NATIONAL RESEARCH CENTRE FOR MEDICINAL & AROMATIC PLANTS

NEWSLETTER

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About the Newsletter

The National Research Centre for Medicinal & Aromatic Plants (NRCMAP) is one of the institutes of the Indian Council of Agricultural Research (ICAR). NRCMAP's mission is to conduct research on all aspects of improvement, production and utilization of medicinal and aromatic crops. It also supports and is engaged in activities of multilocational testing of technologies through its out reach organ, All India Networking Research Project on Medicinal & Aromatic Plants (AINRPMAP).

AINRPMAP works in partnership with State Agricultural Universities and other organizations, undertakes research, multilocation testing of technologies, training and provides scientific and technical advice and information to a host of clients such as farmers and growers, industries, etc.

This newsletter is published half yearly to promote overall concern on medicinal and aromatic plants with emphasis on their conservation and production technology. It provides information, mainly generated in NRCMAP and AINRPMAP.

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Dr. H.P. Singh, DDG (Horticulture) visited NRCMAP

Dr. H. P. Singh, DDG (Horticulture), ICAR visited the National Research Centre for Medicinal and Aromatic Plants (NRCMAP) on 22nd of December, 2007. Dr. S. Maiti, Director welcomed him with presentation of bouquet and thereafter briefed him about the ongoing research and developmental activities. Dr. Singh visited the experimental fields and herbal garden of the centre as well as the laboratories. He expressed his happiness about the facilities available in the laboratories and the quality of work done by the scientists. He met all the scientists and had an in-depth discussion on problems, research priorities and future research needs. He emphasised that the All India Networking Research Project on MAP should be fully utilised as complimentary research programme of the NRCMAP to bring out some meaningful research outcome in both NRCMAP as well as Networking project. He suggested that digitalisation of herbal garden information should be done at the earliest. He also pointed out that the understanding of biochemistry and organic chemistry of the MAPs are very important areas for future research. Further he opined that more number of high yielding varieties with better

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EDITORIAL

Without plants, most of medicines that we take would not exist. Over 40% of medicines now prescribed in the U.S. contain chemicals derived from plants. Historically, plant medicines were discovered by trial and error. Our ancestors observed that pains and aches vanished when they drank tea made from the bark of a willow tree. Later, scientists found that willow bark contains salicylic acid, the active ingredient of aspirin. Importance of green medicines is being recognised more and more and as a result local drug stores or supermarkets are selling large quantities of these products combined with old favorites like aspirin. Medicinal plants are now used commercially, thanks to contributions of traditional cultures worldwide, modern medicine and pharmacognosy. Botanists and chemists are now vigorously searching the plant kingdom for new medicines. They sometimes find treasures in other people's trash. For years, the native Pacific yew (Taxus baccata) was burned as trash generated by logging operations in the Pacific Northwest. In 1975, a substance in its bark, taxol, was found to reduce the production of cancerous tumors. A comprehensive search of known plants for pharmaceutical chemicals is an enormous task. Of the estimated 250,000 plant species on the earth, only 2% have been thoroughly screened for chemicals with potential medicinal use. Because native plant habitats are destroyed almost daily, many valuable medicinal plants would nowhere be found before scientists can even lay their hands for investigation.

Hence, conservation measures should be considered as highly important and immediate action is needed. However, for some plant species, conservationists don't express their concern because their interventions raise the popularity of the species which fuels commercial over collection. For example, Catharanthus roseus is not native to India and, in some states, its widespread growth classifies it as weed. Therefore, over collection is not an issue. Likewise, Tinospora cordifolia also stands sufficiently abundant to withstand collection at current levels. On the other hand, concern for vanishing wild populations of Saraca asoca and guggal (Commiphora wightii) led to their listing as Endangered Species. This means their trade must be monitored to help ensure that large-scale commercial use does not threaten their survival in the wild. But what about native plants for which little is known or those that aren't primarily exported? How can scientists, manufacturers, wild-crafters, conservationists and others work together to anticipate trends and safeguard wild populations before commercial overharvesting reduces their numbers? To a large extent, the hope lies in commercial cultivation, which should help in decreasing collection pressure on wild populations.

Recognizing that commercial demands invariably cause overharvesting from the wild, India needs a proactive Working Group NGO for Medicinal Plants including representatives from industries, government, academia, ethnic groups and environmental organizations to create a framework for discussion and action on behalf of medicinal plants. The primary focus of the Working Group for Medicinal Plants would be facilitating action on conservation concern of native medicinal plants. It must aim to balance the biological and commercial needs of medicinal plants, so as to promote sustainable utilization and long-term conservation of native species. The working group should also facilitate information sharing among central, state, and private organizations. Immediate agenda may be as follows for the working group.

