



# NEWSLETTER

Vol. 6, No. 2

July-December, 2005

## 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 multilocal testing of technologies through its out reach organ, All India Networking Project on Medicinal & Aromatic Plants (AINPMAP).

AINPMAP 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 AINPMAP.

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## First Consultative Meeting on 'DUS' Testing of Medicinal, Aromatic and Seed Spice Plants held



L-R : Dr. S. Maiti, Dr. R.K. Gupta, Dr. S.P.S. Khanuja, Dr. S. Nagarajan

The "First Consultative Meeting on 'DUS' Testing for Medicinal, Aromatic and Seed Spice Plants" under Protection of Plant Variety & Farmers Rights (PPVFR) Act was held at CIMAP, Lucknow on 17-18<sup>th</sup> December, 2005 to discuss modalities of 'DUS' testing and related issues on these speciality plant groups. About 25 scientists from ICAR, CSIR, DBT, TBGRI and NGOs participated in the discussion. Dr. S. Nagarajan, Chairperson, PPVFR Authority, Government of India, Ministry of Agriculture, DOA&C, New Delhi highlighted key features of DUS testing and why MAP and Spices crops are to be dealt separately in DUS testing. He appraised the group on various modalities to be followed in future for registering the new varieties. He informed that all the new varieties needed to be notified in the Indian Journal

of Plant Variety Authority, which would act as official journal for registering varieties. NBPGR would act as National Plant Variety Gene Bank. A computerised database would be prepared covering DUS characteristics, photographs, digital herbaria and chemotypic traits of all the plants. MAPs would be taken up for DUS testing by 2008. It was decided that indigenous knowledge should be an important criteria and accordingly the crops needed to be prioritised for DUS testing. Coordinators would prepare dummy characters for which 15-20 characters of each crop were to be identified. For each crop, expert groups would be required to prepare general and specific guidelines. Dr. Nagarajan suggested that material submitted for registration of the varieties had to be pure. He also stressed

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## EDITORIAL

**T**raditional medicines, more particularly plant based medicines, have been increasingly becoming popular world wide during the last two decades. World trade in this sector has also gone up tremendously during the last five years. Ayurveda has penetrated in the cultural fabric of most of the developed countries like European union and the USA. Similarly, destination of foreign tourist is now aimed to India for health treatment. Kerala and Gujarat have become their favourite destinations since Ayurvedic treatment is very popular in these two states. Unfortunately, in the recent years, news of heavy metal presence in Ayurvedic drugs has created adverse effect in export of these drugs to European union where a ban has been declared. It is a fact that mushrooming of Ayurvedic drug manufacturers during the last decades have resulted manufacturing of some sub-standard medicines without following the Good Manufacturing Practices (GMP). Analysis and studies have pointed out that there are a variety of reasons for poor quality of drugs. One of the major causes of inferior quality is due to poor quality of raw material used for the manufacturing of drugs. Moreover, in the absence of Good Agricultural Practices (GAP) guidelines, medicinal plants are now being cultivated without following the standards. As a result, in many places I have seen substandard water (affluent from the industries) is used for irrigation, city garbage is used as manure and also unsuitable land is used for cultivation, obviously producing substandard material.

Therefore, if we have to compete in the world market, our stakeholders have to be sensitised to address and ritually follow GAP and GMP in their all production and promotion activities. It is very unfortunate that there is no model document available on GAP for medicinal plants yet in our country. WHO organised a consultation workshop on Good Agricultural and Collection Practices for Medicinal Plants held at Geneva, Switzerland during 7-9 July 2003. Absence of India's participation in such an important consultation workshop also delayed the process of GAP development for medicinal plants in India. The challenge before the country is not only preparation of a model GAP document but also its implementation in its true spirit. It would be a difficult task to train farmers and processors of medicinal plant material.

