(ISSN 2395 - 468X)
Year - 2016 Vol. 3, No. 5 Issue: May 2016
www.goo.gle.com

Van Sangyan

A monthly open access e-magazine

Tropical Forest Research Institute
(Indian Council of Forestry Research and Education)
Ministry of Environment, Forests and Climate Change (MoEFCC)
PO RFRC, Mandla Road, Jabalpur – 482021. India

Van Sangyan

Editorial Board

Note to Authors:

We welcome the readers of Van Sangyan to write to us about their views and issues in forestry. Those who wish to share their knowledge and experiences can send them:

by e-mail to vansangyan_tfri@icfre.org

or, through post to The Editor, Van Sangyan,
Tropical Forest Research Institute,
PO-RFRC, Mandla Road,
Jabalpur (M.P.) - 482021.

The articles can be in English, Hindi, Marathi, Chhattisgarhi and Oriya, and should contain the writers name, designation and full postal address, including e-mail id and contact number.

TFRI, Jabalpur houses experts from all fields of forestry who would be happy to answer reader's queries on various scientific issues. Your queries may be sent to The Editor, and the expert's reply to the same will be published in the next issue of Van Sangyan.

Cover Photo: Panoramic view of Achanakmar-Amarkantak Biosphere Reserve
Photo credit: Dr. N. Roychoudhury and Dr. Rajesh Kumar Mishra, TFRI, Jabalpur (M.P.)

From the Editor's desk

The biosphere is the biological component of earth systems, which also include the lithosphere, hydrosphere, atmosphere and other "spheres" (e.g. cryosphere, anthrosphere, etc.). The biosphere includes all living organisms on earth, together with the dead organic matter produced by them.

The biosphere concept is common to many scientific disciplines including astronomy, geophysics, geology, hydrology, biogeography and evolution, and is a core concept in ecology, earth science and physical geography. A key component of earth systems, the biosphere interacts with and exchanges matter and energy with the other spheres, helping to drive the global biogeochemical cycling of carbon, nitrogen, phosphorus, sulfur and other elements. From an ecological point of view, the biosphere is the "global ecosystem", comprising the totality of biodiversity on earth and performing all manner of biological functions, including photosynthesis, respiration, decomposition, nitrogen fixation and denitrification.

The biosphere is dynamic, undergoing strong seasonal cycles in primary productivity and the many biological processes driven by the energy captured by photosynthesis. Seasonal cycles in solar irradiation of the hemispheres is the main driver of this dynamic, especially by its strong effect on terrestrial primary productivity in the temperate and boreal biomes, which essentially cease productivity in the winter time. The biosphere has evolved since the first single-celled organisms originated 3.5 billion years ago under atmospheric conditions resembling those of our neighboring planets Mars and Venus, which have atmospheres composed primarily of carbon dioxide. Billions of years of primary production by plants released oxygen from this carbon dioxide and deposited the carbon in sediments, eventually producing the oxygen-rich atmosphere we know today. Free oxygen, both for breathing (02, respiration) and in the stratospheric ozone (03) that protects us from harmful UV radiation, has made possible life as we know it while transforming the chemistry of earth systems forever.

As a result of long-term interactions between the biosphere and the other earth systems, there is almost no part of the earth's surface that has not been profoundly altered by living organisms. The earth is a living planet, even in terms of its physics and chemistry. A concept related to, but different from, that of the biosphere, is the Gaia hypotheses, which posits that living organisms have and continue to transform earth systems for their own benefit.

This issue of Van Sangyan contains an article on Achanakmar-Amarkantak biosphere reserve (in Hindi). There are also useful articles on Promotion of Melia composita and Emblica officinalis based agroforestry model for livelihood support in degraded land of Punjab and Uttarakhand, Importance of wild plants in treating bone fractures, Seed collection and conservation (in Marathi), Improved cultivation technique of bitter gourd (Momordica charantia L.), Integrated pest management (in Marathi), Kitul palm (Caryota urens): a potential multipurpose agroforestry palm, Importance of motha (Cyperus rotundus Linn.) and its management, Root distribution assessment methods in agroforestry, Significane of 'Earth Day' in the present time (in Hindi) and biodiversity of Lophophorus impejanus (Monal)and Fritillaria roylei.

I hope that readers would find all information in this issue relevant and valuable. Van Sangyan welcomes articles, views and queries on various issues in the field of forest science.

Looking forward to meet you all through forthcoming issues.

Dr. N. Roychoudhary
Scientist G & Chief Editor

Contents

अचानकमार- अमरकंटक बायोस्फियर रिजर्व : विश्व नेटवर्क का मनोनीत सदस्य

डॉ. रूबी शर्मा*, डॉ. राजेश कुमार मिश्र एवं डॉ. एन. रॉयचौधुरी

उष्णकटिबंधीय वन अनुसंधान संस्थान, जबलपुर – 4820021 (म. प्र.)

*पूर्व महिला वैज्ञानिक 'बी', अचानकमार-अमरकंटक बायोस्फियर रिजर्व के अन्तर्गत विज्ञान एवं प्रौद्योगिकी विभाग की परियोजना, उष्णकटिबंधीय वन अनुसंधान संस्थान, जबलपुर- 4820021 (म. प्र.)

अचानकमार-अमरकंटक बायोस्फियर रिजर्व दृश्य

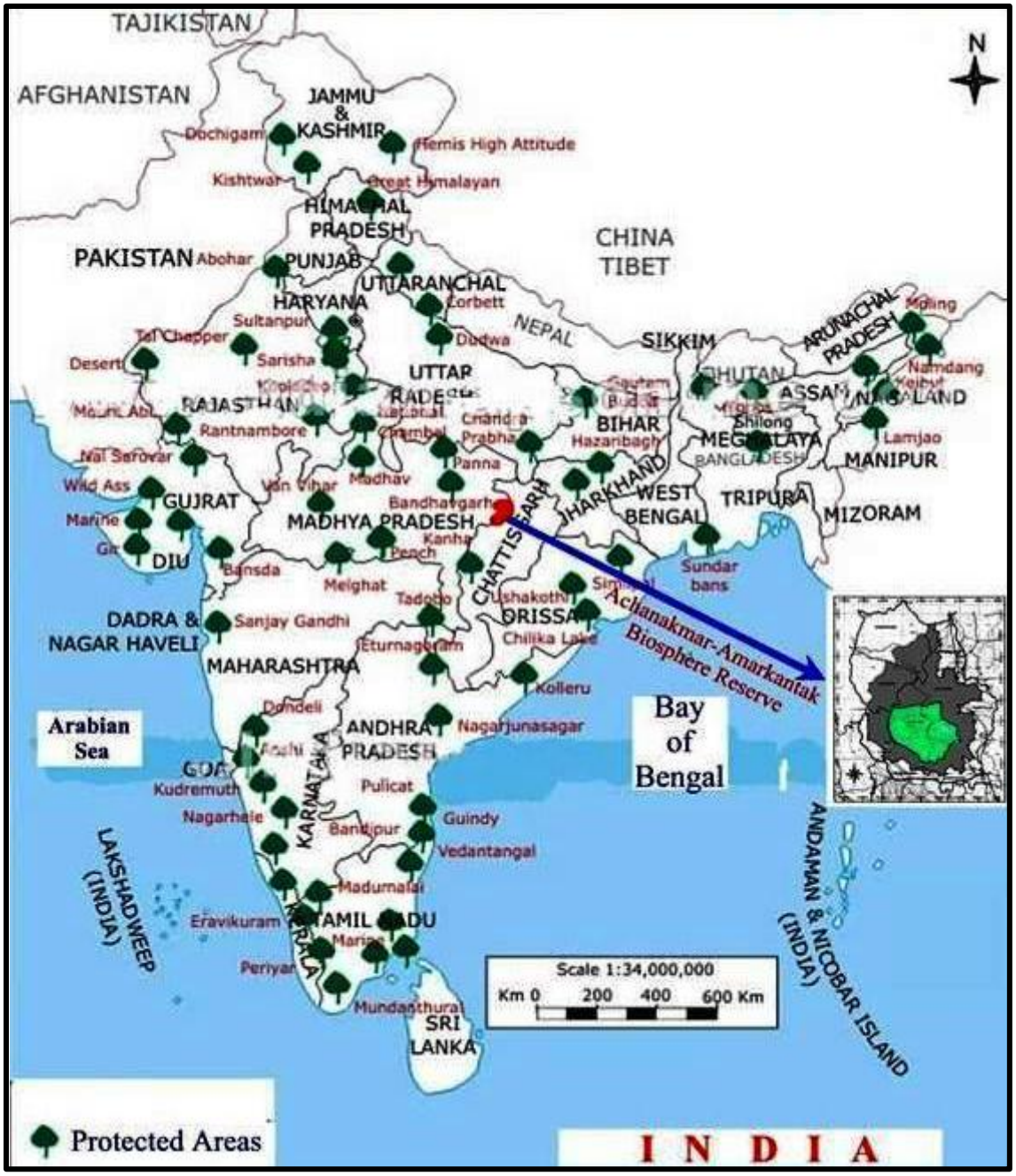
अचानकमार-अमरकंटक बायोस्फियर रिजर्व देश का चौदहवाँ बायोस्फियर रिजर्व है । यह बायोस्फियर रिजर्व मध्य भारत में स्थित है, जो कि छत्तीसगढ़ एवं मध्यप्रदेश में 3836.5 कि. मी. तक फैला हुआ है। यह मैकल पर्वत श्रेणी से लेकर विंध्य व सतपुड़ा पर्वत श्रंखलाओं के जंक्शन तक फैला है। इसका नाम यहाँ पर स्थित अचानकमार अभ्यारण के (यह जीव मंडल का कोर जोन है) तथा अमरकंटक (जो कि पवित्र नदियाँ नर्मदा, सोन तथा जोहिला का उद्गम स्थल है) के नाम पर रखा गया है । अमरकंटक, बायोस्फियर रिजर्व के बफर जोन के अंतर्गत आता है तथा यह हिन्दू, जैन व सिख समुदायों के लिए पवित्र स्थल है। यहाँ कई प्राचीन मंदिर जैसे नर्मदा मंदिर, शिव, सूर्यनारायण मंदिर, दुर्गा मंदिर, जैन मंदिर, आदि स्थित है।

