



NEWSLETTER

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About the Newsletter

The ICAR– Directorate of Medicinal & Aromatic Plants Research (ICAR-DMAPR) is one of the institutes of the Indian Council of Agricultural Research (ICAR). DMAPR’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 Co-ordinated Research Project on Medicinal & Aromatic Plants and Betelvine (AICRPMAP&B).

AICRPMAP&B works in partnership with State Agricultural Universities and other organisations; undertakes research on 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 ICAR-DMAPR and AICRPMAP&B.

Fourteenth Research Advisory Committee Meeting Held



The XIV Research Advisory Committee (RAC) meeting of the Directorate was held at ICAR- DMAPR, Anand under the chairmanship of Dr. S. B. Dandin, Former Vice Chancellor, University of Horticultural Sciences, Bagalkot, Karnataka on April 25, 2016. The other members of RAC attended the meeting were Dr. K. C. Dalal, Former Director, NRCMAP; Dr. Jitendra Kumar, Director, ICAR-DMAPR; Dr. S. K. Pareek, Former Principal Scientist, ICAR- NBPGR, New Delhi; Shri S. N. Tyagi, Mission Director, GSBTM, Gandhinagar; Dr. A.N. Ganeshamurthy, Head, Division of Soil Science and Agricultural Chemistry, ICAR- IIHR, Bangalore and Dr. Satyanshu Kumar, Principal Scientist and Member Secretary, ICAR-DMAPR. The meeting started with formal welcome of the Chairman and

Members of RAC by Dr. Jitendra Kumar, Director, ICAR-DMAPR, Anand. Thereafter, proceedings of meeting started with introductory remarks of the Chairman followed by the other members. Dr. Jitendra Kumar, Director, ICAR-DMAPR presented action taken report on recommendations made in the thirteenth RAC. The Chairman appreciated the action taken on the all suggestions/recommendations made in XIII RAC meeting. The Chairman requested to present the research achievements made by the Directorate during the year.

Thereafter, project wise research achievements of the last year were presented by Dr. Geetha K.A., Principal Scientist (Plant Breeding); Dr.P. Manivel, Principal Scientist (Plant Breeding),

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EDITORIAL

India has rich heritage of 15,000-20,000 medicinal plant species out of which 7,000-7,500 species are being used in Indian System of Medicines. Medicinal and Aromatic Plants (MAP) contribute substantially to drug inventions and primary health care of human population across the globe. Today, about eighty per cent of the population in developing countries rely on traditional medicines largely based on plants. MAP is also significant source of livelihood for many rural communities' especially forest dwellers, landless poor and marginalized farmers.

However, the MAP sector is facing several challenges. Examples are; loss of MAP ecotypes and ecology; non-availability of novel varieties with high yield, quality and tolerance to biotic and abiotic stresses and lack of scientific, economic and safe standardized production and processing technologies. In addition, there is a lack of advancement in innovative extraction technologies for efficient isolation of high value bioactive molecules. Non-availability of standard and innovative medicinal products with compliance to International Conference on Harmonisation guidelines is also a restraint. Since, diversity of bioactive chemicals in MAP is vast and remains untapped for its potential use as human, animal and plant health products, there is need to accelerate efforts for conservation of species and habitats, and development of technologies from production to finished products for sustainable supply of quality raw drugs.

The ICAR-Directorate of Medicinal and Aromatic Plants Research under the aegis of the Indian Council of Agricultural Research, is marching towards achieving the goal of "Health for all" by ensuring and assuring the quality of natural raw materials for drug production through planning, coordinating, implementing and monitoring of research and development programmes on MAP. The Directorate

has been working for enhancing sustainable production and utilization of major agriculturally important medicinal and aromatic plants through research and development to meet the present day demands and to address future national and international challenges. It is also aggressively working to bring more and more MAP under cultivation to assure quality supply of raw drug by encompassing research on various facets of cultivation such as varietal development through plant breeding and biotechnology, crop management through physiology, horticulture and soil science programmes, plant protection for managing pests and diseases as well as supply of quality raw material free from pesticide residues and heavy metals, quality assessment and control by its phyto-chemistry programme and supply of quality planting material, and finally to develop GACP protocol by integrating all the knowledge of various fields.

