneration response was recorded. Maximum shoot height of 9-11 cms was achieved. The excised shoots were cultured on MS medium with various concentrations and combinations of auxins for rooting. The best response in rooting was observed on half-strength MS medium supplemented with IBA (0.2-1.5mg/I). Rooted plants were hardened in earthen pots containing sterile mixture of sand and manure (3:1) before transferring to the field this is a rapid, reproducible for large scale propagation of this rare, much-used medicinal, ornamental, threatened plant species and its ex-situ conservation. Preliminary qualitative screening for bioactive principles and their isolation and characterization have revealed some compounds that could be used to formulate potent antimicrobial drugs in future.

Semi-quantative Estimation of Prussic Acid (HCN) in some Cyanogenic plants with the help of Microbial Glycosidase enzyme.

R.G. Chillawar and O.S. Rathor*

Dept of Botany Yeshwant Mahavidalaya Nanded (M.S.) - 431605.

*PG Dept. of Botany Science College Nanded (M.S.) – 431605.

Keywords: *Cyanogenic plants, Microbial glycosidase, Prussic acid.*

Cyanogenic plants are those plants which are able to synthesize cyanogenic glycosides. These glycosides when enzymatically hydrolyzed then they release Prussic acid. This is known to be a defence mechanism of plants against microbes and other invasions. In most of the cases when the microbes produces B-glycosidase enzymes for invasion into the plant tissue ,the cyanogenic glycoside present in the plant is hydrolyzed with the release of HCN which may kill the pathogen.

In the present study a semi-quantative estimation of prussic acid is being reported in 10 Angiospermic plants.

Studies of Hydrolysable Tannins of *Tephrosia purpurea* (L) DC (Fabaceae)

V.K .Prabhat and Nandjee kumar

Department of Botany,

Magadh University-Bodh Gaya-823234

Email: kumarnandjee@rediffmail.com \ vkprabhat09@yahoo.in

Keywords: *Tephrosia purpurea, butanol, ferric sulphate, petroleum ether and acetic acid.*

The present paper deals with the detection of hydrolysable tannins in the leaf extracts of *Tephrosia purpurea* (L) Dc. The aqueous 0.5g leaf of *Tephrosia purpurea* (L)

DC were grinded with water and filtered with buckner funnel .The filtrate was taken in different tubes for detection of tannins. To each tube 3 ml butanol, 0.1ml ferric reagent were added .The mouth of each tube was covered with glass marble and heated at 970c for 60 min.Now after cooling the leaf extracts were subjected to spectrophotometer and OD was recorded at 550nm. Our results revealed that in *Tephrosia purpurea* (L) DC leaf extractsdeveloped a pink colour which confirms the presence of hydrolysable tannins.

Studies on the Effect of Short Photoperiod Darkness on Floral Induction in Paddy Plants Followed by Various Lengths of Darkness on Floral Induction in Paddy Plants

H. Rafath

Department of Botany,

Annamalai University,

Annamalainagar-608002

Keywords: *Oryza Sativa L, Photoperiod, dark period, light interruption, shoot apex.*

Twenty eight days old paddy plants, in separate sets, subjected to 15 consecutive photoinducitve cycles each comprising of 8 hr photoperiod and 16 hr dark period with 2-3 min light interruption at 10, 12, 16, 20 on 22 hr in the dark period after the commencement of the photoperiodic cycle as well as plants grown under natural 24 hr diurnal cycles, each comprising of 13.30 hr photoperiod followed by 10.30 hr dark period remained vegetative. Plants subjected to photoinductive cycles, each comprising of 8 hr long dark period exhibited a liner relationship between the degree of conversion of shoot apex into a reproductive panicle and duration of dark period following 8 hr short photoperiod.

Studies On The Effect Of Two Conventional Insecticides And *Parthenium hysterophorus* Extracts On Seed Germination Behaviour Of *Vigna radiata* L.

Ujjal Kumar Pati[1], Shirsendu Ghosh[2], Moumit Roy Goswami[3], and Ashim Chowdhury[1]

[1]Department of Agricultural Chemistry & Soil Science, IAS, University of Calcutta, Kolkata-700019.

[2]Department of Environmental Science, University of Calcutta, Kolkata-700019.[3]Department of Environmental Science, Netaji Nagar College For Women, 170/13/1 N.S.C Bose Road, Regent Estate, Kolkata-700092.

Keywords: *Triazophos; Carbaryl; Seed germination; Parthenium hysterophorus.*

The comparative effect of two conventional insecticides viz, carbaryl, triazophos and two different fractions of *Parthenium hysterophorus* extracts were evaluated on seed germination behaviour of *Vigna radiata* L. seed germination percentage, germination index (Gi), relative root elongation (E), relative seed germination (Gr), uniformity of germination (D bar), coefficient of the rate of germination (CRG), mean germination time (MLIT) were calculated. The results clearly demonstrate that phytochemical fractions inhibit the seed germination at much higher extent as compared to control and insecticides treatments. However in insecticides treatments overall germination behaviour was affected insignificantly. Therefore in conclusion, at higher concentration the phytochemicals should not be used as seed protecting agent against insect pests in post-harvest storage condition.

Studies on the Effects of Gamma Radiation on *Sesamum Indicum*

B. Majumder

Bose Institute, Kolkata-700009

Keywords: *Rice, Gamma rays, Deaf abnormalities*

Dry seeds of *Sesamum indicum* L, Culivar, Roma and B^9 were treated with 20 kr and 40 kr gamma rays. Attentions were paid on the morphological abnormalities induced in the left and stem characters of this sesamum. The interesting changes, induced were fission of leaves, presences of cup shaped leaves, changes in the petioles and leaf margines. The major induced change in the stem characters were short stem, wider stem, fasciated stem, and stems with abnormal leaf attachment. A mutant with fascinated stem isolated in the y_4 generation. This mutant was maintained the farm. The progeny of the fasciated mutant segregated with normal and fasciated plant. On analysis it was observed that the fascinated s tem character of the mutant was controlled by three recessive genes.

Two Phytotoxic Substances at Low Doses Enhance Chlorophyll Content and Plant Growth

Sandhimita Mondal, Soma Sukul and Nirmal C Sukul

Department of Botany, Visva-Bharati University,

Santiniketan-731235, West Bengal, India.

E-mail: sandhimita_mondal@yahoo.co.in; sandhimita@gmail.com.

Keywords: *Phytotoxic substances, CCC, MH, Chlorophyll, FPLC.*

Maleic hydrazide (1, 2-dihydro 3, 6 pyridazine dione) (MH) and (2-Chloroethyl) trimethyl ammonium chloride (CCC) are two phytotoxic substances. In the present study, at potentized form, *MH* and *CCC* were applied by gentle touch on both sides of a leaf on cowpea plants. They enhanced plant growth in terms of the number of leaves/ plant and increased leaf protein and chlorophyll content. Leaf proteins of the control and treated plants were separated by Fast Protein Liquid Chromatography (FPLC). Potentized *CCC*

showed marked alteration of the leaf protein profile as compared to the control and potentiozed *MH* treated plants. Potentized *CCC* induced expression of new proteins. These proteins are thought to play a role in the enhancement of plant growth and photosynthesis.

Yield and Nutritional Quality of Biofunctional Protein Concentrates from Some Wild Legumes

Rakesh Pandey and V.N.Pandey

Experimental Botany Laboratory,

Department of Botany,

DDU Gorakhpur University,

Gorakhpur-273009 (India)

Email: vnpgu@yahoo.co.in /pandeybotany_2007@rediffmail.com

Keywords: *wild legumes , biofunctional protein concentrates*.

Legumes are biological nitrogen industry of this planet and serve as a skeleton of biological systems. They produce enormous amount of seed protein. Conventional legumes are used mainly for their protein value. Due to large population size, mainly in developing tropical and subtropical countries, these conventional sources of proteins are now in a state that cannot sustain the basic protein requirement of population. To meet the inadequate supply of proteins in developing countries, various other sources of proteins are being explored. Among the various other prominence sources wild and underutilized legume plants received more attention. In this present study four wild tree legume plants have been selected for their protein content. Seeds of *Pongamia pinnata* (Papilionaceae), *Peltophorum inerme* (Caesalpiniaceae), *Leucaena leucocephala* and *Adenanthera pavonina* (Mimosaceae) were procured from different regions and their biofunctional protein concentrates (BPC) were extracted. Results showed highest extractability in *Leucaena leucocephala* (39.22%) and lowest in *Adenanthera pavonina* (21.11%) while

Pongamia pinnata and *Peltophorum inerme* showed moderate value with 26.61% and 34.28% respectively.

Zingiber officinalis: Chemical and Phytochemical Screening and Evaluation of its Antimicrobial Activities

Shipra Bhargav[1], Kshipra Dhabhai[2], Amla Batra[2]

SMS medical College, Jaipur, Rajasthan[1]

Plant Tissue culture laboratory[2]

Department of Botany

, University of Rajasthan, Jaipur, Rajasthan 302004, India

Keywords: *Zingiber Officinalis, antioxidant, anti-inflammatory, Phytochemical*

Zingiber Officinalis is a common condiment for various foods and beverages and a long history of important Traditional Medicine herb for the treatment of stomach disorders**.** The constituents present in ginger have potent antioxidant and anti-inflammatory activities. The study deals with antimicrobial activity of Zingiber Officinal (ZO) extract and their phytochemical composition. Phytochemical screening revealed the presence of alkaloids, saponins, tannins, flavonoids, terpenoid and phlobotannins in both the extracts. The GO extracts were obtained by sokhlet apparatus and their chemical profile was determined through GC and GC-MS analysis resulted in the identification of 40 compounds in methanolic and 32 compounds in ethanolic extract. Their antimicrobial activity was tested against nine microorganisms that cause various diseases in human. Zingiber extracts showed selective antimicrobial activities.

Environmental Biology

Changing Vegetation in the Forest-Complex of Patharia Hills, Central India

A.S.Thakur* and P.K. Khare#

*Department of Botany, Govt. College, Khurai, Distt. Sagar (M.P.) 470117 INDIA

Department of Botany, Dr. H. S. Gour University, Sagar-470003, INDIA

Keywords: *Forest-complex, Patharia hills, Tropical dry deciduous forest, successional changes*.

The present study has been undertaken to compare the changing status of the forest vegetation of Patharia hills, which was earlier described by Misra & Joshi (1952). Topography, soil properties and extent of human disturbance are attributed as the major factors influencing the vegetation in the patharia hills. Different phytosociological attributes showed that at present *Acacia leucophloea, Diospyros melanoxylon* and *Butea monosperma* are the dominant species showing highest IVI values (25.49 to 32.29) while Mishra and joshi (1952) reported that *Anogeissus latifolia* and *Diospyros melanoxylon* were the dominant species during 1952 on the basis of high percentage frequency and dominance (cover). Most of the species of tree, shrubs and herbs showed contagious distribution and total composition of vegetation appears to be heterogeneous. During both study period common tree species at different subsites ranged from 7 to 15 and similarity index lies between 35.89 and 57.69%.

Climate Change: Combating with Primitive Forestry and Agricultural Practices

S.N.Patro

snpatro11@rediffmail.com

Indian economy is forest and agriculture based traditionally. In forestry and agricultural practices there is no fear of environmental pollution, when compared to industrial activities. However, forest and agro-wastes, when rotten, may cause the problem of methane generation, insanitation, epidemics and loss of aesthetics. Often such wastes are burnt out causing atmospheric pollution due to emission of carbon dioxide and other green house gases. The primitive agriculture of slash-and-burn destroys the standing forest vegetation indiscriminately. But all such problems can be solved with least damage to the environment by appropriate management practices with rural wisdom, application of low-cost eco-friendly technologies and generation of mass awareness.

Rural farmers have been protecting and using the traditional genes since generations which are well adopted to the local site conditions and less dependent on the synthetic fertilisers and chemicals. They take fresh food and lead simple life style putting minimum pressure on nature's resources. The house of the rural farmer is built out of earth, bamboo, timber, wood, leaf, straw, etc that are available within two to three sq km of his/ her place of stay. The primitive farmer never uses cement, steel, marble, tile, oil paint or any such house construction materials which need clearance of forest vegetation, mining of ores, setting up of processing industries and transportation of finished goods to the construction site. Therefore, there is absolutely no fear of environmental pollution in rural and primitive economy.

The time has to come to shift from greed-based luxurious modern life style to need-based environment-friendly simple life style, in order to combat climate change challenges. The former is fossil-energy-intensive and polluting where as the latter is clean- energy- intensive and non- polluting with the blend of rural wisdom. In

inaccessible areas the rural farmer may be encouraged to continue the forestry and agricultural practices with bullock cart, oxen, wooden plough, etc. The farmer will get wood for such agricultural implements as long as the forest is there; hence shall be interested to protect the natural forest. Besides myriads of ecological services it renders, the forest has two most vital functions namely the 'photosynthesis' and 'transpiration'. These two physiological processes regulate the atmospheric temperature and the water cycle by taping the excess carbon dioxide- the prime green house gas and the excess heat energy from the surrounding atmosphere.

Forest and agriculture based activities such as cultivation of medicinal plants, horticultural crops, sabai grass, bamboo, vegetable, fodder, floriculture, apiculture, sericulture, cultivation, leaf plate and cup making, collection of minor forest products and plant parts, etc. need to be promoted by creation of market facilities to attract the farmers with a view to conserving, protecting and promoting the genetic species and also ensuring their livelihood support. Such kind of local activities would enhance the carbon sink capacity of forests and agricultural crops and go a long way in combating climate change impact. Traditional wisdom of the farmers needs to be respected on ecological merit basis and they must be given carbon credit, incentives, and equity. Gandhiji was never opposed to industries as long such activities were non-polluting. His alternative model of development was to promote cottage industries based on natural resources. He preached for mass production by man and not by machine.

The year 2011 has been designated as the International Year of Forests by the United Nations. The World Environment Day (WED) theme for this year was "Forests: Nature at Your Service". The current decade is also declared as the Biodiversity Decade.

Legends: O-Odia; T-Telugu; H-Hindi; B-Bengali; E-English

Current Status and conservation strategies of Banj oak (*Quercus leucotrichophora*) forests in Uttarakhand, Western Himalaya

[1]Gajendra Singh, [1]Amit Kotiya and [2]G.S. Rawat

[1]Department of Habitat Ecology, P.B.# 18, Chandrabani,
Wildlife Institute of India, Dehradun
[2]Deputy Programme Manager / Senior Scientist (ECES),
ICIMOD, Kathmandu, Nepal
E-mail: gajendrawat@yahoo.com

A baseline study is being conducted in Uttarakhand state with a broad objective of to generate a baseline distribution map, status of Banj oak forests and to evolve a conservation strategies. A total of 1284.60 km^2 area was recorded under Banj oak forests in Uttarakhand (5.24% of forest cover and 2.40% of geographical area), of which 774.93 km^2 area falls within reserve forests (RF) and 509.66 km^2 lies outside the RF. The highest cover of Banj oak was recorded in Uttarkashi (209.08 km^2) followed by Tehri (206.68 km^2) and Pithoragarh districts (148.49 km^2), while, minimum was in Champawat (53.92 km^2), Bageshwar (66.25 km^2) and Almora (66.74 km^2) districts of the Kumaun region. Fragmentation analysis revels that Champawat District has most degraded Banj oak forest with high patch density (0.57/100 ha) and edge density (6.01 m/ha), while Banj oak forests of Pithoragarh district are least degraded with low patch (0.19/100 ha) and edge density (2.23 m/ha). Based on the study, conservation strategies are discussed.

Ecological Studies of Plant of Dry Pond of Biharsharif, Nalanda, Bihar

D.D.Pandey, Kiran Pandey and A.P.Sinha*

* Department of Botany, S.P.M.College, Udantpuri, Biharsharif-803101

P. G. Department of Botany, Nalanda College, Biharsharif-803101

Keywords: *Biomass, Energetics, Polygonum, Dry Pond*

Standing crop biomass of *Polygonum plebejum* increased with the advancement of the age of the plant and peak value of shoot biomass was found to be 82. 24g/m^2in the month of March. The root biomass had peak value in the month of April i.e. 28.73g/m^2 . Energy content increased up to the fruiting stage and then decreased . The maximum calorific value in aboveground parts of the plant was recorded 3662.14 cal/g and root had maximum calorific value in the month of April i.e. 3460.15 cal/g.

Ecological Studies of Thermophilic Fungi from Mangrove Forest: pH, Temperature and Salt Relationship

A K Jaitly* and Priya Srivastava

Microbiology Lab, Department of Plant Science,

MJP Rohilkhand University,

Bareilly-243006, UP, India

*jaitly1958@gmail.com

Keywords*: Thermophilic fungi, Mangrove forest, pH, Temperature, Salt Relationship*

A number of diversified fungal forms were isolated from different location of Sunderban mangrove forest. Out of the isolated diversified forms, twelve fungal forms were tested for their ability to grow at different pH, temperature and salt concentration in order to utilize their metabolic maxima where it is required. In the present case we have

to utilize these data for the increasing or decreasing decaying ability of the tested fungal forms, as per requirement.

Among the tested forms Aspergillus flavus, and *Penicillium sp* showed the maximum growth activity at 40 C while *Aspergillus niger, A. fumigatus, A. Humicola grisea, Chaetomium thermophile, Emericella nidulens, and Trichoderma sp* their optimal activity at 45 C whereas *Aspergillus terreus, Humicola insolens, Sporotrichum thermophile and Thermoascus auriantiacus* exhibited their maximal activity at 50 C. Although mangrove habitat showed high pH range even tested forms exhibited pH maxima at lower values. Out of the tested forms four showed their optimal activity at pH 6, three at pH 6.5 while five tested isolates showed their maximal activity at pH 7. Normally all the tested forms exhibited their maximal growth activity at salt level higher than 1% in the medium, although they differ in their growth optima for salt. The detail results are discussed in the paper.

Effect of Chemicals on Certain Characteristics of Lake Water Ram Prakash Vijayvergia

Deptt. of Botany
S.M.B. Govt. P.G. College,
Nathdwara (Raj.) 313301, INDIA

Keywords: *Treatment, Lake Water, Ferrous Sulphate and Lime, Aluminum sulphate, Coagulant, Safe Concentrations.*

Present research paper highlights the impact of certain chemicals on lake water under laboratory condition with the objective of their safe usefulness. In present investigation two chemicals viz. Ferrous sulfate with lime and Aluminum sulphate were used to study their effects on lake water. The study indicated an abrupt change in lake water with regard to physicochemical characters after treatment of lake water of Lake Udaisagar, Udaipur which is 18 Kms from Udaipur and under the stress of sewage pollution & consequent emerging problem of eutrophication was used as test material.

Energy Conserving Efficiency of Grasslands of Bihar

S.N.P. Sinha and Siddhant*

Department of Botany, G.D.M. College, Harnaut, Nalanda, Bihar

* Department of Botany, Magadh Mahavidyalaya, Chandi, Nalanda, Bihar

Keywords: *energy conserving efficiency, grasslands.*

The energy conserving efficiency of grassland of low land was higher as compared to that of upland grassland. The annual energy conserving efficiency (ECE) of *Dicanthium annulatum* dominated grassland was found 0.58% on lowland and 0.40% on upland grasslands.

Energy Convservation, Pollution Control and Zero Maintainence Through Green Buildings.

M.Anusha, R.Lakshmi Narayana, P.Indraniel, J.Santosh

GMR Institute of Technology,

Unisys Global Services

India-Bangalore

Green building is the practice of increasing the efficiency with which buildings and their locations use energy, water and materials, as well as, reducing the impact of buildings on human health and the environment, through better siting, design, construction, operation, maintenance, and removal of buildings. The energy crises of the 1970's spawned research into green building, with the development of new glazing technologies and solar designs, as well as the development of natural cooling, ventilation and daylight systems. Many private sector and government funded demonstration projects were built at this time and in the decades that followed. Worldwide, the building and construction industry consumes more fossil fuels and natural resources than any other human activity.

Green building is the term that refers to designing and building structures that are environmentally sound and follow the tenets of sustainability. Such buildings consume less energy, are durable and can be recycled. The construction, maintenance and demolition of buildings consume a tremendous amount of energy and resources. Building green is important to the protection of ecosystems, to maintain safe air and water quality, and to conserve renewable and nonrenewable natural resources. Energy efficiency and resource conservation also play a vital role. Green building is an immediate, measurable, and cost-effective solution to the complex and interrelated issues of climate change, energy dependence, and human health.

The cost of green buildings is generally overestimated. The additional cost for incorporating green design will be only 5 to 6% of the total cost. This will be offset by the reduced costs of operation and maintenance. Cost of lighting, heating/cooling, water supplied will be much less than that for the conventional buildings. With the costs of cement and steel sky-rocketing, green buildings will prove to be cost effective. **The Energy Conservation Building Code** (ECBC), launched on 28th June 2007, is a document that specifies the energy performance requirements for all commercial buildings that are to be constructed in India. The concept of green building minimises environmental degradation. In India, there are many green buildings like the new **Shamshabad Airport in Hyderabad, TATA Energy Research Institute, Gwal Pahadi, Gujarat Energy Development Agency (GEDA), Medicity in Hyderabad etc….**

Practitioners of green building often seek to achieve not only ecological but aesthetic harmony between a structure and its surrounding natural and built environment, although the appearance and style of sustainable buildings is not necessarily distinguishable from their less sustainable counterparts. **Thus this paper throws light on the aforementioned matter.**

Exploring Fourth World Botany, its Documentation and Preservation is Need of the Hour: a Case Study in the Eastern Ghats of India

S.M. Khasim[1] and K.A. Naidu

Department of Botany and Microbiology,

Acharya Nagarjuna University, Nagarjunanagar,

Guntur- 522510, India.

E-mail: dr_smkhasim@yahoo.co.in

Keywords*: Fourth World Botany, tribal medicine, Jatapu and Savara tribals, floristic diversity.*

To highlight the importance of documentation and preservation of tribal medicine, the concept of Fourth World Botany with special reference to tribals of Eastern Ghats of India has been developed in this paper. The Fourth World Botany includes tribal botany, ethnobotany, indigenous traditional knowledge etc. An ethnobotanical survey was carried out among tribal groups such as *Jatapu* and *Savara* in this region. Traditional uses of 72 plant species belonging to 46 families of angiosperms were described in this study. The documented ethnobotanical plants were mostly used to cure excretory, digestive, circulatory, reproductive and other such ailments. The medicinal plants used by these tribals were arranged alphabetically followed by family name, local name, parts used and mode of preparation for the treatment of various ailments. Taking into consideration, the unprecedented rate of deforestation and habitat destruction, there is an urgent need to explore the Fourth World Botany (tribal botany/indigenous traditional knowledge), its documentation and preservation.

