Volume 14 No. 2

April-June 2008

ICAR NEWS

A SCIENCE AND TECHNOLOGY NEWSLETTER

RESEARCH UPDATE

PROMISING TECHNOLOGIES

Tuberose cultivars propagation

IARI, New Delhi. Tuberose Mild Mosaic Virus has been recognized as the major problem in tuberose plant, *Polianthes tuberosa.* Unlike other bulbous flower crops, *Narcissus, Lilium* and tulip, for which *in vitro* propagation techniques are perfected, tuberose does not have enough tulip, studies on its regeneration through tissue culture. Therefore, *in-vitro* shoot multiplication, rooting and acclimatization protocols were standardized for two elite tubersoe cultivars using different explants.

Tuberose cultivars used for Prajwal

Aseptic culture

Pre-treatment of stem scales and axillary buds with carbendazim 0.1%, mancozeb 0.1% and 8-HQC 200 mg/litre for 4hr gave minimum culture contamination (10.86%) and (17.5%). Minimum contaminated cultures were

Indian Council of Agricultural Research
Krishi Bhavan, New Delhi 110 001, India
www.icar.org.in

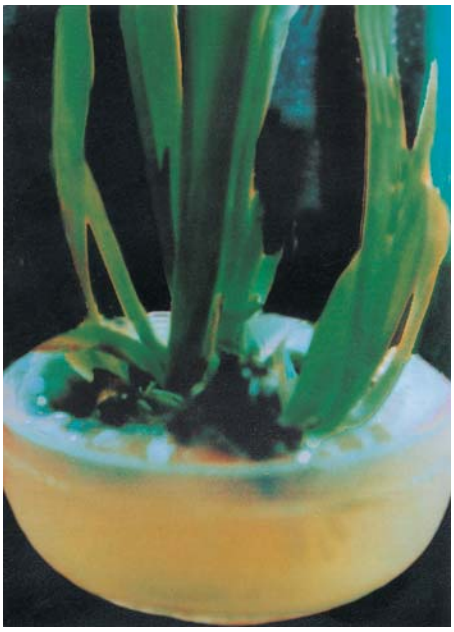
observed in cv. Prajwal (8.3%) when it was pre-treated with carbendazim 0.1%, mancozeb 0.1% and 8-HQC 200 mg/litre for 4hr, followed by cv. Vaibhav (13.2%).

With respect to explants surface sterilization, stem scales and axillary bud showed minimum contamination with treatment $HgCl_2$ 0.1% followed by 0.1% NaOCl for 8 min. Cultivars showed significant difference with surface sterilization also.

Shoot multiplication, rooting and acclimatization

Multiple shoot formation is the most crucial phase in large scale multiplication of plants through tissue culture. Between two explants, stem scale and axillary bud, shoot multiplication was higher in stem scale in both the cultivars. Basal Murashige and Skoog's (MS) medium supplemented with 4 mg/litre BAP and 4mg/litre BAP + 0.2 mg/litre IAA was effective for shoot multiplication for both explants and cultivars.

Rooting of shoots under *in vitro* is a time consuming and expensive process in many recalcitrant species. In this study, maximum rooting and earliest root induction was observed in cv. Prajwal with half strength MS medium + 1 mg/litre IBA



Growth regulator effect on shoot multiplication tuberose

(which was significant) followed by cv. Vaibhav.

Jam bottle with polypropylene cap showed maximum survival (93.3%) which was nonsignificantly followed by pots (90.0%); both were used as hardening strategies.

Both the cultivars (Prajwal and Vaibhav) differed in their laboratory response; Single type cv. Prajwal exhibiting higher regeneration and multiplication than Double type cv. Vaibhav.

Drs Jyothi R[1]., A.K. Singh[2] and Krishan Pal Singh[3] *[1,3]Division of Floriculture and Landscaping, [2]Division of Fruits and Horticultural Technology*
e mail: krishnapalsi@gmail.com

Grow brinjals without insecticides in net-houses

IIHR, Bangalore. Promising technology related to brinjal was developed at the Indian Institute of Horticultural Research, Hessaraghatta.

Brinjal shoot and fruit borer *Leucoides orbonalis* has become extremely difficult to control using traditional insecticides. A new molecule, E2Y45 20 SC at 30 g ai/ha was effective against the pest.

Growing elite, oblong, large- fruited varieties of brinjal without insecticides use inside low-cost net house showed 0 % infestation by *Leucoides orbonalis.* This indicates possibility of raising eggplant without pesticides. Besides, there was no gall midge infestation and leafhopper infestation was reduced under nethouse conditions.

Dr G S R Murti, *Director, IIHR*
e mail: root@iihr.ernet.in

Bio-engineering for protecting river banks

CSWCRTI, Dehra Dun. Seasonal rivers (torrents) cause a huge damage to life and property due to flash floods during monsoon season in Shiwaliks and foothills of outer Himalayas. Cost- effective bio-engineering structures (spurs, protection walls and embankments) have been developed and locally adaptive flow-resistant vegetative species identified for training river flow, bank erosion control and protection of agricultural land and other properties along the banks. The technology is being extended to the development departments. Recently State Forest Department, Uttarakhand, under the technical guidance of this Institute undertook a project on Song river near Dehra Dun (about 2.2 km stretch) that was trained through construction of 93 spurs. The performance of the structures was found very satisfactory and other state agencies are also approaching the Institute for similar consultancy assignments.

Dr V N Sharda, *Director, CSWCRTI*
e mail: vnsharda@rediffmail.com

Diversification of Horticulture

VPKAS, Almora. The VPKAS has initiated a project under Horticulture Technology Mission (Mini Mission – I) in Bhagartola (inhibited by 32 families having 0.4 ha average land) to improves their livelihood security

by diversifying farming system with vegetables and fruits in sustainable manner. The emphasis was laid on crop diversification to enhance farm income as well as to increase foodgrains production in the village. The activities include major farming components comprising, vegetables, fruits, cereal and pulses, protected cultivation, fisheries and water harvesting. Development of water resources by harvesting surface runoff and perennial hill streams in LDPE-lined polytanks and protected cultivation of off-season vegetables utilizing harvested water helped in transforming economy of Bhagartola, where 26 low-cost poly- tanks were constructed with partnership of farmers. These tanks provide >12 lakh litres water available at 10 days interval.

With the available irrigation facilities, diversification of the traditional farming incorporating vegetable crops was possible. The climatic peculiarity of the area provides an opportunity for off-season vegetables cultivation. This niche advantage is being fully exploited by cultivation of tomato, Frenchbean, cauliflower, cabbage, and squash. Cultivation of off-season vegetables resulted in a net returns of Rs 10,000 to 12,000 per year from each polyhouse of 100 m^2 size. The next objective of vegetables cultivation was to enhance their productivity as well as quality with assured and timely production. Therefore, greenhouses using low- cost locally available structural material and covered with UV- stabilized transparent plastic film were introduced. This activity was carried out on a participatory basis.

The production of vegetables increased by >300% with introduction of these greenhouses. Fifty such greenhouses of 80 m^2 average size have been constructed in the village. The average gross income per unit is around Rs 23,000. The earning of whole village from protected cultivation was Rs 2.10 lakh in 2006-07 and Rs 3.84 lakh in 2007-08.

Emphasis was also given on plantation of superior cultivars of suitable fruit crops (peach, plum, apricot, kiwifruit and citrus) for providing sustainability to farm income. Around 6,000 saplings of these fruit plants were planted with an average survival of 62%.

The area that could not come under vegetables was covered with improved varieties of field crops that led to 35% higher productivity. Livestock is also an integral part of hill farming system and scarcity of fodder in hills is well known. To alleviate this problem planting of hybrid napier grass and other multipurpose trees was done. Fish cultivation is also being taken up in polytanks, which is providing an additional income of Rs 6,000 per unit.

As a result of the technological interventions by the VPKAS, Almora, the land-use pattern of the village has changed and area under vegetables and fruits have increased by 7% and 3% respectively.This diversification resulted in a significant increase in farmers' income.

Dr H S Gupta,
Director, VPKAS
e mail: hsgupta@lycos.com

Crop diversification

The agro-horti system of drumstick + greengram – fennel has given net returns of Rs 29,240/ha, whereas, lowest net rerturns of Rs 9,932/ha was realized from tobacco crop. The agro-horti system is 2.95 times more remunerative than planting of tobacco crop. It also reduces irrigation water requirement of the region by 70%.

Dr V N Sharda, *Director, CSWCRTI*
e mail: cswcrti@sanchanet.in

Service reservoir for microirrigation

CIPHET, Abohar. Canal command areas in arid and semi-arid regions of India are facing acute shortage of irrigation water due to huge demand of water for other non-agricultural sectors. Since underground water is brackish in nature and water supply through canal is not regular in these regions due to one or other reason, water scarcity is becoming a serious problem to farmers.

A well-planned service reservoir (pond) is a valuable asset, which provides water for agricultural operations at minimum cost and convenience.

Construction of service reservoir (water-storage tank)

The steps involved in the construction and lining of the service reservoir are as follows:

Excavation of earth for pond

- Level selected site and remove grasses and other obstacles so that demarcation line of the pond can be drawn easily. Draw lines at the selected site according to the design and dimensions of the proposed service reservoir.
- Start digging soil vertically from bottom area of service reservoir. Soil digging can be started from the centre of the pond. Remove the soil up to the required depth. When the soil from the bottom of service reservoir is removed, place the rope connecting to the corner of bottom area and outer top corner; give desired slope at one corner of service reservoir by cutting soil. Shape sides of reservoir with cutting rather than filling of soil, which will facilitate stable boundary. According to the already maintained slope at the previous point i.e. corner, give a prefect shape to the reservoir by cutting soil.
- Sharp rock edges or concrete pieces should be removed, otherwise they may damage or puncture Agri-films.