We hope that we can create better understanding of the subject and facilitate for further action on sustainable development of medicinal and aromatic plant resources, encourages the stakeholders to make timely interventions and boost the exports resulting in enhanced socio-economic benefits to the cultivators/collectors/extractors/exporters. Attempting preparation of a long term perspective plan is a difficult task in this fast changing environment of modern science where developments are happening at an exponential rate. However, we have tried our best to put the concerted efforts to address the challenges and research strategies in the domain of available environment and opportunities in the perspective of Indian agriculture. With this positive approach we are presenting before you the interim updates from the Directorate.

Jai Hind!

Jitendra Kumar

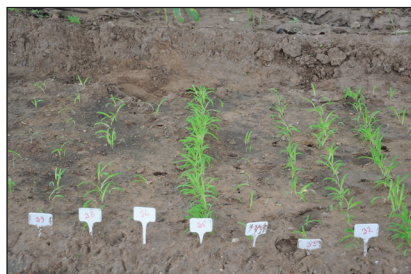
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Dr. Nagaraja Reddy, Scientist (Plant Breeding); Mr. R.P. Meena, Scientist (Plant Pathology); Dr. Satyanshu Kumar, Principal Scientist (Organic Chemistry) and Dr. G.R. Smitha, Scientist (Horticulture). After thorough discussions on the presentations of different research projects, future research activities of the Directorate were meticulously planned in the meeting. The Chairman suggested identifying potential medicinal and aromatic crops as a crop

for tomorrow. Precision farming/protected cultivation of medicinal and aromatic crops with multi-story cultivation was also suggested. It was also pointed out that for skill development a group of five-ten farmers should be selected and training should be imparted to them. Impact analysis of activities such as training, demonstration/farmers' fair and exhibition also should be prioritized. At the end, Dr. P. Manivel proposed vote of thanks.

Breakthrough & Research Highlights

Safed musli genotype with higher seed germination identified



Safed musli (*Chlorophytum borivillianum*) is enlisted as threatened medicinal plant in India and hence sustainable utilization of the species is highly essential. The cultivation through true seed is economical; however, low seed germination is one of the major problems. Hence, an effort was made to identify clones having higher seed germination at ICAR-DMAPR. Seeds of 52 genotypes collected during kharif-2015 were tested for seed germination after 1000ppm gibberellic acid treatment. Result revealed that seed germination varied from minimum of 1.92 (DCB-43) to maximum of 63.33% (DCB-41) among the genotypes. The genotypes DCB-2 (41.74%) and DCB-26 (33.98%) also had > 30% seed germination. The progenies of these accessions are to be studied for their uniformity, yield and quality before taking them to commercial cultivation besides they can be used as parents in the breeding program.

Reports of mutants in Isabgol

During 2008, mutation breeding was initiated in Isabgol variety GI-2 using chemical mutagens for creation of variability at ICAR-DMAPR, Anand. Many stable mutants were obtained and one mutant DPO 1 was identified and recommended for release as "Vallabh isabgol-1". In the seed production plot of this variety (M_8 generation), a petaloid mutant

was identified. On selfing, there was no seed setting, however, when the flowers were pollinated with fertile pollens of its parent DPO 1, it produced seeds. The F_1 plants produced normal flowers indicating that the trait is governed by recessive genes. The F_2 segregation study is in progress.



Petaloid spike

At AICRP MAP&B, AAU, Anand, five different mutants of Isabgol, viz., protruding corolla mutant (PCM) (IC 561246, INGR 08104), ball type spike mutant (IC 610180), tetraploid (IC 610181), wheat type spike mutant (IC 610182) and short branched spike mutant were identified and being maintained for further research programme.



Unique morphotype in *Malaxis acuminata*- an important ingredient of 'Ashtavarga' drug

Genetic diversity assessment studies being conducted at AICRP MAP&B, YSPUHF, Solan resulted in identification of one unique stable morphotype (*Solan Selection*) in *Malaxis acuminata*. The morphotype is characterised by greenish basal sheath (at the base of the shoot in contrast to purplish in wild type), yellowish green floral buds (purplish in wild type), yellow coloured

flowers without any purple tinge on their surface (purple tinge in wild type) and pseudobulbs covered by green sheath (purplish in wild type). All these characters were found consistently stable in three successive growing seasons of years 2013,2014 and 2015.