अचानकमार-अमरकंटक बायोस्फियर रिजर्व में उष्णकटिबंधीय पर्णपाती वन पाये जाते हैं । शीतोष्ण मिश्रित पर्णपाती वन, उष्णकटिबंधीय शुष्क पर्णपाती वन व शुष्क मिश्रित पर्णपाती वन व इसके अन्य प्रकार पाये जाते हैं तथा इसके अलावा सदाबहार वन भी पाये जाते हैं।

जैव विविधता की दृष्टि से यह बायोस्फियर रिजर्व बहुत ही समृद्ध है । यहाँ विभिन्न प्रकार की

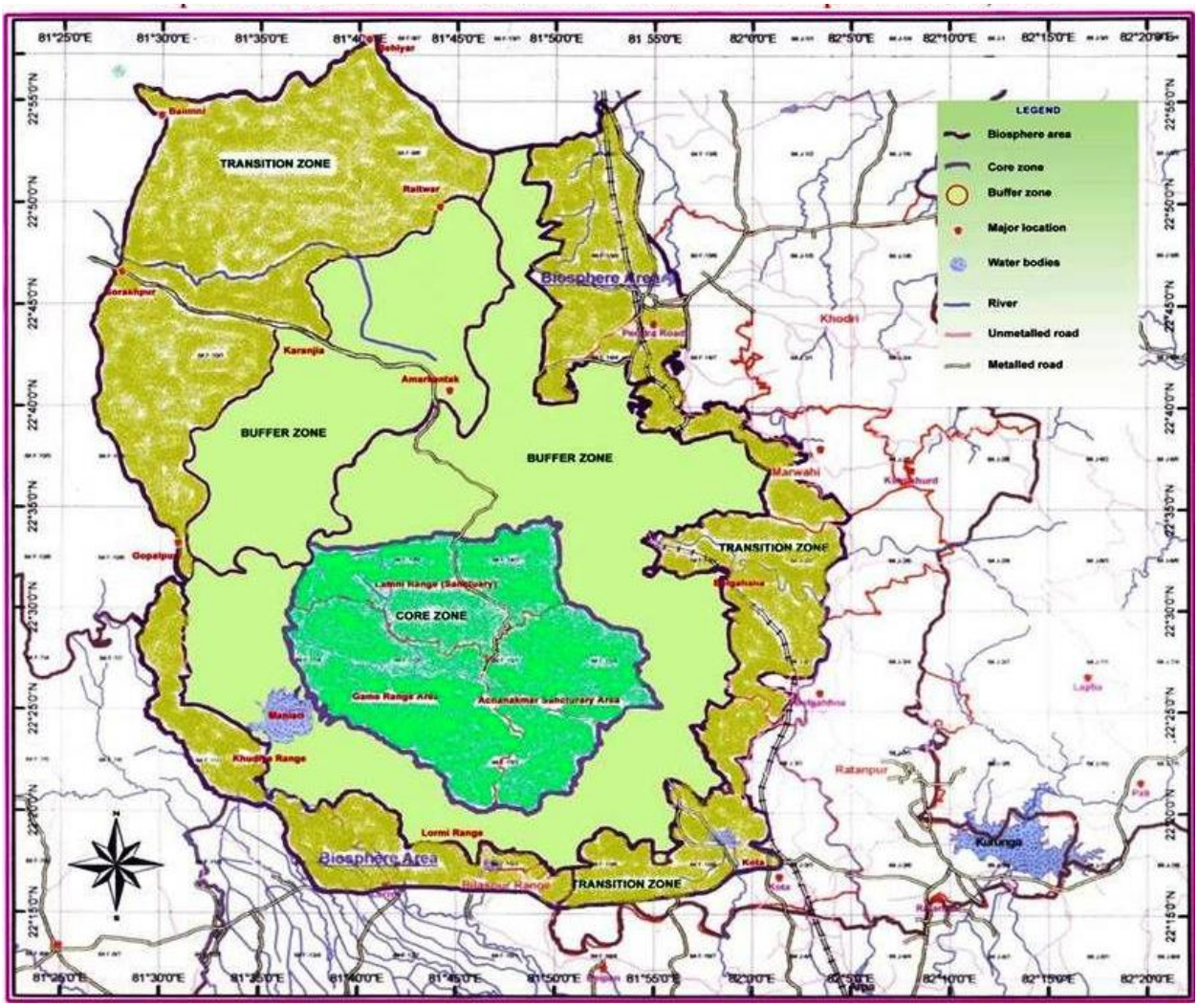
अचानकमार-अमरकंटक बायोस्फियर रिजर्व दृश्य

वनस्पतियों का आवास है जिसमें सूक्ष्म व बड़े जानवर विचरण करते हैं। अभी तक 1527 प्रजाति की वनस्पतियों की पहचान की जा चुकी है।



भारतीय मानचित्र में अचानकमार-अमरकंटक बायोस्फियर रिजर्व

जिसमें 317 थैलोफाइट, 44 ब्रायोफाईट, 40 टेरिडोफाईट, 16 अनावृतबीजी व 1111 आवृत बीजी प्रजातियाँ हैं । बायोस्फियर रिजर्व में कुल 324 प्रजातियों के वन्य जीवों की पहचान की जा चुकी है । वन्य जीवों में अन्य प्राणियों के अलावा बाघ, तेंदुआ, मोर, भालू, चीतल, घुटरी, जंगली बिल्ली, लोमड़ी, जंगली कुत्ता, नील गाय, सांभर, चौसिंघा आदि प्रमुखता से पाये जाते हैं।



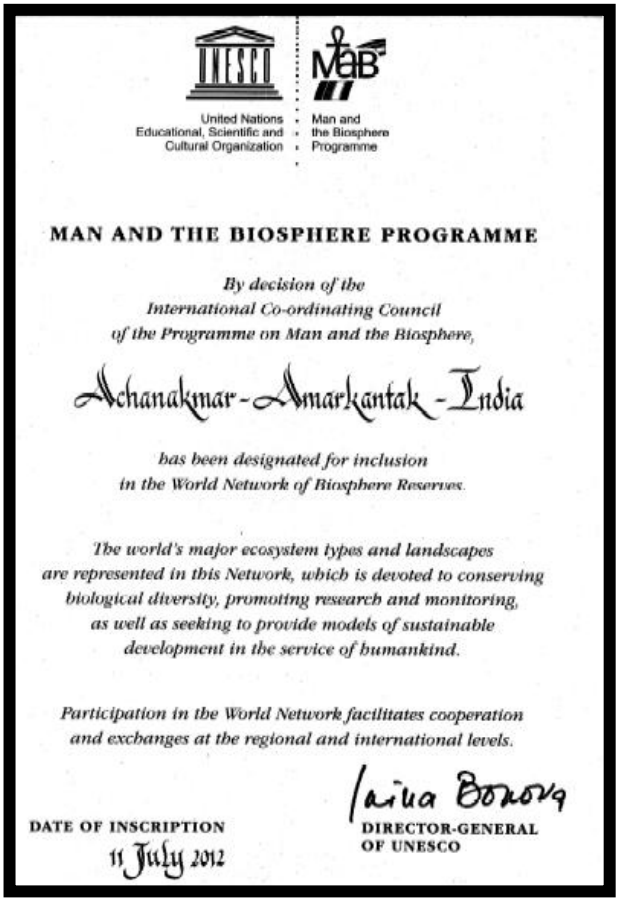
अचानकमार-अमरकंटक बायोस्फियर रिजर्व के कोर, बफ़र एवं ट्रांजिशन जोन को प्रदर्शित करता मानचि त्र

बायोस्फियर रिजर्व में मुख्य रुप से साल वृक्ष हैं, जिसमें बीच-बीच में अन्य प्रजातियाँ भी पायी जाती हैं । साल वृक्षों की अधिकता के कारण यहां आद्र तथा सघन वातावरण निर्मित रहता है, जिससे कि वर्षा भी अधिक मात्रा में होती है । यह सब मिलकर अन्य प्रजातियों के विकास में सहायक होते है । साल के साथ उगने वाली मुख्य सहायक प्रजातियाँ हैं - साजा, बीजा, धवा, कसई, लेंडिया आदि तथा कई प्रकार के झाड़ी, आरोही व छोटी शाकीय पौधे भी विकसित होते हैं । यहाँ पायी जानी वाली वनस्पतियों में 518 ऐसी प्रजातियाँ हैं, जो कि भोजन, औषधीय व अन्य उपयोग की दृष्टि से महत्वपूर्ण है । अतः बायोस्फियर रिजर्व यहाँ के निवासियों तथा पर्यटकों के प्राकृतिक, आध्यात्मिक व आर्थिक आवश्यकताओं को पूरा करता है ।

बायोस्फियर का विश्व नेटवर्क

यूनेस्को की अंर्तराष्ट्रिय समन्वयक परिषद ने संयुक्त राष्ट्र संघ मुख्यालय, पेरिस में अपने 24 वें

अधिवेशन जो कि 9-13 जुलाई 2012 के बीच आयोजित किया गया था, में अचानकमार-अमरकंटक बायोस्फियर रिजर्व को सदस्य मनोनीत किया (UNESCO-MAB, 2012, http://www.unesco.org/mab) । यह विश्व भर के देशों में


United Nations Educational, Scientific and Cultural Organization

Man and the Biosphere Programme

MAN AND THE BIOSPHERE PROGRAMME

By decision of the International Co-ordinating Council of the Programme on Man and the Biosphere,

Achanakmar - Amarkantak - India

has been designated for inclusion in the World Network of Biosphere Reserves.