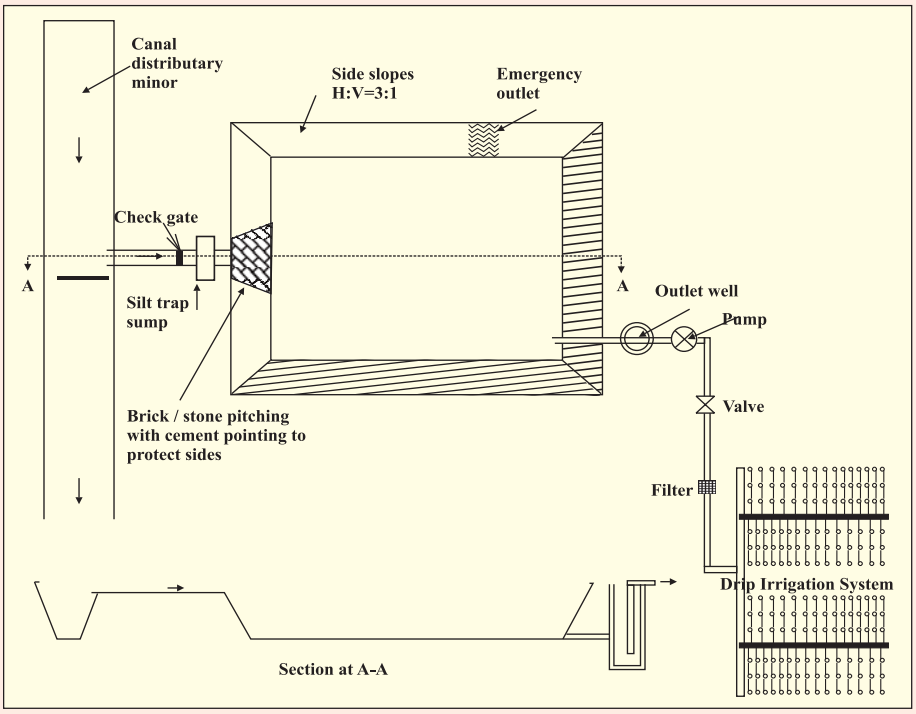
Agri-film lined service reservoir

Weedicides application

- When sides of reservoir are finally prepared, apply weedicide before lining of agri-film to suppress growth of weeds. Weedicides like Biodex-C, Grammaxone, Fenoxone etc, can be used by mixing in water at relatively higher concentration (5 ml / litre); compared to specified for agricultural field use.

Laying of agri-film

- Since black LDPE film, popularly known as agri-film is available in varying length and width, join it in a way to make it one sheet so as to avoid any possibility of water leakage.
- Joining of agri-film should be done very carefully. Before joining, side of the film should be made dust-free. Two layers of the film, to be joined, are placed with a 10-15 cm overlap all along the edge, thereafter, a Teflon sheet or 2-3 layers of newspaper should be placed over the film to avoid risk of film sticking to heating unit. Heated electric press of heavy weight should be



Service reservoir connected with source of water supply of microirrigation system

Drip irrigated potato

moved slowly on the portion, which has been joined and seal different lots so that agri-film can be one unit.

- When whole agri-film is ready for laying in pond, make a roll of the whole film and put it at the bottom of the reservoir and start spreading (de-rolling) roll in the pond uniformly. Put one end of the agri-film buried in the top of the reservoir and fix it.
- Remove wrinkles from the middle and film should be collected on the corner of the pond where these wrinkles should be folded and buried beneath the layer of bricks.
- Make an outlet well at one side of the top bed and pump water for pond from this outlet for running microirrigation system. The outlet is connected through pipe from bottom of the service reservoir.
- Cover agri-film with suitable material like *surkhi* lime, bricks or stone to prevent film from any damage. The brick lining will give strength and long-life to the film with less maintenance cost. However, 15-20 cm thick soil bed on the bottom portion of the reservoir as covering material facilitate aquaculture, if reservoir is to be used for fish production.

Maintenance of service reservoir: A periodical inspection is required for better life of service reservoir. It includes checking any damage and repairing damages. An immediate repair is desirable to check deterioration and to save further damage. Periodical removal of silt and sediment is necessary for higher storage capacity of water in the tank.

Pomegranate fruits with drip irrigation

Feasibility of MIS in conjunction with service reservoir : Research findings have revealed that use of micro-irrigation in conjunction with

Drip irrigated kinnow

service reservoir has techno-economic viability in the canal command areas for crop diversification with horticultural crops to enhance income of farmer of the areas. In guava, pomegranate, kinnow, strawberry, tomato, pepper, and potato, there was tremendous saving of water, and increased yield. Saved water can be used for cultivation of additional area.

The canal command area of arid and semi-arid regions can be benefited by use of microirrigation in conjunction with service reservoir. Judicious use of storage water can be efficiently utilized in production of fruits and vegetables, which can prove to be a boon for farmers in these regions.

Drs Satinder Kumar, Rajbir Singh, R R Sharma, P R Bhatnagar and **R K Gupta,**
AICRP on Application of Plastics in Agriculture
e mail: pr_bhatn@yahoo.com

Tree root management for higher productivity

CSWCRTI Centre, Agra. Pearlmillet-wheat is the predominant cropping system in semi-arid region of the Indo-Gangetic plains under irrigated conditions. Agri-horti system having a fruit crop tolerant to these stress conditions opens up an opportunity for the farmer to get more assured income. Hence, a field study was carried out to work out suitable tree root management practices for *ber (Ziziphus mauritiana)* to reduce competition for moisture and nutrients and obtaining optimum crop production of fields crops, as well as, *ber* fruit tree. It is feasible to grow pearlmillet and wheat with *ber.* The suppression effect of *ber* tree was noticed on wheat and pearlmillet. Tree planted in bottomless bitumen drum produced significantly higher grain yield of wheat. The yields of *ber,* pearlmillet and wheat in bottomless bitumen drum were found 7.4, 1.73 and 3.18 tonnes/ha respectively. Net returns of Rs 49,880 were recorded from *ber,* pearlmillet and wheat crops.

Dr V N Sharda, *Director, CSWCRTI*
e mail: agra-cswcrti@yahoo.com

Balanced nutrients for rainfed sorghum with pigeonpea

CSWCRTI, Centre, Kota. Sorghum with pigeonpea intercropping is more productive and remunerative than other intercropping systems in south-eastern Rajasthan. In a long term study (15 years), the impact of 8 fertility treatments evaluated on yield and soil fertility under this intercropping system at Kota indicated that miximum yield of sorghum (2,231 kg/ha) was obtained with recommended dose of nitrogen, phosporus and potassium (NPK) and farmyard manure @ 5 tonnes/ha/yr as against 743 kg/ha under control plot, whereas, pigeonpea recorded 711 kg/ha yield for recommended dose of NPK as against 489 kg/ha against control plot. Pigeonpea only responded to application of phosporus in combination with nitrogen and phosporus.

The organic carbon, available nitrogen and phosporus underwent reduction in control plot, whereas, organic carbon and available N improved under recommended NPK with and without farmyard manure application. And, the status of available K remained unchanged. This indicates that balanced use of NPK not only gives higher yield of sorghum with pigonpea but also improves soil fertility status under rainfed farming.

Dr V N Sharda, *Director, CSWCRTI*
e mail: cswcrkota@sanchanet.in

Vegetative barriers for arable lands

CSWCRTI, Centre, Kota. Four grass barriers *Vetiveria zizanioides (Khus), Saccharum (Munj), Cenchrus ciliaris (Dhaman)* and *Dichanthium annulatum (Karad grass)* evaluated for their conservation value and compatibility with rainfed sorghum and soybean on 1% slope at Kota indicated that all grass species were almost equally effective in reducing runoff. About 20 to 22% of cropping season rainfall is lost through surface runoff, which can be reduced to 15 to 16%. Similarly, about 1.5 to 2.0 tonne/ha/year soil is lost due to water erosion, which can be reduced to about 0.9 to 1.1 tonne/ha/year with the help of grass barriers.

The filtering effect of these barriers promoted upstream deposition of soil and nutrient and *in-situ* moisture conservation. On an average, the status of organic carbon, N,P and K was 31.8, 40, 15.0 and 12.8% higher in upstream vicinity of grass compared to no barrier plots. The effect of improved soil moisture and nutrient status was reflected in yield of crops in upstream vicinity of grass barriers. About 20 to 23% increase in the grain yield and 9 to 13% on straw yield of sorghum and soybean was observed. *C. ciliaris* and *D. annulatum* also provided about 4-5 q/ha air dry forage.

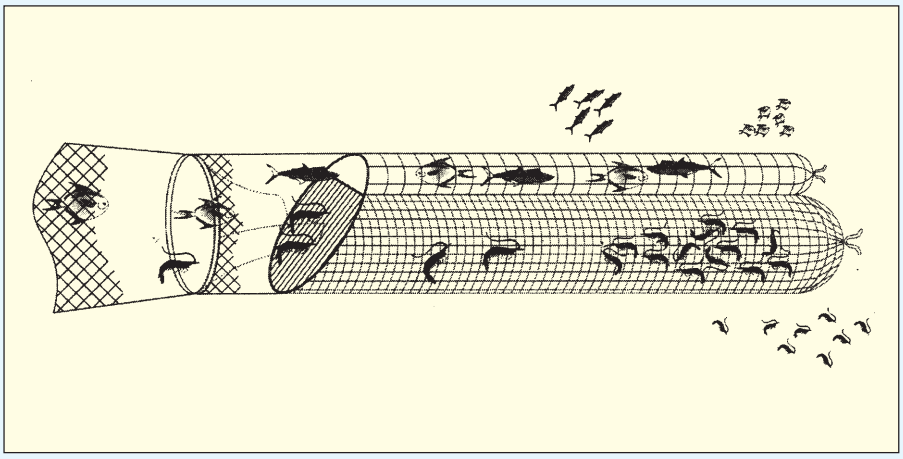
Dr V N Sharda, *Director, CSWCRTI*
e mail : cswcsikota@sancharnet.in

Effective utilization of waterways

CSWCRTI, Dehra Dun. A large tract of agricultural lands used as natural drainage ways is being lost to cultivation. To find the alternative uses of these lands for the production purpose, annual and perennial vegetation species are being tried. Among annuals, rice bean, millet in *kharif* with *Brassica napus,* lentil in *rabi* and *Panicum maximum* as perennial grass have been found promising, and lemon is also grown on side slopes. These measures can yield additional biomass of 10-20 q/ha. Imposition of these treatments have resulted in moderation of peak flows. The treatments were effective in trapping sediment and resulted in net deposition of the sediment to the tune of 15.41 cum and 25.40 cum in segment II and segment III, respectively. Water use was monitored for different species—evaportranspiration demand of *Panicum maximum* was lowest (145.5 mm), followed by lentil (153 mm) and *Brassica napus* (160.5 mm).