However, this issue must be dealt on mission mode since it directly impacts on safety and efficacy of herbal medicinal products. This is only the first step in quality assurance, on which the safety and efficacy of herbal medicinal products directly depends upon and will also play an important role in the protection of natural

resources of medicinal plants in nature for sustainable use. Until now, only few countries like European union, China and Japan have developed their own national and regional GAP and Good Collection Practices (GCP) guidelines for medicinal plants. I believe more and more countries would now develop such guidelines and India should not fall behind in such endeavour. A massive programme is to be initiated to train the medicinal plants cultivators and personnel associated in handling the material. To achieve the monumental task before us needs whole hearted support from all organizations engaged in this sector. Immediate need would be to increase working hands in the sector to accomplish the task in the shortest period which is of paramount significance in this competitive world. I look forward to all organizations engaged in this sector including the Government, National Medicinal Plant Board, ICAR, CSIR and ICMR with a great hope. They must realize this simple fact and act accordingly without mincing words in between. Simply targeting something on paper and preparing a vision plan are easy and not going to help to achieve until and unless it is put into action plan seriously. I do not wish that every time we cut a sorry figure as has been done in achieving the target of Rs. 3000 crores exports of medicinal plants by 2005 set by the Planning Commission in their task force report on conservation and sustainable use of medicinal plants in 2000. This only negatively reflects on our seriousness in putting the action plan in place.

I as a common citizen of India only hope and pray to change the present mind set of the sector in the interest of the country. I wish that all the reader of this newsletter do their mite in whatsoever capacity they are to contribute in changing this sector to achieve prosperous India.

Jai Hind !

Satyabrata Maiti

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that CIMAP should coordinate the programme for medicinal and aromatic crops. Dr. Nagarajan suggested that the referral labs for MAPs might be CIMAP and NRCMAP. Decision was taken that Plant Variety Garden of live specimens would be maintained at NBPGR. Record keeping of DUS data would be as per law. A list of nine medicinal, six aromatic and seven seed spice species was identified by the group for developing DUS testing criteria.

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## Breakthrough & Research Highlights

### ***In vitro* tuberous root formation in Safed Musli**

**S**afed musli (*Chlorophytum borivillianum*), an endangered medicinal herb is valued for its fasciculated roots. It is used as a general tonic in indigenous systems of medicines. Large-scale collections from the natural stands along with destructive nature of harvesting, low seed formation, poor seed germination and low multiplication ratio raise the concern about the possible extinction of the species. This called for the development of *in vitro* propagation.

An efficient protocol was developed at NRCMAP for *in vitro* clonal propagation using shoot base as explants. Multiple



shoots were induced from shoot bases on half strength semisolid Murashige and Skoog's (MS) basal medium supplemented with benzyl aminopurine, 1-naphthalene acetic acid and sucrose. Inclusion of adenine sulphate in the culture medium improved the frequency of production of multiple shoots. The rate of multiplication was found to maintain the same level

for 12 months without loss of vigour. The protocol has been standardized for fleshy root formation since this is important for medicinal uses. Fibrous rooting of the micropropagated shoots was readily achieved upon transferring the shoots on to half-strength MS media containing IAA with sucrose within 8-10 days of culture. Addition of glucose instead of sucrose to the same rooting media formed fleshy roots. Plantlets with fleshy roots showed 100% survival upon transfer to soil. This optimised micropropagation protocol with fleshy root formation might offer the possibility to fulfil the demand of the growers and also conservation of the tuberous roots might be possible *in vitro* for the planting materials to be used in future.

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### **Reproductive biology of Guduchi**

**G**uduchi (*Tinospora cordifolia*) is a trailing medicinal plant generally found throughout India. The drug is a good immunomodulator. In nature, it is propagated both through seeds and stem cuttings. Systematic study on floral biology of the species has been done at NRCMAP. The plant flowers profusely during October to April. Male, female and hermaphrodite flowers are produced in the population. Males remains in full bloom throughout these months, however, flowering pattern in female is staggered in nature. Comparing to males, females were shy in flowering.