Floristics and Phytosociological studies on Plant Resources of Satkosia Medicinal Plant Conservation Area, Mayurbhanj, Orissa

T.Kar, K.K.Mandal and A.K.Biswal

Biosystematics Laboratory,

North Orissa University, Takatpur,

Baripada, Odisha – 757003

Keywords*: Biodiversity, Phytosociology, Conservation, Satkosia, Mayurbhanj*

Traditionaly, biodiversity assessment is based on inventorization of species along with distribution for prioritization of taxa for conservation. The phytosociological studies of plant community with regard to their component, structure, distribution status and classification is essential for understanding the plant diversity in a particular region.

During phytosociological study carried out in tropical moist deciduous forest of Satkosia MPCA, Mayurbhanj, as many as 83 species belonging to 57 genera under 30 families have been revealed .Among the tree species relative density is highest in *Sorea robusta* followed by *Terminalia alata, Anogeissus latifolia, Madhuca indica, Buchanania lanzan* etc. The floristic composition exhibits some of the interesting and threatened taxa like *Urginea indica*, *Dillenia aurea, Opilia amentacea, Pygmaeopremna herbacea, Schrebera swietenioides,Celastrus paniculata, Gloriosa superba, Scindapsus officinalis, Nervilla aragoana, Nervilla plicata, Habenaria commelinifolia* and *Pterocarpus marsupium* have been recorded.

Groundwater Pollution and Botanical Tools for Remedy

Anil K. Dwivedi

Pollution and Environmental Assay Research Laboratory (PEARL),

Department of Botany,

Deen Dayal Upadhyay Gorakhpur University,

Gorakhpur 273009.

E-mail: anil.k.dwiwedi@gmail.com

Groundwater is one of the most important sources of drinking water. Gorakhpur is situated in the Tarai belt of Eastern U.P. and having a concave topography. Here the water table is not deep, so the chances of groundwater contamination are high. In present study which was conducted to estimate the groundwater pollution status in Gorakhpur city for one year show drastic results. Five study sites were located, depending on the study of depth of the bore wells, population density and prevailing health problems of the society, etc. The physicochemical properties of the groundwater were found worse in summer followed by winter season. Highest pH (8.2) was found in rainy season at site 4 while the minimum (6.68) in winter at site 2. Temperature of water was found comparatively higher in summer season as compared to the rainy season. Dissolved Oxygen (D.O.) was more or less high in rainy season as compared to summer at all the sites except site 1. Biochemical oxygen demand (BOD) also showed the same trend as D.O. Free CO_2 was also much higher during winter as compared to summer. Similar trend was recorded in the case of hardness but the chloride concentration showed reverse response at most of the study sites. It is found that the shallow bore well water was more polluted in comparison to deep bore well. The groundwater quality is also affected demographically. Thirty nine botanical tools were tested for the remedy. Best results were obtained in the case of the root of *Tinospora*.

Growth Forms of Macrophytes in Salona Tal and its Adjoining Wetlands of Uttar Pradesh

Santosh Kumar* and Satya Narain**

Duthie herbarium,

Department of Botany,

Allahabad University, Allahabad, India.

E-mail: santosh.allduni@gmail.com*

sn_au@rediffmail.com**

Keywords: *Growth Forms, Macrophytes, Salona Tal and Wetlands*

Salona Tal with their wetlands has large eutrophic water body spread over 4234 sq. km. During the survey 193 angiosperm species belonging to 118 genera of wetland and aquatic macrophytes with rare species e. *g.Centrostachys aquatica, Alternanthera philoxeroides, Neptunea oleracea* etc. are reported and classified according to their growth forms and enumerated with their diversity, growth form and phenology. According to graphical study of growth form Tenagophyte are dominant than Hyperhydate and Epihydate. Minimum number of species has Haptophyte and Rosulate groups because they face the several ecological problems for survival. Tenagophyte have adoptability for terrestrial condition. *Tamarix dioica, Bergia ammannioides, Melochia chorchorifolia, Pentapetes phoenicea, Pepromia pellucia, Arundo donax* and *Phragmites vallutoria* are not true wetland only water loving, grows near river banks, flooded plains and tolerate submergence, anatomically terrestrial so called as Helophytes. Rhizomes permits these plants to endure periods of environmental stress and the rhizome (or corm) is the overwintering bud of plants growing in cold climates. Water lettuce, *Pistia stratiotes* form new plants around the mother plant via underwater stolons. Water hyacinth, *Eichhornia crassipes* and floating fern species of Salvinia, azolla also show explosive poThis is true, e. g. of *Limnophila indica, Hydrilla verticillata,* and.*Potamogeton pectinatus*. There are some bizarre plants that have underwater pollination mechanism. Most notably *Vallisneria natans. Cyperus* and *Sphoenoplectus* are

found in shallow temporary water, fringes of permanent water bodies and in slow running streams. These were associated with species of *Lindernia, Fimbristylis, Eriocaulon* etc. more deep water was mostly harbored by species of *Nymphaea, Nymphoides* and other rooted floating species. *Neptunea oleracea, Limnophila indica, Monochoria hastata, Centrostachys aquatica*, *Crinum defixum* are rare species distributed in few wetlands and their population is very low. Rarity of species due to environmental factor (*e. g.* temperature range, rainfall range, requirement and tolerance, altituditional migeration), ecological factor (Compatibility, allelopathy, distribution, origin, habitat), biological factor, pathological cause and anthropological intereference (grazing, medicinal use and economic value) in the form of habitat destruction or overexploitation. Many species such as *Cyperus rotundus, Spilanthes paniculata*, *Ammania baccifera* etc. has high medicinal value. They are regularly collected by village medicine practitioners for local use along with their perinating parts.

Growth Performance of *Spergula arvensis* L. Under Different Soil Moisture Levels

S.N.Chakhaiyar and Pratima kumara*

Ecology Lab. Depertment of Botany,
Magadh University Bodh-Gaya-824234
*P.G.Center of Botany,Gaya College,
Gaya-823001

Keywords: *Spergula arvensis, Caryophyllaceae, Field capacity, Soil moisture.*

Spergula arvensis L. belongs to the family Caryophyllaceae. It has been found growing in the irrigated cultivated fields with the variety crops like potato, wheat, barley etc. The plants of *Spergula arvensis* also grows in flower beds during winter. Its flowering period is middle of February. The seeds remain in the soil during the whole summer and rainy season. The species propagate by seeds. The effects of excessively wet and dry soils on plant has been studied by several workers. The soil moisture regime has

been defined as an "irrigation treatment in which soil is allowed to dry until a definite measured point is reached with in available water range before sufficient water is applied to restore entire root zone to field capacity ". *S.arvensis* exhibit marked variation due to different levels of soil moisture. Best growth was observed at field capacity i.e. 52 percent moisture level. Less growth of plants in other sets can be attributed to the water stress in those soils.

Impact of Air-bone Sponge Iron Effluents on Surrounding Flroral Community

Anup Kumar mitra, Alkendra Mondal,
Asif Ali, Soham Bagchi,Poushali chakarborty,
Subhamita Dey and Sukanya Guhathakuta
Department of Microbiology,
St. Xavier's college (Autonomous), Kolkatta-7000016
E-mail: drakmitra01@rediffmail.com

Keywords: *Durgapur industrial belt, heavy metals, roadside plants, chlorophyll, SPM, Anatomy.*

The industrial belt surrounding the Durgapur Township consists of maximum sponge iron plants which liberate a lot of pollutants in the atmosphere. In this investigation, we have shown their impact on the roadside plants, thereby to determine the effect of stressed environment on the local flora. The five different plants considered here are *Ageratum conyzoides, Evolvulus nummularis,Alternanthera sesslis, Croton bonplandianum* and *Lantana camara*. The deposition of these pollutants follow higher ratio of Iron and substantially low amount of Cadmium, Chromium and Lead, depending upon the size of the leaf. *Lantana camara* and *Ageratum conyzoide,* having greater leaf area, have relatively more heavy metals deposited on their lamia. With 50% increase in leaf size, *Ageratum conyzoides* shows 85% decrease in heavy metal deposition, depicting that it is the best plant adapted to the polluted environment, having maximum

capability to absorb the heavy metals and remove it from the ambient air. The Suspended Particulate Matter (SPM) level in plants, in the vicinity (10 meters) and far (100 meters) does not show any significant difference, though the metal concentration reduced with distance. So it can be concluded that other than the metals analyzed, there may be silicon and carbon deposition. The chlorophyll content is reduced in some of the plants, *Alternanthera sessli* and *Croton bonplandianum*. The minimum effect in chlorophyll content is noted in *Croton bonplandianum.* Deposition of other pollutant, like carbon and silicon, may be therefore be accounted for the damage in its anatomical featutres. All the five plants show moderate disorganization of mesophyll tissue, accompanied with increase in peripheral air spaces, vacoulation of subsidiary cells and disruption of guard cells. Hence it can be concluded that these plant are ideally suited for this polluted condition and increase in their population density will subsequently reduce pollution in that industrial belt.

Impact of Environment on Genetic Diversity of a Medicinal Plant, *Dipteracanthus patulus* (Acanthaceae).

J.P.Yadav and Sanjay Yadav

Department of Genetics,

M. D. University,

Rohtak – 124001, Haryana

E-mail: yadav1964@rediffmail.com

***Keywords**: Genetic diversity, Dipteracanthus patulus, molecular Marker, RAPD*

Dipteracanthus patulus (Jacq) Nees (Acanthaceae) is an herbaceous, annual or perennial species. In India it is distributed in Tamil Nadu, Western Ghat, Andhra Pradesh, Rajasthan and Haryana. It is commonly known as Kayappacchilai in Tamil Nadu, Chilanthippacha in Western Ghat and Haadjud in Haryana. The present study represents the eco-geographical survey of molecular variation of this important medicinal herb. It is used in treatment of Bone fracture. Despite of its diverse medicinal properties no

molecular data is available about the pattern of variation in its natural range. In this study, 9 RAPD markers were used to detect genetic variations of 10 accessions collected from 8 districts of Haryana and Rajasthan of India. A total of 65 bands were scored corresponding to an average of 7.22 bands per primer with 41 bands showing polymorphism (63.07%). Six out of nine primers gave more than 60% polymorphism. Jaccard similarity coefficient ranged from 0.58 to 0.93. The similarity coefficient matrix generated was subjected to UPGMA to generate clusters using NTSYS 2.02 pc program. The dendrogram has put all the genotypes in two major groups A and B at 66.25% between group similarities. Group A consists 5 genotype having 79.0% within group similarity and group B 5 genotype with 73.5% within group similarity. This study revealed rich genetic diversity among *Dipteracanthus patulus* accessions from Haryana and Rajasthan. The rich genetic diversity is thought to be able to survive the species in changing biotic and abiotic environmental conditions.

Invasive Alien Flora of Mayurbhanj District, Odisha.

K.K Mandal, T. Kar and A.K. Biswal

Biosystematics Laboratory, P.G Department of Botany

North Orissa University

Takatpur, Baripada-757003

Keywords: *invasive; alien; nativity; list; Mayurbhanj*

An alien plant is one that has been introduced by human agency either intentionally or accidentally from one region to another .Some of the naturalised alien spread in the introduced area and display native biota. Invasive alien species are considered as one of the primary threats to the environment as well as to biodiversity. Many Invasive alien species have naturalised in the flora of Mayurbhanj.The present study deals with comprehensive list of invasive alien species in Mayurbhanj with information on habit, nativity and ecological notes. As many as 144 invasive alien species

belonging to 110 genera under 51 families were documented. A better planning is needed for early detection and reporting of infestations of spread of new and naturalised weeds to monitor and control.

Phenological Study of Some Aquatic Plants of Borbeel (wetland), Dibrugarh, Assam with special reference to its ethno-botanical uses by the people of the study area

Bhanu Prova Saikia

Moran College, Sivasagar, Assam

bhanudutta@yahoo.co.in

***Keywords**: phenology, macrophyte, ethnobotany, wetland (borbeel)*

The Borbeel is situated in the Dibrugarh district of Assam at a distance of 3 Km Northwest of 37 NH and 2 Km south west of the river Buridihing at Khowang.. The area of the Beel is about 0.3459 square km and covered with a large number of floating, free-floating submerged and emergent hydrophytes. The most dominant species like *Eichhornia, Nymphea, Salvinia, Trapa, Cyperus, Euryale ferox* etc are found to cover the large part of water body from the month of April to September.

During the study, the phenology of different dominant macrophytes was observed. The aquatic macrophytes like *Eichhornia crassipes, Jussiaea diffusa Nymphea nouchali, Euryale ferox*, *Trapa sp*, etc have different flowering and fruiting phases during the year. In *Eichhornia crassipes* leaf flush takes place between December and March and flowering starts from the Month of April. Flowering and fruiting occurs from the month of May to August in Trapa, Nymphea, Euryeale, and Jussiaea. During the investigation it was found that most of the plants are used as vegetable and medicines by the rural people of the study area.

Phytoplanktonik Index with Reference to Bhalwahi Pond, Gaya

M.Shamsul Islam[1] & Md. Muzafar Imam Ilyasi[2]

[1]SMSG College, Sherghati, Gaya (M.U.Bodhgaya)

[2]K. V.No.-3, Bokaro Steel city, Bokaro.

Keywords: *Diversity Index, Phytoplankton, Physico-Chemical.*

The number of species in a community increases with the complexity of food webs and with the extent of niche overlap or species packing. Diversity Index reflects changes in overall information content rather than enumeration upon an individual species composition changes. Replacement of one genera by another would not hamper the diversity index, it would remain constant. However the changes in genera may be indicative of significant environmental modification Shannon's & Weaver's diversity index for different algal classes witnessed in Bhalwahi Pond, Gaya have been documented which reflects the pollution stress upon the pond ecosystem. The values lie between 2.00-3.56 which reflected a mild pollution in pond.

Plant Exploration in Roopkund and its adjoining area of Nanda Devi Biosphere Reserve (Uttarakhand).

[1]Amit Kotiya, [1]I. D. Rai, [1]U. K. Tiwari, [1]R.R. Bharti & [2]G. S. Rawat

[1]Department of Habitat Ecology, P.B.# 18,

Chandrabani, Wildlife Institute of India, Dehradun

[2]Deputy Programme Manager / Senior Scientist (ECES),

ICIMOD, Kathmandu, Nepal

E-mail: kotia.amit@gmail.com

The Roopkund "The Lake of Skeleton" is mysterious in its past history, mythologically important for people of Himalaya in the occasion "Nandadevi Rajjaat". This area comes under the protected area of Nandadevi Biosphere reserve of Uttarakhand State. The

small lake situated around the elevation of 4850m which comes under greater Himalayan range. During the present investigation flowering plants were explored around the Roopkund and its adjoining areas (Vedani, Aali, Kailu Vinayak and Bagua Basa and enroute to Bedini from wan village). These constitute high altitude vegetation along with medicinal plants, canopy trees, understory and shrub layer of which some are endemic to Himalaya. During the present plants exploration around 460 plants species recorded in this area. The detail investigation of species along with distribution, threats and abundance shall be presented.

Poor Water Management Provides a Mycotoxin Risk to Agricultural Commodities in Bihar.

Chandra Shekhar Varma, Dinesh Prasad Sinha*
and Kanchan Bala Goswami*
Reader, University Department of Botany,
Veer Kunwar Singh University, Ara – 802301, Bihar, India.
*Dept. of Botany, J. J. College, Ara
**Research scholar, V. K. S. University, Ara

Keywords: *water management, flood, mycotoxin, aflatoxin, ochratoxin, citrinin, Fusarium toxins and sterigmatocystin, food grins, agronomic practices.*

Water resources in Bihar is ill conceived and poorly managed. Such stress conditions as flood and drought are a recurrent phenomenon. This provides conducive conditions for mycotoxin elaboration in different food items. High level of illiteracy, socio-economic backwardness and primitive methods of cultivation and storage enhance mycotoxin risk in this state. Altogether 120 samples comprising cereals and pulses were obtained from different parts of flood prone areas of Bihar and analysed for the natural occurrence of different mycotoxins. More than 25% samples were found to have mycotoxin contamination. Some of the important mycotoxins reported to occur naturally were ochratoxin, citrinin, *Fusarium* toxins and sterigmatocystin. Toxin level in most

cases were well above the safe limit (30 µg / kg in case of aflatoxin B_1) as prescribed by WHO. Among the mycotoxins, aflatoxins occurred most frequently and the amount of aflatoxin B_1 ranged from 20 -1850 µg / kg. Some of these toxins are known carcinogens, mutagens, teratogens and immunodepressants and thus very dangerous. Incidence of mycotoxins was substrate and weather dependent. Factors contributing to the problem were discussed.

Seasonal Fluctuation of *Chlorophyceae* in Shaha Lake, karanja (lad), Maharashtra

D.R.Halwe

Department of Botany, S.S.S.K.R. Innani Mahavidyalaya, Karanja (lad),
Dist. Washim,(M.S.)

***Keywords**: Shaha lake, Chlorophyceae, Seasonal fluctuation.*

Monthly water sample of Shaha lake was for collected for phytoplankton analysis during the period of investigation from October 2002 to December 2003. During the study period, 24 species of *Chlorophyceae* count showed two peaks in a year, in October-November & in January-March. IT was found that *Chlorophyceae* dominated the lake during winter & their minimum population was recorded during post summer & pre mansoon seasons. The minimum count recorded was 79 Ind/land 94 Ind/l in the month of July. The maximum count recorded was 1430 Ind/L in the month of November.

Study of Effect of Climatic Condition on Execution if Response and Recovery Time of Mimosa pudica L.

Amerendra Kr Anand, Shubra & Vinod Prasad*

Patna University, Patna-800004, Bihar. *Department of Botany, B.N. College

***Keywords**: ethnomedicine, Lajwanti, Seismonastic.*

Mimosa pudica L., a native plant of South America is an ethanomedicinal plant. It is famous for cure of different common diseases like dysentery, asthama, leucoderma, epilepsy, etc. It is acreeping weed of lenth about 1.5 mt. and in India it is known as Lajjalu or Lajwanti due to its unique seismonastic behavior to stimuli. It is very much sensitive to touch, heat,electrical impulse. And a lot of other stimuli.After getting stimulus it folds its foliose part and droops immediately in defence from predators. Another possible explanation is that the sudden movement dislodges harmful insect to protect itself. In the present work it was tried to study the effect of elimatic condition on the Seismonastic behavior of the plant. The experiment shows that the climatic conditions influence the intensity of the response and post response (recovery time) of the plant. In bright sun light it response and recovers quickly than the cloudy weather and comparatively high air velocity. So the seismonastic behavioral pathway can assumed to be linked with the photo-assimilatory pathway.

Renewable Resource – Wind Energy with Special Reference to India and Rajasthan

Geeta Jakhar

Department of Botany, J.N.V.U. Jodhpur

Keywords: *Degradation , DNES, Propeller, Peninsular, Turbine,Propagation*

Wind energy means production of energy with the help of air. Normally the speed of energy is present near the places of sea coast hill area, continent and desert etc. As well as increase cost of traditional source increases so far interest of wind energy continuously increases. According to world energy council 2,00,000 MW electric will gain from wind till 2020.

In the country there are areas which are quite windy. Average annual wind density of 3 kW/m2/day are prevalent at a number of places in Peninsular India as also along coastline in Gujarat, Western Ghats and parts of Central India. The wind densities

are even more than 10kW/m2/day during winter and wind densities exceeding 4kW/m2/day are available for 5-7 months in a year.

With the help of Bharat heavy electrical limited electricity project of 2 MW is situated in Jaaisalmer near Amarsagar in the Rajasthan State.

With the help of Chennai, memars Asian wind turbine private limited is located in Devgarh (District Chittorgarh) and capacity of that wind mill is 2 MW and by the help of these two plants electricity is produce.

Wind energy means production of energy with the help of air. Normally the speed of energy is present near the places of sea coast hill area, continent and desert etc. As well as increase cost of traditional source increases so far interest of wind energy continuously increases. According to world energy council 2,00,000 MW electric will gain from wind till 2020.

In the country there are areas which are quite windy. Average annual wind density of 3 kW/m2/day are prevalent at a number of places in Peninsular India as also along coastline in Gujarat, Western Ghats and parts of Central India. The wind densities are even more than 10kW/m2/day during winter and wind densities exceeding 4kW/m2/day are available for 5-7 months in a year.

Wind energy may be converted into mechanical and electrical energies. To date wind energy has been utilized for pumping water in rural areas and may also be useful in remote areas. About 2000mW electricity can be generated in India from wind. According to DNES, the wind farms with a total capacity of 3.3 MW have already been set up in Mandvi; 1.1 kW in Deogarh (Maharashtra); 550 kW in Tuticorin (Tamil Nadu) and 550 kW; Puri (Orissa). The types of the wind mills develop are, 12 PU-500, sail Type, Vertical Axis type etc.

Wind fossil fuels, would deliver on the spot small quantity of energy which is free from pollution and environmental degradation. DNES has installed 924 wind pumps

(PU-500 type) with pumping capacity of about 20m throughout the country. Gujarat is the first state in the country to start using wind power.

Plants conducted by wind energy called wind mills. In modern to ideal turbine use of only one or two propeller blade. In producing high air few blades is capable of producing good energy, but they not face heavy storm and broken down easily. So the preference is given to only three blades because this type of propeller balances easily and spins with full effort. Vocational electricity is produces in large scale by wind farm. Wind farms are established not only in hilly area but also in ground surfaces. Wind farm near sea coasts was established by Denmark, Great Britain and Neither land these countries hopes that the 20% necessary past of electricity will produce by wind. Germany is highest producer of wind Power in world. In present, Germany produces 10,000 MW electricity by wind.

In India biggest wind form is situated in Tamil Nadu and Capacity of which is 150 MW. Wind farm was established in Gujarat state of Somnath & Porbander. In mid part of India wind energy help in pulling water up to 100 ft and use in Domestic households etc.

With the help of Bharat heavy electrical limited electricity project of 2 MW is situated in Jaaisalmer near Amarsagar in the Rajasthan State.

With the help of Chennai, memars Asian wind turbine private limited is located in Devgarh (District Chittorgarh) and capacity of that wind mill is 2 MW and by the help of these two plants electricity is produce.

- In the form of conclusion we can say that –
- It is pollution free energy.
- There is no utilization of charges in establishment of wind energy.

By enlightening these possibilities in order to bloom and grow them in real not confining this subject to the seminar only there is a great need for ordinary mass as well for educationist, scientist and media persons to take strict steps together with significant propagation of awareness.