Dr V N Sharda, *Director, CSWCRTI*
e mail: vnsharda@rediffmail.com

Juvenile fish excluder-cum-shrimp sorting device



Perspective view of JFE-SSD

On board demonstration of JFE-SSD at Harnd

Pre-sorted shrimp (deck) and non-shrimp catch (basket)

CIFT, Cochin. Juvenile fish excluder-cum-shrimp sorting device combines shrimp bycatch reduction function with conventional shrimp sorting mechanism. It was developed and field tested under the project 'Bycatch Reduction Devices for Selective Shrimp Trawling'. It is designed to exclude non-target juvenile fishes caught in trawl net. The design concept of this device was proposed by the research team that has won the World Wildlife Fund's International Smart Gear Competition for 2004, in the category of 'Other non-target species-including fish'. The device is fitted by replacing conventional cod-end of the trawl with an oval gril with a top opening which, in turn, leads to an upper cod-end with large square meshes. Shrimp passing through grid are retained in the lower cod-end made up of a square mesh panel with 20-mm mesh size. Juveniles of shrimp and fish are allowed to escape through upper and lower cod-end meshes.

The current initiative with the industry participation by the Central Institute of Fisheries Technology, College of Fisheries and Cameron International is expected to bring about a sea-change in the attitude of fishermen and facilitate adoption of conservation technologies in shrimp-trawling operations, ultimately leading to sustainability of resources and protection of biodiversity in Indian waters.

Dr K Devadasan, *Director, CIFT*
e mail: cift@ciftmail.org

Indian Institute of Natural Resins and Gums

Old building of Indian Lac Research Institute

New building of Indian Institute of Natural Resins and Gums

IINRG, Namkum, Ranchi. Indian Institute of Natural Resins and Gums [formerly known as Indian Lac Research Institute] is a nodal Institute at the national level for research and development on all aspects of lac and other natural gums and resins (excluding production), viz. harvesting/ tapping, processing, product development, training, information repository, technology dissemination and national/ international co-operation.

The Institute has undergone a structural change and its priorities have been redefined, widening the scope and mandate of the Institute. The Institute mandate has been expanded in 2007 to look after important issues related to all natural resins and gums of Indian origin. Accordingly Indian Lac Research Institute has been upgraded and renamed as the Indian Institute of Natural Resins and Gums on 20 September 2007.

MANDATE

- To plan, conduct and promote researches on lac production technologies.
- To conduct basic and applied researches on processing natural resins (including lac), natural gums and gum resins for farmers and industries.
- To develop value added products of commercial use from natural resins, gums and gum-resins, leading to pilot plant demonstration.
- To act as repository and provider of information on lac production and processing, product development, utilization of all natural resins, gums and gum resins.
- To transfer technologies to farmers, entrepreneurs and processors.

Objectives

Harnessing science and engineering by interfacing research and extension initiatives for enhanced productivity, quality, processing technology, use diversification and high value new product development from lac and other natural gums and resins for sustained growth of the industry.

Organizational structure

IINRG is a unit of the ICAR, operating under Engineering Division. The Institute directly reports to the Deputy Director-General (Engg.) and Assistant Director-General (PE) at ICAR (headquarters).

Research Divisions and Core Programmes

The Institute addresses its mandate through 3 Divisions. All research projects and extension activities of the Institute are run under the following nine Core Programmes.

1. Lac Production Division

(i) Insect Improvement
(ii) Host Improvement
(iii) Crop Production

2. Processing and Product Development Division

(iv) Synthesis and Product Development
(v) Surface Coating and Use Diversification
(vi) Processing and Storage

3. Transfer of Technology Division

(vii) Human Resource Development
(viii) Technology Assessment, Refinement and Dissemination
(ix) Liaison, Information and Advisory Services

Manpower

The Institute has scientists from various disciplines including Entomology, Agronomy, Plant Pathology, Biotechnology, Plant Breeding, Organic Chemistry, Physics, Engineering, and Economics. The Institute has a sanctioned strength of 232, including 47 scientific, 60 technical, 36 administrative and 89 supporting staff.

Infrastructure

- The Institute campus is sprawled over 49 ha, which includes offices, well equipped laboratories, residential quarters, Institute research farms etc.
- The Institute research farm is spread over 36.5 ha with a good collection of lac-host plants. The farm has 1,540 trees of *Schleichera oleosa (kusum)*, 2,840 trees of *Butea monosperma (palas)*, 1,351 trees of *Ziziphus mauritiana (ber)* and 8,695 minor host trees. The farm is well equipped with tractors, implements, irrigation facilities including large rain-water ponds
- The Institute has also a gum and resin farm in about 3.1 acres planted with different species of gum yielding plants like *Acacia senegal*, *A. nilotica*, *Sterculia urens, Commiphora weighttii*, *Boswellia serrata* and *Anogiessus latifolia* .
- It has a well organized and informative lac museum.
- The Institute library has more than 50,000 volumes of scientific journals and 2,000 rare books related to lac and allied subjects.
- A Processing and Demonstration Unit for pilot scale study in for processing and products development.

Germplasm collection

The Institute is responsible for the collection and maintenance of

germplasm of lac insect lines as well as lac-host trees. The Institute has been declared as the National Active Germplasm Site by the National Bureau of Plant Genetics Resources. At present it holds 97 collections of 47 species of lac hosts, including those of major lac hosts viz. *palas (Butea monosperma), kusum (Schleichera oleosa)* and *ber (Ziziphus mauritiana)*. About 60 districts of 16 states of the country have been surveyed for collection of lac insects. The 64 lines of lac insects which include 14 cultivated, 21 natural populations, 22 cross bred/inbred/ selected, 1 exotic and 6 uncoded lines are maintained live on potted plants of *bhalia (Flemingia macrophylla)* in the National Lac Insect Germplasm Centre.

Laboratories

The Institute houses several laboratories for carrying out research work. Some important and well equipped laboratories are quality evaluation, surface coating, synthetic chemistry, biotechnology, environmental simulation, high voltage, storage laboratory etc. A number of modern and sophisticated laboratory equipments including DSC, FT-IR, HPLC, HPTLC, etc. are available for research on all aspects of lac production, processing and product development from natural resins and gums.

ISO 9001 Quality Evaluation Laboratory

The Quality Evaluation Laboratory renders services for collection, analysis, testing and reporting of lac and lac-based products, and abide by BIS specifications.

The laboratory is engaged in the quality evaluation of lac and lac-based products for more than 50 years, catering to requests of lac processing industries including samples meant for export.

Pilot plants

The Processing and Demonstration Unit has a few pilot plants for research, refinement, training and demons-tration on important products. These are used for entrepreneurship development.

Pilot plant for lac dye: A pilot plant for preparation of technical as well as pure grade lac dye has been developed and installed. The plant can produce up to 2 kg of technical/crude grade lac dye from the washings of about 400kg of sticklac in a batch.

***Pilot plant for aleuritic acid*:** The aleuritic acid pilot plant (capacity: 2 kg/batch) has been developed and installed for research, training and demonstration to entrepreneurs.

***Pilot plant for bleached lac*:** A pilot plant for bleached lac (capacity: 40kg/batch) is installed for research, training and demonstration to entrepreneurs.

Small-scale seed lac processing unit : A small-scale lac processing unit (capacity: 100kg/day) has been developed. The technology of the machines required for establishment of the unit has been transferred to a manufacturer at Ranchi. The manufacturer has started production of machines and since June, 2006

has sold 13 units in 7 states and got order for 5 more such units.

RESEARCH AND DEVELOPMENT

Some of the salient research achievements are:

Lac production

- Lac host plant management for increased lac production and plant propagation.
- Identification and development of promising lac insect lines for improved productivity and quality.
- Lac pest management techniques *viz*. mechanical, cultural, phenological, chemical and biological approaches.
- Identification of new as also fast growing lac hosts, viz. *Flemingia semialata, Albizzia lucida* and *Acacia auriculaeformis*, for intensive lac culture and integrating it with agriculture.
- Broodlac production technologies on major lac hosts like *kusum* and *palas*, and sticklac production technologies on *palas* and *ber.*
- Identification of productivity-linked biological parameters of lac insects, lac host characterization, lac insect-host plant interaction, studies on systematics, geographical distribution and biodiversity of lac insects.
- Development and fabrication of tools like tree pruner, *phunki* placement and removal hook, lac scraping-*cum*-grading machine to reduce drudgery in lac cultivation.

Processing and development

- Development of barrel washing techniques and identification of chemical washing aids for obtaining washed lac (*seedlac*) for improved yield and colour.
- Machine for separating sand from seedlac,
- Autoclave method for preparation of machine-made shellac,
- Industrial processes for preparation of bleached lac and dewaxed decolourised lac.
- Preparation of hydrolysed lac and rebuilt lac.
- Evolution of storage parameters for lac.

- Isolation of major constituent acids of lac for improved yields, especially aleuritic acid, which is a major raw material for a number of industrial applications.
- Enhancing recovery and utilization of byproducts of the lac industry, *viz.* lac dye and lac wax.
- Fundamental studies on physico-chemical properties of lac and natural gums, their constituents, including constitutional aspects, electrical properties, spectroscopic behaviour etc.

- Synthesis of novel, fine chemicals including perfumery components, sex pheromonal compounds, PGR analogues, prostaglandin synthon, mosquito repellent, nematicides etc. from aleuritic acid, the major constituent acid of lac.
- Formulation of lac-based insulating varnishes, primers, paints, lacquers, adhesives, can coatings, FRP and particle boards etc.
- Standardisation of analytical methods for testing and quality evaluation of lac and lac products.
- Development of BIS and ISO specifications for lac and lac products.