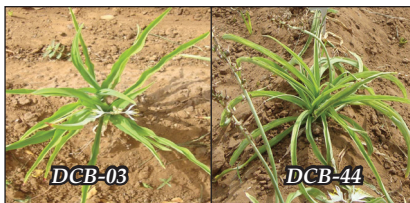
DOB-1: An elite accession of Basil

An elite accession (DOB-1) was identified from the local collection of Hisar, Haryana in *Ocimum basilicum* at ICAR-DMAPR. DOB-1 has upright, bushy or compact plant type. The inflorescence is un-branched type with whitish flowers. Branches are smooth or with less number of trichomes. New branches and inflorescence are purple, while leaves are green at both the surfaces. Average mature leaf area is 1.34 cm² with entire leaf margins, and rough upper surface with prominent veins. It takes 60 days from transplanting to 50% flowering (early maturing group). Maximum herbage yield observed was 616.67 q ha⁻¹ at 45 x 45 cm spacing. Maximum oil content in leaf was 0.70% on fresh weight basis and maximum herbage and leaf essential oil yield were observed during 2015-16 and 2016-17 in DOB-1 compared to local check.



Morphological variants in Safed musli

At ICAR-DMAPR, distinct morphological traits were identified from Safed musli germplasm *viz.*, plants with few number (<15) of leaves per clump (DCB-03), medium number (>15) of leaves per clump (DCB-17,28,34,36) and many number (>25) of leaves per clump (DCB-01). Foliage orientation was erect in DCB-03, semierect in DCB-02 and drooping in DCB-44. Majority of the genotypes were having single longitudinal green patch on the leaf lamina and a new variant was observed which had two (light & dark green) stripes on the leaf lamina (DCB-04-1). Maturity of the crop also varied among the accessions *viz.*, early (120-150 days) in DCB-48, 20, 21, 22, 27, 28, 30, 31, 32, 33, 36, 41 and 43, medium maturity (180 days) in DCB-1, 2, 3,10,16,23,24,25,26,29, 34,35,37,38,39,40,42,47 and 49 and late maturity (210 days) in DCB-4,5,6,7,8,9,11,12,13,14,15,17,18,19,4 5,46,50,51 and 52.



Bentonite Sulphur: Promising sulphur source for improving yield and quality of Isabgol

A field experiment was conducted to evaluate different sources of sulphur on yield and quality of Isabgol at ICAR-DMAPR. Application of 10 kg ha⁻¹ sulphur was found optimum for Isabgol seed yield irrespective of its sources. However, the highest seed yield and husk (seed coat) % was recorded under bentonite sulphur application @ 10 kg ha⁻¹ which was significantly higher than the other sources of sulphur. Application of bentonite sulphur

significantly improved swelling percentage of husk also over the control and application of SSP.

Value added compost: Promising fortified organic fertilizer

At ICAR-DMAPR, value added compost was prepared by using Isabgol crop residue and low-grade Indian rock phosphate (Udaipur). The low grade rock phosphate contains 9.4% total P however, plant available P content is very poor (<0.02%). Two different rock phosphate grades (2 and 4% P) were used along with one control (ordinary compost) where no rock phosphate was used. Fresh cow dung at 10 kg 100 kg⁻¹ of crop residue was made into slurry and sprinkled on each treatment as natural inoculum. The mature compost was analyzed for different fractions P to study the effect of composting on mobilization of P from rock phosphate. About 4-7 folds enrichment in terms of total P was found in value added compost as compared to ordinary compost. Significant improvement in water soluble P as well as Olsen P was found in enriched compost as compared to ordinary compost. This fortified (P enriched) product can be recommended as a promising nutrient source in organic cultivation.

Palmarosa distillation waste as an effective biosorbent

An inexpensive material made up of Palmarosa (*Cymbopogon martinii* Roxb. var. motia) distillation waste encapsulated in calcium alginate beads was proved efficient in removing harmful organic pollutants like dyes from water at ICAR-DMAPR. The dye uptake by this adsorbent increased with increasing pH, time of contact and dye concentration. This material has strong potential for replacing commercial activated carbon in treatment of wastewater. Its application in

developing low cost industrial wastewater recirculation system need to be explored in future and scientists are continuing studies to determine its life cycle and the ideal reagent for regenerating the material.



Marker based quality evaluation of Brahmi

Thirty fresh samples and seven formulations (5 powders and 2 granules) of Brahmi (*Bacopa monnieri*) collected from markets of Kerala were tested for the raw drug purity at AICRP MAP&B KAU, Trichur. As a reference sample, fresh sample from authenticated source was taken and analysed for the presence of Bacoside as a marker compound by HPTLC analysis. Adulteration/substitution was not found in fresh Brahmi samples. Chemical analysis showed that the samples contained Bacoside A in varying amounts ranging from 0.90 to 2.55 mg g⁻¹. All the fresh Brahmi samples had similar TLC fingerprints, thereby, confirming the genuineness of the samples. Brahmi powder as such is rarely sold in Kerala markets. Among the tested five samples, four gave negative results. This may be due to substitution of Brahmi with non Brahmi powders. The two granular formulations of Brahmi when tested gave very small content of bacoside A. Hence it can be suggested that as far as possible fresh brahmi samples should be used which will definitely contain the active ingredient Bacoside A.