Generate and share information regarding species of medicinal and economic importance and conservation concern;

- *Promote appropriate conservation measures for native medicinal plants;*
- *Promote sustainable production of native medicinal plants;*
- *Increase participation in native medicinal plant conservation; and*
- *Encourage active participation by tribes and other holders of traditional native medicinal plant knowledge.*

I take this opportunity to invite all citizens of India to join hands in saving the medicinal plants from vanishing from this Mother Earth by creating an effective Working Group for Medicinal Plants for their protection and sustaining it through individual as well as collective contributions.

Jai Hind!

Satyabrata Maiti

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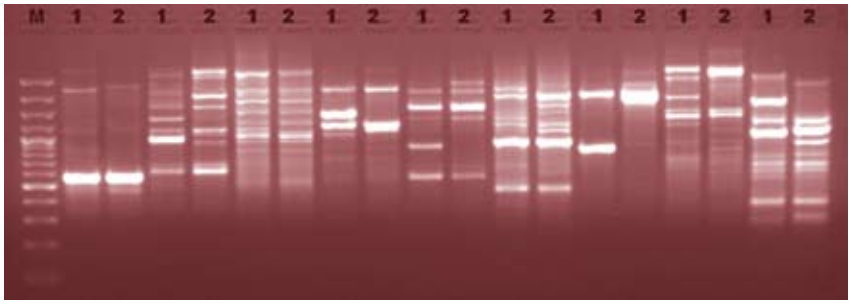
quality parameters needs to be developed and their production technologies should be optimised to increase the production, productivity and export of medicinal and aromatic plants. He put on record his impression as "I am happy to see an excellent infrastructural facilities developed at this centre, by personal efforts of Dr. Maiti, Director. I wish to compliment the Director and the Scientist for their efforts. But, we have to enhance our efforts for team work to achieve the excellence. Keep it up."

New plant type of mandookparni identified

Single leaf of Plant type 1 & 2 of Mandookparni

'Mandookparni' (*Centella asiatica*) is a prostrate, slightly aromatic stoloniferous perennial herb commonly distributed in India. The plant is well known in indigenous system of medicines and sometimes confused for 'brahmi' (*Bacopa monnieri*). Mandookparni is used for the treatment of leprosy and skin diseases and also to improve memory. The plant is used as an antidote to cholera. It is also used as an external application in rheumatism, elephantiasis, etc. The pharmacological property of the species is proven in clinical studies also. The leaves are used as a vegetable in some parts of the country.

Two distinct plant types were identified at NRCMAP and a comparative study of these two was conducted. Plant type 2 (Faizabad collection) was superior to plant type 1 in growth, yield and quality parameters. It had higher leaf area (40.39 cm^2), nodes per m^2 (434.23), fresh and dry herbage yield (4.29 and 0.79 q ha^{-1}), asiaticoside (1.620%). Plant type 1 was having smaller leaves (area 9.19 cm^2), 100.83 nodes per m^2, fresh and dry herbage yield (1.72 and 0.27 q ha^{-1}) and asiaticoside (1.468%). However, chromosome number of both the plant types was found as 2n = 2x = 18. Characterisation based on molecular markers also reveals the differences between these plant types.



RAPD profile of Plant type 1 & 2 of Mandookparni

Hybridisation - a viable approach for genetic improvement of Betelvine

Betelvine (*Piper betel*) is a perennial dioecious climber. It is an important commercial crop of India and cultivated for its leaves. It is chewed as stimulant and also used for its medicinal values in home remedies. Betelvine being vegetatively propagated, variability in the cultivated clones is limited. Hybridisation is a potential tool to breed new varieties having high yield potential with better quality and resistance to diseases and pests. Systematic breeding programme has been initiated at CHES Hirehalli under the AINRP on Betelvine. Flowering has been observed in 16 female and 13 male clones out of 70 collections. Among these, continuous and profuse flowering has been observed in SGM-1 (female) and Swarna Kapoori (male). The

High variability in betelvine hybrid combinations of different males and females

techniques of hybridisation, seed germination and seedling raising have been standardised.

In the male catkins, anthesis started at 10.30 a.m. and peak anthesis was recorded between 2 to 4 p.m. Female catkins remained in flowering phase for 8 days. Continuous pollination for 7-8 days resulted in uniform fruit development with 80-85% fruit set in all crosses. Fruits took 90-120 days to ripen.