Plant Biotechnology and New Biology

Expression Employing Plant Virus Promoters

Sunita Patro[1a], Deepak Kumar[1a],
Rajiv Ranjan[1], Nrisingha Dey[1*]
Department of Gene Function and Regulation,
Institute of Life Sciences,
Bhubaneswar

Employing recombination approach two chimeric promoters; FUAS35SCP and MUAS35SCP were developed and evaluated in transient (tobacco protoplasts; *Xanthi Brad*) and transgenic systems (*Nicotiana tabaccum* and *Arabidopsis thalina*). The FUAS35SCP promoter was constructed by fusing the upstream activation sequence (UAS) of *Figwort mosaic virus* full-length transcript promoter (FUAS; -249 to -54) with the core promoter domain of *Cauliflower mosaic virus* 35S promoter (35SCP; -343 to +1) while the MUS35SCP was developed by fusing the UAS of *Mirabilis mosaic virus* full-length transcript promoter (MUAS; -297 to -38) with the 35SCP promoter. FUAS35SCP and MUAS35SCP showed enhanced activity compared to the CaMV35S, CaMV35S^2, 35SCP, FUAS and MUSA promoters in both transient and transgenic plant systems. The level of *uidA*-mRNAs accumulation in transgenic tobacco plants expressing each of these chimeric promoters' constructs individually established good co-relation with the corresponding level of accumulation of transcriptoms (GUS activities). In presence of abotic stress elicitors SA and ABA, both the chimeric promoters showed increased activities compared to the CaMV35S promoter in root and leaf. Histochemical staining confirms near constitutive nature of expression for these chimeric promoters including in reproductive tissues. Enhanced cell-specific expressions of the *GUS* reporter gene in cells/tissues of leaf petioles under the control of these chimeric promoters were obtained in comparison to CaMV35S and CaMV35S^2 promoters. Chimeric promoter-driven tobacco-protoplast derived human β-defensin-2 showed enhanced bio-activity compared

to that obtained from CaMV35S promoter. Stress inducible chimeric promoters with much enhanced activities would be very useful for eptopic gene expression in plant for its better productivity.

Biotechnology and Plant-Made Pharmaceuticals

Manoj Dixit* and Kamlesh Meena

* L.B.S. College of Pharmacy,

Jaipur (India)

Keywords: *Bioactive metabolites, pharmaceutical proteins, secondary metabolites*

Biotechnology is defined as a body of techniques that use biological systems, living organisms, or derivatives thereof to make or modify products or processes for specific use.

The major obstacles faced in the study of medicinal plants include inaccurate identification and low yield of bioactive metabolites prepared by chemical methods. A range of biotechnological DNA-based techniques like PCR, RFLP, AFLP, RAPD and sequencing can be employed to resolve ambiguities in plant identification. *In vitro* plant organ and tissue culture methods can be employed to produce bioactive metabolites (alkaloids, flavonoids, terpenoids etc). Recombinant DNA techniques can be used to manipulate metabolic pathways and produce protein pharmaceuticals such as antibodies, and protein hormones. The new disciplines of Bioinformatics and Genomics can find application in drug discovery from plant-based products. These rapidly growing fields of plant biotechnology research offer immense possibilities in long and short-term conservation, micropropagation and production of pharmaceutical proteins.

Plant-made pharmaceuticals are the latest advance in the genetic engineering of plants and promise to produce medicines inexpensively and abundantly by using a range of different plants as factories to express active medicinal ingredients. Plant-made pharmaceuticals are designed to produce vaccines and antibodies for a wide range of

diseases like rabies, traveler's diarrhea, cholera, hepatitis B, antibodies to fight cancer, and tooth decay, and therapeutic proteins for cystic fibrosis, liver disease, and hemorrhages.

The advantages offered by these plant-made pharmaceuticals in terms of production scale and economy, product safety, ease of storage and distribution cannot be matched by any current commercial system. They also provide the most promising opportunity to supply low-cost plant-made vaccines and antibodies. Despite its potential, emphasis on the adoption, diffusion and regulation of plant biotechnology is still in its infancy.

Diversity, Indegenous uses and Conservation Status of Some Important Medicinal Plants Around the Rural areas of Jaipur District(Rajasthan).

Aparna Pareek and PC Trivedi

Department of Botany, University of Rajasthan,

Jaipur.302055

E-mail:aparna992000@yahoo.com

***Keywords**: Ethnomedicinal plants,Plant resources,Habitat Protection.*

A floristic survey of ethno medicinal plants occurring in the tribal area around the rural areas of Jaipur district Rajasthan was conducted to assess the potentiality of plant resources for modern treatments. The information on medicinal uses of plants is based on the exhaustive interviews with local physicians practicing indigenous system of medicine, village headmen, priests and tribal folks Identification of active ingredients and mass multiplication of the potential species have been suggested in view of economic importance. Regular monitoring of populations and habitats of threatened medicinal plants, restricted harvesting and habitat protection are suggested.

Effect of Carbon Nanoparticles, Single- or Multi- Walled Carbon Nanotubes on the Flowering Time of *Arabidopsis thaliana*.

Khushbu Kumari and Kishore Panigrahi

School of Biological Sciences, National Institute of Science Education and Research

Bhubaneswar -751005, Orissa, India

Email: khushbu@niser.ac.in

Keywords: *SWNTs (Single walled nanotubes), MWNTs (Multi walled nanotubes), Arabidopsis thaliana, Flowering Time.*

Carbon nanoparticles and single walled and multi walled nanotubues were shown to have an effect on plant growth and development[1,2,3,4]. Although these pioneering studies were informative, have its own limitations and do not address issues like flowering time control that has a direct consequence with productivity. In the current study, we have tried to address the effect of carbon nanoparticles, single and multi-walled carbon nanotubes on the flowering time in the genetic model plant *Arabidopsis thaliana*(At). Arabidopsis is a facultative long day plant and flower earlier in summer long days with a 16hrs photo period, compared to winter short days with 8hrs photo-period. Toward this goal, we have sterilized the At seeds and plated on MS media supplemented with different concentration of carbon nanoparticles, SWNTs, MWNTs, in long days (16 hrs light/8 hrs dark) or short day (8 hrs light/16 hrs dark) photoperiod, in the perceval growth cabinets. The plant growth and phenotypic changes were monitored and compared carefully every alternate days. The flowering time was scored and shows that the plants treated with carbon nano-particles flower earlier compared to their untreated control. Since flowering is a phenomena, largely induced by a inductive signal, the florigen, at the leaf, we wish to evaluate the tissue specific distribution of carbon nano-particle, *invitro* using Absorption spectroscopy and *invivo* by using Raman spectroscopy. We identified the carbon nano particles to be accumulated significantly in the leaf tissues compared to other plant organs. We wish to present a detailed picture of

our study on SWNTs and MWNTs on plant development and discuss the consequence and importance of our observations.

Effect of Nitrogen to Accomplish Multiple Shoot Propagation Through Immature Seeds of *Murraya koenigii* (L.) Spreng

Uzma Rani *, Najma Ismail and Amla Batra

Plant Biotechnology lab. No.5,

Department of Botany

University of Rajasthan, Jaipur

E-mail: uzmarani786@gmail.com

Keywords: *In vitro propagation, immature seeds, Murraya koenigii (L.) Spreng.nitrogen source,glycine etc.*

Immature seeds excised from fruits were employed as explants. The effects of NH_4^+ and NO^{3-} ionic concentration as provided in the form of ammonium nitrate (NH_4NO_3) potassium nitrate (KNO^3) and glycine (NH_2CH_2COOH) to Murashige and skoogs medium (MS) was evaluated in reference to the multiple shoot proliferation, shoot length, number of nodes per shoot and size of leaves.MS medium fortified with BAP (1.0 mg/l) along with original concentration of NH_4^+ ,NO_{3-} and glycine gave maximum number of shoots (16.00±1.453) with various strength of NH_4^+ ,NO_{3-} and Glycine (control ,half ,normal and double concentration). The multiple shoots were dwarf and they were transferred to shoot elongation medium comprising of MS salts fortified with GA_3 (0.4mg/l). MS medium with original amount of nitrogen source was found to be most effective. The elongated shoots (5.6±0.35cm) were then rooted on half strength MS medium supplemented with IBA (0.5mg/l). Seasonal influence were also observed in multiplication from immature seed of *Murraya koenigii*(L.) *spreng.* The complete plantlets were hardened and acclimatized in plant growth chamber at 26±2°C temperature, 80% humidity and control light about 3000 lux. Finally the plantlets were transferred in the field condition, where they survived with 80% survival rate.

Efficient Protocol for Micropropagation Through Seedling Explants in *Jatropha curcas* L. – a Biodiesel Plant

Veena Agrawal, Nidhi Pandey Singh, Prince Chaubey, Monika Heikrujam, Siva K. Chetri and Gaurav Sharma

Department of Botany, University of Delhi,

Delhi- 110007, India

E- mail: drveena_du@yahoo.co.in

Keywords: *Jatropha curcas · Decoated seeds · Benzyl aminopurine ·Micropropagation · Adjuvant Putrescine*

Seedling derived cotyledonary nodal explants on MS medium supplemented with 2 mg/l benzylaminopurine (BA) and various adjuvants gave an average 6.02±0.16 multiple shoots. On addition of putrescine, multiple shoots were enhanced up to 15.0±0.47. Shoots were rooted on ½ MS medium containing 0.25 mg/l Indole-3-butyric acid (IBA) producing an average 5.33±0.18 roots. Plants were shifted to the field after gradual hardening. Protein profiling of the explants have shown three bands that were poorly visible in control and putrescine lacking cultures get over expressed in the putrescine treated explants.

Enhancement of Insulin Sensitivity in Dibetes Mellitus Using Phytochemicals

Nithyakala.C. and Sindhu Anoop

Department of Molecular biology, Bangalore University

Mount Carmel College, Bangalore.

Keywords: *Diabetes Mellitus, Insulin Receptor, Antidiabetic agents, Phytochemicals*

Diabetes mellitus is a chronic disease that causes serious health complications and it is now one of the most common non-communicable diseases globally. The antidiabetic agents have been focused on plants used in traditional medicine because that

may be a better treatment than currently used synthetic drugs due to its affordability and minimum side effects .Our study is focussed on the antidiabetic effect of some common Indian plants(Piper species, Coriandrum species and Anethum species) on streptozotocin induced diabetes in rats. Besides investigating the glucose level, insulin receptors were also monitored in liver and muscle tissues. Treatment of diabetic animals with crude aqueous extract of all the three plant species for 30 days lowered the glucose level and elevated the hepatic glycogen content and body weight was also stabilised. Further it was also noted that there was a increase in the total insulin receptors expressed in liver cells and muscle cells when the diabetic rats were treated with high concentrations of the aqueous extract of piper species and anethum species in comparison with coriandrum species. It is possible that the compounds from the aqueous extract of the plants enhanced the auto phosphorylation of insulin receptors thereby increasing the GLUT in the cells or the aqueous extract inhibited the cellular protein tyrosine phosphatase activity. Impaired insulin signalling leads to hyperglycemias and therefore pharmacological agents that enhance the insulin receptor activity could be useful in the treatment of type 2 diabetes. This study will provide an opportunity to develop a novel class of anti diabetic agent from phytochemicals which is less toxic than the currently available drugs.

Enhancement of Kaempferol in *Tylophora indica* (Asclepediaceae) Callus

Pratibha chaturvedi ,Supriya shinde and Abhay chowdhary

Haffkine institute, Parel,Mumbai.

E-mail: pratibha.c@ rediffmail.com

Keywords: *Callus; ,NAA; BAP ; Phenylalanine; Ornithine;Tyrosin;Cinnamic acid ; Zenk media*

The accumulation of Kaempferol was evaluated in undifferentiated callus of *Tylophora indica* through TLC, HPTLC analysis with standard reference compound**.**. Kaempferol is a strong antioxidant and help to prevent oxidative damage to our cells, lipids and DNA. In the present investigation, we have enhanced the kaempferol content

in *Tylophora indica* tissue culture by using precursors like sallicyclic acid, ornithine, cinnamic acid,,tyrosin and phenylalanine in different concentration(10 and 20 mg/100 ml).Here we have used static as well as suspension culture to enhanced the kaempferol concentrarion . The callus of Tylophora indica was initiated and maintained on MS (Murashige and Skoog's) medium supplemented with 3% of sucrose, while Zenk production media was used as production media. A remarkable enhancement in kaempferol content was obtained by using 20 mg /100 ml of tyrosin (1.49% dw ;control -0.096%dw) in suspension culture ,which is more than tenfold increase. The enhancement of kaempferol in callus of *Tylophora indica* by using these amino acids was reported for the first time.

Finger print

Anupam Sinha

Arvind Mahilla College ,

Patna

The technique by which be conducted the variation in copy number between individuals we called DNA finger print. DNA pattern of each individual is as unique as are our finger print. In fact our DNA finger-print patterns are much more unique compared to our finger print. DNA finger printing is more commonly and popularly known as tool to track down criminals. But today it is finding applications is as varied areas as Medical diagnosis, Pedigree analysis, sex selection in animals, wildlife conservation and even ascertaining human origins Here's an insight into this revolutionary Technology by someone who helped establish its authenticity available evidence in court of law in India. This Discovery of DNA fingerprint as a surprise to population geneticists who believed that all of us have similar DNA and that there is no difference.

Genetic Tools and Gene Expression Vectors Developed for Molecular Farming of Pharmaceutical Proteins, Vaccines and Recombinant Antibodies.

Indu B. Maiti[1], Dipak K. Sahoo[1],
Joydeep Banerjee[1] and Nrisingha Dey[2]

[1]Molecular Plant Virology and Plant Genetic Engineering Laboratory, Kentucky Tobacco Research and Development Center, University of Kentucky, Lexington, Kentucky 40546-0236, USA;

[2]Institute of Life Sciences, Bhubaneswar 751023, Orissa, India

'Molecular farming' is the mass production of pharmaceutically important and commercially valuable recombinant proteins in plants. From the ancient age traditionally various plants have been used as a source of valuable medicines; and now use of transgenic plants in molecular farming generates the platform of producing valuable molecular medicines that include growth factors, plasma proteins, enzymes, cytokines, interleukins, vaccines and recombinant antibodies. Complex mammalian proteins can be produced in transgenic plants or transformed plant cell suspension culture in fermentation. Molecular farming in plants has the great potentials in health care and the life sciences.

There is a rapidly growing interest worldwide in improved new technology and production systems. We have designed, developed and analyzed plant genetic engineering tools, genetic promoters and a series of gene expression systems for constitutive expression of single, and also multiple genes from a polycistronic unit in transgenic plants. A number of genetic promoters isolated from different members of the *Caulimoviridae* family- plant ds-DNA virus are modified for enhanced expression of genes in plants. We have developed high-level expression vectors to be used for both Agrobacterium-mediated transient and stable expression applications.

In Vitro Anti inflammatory Activity of Methanolic Extract of *Centella asiatica* by HRBC Membrane Stabilisation

Seema chaitanya Chippada, Srinivasa Rao Bammidi,
Sumanjali Avanigadda and Meena Vangalapati *
Centre of Biotechnology,
Department of Chemical Engineering,
A.U. College of Engineering (A), Andhra University,
Visakhapatnam, INDIA.
E-mail: meena_sekhar09@yahoo.co.in

Keywords*: Anti-inflammatory, Centella asiatica, Diclofenac Sodium, Human Red Blood Cell (HRBC), Membrane stabilization.*

Phytochemical analysis of *Centella asiatica* plant extracts revealed the presence of various biochemical compounds such as alkaloids, flavonoids, glycosides, triterpenoids and saponins etc. Since triterpenoids and flavonoids have remarkable anti inflammatory activity, so our present work aims at evaluating the in vitro anti inflammatory activity of *Centella asiatica* by HRBC membrane stabilization. The inhibition of hypotonicity induced HRBC membrane lysis was taken as a measure of the anti inflammatory activity. The percentage of membrane stabilisation for methanolic extracts and Diclofenac sodium were done at different concentrations. The maximum membrane stabilization of C. asiatica extracts was found to be 94.97 % at a dose of 2000 μg/ml. Therefore, our studies support the isolation and the use of active constituents from *Centella asiatica* in treating inflammations.

In Vitro Cultures of *Asparagus* and *Artemisia* Having Potential to Produce Bio-active Components in Regenerated tissues

Pallavi Singh, Vineet Kumar Singh and Padmanabh Dwivedi*

Laboratory of Plant Tissue Culture and Stress Physiology
Department of Plant Physiology,
Institute of Agricultural Sciences,
Banaras Hindu University,
Varanasi 221 005
pdwivedi25@rediffmail.com

Keywords: *Artemisia, Asparagus, In vitro culture, growth regulators, Protocol.*

Steroidal saponin, shatavarins, the major bioactive component in A*sparagus racemosus,* is particularly drawing attention because of its role as an immunomodulant, galactogauge, adaptogen, antitussive, anticarcinogen, antioxidant, antidiarrhial and as a general tonic for both the sexes. This plant has been recognized as 'vulnerable'. It is thus one of those several medicinal plants for which sustainable conservation methods are required on a priority basis. Similarly, presence of high content of bioactive alkaloids like artemisinin in *Artemisia vulgaris* receives attention towards pharmacological industries as it is used for the treatment of malarial fever. Artemisinin is a sesquiterpene lactone which is produced both *in vivo* and differentiated *in vitro* cultures, by *Artemisia vulgaris.* In the present study, seeds of *Artemisia vulgaris* and *Asparagus racemosus* performed well when cultured in MS medium supplemented with Kn (1.0 mg/l) + GA (1.0 mg/l) and Kn (0.5 mg/l) + GA (0.1 mg/l), respectively. The shoot and root primordia were initiated after 10-15 days of culture in case of *Asparagus*. Here, multiple shooting (1.75±0.27) with **s**hoot length of 6.25±0.75 cm having 16 to18 nodes per shoot and 5-6 roots with average root length of 4.0 cm was noticed. GA shows antagonistic effect with Kinetin on root length and synergistic effect in case of shoot length. However, in case of *Artemisia vulgaris,* shoot primordia were seen after 12 days of inoculation. Combined effect of GA

and kinetin produced 3.25±0.62 number of shoots, 1.8±0.45 shoot length and 15.8±0.47 number of leaves. *In vitro* regenerated leaf of *Artemisia vulgaris,* when transferred in basal MS medium, developed callus. Organogenesis through callus is in progress. *In vitro* studies describe a prime and easy-to-use protocol for large scale production of these plants and the method is useful for the *ex situ* conservation of these species as well. In addition, the future findings will provide a baseline data for further research in both the plants.

In Vitro Regeneration and Assessment of Genetic Fidelity of Elite Clone of *Artemisia annua* L. using Molecular Markers

Gaurav Sharma, Vinay Shankar, Monika Heikrujam and Veena Agrawal*

Department of Botany,

University of Delhi, Delhi- 110007, India

E- mail: drveena_du@yahoo.co.in

Keywords: Genetic fidelity · Scorable bands · Micropropagation · Jaccard's coefficient DNA markers.

The genetic fidelity of *in vitro* – raised plants of high artemisinin yielding elite clone of *Artemisia annua* was assessed by using random amplified polymorphic DNA (RAPD) markers. Out of the 20 RAPD primers screened, 18 RAPD primers produced clear, reproducible and scorable bands. In total 91 distinct and scorable bands were generated, with an average of 5.1 bands per primer. A similarity matrix based on Jaccard's coefficient revealed that the pairwise value between the mother and the *in vitro*-raised plantlets was 1, indicating 100% similarity. This confirmed the true-to-type nature of the *in vitro*-raised plants.

In-Vitro Anti-Arthritic Activity of Methanolic Extract of *Bacopa monniera*

Srinivasa rao Bammidi and Meena Vangalapati *

Centre of Biotechnology, Department of Chemical Engineering,

A.U. College of Engineering (A), Andhra University,

Visakhapatnam, INDIA.

E-mail: meena_sekhar09@yahoo.co.in

Keywords: *Bacopa monniera, anti-arthritic activity, Diclofenac sodium, triterpenoids, bacosides.*

Bacopa monniera also referred to as *Bacopa monnieri, Herpestis monniera*, water hyssop, and "Brahmi," has been used in the Ayurvedic system of medicine for centuries. Phytochemical analysis of *B. monniera* plant extracts revealed the presence of various biochemical compounds such as alkaloids, bacosides, flavonoids, glycosides, triterpenoids and saponins etc. Our present work aims at investigating the in-vitro anti-arthritic effect of *B.monniera at* various concentrations. The inhibition of protein denaturation and membrane stabilisation were taken as a measure of the in-vitro anti-arthritic activity. The maximum percentage inhibition of protein denaturation and membrane stabilisation for *B. monnieri* extracts were found to be 90.34±0.83% and 93.67±1.34% respectively at a dose of 2000μg/ml. When compared to standard Diclofenac sodium was found out to be 96.52±1.25% and 98.76±1.67% respectively at a dose of 2000 μg/ml. Therefore, our studies support the isolation and the use of active constituents from *B. monnieri* in treating arthritis.

In-vitro Shoot Bud Differentiation from Various Explants Excised from Seedling and Mature Tree Species of *Prosopis cineraria* Linn and *Prosopis juliflora* (swartz)DC.

LK Pareek and Aparna Pareek

Department of Botany, University of Rajasthan, Jaipur-302055

E-mail: lkpareek@yahoo.com

Keywords: *micropropagation,shootbuddifferentiation,rhizogenesis*

Realizing the importance of micro propagation in tree breeding two species of Prosopis viz *Prosopis cineraria* Linn and *Prosopis juliflora* (Swartz) DC were selected for tissue culture studies with the ultimate objective of establishing an efficient method for their micropropagation. Seeds of these tree species were procured from CAZRI, Jodhpur in order to raise seedlings while mature tree explants were taken from the tree species growing in the areas of Jaipur. Seedling explants viz. shoot tip, primary leaf, epicotyls segment,cotyledon,cotyledonary node, hypocotyls and root segment while mature explants viz. shoot tip, axillary bud, leaflet, petiole segment, internodal segment, nodal segment, infloresense segment and immature embryo were cultured on MS medium supplemented with auxins and cytokinins added singly or in various combinations. Best response was observed when cotyledonary node was cultured on MS medium supplemented with BAP(2mg/l) and IBA (0.05mg/l)where 15 -20 shoot buds were differentiated.

Relatively less number of shoot buds (4-5) were recorded in the case of *P.juliflora*. Similarly mature tree nodal segments showed best response of shoot bud differentiation in more then 80% cultures on MS medium supplemented with IAA(0.1 mg/l) and BAP (5mg/l). Rhizogenesis was achieved when 5-7 cm long shoots were cultured on MS medium supplemented with IBA (2mg/l) incorporated with phytagel

(2mg/l). Histological study was also carried out after fixing the cultured material following customary methods.