The world's major ecosystem types and landscapes are represented in this Network, which is devoted to conserving biological diversity, promoting research and monitoring, as well as seeking to provide models of sustainable development in the service of humankind.

Participation in the World Network facilitates cooperation and exchanges at the regional and international levels.

DATE OF INSCRIPTION
11 July 2012

DIRECTOR-GENERAL OF UNESCO

अचानकमार-अमरकंटक बायोस्फियर रिजर्व को विश्व नेटवर्क में शामिल किये जाने हेतु यूनेस्को द्वारा प्रदत्त प्रमाण पत्र ।

स्थापित बायोस्फियर रिजर्व मे से चयनित बायोस्फियर रिजर्व का समूह है, जिनका चयन यूनेस्को की प्रक्रिया के तहत् किया जाता है । इस समय 117 देशों के 610 बायोस्फियर रिजर्व का चयन इस समूह के सदस्य के रूप में किया जा चुका हैं, इनमें 12 अंतराष्ट्रीय ट्रांसबाउंडरी (दो या अधिक देशों के बीच) बायोस्फियर रिजर्व भी शामिल हैं ।प्रकृति एवं प्राकृतिक संसाधनों के संरक्षण हेतु कार्य कर रहे अंतर्राष्ट्रीय संघ के द्वारा बायोस्फियर रिजर्व को संरक्षित क्षेत्र की पांचवीं श्रेणी में रखा गया है । इसका मुख्य उद्देश्य जैव विविधता संरक्षण, जैव विविध प्रजातियों की आनुवांशिक भिन्नता तथा प्राकृतिक अस्तित्व का बचाव एवं इनका सतत् उपयोग है । इसमें स्थानीय जनसमुदाय के आर्थिक विकास में सुधार लाने के लिए उपयुक्त तकनीक का प्रयोग एवं जनसमुदाय को शिक्षण एवं प्रशिक्षण द्वारा आर्थिक एवं सामाजिक उन्नति में सहयोग प्रदान करना भी सम्मिलित है ।

अचानकमार-अमरकंटक बायोस्फियर रिजर्व

बायोस्फियर रिजर्व का विश्व नेटवर्क, मानव और बायोस्फियर कार्यक्रम उत्तर-उत्तर एवं दक्षिण-दक्षिण समन्वय तथा अंतर्राष्ट्रीय सहयोग के लिए विलक्षण उपकरण है जिसके द्वारा ज्ञान, अनुभव, क्षमता निर्माण व उन्नत पद्धतियों का आदान-प्रदान किया जा सकता है ।

बायोस्फियर रिजर्व का विश्व नेटवर्क गतिशील व परस्पर उत्कृष्ट स्थलों का नेटवर्क हैं। यह लोकजन व प्रकृति के बीच एकीकरण, सतत् प्रबंधन व सहभागिता को बढ़ावा देता है तथा लोकजन के ज्ञान संर्वधन व कल्याण के लिए करता है। बायोस्फियर रिजर्व नेटवर्क विश्व स्तर पर संकुल सामाजिक परिस्थिकीय निकाय की क्षमता निर्माण, खास तौर पर विज्ञान-नीति, पर्यावरण शिक्षा व बहुमाध्यम संचार द्वारा जनसमुदाय तक पहुँचाने हेतु कार्य करता है।

बायोस्फियर रिजर्व का विश्व नेटवर्क में मनोनीकरण एक निश्चित प्रक्रिया के तहत किया जाता है। 1995 विश्व नेटवर्क के स्टेटयूटरी फ्रेमवर्क के अनुच्छेद 5 के अंतर्गत यह मनोनीकरण किया जाता है। विश्व नेटवर्क अपने आप में इकलौता स्थलों का अंतःशासकीय नेटवर्क है जो कि संरक्षण, सतत् विदोहन व वैज्ञानिक सहयोग जैसे उद्देश्यों के लिए कार्यरत है। बायोस्फियर रिजर्व विश्व नेटवर्क के सदस्य होना अंतर्राष्ट्रीय संरक्षण, सतत् विकास के प्रति हमारे दायित्व का प्रमाण प्रस्तुत करता है।

सन्दर्भ ग्रंथ

Anonymous (2007a). Achanakmar-Amarkantak Biosphere Reserve. Compendium. Tropical Forest Research Institute, Jabalpur, 69 pp.

Anonymous (2007b). Achanakmar-Amarkantak biosphere reserve. Biosphere Reserve Information Series (BRIS) **1**(1): 134 pp.

Anonymous (2008). Achanakmar-Amarkantak biosphere reserve. Biosphere Reserve Information Series (BRIS) **1**(2): 86 pp.

Anonymous (2010). Achanakmar-Amarkantak biosphere reserve. Biosphere Reserve Information Series (BRIS) **2**(1-2): 158 pp.

Anonymous (2012). Achanakmar-Amarkantak Biosphere Reserve. Biosphere Reserve Information Series (BRIS) **3**(1-2): 93 pp.

Joshi, K. C. (2009) Project completion report on Lead Institute Achanakmar-Amarkantak biosphere reserve. Submitted to Ministry of Environment and Forests, New Delhi, 150 pp.

Roychoudhury, N. (2013). Project completion report on Lead Institute Achanakmar-Amarkantak biosphere reserve. Submitted to Ministry of Environment and Forests, New Delhi, 91 pp.

Roychoudhury, N., Sharma, R., Yadav, D. K. and Kushwaha, D. K. (2012). Achanakmar-Amarkantak biosphere reserve: a paradise of biodiversity. Vaniki Sandesh **2** (4): 27-37.

Promotion of *Melia composita* and *Emblica officinalis* based agroforestry model for livelihood support in degraded land of Punjab and Uttarakhand

Rambir Singh, Dr. Charan Singh and Ajay Gulati
Extension Division, Forest Research Institute,
Dehradun - 248006 (U.K.)

Unfortunately the population growth is increasing at a rapid rate and there is an urgent need to accelerate agricultural growth with forestry to address issues on food security, nutrition adequacy, rural income generation, employment, environment and poverty. A major opportunity to meet the challenges exist, if only we are able to break the traditional sectoral divide between 'agriculture' and 'forestry' and recognize 'agroforestry' as farmer-led efforts to meet livelihood needs on a limited land base. Agroforestry systems have existed since the dawn of agriculture and have continued to exit in many land-use systems even in the recent past. But they have attracted greater attention in the last decade or so. This may be due in part to the frequent failure of some traditional approaches to stimulate agriculture and forestry, in part to a genuine belief that AF is a superior land use system.

In India, till very recently there was not much concern to return the disturbed land to a natural state, but in the last two decades a lot of awareness and societal priority is there towards restoration of environmental quality on an ecosystem basis. Recently, (2005) National Bureau of Soil Survey and Land Use Planning (NBSS & LUP), Nagpur of ICAR has published that 146.82 million hectare area is reported to be suffering from various kinds of land degradation. It includes water erosion 93.68 million ha., wind erosion 9.48 million ha., water logging/flooding 14.30 million ha., salinity/alkalinity 5.94 million ha., soil acidity 16.04 million ha. and complex problem 7.38 million ha. Degraded, fragmented or abandoned landscapes are the areas that require ecosystem restoration. India has vast expanse of degraded lands and nearly half of our landmass is under various types of degradation and needs ecosystem restoration interventions through different agroforestry practices.

According to WHO report, over 80% of the world population relies on traditional medicine largely plant based for their primary healthcare needs. The forest areas have been the traditional source of medicinal plants and herbs. The position cannot be sustained much further because on the one hand the areas under forests have been steadily shrinking and on the other the requirement of medicinal plants and herbs has increased steeply. This has resulted in unscientific and over exploitation of medicinal plants in the forests. About 95% of medicinal used by the industries are collected from the wild. Over 70% of the plant collections involve destructive harvesting because of the use of parts like roots, bark, wood, stem and the whole plant in case of herbs. This poses a definite threat to the genetic stocks and to the diversity of medicinal plants if biodiversity is not sustainably used. Keeping in view the cultivation of some

important medicinal plants will be enhanced the economy by developing a suitable and economically viable Agri-Silviculture-Medicinal system under traditional agroforestry practices.

This is a serious problem and it resolve through the cultivation of medicinal plants. Especially high value medicinal plants are creating new dimension in the field of agroforestry. The medicinal plant industry puts together the various facets of this multi-disciplinary industry and its global interest. The need for developing countries to acquire technologies and techniques for programmed cultivation of medicinal plants is a current issue.