Ripened fruits were harvested when they turned brownish green and soft. Seed germination drastically reduced in dried fruits on the vine, air dried fruits and air-dried seeds. Wide variation was observed among hybrids for number of seeds per fruit (8-61). Extracted seeds were treated with sodium hypochlorite for one minute and placed on a layer of sterile cotton and germinated under room temperature. Seed germination ranged from 20 to 80% in different crosses. Emergence of radical was observed within 11-15 days. Germinated seeds were transferred on soil. Large number (1050) of hybrid seedlings were raised from sixty different crosses. Wide variability was observed for many morphological traits like plant vigour, leaf size, leaf shape, leaf colour, internode length and stem pigmentation. Severe reduction in growth and vigour, leaf size and growth abnormalities were also observed within the hybrid population. Twenty hybrids selected from different crosses based on the plant vigour, vine length, internode length, leaf number, leaf size, leaf colour are being multiplied. The selected hybrids are being propagated through split bamboo technique. In a span of three months, 18-20 single node cuttings are generated from single plant, which aids in rapid multiplication of selected hybrids for further screening.

Variability in pollen fertility of Aloe

Considering the increasing demand as raw material and looking into the future commercial potential of Aloe (*Aloe barbadensis*), a large number of germplasm from different parts of the country has been assembled at NRCMAP. Collections have shown a great variability in terms of fruit setting. Fruit setting was totally absent in some accessions while profuse in some other accessions. Hence, screening of pollen fertility in thirty accessions was planned. Two different morphological forms of pollen grains, spherical and elongated, were observed. The rounded forms were stained with acetocarmine while the other remained unstained. Pollen staining percentage by this method varied from 80.03 (IC 310594) to 47.60 (IC 310908) among the different accessions tested. Viability, determined by fluorescence diacetate test ranged from 30.50 to 67.55%. This method also identified the same accession for highest pollen viability however, IC 310596 was found to have lowest pollen viability. Pollen germination in Brewbaker and Kwack's medium also identified IC 310594 as having highest viability (55.00%). Lowest germination percentage was in GUJ 3 (3.65%). The study showed that accession IC 310594 showed maximum pollen fertility. Fruit setting percentage also was maximum in this accession (~33%).

Floral infection by downy mildew induces sterility in isabgol

Isabgol (*Plantago ovata*), an important medicinal crop with export demand is cultivated in India. Downy mildew (*Peronospora plantaginis*) is one of the major threats in its successful cultivation. The foliage infection produces symptoms consist of ash coloured downy growth with corresponding chlorosis causing crop loss by reducing the photosynthetic area. However, floral infection causes direct reduction of seed yield. Two different types of infection were seen in the floral parts. Systemic infection resulted in elongation of spikes bearing weak and sterile florets, which later became black due to saprophytic growth. Localised infection produced various symptoms ranging between normal flower opening and failure to bloom. Infected flowers and its different parts – sepal, petal, filament and anther – were reduced in size. Localised infection induced gradual sterility of isabgol flowers. Androecium was affected more than the gynoecium. Pollen number, pollen viability and germination reduced drastically due to localised infection. On the contrary, infected flowers became protogynous and stigma receptivity was not affected in locally infected flowers. However, in systemically infected spikes, bud development was arrested leading to sterility. Similar symptoms were also produced when localised disease severity was high. Involvement of variable levels of plant hormones in this phenomenon was a possibility. Deciphering this hormonal code can also prove helpful in producing functional male sterility in this crop.

From the Institute

Institute Management Committee meeting

The Institute Management Committee meeting was held on 4th August, 2007 under the chairmanship of Dr. Satyabrata Maiti, Director, NRCMAP. The meeting was attended by Dr. K. V. Ramana, ADG (Hort-II), ICAR, New Delhi; Thakur Randhir Singh, President, Aromatic & Medicinal Plants Growers Association of India, Jammu; Dr. S. Chaphalkar, Director, Vidya Pratishtha's School of Biotechnology, Vidyangari, Baramati; Mr. D. V. Barot, Dy. Director of Horticulture; Dr. B. G. Bagle, Head, CHES, Godhra; Dr. S. Samantaray, Sr. Scientist (Biotechnology); Dr. M. Das, Sr. Scientist (Plant Physiology); Dr. K. Mandal, Sr. Scientist (Plant Pathology); Mr. V. S. Parmar, AAO and Mr. T. A. Vishawanath, AFAO as members. Dr. Bali Ram Tyagi, Chairman, QRT, NRCMAP & AINRPMAP also attended the meeting as special invitee and presented the recommendations of the QRT for information to the committee. The committee reviewed the various research and developmental activities of the institute and suggested a number of measures to speed up the development of the institute.