Isolation, Characterization and Expression of Sodium Proton Antiporter (*NHX1*) Gene for Salt Tolerance and it's *in Silico* Mapping

P.Hima Kumari[1], S.Anil Kumar[1], Santosh Deshpande[2], Trushar Shah[2], C.T.Hash[2] and P.B.Kavi Kishor[1].

[1]Department of Genetics, Osmania University,Hyderabad, India

[2]Division of Bioinformatics, ICRISAT,Hyderabad, India.

phimakumari@gmail.com

***Keywords**: Salt stress, NHX1 gene, homologs, comparative map.*

Crop production is threatened by global climate change. Excess salts adversely affect all the major metabolic activities in plants including cell wall damage, accumulation of electron-dense proteinaceous particles, plasmolysis, overall decline in germination and seedling growth. To overcome salt stress, efforts have been made in the isolation and expression of genes controlling yield and tolerance. The present work is carried out with an objective to isolate and characterize *NHX1* gene from *Sorghum bicolor,* its heterologous expression. *Agrobacterium* mediated genetic transformation was used using pCAMBIA1302 binary vector. Transgenics (T_0 and T1) were confirmed by PCR, RT-PCR, Southern blotting and physiological studies like ion analysis (Na^+, K^+ and Ca^{2+}). To know the evolutionary conservation of the *NHX1*gene, we compared homologs of *NHX1* in rice, maize, sorghum and a comparative map (cMAP) has been developed.

Micropropagation and establishment of genetic fidelity in *Spilanthes calva* L. through RAPD marker

Mohd Razaq,* Siva K. Chetri and Himanshi Kapoor

Department of Botany, University of Delhi, Delhi – 110007, India

E- mail: razaq198@gmail.com

Keywords: *Spilanthus calva L., Micropropagation, RAPD, Genetic fidelity, Scorable bands, Similarity index.*

Genetic fidelity of *in vitro* regenerated plants and mother plant were assessed through RAPD markers. Twenty RAPD primers were screened, among which 19 primers gave clear and scorable bands. A total of 924 clear and reproducible bands, were generated. The number of bands per primer varied from 1-8 with an average of 4.05 bands per primer. All banding profiles from micropropagated plants were monomorphic and similar to those of mother plant. Similarity matrix based on Jaccards coefficient revealed that pairwise value between all the plants was 1, indicating 100% similarity, this confirming true-to-the type nature of the *in vitro* clones.

Micropropagation of *Cocculus hirsutus* L. Diels and Assesment of Genetic Fidelity of Micropropagated Plants Using RAPD Analysis

Mukesh Kumar Meena , Neelam Singh and Vidya Patni

Plant Pathology, Tissue Culture and Biotechnology Laboratory,

Department of Botany, University of Rajasthan, Jaipur- 302004, India.

Keywords: *Micropropagation, Cocculus hirsutus, organogenesis, cotyledonary node, RAPD.*

Cocculus hirsutus (L.) Diels is an important climber mainly found in tropical and subtropical climates. Traditionally the plant was patronized for its unique property of

healing all types of cuts, wounds and boils. The roots and leaves of *C. hirsutus* have great medicinal value and are used as alterative, emollient, demulcent, tonic, antiperiodic in fever, in malaria, in arthritis, in treatment of skin diseases, constipation, diabetes and kidney problems. An efficient *in vitro* propagation system has been developed for rapid micropropagation of *Cocculus hirsutus*, a medicinally important plant using cotyledonary node from *in vitro* grown seedlings. Maximum shoot bud development (48±0.451) was achieved on MS medium supplemented with BAP (0.5 -2.5 mg/l). The shoot bud best elongated on medium containing 0.25 mg/l BAP. Excised shoots were transferred on medium containing 0.25-2.5 mg/l IBA for rooting. Best rooting was observed at ¼ MS medium supplemented with 0.5 mg/l IBA and number of roots per shoot was 5.4±0.219.These rooted plantlets were successfully acclimatized in pots containing vermicompost and sterilized soil. Genetic stability of the regenerated plants was assessed using random amplified polymorphic DNA (RAPD). The amplification products were monomorphic in micropropagated plants and similar to those of mother plant. No polymorphism was detected revealing the genetic integrity of micropropagated plants. This is the first report of an efficient protocol for regeneration of *Cocculus hirsutus* through organogenesis, which can be applied for further genetic transformation assays and pharmaceutical purposes.

Micropropagation of *Lawsonia inermis* L.

Moharana, B. Behera, S. A. Nayak,
D. P. Barik*, S. K. Naik & P. K. Jena
Department of Botany, Ravenshaw University,
Cuttack-753 003, Orissa, India

Keywords: *Lawsonia inermis, medicinal plant, micropropagation, nodal explants.*

Henna / Mehandi (*Lawsonia inermis* L.) belongs to family Lythraceae is an important medicinal plant. The plant has analgesic, antibacterial, anticancer, antifungal, antifertility, anti-inflammatory, antiviral, hepatoprotective and immunomodulatory

properties. Besides, the plant is known for its ornamental and dye yielding properties. In India it is popularly use among females as cosmetic for staining hair and beautifying their hands, feet etc. Conventional methods of propagation of *Lawsonia* are through either seed or stem cutting. The propagation rate through conventional methods is too slow to meet the demand of high quality planting material for commercial cultivation and pharmaceutical industries.

An efficient protocol was standardized for micro-propagation of *Lawsonia* by axillary shoot proliferation method using *in vivo* and *in vitro* nodal explants. Of the two different types of explant tested, *in vitro* nodal explant was found to be better. Maximum shoot proliferation (ca. 88%) with 10-11 shoots /explant with average shoot length 5-6 cm was achieved on Murashige and Skoog's, 1962 (MS) medium supplemented with N^6-benzyladenine 1.0 mg/l at 21 days of culture. Highest rooting of *in vitro* derived shoots was achieved (ca. 91%) on half-strength MS without any growth regulators. Regenerated plantlets were hardened and transferred to soil with an 85% survival rate. The results of this study tend to give credence to the use of *in vitro* culture and *in vitro* derived plants of henna for the pharmaceutical industries without disturbing the natural stocks.

Modifying Promoter Through Molecular Evolution and Recombination

Rajiv Ranjan* Sunita Patro and Nrisingha Dey

Department of Gene Function and Regulation,

Institute of Life Sciences,

Bhubaneswar

State-of-the-art molecular biology comprises many different tools and methods for tuning gene expression. Naturally, most of these methods rely on modulation of the initiation of transcription by different promoter and, depending on the specific application one can choose the desired promoter from pool of promoter libraries with varying strengths. Adopting DNA shuffling, hybridization and hybridization-shuffling combo approaches two single shuffled promoter libraries (L-SS-F and L-SS-FS), two multiple

shuffled promoter libraries (L-MS-FSF and L-MS-FFS), two hybrid promoters (FUASFSCP and FSUASFCP) and two hybrid-shuffled promoter libraries (L-HS-FUASFSCP and L-HS-FSUASFCP) were generated using the *Figwort mosaic virus* full-length transcript promoter (F) and the sub-genomic transcript promoter (FS) sequences. Activities of approximately 50 shuffled promoter clones from each of these libraries were assayed in transient tobacco protoplasts (*Nicotiana tabaccum* c. v. *Xanthi* Brad). It was observed that most of the shuffled promoters showed activities less than those obtained from parent promoters (F and FS) and CaMV35S promoter. *In silico* studies revealed that the decrease of promoter activities for the shuffled promoters could be due to their higher helical stability. On the contrary, hybrid promoters, FUASFSCP and FSUASFCP, showed enhanced activities compared to F, FS and CaMV35S promoters in both transient and transgenic *Nicotiana tabaccum* and *Arabidopsis* plants. Hybrid-promoters driven protoplast-derived human defensin (HNP-1) showed enhanced antibacterial activity compared to the CaMV35S promoter.

Morphogenetic and Tissue Cultuture Studies for Herbicide Resistance Certain Food Legumes.

Ch.A.Ramulu

Regional Institute of Education,

Unit IX, Sachiwalaya marg,

Bhubaneswar- 751 022.

E-mail:charamulu@rediffmail.com

Keywords*: Grain Legumes, Morphogenesis, M.S medium, , Atrazine Glyphosate, Static cultures and Somatic Embryos.*

Crop improvement programmes includes the alteration of modification is desirable genes using various selection agents, antimetabolites and herbicides.Plant tissue culture and Biotechnology is considered in a wide sense, which comprises the various culture methods of plant organs and explants to facilitate experimental approaches with large

objectives of developmental biology in grain Legumes for crop-modification. The cell line for crop medications has made tremendous progress in plant biotechnology by manipulation of genetic material at cellular and molecular level. Studies were made to establish the static cultures using various seedling explants of *Vigna*, *Cicer*, *Glycine* and *Cymopsis* to investigate the Morphogenic potential and selection against the herbicides and antimetobolites. High efficiency of callusination and somatic embryogenesis were observed in *Glycine max* followed by *Vigna*. The recalcitrant species *Cyamopsis* not responded well under *in vitro* experimental conditions for both multiple shoot development from Cotyledons, the high effiency of multiple shoot induction observed cotyledonary cultures of *Glycine max* which facilitate genetic transformation for production of transgenic plants.Embryogenic suspension cultures of *Vigna* and *Glycine* selected against the Atrazine and Glyphosate 20mM for Herbicide tolerance.

An Assessment of Genetic Diversity of Three Sugarcane Varieties by RAPD Markers

Kalpana Sengar[1], R.S. Sengar[1] and Sanjay Kumar Garg[2]

[1]Tissue culture Lab, College of Biotechnology,
Sardar Vallabh Bhai Patel University of Agriculture
& Technology, Meerut-250110.
[2] Department of Plant Sciences,
M.J.P. Roheilkhand University, Bareilly.
kalpana.sengar19@gmail.com; rakesh.sengar77@gmail.com

Keywords: *Callus culture, sugarcane, shoots regeneration, light intensity, photoperiod, in vitro micropropagation.*

Assessing variability and identification of available germplasm are essential components of crop improvement programs. Knowledge of the genetic distances among different varieties is very useful for genetic improvement The RAPD-PCR technique has been used successfully in this regard . RAPD-PCR amplification patterns resolved

varying degrees of polymorphisms between the three sugarcane genotypes considered in this study. The RAPD-derived genetic similarity indices ranged from 9 % between CoS 96258, and CoS 99259 to 37% between CoS 96258, and CoS 98259. CoS 98259and CoS 99259 share 22% of their genomes. These results suggested a relatively wide genetic diversity among these genotypes.

Rapid Micropropagation of *Woodfordia fruticosa* (Linn.) Kurz. and Screening and Isolation of Bioactive Principles

Neha Grover and Vidya Patni

Plant Pathology, Tissue Culture and Biotechnology Laboratory,

Department of Botany, University of Rajasthan, Jaipur- 302055, India.

***Keywords**: High frequency, Regeneration; Woodfordia fruticosa ; Tissue culture; Screening; Bioactive principles*

An efficient high frequency *in vitro* regeneration protocol was developed for *Woodfordia fruticosa* (Linn.) Kurz., a wild threatened medicinal ornamental shrub, which is in need to be conserved, by tissue culture techniques. The plants were regenerated from young nodal segments and shoot tips. Shoot tips were the best explants for direct organogenesis and nodal segments were used as explants for indirect organogenesis. Maximum number of multiple shoots was obtained from nodal segment explants on MS medium supplemented with BAP (0.2-2.5 mg/l). 95% shoot regeneration response was recorded. Maximum shoot height of 9-11 cms was achieved. The excised shoots were cultured on MS medium with various concentrations and combinations of auxins for rooting. The best response in rooting was observed on half-strength MS medium supplemented with IBA (0.2-1.5 mg/l). Rooted plants were hardened in earthen pots containing sterile mixture of sand and manure (3:1) before transferring to the field This is a rapid, reproducible protocol for large scale propagation of this rare, much- used medicinal, ornamental, threatened plant species and its ex-situ conservation. Preliminary

qualitative screening for bioactive principles and their isolation and characterization have revealed some compounds that could be used to formulate potent antimicrobial drugs in future.

Regeneration and *in vitro* Flowering of *Centella asiatica* (L.)- Brain Food of India.

Sakshi Singh* and Amla Batra

Plant Biotechnology Lab No.5,

Department of Botany, University of Rajasthan,

Jaipur- 302004.

E-mail:ten14@rediffmail.com

Keywords: *Centella asiatica, pharmacological utilization, in vitro flowering, BAP.*

Centella asiatica (L.) urban is a multidimensional herb with its extensive use in the area of folk and contemporary medicinal World. The presence of various bioactive compounds made its pharmacological utilization incredible in skin diseases, mental disabilities, memory enhancement and nervine disorders etc. Due to these comprehensive properties its need is now congregating with the populace headed towards its listing in threatened and endangered species. Thus micropropagation techniques are prominently required for the conservation of this valuable species. In the present study a protocol for successful regeneration of *Centella asiatica* through vegetative propagation has been engendered. Multiple shoots were obtained on the full strength MS medium supplemented with 1.75 mg l^{-1} of BAP. Proliferation of flower buds under aseptic *in vitro* culture conditions is enormously an infrequent process. *In vitro* flowering was observed when BAP (1.75 mg l^{-1}) were used in combination with NAA (0.5 mg l^{-1}).

Remote Sensing and Geotechnical Information Technology --*a Case Study on Kolleru Sanctuary*

T.Raghavendran, B.Rajasekhar, M.Anusha and O.Santhosh

GMR Institute of Technology,

Anil Neerukonda Inst of Tech and sciences,

Tata Consultancy Services-Chennai, Pydah College of Engineering, Vishakapatnam

Remote sensing means the process of acquring information about any object without physically contanting it in anyway regardless of wheather the observer is immediately adaject to the object or million of miles away.Remote sensing data basically consist of wavelength intensity information acquired by collecting the electromagnetic radiation leaving the object at specific wavelength and the measuring its intensity.

To know the geographical information about art,science,engineering &technology GIS system is used.GIS is a generic term denoting the use of computer to create and depict digital represantation of the earth's space.

GIS has the roots for the development of remote sensing, in the late 1960's and early 1970's, as a potentially cheep and effective source of earth observations.While many of techniques for processing remote sensing data are highly specialized, more general GIS techniques become important in order to combine information desired from remote sensing with other collateral information. GIS has many roots of evolution like map production process. The root of large scale data integration around a common data model & possibility storing large number of layers of information.

Sacred Groves as Repository of Medicinal Plants: a Case Study of Sambalpur District, Orissa

Preeti Das, A.K. Mishra and Mihir. K. Das

P.G.Department of Botany, G.M.College (Autonomous),

Sambalpur -768 004(Orissa)

E-mail:mihir_gmc@rediffmail.com

Keywords: *Phytodiversity, Sacred Groves, medicinal plants*

The institution of sacred groves is as old as the civilization itself. They are found all over India and abundantly occur in Western Ghats. Although there has been no study in the entire country, approximately 13,270 sacred groves have been documented so far. The information on sacred groves of Eastern Ghats is scanty and so far the state of Orissa is concerned, no study has been conducted on the importance of sacred groves yet. An attempt has been made to study the phytodiversity of the sacred groves of Sambalpur District of Orissa and the medicinal properties associated with these plants .In the present study, 43 species belonging to 30 families have been collected from 12 sacred groves of Sambalpur District. Further it has been suggested that the sacred groves can be considered as the biological asset. Hence preservation of natural habitat within the grove and the mass awareness among the local people must be given priority to protect the sacred groves.

Somatic Embryogenesis, Protoplast Isolation, Culture and Plant Regeneration from Leaf Cultures of *Dianthus caryophyllus* L

Aparna Pareek

Department of Botany, University of Rajasthan, Jaipur-302055

E-mail: aparna992000@yahoo.com

Keywords: *Embryogenesis,Microcolonies*

Protocol for direct embryogenesis from leaf explants of *Dianthus caryophyllus* has been developed. MS (Murashige & Skoog"s, 1962) liquid medium supplemented with 2, 4-D (1 mg/l) was used for direct somatic embryogenesis without an intervening callus phase. Initially globular structures were observed after 21 days culture of leaf explants in liquid medium. Development of embryo to heart and torpedo stages was achieved in the liquid medium incorporated with polyethylene glycol (PEG 6000) at a concentration of 2.5%. Embryo maturation was further promoted by addition of casein hydrolysate (CH) (200 mg/l) in MS liquid medium. Embryos germinated to form plantlets on solid MS medium supplemented with GA_3 (1 mg/l) regenerated plants with well developed root and shoot systems were successfully transferred to field conditions.

The enzyme mixture containing 2% cellulose and 0.1% pectolyase was found most suitable for high yield and viability of protoplasts. Protoplasts were cultured at a density of 10^5 per ml. in MS liquid medium supplemented with 1 mg/l BAP, 2 mg/l. 2, 4-D, 2 mg/l NAA and 9% mannitol. Microcolonies were formed after four weeks of culture in the dark at 26 ± 10C. Microcolonies were subcultured on similar medium for further growth and development of callus masses. The callus formed was nodular and regenerative. After two weeks, callus gave rise to green shoot buds which elongated on gibberellic acid (0.5 mg/l.) supplemented medium. The shoots were rooted on medium supplemented with 2 mg/l. IBA and were successfully transplanted to field conditions.

Successful Regeneration and Hardening of *In vitro* Developed *Tinospora cordifolia* (Willd.) Hook. F. & Thoms.: An Important Diabetic Plant

Abhimanyu Sharma*, Roop Narayan Verma and Amla Batra

Plant Biotechnology lab. No.5,

Department of Botany, University of Rajasthan, Jaipur.

E-mail: abhsbiotech87@gmail.com

Keywords: *Tinospora cordifolia, Nodal segment, TDZ, BAP, Kn, IBA*

An efficient and rapid regeneration protocol of *Tinospora cordifolia* has been developed through nodal segment's proliferation on Woody Plant medium supplemented with different concentrations of cytokinin and auxins. About 9.66±0.88 numbers of shoots were achieved on W.P.M. medium fortified with kn for shoot initiation (0.6 mg/l) and TDZ / BAP (2.5 mg/l) for elongation of shoots. These shoots were separated and cultured on rooting medium consisted with half strength of MS salts along with different concentrations and combinations of auxins. The *in vitro* recreated shoots were rooted best on half strength MS medium with IBA (0.6 mg/l). The complete plantlets have been transferred to small thermocol cups containing different potting mixture such as soil, vermi-compost, soil rite along with autoclaved garden soil (1:3) and coco-peat for hardening. Coco-peat gave maximum percentage of survival rate of the plantlets in the nature (90%).

Synthesis of Silver Nanoparticles Using *Potamogeton pectinatus* Leaf Extract and Evaluation of its Antibacterial Activity.

Aditya Prasad Nayak and Kishore Panigrahi

School of Biological Sciences,

National Institute of Science Education and Research,

Bhubaneswar – 759005, Orissa, India

Keywords: *Silver Nanoparticles, Biosynthesis, Antibacterial Activity, Extract preparation.*

Synthesis of nanomaterials using living organisms is an emerging aspect in nano-science and technology. Biosynthesis of nanoparticles is advantageous over chemical and physical methods as it is highly cost-effective and environment friendly. The use of plants for the fabrication of nanoparticles is a rapid, low cost, eco-friendly and a single step method for biosynthesis process. The use of plants in process of nanoparticle synthesis is more beneficial than other processes since the nanoparticles are produced extra-cellularly. We have used a plant species namely, *Potamogeton pectinatus* from the Chilika lagoon. The leaf material were dried and ground to fine powder and subjected to hexane based lipid extraction. and lipid free powder was obtained. Microwave based extraction was done to get an aqueous extract of the *Potamogeton pectinatus* leaf extract. This extract was used to synthesize silver nanoparticles in the presence of silver nitrate. Small aliquot of this solution is used for the UV–Vis spectroscopy and Raman spectroscopy and SEM analysis. Antibacterial study was done to test the activity of the synthesized nanoparticles and data will be presents and discussed

PROCEEDINGS
OF THE
NINETY NINTH SESSION OF THE
INDIAN SCIENCE CONGRESS

BHUBANESWAR, 2012

Part II:

Abstract of Symposium/Invited Lecture

SECTION OF
PLANT SCIENCE

President: Prof. P. C. Trivedi

99th Indian Science Congress

January 3-7, 2012, Bhubaneswar

IV

ABSTRACTS OF SYMPOSIUM/INVITED LECTURES

INVITED LECTURES

1. Bio-inoculant : An Eco-Friendly Approach for Plant Disease Management in Modern Agriculture

Anupam Dikshit

Biological Product Laboratory, Department of Botany,

University of Allahabad, Allahabad-211002, India

E-mail: anupambplau@rediffmail.com;

Keywords: *Antagonistic microorganisms; Bio-pesticide; Iatrogenic diseases and Plant pathogens*

The crop protection against plant pathogens through the use of chemical pesticides to maintain the productivity in the present era of our modern agriculture system are not a long- term solution to crop, human and animal health. The over use of these chemical fertilizers have posed serious problems including development of resistant strains of the pathogen; build up of harmful residues in the edible plants, development of iatrogenic diseases etc. Research and development activities have been diverted towards the use of antagonistic microorganisms for the management of pests and diseases. It is well accepted and widely recognized that eco-friendly bio-pesticide derived from microorganism is a distinct possibility for the future and can be successfully exploited in modern agriculture. Some of the microbial taxa that has been successfully commercialized and are currently marketed as AU-derma; Kitonil; Azotogold; Phosphogold; Potashgold; Rhizogold from *Trichoderma viride; Beauveria bassiana; Azotobacter chroococcum; Bacillus subtilis; Frateuria aurentia Rhizobium* respectively and herbal fumigant- Pestoban was developed after organoleptic, pharmacological and other necessary toxicological test as a substitute of synthetic fumigant, Aluminium phosphide. All these have been utilized as potential bio-control agents which suppressed the growth of plant pathogenic fungi around rhizosphere and thereby provide protection from the attack of pathogen and improve plant health.

2. Biodiversity and Conservation of Medicinal Plants

Veena Chandra
Botany Division
Forest Research Institute
Dehradun-248001

Keywords: *Biodiversity,Conservation,Medicinal Plants*

Diverse ecological conditions, rich ethnic diversity and a traditional knowledge base of India accounts for 11% of world's known botanical diversity and 6% of flowering plant diversity. Medicinal plants as a group account for around 50% of all the higher flowering plant species of India. Of the botanical diversity, more than 8000 species are used in some 10,000 herbal drug formulations. Ninety percent of the industry's requirement is sourced – most destructively – from the forests. Millions of rural households also use medicinal plants in a self-help mode. Over one and a half million practitioners of the Indian System of Medicine in the oral and codified streams use medicinal plants in preventive, promotive and curative applications. There are estimated to be over 7800 manufacturing units in India. About 90% of medicinal plant used by the industries are collected from the wild. While over 800 species are used in production by industry, less than 20 species of plants are under commercial cultivation. Over 70% of the plant collections involve destructive harvesting because of the use of parts like roots, bark, wood, stem and the whole plant in case of herbs. This poses a definite threat to the genetic stocks and to the diversity of medicinal plants if biodiversity is not sustainably used. In recent years, the growing demand for herbal product has led to a quantum jump in volume of plant materials traded within and across the countries. Though India has a rich biodiversity, the growing demand is putting a heavy strain on the existing resources. There is no reliable assessment or the volume of the value of the herb – related trade in India but there have been many estimates on the commercial demand and the costs of Indian medicinal plants but these were not based on any uniform or scientific criteria.