About melia and aonla based agri-silvi-medicinal systems

Under the project current agroforestry practices in relation to *Melia* sp. were studied in different districts of Punjab and Uttarakhand. A survey to study the current practices on *Melia* species in different climatic zones of Punjab and Uttarakhand has been made and the districts Hoshiarpur, Roopnagar, Nawashahar and Mohali of Punjab and the districts Dehradun and Haridwar of Uttarakhand have been surveyed for this purpose. As per close observation it was found that different types of agroforestry practices like block plantations, row plantations and boundary plantation are in practice in the state. The block plantation was founded prominent in the farmers having large land holdings while boundary plantation was seen in the farmers having small land holdings. Observations on tree quality were also taken under which straightness and smoothness of bole and canopy. Farmers were also interviewed regarding collection of planting material with special reference to source of origin of the plants.

Data on growth parameter in these plantation systems were collected and analyzed. A nursery of *Melia* species was maintained in Central Nursery, FRI, Dehradun. These grown plants were utilized for planting in Punjab and Uttarakhand to make different agroforestry models. Demonstration plots of *Melia and Aonla* with medicinal plants Sarpgandha and Ashwagandha were established in farmer's field at Handsera in district Mohali of Punjab and at Naukragrant (Buggawala) in district Haridwar of Uttarakhand States. Growth data of tree species and yield of medicinal and agriculture crops were observed. Monitoring and maintenance with pruning operation is being done whenever required. Crop plants are being grown with the willing of farmers every year in Kharif and Rabi seasons under project activities.

Plots of *Melia composita* established in farmer's field in Punjab and Uttarakhand states in 2012

Place	Geometry of plantation	Spacing (m)	Planted number of plants			
			Aonla	Survival (%)	Melia	Survival (%)
Handesra, Mohali (Punjab)	Block	6 X 4	170	90	170	95
Naukragrant Haridwar (Uttarakhand)	Block	6 X 4	170	93	170	94

Casualty replacement of plants was done during 2013-14 and 2014-15 at Handesra in Mohali district and at Naukragrant (Buggawala) in Haridwar district.

Melia

Melia composita locally known as Drek in Punjab it is an example of such type of tree under modern agroforestry practices. This tree can survive and performs better under

scarcity of water. It is a fairly large, deciduous and fast growing tree and popularly grown in agroforestry in plains of North-Western states of India.

Melia composita or *M. dubia* is a large Indonesian species cultivated in Africa and Austratila where it is also known as the White Cedar or the Ceylon Mahogany. It is usually planted for ornamental purposes and fuel wood purposes. Its trade name as Burma or Ghana Neem and in India is Malabar Neem. The tree attains heights of 20 m with spreading crown and a cylindrical straight bole of about 9 m length and 1.2 to 1.5 m girth. In India it is found in Sikkim, Himalaya, North Bengal, Upper Assam, hills of Orissa, Deccan, Western ghats and in tropical forests. The fragrant greenish white flowers contribute to its ornamental value. It grows rapidly and hence is a favored species for reforestation purposes. It is observed that *Melia composita* can be grown in adverse conditions and has a wide altitudinal range of 600 to 1800 m. As earlier study it was found that in 8 years rotation the tree attains height up to 14m and 65 cm girths.

The wood of this species is useful for packing cases, cigar boxes, ceiling planks, building purposes, agricultural implements, pencils, match boxes etc. It is also suitable for musical instruments, tea boxes and ply board. *Melia composita* is usually not attacked seriously by pests and pathogens. However some defoliators cause some injury to the plants.

In the market, the wood of this species is useful for packing cases, cigar boxes, ceiling planks, building purposes, agricultural implements, pencils, match boxes etc. It is also suitable for musical instruments, tea boxes and ply board. *Melia composita* is usually not attacked seriously by pests and pathogens.

***Melia composita* with groundnut**

Aonla

Another tree species as Aonla (*Emblica officinalis*) is being a medicinal tree also used as a good fuel wood in many parts of the country. The species can be grown in dry conditions also. Aonla has a wide range of adaptability to grow in any type of soil. It is quite hardy fruit tree; it can survive at very high temperature (44^{o} C) and can tolerate hot wind and frost. Aonla is an important fruit crop of semi-arid region of India. It is grown commercially because of its high economic return, therapeutic and neutraceutical value and its suitability for marginal lands without much care (Ram Newaj *et al*., 1999).

Aonla leaves quickly decompose during monsoon season and add organic carbon in the soil and lower down soil pH, thus improve soil health. Aonla starts fruiting

after 4th to 5th year & farmers get some income from trees. After six years, Aonla may yield 60 to70 Kg fruit per tree.

It is known as the wonder tree on the basis of its medicinal value. This species is also known as Herbal Rasayan and used in many tonics for body revival. It is also a good source of Vitamin C. The Aonla is used as a major ingredient of Chyavanprash. Aonla contains considerably higher concentration of most

***Emblica officinalis* with sarpgandha and groundnut**

minerals and Amino acids than Apple. Aonla is widely used in Ayurvedic medicine including hair wash, hair oils. Besides medicine, Aonla can be preserved as Chavanprass, Murabba, Sauce, Candy, Jellies, Pickles, Tophies and Powder etc.

Most of the farmers are adopting this species on their farm lands in different geometry. Usually they grow the crops which do not give direct cash to them. So there is an urgent need of value addition like growing of medicinal plants under Melia and Aonla plantation which may be a source of direct cash for a farmer. Recently, global and domestic demands of medicinal plants have developed new vistas in the cultivation of medicinal plants. Several of these species are in great demand for domestic consumption as well as for commercial use by the herbal industry. About 95% of medicinal used by the industries are collected from the wild. This poses a definite threat to the genetic stocks and to the diversity of medicinal plants if biodiversity is not sustainably used (Upadhyaya and Sharma 2006).

The several market information on medicinal plants are available in quarterly Newsletter issue by RS&M Division, FRI, Dehradun. The prices of important medicinal plant parts are also indicated in different markets i.e. Delhi, Ramnagar, Saharanpur, Tanakpur and Haridwar along with information on export of medicinal plants. The Uttarakhand Forest Department Corporation (UAFDC) is also dealing in the value addition and marketing of the medicinal plants in the state. There are many pharmacies in India, which manufacture Ayurvedic drugs and purchasing raw materials of different medicinal plants from different small Mandi and other sources.

The promotion of agroforestry on degraded land through planting of suitable species and may be develop a sustainable medicinal based agroforestry model for utilization of these lands in Uttarakhand and Punjab to maintain soil fertility as well as economy on priority. To maintain this economy and ecology *M. composita* and *E. officinalis* may be a promising species under dry conditions in these states. Every farmer wants maximum returns from his farmland but due to excessive application

of chemical fertilizers and change in

Bee keeping under *Melia composita* plantation

climatic condition affected the production drastically. Due to these reasons land is going to be degraded day by day. In this condition some changes in land use pattern are required to fulfill the needs of farmers. The study revealed that the *M. composita* is suitable and performing better in Handesra, Mohali (Punjab) and *E. officinalis* gave better results in Naukragrant, Haridwar (Uttarakhand).

Some useful web sites for marketing of medicinal plants

- www.exoticnatural.com
- www.fao.org/docrep
- www.islamset.com/sc/plants

Buyers of medicinal plant parts

Haldwani

1. M/s Badri Prasad Jagdish Chandra, Shop 15C, Naveen Mandi, Bareilly Road, Haldwani, Nainital.
2. M/s Kanahiya Lal Hari Shanker, Kanahiya Kuteer, Kathgodam, Haldwani, Nainital.
3. M/s Sanjay Kumar Ajay Kumar, Mandi gate, Haldwani, Nainital. Ph. 05946-252086
4. M/s Deepak traders A-69, New Mandi, Haldwani, Nainital. Ph. 05946-252706
5. M/s Deen Dayal Radhey Shyam, C-11, New Galla Mandi, Haldwani, Nainital. Ph. 05946-253165

Dehradun

1. M/s T.C. Mittal, Himanchal Drugs Company, Sernimal Bazar, Dehradun-248001. Ph. 0135-2655279
2. M/s Ashok Sharma, Sharma Traders, 60, Dispensary Road, Dehradun-248001
3. M/s Pawan Kumar Mohit Kumar, 786, Amrit Kaur Road, Dehradun-248001. Ph. 0135-2659555
4. M/s Bharat Vastu Bhandar, Dhamawala, Dehradun-248001. Ph. 0135-2625146
5. M/s Swaran Singh, National Trading Company, 19/17, Babuganj, Darshani Gate, Dehradun-248001. Ph. 0135-2626339
6. M/s S.G. Balkrishna & Sons, Paltan Bazar, Dehradun-248001

References

Ram Newaj, Shukla, S.K. and Yadav, R.S. (1998-99). Varietal evaluation of aonla (Emblica officinalis) in agri-silvi-horticultural system under rainfed conditions on marginal lands. Annual Report, NRCAF, Jhansi, pp.44-46.

Upadhyaya, S. D. and Sharma, Ashutosh (2006). Utilization of wastelands by cultivating medicinal plants under agroforestry system. (Agro-techniques of medicinal & aromatic plants. Ed. Dr. V.K. Agawam and Dr. S.D. Upadhyaya) pp. 227-235.

