NATIONAL RESEARCH CENTRE FOR MEDICINAL & AROMATIC PLANTS

NEWSLETTER

Vol. 9, No. 1 January - June, 2008

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.

Contents

Upgradation of NRCMAP to Directorate of Medicinal and Aromatic Plants in XI Plan

The journey of Medicinal and Aromatic Plant research in ICAR system started under Plant Introduction Division of IARI way back in the fourth plan. In 1972, All India Coordinated Research Project on Medicinal and Aromatic Plants (AICRPMAP) was created under the ICAR to boost the research and cultivation of this group of plants, considering its future importance in the global scenario. After gaining experience of doing research on MAP for two decades, the ICAR took another historic decision to establish a National Research Center for Medicinal and Aromatic Plants (NRCMAP) at Anand in 1992 keeping the AICRPMAP as an outreach programme. The idea was to give a blend of basic, strategic and applied research for popularization of the MAP cultivation in view to make the quality raw drug available to the various end users. The phenomenal progress made by the NRCMAP in last one decade and looking into the ever-growing demand of the MAP sector in primary health care as well as herbal industry, planners in ICAR have proposed to upgrade NRCMAP to Directorate of Medicinal and Aromatic Plants in XI plan. This would facilitate efficient forward and backward integration of basic, strategic and applied research in various agro-climatic regions. Another significant decision has been taken by the ICAR to merge the AINRP on Betelvine into AINRPMAP to form AINRP on MAP and Betelvine considering the proximity of these crops. These changes will also strengthen the MAP programme by providing additional centers to represent all possible agro-climatic zones. Two new centers, one in Chattrisgarh

...Continued at page 2

EDITORIAL

The Medicinal Plants as a group comprise of a large number of species (about 8000) and account for about 50% of all the higher flowering plant species present in India. Medicinal plants are usually used in India in self-help mode as well as in its codified systems of medicines such as Ayurveda, Unani, Siddha and Homeopathy. It is also used in different forms in several folk and tribal medicines. About 10000 designed formulations are in production and sold in length and breadth of the country. Analysis of different botanical habits of the medicinal plants reveals that about 33% plants species are trees, 32% herbs, 20% shrubs, 12% climbers and others 2%. If we examine the nature of use of medicinal plants, we shall find that about 90% of medicinal plants used by the industries are collected either from the forests or from its wild natural habitats. About 800 species are used by the industries in bulk of which about 20 species come from the commercial cultivation. More than 70% of the plants used involve destructive harvesting because usable parts are roots, bark, wood, stem or the whole plant in some cases. This causes threat to genetic biodiversity of species as well as sustainable supply of the raw drug.

The need of medicinal plants cannot be met with from forests alone, even with their improved management. There is a great scope for growing medicinal plants on private agriculture holdings, which would require the supply of planting material, marketing assistance and technical inputs at least in the initial stages. This must come from the State Agriculture Departments with inputs from State Forest Departments as well.

Although the tree species of medicinal plants are about one third of the total medicinal plants used, research and development of this whole lot is neglected due to long gestation period required for yielding the result. Neither researchers are interested for any kind of crop improvement work which some times need their life contributions in a species, nor funding agencies are interested to support the project for about 15-20 years that is required to complete the project to infer a tangible conclusion. Public funding agencies are governed by the plan fund of five years duration and are not sure about future funding. As a result they are sceptical to fund a project of long gestation. This situations need to be overcome, if sustainability has to be addressed.

Suitable lands outside village forests, falling in the category of permanent agricultural fallows or wastelands fit for agriculture (e.g. canal side lands), or problem lands (e.g. usar, ravines, etc.), may be allotted to individuals or groups for medicinal tree cultivation in any form. In addition, suitable incentives need to be designed and put in place to promote medicinal tree planting on lands distributed to the landless persons. Carbon sequestration by major forest is now an important component of carbon trading and if properly managed, it will bring additional income to the growers of medicinal tree species. Lots of data have to be generated on carbon sequestration of medicinal tree species for harnessing this as a component of carbon trading.

Identification of elite strains of important medicinal tree species with clear genetic markers for quality drug along with efficient clonal propagation techniques for fast multiplication should find a priority in the research. This would enable improvement of the quality of medicine and also improve the credibility of Indian Systems of Medicines.