Appearance of female phase in male flowers is also observed in the population. In the earlier part of this conversion to hermaphroditism, small protuberance appears in the centre and later it is converted to fully developed pistils. Fruit set in these hermaphrodites is low

comparing to females, where fruit set is almost 100%.

Male flowers take 35-45 days to reach mature bud stage from bud initiation. Anthesis occurs throughout the day and maximum anthesis (75%) takes place during 12.00 to 16.00 hrs in both male and female plants. In population, anthesis is completed within 2-3 days in male plants. Here anthesis progresses very slow and takes about 2-4 hrs from initiation to completion. In the bud stage, flower remains completely surrounded by calyx and anthesis occurs by splitting of the sepals of the calyx in the longitudinal direction. Freshly opened staminate produces fragrance and a number of insect visits inflorescence. Interestingly, insects selectively visit male flowers and do not go to even nearby female flowers. Hence insects are supposed to be pollen eaters without having any role in pollination. The flower remains fresh in the plant for about 2-4

days and then starts to wither.

Female plants take about 25-35 days from young bud initiation to bud maturation. Anthesis in matured female inflorescences is comparatively faster and is completed within a day. Anthesis in females is also comparatively faster and it takes an hour for completion. Calyx withers within 4-7 days and from bud to fruit maturation, it takes about 50-60 days. Stigma is found to be of sticky nature in freshly opened flowers. Number of fruits developed from a single flower varies from 1 to 4.

Anther dehiscence starts at the time of anthesis, but the pollens were clumped together at this stage. Pollen dispersal starts after about 6 hrs of anthesis and become powdery mass enabling it to disperse through air.

Freshly collected pollen showed 53.27% germination in Brew Baker and Kwack's medium

with 5% sugar concentration. Acetocarmine test showed 80.41% and fluorochrome reaction showed 69.45% pollen staining. Pistils collected from artificial and natural crossing showed large number of pollen tube growth in both the treatments. The study will help in understanding and formulating breeding strategy in this species.

### Starch accumulation pattern in guduchi stem

Iodine test in hand sections of stems was carried out to study the accumulation pattern of starch in guduchi (*Tinospora cordifolia*) stem at NRCMAP. Starch deposit was found in the cells of cortex, endodermis, medullary rays and pith of the stem. There was no specific pattern related to gender of the plant, however, different types of starch accumulation were present in different male and female genotypes. IC 285624 - a female accession showed practically very little starch granules in the stained sections and chemical analysis also confirmed that the accession contains the lowest starch content compared to the other accessions.

Starch granules varied in shapes starting from round, dumbbell,



Stem section of guduchi stained with iodine

cylindrical, cylindrical with concave and convex surfaces, triangular to different non-specific shapes. Starch granular size also varied greatly within and between the genotypes of guduchi. Smallest starch granules were recorded in IC 285624 accession.

### Primary infection of downy mildew in opium poppy

Oospore of *Peronospora arborescence* has been established as a source of primary infection of downy mildew of opium poppy. However, study conducted at AINPMAP, Faizabad has established that infection hyphae from dormant mycelium in crop residue also can initiate infection. Tufts of hyphae develop from surviving mycelia of the fungus in leaf tissues. These invade

cotyledonary leaves of the adjacent germinating seeds and within a week first batch of sporangia are produced that help in further spread of the disease. Different modes of oospore germination have also been observed. The oospore forms a sack like structure into which its protoplasm migrates, undergoes cleavage, forming zoospores. Sometimes zoospores are produced inside the oospore and a pore develops on the cell wall through which zoospores are discharged. In rest of the oospore protoplasm gets detached from the cell wall, shrinks and finally disintegrates.