Transfer of Technology and HRD

The Institute undertakes a wide range of activities for promoting lac use and for transfer of technologies developed at the Institute. Various programmes include:

- In-house (1 week) and on-farm (1-3 days / flexible) training of farmers on '*Improved Methods of Lac Cultivation'*.
- Certificate courses on 'Improved Methods of Lac Cultivation' and 'Industrial Uses of Lac'
- Conducting one day '*Orientation Programme*' for farmers, students, trainees and others.
- Training international students, sponsored trainees etc.
- Transfer of technical know-how to entrepreneurs on lac-based products and processes.
- Promotion of lac and lac-based technologies through literature, mass media, exhibitions, seminars, symposia, museum visits etc.
- Consultancy and technical guidance on all aspects of lac cultivation, processing and utilization.
- Technology transfer through linkages established with Government and Non-Government Organisations.

Technologies available

Lac production

- Brood lac production on conventional hosts
- *Rangeeni* lac production
- *Kusumi* lac production
- Lac production on bushy hosts

- Lac insect pest and disease management

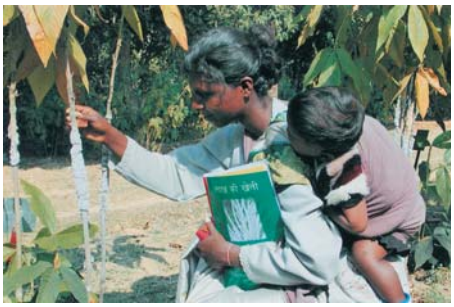
Lac-based products

Fine chemicals for perfumery industry

- *Aleuritic acid*: Constituent acid of lac resin used in different industrial applications.
- *Isoambrettolide*: The compound used in perfumery industry as a fixative.

Varnishes and lacquers

- *Spiritless heat and water-resistant wood varnish*: It is based on spiritless solvent system and possesses superior heat and water resistance.
- *Melfolac*: A spirit-based heat and water-resistant wood varnish composition.
- *Multipurpose shellac-based glazing varnish:* This is for application on metal surfaces, leather, rexin and plastics etc. The coating is fairly resistant to water.
- *Water soluble lac*: Useful for coating earthenware, bamboo products etc.; to make them humidity resistant.
- *Shellac-based can coating lacquers*: Useful for coating of cans for packaging of foods.



Food and pharmaceutical industry

- *Dewaxed decolourized lac:* Used for coating capsules and tablets
- *Bleached lac:* Used widely for coating of fruits and vegetables
- *Lac dye:* Used as colourant in food and textile industry.

Electrical industry

- *Air-drying type insulating varnish:* This is suitable for coating of coils of electric motors (including ceiling fan), transformers and manufacturing of laminated products.
- Shellac-based baking type high thermal resistant insulating varnish.

Adhesives and binders

- *Gasket shellac compound:* It is used in automobile industry.
- Shellac/gummy mass and synthetic resin fiberglass jute/ plywood composite.

Service provided

- HRD to entrepreneurs on above mentioned technologies.
- On and off-farm training on lac-cultivation.
- Quality evaluation of lac and lac-based products.
- Pilot scale training and demonstration of lac dye, aleuritic acid, seed lac processing, and bleached lac manufacturing.
- Project profile on lac and lac-based products.

The Institute has consistently maintained close collaboration with the other ICAR institutes, State Agricultural and General Universities, and national agencies like Shellac Export Promotion Council, Indian Council of Forestry Research and Education, Bureau of Indian Standards, Tribal Co-operative Marketing Development Federation etc. A number of external projects, funded by agencies, viz. Department of Biotechnology, NAIP, NABARD, Jharkhand and Gujarat State Government are operational at the Institute.

Dr Bangali Baboo, *Director, IINRG*
e mail: bbaboo@@ilri.ernet.in

Coconut climber
A device to make coconut harvest easy and create self-employment

KVK, Kanyakumari. The farmers and growers find difficult to harvest the coconuts in time due to labour scarcity and high harvest cost. Krishi Vigyan Kendra, Kanyakumari in Tamil Nadu introduced one Kerala and TNAU model mechanical device of coconut climber for the harvest of nuts. The coconut harvesting device is very easy to handle and can be used even on rainy days. The rural youths, those who have purchased the coconut climbing device have started their own service for harvesting coconuts on cost basis.

Coconut climbing device: a self employment opportunity for rural people

By using the coconut climbing device the rural youth are earning Rs 4.00/tree and covering 100 to 125 trees/day. The beneficiary farmers are saving Rs 3.00/tree towards the harvest charges.

Dr S Prabhu Kumar
Zonal Coordinator, Zone VIII
e mail: icartot8@yahoo.com

Integrated farming of seaweed and shrimp

CMFRI, Cochin. Integrated farming of seaweed and shrimp taking *Gracilaria verrucosa* as seaweed species with *Penaeus monodon* was initiated at experimental level at the pond of Krishi Vigyan Kendra, Narakkal. No white spot-syndrome virus was recorded during the farming practice for 2 years consecutively.

The seaweed was spongy and found to be accumulating good quantity of oxygen in its intercellular spaces. This has prevented to develop anoxia condition to the shrimp during night. There was no water exchange throughout the culture period. Some quantity of water would have entered to the pond by seepage. The whole culture was done without any additional expenditure except for pond preparation and purchase of seed.

In the field trial, done at Puduvayappu of Vypeen island, *Penaeus monodon* was integrated with seaweed, *Enteromorpha intestinalis*. The farming was carried out in water area of less than 0.40 ha with low stocking density (15,000 seeds) of *P. monodon* is from December 2007 to March 2008, with zero water exchange. *E. intestinalis,* which appeared after 15 days of pond preparation, was allowed to grow in the pond with the shrimp. No feed was given to the shrimp throughout the culture period. The shrimp grew to a size of 43 g within 60 days of culture period with a mean length of 20 cm. Further, it grew to 56 g on 75 days of the culture period. Unusual summer shower during March retarded growth of the shrimp but the average weight was 55 g. A total of 150 kg shrimp was harvested from the pond. In this, silicate was 118.67 µ atom/ litre, whereas phosphate showed a value of 3.25 µ atom/litre. Nitrate was zero, nitrite content was 0.47 µ atom/litre and ammonia value was 14.625µ atom/litre. Excess accumulation of silicate might be due to zero water exchange and these nutrient might not have been directly utilized by seaweed. This type of shrimp farming was conducted for 2 years in the same pond. Nitrogen has been important nutrient for the growth of seaweed in first year but may be a limiting factor in the second year.

In the integrated farming, the output from one subsystem (Shrimp) becomes an input of the other (seaweed) resulting in a greater efficiency to create a favourable environment. Green algae in general have good antibacterial properties and high photosynthetic activity. Thus the nitrogenous waste released from shrimp as nitrate, nitrite and ammonia after bacterial mineralization can be utilized for the growth of seaweed, making the system enriched with more oxygen and less nutrient load.

If the algae were able to trap these nutrients, the total nutrient retention of algae would increase and the produced algae could be used for animal feeds or as a fertilizer. This method not only generates a potentially valuable algal biomass in parallel with aquaculture management through uptake of inorganic nutrients by the algae, it will also help to reduce environmental impact of shrimp aquaculture. This is a suitable eco-friendly and economically feasible method of shrimp farming. Low and marginal farmers having less than 0.40 ha of field should be encouraged to adopt such farming technology.

Dr Reeta Jayasankar,
Principal Scientist
Central Marine Fisheries Research Institute, Cochin
e mail: midcmfri@md2vsnl.net.in

Easier detection of insects in stored grains

CIPHET, Ludhiana. A mechanical device for detection of insects in stored grains has been developed and patented by the Central Institute of Post-Harvest Engineering and Technology. The device detects instantly, and gives a fair quantification of insect infestation in stored food grains. The device facilitates detection of presence or absence of live or dead insects in stored grains and it also allows to visualize egg infestation in grains sample.

The mechanical device consists of two separate units, a set of insect-detecting boxes and a mechanical system to provide desirable motion to the set of insect-detecting boxes. The insect detecting boxes have upper container for grain samples, magnifying glass at the top lid, circular sieves of different sizes and insect collecting chamber at the bottom. The desirable motion provided by mechanical unit is clockwise and anticlockwise semi-circular motion to detecting boxes. The peculiar and eccentric motion is agitate grain samples. This particular motion seemingly frightens hidden insects that are then trapped in insect collecting box. If there is any dead insect present in the sample, this will also sieve-out and be collected in insect collecting box.

The device is tested for stored chickpea grains and detects adults of *Callosobruchus* sp. However, immature and internal feeders could not be detected. Further it was tested for greengram, blackgram, rice and wheat to detect insect pest like *Sitophilis oryzae*, *Rhizopertha dominica* and *Tribolium castaneun.* The device also detects insects in flours by changing disk sieve size.

Grain stored for consumption, seed and trade purpose need regular monitoring for the type and level of infestation to prevent damage. Detection and removal of internal insects from grain kernels are important control measures for longer and safe storage, better seed quality and food safety.

Dr R T Patil, *Director, CIPHET,*
e mail: ramabhau@yahoo.com

Mini-carp hatchery installed

NRCWA, Bhubaneshwar. Mini-hatchery for production and rearing of carp seed has been installed at NRC on Women in Agriculture.

The features of this model make its very convenient for handing by women for small-scale backyard operations as a family activity. The structure consists of three separate tanks for breeding, hatchery and collection of egg. The light-weight hatchery can be dismantled, reassembled and easily transported.

Dr Krishna Srinath
Director, NRCWA
e mail: dirnrcwa.org

Dhanauri Maize Sheller developed

GBPUA and T, Dhanauri. Dhanauri maize sheller, a hand operated simple device to separate maize kernels from dehusked cobs, was developed at the Govind Ballabh Pant University of Agriculture and Technology, Research and Extension Centre, Dhanauri, Haridwar.

This helps in reducing drudgery of farm-women involved in maize shelling operation by hand peeling. The machine has following specification:

(a) Overall dimension : 350 mm x 175 mm x 150 mm, 45 mm diameter of the pipe;

(b) Capacity: 20-25 kg of cob/hr;

(c) Power required: Hand-operated and its function is to shell kernels from maize cobs.

The salient features include easy to operate by hand, no grain breakage, portable in structure, and can be mounted on any table or bench easily. It is especially suitable for seed purposes and dehusked maize cobs are to be used. The efficiency of the unit is 100%. The cost of the unit is Rs 200.