Investment projection in XI plan on research and development of medicinal plants is encouraging. There is enough funds available now through National Medicinal Plant Board, ICAR, NAIP fund of World Bank, CSIR, Central Sector Schemes of Ministry of Agriculture, Horticulture Mission, etc. However, I find there is no data base for sharing among these organizations for weeding out the duplicate proposals as well as to create a synergy in solving the problems of medicinal plant sector as a whole.

Sharing of project information is only possible if a uniform database platform is created and is used by all the major players. I wish some organization should come forward to create such database platform with the help of IT professionals at the earliest.

Jai Hind !

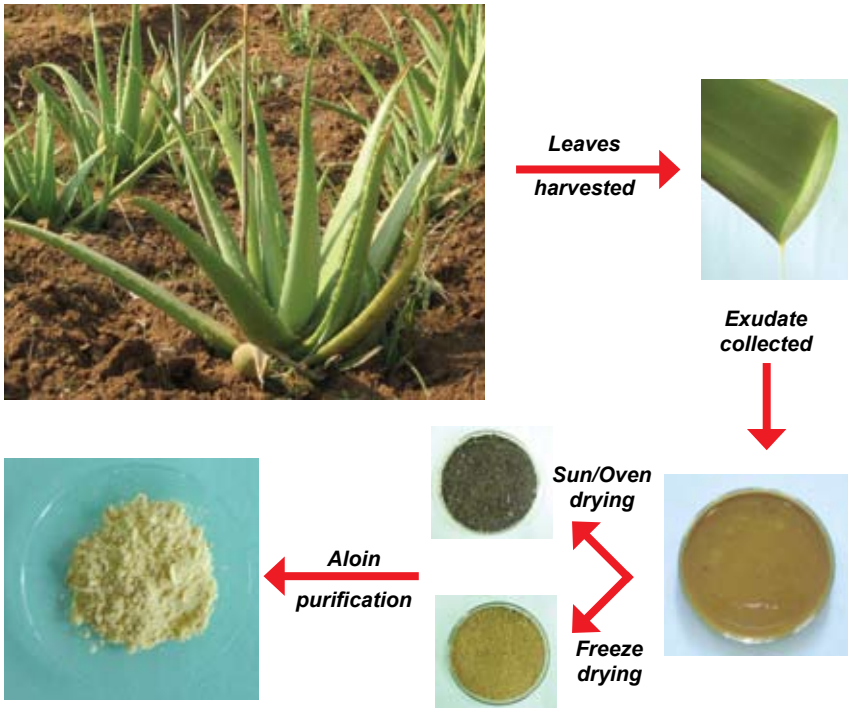
Satyabrata Maiti

...Continued from page 1

and one in Jharkhand have also been proposed in the XI plan. A total of 84 scientists will be available in the system to work on different aspects of MAP research. The total plan budget out lay for XI plan accepted by the Council is Rs. 3790 lakh.

New effecient aloin extraction method

A process patent has been filed by NRCMAP at Indian Patent Office, Mumbai for preparation of pure aloin from Aloe (*Aloe barbadensis* Mill.) through extraction and purification. Aloin (aloin A) is the major active principle in aloe. It is a pharmaceutically important compound and utilized for the production of various drug intermediary compounds like Diacerin, etc,. Diacerin is extensively used in the treatment of abnormal degeneration of the connective tissues, e.g. rheumatoid arthritis, osteoarthritis, osteoporosis, or in other diseases such as acute respiratory syndrome of adult (e.g., asthma) and pulmonary emphysema.