While the demand for medicinal plants is growing, some of them are increasingly being threatened in their natural habitat. For meeting the future needs cultivation of medicinal plant has to be encouraged. Nevertheless, they indicate that the demand is very heavy and detrimental to species survival. This has already placed certain species at risk and others will soon follow if immediate corrective measures are not taken. Ongoing conservation efforts in the country are directed towards both *in situ* and *ex situ* approaches.

3. Biosystematics of *Drimia* (Hyacinthaceae) species in India.

S. R. Yadav,

Department of Botany, Shivaji University,

Kolhapur-416 004(MS) India

Genus *Drimia*(=*Urgenia*) is represented by about 7 species in India of which 2 are endemic to the country. The primary centre for diversification of Hyacinthaceae is Africa and most of the species of the genus are found in African continent. The taxonomy of bulbous plants is a terrifying job for the taxonomists because of lack of good qualitative characters in identification of species, survival of populations with variations through vegetative propagation, polyploidy and, loose cross incompatibility resulting into mixing of genomes of various populations/species resulting into polymorphism in the species. Genus *Drimia* is not the exception for it and is highly polymorphic resulting into confused taxonomic status of species within the genus. *Drimia polyphylla* is an example and the species is reported to be synanthus i.e. having leaves and flowers together. During last 30 years of exploration, no synanthus species of *Drimia* is found in India, however, few abnormal specimens with flowers and leaves together(synanthus) are observed in *Drimia coromandeliana* and it is for sure that *D. polyphylla* does not stand as a distinct species and could be a abnormal specimen collected by original collecter. Similarly, *D. coromandeliana* is considered to be tetraploid of *D. indica* and the taxonomic status of former species is questioned. Indian species of *Drimia* can be grouped into day blooming and night blooming species thereby reproductively isolated in nature but if crossed artificially, easily they produce hybrids indicating that the reproductive isolating blocks

are yet to be fully developed among the Indian species. Polyploids and accessory chromosomes are common in *Drimia* species. Thus the taxonomy of the genus is complicated and needed through biosystematic approach. The present paper speaks about the biosystematics of *Drimia* species in India.

4. Biotechnological Advancements in the Field of Mushroom Biology Ensuring Food Security, Medicinal Needs and Environmental Management

Arun Arya
Department of Botany, Faculty of Science
The Maharaja Sayajirao University of Baroda,
Vadodara-390002 (Guj.) INDIA
E-mail: aryaarunarya@rediffmail.com

Keywords: *biotechnology, mushroom biology, food security*

It is said that during Roman times one of the Caesars described mushrooms as "The foods of the Gods," and Promptly reserved them for himself, his ministers and soldiers. However, it is only recently the protienaceous food value of mushrooms is recognized and it may turn miracles by solving the problems of child malnutrition and protein supplement. Advancements have been made in the field of understanding mushroom biology, cultivation aspects, medicinal importance and use of these unique fruiting bodies in bioremediation and waste management. Paper deals with spwan production in certain mushrooms, and advances made in cultivation of two medicinal mushrooms at different temperature in recent years.

After first cultivation of rat ear fungus *Auricularia auricula* in 600 A.D. now more than 12 species are commercial cultivated and cultivation of 200 mushrooms is known. New cultivation methods are develoved for Shittake mushroom (*Lentinus edodes*) and Reishi mushroom (*Ganoderma lucidum*) with biological efficiency of 45% for Lentinus

and 56% for Reishi was obtained. The cultivation of medicinal mushroom is more profitable at the same time interesting. An effort was made to eliminate use of polythene bags by using earthen pots. After first harvest the substrate was removed from pot and oyster mushroom appeared from all side. A range of substrate have been used to increase the yield and manage agro-waste produced in large quantity in whole country. Cellulose and hemicelluloses served better sources of mushroom production, in lignin containing substrates the growth was slower. Dilute acid soaking of the leaves produced better growth. Lentinus cultivation required 15-20^0 c temps, while it was 20-25^{0}c in certain other species and presence of light was important factor for both the fungi.

It is interesting to note that there are 14spp. And 4 more being tried in India. Temperature range suggested for the Shittake mushroom is 10-22^{0}c, climate change and particularly warming will effect extinction of some of its rare spp. reported from all over the world. Mushrooms breeding and strain improvement has resulted into many new and high yielding strains. Production of oyster mushroom is now possible in almost all parts of the country. The efforts are being made to increase number of fruiting bodies by the use of Ni and Sn salts.

5. Biotechnological Approaches for Propagation of Medicinal Asclepiadaceous Members

T.Pullaiah, T. Chakradhar, D. Raghuramulu, P.J.N. Prasad, M. Anitha, A. Agraiah, P.Krishna Reddy, V. Aruna and C. Kiranma

Department of Botany,

Sri Krishnadevarya Uniyersity,

Anantpur-515003, A. P.

In vitro propagation is an efficient mean of ex situ conservation of plant diversity because with this technology many endangered species can be quickly propagated and preserved from a minimum plant material and with little impact on wild population . In

view of the importance of Asclepiadaceous members in medicine and their rarity author and his team have studied methods for In vitro propagation.

Nodal segments of mature explants of three varieties of Caralluma adscendens gave best response on MS medium + 2mg BAP. Nodal segments of mature explants responded on MS medium supplemented with BAP 2mg/l and 3mg/l in Caralluma bhupenderiana and Boucerosia truncate-coronata respectively. Shoot multiplication of Marsdenia brunoniana was achieved from nodal explants of mature plants on MS medium fortified with 1mg/l BAP. In Purgularia daemia nodal explants of aseptic seedlings responded better on MS medium supplemented with 2mg/ml BAP.The best efficiency of BAP for maximum shoot induction was observed in Hemidesmus indicus and Decalepis hamiltonii. For Boucerosia indica MS medium fortified with BAP (2mg/l) + NAA (0.5mg/l) was found best for regeneration. Shoot regeneration efficiency of nodal explants of Ceropegia juncea was maximum with BAP 2mg/l + TDZ (1mg/l), whereas in Ceropegia elegans Kn (5mg/l) + IAA (1mg/l) gave better response. Microprpagation of Cryptolepis buchanani was achieved on MS medium fortified with BAP 2mg/l + Kinetin (0.1mg/l) + NAA (0.05mg/l) + GA_3 (0.05mg/l). In Wattakaka volubilis nodal explants of in vivo plants and in vitro seedlings were culpured on MS medium fortified with Kinetin for best response. In majority of the members half strength MS medium fortified with IBA 1mg/ml or NAA 1mg/l was effective for better rooting.

6. Biotechnology as a Tool for Conservation of Important Medicinal and Aromatic Plant Species: Prospects and Potentials

Ashok K Jain

School of Studies in Botany,
Jiwaji University Gwalior (M.P) India.
E-mail: **asokjain2003@yahoo.co.in**

Keywords: *Plants, Human welfare, Biotechnology, Conservation,*

Since the inception of human civilization man has been reliant on plants and plant based products for food, medicine, perfumery, fodder and different cultural and environmental values. The evolution of human curiosity and need for plants led to the exploration and unveiling of natural enigmas in every dimension of life. Loss of valuable plant genetic resources has gained global anxiety and stirred many new programs for their conservation. Conservation of such plant species is important to ensure sustainable human development and need a holistic approach involving both *in situ* and *ex situ* methods. Using *In situ* methods conservation and ongoing natural evolutionary processes go parallel. For *ex situ* conservation the recent exhilarating developments in biotechnology like *in vitro* culture techniques have been proved successful for multiplication and conservation of important plant species. The development of reliable *in vitro* protocols are of great importance for producing uniform type to type planting material for offsetting the pressure on the natural populations and to cater the demands of different pharmaceutical industries.

In the present study efforts have been made for *in vitro* regeneration and conservation of some important plant species like *Acorus calamus*, *Aristolochia indica*, *Tylophora indica*, *Plumbago zeylanica* and *Portulaca grandiflora.* These species are used in the preparation of drugs for curing several ailments. Efficient micropropagation protocols for regeneration and conservation of these species were formulated using different nutrient media adjuvant by different concentrations and combinations of plant growth regulators. The micropropagated plants after their primary and secondary hardening were in fine fettle in *ex vivo* conditions. Efforts are being made for the restoration of these plant species in their natural habitat.

7. Biotechnology- Second Green Revolution-Vision 2020

C. M. Govil

Department of Botany, C.C.S. University,

MEERUT-250004

Prime Minister Dr. Man Mohan Singh in a meeting addressing agriculture scientists emphasized on the need of second "Green Revolution" in the nation to meet the food requirements of the people and the right of food to poor living below poverty line. The first Green Revolution was the result of efforts made by our plant breeders who used the conventional methods of plant breeding techniques in which planl breeders crossed wheat variety Norin-10 of Japan. Norin-10 itself is a cross between Japanese dwarf wheat and American red wheat variety Fultz in 1917. Norin-10 was crossed with var. Brevor. Norman Borlaug crossed the hybrid of this with a Mexican var. which was rust resistant. The Indian plant breeders crossed this Mexican var. with brown grains with our amber color grains var. to produce dwarf wheat var. with high yield and amber colored grains These experiments not only increased the yield many fold but also made the country self sufficient in food production. However, during the passing of time the first Green Revolution has started showing signs of fatigue because of the following reasons:

1. Reduced area in cultivation due to urbanization and industrialization.
2. Deterioration in soil health, because of paucity of irrigation, over exploitation of ground water, deterioration of water quality due to pollution of river water, soil salinity, industrial effluent and urban sewage *etc.*
3. Change in pattern of pests, pathogens and weeds, further new agents have also invaded the cultivated land resulting decreased yield.

The conventional methods of plant breeding have their inherent limitations because they depend upon-1, the availability of germplasm which has a limited germplasm pool

.2. In most of the cases distantly related plants breeding is not possible because of sexual incompatibility and hence do not undergo genetic exchange, 3. Maintenance of huge amount of germplasm which needs large investment, labor, time and space for storage. Therefore, breeding techniques have limitations beyond certain point hence first Green Revolution has started showing signs of fatigue and our farm yield is gradually declining. It is estimated by the end of year 2020 India will need over 400 million tons of food grains. To achieve this goal alternative techniques have to be applied. Further, agriculture is fast developing into an industry and it has begun to acquire the status of commercial industry in controlling the biological systems.

Indian farmers provide a strong base for traditional farming system for maintaining sustainability of land and stability in production. However, to meet the growing demand and international competition in the commercial market based on agriculture produce it is now considered that all out efforts be made to increase the yield of farm produce many fold.

Biotechnology has lit a ray of hope towards this direction. By using the biotechnological techniques we can not only achieve the set targets of food production but also we can have better quality of food and products like pharmaceutical compounds, drugs, vaccine etc and better utilization of agricultural and industrial wastes. Biotechnological techniques are relevant to plant, breeding.

Tissue culture techniques are widely used for crop improvement and mass propagation of elite plants in agriculture in which tissue culture techniques are useful and applied widely are:

1. Micro-propagation and colonel propagation.
2. Cell line selection of stress (biotic and abiotic) resistant clones
3. Haploid production through pollen culture for the production of homozygous crops and mutation breeding.
4. Isolation of soma clones for stress resistant plants.

5. Protoplast culture and somatic hybridization between distant species.

6. Maintenance of hybrid crops

7. Germ-plasmas conservation and cryopreservation.

Besides, the above mentioned applications techniques of production of genetically modified (GM) crop plants are gaining importance in agriculture field. The genetic engineering or recombinant DMA technology is a powerful tool to augment conventional plant breeding. Plant breeders are no longer restricted to genera in plants that can be crossed but they have the pool and variety of germ- plasm at their hand to target for crop improvement. The whole living kingdom is now a source of desired genes i.e. the genetic engineering has dramatically expanded the gene pool. Plant varieties with good agronomic characters can further be improved according to the choice of the human requirements. The potential of technique of genetic engineering is very evident to the commercial world. The gene transfer is a controlled process so that only well characterized sequences is introduced. The G.M. plants can be produced for, improved and better processing, solid contents, flavor, color, shape, size. texture, sweetness, improved edible parts, mechanical harvesting, storage, resistance to biotic and abiotic stresses etc. Production and their use is a common feature in developed countries and U.S.A. leads in it. But in Europ and developing countries there is still reluctance to accept their introduction for consumption due to various reasons

The present status of G.M. plants in the world is that over 100 G.M. plants released America is at the top. In 2003 the total area in cultivation globally was about 70 million hectares out of which 48 million hectares are occupied by developed countries and only 20 million hectares by developing countries. If we take the example of Bt cotton alone, in India the farmers are benifited by using Bt cotton seeds from 80-87% higher yield. In a recent report in news paper in two villages of Maharastra, prone to suicide used Bt cotton seeds and now they are economically sound. The results of use of Bt cotton seeds by the farmers are encouraging and farmers are "reaping gold" through Bt cotton. Purpose of

this article is to emphasize the fact that if we want a second "Green Revolution", we havato use besides the convetiotnal methods techniques of genetic engineering which will increase production many fold. Further, our scientists should convince the masses importance of G.M. plants.

8. Can Biotechnology Contribute Towards Sustainable Agriculture?

C P Malik

School of Life Sciences, Jaipur National University,

Jaipur

Keywords: *Biotechnology, Sustainable, Agriculture*

The anticipated increase in the world's population, the decline in land and soil productivity as a result of inappropriate soil and water management practices, concomitant with the limits in the supply of natural resources and widespread deterioration of the environment, posses a serious challenge to agricultural scientists presently. Biotechnology may provide an alternative to technologies that have damaging effects on the environment. Biotechnology has the potential to supply useful products for sustainable agriculture, and to increase production. Being flexible in its applications, it can be adapted for small- and large-scale operations.

It will reduce the use of agricultural chemicals, while sustaining the productivity. Available techniques will raise productive and resistant crop, supply nutritious foods etc.

Agricultural sustainability is the successful management of resources for agriculture to satisfy changing human needs, while maintaining or enhancing the quality of the environment and conserving natural resources (Gregory 1989).

Sustainable production is hampered by the decline in land and soil productivity as a result of inappropriate soil and water management practices. Furthermore, hazardous

chemicals (pesticides and fungicides) are constantly being released into the environment, and are becoming increasingly toxic to human and animal life (Gregory 1989).

In many instances, the achievement of sustainability requires the use of purchased inputs such as improved seeds, chemical fertilizers, pesticides, tools and machinery (Gregory 1989). These requirements currently command high prices, making them unavailable to resource-poor farmers.

There are innumerable reasons why biotechnology is regarded as appropriate for developing tropical countries and these are:

- Agriculture in tropical countries produce a sizeable amount of crop residues and other biomass which offer opportunities for conversion into beneficial products;
- Biotechnology uses simple techniques which are already available in living materials (such as microorganisms or living tissue
- The technology can be used in rural industries as well

Some of the areas of significant interest are: genetically engineered animal vaccines, several growth hormones from genetically engineered microorganisms. Disease diagnosis (plants and animals) using DNA probes , antisera and monoclonal antibody (MAb) kits..

Another related technology is the production of biocontrol agents with the potential to replace chemical pesticides. Although wild organisms may be used, as in the case of some *Bacillus thuringiensis* (Bt) - based insecticides, bacteria may also be manipulated in order to achieve a more potent formulation. Some of these techniques require refinement.

Recent research has focused on understanding the molecular basis of many biochemical processes, and applying this knowledge to crop improvement.

Modern biotechnology is relatively expensive, and presumably will take years to develop a useable product, and put to practical use. Genetic engineering is one way in which biotechnology has made an enduring impact. The technique is rapid , precise and certain than conventional cross-breeding. Through genetic engineering, the nutritional traits of plants can be adjusted and pest- and disease-resistant crops have been produced. Plants which can withstand drought, extreme heat or cold, or can thrive on salty soils, are raised. Such like approaches provide new techniques to use usher land.

Restriction fragment length polymorphism (RFLP), RFLP have helped in screening the traits and precisely recognize them.

A less sophisticated technique which has already been practiced for a number of years is micropropagation. Plants are grown from single cells or from small pieces of plant tissue, thus allowing the rapid multiplication of identical plants of improved cultivars and pathogen-free planting stock. The technique has been widely used in raising haploids from pollen, somatic embryos, This method not only speeds up the breeding of improved cultivars but is a means of evaluating germplasm for various purposes.

While advanced techniques of biotechnology, in particular the genetic engineering of plants, animals and microorganisms and the use of DNA probes, is still mainly being carried out in developed countries, traditional biotechnology can be harnessed fully in developing countries.

Developing countries with their agricultural economies need to improve their agricultural practices to optimize their efficiency. There is a growing consensus that the basic aim of agricultural development is not only improved production, but an equitable, efficient and ecologically sustainable system of agriculture.

The use of biofertilizers is gaining increased interest as a cheap, safe alternative to conventional chemical fertilizers. *Rhizobium* technology reduces chemical fertilizers and thus conserves energy resources Mycorrhizal technology has likewise made possible the

production of inoculants to significantly improve the survival, growth and establishment of trees and crops.

Another BIOTECH product is a bacterium-based fertilizer substitute. Inoculating corn with the microorganism *Azospirillum*, isolated from the roots of a pernicious weed, *Saccharum spontaneum*,

BIOTECH has also developed products to accelerate the conversion of large amounts of farm wastes into biofertilizers, using a combination of cellulose degraders and nitrogen fixers. This technology, which is both low-cost and effective, uses a commercially manufactured, low-cost composter. Simple bio-organic fertilizer plants can be established by small entrepreneurs to supply the fertilizer needs of nearby areas.

Crop residues could also be used, for organic fertilizers, and livestock feed, ensilage, mushroom cultivation etc. This constitutes low-cost feed, eliminates problems of agricultural waste disposal. Microbial treatment of carbohydrate-rich agricultural crop residues for animal feeds can be carried out at a farm level..

Biogas technology likewise offers a solution to energy and environmental pollution problems and sludge after processing could be utilized as organic fertilizer.

In summary, biotechnology in agriculture has great hope for food security especially n India which is presently battling food insecurity, poverty and starvation.

There are several myths which engulf New Biology; These are safety, loss of biodiversity, non saving of transgenic seeds, exclusive role of multinational companies, biosafety, European countries refusal to grow and consume transgenic foods etc.,

9. *Commiphora wightii* (Guggal) needs attention of biotechnologist for its conservation and micro-propagation

L.K. Pareek and Aparna Pareek

Department of Botany, University of Rajasthan, Jaipur-302055

E.mail:lkpareek@yahoo.com

***Keywords**: Endangered, Endemic, Micropropagation.*

Commiphora wightii has become an endangered species due to its over exploitation for its gum and resin. Guggulsteron present in gum resin are potent lipid and cholesterol lowering natural agents. The plant is endemic to Indian subcontinents therefore major contributions on its biology, chemistry, pharmacology and biotechnology have been made by Indian researchers. Biotechnological studies via cell culture and micro-propagation are reviewed. Although in the recent years this important medicinal plant has received attention by chemists, pharmacist, biochemist, morphogenetisist and biotechnologists (Ulbricht et al 2005,Saxena et al 2007,Siddiqui 2011) in order to study the ways and means to develop suitable drugs and medicines on one hand and to conserve this endangered plant by evolving a reproducible protocol for its micro-propagation on the other hand. Even then looking to its medicinal value and threat of exploitation the plant needs much more and immediate attention and efforts especially of biotechnologists to protect and conserve this national wealth.

10. Conservation and Propagation of Germplasm Biodiversity of Plants Through Traditional Knowledge

Sanjay Sood*, K.S. Kapoor+ and T.N. Lakhanpal**

* Conservator of Forests,

Hamirpur, Himachal Pradesh.

+ Scientist- F, H.F.R.I Shimla-171009

** Department of Biosciences H.P. Univ. Shimla

***Key words**: Sacred groves, Sarv Dharam Vriksh Kunj, Aesthetic Environment, Communal Harmony*

Documentation and utilization of traditional knowledge is the best and surest method of conservation of depleting biodiversity of plants. All religions of the world have some prominent plant species which have been accorded a sacred status and worshiped since times immemorial. Hence importance of trees has been emphasized in scriptures pertaining to various religions. In the past, people preserved sacred groves (Navgrah Vatika, Nakshtra Vatika etc.) considering such trees to be incarnations of Gods. A *Sarv Dharam Vriksh Kunj* with trees of various religions planted in different sectors of an Earth shaped model shall help achieve the twin objectives of enhancing the aesthetic environment of the site as well as to foster a sense of communal harmony amongst the locals. The concept of commonality of trees like Pipal (*Ficus religiosa*), Bargad (*Ficus bengalensis*) etc. which are universally revered shall be the focal theme of this endeavor.

11. Development of a High Efficiency*In- vitro* Propagation Protocol for *Jatropha curcas* from Apical Buds

Vineeta Shrivastava and Tarun Kant#

Biotechnology Laboratory,

FGTB DivisionArid Forest Research Institute,

New Pali Road, Jodhpur

Email: tarunkant@icfre.org

***Key words**: Biodiesel, propagation, callus, shoot, root, hardening*

Jatropha curcas is an oil bearing species with multiple uses and considerable economic potential as a biofuel plant; however, oil and deoiled cake are toxic. It is a multipurpose plant valued not only for its medicinal properties and resistant to various stresses but also for its use as an oil seed crop. The members of this family are rich in reduced hydrocarbon material. The latex of the plants and seeds are used for medicinal purpose. The latex has also been used in local ayurvedic pharmacopoeia and seeds contain semidrying oil that can be used as an efficient substitute fuels for diesel engines and ingredient for various soaps, dyes and material used in wood industries. A regeneration protocol was optimized for the faster propagation of *Jatropha curcas*. Out of different explants tested (petiole, apical bud and leaf), apical buds were found to be the one of best for callus induction. Shoot regeneration from apical bud was the best. Various combinations of auxins with cytokinins were suitable for callus induction and regeneration. The best shoot regeneration was observed in MS medium supplemented with auxin and cytokinin combination. Root induction was successfully obtained in 1/2 MS medium with auxin. Acclimatization and hardening was successful and rooted plants could be established in soil.