Importance of wild plants in treating bone fractures

Dr. P. Shivakumar Singh[1] and Dr. D. S. R. Rajender Singh[2]

[1]Department of Botany, Palamuru University,
Mahabubnagr - 509001, Telangana, India.
[2]SV Government UG and PG College, Palem,
Mahabubnagr, Telangana, India.

Abstract

The present account is concentrated on the documentation and conservation of traditional wild food plants used by rural, folkloric people of southern districts of Telangana, India. A total of seven species were recorded as wild medicinal plants treating in bone fractures. Of those species, 07 species of each single family. The maximum, herbs were in the information are considered. In the present results the importance of the wild leafy vegetables plants wisdom has been observed. Except efforts are ended to educate the further generations about their importance, it may be vanished in future. This variety of information might contribute comprehensively in modern drug designing or in government policies to progress modern innovative drug design systems in rural, folkloric areas, and in the improvement of pharmaceutical and pharmcognostic formulas with reference to wild medicinal pants.

Introduction

The importance of wild medicinal plants in treating bone fractures have not been documented perfectly from rural, folkloric background from Indian society. As we know India have been considered rich in biodiversity with special reference to medicinal plants and their indigenous wisdom. Bone-fracture is defined as a complete or incomplete separation in the continuity of the bone (Piermattei *et al.*, 2006). Fracture healing is a complex physiological process that involves the coordinated participation of hematopoietic and immune cells within the bone marrow. In conjunction with vascular and skeletal cell precursors, it also includes mesenchymal stem cells (MSCs), which are recruited from the circulation and the surrounding tissues (Gullberg *et al.*, 1997, Li *et al.*, 2005). The two basic types of fracture healing are the primary or direct fracture healing and the secondary or indirect fracture healing. Primary (direct) fracture healing occurs with very minimal callus formation. It is a direct attempt of bone to re-establish its continuity and thus requires direct contact of cells in the cortex (Giannoudis *et al.*, 1997). Primary healing occurs rarely as the majority of fracture repairs undergo secondary or indirect healing (Jahagirdar and Scammell, 2009). According to the newest approximate of World Health Organization (WHO), the prime health care of 70-95% of the population in the emergent countries is based on conventional medicine while in developed countries like Germany and Canada, 80% and 70% of the population correspondingly have used harmonizing and alternative medicine at least once (Kosalge and Fursule, 2009). Medicinal products from plants or other natural sources have taken a very hefty share of the healthcare market (Chan, 2003). The reliance and consistency on the herbal drugs is escalating swiftly and is mounting popular. Only a small amount of previous

contributions (Venkataratnam and Venkataraju, 2008, Lal, 1988, Hegde, *et al.,* 2012) are available, which have attempted to study and understand medicinal plants used in treatment of bone fracture. The present work is an effort to document and analyze the traditional knowledge regarding the practice and use of plants in treatment of bone fracture. So that the present work is carried out in the southern districts of Telangana.

Methodology

An integer of countryside trips were undertaken in south districts of study area (Fig. 1). At each one time of trip, diverse folkloric and forest or rural people's information was collected in different seasons. The information was accrued after discussions with several users like village head, elder women and other local informants. Repeated interviews through questionnaires were made in diverse villages to substantiate the information. Plant specimens were collected and identified with regional floras (Gamble, 1928, Pullaiah and Chennaiah, 1997, Pullaiah and Moulali, 1997, Pullaiah, 2015).

The study area Telangana is one of the southern states of India. This region is situated in the central stretch of the eastern seaboard of the Indian Peninsula. Telangana has an area of 1, 14, 840 square kilometers (44, 300 sq m.). The area is divided into two main regions, the Eastern Ghats and the plains. Telangana lies between 15 50' – 19 55' North latitudes and 77 14' – 78 50' East longitudes. Telangana is bordered by the states of Maharashtra to the north and north-west, Karnataka to the west, Chhattisgarh to the north-east and Odisha to the east and Andhra Pradesh to the south. The state is drained by two major rivers, with about 79% of the Godavari river catchment area and about 69% of the Krishna catchment area, but most of the land is arid. It is an extensive plateau with an average elevation of about 400 m above sea level. This plateau consists mainly of the ranges of erosion surface: (i) above 600 mt, (ii) from 300 – 450 mt and (iii) from 150 – 300 mt. The State Telangana has the monsoon type of tropical climate. On the whole State enjoys warm climate. In northern Telangana tropical rainy type of climate prevails. Hot Steppe type of climate is noticed in the southern parts of the State. In Tropical Rainy type, the mean daily 0 temperature is above 20C with an annual rainfall of 150 to 200 cms, mostly in summer and South-West monsoon. In the Hot Steppe type, the mean daily temperature is 18C and less. In the state of Telangana Maximum temperature in the summer season varies between 37C and 44C and minimum temperature in the winter season ranging between 14C and 19C. The State has a wide variety of soils and they form into three broad categories - red, black and laterite. The type of forests met within Telangana, as per the classification of Champion and Seth are Tropical moist deciduous forests, Southern dry deciduous forests, Northern mixed dry deciduous forests, Dry savannah forests and Tropical dry evergreen scrub. In the Telangana there is about more than 20 tribes were recorded. Commonly they are located hilly and interior forest areas (Singh and Singh, 2016). The research report is focusing on a number of important wild medicinal plants, which need to be documented for diverse usages in future.

Results

Sums of 07 species were recorded as wild medicinal plants. Of these species, 07 species belongs to the 07 families representing single species from each of them. The maximum, herbs were in the information are considered. In the present results the importance of the wild medicinal plants wisdom has been observed. Except efforts are ended to educate the further generations about their importance, it may be vanished in future. This kind of reports could donate extensively in Government policies to progress medicinal plants knowledge conservation schemes in rural, folkloric areas, and in the improvement of ancestors wisdom protecting and its importance in innovative drugs system.

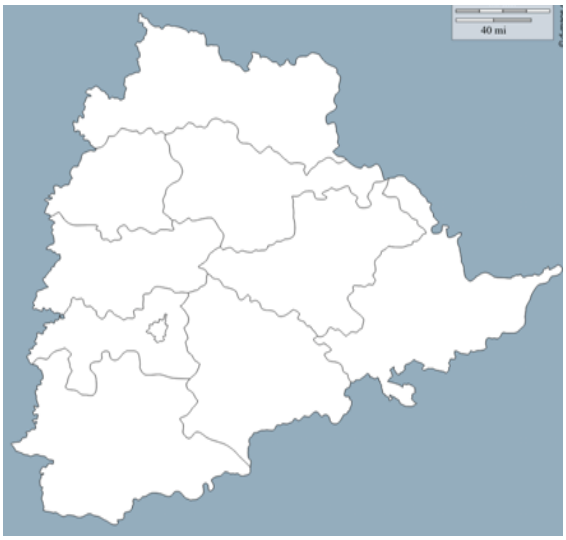


Figure 1: The study area: Telangana state.

Table 1: The important wild plants list in treating bone fractures of the study area.

Botanical name	Family	Habitat	Local name	Part Used
Acacia arabica	Mimosaceae	Tree	Thumma (Telugu), Bhabul (Hindi).	Seed powder
Caesalpinia bondu	*Caesalpiniaceae*	Shrub	Gachakaya (Telugu), Gajga (Hindi).	Seed cotyledon
Cissus quadrangularis	*Vitaceae*	Herb	Nalleru (Telugu), Veldt grape (Hindi).	Arial part
Dodonaea viscosa	*Sapindaceae*	Shrub	Pulivavili (Telugu), Sannata (Hindi).	Leaves
Gmelina arborea	Verbenaceae	Tree	Peddagudutekku (Telugu), Gamhar (Hindi).	Leaves
Peristrophe bicalyculata	Acanthaceae	Herb	Chibirachettu (Telugu), Athrilal, Kakajanga (Hindi).	Stem bark
Phyllanthus fraternus	Euphorbiaceae	Herb	Neelausiri (Telugu), Bhuinavalah (Hindi).	Un-ripened Fruit

Acacia Arabica

Caesalpinia bondu

Cissus quadrangularis

Dodonaea viscose

Gmelina arborea

Peristrophe bicalyculata

Phyllanthus fraternus

Conclusion

At this instant the population is escalating copiously, at the same time people are forgetting their fore fathers information. This will be effects on future health care. Therefore, steps are needed to undertake extensive education about their importance as a medicinally importance and as a direct and indirect source of maintenance in health care system for the poor families. A very few of the wild plants are available in the treating of bone fracture. So, efforts must be engaged to safeguard wild medicinal plants and also the rural intelligence for future health care systems.

Acknowledgement

Authors are grateful to rural, folkloric; ethnic peoples of Telangana for contribution their secret information.

References

Piermattei D. L., Flo G L and De Camp. (2006). Handbook of Small Animal Orthopedics and Fracture Repair, Saunders Elsevier, St. Louis, Mo, USA, 4th edition.

Gullberg B, Johnell O and Kanis J A. World-wide projections for hip fracture, Osteoporosis International, 7 (5): 407–413.

Li X, Quigg R J, Zhou J, Ryaby J T and Wang H. (2005). Early signals for fracture healing, Journal of Cellular Biochemistry, 95(1): 189–205.

Giannoudis P, Tzioupis C, Almalki T and Buckley R. (2007). Fracture healing in osteoporotic fractures: is it really different? A basic science perspective, Injury, 38(1): S90–S99.

Jahagirdar R. and Scammell B. E. (2009). Principles of fracture healing and disorders of bone union, Surgery, 27(2): 63–69.