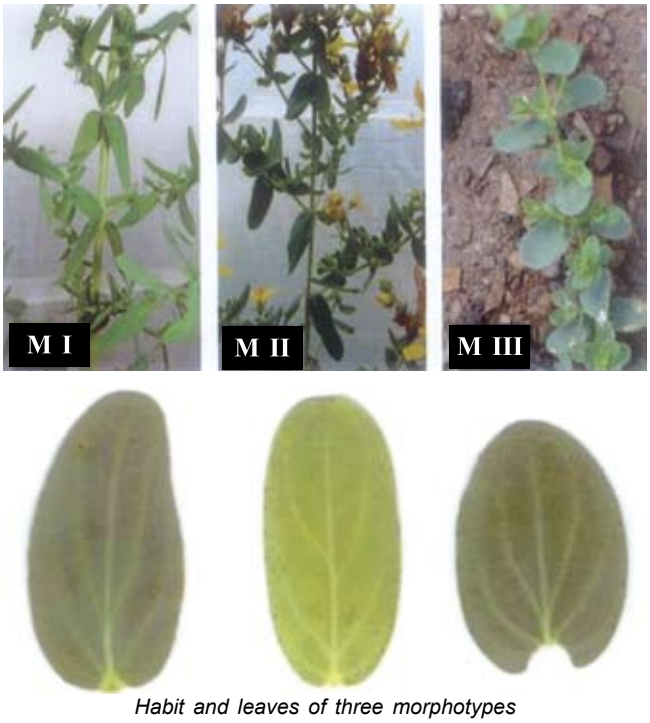
An outline of the novel method

The new method is easy to perform, can be used for purification of aloin from fresh, sun dried, oven dried and freeze dried leaf exudates. The method is also quicker, efficient (recovery up to 90%) and cost effective (most of the solvent used can be recovered for reuse). Aloin purity can be achieved more than 90-95% by this method which is suitable for industrial purposes. The product is available in bulk quantities on demand.

Morphotypes in *Hypericum perforatum*

Hypericum perforatum (St. John's wort), locally known as Bassant and Dendhu in Hindi, is chiefly valued as an antidepressant due to the presence of active content hypericin. It is also valued as an astringent, expectorant and diuretic and is used in pulmonary and urinary troubles. St John's wort oil (*oleum hyperici*), prepared by infusing the fresh flowers in olive oil, is used externally in the treatment of wounds, sores and swellings. It is found in Europe, Western Asia, North Africa and in Canary Islands. It is naturalized at many places in East Asia, Australia, New Zealand and North & South America. It is a frost resistant species, chiefly distributed in western Himalayas at an altitude of 1200-3000m in India.

After extensive explorations, three distinct plant types based on morphological features have been identified by AINRPMAP, Solan.



Habit and leaves of three morphotypes

Morphotype M-I is semi erect with oblong lanceolate leaf (leaf length: breadth ratio 3.0 or more) and reached 50% flowering at 3rd week of June having 100 days flowering duration. M-II is erect, having oblong leaves (L:B ratio ~2.3). It has slightly extended flowering duration (123 days) and reaches 50% flowering at 2nd week of June. M-III has shortest flowering duration of 77 days and attains 50% flowering in 4th week of June. It is prostrate (decumbent) in habit with obvate leaf shape (L:B ratio ~1.8). These morphological features have been found to be stable among the inbred lines after successive generations. These morphological features could be used in varietal development programmes conforming to the DUS criteria.

High valepotriates yielding strain in *Valeriana jatamansi*

Valeriana jatamansi (*Valerianaceae*), distributed in temperate Himalayas (1500 to 3000 m) is valued both in traditional and modern systems of medicine. Traditionally it is used for treating hysterical fits, nervous unrest, emotional troubles, epilepsy, asthma, leprosy, etc. The roots are also used as carminative, laxative, antiperiodic, hypnotic and aphrodisiac. Most of the therapeutic properties like tranquillising and sedative effects of this species are due to the presence of a group of compounds termed as valepotriates (present in roots and rhizomes) and essential oils (present mostly in roots).

After extensive evaluation of various populations of this species growing in Himachal Pradesh, one strain with valepotriates content more than 4 per cent and essential oil about 1.8% has been isolated by AINRPMAP, Solan. This chemotype can produce dry rootstock yield of about 1000 kg/ha after two years of field growth (population density 85000 plants/ha). It can be multiplied both by seeds as well as rootstock splits. The centre is multiplying the strain for large scale cultivation and supply to interested farmers.