Er Minati Mohapatra
Assistant Professor
e mail: minati_m@yahoo.com

Varietal releases in Madhya Pradesh

Government of Madhya Pradesh. The Jawaharlal Nehru Krishi Vishwavidyalaya in Madhya Pradesh has developed varieties of soybean, wheat, chickpea, rice, groundnut, *ragi,* and kodo millet.

JS 97-52 Soybean

JS 97-52 soybean is widely adaptable, high-yielding and multiple resistant variety which has secured top rank and is found suitable for 2 zones north-eastern and central, providing at least 10% more yield than leading variety JS 335 soybean. Its yielding potential is 25-30 q/ha and it possesses excellent germinability, field emergence and longevity during storage. Its maturity period is 98-102 days, categorized as medium duration; plants are of medium height (58-60 cm.); and seeds of medium size (9-10g/100 seed).

The flower is white and hilum colour of seed dark black. The pods and stem are pubscent with tawn colour and at maturity pods show light straw colour. It has been found resistant to Yellow Mosaic Virus, Root-rot, Bacterial pustules, Charcoal rot, *Cercospora* leaf spot and Target leaf spot and rated as resistant high-yielding on the basis of reaction to disease complex. It has been rated as resistant high-yielding against insect pests on the basis of tolerance shown against stem-fly, girdle beetle and defoliators. It is also tolerant to excessive moisture stress conditions. It contains balanced amount of protein (40%) and oil (20%). This variety has been identified for north-eastern zone.

JW 3173 Wheat

Being a semi-dwarf JW 3173 wheat has good yield potential (23-25 g/ha) and limited irrigation (37-40q/ha). It has lustrous and bold grain, non-lodging plant- and non-shattering habit, resistant to drought and rust, with good *chapatti* making coupled with other nutritional attributes. It is new non-lodging semi-dwarf wheat variety for rainfed and limited irrigation areas of Madhya Pradesh.

JG 14 Chickpea

JG 14 chickpea is an early, wilt-resistant, high-yielding variety under late sown condition having better milling quality.

It is development from multiple cross [(GW 5/7 × P327) × ICCL 83149]. Its plant is semi-erect having attractive pods. Seeds are brown, angular, medium-bold (21g/100 seed). It matures in 100-105 days and gives an average yield of 18-19/ha under rate sown condition. It is better in milling due to its high *dal* recovery rate. It is resistant to *Fusarium* wilt, moderately resistant to dry root-rot and shows less incidence of pod-borer. It has wider adoptability, and responded well to recommended agronomic management practices.

JG 6 Chickpea

JG 6 chickpea has been developed from a double cross (ICCV 10 × K 850) × (H 208 × RS 11) by bulk-pedigree method as ICC × 33775. The variety has been tested under drought condition in central and south zones of the country where, it has shown superiority in seed yield. It has given distinctly higher yield of 17, 20 and 56% over checks, C 235, H 208 and RSG 143-1in central zone and 5.91, 22.76 and 84.94% over checks, JG 11, ICCV 10 and C 235 in south zone, respectively. It poseses dark brown large seeds of 24.9 g/100 seeds with angular shape and smooth surface. It matures in 113 days with average seed yield potential of 2,000-2,100 kg/ha. It is resistant to *Fusarium* wilt, moderately resistant to dry root rot and tolerant to *Helicoverpa.*

The variety bears semi-spreading and semi-dwarf pubescent plants with profuse branching; low anthocyanin and pink flower. The variety is resistant to lodging and shattering. It responds well to 20:60:20:20 kg NPKS/ha and its seed rate is 90 kg/ha for a row-to-row spacing of 30 cm × 10 cm. It posseses good nodulation status with native *Rhizobia.* It is highly acceptable to farmers, consumers and traders due to its large dark brown smooth seeds and better nutritional quality. It is suitable for timely sown rainfed conditions of Madhya Pradesh as well as central and south India.

JRH 8 hybrid Rice

JRH 18 hybrid rice has been tested in AICRP trial and found promising under different situations.

Its grains are long slender with intermediate amylase content. Grain quality is comparable with quality rice variety Pusa Basmati and it matures early (105 days). It is tolerant to stress. This is resistant to lodging and is responsive to fertilizer.

This is hybrid can be best suited to the area where farmer are growing Kranti rice or IR 64 rice under irrigated situations, and will be helpful to enhance productivity in irrigated areas.

JGN 23 Groundnut

In Madhya Pradesh groundnut is grown in around 0.2 million ha with average productivity of 1,000 kg/ha, and 90% of the area is under rainfed condition. Presently released variety JGN 23 is 15-19% higher yielder than existing varieties coupled with bigger pod size (1.8-2.6 cm), and its pods are well filled, 2 kernels in each pod. Kernels are cylindrical in shape with tan colour testa. The average yield is 16 q dry pod/ha and 11 q/ha kernel yield. This variety is tolerant to groundnut diseases.

Kutki 36 Ragi

Newly released Kutki variety (Kutki 36) has plant height of 91.7 cm, matures in 76 days, 1,000 grain weight 2.1 g and tolerant to grain smut and shoot fly.

This variety is suitable under sole as well as in intercropping and average yield is 10.13 q/ha. It has 55.10% and 39.2% more yield over check varieties CO 2 and, OLM 203, respectively. In farmers' field it gave 105.3 and 115.7% more yield than the local variety.

Jawahar Kodo 106

The variety JK 106 (Jawahar Kodo 106) is the product of selection from local variety and having average grain yield 19.47q/ha.

This variety is suitable for Madhya Pradesh particularly tribal areas where kodo millet is under cultivation. It has 5.6 cm height, matures in 100 days, 1,000 grain weight 5.56 g, and resistant to lead smut and shoot fly. It has been grown under farmers' field as a sole crop and in intercropping and gave 43.5% and 45.2% more yield than the check variety respectively.

Dr H B S Bhadoria
Dy. Secretary, Government of Madhya Pradesh

Yeast with biocontrol potential

RAU, Jobner. KEY-1 yeast, a strain of *Sporidiobolus pararoseus* Fell & Tallman, has been discovered with great biocontrol potential against post-harvest rots of fruits and vegetables at the SKN College of Agriculture, Rajasthan Agriculture University.

Kinnow–a hybrid mandarin (*Citrus nobilis* Lour. × *Citrus deliciosa* Tan.) crop faces recurrent post- harvest losses due to various fungal pathogens. Hence a novel yeast strain of *Sporidiobolus pararoseus* was isolated from a kinnow fruit showing variable efficacy *in vitro* against *Penicillium italicum* (blue mould rot), *Penicillium digitatum* (green mould rot), *Botrydiplodia theobromae* (stem-end rot), *Geotrichum candidum* (sour rot), and *Alternaria alternata* (core not) and the same was when evaluated for rot reduction, both by pre- and post-inoculation treatments exhibited efficacy *in vivo* as well. In general, the pre-inoculation treatment proved more effective, perhaps by out-competing post-inoculated (post-harvest) pathogen(s) for space and nutrients.

The present yeast strain has been designated as KEY-1 strain of *Sporidiobolus pararoseus* with MTCC number assigned 8337 and culture preserved in the microbial type culture collection and gene bank of Institute of Microbial Technology, Chandigarh.

This yeast species is also known to produce killer toxins and its presence on fruit surface of kinnow is new and interesting. Its antagonistic potential against post-harvest fungal pathogens as well as rots incited by them, thus, seems to be a new record from Rajasthan, India. The biocontrol of various rots of kinnow fruits by this yeast strain, may have the commercial importance too, possibly after a large scale testing with convenient formulations. Two biocontrol products, *Aspire* (Ecogen, Langhore, PA), which contains the yeast *Candida oleophila* strain I-182 and Bio-Save 110 (EcoScience, Woreester, MA; formerly Bio-Save 11), which contains a saprophytic strain of the bacterium *Pseudomonas syringae* are currently registered for post-harvest application to fruit.

Dr Rajendra Prasad Mahrishi
Head, SKN College of Agriculture,
e mail: rpmaharishi@rediffmail.com

CHM 7 : An early-maturing mango clone

CHES, IIHR, Bhubaneshwar. The CHM 7 mango clone has been identified at the Central Horticultural Experiment Station, IIHR, for extremely early fruit maturity, and freedom from fruit fly under coastal Orissa. In this clone, flowering starts during mid-November and fruit setting completes by the end of December. Fruit growth takes place during December–January and requires lesser Heat Unit Submission (1500-1600

Growing degree days) for fruit maturity. Fruit ripening in CHM 7 mango clone starts by 20 March and completes by 20 April with a yield of 70-110 kg fruits/plant from a grown up plant of 8-9 years. The fruits are attractive in appearance and better in quality. Owing to its extremely early ripening nature, it has been observed to be free from fruit fly incidence continuously for 4 years (2005-08) under Bhubaneshwar conditions.

The striking characteristics of CHM 7 mango include fruit maturity, extremely early maturity (20 of March); yield potential, 70-110 kg fruits/plant; fruit colour, attractive yellow with red blush on shoulders; fruit size, 80-100 mm long, 60-75 mm wide and 55-65 mm thick; fruit weight, 200-250 g; pulp content, 50-25%; peel content, 22-24%; seed content, 22-24%; and TSS, 18° to 22° Brix.

So far 3,000 plants of this clone have been supplied to growers in Jagatsinghpur, Cuttack, Dhenkanal, Puri, Nayagarh, Khurda, Jajpur, Balesore, Bhadrak and Kendrapara districts of Orissa and Research Farms of ICAR Institutes and progeny orchards of Directorate of Horticulture, Government of Orissa. With a modest estimate of 70 kg fruit yield per tree, 100 trees/ha plant population and selling price of Rs 25/kg, CHM 7 mango has a potential of giving gross

returns of Rs 175,000/ha under coastal Orissa conditions.

Drs V Pandey, Vishal Nath, Dinesh Kumar, H S Singh and Sudhamoy Mandal
e mail: headches@rediffmail.com

News from CSWCRTI

CSWCRTI, Dehra Dun. The project "More crop and income per drop of water" under Farmers Participatory Action Research Programmes funded by Ministry of Water Resources, New Delhi has been initiated at Dehra Dun and its 8 Research Centres.