Kosalge, S. B. and Fursule, R. A. (2009). Investigation of ethno medicinal claims of some plants used by tribal's of Satpuda Hills in India. Journal of Ethno pharmacology, 121: 456–461.

Chan K. (2003). Some aspects of toxic contaminants in herbal medicines. Chemosphere. 52: 1361–1371.

Venkataratnam, K. and Venkataraju, R. (2008). Traditional medicine used by the Adivasis of Eastern Ghats, Andhra Pradesh—for bone, Ethno-botanical Leaflets, 12: 19–22.

Lal, Brij. (1988). Traditional remedies for bone fracture among the tribal's of Madhya Pradesh, India. Aryavaidyan, 1: 190–195.

Hegde, G. R. *et. al*., (2012). Ethno medicinal plants used to treat bone fracture from North-Central Western Ghats of India, Journal of Ethno pharmacology, 142: 557–562.

Gamble, J. S. (1928). Flora of Presidency of Madras, Adlard and Son Ltd., London.

Pullaiah, T. and Chennaiah, E. (1997). Flora of Andhra Pradesh, Vol I, Scientific Publishers, Jodhpur.

Pullaiah, T. and Moulali, D, A. (1997). Flora of Andhra Pradesh, Vol II, Scientific Publishers, Jodhpur.

Pullaiah T. (2015). Flora of Telangana, Vol. I, II, III. Scientific Publishers, Jodhpur, P.S., and Singh. D. S. R. (2015). The forest flowers and their medicinal properties, Van Sangyan, 3 (4): 7-13.

बिजमळे व बिज संकलन

ममता मेश्राम एंव डॉ विजय इलोरकर*

वानिकी अनुसंधान एंव मानव संसाधन विकास केन्द्र, छिन्दवाडा (म.प्र.)

*कृषिवनशेती संशोधन प्रक्षेत्र, कृषि महाविद्यालय,

डॉ पंजाबराव देशमुख कृषि विद्यापीठ, नागपुर (महाराष्ट्र)

बिज संकलन

उत्तम दर्जाची रोपवने तयार करण्यासाठी चांगले गुणधर्म असणान्या झाडापासून बी गोळा करणे महत्वाचे असते. यासाठी काही वनांत बिजोत्पादनसाठी अशा निवडक झाडांना खुणा करून ती जननवृक्ष म्हणून ओळखली जातात. त्याप्रमाणे अशा निवडक जननवृक्षापासून निर्माण केलेल्या रोपटयांची मोठी रोपवने करून त्याचे बिजमळे तयार करण्याची पद्धत आहे. बिजमुळे तयार करण्यात खुब वेळ लागत असल्यामुळे तात्पुरती व्यवस्था म्हणून बिजात्पादन क्षेत्र उपलब्ध चांगल्या वृक्ष समुदायपासुन तयार करतात भारतात सागवानसारख्या मुख्य वन पिकांचे बिजोत्पादन क्षेत्र व बिजममुळे तयार करण्यात आली आहेत.

बिज प्रक्रिया

वृक्षबीज संकलनानंतर पेरणीपूर्वी बीज प्रक्रिया करणे आवश्यक असते. बियाणे जर ओले असेल तर साठवणुकापूर्वी बाळविणे आवश्यक आहे. बियाण्याच्या उगवणीस पाणी, प्राणवायू व विशिष्ट तापमानाची आवश्यकता असते.

सागाची बीजप्रक्रिया पद्धती

- मे महिन्यामध्ये सागाचे बी 24 तास पाण्यात भिजवून ठेवतात. नंतर कडक उन्हात 48 तास वाळवतात आणि हीच क्रिया सतत 3 आठवळे केली जाते.
- सागाचे बी गरम पाण्यात 48 तास ठेऊन नंतर ते उकडत्या पाण्यात टाकतात आणि पाणी थंड होईपर्यत पाण्यातच ठेवतात.या पद्धतीमुळे बियाण्यांची उगवण 24 तासांत होते.
- काही दिवस सागाचे बी पाण्यामध्ये भिजत ठेऊन पेरणीकरीता वापरतात.
- सागाचे बी एक वर्गाकरीता उधळी असलेलया वारूळात गाडून ठेवतात. त्यानंतर हे बियाणे पेरणीस योग्य होते.
- सागाचे बी शेण आणि पाण्याच मिश्रणात एक आठवडा ठेऊन नंतर पेरणीस उपयोगात आण्तात.
- सागवन फळाचे टरफल मऊ करण्यासाठी फळे आळी पाळीने पाण्यात कुजविणे व सुकविणे ही पद्धत बहुधा वापरली जाते.
- खड्डा पद्धतिमध्ये सागाचे बी आणि पालापाचोळा व शेण मातीचा आलटून पालटून एकावर एक थर देऊन खड्डा पूर्ण

भरावा,या खड्डयात रोज 21 दिवसापर्यत पाणी टाकावे. 21 दिवसानंतर खड्डयातील बियाणे काढून पालापाचोला वेगळा करून बियाणे स्वच्छ धुवुन ध्यावे, बियाणे सावलीत वाळवावे व नंतर पेरणीकरिता उपयोगात आणावे.

- सागाचे बियाणे 20 मिनिट त्रीव गंधक आम्लामध्ये बुडवून ठेवतात. पेरणीपूर्वी बियाणे पाण्याने धूवून घेतात.
- सागाचे बी साधारणप्रमाणे 15 ऑगस्टपासून तीन ते चार आठवडयापर्यंत पावसात 10 सेमीच्या थरात सिमेंट धक्क्यावर पसरून वाळवावे. लाकडाने हलकेच बडवून वरचे आवरण मोकडे करावे. त्यामुळे फळाचे कठीण कवच मऊ होण्यास मदत होते. उत्तम प्रक्रिया झाली असली की प्रत्येक फळावरील मखमली आवरण निघून जाऊन कठीण कवचावर उभ्यास रेषा दिसू लागतात. चार छिद्रे मोकळी व स्पष्ट दिसू लागतात.
- सिमेंटच्या ओटयावर किंवा चटईवर सागाच्या बियाण्याचा 10 सेमी जाडीचा थर देऊन त्यावर सारख्या प्रमाणात पाणी द्यावे. नंतर काही दिवसाने बियाण्याची उगवण प्रक्रिया सुरू होते.

साग रोपवाटिका

साग रोपवाटिका तयार करण्यापूर्वी खालील बाबींचा विचार करणे आवष्यक आहे .

- रोपवाटिका ही सागाची झाडे लावण्याच्या शेताच्या ठिकाणी जवळपास आवी.
- रोपवाटिकेवर देखरेख तसेच नर्सरीमध्ये काम करण्याकरीता मजुराची उपलब्धता असायला हवी.
- शक्यतोवर रोवाटिका ही समतल जागेवर असावयास हवी व पाण्याचा उत्तम निचरा होणारी असावी.
- नर्सरीमध्ये मुबलक पाण्याचा पुरवठा असावा.
- मोकाट जनावरपासून सुरक्षा करण्याकरीता नर्सरीला कुंपण असावे.

रोपवाटिकेकरिता जमिनीची मशागत

रोपवाटिका तयार करण्याकरीता जमीन नांगरल्यानंतर 03 मी. खोल खोदून ध्यावी. झाडाची घसकटे कचरा व इतर झाडे झुडपे खोदून जमा करून दूर फेकावे. गवत व इतर झाडाची मुळे, दगड खोदून द्यावे. तसेच माजी ढेकळ बारीक बरावे आणि नंतर जमीन एक महिण्याकरिता तशीच ठेवावी व नंतर ही माती नर्सरीच्या वॉफयामध्ये वाळू व सेंद्रिय खताचे प्रमाणबद्ध मिश्रण घेऊन टाकावे.

अशाप्रकारे तयार केलेल्या जमिनीवर 12 मीटर लांब व 1 मीटर रूंद व 0.30 मिटर उंची गादी वाफे तयार करावे. गादी वाफयावर मे महिन्याच्या शेवटी 10-15 सेमी अंतर ठेऊन 0.5 ते 1 सेमी खोल सरी करून त्यामध्ये 3 ते 4 किलो प्रक्रिया केलेले बी परोवे नंतर 20 दिवसापासून बी रूजण्यास सुरूवात होते व 1 ंिकंवा 2 अंकुर फुटून वर येतात.

गादी वाफयावर लावलेल्या रोपांची वाढचांगली व्हावी म्हणून 20:20:20 या रासायनिक खताची मात्र सुमारे) किलो प्रती वाफा या प्रमाणात द्यावी जुलै आगॅस्ट आणि सप्टेबर मध्ये प्रत्येक महिन्यात एक एक डोज दिल्यास रोपे तजेलदार व जोमदार होतात. वाफयावरील रोपांना आगॅस्ट महिन्यात हुमणी अहीचा प्रादुर्भाव मोठया प्रमाणावर जाणवू शकतो. संपूर्ण न कुज्जेले शेणखत वापरल्यामुळे शेणखत वापरल्यामुळे ही पांढरी मोठी अळी मोठया प्रमाणावर जमिनीत 15 से मी. पासून जमिनीत सागवन रोंपांच्या मुख्य मुळाला तोडते त्यामुळे पाने मलुल होऊ लागल्यावरच अळीचा प्रादुर्भाव झाला असल्याचे कळते. लिंडेन 50 टक्के प्रती वाफा 400 ग्राम प्रमाणे पाण्यात मिसळून दिल्यास अथवा फोरेट, थिमेट 10 जी. किवा इतर किटनाशकचा आवश्कतेनुसार वापर केल्यास रोपे निरोगी व दमदार होतात. गादी वाफयावर रोपे एक वर्ष पूर्ण वाढल्यावर ती पुढच्या मे महिन्याच्या शेवटी लागवडी योग्य होतात.