From the Directorate

Institute Management Committee (IMC)

Institute management committee meeting (IMC) was held on 26.02.2016 under the Chairmanship of Dr. Jitendra Kumar, Director, ICAR-DMAPR. Various developmental issues and activities were discussed in the IMC meeting.

Tribal Sub-Plan (TSP)

Seeds and planting material of Kalmegh (*Andrographis paniculata*), Dodi (*Leptadenia reticulata*), Aloe (*Aloe barbadensis*), Ashwagandha (*Withania somnifera*) and Mandukaparni (*Centella asiatica*) were distributed to the beneficiary tribal farmers under the TSP Plan Scheme of ICAR-DMAPR. Technical know-how was also given to the tribal farmers about the planting, sowing and other cultivation practices of these medicinal plants. Improved sowing-cum-weeding hoes were distributed keeping in view of the practical difficulties to be faced for sowing and weeding on undulated topography and shallow soils in the targeted areas under the scheme. The implement was modified to adjust the row spacing, soil depth and sowing/weeding operations.



Villages of Jambughoda tehsil in Panchmahal district were surveyed and new beneficiaries were added. With the help of an NGO; the VIKSAT, 112 beneficiaries from 7 villages of Bhiloda and 13 villages from Vijaynagar tehsils of Sabarkantha and Arvalli districts, respectively were selected and invited to the Directorate for exposure visit cum training. An on-farm introductory training programme was organized at Zarva village in Jambughoda tehsil. Keeping an aim to promote cultivation of MAPs, a field day was organized at Jadoli village of Dediapada Tehsil in Narmada District. During the training programme, improved farm implements, sickles, *Phavda* and seed materials of different MAPs were distributed to the beneficiaries.

Farmers' fair

An exhibition was displayed in Gujarat State level farmers' fair at KVK Godhra on 1st March, 2016. Another exhibition was displayed in National *Kissan Unnathi Mela* during 19th -21st March, 2016 at IARI New Delhi. During these exhibitions, live plants, planting material of MAPs, raw drug materials and posters exhibiting the Directorate's major research findings and technologies were displayed with a main objective of encouraging the MAP based agro-commercial sector, agro based industries, and export oriented market, scientists to produce their optimum potential products and to showcase the Directorate's research findings for farming and business community.



Training on cultivation of aromatic plants in Gujarat

One-day training programme entitled "Cultivation of aromatic plants in Gujarat" was organized on 18.02.2016 at Pandoli, Petlad, Anand, Gujarat by the ICAR-DMAPR under the Central Sector Scheme (CSS). One hundred farmers were selected from different villages of Petlad *tehsils* of Anand for the training. In this training programme, different cultivation and marketing aspects of MAPs were covered through lectures. The various topics covered under this training programme included propagation techniques, good agricultural practices including planting material selection, agro-techniques, disease management, efficient marketing and importance of record keeping and contract farming.



Visit of Mr. C. Roul, Additional Secretary (DARE) & Secretary (ICAR)



Mr. Chhabilendra Roul, IAS, Additional Secretary, DARE, Ministry of Agriculture and Farmers' Welfare, Govt. of India & Secretary, ICAR, New Delhi visited ICAR-DMAPR, Anand on February 01, 2016. Mr. Roul visited the experimental fields of the Directorate and during his visit he keenly interacted with the scientists of the Directorate. An interaction meeting with the staff members was also organized after the field visit. Dr. Jitendra Kumar, Director, ICAR-DMAPR, presented an "An Overview of ICAR-DMAPR" during the interaction meeting. Shri Roul asked many detailed information about the activities those were presented by Dr. Kumar. Shri Roul specifically inquired about the implementation and progress of programmes such as ARYA, Tribal Sub Plan, *Mera Gaon Mera Gaurav*, etc. He categorically expressed the need of variety release of Medicinal and Aromatic plants for the benefit of stakeholders and formation of guidelines for minimum support price for MAP crops as well as marketing.