Distinguished visitors

- Thakur Randhir Singh, President, Aromatic & Medicinal Plants Growers Association of India, Jammu on 4.8.2007
- Dr. (Mrs.) S. Chaphalkar, Director, Vidya Pratishtha's School of Biotechnology, Vidyangari, Baramati on 4.8.2007
- Dr. K. V. Ramana, ADG (Hort. II), ICAR, New Delhi on 4.8.2007
- Dr. Bali Ram Tyagi, Chairman, QRT, NRCMAP & AINRP on MAP on 4.8.2007
- Dr. S. P. Tiwari, DDG (Education.), ICAR, New Delhi on 25.10.2007
- Dr. S. Edison, Director, CTCRI, Trivandrum on 20.12.2007
- Dr. H. P. Singh, DDG (Horticulture), ICAR, New Delhi on 22.12.200

Human Resource Development

Name	Course	Course
Dr. P. Manivel, Principal Scientist (Plant Breeding)	Training on Leadership and Personality Development at NAARM, Hyderabad	5–12 July, 2007
Mr. N. J. Ganatra, Sr. Clerk	Training on Intelligent Reporting System at NAARM, Hyderabad	30–31 August, 2007
Mrs. S. H. Nair, T-2 (Lab. Tech.)	Training on Intelligent Reporting System at NAARM, Hyderabad	30–31 August, 2007
Dr. Geetha K. A., Sr. Scientist (Plant Breeding)	Protection of Plant Varieties Procedures, Methodology at NAARM, Hyderabad	3–6 October, 2007
Mr. N. S. Rao, Scientist (Sr. Scale) (Computer Application)	Networking Essentials for Information Management in Agriculture at NAARM, Hyderabad	16–25 October, 2007
Dr. G. Sridhar, Scientist (Plant Physiology)	Noni Search 2007 Second Symposium on Noni for Health and Wellness at Chennai	27–28 October, 2007
Dr. M. Das, Sr. Scientist (Plant Physiology)	National Seminar on Plant Physiology at DBSKKV, Dapoli	30 November–2 December, 2007
Dr. Vipin Chaudhary, Sr. Scientist (Entomology)	Team Building Workshop cum Training at NAARM, Hyderabad	12–15 December, 2007

Cultivation of Shankhpushpi

Shankhpushpi (*Convolvulus microphyllus*) is a medicinal herb commonly used as memory vitalisation drug. It is also used to reduce mental tension as a psycho-stimulant and tranquilliser. Herbage including leaves and stems is the source of raw drug. The plant contains various alkaloids such as convolvine, convolamine, phyllabine, convolidine, confoline, convoline, subhirsine, convosine, scopoline and convolvidine along with β-sitosterol. AINRPMAP, Anand has developed cultivation practices for the farmers of this region. A basal dose of 10 tonnes FYM is applied in 1 ha area before sowing. The crop is sown at the onset of monsoon (Ist week of July). Only 400 gm seed is enough for 1 ha land when sown at a row distance of 45 cm. First harvesting is done in the month of October by cutting at the ground level. The crop needs irrigation after each harvesting and need based weeding is done. Two subsequent cuttings are obtained at 90 days intervals i.e. in January and in April. Total dry biomass yield becomes 10,843 kg per ha. The herbage should be dried under shade to preserve the green colour and quality.

Threatened Plant

Aphanamixis polystachya (Wall.) Parker = *Amoora rohituka* (Roxb.) Wight& Arn. (Family: Meliaceae)

The tree is commonly known as Harin hara, Rohitaka. It is found in moist deciduous to evergreen forests at an altitude of 700–1500 m. Natural distribution of the species spans over India, Pakisthan, Nepal, Bhutan, Bangladesh, Myanmar and Sri Lanka. In India, it is distributed through out except north and north western regions. It is common in higher altitudes of Western Ghats and sometimes in Eastern Ghats of South India. Also distributed in Sub Himalayan tracks from up eastwards to Bengal, Sikkim and Assam. It grows up to a height of 8–20 m with umbrella shaped crown. Leaves are alternate and odd-pinnate. The wood is reddish brown and the bark is dark brown. Flowers are unisexual arranged in drooping spikes. Male flowers are in branched spikes and female flowers are in simple spikes, which are shorter than the male spikes in length. Fruits are pear-shaped capsules. Flowering occurs twice in a year between September and November and again during January to July. Seeds have fleshy scarlet coloured arils. The tree is propagated by seeds.

The stem bark commercially known as 'roheda chhal' or 'rohitaka' or 'rakta rohida' is used to treat enlargement of liver, spleen and abdominal complaints. Seed oil is applied in sores and as an external application in rheumatism. Bark is also used for the treatment of tumours.

The plant is enlisted as vulnerable in Southern parts of India especially in Karnataka and Kerala.

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