A short course on "Watershed Planning" under NWDPRA sponsored by Divisional Soil Conservation Officer, Hoshiarpur (Punjab) was conducted at this Institute between 21 and 26 April 2008 in which, 20 participants attended the course.

Dr V N Sharda, *Director CSWCRTI*
e mail: director@cswcrtiddn.org

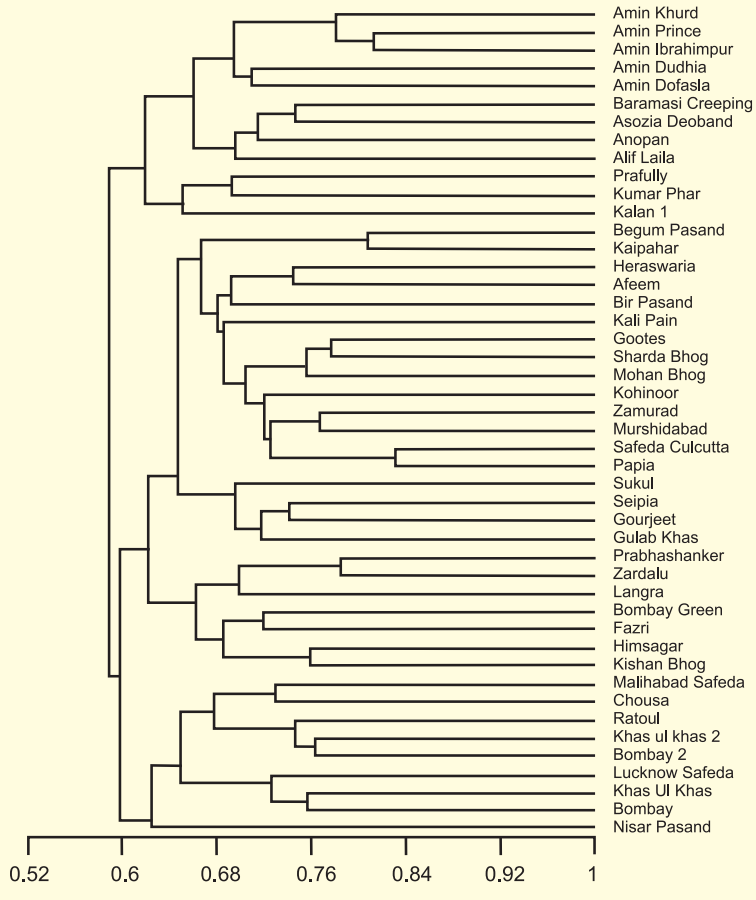
Genetic characterization of mango germplasm

CISH, Lucknow. Characterization based on agronomic traits evaluation needs complementation with molecular markers as they can contribute better to the utilization of genetic diversity through descriptive information of structure of genotypes, analyses of relatedness, the study of identity and location of diversity. Characterization of mango cultivars and breeding lines maintained in field gene bank belong to eastern and northern parts of India which have been traditionally important centres for diversity and cultivar develpment. Characterization data in combination with evaluation data provide most representative core subset collection besides offering advantage of using marker aided selection and distant hybridization.

The mango cultivars (46) were screened using RAPD and ISSR markers. The 9 decamer oligonucleotides and 11 dimple sequence repeats yielded 110 and 160 discrete fragments respectively. RAPD primers yielded 14 monomorphic bands and 96 displayed polymorphism. Per cent polymorphism generated by these primers was 87.3%. OPA 19, OPA 20 and OPC 6 were highly polymorphic primers.

Overall polymorphism detected by ISSR amplification was 79.38%, 14.5 band per primer. ISSR-5 yielded 14 polymorphic bands and 7 monomorphic band. UPGMA tree constructed on RAPD data on the basis of Jaccard's coefficient clustered accessions into 3 groups, one comprising majority of north Indian varieties and other having eastern Indian and third cluster comprising accessions from both regions. UPGMA clustering of ISSR data alone could not arrange cultivars as per geographic separation.

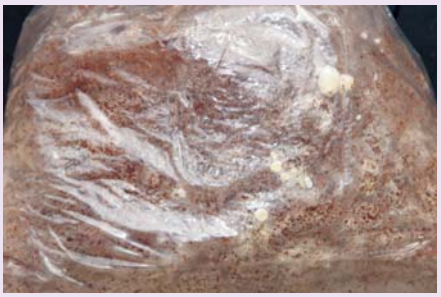
Cumulatively band data from these two methods precisely arranged accessions from two eco-geographical regions in such a way that inter-cultivar affinities were congruent with our understanding of the group. Since geographic distance between east India and India genotypes is very less, it is logical to have overlapping, as cultivar pool from these two regions is considerably homogenous, it has arrived at close pair-wise similarity values.



UPGMA tree based on Jaccard's Coefficient revealing clustering in mango accessions based on RAPD and ISSR data.

Drs Anju Bajpai, R Chandra and S Rajan
Scientists, Central Institute for Sub-tropical Horticulture, Lucknow
e mail: director@cish.ernet.in

Enhancing production of medicinal mushroom Shiitake



Mycelia growth stage of mushroom

Popcorn stage of mushroom

Browning of mycelium of mushroom

Bark formation stage of mushroom

Shiitake hybrid grown at NRC on mushroom

Chambaghat, NRC on Mushroom. An improved technology for production of Shiitake *(Lenticula edodes)* mushroom, was developed using superior strains and sawdust (mixed sawdust from saw mill instead of timber logs) which gives consistently higher yields (65-76% BE against current level of 20-30% BE) with assured profit to the growers.

In this technology, termed as synthetic logs, mixed sawsust available in plenty and cheap from the saw mills is used. Sawdust-based substrate supplemented with wheat bran (20-25%), gypsum (2-3%), calcium superphosphate (0.5-1%), sugar (1.5-2%) was developed and used for production of spawn and substrate for cultivation. The sawdust-based spawn proved advantageous over cereal grain spawn as it reduced the spawn run period from usually 4-5 months to about 3 months and brought down the cost of spawn production substantially. The supplemented substrate is pre-wetted for 18 hr and sterilized at 22 p.s.i. at 126°C in an autoclave in polypro-pylene bags fitted with non-absorbent cotton in the plastic necks. For spawn production half kg substrate and for cultivation 2 kg (wet weight) substrate was found the most suitable. The fresh growing mycelial culture is inoculated in sterilized substrate on clean-air station (laminar flow) and incubated at 22°-27°C in incubation chambers in complete darkness for 2-3 weeks. The substrate for growing is then inoculated by thorough spawning and taken to incubation chambers maintained at 22°-27°C for 3 months. During this period four different stages are observed.

Stage 1. Mycelium growth stage: During this period whitish shiitake mycelium begin to grow on the substrate, till colonization is complete, which takes 2-4 weeks after spawning depending upon the strain used.

Stage 2. Mycelial coat formation: towards the later stage of spawn run, a thick mycelium coat forms on the outer surface of the colonized substrate.

Stage 3. Popcorn stage: The mycelium coat begins to aggregate as popcorn-like bumps after about 2 months of spawning.

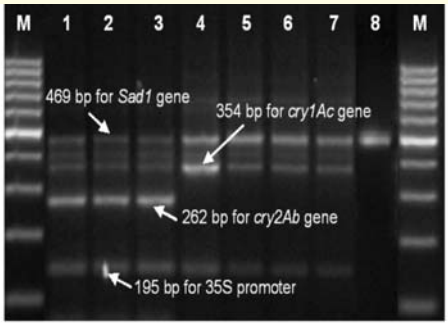
Stage 4. Browning of mycelium: The whitish mycelium starts becoming brown between 2.5 and 3 months. The timing of bag opening is crucial; the yield is adversely affected if bags are removed too early or too late.

After spawn run is complete, the polypropylene cover is removed and kept in environmentally controlled growing rooms. The substrate blocks are sprayed with water twice a day at 25°C for 18-20 days. Now the mycelium recedes and dark brown bark is formed resembling colour of wood. At this physiological maturity stage, each substrate block is subjected to chilling treatment with ice cold water for 15-20 minutes and the growing room temperatures are reduced from 25°C to 15°–18°C to induce pinhead (primordia) formation. During this period, a delicate balance of physical growth parameters is crucial for pinhead formation growth and maturity: RH 60-95%, CO_2 <1000 ppm with fresh air exchange for 4-8 hr/day and exposure to light 500-2500 Lux. The maintenance of above parameters reduces need and expenditure on repeated chilling treatments after each flush, regular normal fruiting is achieved and the crop is harvested for two-and-a-half months. The technology gives 650-750g/kg mushrooms dry weight of the substrate.

Drs S K Singh, M C Yadav, R D Rai and R P Tewari
e mail : tewari_rp@rediffmail.com

PCR-based Molecular Diagnosis of Transgenic Planting Material

NBPGR, New Delhi. The global area under commercial cultivation of genetically modified (GM) crops is increasing rapidly. In India too, there has been dramatic increase in commercial cultivation of Bt cotton. There is an urgent need for upgrading the analytical methods for GM detection, to check the authorized GM crops being cultivated and to solve the legal disputes as well as to meet the labelling and international trade requirements. DNA-based detection strategies are based on polymerase chain reaction (PCR) and hybridization. The various PCR strategies currently used for GM detection are Qualitative PCR, Multiplex PCR, Quantitative Competitive PCR (QCPCR) and Real Time PCR (RT-PCR), whereas Southern Hybridization and DNA Chip Technology are used as hybridization based detection techniques.



Multiplex PCR in Bt cotton

M: 100 bp ladder; 1-3: Bollgard II (MON 15985); 4-7: Bollgard I (MON 531); 8: Non-transgenic cotton

Corresponding to the different levels of specificity, the PCR-based GM detection techniques can be categorized as:

(i) Screening methods, targeting the control elements present in GMOs *e.g.* CaMV 35S promoter, *nos* terminator;

(ii) Gene specific methods, targeting the gene of interest;

(iii) Construct specific methods, targeting junction between the adjacent elements of the construct, *e.g.* a region spanning the promoter and the gene of interest; and

(iv) Event specific methods, the most specific, targeting the junction between the host genome and the inserted DNA.