International Women's Day (IWD) Celebration



ICAR-DMAPR celebrated International Women's Day (IWD) on 8th March 8, 2016. The function was organized by the Women's Committee, ICAR-DMAPR. The United Nations (UN) theme for the International Woman's Day for 2016 was "Planet 50-50 by 2030: Step It Up for Gender Equality". Another independent campaign, separate from the UN, put forward the theme for the year 2016 as "Pledge for Parity". A formal function was organized in the auditorium of the directorate under the Chairmanship of Dr. Manivel, Director in Charge, ICAR-DMAPR. The function started with welcome address by Dr. Smitha G.R., Scientist (Horticulture). Dr. Geetha K.A., Chairperson, in her lecture, reminded the audience about the empowerment of women for the well being of the society. Dr. P. Manivel in his presidential address appraised the audience about the role of women in different facets of life. The day was dedicated to the womanhood who are the strength behind a healthy society.

Transfer/promotion

- Dr. R.S. Jat, Senior Scientist (Agronomy) was transferred to ICAR-DRMR, Bharatpur w.e.f. 02.01.2016
- Dr. Thania Sara Varghese, Scientist (Entomology) was transferred to JN-TBGRI, Palode consequent upon her selection as Scientist (C) w.e.f. 23.03.2016
- Dr. Rohini M.R., Scientist (Economic Botany and Plant Genetic Resources) ICAR-DMAPR was transferred to ICAR-IIHR, Bengaluru w.e.f. 13.04.2016
- Dr. Smitha G.R., Scientist (Horticulture) was transferred to ICAR-IIHR, Bengaluru w.e.f. 29.5.2016

New Joining



- Dr. Manishkumar Suthar, Scientist (Plant Biotechnology) joined ICAR-DMAPR after NAARM training on 09.04.2016

Distinguished Visitors during 2015-16

- Sh. C. Roul, Addl. Secretary (DARE) & Secretary, ICAR, New Delhi on 01.2.2016
- Dr. Dhaval Patel, Collector, Anand on 13.4.2016

Human Resource Development

Training imparted by the Directorate

Date	Programme details
20 -22 January, 2016	Trainers' Training programme on Conservation, Cultivation and Post Harvest Management of Medicinal and Aromatic Plants at ICAR-DMAPR
20 -22 January, 2016	NMPB Sponsored Farmers' Training programme on Conservation, Cultivation and Post Harvest Management of Medicinal and Aromatic Plants at ICAR-DMAPR
18 February, 2016	One Day Training Programme on Scientific cultivation of Aromatic Plants in Gujarat for farmers at ICAR-DMAPR
5 March, 2016	One Day Training programme on Promotion of Medicinal Plants cultivation in Tribal Areas of Gujarat for Livelihood and Health Security at Petlad, Anand, Gujarat
15 March, 2016	One Day Training Programme on Promotion of Medicinal Plants Cultivation in Tribal Areas of Gujarat for Livelihood and Health Security conducted at Zarva Village, Kambughoda, Panchmahal, Gujarat.
29 March, 2016	Field Day on promotion of medicinal plants cultivation organized at Jadoli village of Dediapada Tehsil in Narmada district, Gujarat

Training and Capacity Building Training and Seminar/Symposium attended

Name	Details	Date
Trainings		
Scientific staff		
Mr. Manish Mittal	DST training on 'Role of scientist in natural resources and environment management' at Indian Institute of Forest Management, Bhopal	February 08-12, 2016
Dr. Satyanshu Kumar	Workshop on 'Competency development for HRD Nodal Officers of ICAR' at HRM Unit ICAR and ICAR-NAARM	February 10-12, 2016
Dr. V. Thondaiman	Short course on 'Exploitation of underutilized horticulture crops for sustainable production' at ICAR-CHES, Godhra	February 11-20, 2016
Technical staff		
Mrs. Parul Purohit	Training on 'Conservation cultivation and Post harvest management of Medicinal and aromatic plants' at ICAR-DMAPR, Anand	January 20-22, 2016
Mr. R.B. Koli, Mr. B.K. Mishra, Mr. S.R. Patel, Mr. M.B. Vaghari, Mr. J.M. Padhiyar, Mr. K.R. Patel	Training Programme for Technical and Skilled Supporting Staff at ICAR-DMAPR, Anand	March 17, 2016
Administrative Staff		
Mr. Vijay Kumar	MDP on 'Public procurement' at NIFM, Faridabad	February 01-06, 2016
Skilled /Support Staff		
Mr. M. A. Saiyed, Mr. J. S. Vasava, Mr. C. K. Vankar, Mr. D. M. Parmar, Mr. R. B. Bhoi, Mr. A. C. Bhoi, Mr. L. F. Talpada, Mr. C. A. Vankar, Mr. R. N. Parmar, Mr. A. S. Bhoi, Mr. S. B. Bhoi	Training Programme for Technical and Skilled Supporting Staff at ICAR-DMAPR, Anand	March 17, 2016
Seminar/Symposium		
Dr. Satyanshu Kumar	International Symposium on Medicinal Plants and Herbal Drugs in Human and Livestock Wealth A Global Prospective at P.G. & Research Department of Botany, Pachaiyappa's College, Chennai	January 29-31, 2016
Mr. R. P. Meena	Workshop on 'Application of technical terminology in higher education' at JNVV, Jodhpur	March 27-28, 2016