12. Diversity of Fungi and Its Impact on Forest Productivity in Central India

Jamaluddin
Dept of Bio Sciences,
R.D. University Jabapur (M.P.),
Ex Director T.F.R.I. Jabalpur (M.P.),
Email: jamaluddin_125@hotmail.com

***Keywords**: Fungal Diversity, Bioremediation, Global ecology, Forest.*

The forest of central India very rich in fungal diversity and they are having impact on its growth and productivity. Besides this the fungal population is being exploited as food and also for medicinal purposes. The fungi exist in different forest compositions particularly Teak, Sal, Bamboo and miscellaneous forest habited. A wide variety of habitat types can be expected to safeguard fungi *in situ*. The diverse groups of fungi occur in different forest types and it is a congenial habitat for this heterotrophic group of microbic world. It is rich in cellulose and lignin and a variety of fungi come in succession and flourish for the available food. Majority of fungi secrete different forms of enzymes to convert the complex substances suitable for utilization. Ecology of fungi is considerably changed when it is associated with agriculture or forestry species as the forest plants have long gestation period. Many of the mycorrhizal fungi are eliminated by deforestation and plantation of other species, obstacle the reestablishment of such associated fungi. Similarly a large number of wood decay fungi are affected when they did not find mature trees or timber for decay. Many of the fungi are indicator of forest types or ecosystems.There are culture collections or herbaria of fungi at national level. They should also be maintained or strengthened at regional level. Out of 1.5 million of estimated fungi, only 5% are characterized. The importance of fungi is well known in agriculture, forestry, medicines and industries. Furthermore, they are potential source of bio-remediation, natural recycling, as bio-fertilizers, as food and also other means. The

fungal bio technology has become integral part of biological sciences. There is need for proper documentation of diverse groups of fungi. The potential classical mycologists and forest pathologists, who are on the verge of extinction, are desperately needed to maintain and explore this significant group of microbial world. The study of fungi has become a neglected component in the field of agriculture and forestry. Fungi should no longer be excluded from the current world discussions on the conservation of bio-diversity, ecosystem functions and global ecology.

13. Diversity, Taxonomy and biogeography of Cardueae (Asteraceae)- an overview

Arun K. Pandey

Department of Botany, University of Delhi, Delhi-110007

Cardueae Cass. is one of the largest tribes of Asteraceae, with ca. 73 genera and 2400 species. The members are mainly distributed in northern hemispheric Old World. In India the Cardueae is represented by 21 genera viz., *Acroptilon* (1 sp.), *Amberboa* (2 spp.), *Arctium* (1 sp.), *Breea* (1 sp.), *Carduus* (4 spp.), *Carthamus* (3 spp.), *Centaurea* (6 spp.), *Cirsium* (7 spp.), *Cousinia* (5 spp.), *Crupina* (1 sp.), *Echinops* (3 spp.), *Goniocaulon* (1 sp.), *Hemistepta* 1 (sp.), *Jurinea* (2 spp.), *Olgaea* (1 sp.), *Onopordum* (1 sp.), *Saussurea* (61 spp.), *Serratula* (1 sp.), *Silybum* (1 sp.) *Tricholepis* (10 spp), *Zoegia* (1 sp.). The Cardueae are traditionally subdivided into four subtribes: Echinopinae, Carlininae, Carduinae and Centaureinae**.** The bulk of genera within the Cardueae is placed in the subtribes Carduinae and Centaureinae, which together probably form a monophyletic group. Morphologically members of tribe Cardueae vary in habit, floral morphology, and achene anatomy but share some common characters like style morphology. Molecular systematic studies have shown that Cardueae are monophyletic. The subtribe Carlininae has been considered to be basal lineage of the tribe Cardueae. Carduinae are paraphyletic assemblage of taxa. Subtribe Centaureinae show complicated

morphological characters due to reversals of character states and parallelism. Pollen morphology varies from spiny to smooth ornamentation. Chromosome numbers vary from x=16 to x=7. Polyploidy is common. Cardueae are chiefly Mediterranean with three main centers of diversification.

Molecular systematic studies on tribe Cardueae has been done in recent years (Garcia-Jacas *et al*., 2000; Susanna *et al*., 2006). Generic delimitation and phylogeny of the subtribe Centaureinae has been carried out by using a combined nuclear and chloroplast DNA analysis (Garcia-Jacas *et al.*, 2001). Molecular phylogeny of *Cheirolophus* (tribe Cardueae) has been carried out by Susanna *et al*., 2006. Morphological cladistic studies on Cardueae taxa have been carried out by Petit (1998) and chromosome counts have been made by Ghaffari *et al*. (2006).

We have revised the genus *Tricholepis* (Cardueae) in India (Chaudhary and Pandey, 2001) and have also studied embryology and seed structure in some Cardueae (Singh and Pandey, 1984).

tribe Cardueae is represented by 119 species in India, no molecular systematic studies have been undertaken using nuclear and plastid markers

14. Effect of Nitrogen Fertilization in Integration with Certain Growth-Promoting Diazotrophs on Rhizosphere Micro-flora Population in the Paddy Cultivated Soil: Certain Studies on Nitrogenase Activity of Root Surface Diazotrophs on Rice Plant (var. IR-64)

Mihir Lal Roy[1] and Ramesh C. Srivastava[2]*

[1]Tripura State Council for Science & Technology,
Gorkhabasti – 799 006,
Agratala, Tripura (West), India.
[2]Plant Physiology and Biochemistry Research Laboratory,
Department of Botany, Tripura University
(A Central University),
Suryamaninanagar-799 022, Tripura (West), India.
***E-mail:** rcsrivastavatu@yahoo.co.in

Keywords: *Diazotrophs, Oryza sativa, N-fertilization, Nitrogenase Activity,Colony forming units (CFU), Rhizobacteria (Azospirillum brasilense and Azotobacter chroococcum).*

Certain plant growth-promoting rhizobacteria (*Azospirillum brasilense* and *Azotobacter chroococcum*) were inoculated on rice (var. IR-64 of *Oryza sativa* L) in integration with different levels of urea-nitrogen. The experiments were conducted in earthenware pots containing un-sterilised paddy field soil of West Tripura in rainy autumn (aman) season in 2008. The result showed that, the colony forming units (CFU) in paddy soil, were less in without nitrogen and increased in the 50% of recommended dose and was maximum in 75% urea dose However, in the case of 100% urea dose (80 Kg ha^{-1}), the CFU minimized to greater extend. The *in vivo* nitrogease activity of root surface diazotrophs of rice plants also showed adverse effect with full dose of urea**.**

13. Efficacy of 4-cppu in the in Vitro Shoot Regeneration in Sugarcane Genotypes.

A.K.Dhawan
CCS Haryana Agricultural University,
Regional Research Station,
Uchani, Karnal-132001

Keywords: *4-CPPU,sugarcane, tissue culture, growth regulators*

Low multiplication rates and build up of systemic pathogens in the setts make micropropagation an important tool for commercial multiplication of sugarcane. Effect of 4-CPPU[N-(2-chloro-4-pyridyl) N-phenylurea], a non purine compound on in vitro shoot regeneration in sugarcane var. CoS 8436 and Co 1148 and S officinarum clone 'Gungera' was observed at 15, 25 and 35 days and compared with commonly used cytokinins such as BAP, Kinetin and Zeatin. 4-CPPU greatly enhanced shoot regeneration in var. CoS 8436, but showed no effect or caused only a slight promotion in var. Co 1148 and clone 'Gungera'. The results suggest that 4-CPPU simulates cytokinin activity and may provide a better substitute of cytokinins like BAP or kinetin that are generally used in tissue culture.

14. Enhancement of Antioxidants in Plant Through in Vitro Technique

T. N. Nag
M. N. Institute of Applied Sciences (MGS University)
Bikaner - 334022,
Rajasthan, India

Biotechnology offers an opportunity to exploit the cell, tissue, organ or entire organism by growing them in-vitro and to genetically manipulate them to get desired compounds. Plant in vitro cultures are able to produce and accumulate many medicinally

valuable secondary metabolites. Antioxidants are an important group of medicinal preventive compounds as well as being food additives inhibiting detrimental changes of easily oxidizable nutrients. Many different in vitro approaches have been used for increased biosynthesis and the accumulation of antioxidant compounds in plant cell and are capable of stabilizing, or deactivating, free radicals before they attack cells and absolutely critical for maintaining optimal cellular and systemic health and well-being. Antioxidants are gaining a lot of importance as a panacea for a large number of life-style diseases like aging, cancer, diabetes, cardiovascular and other degenerative diseases etc. The present paper summarizes the achievements of in vitro technology for the production of antioxidants compounds. The focus will be on the major chemical classes of antioxidants and on the approaches used to improve the in vitro methods for producing these compounds.

Unorganized callus tissues of various plant species were established by us on Murashige and Skoog's (1962) medium supplemented with different hormones. Callus tissues thus obtained were maintained for 10-12 months by frequent sub culturing on MS medium supplemented with different growth regulators. The cultures were maintained at 25±1°C temperature, 55% relative humidity and 3000 lux diffused light. The tissues thus grown were transferred to fresh MS medium and MS medium singly supplemented with glucose and ascorbic acid for the production of ascorbic acid and phenylalanine for the production of flavonoid. Dried and powdered tissues were then analyzed for antioxidants (Ascorbic acid, Flavonoids, Gossypol) adopting the standard procedures. The tissues fed with various concentrations of precursors showed marked increase in the endogenous level of ascorbic acid from two to eight weeks.

The objectives of this study were to determine the variability in antioxidant content of plants and biosynthetic potentialities of the callus tissues to produce ascorbic acid, flavonoid and promote the application of plant tissue culture technology in the area of the production of antioxidants.

15. Exploitation of Low Cost Input Microbial Technology for Eco-friendly Wasteland Management

A.N. Singh

Manager (Environment)

Rungta Mines Limited,

Barbil, Odisha-758035

E-mail: amaranc2010@gmail.com

Keywords*: *Wasteland Management, Microbial Technology, AMF, Vermicompost.

Generation of overburden dump (OBD) during open cast operation is an inevitable event, which consists of stone pebbles, spoils along with nutritionally poor soil. The newly generated OBD has poor soil nutrients, water deficient and often lacking in the necessary organic matters essential for the establishment of micro and macro flora, but in due course of time soil particles are settled down and allowing natural vegetation to grow. Open cast mining operations have a number of irreversible impacts on the surrounding environment and ecosystems. Thus OBD represents the extreme physico-chemical profile of soil along with disturbed dynamics of micro flora obviously due to broken myriad of tight and tenuous links between vegetation and soil microorganisms.

Microorganisms represent the richest source of biological diversity inhabiting all types of ecosystem. Microbial diversity in rhizosphere and OBD soil is influenced by the several abiotic & biotic components including edaphic factor in an ecosystem which includes soil pH, soil moisture, soil temp, soil nutrient, soil disturbance, soil fertility, soil organic matter and climatic condition. In general diversity of fungi and bacteria has been observed in the same plant and also within the same plant species. Of which several microbes like bacteria, fungi, mycorrhizae, yeasts, and actinomycetes have great role in plant health as well as disease management. The health of soil is also determined by microbial flora due to their immense potential for nutrient cycling, mobilization as well as

plant growth promotion by the release of growth hormone and siderophore. For the management of mining wasteland on sustainable basis it is essentially required to evaluate the role of microbes on plant growth without affecting the bio resources, environmental quality and economical losses.

An extensive survey of Samleshwari Open Cast Project (OCP) of MCL (Odisha) was conducted throughout the year to record the impact of mining on native vegetation. Though it is not at all advisable to suggest the ban on mining but due to apparent loss of native plants it may be recommended for the application of Microbial Biotechnology for the revegetation of overburden dumps.

Vermicompost (VC) along with propagules of Arbuscular Mycorrhizal Fungi (AMF) i.e Endomycorrhizae when applied with overburden dump (OBD) soil in 1:1&2:1 (w/w) ratios improved morphometeric growth in terms of Shoot height, number of branches and number of leaves of *Sesbania grandiflora* plant significantly. However, the former combination was found superior than latter. The same dose of VC+OBDsoil+AMF was also noticed to influence the spore population and root colonization of mycorrhizal fungi in soil.

16. Exploitation of Microbes to Tackle the Phytonematode Menace in Medicinal and Aromatic Plants

Rakesh Pandey, Shilipi Khare Saikia, Arun Mishra and Sudeep Tiwari

Microbial Technology & Nematology

CSIR-Central Institute of Medicinal and Aromatic Plants

P.O.CIMAP, Lucknow - 226 015, INDIA

E-mails: ***r.pandey@cimap.res.in***, ***rakeshpandey66@hotmail.com***

An unseen, underground and hidden, enemy pest, which silently spread from nursery to nursery, and field-to-field, attacking most of the agricultural crops including medicinal and aromatic crops throughout the world is plant parasitic nematode. Plant parasitic nematodes are microscopic roundworms that live in diverse habitats viz. soil and

plant tissues. Due to obligate nature of these parasites, nematodes attack the root or other plant parts in soil like bulb and tubers, and interrupt the uptake of water and nutrients by plants. The annual global loss in agriculture due to damage by variety of phytonematodes can be estimated as more than US$100 billion worldwide. Besides direct damage some plant parasitic nematodes transmit plant viruses and also interact with fungi and bacteria to enhance damage several folds. Organic soil amendments have been reported by a large number of researchers to manage nematode problem but the large quantities required per unit area renders the strategy largely inapplicable in large scale farming enterprises. The assault on the environment through the use of chemical nematicides as well as unreliable results from cultural methods of nematode management has necessitated the search for sustainable, effective and environmentally acceptable nematode management options.

Rhizosphere is the site of intensive interaction between plant and other rhizospheric microbes. Rhizospheric flora has reportedly immense potential for soil and plant health. But this all depend on the density and types of microbes.Useful microbes like PGPR, mutualistic fungi, and other nematode antagonists disfavor the multiplication and development of phytonematode population in soil, enhancing the growth/yield of the crop. For example when nematode population density reaches a certain level, host crop yields suffer greatly as few host plant support faster multiplication of nematodes and others do not. For sustainable cultivation of medicinal and aromatic plants, effective management of plant parasitic nematodes is essential. As my group begins to develop a better understanding of the complex ecologies of soils and agricultural ecosystems, more strategies for exploitation of microbes for the management of plant parasitic nematodes will be developed. The suggested characteristics of microbes for nematode management and better crop health include host specificity, easy in vitro/in vivo manipulation, mass production and easy dissemination with standard equipments. Besides it should also have potential for establishment and recycling, longer shelf life providing control for extended periods and should not be harmful to the environment.

17. Fomeag Cafeteria: A New Hope for Biotechnology, Nutraceuticals, Biodiversity Conservation and Biodiversity-Climate link

V.N.Pandey

Experimental Botany Laboratory,

Department of Botany, DDU Gorakhpur University,

Gorakhpur-273009 (U.P.)

E-mail:vnpgu@yahoo.co.in

Biodiversity is the variability among the living organisms i.e. plants, animals and microbes from all sources. Plant biodiversity is a natural boon for the biological system on this planet i.e. they govern all the biofunctions, bases of biotechnology, distribution and climatic link of the different habitats of the world. Local plant biodiversity (LPB) is important in the world because of their species composition, specificity of species, habitats and local climate-link. These plant biodiversity have enormous biofunctional potential including food and medicine for the welfare of human being by the application of biotechnology. The word Nutraceutical was coined from "Nutrition" and "Pharmaceutical" in 1989 by Stephen De Felice.

There is an urgent need to develop a new integrated design and model to conserve our natural biodiversity and biodiversity-climate links at global level. Different regions or parts of the state and country have specific regions with "region specific biodiversity" which directly linked with economy, health, wealth and status of common people of that specific region which will be developed and named as "FOMEAG CAFETERIA"

FOMEAG (FO = Food/ Forest/ Fodder/ Forage+ ME = Medicine + AG = Arborteum Garden /Aquatic Garden/ Agricultural Garden) Cafeteria are the important for the sustainability of life and have basic regulatory role in biodiversity and biodiversity - climate links. Fomeag Cafeteria provides information, knowledge links among the local people, farmer, women, students, teachers, scientists, forest officers, agricultural scientists, planners, NGO's, Govt. official and policy makers. Fomeag cafeteria strategy

will provide great role in sustainable utilization and conservation of plant biodiversity. Strategy for sustainable utilization and conservation of biodiversity/ Plant biodiversity is through FOMEAG CAFETERIA.

18. Fumigant Efficacy of essential Oil Based Botanical Pesticides in Protection of *Cajanus cajan* L. (Pigeon Pea) Seeds From Bio-Deterioration

Abhay K. Pandey[a], Pooja Singh[a], Uma T. Palni[b] and N. N. Tripathi[a]*

[a]Bacteriology & Natural Pesticide Lab,

Department of Botany, DDU Gorakhpur University, Gorakhpur, 273009, India

[b]Department of Botany,

DSB Campus, Kumaun University, Nainital, 263002, India

Email: nijendratripathi@rediffmail.com

Keywords: *Pigeon pea seeds, Essential oils, Botanical Pesticides, Storage pests.*

This study evaluated the fumigant effect of formulated botanical pesticides made from different concentrations of *Chenopodium ambrosioides* and *Clausena pentaphylla* oils against storage pests of *Cajanus cajan* seeds. Bio-product A was named for *Chenopodium* oil and bio-product B for *Clausena* oil. The fumigant efficacy of developed bio-products for preservation of pigeon pea seeds was assessed by storing the 250 and 500g of seeds along with vapours of formulations in close containers (polyethylene bags). The bio-product A was more effective than B, controlled appearance of fungi and insects when used 3g of 5% concentration showed its Minimum Effective Dose (MED) while MED for bio-product B was 3g of 10%. The results obtained from polyethylene bags prompted to carry out the experiments at groceries' level too. On comparing, the data collected from different sites of trials were quite encouraging; reducing pest infestation. Both the bio-products were found to be more efficacious than aluminium phosphide and

ethylene dibromide, synthetic fumigants used in current study. Surprisingly, both bio-products had no adverse effect on per cent protein content (17.8-20%), per cent seed germination (44-79%) and seedling growth as compared to fresh healthy seeds. Therefore, after multilocation field trials, formulated bio-products may be commercialized as substitute of synthetic fumigants for safe storage of pigeon pea seeds.

19. *In planta* and *Agrobacterium* Mediated Genetic Transformation of Tomato (*Solanum lycopersicum* L.) by Heterologus Expression of *Osmotin* and *Chitinase* Genes for Fungal Resistance

S.Anil Kumar, P. Hima Kumari and P.B. Kavi Kishor

Department of Genetics, Osmania University,

Hyderabad 500 007

anilkumarou@gmail.com

Keywords: *In planta transformation, Osmotin, Chitinase, Agrobacterium, Fusarium oxysporum f.sp.lycopersici, Alternaria solani*

Tomato (*Solanum lycopersicum* L.) is an excellent source of many nutrients and secondary metabolites. Total world production of tomato is about 100 million tons, and India ranks 4th in production. Tomatoes are usually attacked by various fungal pathogens *viz*., *Fusarium oxysporum* (*Fusarium* wilt) and *Alternaria solani* (early blight). The present work is carried out with an objective for *in planta* transformation in tomato with the double construct *Osmotin* and *Chitinase* genes (for fungal resistance), confirmation and expression of the insert by PCR, Southern blotting, RT-PCR in T_1, T_2 and T_3 and to test the transformants for their tolerance to fungal pathogens *vis-à-vis* with controls in T_2 and T_3 generations respectively. *Agrobacterium tumefaciens* LBA4404 strain used for *in planta* transformation in PED genotypes. Putative seedlings were selected on kanamycin, confirmed by PCR, Southern blotting and RT-PCR for transgene integration.

T_2 plants were tested for their tolerance to the fungal pathogens along with controls. Independent transgenic lines showed various degrees of resistance to fungal pathogens compared to controls.

20. *In vitro* Plantlet Regeneration of *Aegle marmelos* (L.) Corr. through Aseptic Seedling Explants

Priyambada R. Biswal[1], G. Rout, L. P. Mishra & S. P. Rath*

[1]Trident Academy of Creative Technology,
C. S Pur Industrial Estate, Bhubaneswar-751024.
Plant Biotechnology Laboratory, P. G. Department of Botany,
Utkal University, Bhubaneswar-751004 (India)
***(**Former Vice-Chancellor, North Orissa University),
258, MIG-2, Kanan Viahar, Patia, Bhubaneswar-751031

***Keywords*:** *Aegle marmelos* (L.) Corr., *In vitro* regeneration, medicinal plant & organogenesis.

Aegle marmelos (L.) Corr. is more prized for its medicinal virtues than its edible quality. Various parts of the plant are being used in many Ayurveda and Unani patented drugs in India for treatment of various diseases. An efficient *in vitro* propagation protocol was developed for *Aegle marmelos* to meet the increasing demand. Direct organogenesis or organogenesis via formation of calli was observed from cotyledonary explants from *in vitro* grown seedling explants cultured on MS nutrient medium supplemented with different concentrations of auxins (2,4-D, NAA, IAA) and cytokinins (BA and Kinetin). Higher concentration of cytokinin (BA) with lower concentration of auxin (NAA and IAA) was beneficial for bud break response. Bud break response has been observed when BA or Kn (0.8-1.2 mg/l) and IAA or NAA (0.4-0.7 mg/l) supplemented in the nutrient medium induced about 3-5 shoots per explant. Subsequent culture for rapid multiplication

of shoots on MS medium with BA (0.8-1.0 mg/l) enhanced the number of shoots more than 55. *In vitro* regenerated shoots while transferred to half strength MS medium with 2-3 mg/l indole-3-butyric acid (IBA) showed 3-4 roots per shoot at the basal cut ends. Ninety- five percent of the rooted shoots survived when transferred to the greenhouse and subsequently to the natural environment.

21. In vivo/in vitro salt stress: Yield loss or Pharmacofarming

Y. Vimala

Department of Botany, CCS University, Meerut-250004

yvimala@gmail.com

To the existing 700 m ha of the salt affected land in the world, there is an estimated continual increase @ 25 m ha per year owing to secondary salinization caused by faulty / brackish water irrigation, and wrong cropping systems. In India alone over 10 million hectare of land is affected by salinity of which nearly 02 million exists in Uttar Pradesh only. Indiscriminate dispersal of heavy metals added to the soil further aggravates the soil health problem.