### New variety of isabgol released

A new cultivar of isabgol - Gujarat Isabgol-3 (GI-3) has been released by the State Seed Sub-Committee of Gujarat. The research scientists of Spices Research Station, Jagudan, S. D. Agricultural University, have developed GI-3. The variety has been found to be superior to variety GI-2 in terms of yield and yield attributing characters and reaction to diseases and insect pest. On an average, it gives seed yield of 1284 kg/ha.

## From the Institute

### Annual Day celebrated

The foundation day of the institute, 24<sup>th</sup> November was celebrated as the Annual Day at NRCMAP. The Staff Welfare Club (SWC) arranged a humble function on this occasion. Mr. Akshay Kumar Saxena, Mission Director, Gujarat State Biotechnology Mission (GSBTM), Gandhinagar was guest of honour and Prof. L. K. Vaswani, Director, IRMA, Anand was chief guest of the function. Dr. S. Samantaray, Vice-President of the SWC, welcomed the honourable guests and all the staff members.

Mr. Sinha expressed his happiness to be present at NRCMAP on that special day. He congratulated the Director and all staff members for astonishing speed of progress of the institute. He hoped that the relationship between GSBTM and NRCMAP would be instrumental for the progress of the nation. Prof. Vaswani expressed that he had personal relationship with the Director of the NRCMAP and wished the relationship between IRMA and NRCMAP would be in the same path of mutual understanding and

prosperity. In his presidential address Dr. Satyabrata Maiti, Director of NRCMAP expressed his thankfulness to all the staff members for their cooperation in building the institute. He invited all to use the facilities of the NRCMAP to its fullest extent to make it one of the best institutes. The programme ended with vote of thanks proposed by Mr. Saravanan Raju, Member Secretary, SWC. Several friendly competitions among the staff members and lunch were arranged on this occasion by SWC.

## Hindi Week observed

NRCMAP observed Hindi week between 14-20 September, 2005 to create awareness about our official language and to encourage the use of Hindi in our day to day life. During this period several competitions *viz.*, Hindi vocabulary test, Hindi essay writing, *etc.* were arranged. On the penultimate day, the Official Language Implementation Committee (OLIC) of the institute arranged a small function to celebrate Hindi Day. Dr. H. B. Singh, Principal Scientist, CSWCRTI, Vasad was the chief guest of the function. Dr. Satyabrata Maiti welcomed the chief guest by presenting a bouquet and Dr. O. P. Aishwath, Member Secretary, OLIC, welcomed the dignitaries. Hindi recitation competition was arranged during the function in which the chief guest acted as the judge. Dr. Maiti and Dr. Singh given away the prizes to the winners of different competitions. Dr. Singh presented the usefulness and essence of Hindi language. He informed that this language is used by the common mass and suggested to use this in the science also so that our works reaches the grass root. In the presidential address Dr. Maiti stressed that we need

to make Hindi the communication language in reality and that would not come from mere celebrations. He presented the Hindi software to the ARIS cell for its proper utilisation. The programme ended with the vote of thanks presented by Dr. Aishwath.

## Distinguished Visitors

- ❑ Dr. Gurbachan Singh, Director, CSSRI, Karnal visited on 23.7.2005
- ❑ Mr. JACS Rao, Director of Horticulture, Govt. of Chhattisgarh, Raipur visited on 26.7.2005 & 11.8.2005
- ❑ Dr. S. N. Rao, Chairman, QRT, CIAH, Bikaner visited on 17.8.2005
- ❑ Dr. P. Das, INSA Sr. Scieintsit, Khadagpur visited on 27.9.2005
- ❑ Mr. Ranjit Puranik, Hon. Treasurer, ADMA, Mumbai visited on 10.10.2005
- ❑ Dr. K. V. Ramana, ADG(PC), ICAR, New Delhi visited on 11.11.2005
- ❑ Mr. Akshay Kumar Saxena, IFS, Mission Director, GSBTM, Gandhinagar visited on