Scientists' attachment training provided to ICAR-ARS scientists at ICAR-DMAPR

Name of the Scientists	Institute	Area of research	Duration
Ms. Sivaranjani R.	ICAR-IISR, Kozhikode, Kerala	Plant Biochemistry	75 days
Dr. Azeze Seyie	ICAR-RC for NEH region, Umiam, Meghalaya	Spices, Plantation, Medicinal and Aromatic Plants	90 days

Our new DG



Dr. Trilochan Mohapatra took over the charge of Secretary, Department of Agricultural Research and Education & Director General, ICAR from Dr S Ayyappan on 22nd February, 2016. Dr. Mohapatra was holding the position of Director-cum-Vice Chancellor of the prestigious Indian Agricultural Research Institute (IARI), New Delhi. Prior to this, he worked as the Director of National Rice Research Institute (formerly CRRI), Cuttack. He served National Research Centre on Plant Biotechnology, IARI, New Delhi as researcher and teacher for about 20 years. He is a scientist of global repute working in the area of molecular genetics and genomics. Dr. Mohapatra has over 145 research papers in national and international journals of repute and several book chapters. His research accomplishments include development of the first high yielding Basmati rice variety resistant to bacterial leaf blight through molecular marker assisted selection, and physical mapping and genome sequencing of rice and tomato. He is a Fellow of the Indian National Science Academy, National Academy of Sciences-India, Allahabad and the National Academy of Agricultural Sciences, New Delhi.

Species of Conservation Interest

Malaxis acuminata D. Don.
(syn. *Microstylis wallichii* Lindl.)



Malaxis acuminata D. Don. syn. *Microstylis wallichii* Lindl. (Orchidaceae) is an important ingredient of Ayurvedic formulation 'Ashtavarga' and is variously known as *Jivakah*, *Jivya*, *Dirghayu*, *Cirajivi*, *Jeevak*, *Jeevakam* and *Jeevakamu*. It is a terrestrial, perennial and endangered medicinal terrestrial orchid of Himalayan region, being used in Ayurveda for the preparation of *Chayawanprash*, *Astavarga churna*, *Chitrakadi taila*, *Vachadi taila*, *Vajikarn ghrita*, etc. The species is used to cure tuberculosis and is a great aphrodisiac. Its pseudobulbs are sweet, refrigerant, aphrodisiac, styptic, antidiarrhetic, febrifuge, tonic and useful in the conditions of sterility, seminal weakness, internal/external hemorrhages, dysentery, fever, emaciation, burning sensation as well as general debility. It is mostly distributed in India in temperate to subtropical Himalayas at an altitude of 1200-2100 m from Himachal Pradesh, Uttarakhand to Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram and Tripura and at an altitude of 1500-1800 m in Khasi hills. The species grows in shady moist areas in colonies consisting of about 5-25 plant per colony. Commercial cultivation is not yet popularised in the species and forests are the sole source for the raw drug collection. Its collection from the wild is prohibited in Uttarakhand. In other areas, due to unscientific collection strategies, overexploitation and habitat destruction, the existence of *M. acuminata* is under threat and is listed in CITES Appendix-II for ensuring its conservation. It can be propagated by seeds as well as by dormant apical bud from the underground part in the month of April. Due to its widespread demand and limited availability in the market, the raw drug is commonly adulterated. An urgent effort is required for its *in situ* and *ex situ* conservation programmes for saving this important species to face the threat of extinction.

Editor : Dr. Jitendra Kumar, Director

Associate Editor : Dr. Geetha K. A., Principal Scientist (Plant Breeding)

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