Air layering – A new propagation method of Asoka

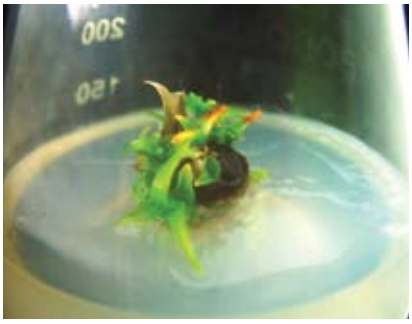
Asoka [*Saraca asoca* (Roxb.) De wilde] belongs to the family Caesalpinaceae, is a small evergreen tree. Asoka has high medicinal value and is used in many ayurvedic drugs. Bark contains tannins, glycosides and alkaloids (leucopelargonidin and leucocyanidin). Bark of the tree is used in medicines for women's genitor-urinary problems, dyspepsia, fever, burning sensation, visceromegaly, piles, ulcers, menorragia, metropathy, leucorrhoea and pimples. Due to overexploitation of this species, IUCN describes this species as globally vulnerable.

Conventionally, the plant is propagated by true seeds in rainy season. However, success of tree species improvement depends upon efficient clonal propagation technique. Therefore, standardization of various vegetative propagation techniques such as budding, grafting, air layering etc. was tried at NRCMAP. Of these techniques, air layering has been successfully standardized. Shoots are used for air layering during monsoon. About 90% success with excellent rooting was obtained within 45 days. Therefore, air layering would be suitable for mass production of true to the type saplings of *S. asoca*.

In vitro propagation of *Chlorophytum arundinaceum* from stem disc

Chlorophytum arundinaceum – an endangered medicinal herb is valued for its fleshy roots. In traditional Indian systems of medicine it is used for its aphrodisiac and natural tonic (for strength and vigour) properties. Besides, the fleshy root is especially used in the treatment of rheumatism. Large-scale collections from the natural habitat along with destructive nature of harvesting, poor seed germination and low multiplication ratio raise the concern about the possible extinction of the species. Therefore, a micropropagation method has been developed at NRCMAP for its large scale multiplication.

Micropropagation using stem disc as starting material (explants) has been achieved on Murashige and Skoog's medium supplemented with BA (1.0-1.5 mg/l), NAA (2.0-2.5 mg/l) and



Proliferation of shoot buds

3% sucrose. Within 10-12 days of initial culture, proliferation of 11-13 shoot buds was observed from a single stem disc. Multiple shoots of 8-10 numbers/explants were produced after 4-week of culture. Rooting of the micropropagated shoots were readily achieved in IBA (0.1-0.25 mg/l) after 8-10 days of culture. The plantlets were hardened and successfully transferred to the field. This protocol will provide an effective multiplication strategy for the nuclear base population of this important medicinal herb.

Root knot in Chirayita

Chirayita (*Swertia chirayita*) is a critically endangered medicinal herb of temperate origin. It is used as blood purifier and hepatic stimulant. Initiatives for its cultivation have been taken under AINRPMAP, Kalimpong. However, the plants were found to be susceptible to root knot nematodes. Plants collected from farmers' field at Lava were infected with root knot nematodes. Infected plants showed stunted growth. Upon uprooting, the roots with galls were seen. Number of galls per plant varied from 45-120. The nematode associated with the disease was identified as *Meloidogyne javanica.*

Severely infected root of Chirata

From the Institute

Distinguished visitors

Dr. T. P. Trivedi, Project Director (DIPA) & ADG (ARIS), ICAR, New Delhi on 12.03.2008

Dr. G. B. Singh, Ex. DDG (NRM), ICAR on 15.03.2008

Dr. A. Bandyopadhyay, National Coordinator, NAIP, New Delhi on 17.03.2008

Dr. K. M. Bujarbaruah, DDG(AS), ICAR, New Delhi on 15.05.2008

Director's Visits in Meetings/Seminars

- Project Screening Committee meeting at NMPB, New Delhi on 17.01.2008
- National Workshop on Spices & Aromatic Plants at Agricultural Research Station, Mandor, Gujarat on 06.02.2008
- Networking Project on Guggal in the Project Screening Committee meeting held at NMPB, New Delhi on 20.02.2008
- Networking Project on Guggal in the SFC meeting held at NMPB, New Delhi on 22.02.2008