The National Bureau of Plant Genetic Resources (NBPGR) has been designated as a 'Referral Centre for Molecular Diagnosis of Transgenic Planting Material' by Department of Biotechnology, Government of India. Thus, all the seeds of imported transgenic materials received at NBPGR are tested to ensure the absence of terminator technology (embryogenesis deactivator gene) using PCR analysis with the primers for *cre-lox* system. Plasmid cloned with *cre* sequence is used as positive control. The imported transgenic lines are also regularly tested for the specific transgenes/ promoters/ marker genes using PCR-based detection methods. These include *CaMV* 35S promoter, *nos* terminator, marker genes and endogenous genes in different transgenic crops such as Bt cotton (MON 531 with *crylAc* gene, MON 15985 with *crylAc* and *cry2Ab* genes, Widestrike with *cry1F),* Roundup Ready cotton (MON 1445 with *CP4epsps* gene) and Roundup Ready Flex cotton (MON 88913 with *CP4 epsps);* Bt brinjal, Bt cauliflower, Bt rice and Bt okra with *crylAc* gene; transgenic tomato with *osmotin* gene; transgenic mustard with *barnase and barstar* genes.

PCR-based diagnostic kits have been developed at NBPGR for the five GM crops, as shown in the table.

The diagnostic kits are reliable, sensitive and efficient, as more than one target sequence can be detected in a single assay. The sensitivity of the kits is up to 0.1 %. These kits were released by Shri Kapil Sibal, Union Minister for Science and Technology and Earth Sciences at Press Information Bureau, Shastri Bhawan, New Delhi on 7 April 2008.

PCR-based Diagnostic Kit	Crop	Transgene/promoter/ endogenous gene	Trait
Cot-boll I Cryplex	Cotton Bollgard I (MON 531event)	crylAc/CaMV 35S/Sad 1	Insect resistance
Cot-boll II Cryplex	Cotton Bollgard II (MON 15985 event)	crylAc & cry2Ab/CaMV 35 S/ Sad 1	Insect resistance
Brinjal Cryplex	Bt brinjal	crylAc/CaMV 35 S	Insect resistance
Cauli Cryplex	Bt cauliflower	crylAc/CaMV 35 S/ SRK 1	Insect resistance
Mustard Starplex	Mustard	barnase & barstar/CaMV 35S/ HMG	Cytoplasmic male sterlity
Tomato Osmoplex	Tomato	osmotin/CaMV 35 S/ LA T 52	Salinity and drought tolerance

Dr Gurinder Jit Randhawa, *NRC on DNA Fingerprinting, NBPGR, New Delhi*
Email : gjr@nbpgr.ernet.in

New varieties of cereals, oilseeds and horticultural crops

MPKV, Rahuri. Five new varieties of agronomic and horticultural crops along with twenty eight recommendations of MPKV, Rahuri were released during the Joint Agricultural Research and Development Committee Meeting-2008 of State Agricultural Universities of Maharashtra at College of Agriculture, Nagpur.

Sorghum : Phule Anuradha (RSV 458) is recommended for cultivation during *rabi* exclusively on shallow soils of Maharashtra. It has given on an average 1,034 kg/ha grain yield and 2,846 kg/ha fodder yield, which is 35.7 and 23.3% higher than the check Selection 3. In addition, it has higher ear excertion, better physiological traits associated with drought.

RSV 458 sorghum crop

Niger : Phule Karala (IGPN 2004-1) is recommended for its cultivation during *kharif* in Western Maharashtra. It has given 24.28% higher yield (485 kg/ha) than the check IGP-76 (391 kg/ha). It has bold shining black seeds; early maturing with high oil content (39.00%). As well as it is resistant to leaf spot.

Sunflower : The hybrid Phule raviraj (KSFH-437) is recommended for release in *kharif* in western Maharashtra. It high yielding (1,795 kg/ha), which is 21.6% higher than the check MSFH-17 (1,476 kg/ha). This has synchronized flowering of male and female parents. It has big head size (16.98 cm) with 34.5% seed content oil. It is tolerant to bud necrosis, *Alternaria*, pests like capitullum borer.

Cotton : Phule 688 (RHC 0688), a variety of *Gossyplum hirsutum* cotton is recommended for summer irrigated conditions of western Maharashtra.

It is high yielding (1,791 kg/ha) which is 22% higher than national check LRA 5166 (1,469 kg/ha). It has high ginning out turn (37.3%), better fibre strength (22.1 g/tex), as per the requirement of modern textile mills.

Further, it is tolerant to sucking pests and being early maturing (160 days), and is suitable for crop rotations like cotton-wheat/gram-sugarcane in irrigated tracts of western Maharashtra.


RHC 0688 cotton crop

Acid lime : Phule Sharbati is recommended for cultivation in western Maharashtra. It has recorded better plant growth, better fruit quality (52% juice content) and higher yield (52.19% tonne/ha) particularly higher yield (25.42%) during summer (11.28% higher over cv. Sai Sharbati) and lower disease, pest reaction especially to citrus canker (9.09 PDI) and tristeza (0.90 flecks/leaf).

Sweet Orange: Phule Mosambi is recommended for cultivation in western Maharashtra. It has recorded vigorous plant growth, high yield

potential (72.95 kg/plant) coupled with thinner rind (0.33 cm), medium-sized higher number of fruits (303/tree), better fruit quality (47.37% juice with 9.66 Brix TSS and 62.31 mg/100 g ascorbic acid content) and less pest and disease reaction (e.g. 2.42% greening and 2.07% tristeza).

Dr Kiran Kokate
Director
Extension Education, MPKV, Rahuri
E mail: deempkv@rediffmail.com

Pest control in Frenchbean

IARI Regional Station, Katrain, Kullu. Farmers of Kullu area are facing problem in Frenchbean cultivation as April-sown Frenchbean does not germinate owing to low temperature and diseases, and resulted in rotting of seeds. Research, therefore, was undertaken to find out the possible cause of interference in the germination of this crop.

April-sown Frenchbean seeds, which did not germinate and had started rotting, were collected from the field. They were found infested by the maggots. The International Institute of Entomology, London confirmed these as *Delia platura* Meig pest. Further, pesticides were evaluated to determine the role of this insect and diseases in the germination of bean seeds. Thus, identity of French bean seed maggot, *D. platura* as a pest of April-sown French bean crop was confirmed as it

responded to the application of insecticides. Unlike insecticides, however, the antibiotics did not suppress the rotting of seeds. Among granular formulations, application of carbofuran-3G @ 5 g/m row was effecitve. Soaking of Frenchbean seeds in chlorpyriphos (1.0%) for 4 hr before sowing was found effective in the management of this maggot. Though carbofuran granules could be used against this maggot in the French bean seed production, it could not be recommended in the production of its vegetable crop due to the problem of residues in the produce. Thus, for the insecticide-free production of vegetable French bean in the summer, the method of soaking of seeds for 4 hr in chlorpyriphos (1.0%) before sowing was recommended. The April- sown crop, therefore, was advanced for 1 month and did not need application of any other pesticide as compared to the late season crops.

Dr R N Barwal
Pr. Scientist (Agric. Ento.)
e mail: barwalrn@yahoo.co.in

Bioremediation of wastewater

CSSRI, Karnal. In recent years, due to scarcity of good quality water, the use of wastewater in agriculture has increased manifold. The wastewater, particularly from industries contains high concentration of heavy metals, which enter into human beings and animals through food chain. Therefore, it is desirable to remove these heavy metals from wastewater through low cost technology before its use in agriculture. Many microbes act as adsorbent to remove heavy metals from wastewater through low cost technology before its use in agriculture. Many microbes act as adsorbent to remove heavy metals from waste water. The ability to remove heavy metals from wastewater varies greatly among microbes. The microbes efficient in removing heavy metals need to be exploited. In laboratory, 93 bacterial and 81 fungal isolates tolerant to heavy metals (25 ppm of Pb, Cd, Cr and Ni) were isolated from sewage and sludge samples collected from Karnal, Panipat and Sonepat districts. There efficient organic matter decomposing fungi namely *Aspergillus awamorii, Phanaerochaete chrysosporium* and *Trichoderma viride* were procured from Division of Microbiology. IARI, New Delhi. Out of bacterial isolates, 14 were tolerant to Cd, 8 to Cr. 44 to Pb, and 29 to Ni and from fungal tolerant to Cd, 8 to Cr. 44 to Pb, and 29 to Ni and from fungal isolates, 9 each were tolerant to Cd and Cr, 34 to Pb and 29 to Ni. Majority of microorganisms were able to tolerate heavy metails up to 400 ppm.

In laboratory removal of lead from liquid medium containing 50, 100 and 400 ppm of lead was studied using four fungal isolates (F2, F3, F7, F8) and three fungal cultures (*A awamorii, T. viride* and *P. chrysosporium).* The metal uptake from liquid medium depended on concentration of lead in the medium. There was less uptake of lead by fungi at lower concentration

of lead in the medium. Maximum uptake of lead by different fungi was observed at 400 ppm concentration of lead and was in the range of 12.76 to 113.08 mg/g dry weight of fungus. The maximum uptake of lead at 400 ppm concentration was by isolate F3 followed by *T. viride* Growth of fungi at 100 ppm lead in potato dextrose broth. The dried biomass (500mg) of *Trichoderma viride* and fungal isolate F2 removed 89.8 and 68.6 percent of lead from water cotaining 100 ppm of lead at pH 5.0 after 6 hours of contact.

Similarly, in another adsorption study, fungi. *A. awamorrii* and *A. flavus* removed 25.1 and 44.4% of Cd from water containing 100 ppm of Cd at 500 mg does of fungal biomass.

Encouraging results were abtained for removal of heavy metal by some of the bacterial isolates from liquid media containing 50 ppm of heavy metal i.e. 2.4 mg/g of Cd of isolate BCd-4, 1.9 mg/g of BCd-10, 28.8 mg/g of Pb by BPb-14, 5.4 mg/g of Ni of isolate BNi-16 and 2.1 mg/g of Cr by BCr-23. Some of the bacterial isolates (BS-15 and BS-26) and fungal isolates (FCr-08, FCd-09, FNi-27, FS-21, FS-22, FS-23, FS-26) and fungi (*T, viride, A. awamorii, P. chrysosporium* and *A. nidulans*) were found tolerant to liquid containing 12.5 ppm each of Pb, Cd, Ni and Cr.