साग जडया किंवा स्टंप तयार करणे

गादी वाफयावरील रोपे साधारणप्रमाणे आपल्या हाताच्या अंगठया एवढया जाडीची तयार झाल्यावर बुंध्याची वेढी 15 से मी. 2 से. मी. गादी वाफयांना पाण्याने भिजवून त्यातून रोपे खोदून मुळासकट उपटून काढली जातात. रोप जमिनीलगतच्या फुगीर भागास कॉलर म्हणात. जडया तयार करतांना मुळाकडील 20 से मी भाग व खोडाचा 1 से मी भाग ठेऊन उर्वरीत भाग धारदार हत्याराने तोडतात. खोडया बाजूस सरळ छाट देतात व मुळाकडील बाजूस तिरपा छाट देतात. छाट देतांना जडीचा भाग फुटणार नाही याची काळजी घ्यावी. साग जडया तयार केल्यावर त्याची लवकरात लवकर लागवड करावी. एका वाफयातून सुमारे 400-500 चांगल्या प्रतीच्या जडया मिळू शकतात. सागाच्या निरोगी लागवड करून उत्तम रोपवने तयार करता येतात. वृक्ष लागवडीसंबधी तांत्रिक माहितीसाठी डॉ पंजाबराव देशमुख कृषि विद्यापीठ, अकोला अंतर्गत कार्यरत असलेल्या संबधित विभागाची संपर्क करावा.

Improved cultivation technique of bitter gourd (*Momordica charantia* L.)

Dr. Sunil Prajapati, Dr. P. K. Jain and Dr. Akhilesh Tiwari
Department of Horticulture, Collage of Agriculture
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh) 482004

Introduction

Bitter gourd (*Momordica charantia* L.) is one of the most popular vegetables in Southeast Asia. It is a member of the cucurbit family along with cucumber, squash, watermelon, and muskmelon. It is Native to China or India, the fast-growing vine is grown throughout Asia and is becoming popular worldwide. To depending on location, bitter gourd is also known as bitter melon, karella, or balsam pear. The immature fruits and tender vine tips are used in a variety of culinary preparations. The fruit of bitter gourd fruit is similar in nutritional value compared to other cucurbits, with the notable exceptions that it is much higher in folate and vitamin C. The vine tips are an excellent source of vitamin A. The fruit is reported to have an herbicidal effect and is laxative and easily digestible. It is considered good for curing blood diseases, rheumatism, diabetes and asthma. The cucurbitacin-bitter glucoside may help in preventing spoilage of cooked vegetable of bitter gourd. The fruits are also utilized in the preparation of pickles and stored as a dry vegetable.

Botany

Genus *Momordica*, to which bitter gourd belongs has the following four species in India.

- *M. charantia* (cultivated bitter gourd)
- *M. charantia var. muricata* (Highly bitter and small fruited wild bitter gourd)
- *M. dioica* (kakrol, spine gourd)


Bitter Gourd

- *M. cochinchinensis* (sweet gourd of Assam)
- *M. balsamina* – Immature fruits are used as vegetable or picked.
- All the species have 2n=2x=28.

M. charantia is propagated through seeds


M. dioica


M. balsamina

and is monoecious. *M. dioica* and *M. cochinchinensis* are propagated through

M. cochinchinensis

underground tubers and are dioecious in nature. Both species have small fruits covered with spines.

Season, climate and soil

Bitter gourd is a warm season crop but has a wide range of adaptability and can be grown in regions with comparatively low temperatures. At temperature between 25°-30° C, the growth is normal and yields are high. When the temperature is less than 18°C, the growth is slow leading to poor yield. When the temperature is above 36°C, there is poor production of female flowers resulting in poor yield. Short day treatment slightly reduced the production of staminate flowers and increased the number of pistillate flowers. The production of female flowers was increased by low temperature treatment (20°C) under short day.

Bitter gourd tolerates a wide range of soils but prefers a well-drained sandy loam soil that is rich in organic matter. The optimum soil pH is 6.0–6.7, but plants tolerate alkaline soils up to pH 8.0.

Varieties Selection

There are numerous bitter gourd hybrids and open-pollinated varieties are available. Hybrids usually produce higher yields, but their seeds are relatively expensive and must be purchased for every new planting. Open-pollinated varieties have the advantage that their seeds may be saved and used for future plantings. The choice of variety depends on market preference in a certain region, and is based on fruit shape and color. Generally, there are three types:(1) small, 10–20 cm long, 100–300 g, usually dark green, very bitter, (2) long, 30–60 cm long, 200– 600 g, light green in color with medium size protuberances, and only slightly bitter and (3) triangular fruit type, cone-shaped, 9–12 cm long, 300-600 g, light to dark green with prominent tubercles, moderately to strongly bitter. Select a variety that is well adapted to your growing conditions and preferred by consumers. Growers are encouraged to compare the performances of different varieties during different seasons to identify superior types.

Improved varieties

- Pusa Domousmi
- Konkan Tara
- Pusa Vishesh
- Coimbtore Long
- Coimbator Green
- Phule Green
- MDU-1
- Arka Harit
- Preethi
- Priyanka

Hybrids

- Sheena
- Maya
- Chayan
- Arjuna
- Nagesh
- Parijat
- Paras
- Trishul
- TCH-1

Seed treatment and sowing

The sowing can be done during January to March and second crop is taken in June to July. 5-6 kg of seeds is sufficient to sow 1 hectare. The spacing required for sowing depends upon season and the variety grown. A distance of 2.5-3.5 m between the rows and 90-120 cm between the hills in the rows. The seeds have to be treated with Thiram @ 2g/kg of seeds. Soaking the seeds for 6 hours will facilitate germination. The seed has a hard seed coat and germinate slowly due to slow absorption of water. The germination takes longer time at low temperatures. The seed germination is optimum at temperature between 25°-35°C and inhibited at 8°C, and above 40°C. Four seeds are sown per pit and later two-three seedlings per pit are retained.

Quality seedling production

Bitter gourd is a direct sown vegetable but polythene bag nursery is more advantageous to get early marketing and to avoid more gaps filling. Use 200 gauge poly bags of10 cm diameter x 10 cm height for sowing the seeds. Transplant about 15 day's old seedlings to the main field.

Intercultural operations and fertilizer requirements

Plough the field for 3-4 times. Apply 20-25 tones of FYM at the last ploughing. Long channels of 60 cm width are formed at a spacing of 2 m. along this channel; pits of 45 cm are dug at a spacing of 1.5 m. The recommended dose of fertilizers for bitter gourd crop is 100:50:50 NPK kg/ha for good crop growth. Being a shallow rooted vegetable, roots are mostly concentrated at top 60 cm soil layer. The crop should be irrigated immediately after planting in summer and subsequently at 2-3 days interval until flowering. Glyphosate @ 4.5 kg/ha if applied after weed emergence and before sowing, weeds can be effectively controlled.

Staking and trellising

Bitter gourd grows very fast and vines elongate rapidly within two weeks after planting. Thereafter, the plant sends out lateral stems. Staking and trellising will increase fruit yield and size, reduce fruit rot, and make spraying and harvesting easier. There are several methods of trellising bitter gourd. The bamboo poles, wood stakes, PVC pipes or other sturdy material are used to provide support and keep the fruit and foliage off the ground. The trellis is arranged either in a lean-to or tunnel structure. The trellis should be 1.8–2.0 m high, constructed from stakes 1.2–1.8 m apart, which is almost similar to the plant row spacing. For the lean-to type, the stakes are joined between two adjoining beds forming an A-shape structure. Horizontal stakes are installed at the top joining all other beds. The stakes support the climbing vines and lateral stems. Strings are used to secure adjoining stakes. Plantings are easier to manage and more productive when 2-mhigh rather than 1-m-high string trellises are used.

For the tunnel type, plants are grown inside an arch-shape structure made of either PVC or galvanized iron pipe. Plants are supported by bamboo stakes where vines freely climb and reach the top. The vines and lateral stems will then grow along the structure. Another type of trellising consists of a system of vertical

strings running between top and bottom of horizontal wires, or horizontal wires running across all directions on top.

Pruning

Bitter gourd develops many side branches that are not productive. To improve yield, remove lateral branches until the runner reaches the top of the trellis. Leave 4–6 laterals and cut the tip of the main runner to induce early cropping. Removal of lateral branches in the first 10 nodes has a positive effect on total yield. Without pruning, most of the female flowers occur between the 10th and 40th nodes, or at a height of 0.5–2.0 m.

Pollination behavior in bitter gourd

Flowers of bitter gourd are first developed at 45-55 days after sowing and vines will bloom for about six months. Flowers are cross-pollinated by insects, especially bees. Pollination can be a problem during the wet season since bees are less active during overcast conditions. Each flower opens at sunrise and remains viable for only one day. Pollen loses viability as the day advances and may be fully inviable by midday. To ensure good pollination and avoid the need for hand pollination, introduce beehives or blow pollen around with an unloaded mister. Bitter gourd is monoecious, in other words, male and female flowers are borne separately on the same plant. The male flowers normally exceed the females by about 25:1. Long days cause male flowers to bloom up to two weeks before female flowers, while short days have the opposite effect.