Human Resource Development

Name	Details	Date
Dr. P. Manivel, Principal Scientist (Plant Breeding)	The stakeholders' workshop-component -4 of NAIP at CRRI, Cuttack	9-10th January, 2008
	RPC meeting of NAIP project on "Studies on relationship between ecogeography of the chemotypic variation of nine important but highly threatened medicinal plant species and prospects of their cultivation" at Krishi Bhavan-II, New Delhi	19th March, 2008
Mr. Saravanan Raju, Scientist (SS) Plant Physiology	Recent trends in chromatography at M/s Spinco Biotech, Ahmedabad	12th February 2008
Dr. G. Sridhar, Scientist (Plant Physiology)	MDP on Harnessing Intellectual Property for strategic competitive and collaborate advantage at IIM, Ahmedabad	10-12 March, 2008

Nursery technology for Chirayita

Domestication and cultivation are some of the possible ways to revive the natural population of the critically endangered species, *Swertia chirayita* (Chirayita). Towards this goal, work has been initiated to standardize cultivation practices at different centres under AINRPMAP. Seed germination is difficult in the species. Hence, nursery technology has been targeted at AINRPMAP, UBKV, Kalimpong. Poor seed germination is overcome by treating the seeds with gibberelic acid. The treatment resulted in 63.7% seed germination compared to 37.0% in untreated lot. Different sowing depth is also tested for seed germination. Placing the seeds at a depth of about 0.5 cm produced considerably high germination compared to deeper sowings. Composition of seedbed medium also plays important role in seedling growth. Mixtures of soil, sand and FYM in different proportions have been tried and maximum germination was observed with composition of soil : sand : FYM in 1:1:2 ratio and was followed by 1:2:1.

Endangered Plant

Swertia chirayita (Roxb.ex Flem.) Kart. = *S. chirata* Buch.-Ham.ex C.B. (Fl.Br.Ind.) (Family: Gentianaceae)

Swertia chirayita, commonly known as *chirayita* or *kirata tikta* or *bhunimba* is a high value endangered medicinal plant used in traditional therapies. The species is distributed in temperate Himalayas at an altitude of 1200-1500 m from Kashmir to Bhutan, and in the Khasi hills in Meghalaya.

The dried herbage is the source of raw drug. The species is valued for its bitter principles as hepatic stimulant, blood purifier, tonic etc. The species is on the verge of extinction due to massive unscientific exploitation from its wild natural areas. The situation is so alarming that it has been classified as critically endangered plant species and has been put in negative export list of Ministry of Commerce, GOI. This is one of the 32 species short listed by NMPB for extensive cultivation and research. Most of the domestic demand is met from imports from Nepal and other areas. Due to lack of genuine raw material of this species and great demand from industries, substitute species like *S. angustifolia, S. paniculata, etc.* and even *Andrographis paniculata* are traded in the name of *S. chirayita*.

Considering the demand and importance of genuine chirayita, work on exploration, domestication and development of cultural practices and chemical profiling of *S. chirayita* has been initiated at AINRPMAP, Solan and Kalimpong. Plants of *S. chirayita* can be identified on the basis of erect and pluri-annual (once flowering herb) plant habit; yellow coloured small tap root; 5 nerved large broadly lanceolate sub sessile radicle leaves, forming a dense rosette at the shoot base with purplish tinge on lower surface; cauline, lanceolate, 5-7 nerved, sub sessile, opposite and decussate leaves smaller than radicle leaves, gradually diminishing in size upwards; robust stem, purplish in colour, circular in outline up to middle and quadrangular above containing large continuous and easily separable pith; panicle bearing 3-5 flowers in each cluster; greenish yellow tetramerous flowers, tinged with purple; each corolla lobe bearing a pair of nectar glands with long hairs; capsule bearing numerous dark brown minute seeds and extremely bitter plant parts. Flowering occurs from July to October and the seeds are ready in October to November.

The species has now been successfully domesticated at the research farm of AINRPMAP, Solan and Kalimpong. Viable seeds have been produced from the plants raised at these locations and basic nursery practices are standardized. The centres are now in a position to supply genuine planting material of this species to interested growers.

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Published by : The Director, NRC for Medicinal & Aromatic Plants, Boriavi, Anand 387 310, Gujarat. • Phone : 0268-2578602 • Fax : 0268-2578601 • E-mail : nrcmap@gmail.com • Visit at: www.nrc-map.org
Printed at : Anand Press, Anand 388 001 • E-mail: anandpress@gmail.com