This has led to alarming shrinkage of land for agricultural purpose. Besides, the same land is generally under cultivation of medicinal plants for growing herbal industries. Our studies generate a ray of hope, as some medicinal plants raised in such problem soils have shown better yield of medicinal principle, along with reclamation of land to some extent. The explants taken from plants grown in problem lands have also shown remarkable response in secondary metabolite accumulation. Thus there is a silver line since the land thus reclaimed / improved by cultivation of select medicinal plants could be suitably used for agricultural purpose for cultivation of cash crops. The medicinal principles collected from preparative cultivation could support herbal drug industries without actually disturbing the green cover.

This is an established fact that plants adapt through evolving strategies to combat stresses. *In vitro* culture conditions not only help to evolve the target plants against stressed environment, but provide a means to understand the stress adaptation mechanism. Their propagation and manipulation *in vitro* facilitate their optimum utilization for exploration of synthesis of defense compounds vis-á vis drug principle, and cultivation for industrial application.

22. Income Generating Spirulina Cultivation-Management by Rural Women

Pushpa Srivastava

Algal Biotechnological Laboratory, Department of Botany

University of Rajasthan, Jaipur-302004 (Raj).

Keywords: *Spirulina, cyanobacterium, neutraceutical, commercial enterprise*

Neutraceutical Spirulina – a cyanobacterium is a commercial enterprise which has traveled from laboratory to land in a village Burthal – Bassi to some ST/SC women of five villages. Thereafter moved to Gujrat state to serve earthquaqe affected women of Halvad village of Saurashtra. This scientific project is being managed by illiterate, uneducated women of both the states. After serving as a source of income now it has entered in the field of pharmaceutical and serving in the treatment of a number of preventive and therapeutic diseases. The first trial was carried on 48 women of Burthal village and the women felt relieved in a number of diseases i.e. itching sensation, gastric trouble, cholesterol, anaemia, chest burning, leucorrea and burning sensation in palms and soles, while women were relieved of their deseases, simultaneously it further reduced the sugar level of blood serum. The diseases treated by Spirulina will be discussed.

23. Increased Alpha-Tocopherol Helps in Maintaining Photosynthetic Activity and Antioxidant Status in Transgenic *Brassica juncea* Plants Growing Under Abiotic Stress Conditions.

Mohd. Aslam Yusuf[1,a], Deepak Kumar[1,a], Neera Bhalla Sarin[1,*]

[1]School of Life Sciences,

Jawaharlal Nehru University, New Delhi-110067, India

***Keywords*:** alpha tocopherol, abiotic stress, *Brassica juncea*, antioxidants

Alpha-tocopherol, the most potent form of vitamin E is a very powerful antioxidant involved in the termination of recyclable free radical production in cells exposed to increased oxidative conditions arising from different abiotic stresses. Herein, we compared the performance of transgenic *B. juncea* plants with increased α-tocopherol content, previously reported by us, and untransformed control plants with respect to their tolerance to conditions of salt, heavy metal, and drought stress, their photosynthetic activity, and content of other antioxidant enzymes. Our results show a distinct edge that the transgenic plants had over the control plants in coping with the induced stress.

24. Indigenous Knowledge and Uses of Marula (*Sclerocarya birrea* Hochst.) in Limpopo Province, South Africa

R.B. Bhat

Department of Botany,

University of Venda,

Thohoyandou, Limpopo Province, South Africa

Keywords: *Marula tree (Sclerocarya birrea), fruit wine, Handicrafts, indigenous knowledge*

Sclerocarya birrea or Marula tree is indigenous to the miombo woodlands of southern Africa and the Sudano-Sahelian range of West Africa and considered as one of

Africa's botanical treasures. It belongs to the family Anacardiaceae. Traditionally the fruits and nuts are used as food, and bark and leaves are used for curing various ailments. The tree has got great cultural and social significance. The primary concern of this investigation is to assess the marginal utilization of this wild tree that is not cultivated for commercial purposes. The traditional uses of marula trees are widespread and it contributes to combating poverty.

25. Induced responses to Paraquat-mediated Oxidative Stress in *Neurosporacrassa* with specific reference to Superoxide-Dismutase, Catalase and other proteins separated by2-Dimensional IEF/SDS-PAGE.

Parvathi Chary

R&DDirector of Life Sciences and HOD Applied Genetics,

Garden City College, T.C. Palya, Bangalore,

Karnataka, 560049, INDIA.

pchary2000@yahoo.com

***Keywords**: Catalase, Superoxide-Dismutase, Oxidative-Stress, Paraquat, Superoxide, Hydrogen-Peroxide.*

Although most of the oxygen consumed by aerobic organisms is reduced to form H_20 during respiration, it is now clear that enzymatic and non-enzymatic electron transfers can result in the release into the cellular environment of toxic intermediate states of reduced oxygen. The intermediates produced upon the univalent stepwise reduction of O_2 include the superoxide radical (O_2^-) hydrogen peroxide (H_2O_2) and the hydroxyl radical ($OH^\bullet$). Taken together, these active-oxygen species have been implicated in damage to virtually all types of major biological macromolecules, including DNA. Production of active-oxygen species can be exacerbated by exposure to ionizing radiation, to redox-active compounds and to certain antibiotics. As a result, several

chemical agents, most notably the herbicide Paraquat, have become an important experimental tool for studying cellular responses to oxidative stress. Intracellular protection against active-oxygen species exists in antioxygenic enzymes, non-enzymatic active-oxygen scavengers, and in as yet poorly-understood DNA repair systems. Two enzymatic scavengers that have received substantial attention are **catalase**, which protects against hydrogen peroxide ($2\ H_2O_2 \rightarrow 2\ H_2O + O_2$) and **superoxide dismutase** (SOD), which scavenges superoxide ($O_2^- + O_2^- + 2H^+ \rightarrow H_2O_2 + O_2$). An important aspect of defense against active-oxygen species appears to be the ability on the part of many organisms to induce protective enzymes in response to an increase in oxidative stress.

The **herbicide Paraquat** exhibits toxicity toward aerobically-grown cells via the production of superoxide and (indirectly) other active-oxygen species. Studies with ***Escherichia coli*** and other organisms demonstrate that paraquat-mediated active-oxygen stress elicits a cellular response that involves induction of **active – oxygen scavenging enzymes**, particularly **superoxide-dismutase** (SOD), **catalase** and other defensive responses including **DNA repair**. The ***present study*** is an exploration of the nature and magnitude of the cellular responses to ***Paraquat-mediated oxidative-stress*** in an aerobic eukaryote, ***Neurosporacrassa***. Paraquat was found to be a **potent inducer of catalase** (up to **40-fold**) and a **weaker inducer of Cu/Zn SOD** (upto**7-fold**); results that ***differ*** from those reported for ***E. coli*** and other organisms. **Two-dimensional gel electrophoresis** (2-D IEF/SDS-PAGE) of total cellular proteins extracted from ***N. crassa*** demonstrated that catalase and Cu/Zn SOD are but ***only*** two of more than ***thirty proteins*** induced upon 5-hr exposure to 1.0 mMParaquat. Although the identities of most of these proteins are unknown; it is however significant to mention that, among the most strongly induced proteins, the probability of the **up-expression** of the **gene product** of the ***mei-3*** **locus** that is involved in **DNA repair**, is high-lighted .

26. Innovation, Patents, Industrialization (SME) and transfer of Technology of Polypeptide-K, an Antidiabetic Product.

Pushpa Khanna

E14/7, Vasant Vihar, New Delhi-110057

Polypeptide-K (Gourdin - Trade Name) extracted from seeds of Momordica Charantia L. (Bitter gourd) is dissolved in weight 10% formic acid. On hydrolysis it shows more than 18000 mol. Wt. containing 19 amino acids. A total of 35 amino acids is arranged in four cycle in interchangeable positions at 12, 13, 15-19, 25-27, and 31-34. Mass electrospectra did not show clear peaks due to noise but gave clear indication of two separate molecules with masses as 11474.32± 8.77 and 11708± 6.30. The MS/MS search after trypsin digest sample of Polypeptide-K showed 229 peptide with no matching with any of the known NCB nr database. However, Edman sequencing did show one excellent matching peptide with Cucurbita maxima and another with a mixture of known sequence of this species.

The shelf life of this protein was calculated as two years. No toxicity was observed even at dose used (60mg/Tab). A significant blood sugar lowering effect was observed on clinical trial on diabetic patients.

The polypeptide-K has been patented in India, China, Malaysia, Indonesia, Japan, Australia, South Africa, USA, European Union (EU) and after obtaining search report from PCT (Patent Co-operation Treaty).

The Polypeptide-K was commercialized by SME at Gurgaon, HR. The Technology was transferred to China, Malaysia, Indonesia and Australia after launching the product (Gourdin) in India.

27. *Jatropha* genotypes in Bangldesh and its *In vitro* Regeneration

M A Bari Miah

Institute of Biological Sciences,

University of Rajshahi

Rajshahi-6205, Bangladesh.

Keywords: *Jatropha, immature embryo, plantlet, in vitro Regeneration, bio-diesel*

Five *Jatropha* genotypes (*Jatropha curcas, Jatropha gossypifolia, Jatropha multiifida, Jatropha podagrica and Jatropha pandurifolia*) were identified in Bangladesh producing important non-edible oil as alternate source of bio-diesel. Potentialities of immature embryo were evaluated *in vitro* regeneration. After germination elongated hypocotyls and cotyledonary leaves were isolated from germinated seedlings and used as explants for callus induction and plantlets formation. Size of embryo was found critical in response. Immature embryo (0.87cm) from dark green fruits 6 weeks after pollination showed a good response of callus induction (83.33%) and yellowish fruits after 7 weeks of pollination produced maximum number plantlets (75.0%).

28. Management of Disease Complexes Caused by Root Knot Nematode and Wilt Causing Fungus on Tomato Through Botanical Antagonist, Oil Seed Cake and Fungal Bioagents.

B.K. Goswami and *Chaitali Bhattacharya

Amity Centre for Bio Control and Plant Disease Management

Amity University,

Sec-125, NOIDA-201303, U.P.

*Centre for Mycorrhizal Research

The Energy and Resource Institute, Dardari Seth Block, India Habitat Centre,

Lodhi Road New Delhi – 110003

E-mail: Chaitali.bhattacharya@teri.res/ bgoswami@amity.edu.in

Micro flora and micro fauna both being constantly exposed to the rhizosphere of agricultural crops are involved in interaction under a common pathosystem. Out of the plant parasitic, nematodes, the endophytic one i.e. root knot nematode being polyphagous, sessile and vascular bundle feeder along with soil inhabiting fungi mainly causing root wilt diseases do interact frequently on common hosts tomato, causing disease complexes. In this case both the above maladies were observed to result synergistic effect on the common host tomato in farmers' fields being recorded from extensive surveys of vegetables growing regions in and around district Bulandshahar conducted between 2006 and 2007. The affected crop show patchy growth which on uprooting were observed to be heavily galled with root knot nematodes identifies as *Meloidogyne incognita*. Most of the heavily galled roots were found to be wilted which on closer examination exhibited micro and macro spores of *Fusarium oxysporum f.sp. lycopersici.* The role of root knot nematode through preliminary pot experiments was established to predispose the host tomato for the attack of Fusarium.

For the management of the disease complex although success have been achieved through the chemical nematicides. However, due to the toxicity, ground water pollution and carcinogenic properties of chemical pesticides an alternative approach was carried out with sustainable components viz. botanical antagonist, *Phylanthus niruri*, oil seed cake of Mohua, fungal bioagents *(Trichoderma harzianum and Paecilomyces lilacinus*) The combination of the above sustainable components in the present investigation under micro plot trial in farmers' fields exhibited an ideal management of both fungal and root knot nematode which caused the disease complexes on tomato. In this integrated approach of management the botanical antagonists and oil seed cake were applied atleast two to three weeks prior to transplantation for decomposition in above for making the host more tolerant. All the three components knot nematode in terms of both soil and root. In these IPM treatments the yield as well as quality was applied alone. This integrated approach of management with sustainable and ecofriendly component to combat both the soil borne diseases helped in transforming both soil and plant healthy without casing residual toxicity.

29. Management of Rhizome Rot of Ginger

B.C.Lodha

Department of Plant Pathology,RAU.Udaipur

The disease is both rhizome (SEED) and /or soil borne in nature,primarily caused by Pythium myriotylum and Fusarium solani in district of Udaipur and Dungarpur of Southeren Rajasthan,where 38 of 53 farmers field had 20 to 75 percent of disease. A few fields also revealed natural bio-controle agents in rhizosphere viz. Trichoderma aueoviride, T. herzianum,

T.longibrachiatum,Gilochladium virens and Pythium acanthophoron isolated by pathogen baiting technique.

Fungicidal rhizome treatments with bavastin, captan, dithame M-45,ridomil MZ, topsin, thiram, difoltan, apron, burgundy mixture were evaluated for disease suppression

capabilities in the laboratory as well as in fields, and finally bavastin combined with rhizomil MZ were selected for futher study.Rhizome palating with above noted Trichoderma and Gliocladium was also evaluated.Soil amendment with oil cakes of castor, groundnut ,karanj, Mahua, neem; and wood saw dust (w.s.d) with or without biocontrole agents were also cultivated.Oil caked of neem, karanj and w.s.d with or without noted Trichoderma species as biocontrol agents were selected for futher detailed study.

Finally,at farmer's fields,biocontrol agents grown on w.s.d. as soil amendment combined with fungicidal seed treatments were evaluated at seven farmers fields in last two years of nine years study.

Rhizosphere and non-rhizosphere populations of both pathogens and biocontrol agents in the fields during and after the crop period was also estimated to infer if any correlation of biocontrol agents population on disease suppression exists.The results of this successful study are presented and discussed.

30. Metabolic Engineering and Production of Next-Generation Bio- Fuels

Ashwini Kumar

Energy Plantation Demonstration Project Centre.

Department of Botany, University of Rajasthan, Jaipur – 302 004, INDIA

E-mail : Ashwanikumar214@gmail.com

***Keywords**: Fuel molecules, Biomass waste, Cellulosics, Biofuel.*

Global climate change has stimulated efforts to reduce CO**2** emissions**.** Photosynthetic organisms use solaenergy to generate reducing equivalents and incorporate atmospheric CO2 into organic molecules. Cellular phenotype is amanifestation of gene expression levels, metabolic demand, resource availability, and cellular stresses. Currently, cellulosicbiofuels and algal biodiesels are prominent

biological approaches to sequester and convert CO2. Today, ethanol andbiodiesel are predominantly produced from corn kernels, sugarcane or soybean oil. However another biofuel feedstock,lignocelluloses—the most abundant biological material on earth is being explored. Lignocelluloses is everywhere—wheatstraw, corn husks, prairie grass, discarded rice hulls or trees. The race is on to optimize the technology that can producebiofuels from lignocelluloses sources more efficiently—and biotech companies are in the running. There is campaign, which advocates that 25% of US energy come from arable land by 2025. The EU had called for a threefold increase in biofuel use by 2010, to 5.75% of transportation fuel.

31. Micropropagation of Leguminous Crop Plants and Some Lower Plants-An Overview

Harvinder K. Cheema

Department of Botany, Punjab University, Chandigarh-160014

Recent trends in biotechnology particularly the application of plant tissue culture through micropropagation are reviewed briefly. Though investigations have been undertaken on some important leguminous crop plants viz., Cow pea (*Vigna unguiculata*), pigeon pea (*Cajanus cajan*) and Soyabean (*Glycine max*.) to extend work on regeneration and propagation of legumes under culture conditions. Mulltiple shoots were induced directly from the hypocotyls, stem explants and cotyledonary nodes on Murashige and Skoogs medium supplemented with BAP, Kinetin and combinations of NAA with BAP and Kinetin. High frequency of multiple shoots were successfully induced from the stem and hypocotyls explants of pigeon pea(*Cajanus cajan*) directly on Kinetin alone or in combination with NAA and from cotyledonary nodes and stem explants of cow pea (*Vigna unguiculata*). Regeneration of multiple shoot buds was observed on BAP containing medium but complete plants develoved only when BAP was omitted from the medium. Combination of NAA and BAP was found to induce condenced shoots from stem explants with apex and shoot buds from the hypocotyls explants which develoved complete plants later on harmone free medium.

An important point that emerges from the investigations is that the requirement for the initiation and development of multiple shoots is different. BAP is required only for the initiation of shoot buds but has to be omitted for the development of complete plants.Secondly, best results are obtained from the nodal part of the stem segment of *Vigna unguiculata*,presumably because of the high meristemate activity of cells in that zone.The nutritional requirement for the induction of multiple shoots in *Brassica* species were rather sample. Sucrose, Kinetin and NAA alone could produce vegetative buds, multiple shoots and complete plants.

The importance of pteridophytes as experimental material for morphogenetic studies and more recent realization of their medicinal, horticultural and ecological value has brought into focus the need to investigate the potential of the group of early land plants in deciphering morphogenetic events which may serve as basis for their conservation and commertial exploitation. A large number of plants can be raised by clonal and multiple shoot induction in ferns leading to the conservation of biodiversity.

32. New records of the genus *Pleurotus* (Oyster mushroom) from India

R.C. Upadhyay and Babita Kumari

Directorate of Mushroom research Solan-173213 (H.P.) India

Members of *Pleurotus* species are distributed worldwide and reported from tropical, subtropical and temperate regions of the World. The basidiopcarps are found growing on different kinds of trees and perennial shrubs. They are characterized by flabelliform basidiocarps decurrent lamellae, short lateral stipe, presence of vermiform shaped cheilocystidia, monomitic to dimitic hyphae and ellipsoid to cylindrical, inamyloid, cyanophilic basidiospores. The genus *Pleurotus* is very interesting, as all the three forms of propagation viz. vegetative, sexual and asexual spores have been reported in different species. The mycelium of coremia forming *Pleurotus* species namely, *P. cystidiosus* and *P. smithii* produces black head like aerial structures (Coremia), which bears asexual spores. These asexual spores on germination give rise to fresh mycelium and fruiting

bodies. Simiilarly *P. tuber regium* forms hypogenous tuber like structure, which is edible and new basidiocarps, may develop under suitable conditions. During last ten years several *Pleurotus* species have been collected and identified for their medicinal and culinary properties. New and interesting *Pleurotus* species collected from India namely, *P. angustus. P. djamor var. cyathiformis., P. platypodus, P. albidus, P. pometi* and coremia forming species will be presented.

33. On-chip Cell Analysis System to Study Cancer Preventive Phytochemicals In Indian Herbal Plant Extracts

Manish Biyani[1,2], Takanori Akagi1, Nupur Nigam[2], Ashok Kumar[3] and Takanori Ichiki1

1.Department of Bioenginnering, The University of Tokyo, Japan,

2.Department of Biotechnology, Biyani Girls College, India,

3.Department of Zoology, University of Rajasthan, India

Keywords*: Cancer, Phytochemical, Cell electrophoresis, Cell Cycle, Microfabrication.*

We describe the development and application of high-throughput on-chip analysis system to study chemopreventive action of dietary phytochemicals found in Indian herbal plants. Cancer chemopreventive action in the extracts of four Rajasthan-origin plants (*Prosopis cineraria, Theobroma cacao, Permelia perlata and Embelia ribes*) which are commonly used in herbal medicines and are rich source of flavonoid was investigated. The major chemical constituents in all plants were isolated, identified and their cytotoxic effect was confirmed on HeLa cells. The highest IC50 value (concentration that causes reduction in cell viability to 50%) was measured for *Prosopis* (201 μM) and the lowest for *Embelia* (31.6 μM). Next, in order to perform a comprehensive single cell-based analysis of phytochemical treated HeLa cells, we developed a high throughput on-chip system using microcapillary electrophoresis chips and FUCCI (Fluorescent Ubiquitination-based Cell Cycle Indicator). This system is based on a combination of

optical and electrical measurement and provides the benefitsof analyzing single cell via their electrophoretic mobility (EPM) representing thechanges in electrical state of the cell surface in accordance with the progress of its cell cycle. The EPM of HeLa cells was measured after apoptosis induction by treatment with isolated phytochemical from *Embelia.* Interestingly, a decrease in EPM was observed than of untreated cells and thus can be used as an indicator of changes in the cell surface induced by apoptosis. The utility of this high-throughput system will be discussed, in particular to study synergistic effects of combinations of various phytochemicals and discover novel compounds to inhibit, reverse or retard tumorigenesis.

34. *Pseudomonas fluorescence,* a Potential Biological Control Agent Against Wilt Fungus in *Cajanus cajan*

Sampat Nehra
Birla Institute of Scientific Research,
Statue Circle, Jaipur, Rajasthan, INDIA

Keywords: *Cajanus cajan*; *Fusarium udum*; rhizobacteria; *Pseudomonas fluorescence*, biocontrol

Pseudomonas fluorescence, a plant growth promoting rhizobacterium and *Fusarium udum*, a root rot fungi inhibited the growth of *Cajanus cajan* L. About 165 rhizobacteria were isolated from cultivated soils of north-east India from 20 villages of Alwar distt. Among the total isolates, 25 isolates were confirmed as *Pseudomonas fluorescence* based on the biochemical tests such as arginine hydrolysis, catalase activity, production of fluorescing compounds, gelatin liquefaction and growth at 4°C and 42°C. Their antifungal activity against wilt fungus *Fusarium udum* (strain of pigeon pea) was examined *in vitro* as well as *in vivo*. Survivality of the isolates under stress conditions of temperature and pH was examined. Five strains (BISR-E, BISR-T, BISR-V, BISR-X and BISR-Y) gave maximum temperature tolerance and four strains (BISR-B, BISR-C, BISR-

D and BISR-H,) could survive under variable pH range (4-10). Twelve isolates of *Pseudomonas fluorescence* were exhibited strong antifungal activity against *F. udum.* Zone of inhibition was measured. Twelve isolates were observed with more than 30% RI value with maximum RI value recorded in strain BISR-W and BISR-N (42.0%). Net house pot studies screening results revealed that 17 isolates (BISR-A, BISR-B, BISR-C, BISR-D, BISR-E, BISR-G, BISR-H, BISR-I, BISR-K, BISR-L, BISR-N, BISR-O, BISR-P, BISR-R, BISR-U, BISR-W and BISR-X) were observed as good PGPRs as well as BCAs. Among these strains isolate no. BISR-B, BISR-F, BISR-K, BISR-N, BISR-O, BISR-P, BISR-W and BISR-X, were proved themselves superior isolates having good biocontrol potential to manage *F. udum* in Pigeon pea plant and to enhance plant growth parameters to a significant level. Out of 25 isolates, 20 isolates (BISR-A, BISR-B, BISR-C, BISR-D, BISR-F, BISR-G, BISR-H, BISR-I, BISR-J, BISR-K, BISR-L, BISR-M, BISR-N, BISR-O, BISR-P, BISR-Q, BISR-R, BISR-S, BISR-T and BISR-V) could produce siderophore.