24.11.2005

- ❑ Prof. L. K. Vaswani, Director, IRMA, Anand visited on 24.11.2005

## Promotion

- ❑ Mr. Raghunadhan K., promoted to Assistant from Sr. Clerk from 24.8.2005
- ❑ Ms. Roshani Vasava promoted to Sr. Clerk from LDC from 24.8.2005
- ❑ Mr. V. P. Rohit promoted to LDC from SSGr. III (Watchman) from 17.9.2005
- ❑ Mr. L. F. Talpada promoted to SSGr.II (Beldar) from SSGr. I (Beldar) from 17.9.2005
- ❑ Mr. C. A. Vankar promoted to SSGr.II (Beldar) from SSGr. I (Beldar) from 17.9.2005

## Transfer

- ❑ Dr. Dinesh Kumar, Scientist (Sr. Scale) transferred on promotion to Sr. Scientist at Zonal Coordinating Unit, Zone I, TOT Project, Ludhiana on 14.12.2005

## Human Resource Development

Name	Course	Date
Dr. Manish Das, Scientist (Sr. Scale) (Plant Physiology)	IPA-ICAR National Conference on IPR Management in Agriculture at New Delhi	August 27-29, 2005
	Workshop on Agricultural Resources Information System (AGRIS) Project at Gandhingar	December 22, 2005
Mr. Saravanan Raju, Scientist (Sr. Scale) (Plant Physiology)	IPA-ICAR National Conference on IPR Management in Agriculture at New Delhi	August 27-29, 2005
	National Convention on Essential Oils & Isolates at Mumbai	December 2-3, 2005
Dr. Gutam Sridhar, Scientist (Plant Physiology)	Winter School on Implications of WTO Agreements on Indian Agriculture at NAARM, Hyderabad	October 4-24, 2005
Mr. N. S. Rao, Scientist (Computer Application)	Workshop on Agricultural Resources Information System (AGRIS) Project at Gandhinagar	December 22, 2005

## Morphotypes in Guggal



Two different morphotypes of Guggal (*Commiphora wightii*) were identified at NRCMAP. The morphotypes were identified from germplasm collected from Dwaraka. NRCCW 1 is female and growth habit is of weeping type (branches bending over and hanging down). NRCCW 2 is male and the plant growth form is of divergent type (branches spreading away from each other). Guggulosterone Z contents were 0.176% and 0.125% (in bark, dry weight basis), respectively.



## Gel and aloin rich clones of Aloe

**A**loe (*Aloe barbadensis* Mill.) is important for its gel and aloin-A contents. Germplasm evaluation at NRCMAP resulted in identification of IC 283932 as the highest gel rich clone (2191.18 g plant<sup>-1</sup>) and NMRM 2 as the highest aloin-A rich clone (26.13%).

## Red Listed Plant

### *Chlorophytum arundinaceum* Baker



**C**hlorophytum arundinaceum belongs to family liliaceae and is known in different languages as biskandri, safed musli (Hindi), bharat batuli (Oriya) and swetamusli (Sanskrit).

It is a perennial herb with fasciculated fleshy roots. Fleshy roots are sessile or semisessile and creamish/white in colour. Stem is condensed to a disc. Leaves are simple, lanceolate, sessile and attached to the condensed stem disc in a whirl. The plant flowers through out the year. Inflorescence is a raceme. Flowers are with six tepals. Anthers are longer than the filaments. Fruit is a capsule and trilocular. The species is distributed through out the forest areas of Assam, West Bengal, Orissa, Bihar, etc.

Fleshy roots are used for the preparation of herbal vital tonics. Saponins contained in the roots are the active principle of the species. The species has the same

medicinal value as that of the popular species *Chlorophytum borivilianum* Santapau & Fernandus, which is commercially utilized for cultivation.

The plant regenerates in nature by seeds as well as by rootstocks. The occurrence of the species is dwindled in its natural habitat due to the reckless collection for the raw drug, habitat loss, etc. It is not under commercial cultivation. Conservation attempts are required for the sustainability of the species since the species has already enlisted in endangered category.