Growth of efficient bacterial and fungal isolates/culture of bioremediation of heavy metals is depicted in Figures C and D. The above results indicate potential of some of the fungal isolates/culture and bacterial isolates for removal of heavy metals like Pb, Cd, Ni and Cr from liquids through adsorption. These can be used for removal of lead from wastewater at low cost and in eco-friendly way. Further work regarding bioremediation of industrial wastewater for heavy metals using these micro-orgnisms is in progress.

Drs P K Joshi, Raman Kumar and Sonu Maheshwari, *CSSRI, Karnal*
e mail: director@cssri.ernet.in

Capping cement used in electrical lamp industry

IINRG, Ranchi. Lamp capping cement (LCC) is used in bulb industry to adhere the lamp base to the lamp glass. It is used in General Lighting System (GLS *i.e.* bulb), Tube Light (TL), and Compact Fluorescent Lamp (CFL). A ring of the capping cement is mounted on the inside of the cap shell, in the vicinity of its rim. Its consumption is huge as light is required everywhere. According to Indian Electrical and Electronics Manufacturers Association (IEEMA), around 1150 Million bulbs and tube lights are produced in India annually by organized, unorganized and small sectors. Approximately 1.5 - 4.0g of the capping cement is used in each GLS, TL and CEL. Total capping cement required for GLS, TL and CFL is around 2225 tonne/year. The capping cement is manufactured using 4-5 ingredients i.e. shellac, synthetic resin, rosin, marble powder, pigment and thinner (mostly alchol). Shellac is the main constituent of the capping cement (about 60% of the total cost). More than 150 tonne of shellac is consumed annually by this industry itself in the capping cement.

A request was received from a leading firm, engaged in manufacturing the capping cement, for help in solving the leading firm, engaged in manufacturing the capping cement, for help in solving the problems faced by the firm. The firm supplies the LCC to most of the bulb manufacturing factories. They also export LCC to Bangladesh and Iran.

Two scientists from the institute visited the firm to understand the problems thoroughly faced by the firm in manufacturing LCC. The problems were recorded as discussed here.

- Lack of required flow *i.e.,* no proper application around the cap.
- Fails torsion test *i.e.* loose adhesion.
- Drying of paste before application.
- These also result in cracking of capping cement resulting in fusing of lamps early i.e. reducing life.

The problems were thoroughly analyzed and short studies were carried out at the institute. It was detected that polymerized/degraded lac was the major cause of these problems.

These problems were ratified by using fresh and good quality of shellac, without any adulteration, meeting IS:16(Part II)-1991 specifications. It was found by the industry that the problems were alleviated as the capping cement, thus modified, passed all the standard specifications and tests. The institute was well appreciated by the industry.

Drs M F Ansari, B Baboo and S K Pandey
Indian Institute of Natural Resins and Gums
email: bbaboo@ilri.ernet.in

Tomato farming in Farmers' Field School

IIHR, Bangalore. The tomato-growers (15), from Agrahara, who had at least 5 years experience in tomato farming were involved in Farmers' Field School. An IPM team consisting of expert scientists from divisions of plant pathology, entomology, vegetable crops, soil science and agricultural extension actively participated in this programme. Weekly classes were conducted in the field itself. The study focused on the impact of IPM in terms of reduction in pest and disease levels, on usage of chemicals and reduction in cost of cultivation compared to farmers' practice. The impact analysis study indicated that there was significant reduction in use of chemicals. Data on pests and diseases were recorded by farmers themselves. Farmers became aware that by following IPM practices, the marketable yield can be increased. The frequency of insecticides came down to 2.5 in IPM compared to 8.5 and fungicides to 3 from 4.5 under the training of IPM in farmers perspective. There was 23.3% increase (from 41.6 to 51.3 tonnes/ha) in marketable yield of tomato following IPM.

Dr G S R Murti, *Director, IIHR*
email: director@iihr.ernet.in

Quantitative techniques for Agricultural Policy Analysis

New Delhi, 13 June 2008. NCAP organized a programme on 'Quantiative Techniques for Agricultural Policy Analysis'. It was intended to strengthen the analytical skills of agricultural economists in agricultural policy analysis especially those working in National Agricultural Research System. About 30 participants from different institutes/ universities of National Agricultural Research System participated in this programme. The major emphasis in this programme was given on the use of multi-market and simulation of dynamic models to assess the role and impact of different policy interventinos at different levels of the economy. Experts of national and international repute were the resource persons for this programme. One of the important featuers of this programme was more emphasis on hands on practice on the application of quantitative techniques. The greater interaction between resource persons and the participants further helped in better understanding of the contents.

Dr P K Joshi, *Director, NCAP*
email: director@rcap.res.in

New accessions in Medicinal plants

IIHR, Bangalore. Sixty-three accessions belonging to 40 species were collected from Western Ghats and are being maintained. Some important species collected were *Alpinia galangal, A. purpurata, Barleria cristata, B. grandiflora, B. longiflora, Brownia grandiceps, Clerodendron infortu-natum, C. paniculatum, C. viscosum, Heliconia psittacorum, Ixora coccinea, I. parviflora, Moullava spicata, Mussandea frundosa,* and *Ochna obtusata.*

An indigenous climber *Jasminum malbaricum* with white fragrant flower was collected from northern parts of Western Ghats (Amboli forest, Kolhapur) and established successfully.

The new accessions in medicinal crops added to germplasm from different parts of the country include 10 in *Ashwagandha,* 20 in *Mucuna,* besides seeds of *A. coleus, S. asoca* and *Oroxylum.*

A Project on *ex-situ* conservation of RET medicinal plants was launched with IIHR as the lead centre with 9 other collaborating centres in Kerala, Karnataka, Tamil Nadu and Assam.

Dr G S R Murti,
Director, IIHR
email: director@iihr.ernet.in

Published by Dr T.P. Trivedi, Project Director, Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi 110 012. Lasertypeset by M/s Print-O-World, Shadipur, New Delhi 110 008, and printed in India at M/s Royal Offset Printers, A-89/1, Naraina Industrial Area, Phase I, New Delhi 110 028.

Editorial Incharge : **Dr Sudhir Pradhan;** ***Production :*** **V.K. Bharti and Punit Bhasin;** ***Art :*** **Narendra Bahadur**

INDIA with a production of over 6.8 million tonnes of fish occupies third position in the world in the total annual fish production and second in inland fish production, accounting for nearly 5% of the world's fish. Our share is to the extent of 2.5% in the global fish market valued at Rs 70,000 million.

In the diverse aquatic resources there is a notable shift in the composition of the fish production. The present day production of inland fish is almost 17-fold more than production level in 1950-51.

The ICAR has been taking a number of steps to reorient and strengthen the institutional capabilities to address the emerging issues. The fisheries research institutes were reorganized on the basis of reasource specificity to undertake focused research in marine, coastal, inland fisheries, freshwater aquaculture, coldwater fisheries, fish genetic resources, harvest and post-harvest technology and conduct post-graduate education. The mandate of respective institutes were revisited during the formulation of the *Vision-2025: Perspective Plan Documents.* Divisions/Centres were reorganized at the Institutes to enable effective disciplinary approach to problems. In a major decision during the XI plan, the National Research Centre on Coldwater Fisheries at Bhimtal, Uttarakhand has been made a Directorate of Coldwater Fisheries, to develop location, situation and system specific technology by utilizing/augmenting resources in all the Himalayan States from Jammu and Kashmir to Arunachal Pradesh. Infrastructure Development in terms of farms, hatcheries, aquaria, feed mills, world-class laboratories and students' hostels was given a major emphasis.

Capacity building of researchers was taken up on a mission mode. Establishment of a Referral Laboratory for fishery products at Kochi provided fillip to quality assurance in the country's exports.

Networking of researchers at various levels received much attention. A project on aquatic biodiversity undertaken during the NATP brought out 31 new fish species, mainly from the north-east and Western Ghats. Likewise, other network projects are on to exlore possibilities of incorporation of salt-tolerant genes from halophytic bacteria of marine system and genes from tiger shrimp into plants, and evaluation of seaweeds as a dietary component of cattle. Production of quality fish seed for different environments has been a unique effort under the ICAR seed project on 'Agricultural crops and fisheries'. In a similar attempt at harnessing the potentials of the microbes from different ecosystems, the National project on 'Application of microorganisms in agriculture and allied sectors' provided a platform for addressing microbial diversity from aquatic habitats and aspects of health and biopreservation. Taking the process forward, three outreach activities on Fish feeds, Fish genetic stocks and Nutrient profiling of fishes have been initiated during the XI Plan.

Dr Mangala Rai, Secretary (DARE) and Director-General (ICAR)

Education and training are the key inputs in building a competent human resource to address the new R&D needs. The Council has taken steps to ensure quality in education through the Deans' committee set up for the purpose as also the accreditation process.

Steps are being continuously taken to expand areas of specializations in fisheries at CIFE, Mumbai. Mariculture, freshwater aquaculture, post-harvest technology, fish genetics and biotechnology, fish nutrition and biochemistry and fish pathology and microbiology, fisheries business management and aquatic environmental management specializations have been launched in the last few years. Similar disciplines are available at the Doctoral level also. Besides certificate courses are also run to develop entrepreneurship as well as to improve the knowledge and skills of officials and workers. Further, to provide scientists trained in relevant aspects at the feeder level, the eligibility criteria for ARS examination have recently been modified to include post-graduates in specialized disciplines of fisheries.

Public-private partnerships have been growing strong in all aspects of agriculture and particularly so in fisheries. This is going beyond the borders of the country, as can be seen from the interest of several overseas agencies seeking our collaboration in different segments of fisheries.

With increasing pressure on land and land-based food production systems, it is appropriate that we look at the waters, the seas all around this subcontinent. The paradigm of 'look to the seas' is awaiting our attention to utilize this vast resource for various products, starting from drinking water to high value compounds apart from the fish wealth. Our efforts in this direction need to be enhanced, with coordination between various agencies, along with constant vigil and introspection. We must endeavour to realize the potentials fish farming and ensure a smile on every fish farmer of our country.

(Mangala Rai)
e-mail: mrai.icar@nic.in