35. *Rhizobacteria* for Sustainable Crop Production

A.Bhadraiah and K. V. B. R. Tilak

Department of Botany, Osmania University

Hyderabad-500007. A.P., India.

Keywords: *Rhizobacteria, Sustainable, Crop Production*

During the last two decades, agricultural production has increased in developed and certain developing nations due to use of high yielding varieties and enhanced consumption of chemical fertilizers and pesticides. This has, however, been accompanied by an exponential increase in the consumption of non-renewable forms of energy. In view of escalating energy costs, it is essential for us to evolve and adopt a

strategy of integrated approach by using a combination of chemical fertilizers/pesticides and bioinputs.

Root colonizing bacteria (*rhizobacteria)* that exert benellcial effects on plant development via direct or indirect mechanisms have been defined as plant growth promoting *rhizobacteria* (PGPR). Although significant control of plant pathogens or direct enhancement of plant development has been demonstrated by PGPR in the laboratory or in the green house, results in the field have been less consistent. Recent progress in our understanding of their diversity, colonization ability, mechanism of action, formulation and application should facilitate their development as reliable components in the management of sustainable agricultural system.

The importance of rhizosphere microbial populations lor maintenance of root health, nutrient uptake, and tolerance of environmental stress is now recognized. These beneficial microorganisms can be a significant component management practices to achieve attainable yield, which has been defined as crop yield limited only by the natural environment of the crop and its innate genetic potential. Recent progress in our understanding of the biological interactions that occur in the rhizosphere and of the practical requirements for inoculums formulation and delivery should increase the technology's reliability in the field and facilitate its commercial development.

Bacterization of seed with the carrier/liquid -based inoculants of *rhizobacteria* resulted in increased crop growth, yields. biomass and control of soil-borne root phytopathogens such as *Rhizoctonia sokmi, Fusarium oxysporum. Colletotrichum falcons, Macrophomina phaseolina, Verticillum* etc. of economically important crop species. Recent investigations have brought to light instances where biological activities are markedly enhanced in two or three membered associations of organisms. Such syntrophic associations are of ecological importance with implied agricultural significance. For example, combined inoculation of nitrogen fixers, biocontrol agents, AM fungi etc. with PGPR resulted in beneficial responses in crop plants.

36. Role of Biological control in Plant Disease Managaement

Pratibha Sharma

Biocontrol Lab, Plant Pathology, IARI, New Delhi-12

Plant disease control measures are aimed at reducing or eliminating one of the three factors involved in disease development: an infectious pathogen, a susceptible host and a suitable environment. Not only do these factors interact, but disease control strategies also must be woven together with management methods to address weed, insect and other production concerns. There is considerable public pressure from environmental scientists to decrease emphasis on chemical control and use biological methods for controlling plant pests and diseases. Pesticides are necessary at present, but are not a long –term solution to crop health. Besides, their non-target effects and hazardous nature, petroleum-based pesticides will become more expensive, and some are now losing their effectiveness because, of development of resistant strains. Breeding for resistance, which continues to be the most practical and feasible method to control plant diseases, is not able to keep pace with the development of more virulent pathogens. In this context, the increased emphasis on recourse to biological control of plant diseases is fully justified. Biological methods mainly consist of using a microorganism to control harmful microorganism (by biological destruction) causing plant diseases without disturbing the ecological balance. Extensive efforts were made in the 1920_S and1930_S to introduce antibiotic-producing microorganisms into soil for root disease control, but the experiments were so unsuccessful that research on this method of biological control virtually ceases for about 3 decades. The failures in these earlier years also fostered negative attitude among plant pathologists toward biological control. Thereafter, more many international symposia have been held on this topic and first book entitled, Biological Control of Plant Pathogens,(Baker and Cook, 1974) devoted wholly to the subject was published..The last few years, however, have witnessed a dramatic increase in research efforts on biological control of plant diseases in India also . The

microorganism used in biological control of plant disease is termed as, antagonists, also commonly termed as biocontrol agents (bcas). 'Antagonist' is a microorganism that adversely affects another growing in association with it, balance wheel of nature, operates through competition, parasitism and antibiosis. Biological control is a natural phenomenon, nature's own way of keeping diseases from getting catastrophic which need to be well utilized, at an insight into the phenomenon is a pre-requisite .Fungal and bacterial antagonists play a major role in biocontrol technology. Most prominent are Trichoderma and Pseudomonas which are fully exploited at commercial level. Antagonism includes antibiosis, competitions and mycoparasitism and, therefore, a brief look on mycorrhizae, and plant growth promoting rhizobacteria (PGPR) in biological control. The soil is a complex system where processes have direct influence on crop nutrition and plant health. Unfortunately, most of the agricultural soil management practices, compact them producing poor oxygenation, low beneficial microorganism populations and metabolic disorders in plants. The term PGPR refers to bacterial strains isolated from rhizosphere and used as seedling inoculants to provide better growth of plant and resulting in higher crop yield. The PGPR colonize the root surfaces and reduce microbial populations detrimental to plant growth. The competition and colonization are the driving of PGPR. In recent years, it has been established that an ill-defined category of rhizosphere affect roots through their toxic metabolites. These are termed deleterious' microorganisms. PGPR suppresses the deleterious microorganisms, the pathogens.

Important soil borne plant pathogens as: *Sclerotium cepivorum, Sclerotium rolfsi, Sclerotinia sclerotiorum*, *Rhizoctonia solani,Fusarium oxysporum, Phytophthora palmivora*, *P. parasitica*, *Pythium sp,Aspergillus flavus, A. niger*, .have been tackled through bioagents like Trichoderma including air borne pathogens as powdery mildews, Alternaria Colletotrichum sp.Different strains of the bioagents have biocontrol effect and therefore, well tested and proven strains should be used.

Field performance of *Trichoderma harzianum* (Th3 (Sharma et.al 2009,2010,2011), was evaluated in terms of its rhizosphere colonization and competence, survivability

(root colonization behaviour) and non host specificity in different crops including cereals (Rice, Wheat, Maize, Pearl millet, Barley), Legume (Chickpea), oilseed crops (Groundnut, Soybean, Mustard, Linseed), Vegetables (Cauliflower, Brinjal, Okra, Pea, Potato, Tomato, Chilli, Garlic, Onion, Coriander, Fenugreek) , Ornamental crops (Rose, Marigold) and fruit (Watermelon) of both Rabi and Kharif season. Field trials on seed treatment with powdered bioformulation of *Trichoderma harzianum* (Pusa *Th3*) @ 4-5 g/kg seed, followed by spray of liquid bioformulation (Pusa *Th3*) @ 4-5 ml/l were conducted. The associations of *Trichoderma harzianum* (*Th3*) with rhizosphere were measured by periodic observation of rhizosphere competence and survivability at three different stages of crops (seedling, flowering and pre-harvesting stage), has been taken at 20 different locations (Villages) of two districts of Rajasthan (viz., Jaipur and Kota). Populations of *Trichoderma harzianum* (*Th3)* were isolated on Trichoderma Selective Medium (TSM), was not only found antagonistic to pathogen but also showed colonizing behavior to rhizosphere. Survivability of *T. harzianum* was found maximum with R.C. Index value: 0.31 at flowering stage and c.f.u. value: 5.16 x 10^7/gm at pre-harvesting stage, while it was minimum with R.C. Index value: 0.16 and c.f.u.: 0.72x 10^7/gm at seedling stage of most of the crops. *Trichoderma harzianum* (*Th3*) was detected in large quantities with every crop tested when roots with adhering soil (rhizosphere soil) were assayed. Different crop species and cultivars of Groundnut, Soybean, Garlic, Onion, Coriander, Mustard, Wheat, Cauliflower and Rice varied in rhizosphere densities of *Trichoderma harzianum* (*Th3*), but rhizosphere population densities were consistently higher than in untreated rhizosphere soils. *Th3* also found to play major role in plant growth promotion in different crops of Rajasthan and control major crop diseases. This tremendous potential of biocontrol agent can be well utilized by integrating it with IPM or organic farming systems and also can work for crop protection and growth promoter strategy.

The economics of using biopesticides is similar to using any other pesticides in field. It has been observed that the prices of biological formulation are lesser as compared to common fungicides, therefore using biopesticides does not increase the expenditure.

The main problem is the availability of pure products, which creates disbelief towards the technology in the minds of farmer's .Multiplication of biological agents, is possible at field level under scientific supervision possible through FYM and agriculture substrates.

37. Secretary Cells in Vetiver Roots: Pre-Requisites for Essential Oil Biogenesis

Seshu Lavania
Department of Botany, Lucknow University,
Lucknow 226 007
lavaniaseshu@yahoo.co.in

***Keywords**: Essential oil accumulating cells, mycorrhiza and essential oil interaction, AMF association, interactions.*

Special anatomical and growth characteristics make vetiver grass suitable for air, water, soil conservation and amelioration, pollution mitigation, sustainable agricultural practices and multiple eco-friendly applications. However, it is the rhizospheric microbial association that makes vetiver roots valuable for its essential oil.

Of the two common species of *Vetiveria*, i.e. *V. zizanioides* and *V. nemoralis*, only the former comprises of essential oil accumulating cells in its cortical region, more particularly in the inner cortical layer adjoining the endodermis owing to lysigenous aerenchyma formation in the outer cortical region. There is no occurrence of secretary cells in the latter species. It is reported that in vetiver certain microbes belonging to Pseudomonadaceae, Enterobacteriaceae, Aeromonadaceae and Arbuscular mycorhizal fungi are selectively associated with the cortical aerenchyma, especially the inner cell layers containing the essential oil accumulating cells in naturally grown vetiver roots. However, the vetiver grown *in vitro* where such arbuscular mycorhizal fungi and said

bacteria are missing their roots also does not accumulate essential oil. This clearly implies the significance of microbial association for production of essential oil. The assumption is strengthened by the ability of many bacteria to synthesize ordorous sesquiterpenes and metabolize plant terpenoids.

Occurrence of such an associations opens the distinct possibility, that strategic promotion of specific microbial association with vetiver could not only help enhance the productivity of the essential oil in the roots but also underpins the signification of microbial interaction for value addition to the essential oil quality and its exploitation for industrial applications **.**

38. Transgene Technology For Improvement Of Salt Tolerance In Cultivated Tomato

Nanna Rama Swamy*&Mamidala Praveen[1]

Department of Biotechnology, Kakatiya University

Warangal-506009 (AP), INDIA

[1]Ohio State University, Ohio, USA

*swamynr.dr@gmail.com

Keywords*: *cultivated tomato,antiporter gene, salt tolerance, expression of at NHX1

Salinity sress is a major limiting factor that limits crop productivity in drought prone areas. There is a need to develop the crop species which confer resistance to salinity stress. Developing salt tolerance in crop plants is still at infancy stage. The objective of the present investigation is to develop the salt tolerant cultivated tomato by using transgene technology for growing them in saline salts.

Tomato (*Solanum lycopersicum* L) is considered to be an important vegetable crop and a model species for introduction of agronomically important genes. Tomato contains

vitamin A, rich in vitamin C and also source for lycopene which is the most powerful antioxidant. Though it has importance in the daily food, as vegetable and medicine, the crop can not be grown in drought prone areas. In order to engineer the salt tolerance after molecular cloning, the present investigation have been undertaken in cultivated tomato cv PKM-1. Molecular cloning was done by using antiporter gene (At NHX1) with stress inducible promoter (SIP) and constitutive promoter CaMV 35S with bar gene as a selectable marker by replacing hpt gene in the pCAMBIA 1300/1301 cassettes. Two different vectors were developed (pMS $pMEX) to use in genetic transformation experiments. Genetic transformation experiments were carried out using *Agrobacterium tumefaciensm LBA 4404* harboring cloned vectors pMS (with SIP 1314 SWAP2+AtNHX1) and pMEX (with CaMV 35S+antiporter gene) separately in tomato cv PKM-1. The putative transformants were identified by using different molecular techniques such as PCR, RT-PCR, Southern and Northern blots. Two types of transgenic lines were screened (AtNHX1 with 35S& At NHX1 with SIP 1314 promoter) to know the levels of expressions of antiporter gene during salt stress in tomato cv PKM-1. Various physiological experiments were conducted to assess the transgenesis under salt stress with 35S and with SIP promoter lines.

It was found that the transgenic lines with OEX1SIP were accumulated more proline compared to OEX135S line treated at 200mM and control lines which were treated at 5mM NaCl. Thus it was observed that OEX1 SIP transgenic c lines were healthy even at 250mM NaCl whereas OEX1 35S transgenic lines were healthy at 200mM NaCl. The salt tolerance acquired by these transgenics is due to the accumulation of solutes. The increased accumulation of Na+/H+ (Sodium/Proton) antiporter. According to our findings we suggest that these transgenic tomato lines consisting of OEX1 SIP can be used to grow them in semiarid/saline soils/drought prone areas.

39. *Trichoderma* Based Biopesticides for the Managing Plant-Diseases

H.B. Singh

Department of Mycology & Plant Pathology

Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005

E-mail: hbs1@rediffmail.com

Trichoderma belongs to the group of asexually reproducing fungi and the most frequent among fungi isolated from soil. Many strains of *Trichoderma* spp. are strong opportunistic invaders, fast growing, prolific producers of spores, extracellular enzymes and powerful antibiotics. Many strains of *Trichoderma*, including the most biocontrol strains, have no known sexual stage. In nature, the asexual forms fungi persist as clonal, often heterokaryotic, individuals and populations that probably evolve independently as the asexual stage. These have high levels of genetic diversity can be used to produce as wide range of products of commercial and ecological interest. *Trichoderma* based biopesticides can also help people find employment solutions through ecological farming as they grow on various agricultural residues. Eco-farmers are adopting production of commercial crops using home made *Trichoderma* fortified organic fertilizer to get organic produce and subsequently, better economic returns. On the other hand, low-cost methods for the production of *Trichoderma* using cow dung as a growth substrate has been developed and are being popularized among rural poor. Such products have shown high level of disease suppressing potential in field conditions and can be used to produce a wide range of products of commercial value. In addition to their biocontrol activities, *Trichoderma* species have been reported to promote plant growth. Possible explanations of this phenomenon include: control of minor pathogens leading to stronger root growth and nutrient uptake, secretion of plant growth regulatory factors such as phytohormones, auxins and release of soil nutrients and minerals by increased saprophytic activity of *Trichoderma* in the soil. Now-a-days, these eco-friendly microbial technologies are now emerging as alternatives to the deadly chemical farm inputs and gaining popularity among farmers. Many *Trichoderma* spp. are being introduced in the farmer's field to

combat plant diseases for sustainable crop production. Details of soilborne pathogens affecting various crops and their management using *Trichoderma* will be discussed during the presentation.

40. Use of 'Chir' Pine Needles as an Alternate Source of Industrial Biofuel Reduces Environmental Pollution.

Sanjay Sood*, K.S. Kapoor+ and T.N. Lakhanpal**

* Conservator of Forests, Hamirpur, Himachal Pradesh.

\+ Scientist- F, H.F.R.I Shimla-171009

** Department of Biosciences H.P. Univ. Shimla

***Keywords**: biofuel, Forest fires, chil pine,*

The needles of 'Chir' Pine (*Pinus roxburghii*) are a major source of forest fires. The removal of pine needles is a cumbersome and costly process. A practical and profitable use was devised for these needles. Since these needles, have a high calorific value could be alternatively used as a part biofuel in the furnaces of the cement, paper and 'kathha' industry. A case study reveals that local people earned Rs 150 for each quintal of pine needles collected .The industry, in turn, managed to cut its fuel costs drastically using these needles in briquetted form with certain additives. A drastic reduction in forest fires was further observed in the sensitive forests due to cleaning up of these needles.

41. Variation in Chromosome Numbers in Early Generations of *Arabidopsis* Allohexaploids

Anand Tyagi[1,2], Starr Matsushita[1] and Andreas Madlung[1]

[1] Department of Biology, University of Puget Sound, Tacoma, WA,

[2] School of Biological and Chemical Sciences, the University of the South Pacific, Suva, Fiji

KeyWords: *Allopolyploids, anueploidy, cytotypic, genome structure, gene regulation.*

Polyploids contain more than two complete sets of chromosomes and it is estimated that more than 90% of extant angiosperms have undergone whole genome duplication events in their evolutionary history. Polyploidization leads to changes in genome structure, gene regulation, and chromosome maintenance. Thus, the mechanism of polyploidization introduces diversity into a population and promotes evolutionary change. Mosaic aneuploidy, variation in the loss or gain of individual chromosomes from cell to cell of the same individual, has been observed in some polyploids, but it is unclear if this phenomenon can contribute to novel diversity or act as a mechanism for speciation. We tested the hypothesis that mosaic aneuploidy contributes to lasting genetic diversity in neoallopolyploids by generating a population of synthesized *Arabidopsis* allopolyploids and monitoring cytotypic and phenotypic variation in this population over the first seven generations. We report evidence of line-specific chromosome number variations and rapidly diverging phenotypes between sister lines, including flowering time, leaf shape, and pollen viability. Our data show that aneuploidy varies between sister lines, correlates with phenotypic novelty, and remains a destabilizing factor for at least the first seven generations. While it remains unclear if new stable aneuploid lines will arise from these populations, the data are consistent with the notion that somatic aneuploidy can induce rapid variation and potentially lay the genetic foundation for multiple, rather than just a single new species during allopolyploidization.

42. Vetiver Grass Model for Carbon Sequestration and Human Welfare

Umesh C Lavania

Central Institute of Medicinal and Aromatic Plants,

Lucknow 226 015

E-mail: lavaniauc@yahoo.co.in

***Keywords**: Vetiver, polyploid vetiver, Carbon Sequestration, Climate Change, Ecological plantations, Social forestry*

Vetiver [*Vetiveria zizaniodes* (L) Nash. syn. *Chrysopogon zizaniodes* (L.) Roberty] is a perennial densely tufted C_4 grass native to India, sporting deep penetrating tufted fibrous roots. Its roots hold initial growth potential of 3cms per day reaching upto 2.5 meters in just six months. The grass is now grown all across the globe from tropical to Mediterranean climate and can tolerate wide range of temperature and soil conditions. It is an important candidate to address current environmental concerns and human well being. This grass traditionally used for extraction of essential oil, has attracted world attention as a natural inexpensive and practical means for its multifarious environmental applications, including conservation and detoxification of degraded soil and water, flood and landslide disaster mitigation. Lately, we have proposed a "vetiver grass model" for sequestration of atmospheric carbon into subsoil horizons to mitigate global warming. However, for successful implementation of Vetiver grass for environmental applications it is desirable that such plantations meet the specific environmental objectives without any threat of becoming weedy through seed dispersal and trespassing the target areas. As such, the ideal plant type should have non-seeding habit suitable for eco-friendly plantations.

We isolated a progenitor diploid clone with low seed fertility and other desirable biological characteristics and experimentally converted the same to realize seed infertile clonal autopolyploid, which is the first report of its kind in vetiver. Strategic plantation of this autotetraploid clone in crop fields, tree lines, river, road and rail-line embankments as

hedgerows could potentially contribute to carbon sequestration vis-à-vis eco-technological management of land and soil, and as a resource for biomass and bioenergy with no threat of becoming weedy in unattended plantations. Owing to its fast growing deep penetrating root system the developed clone could potentially sequester atmosphere carbon (through photosynthetic capture) into sub-soil horizons likened to forest trees, with least risk of carbon being recycled to atmosphere.

99th Indian Science Congress

January 3-7, 2012, Bhubaneswar

V

LIST OF PAST SECTIONAL PRESIDENTS

PAST SECTIONAL PRESIDENTS

Section of Plant Sciences

T N Lakhanpal	(2011)	S S Bir	(1988)
Pramod Tandon	(2010)	K S Bilgrami	(1987)
S M Paul Khurana	(2009)	L P Mall	(1986)
S V S Chauhan	(2008)	Syamapada Sen	(1985)
S M Reddy	(2007)	Deepesh N De	(1984)
S P Vij	(2006)	M S Chennaveeraiah	(1983)
R C Rajak	(2005)	T N Khoshoo	(1982)
C M Govil	(2004)	V R Dhyansagar	(1981)
P S Bisen	(2003)	H Y Mohan Ram	(1980)
Botany		S B Saksena	(1979)
C Manoharachary	(2002)	D D Pant	(1978)
G N Bhattacharya	(2001)	K K Nanda	(1977)
Uma Kant	(2000)	K S Thind	(1976)
S K Hasija	(1999)	C V Subramanian	(1975)
A K Koul	(1998)	R N Singh	(1974)
R S Mehrotra	(1997)	A K Sharma	(1973)
S C Pandeya	(1996)	R P Roy	(1972)
C P Malik	(1995)	B M Joshi	(1971)
Dalbir Singh	(1994)	V Puri	(1970)
R S Dwivedi	(1993)	H K Baruah	(1969)
R M Pai	(1992)	P N Nandi	(1968)
G P Agarwal	(1991)	R N Tandon	(1967)
Y D Tiagi	(1990)	T S Mahabale	(1966)
R P Purkayastha	(1989)	Father H Satapau	(1965- 1964)

S M Sircar	(1963)	Krishnadas Bagchee	(1939)
J Venkataswarlu	(1962)	B Sahni	(1938)
P N Mehra	(1961)	M G Champion	(1937)
S K Pande	(1960)	S R Bose	(1936)
R Misra	(1959)	J M Mitter	(1935)
T S Sadasivan	(1958)	R H Dastur	(1934)
S N Das Gupta	(1957)	S L Ghose	(1933)
M Sayeeduddin	(1956)	Haraprasad Chaudhuri	(1932)
J C Sen Gupta	(1955)	T Ekambaram	(1931)
B C Kundu	(1954)	P Parija	(1930)
R K Saksena	(1953)	K C Menta	(1929)
S Ramanujam	(1952)	M P Parthasarathy Iyengar	(1928)
B B Mundkur	(1951)	M A Sampath Kumaran	(1927)
P Maheswari	(1950)	E Blatter	(1925)
M S Randhawa	(1949)	R S Inamdar	(1925)
K A Chaudhury	(1948)	S P Agharkar	(1924)
A C Joshi	(1947)	W Dudgeon	(1922)
B P Pal	(1946)	S Milligan	(1921)
G P Majumdar	(1945)	**Agriculture & Applied Botany**	
T S Sabnis	(1944)	D Clouston	(1920)
K Biswas	(1943)	G F Keatinge	(1919)
J C Sen Gupta	(1942)	Botany	
Shri Ranjan	(1941)	W Burns	(1920)
Y Bharadwaja	(1940)		

Pure Botany		A Howard	(1916)
S R Kashyap	(1919)	C A Barber	(1915)
Botany		C C Calder	(1914)
R S Hole	(1918)		
Rao Bahadur K Ranga Achari	(1917)		