Spraying vines with flowering hormones after they have six to eight true leaves will increase the number of female flowers and can double the number of fruits. For example, application of growth regulators at 2-4 leaf stage plays an important role in sex expression and sex ratio. MH @ 50-150 ppm and CCC @ 50-100 ppm increase female: male ratio and at a high concentration of 200 ppm CCC, it is reduced. Ethrel @ 25 ppm increases female flowers. GA @ 60 ppm reduces the ratio of male: female flowers. High levels of endogenous GA like substances occur between 45-60 days when the ratio of male: female flowers are low.

The yield of bitter gourd can be increased by grafting with luffa (*Luffa* spp.). Luffa resists fusarium wilt and is more tolerant to flooding, which allows bitter gourd to survive in waterlogged soils.

Bitter gourd's diseases

A large number of diseases affect the bitter


Bitter gourd

gourd at different stages of growth. The major diseases of bitter gourd are as follows:

Powdery mildew (*Sphaerotheca fuliginea*)


Powdery mildew

Symptoms

White, fluffy somewhat circular patches or spots which appear on the under surface of the leaves. Severely attacked leaves become brown and defoliation may occur. Fruits of affected plants do not develop fully and remain small. The disease occurs mostly on cucumber, muskmelon, pumpkin, *etc.*

Control

Fortnight spray of Carbendazim (0.1%), Culixin (0.05%), Karathane (0.5%) and Sulfex (0.2%) have been found effective. Seed treatment and seed drenching with systemic fungicides also give protection to young seedlings.

Downy mildew (*Pseudomonas cubensis*)

Symptoms

It is a disease affecting most of the bitter gourd like cucumber, muskmelon, ridge gourd etc. It is prevalent in areas of high humidity, especially when summer rains occur regularly. The disease is characterized by formation of yellow, more or less angular spots on the upper surface of leaves. The disease spreads rapidly killing the plants quickly through rapid defoliation.

Control

Disease can be effectively controlled with sprays of Dithane M-45 (0.2%), Daconil and

Difolatan (0.2%), on spraying gives protection for nine days. Copper oxychloride spray has also given good control.

Anthracnose (*Colletotrichum* sp.)

Symptoms

The spots on the leaves first appear as small, yellowish, water soaked areas, which enlarge in size, that later coalesce and turn brown to black in color. Distinct elongated necrotic lesions having pointed ends appear on petioles and stems and they later show cracks along with partial girdling of branches. When fruit pedicels

are infected, young fruits shrived, darken and finally dry up. Lesions on fruits are circular, water soaked, sunken, dark-brown to black, and variable in size depending upon the age of the plant and weather conditions.

Control

The disease is effectively controlled by sprays of systemic fungicides, such as Benomyl, Bavistin and Thiophanate M (0.1%).

Fusarium wilt (*Fusarium oxysporum*)

Symptoms

It is a common disease affecting several crops like watermelon, muskmelon *etc.*

There are also reports that *Fusarium solani* is causing wilt in muskmelon. In young seedlings, cotyledons droop and wither. In older plants, leaves wilt suddenly and vascular bundles in the collar region become yellow or brown.

Control

The disease can be checked to some extent by drenching the soil with Captan or Hexocap or Thiride 0.2-0.3% solution. Use of disease free seed and cultivation of resistant varieties is the best way to control the disease incidence. It is brought down by seed treatment with Carbendazin or Benomyl. Hot water treatment @ 55°C for 15 minutes also helps in eliminating seed-borne infection.

Alternaria blight and fruit rot (Fungal disease)

Symptom

Leaf blight has been recorded on

muskmelon, watermelon and cucumber. Initial infection, small spots are noticed on the leaves, which rapidly increase in

number and size. After coalescing of adjoining spots and on severely affected leaves, a burning effect or blight symptom is seen; especially in watermelon, concentric rings, typical of the pathogen are invariably present.

Control

Use of disease free seeds, its pre-treatment, crop rotation and proper drainage are effective means of controlling the disease. Borax wash (2.5%) at 45°C for 30 sec. or at 40°C for 2 min before packing of the fruits prevents fruit rot. Captan, Mancozeb and Ziram are effective at low temperatures.

Rhizoctonia Root Rot (Fungal disease)

Symptom

The fungus is pathogenic to the bitter gourd, causing both pre- and post-

emergence mortality. The older plants found to be less susceptible.

Control

Good control of the disease is obtained by seed treatment with Vitavax and Brassicol. Soil application of Brassicol and rotation with non-host crops are also recommended.

Virus diseases

There are large numbers of viruses which cause much damage to bitter gourd. The leaves showing mosaic, crinkling, twisting and shortened internodes and flowering is adversely affected. Exact transmission has not been studied. There are some, which are partially seed transmitted, some are transmitted through insect vectors like aphids and some are even mechanically transmitted. Chemical control of insect vectors by spraying Malathion at 5-7 days interval may partially check the spread.

The complete control of virus disease has not been possible. One way of checking the spread is to dissuade the farmers not to collect seeds from virus infected plants, wherever the virus is transmitted through seeds. Some viruses are thermo-sensitive and get inactivated due to high temperature occurring in summer and sometimes virus affected plants do recover partially or temporarily. In the bitter gourd grown in rainy season, insect vectors like white fly spread the viruses rapidly. The only solution to control virus is the development of virus resistant cultivars. As far as possible the fields should be kept free of weeds, uncontaminated water should be used for irrigation as cucumber green mottle virus can be transmitted through water. For crops that are affected by CGMV, hygiene is important as the virus spreads easily by contact and contaminated tools. Avoidance of overlapped cropping will help to reduce the incidence of viruses transmitted by aphids or white flies. Use of mulches also reduces virus diseases incidence and helps in improving the yields. These should be tried in areas where virus disease is a problem.

Insects and pests of bitter gourd

Red pumpkin beetle

The beetles attack most of the bitter gourd at seedling stage, especially at cotyledonary leaf stage. They make holes in cotyledonary leaves. Severe damage is caused at this stage, although they attack the vines in the grown up stage also. Muskmelon, pumpkin, cucumber and watermelon are attacked mostly with the exception of bitter gourd. Effective control can be done by spraying Carbaryl (sevin) 0.1-0.2 % or Rogor 0.1%.

Aphids

These small green insects (Aphis sp.) damage the plants by sucking the leaf sap. In young stage, cotyledonary leaves crinkle and in severe cases, the plants wither. In grown up vines, the leaves turn yellow and plant loses its vigor and yield. The aphids can be easily controlled by spraying Malathion 0.1% or Metasystox 0.1-0.2% or Rogor 0.1-0.2%.

Fruit fly

This is the serious pest of bitter gourd. Maggots of the fly cause severe damage to young developing fruits. The fly attack is severe on muskmelon, bitter gourd, pointed gourd, watermelon etc. The fly attack is severe when the humidity is high. There is no direct control of maggots because they are inside the developing fruits. The adult flies can be controlled by using light-traps in the night and poison baits. Spray of Thiodan @ 6 ml per 4.5 liters of water also partially checks the fly incidence. Some newer chemicals like Methyl Eugenol are also effective. The affected fruits should be regularly pinched off and buried in a pit.

Mites

This pest is serious in muskmelon and watermelon, especially during severe summer weather. These tiny insects are seen on the undersurface of the leaves. Tiny spider-like creatures covered with fine self made webs colonize the ventral


Red pumpkin beetle

side of the leaves. Both nymphs and adults suck the sap, which results in yellowish specks on the upper surface of the leaves. The leaves gradually turns pale and then dry up. Spray of Diazinon 0.03 % or Lebaycid 0.05 % is effective.

Harvesting

The flowering starts in bitter gourd by 45-55 days and the first picking could be done in 60-70 days after planting depending upon variety, planting season, soil types, management practices etc. Immature tender fruits are harvested. The color of tender fruit is light-green or dark-green or whitish-green depending upon variety. At fully ripe stage, the color of the fruits turns to yellow or orange and for seed purpose the fruits are harvested at this stage. Regular harvesting at shorter intervals will increase the fruit number and irregular harvesting may delay the formation of successive fruit production and affect their growth and development adversely. With proper management practices in bitter gourd crop, total fruits yield of 8-14 tones/ha can be obtained from open pollinated and 20 tones/ha from hybrid varieties.

Seed production

For seed purpose, fruits are harvested when fruits turn yellow in colour. Seeds along with red placenta are rubbed against a hard surface and washed in running water and dried under shade. Seed yield: 200-250 kg/ha.

References

Narkhede, V.G., Gopal, R. and Deshmukh, S.B. (2014). Improved Cultivation of Bitter Gourd. Popular Kheti, 2 (4): 2-6.

Palada, M.C., Change, L. C. (2003). Suggested cultural practices for bitter gourd. Asian Vegetable Research and Development Center.

TNAU Agri-tech Portal-Horticulture.

शाश्वत उत्पादनासाठी – एकात्मिक कीड/रोग व्यवस्थापन

शालिनी भोवते
वानिकी अनुसंधान एवं मानव संसाधन विकास केंद्र, छिंदवाडा (म. प्र.)

भारत हा कृषिप्रधान देश असून जवळ – जवळ ७०% ग्रामीण कृषीवर अवलंबून आहेत. हरितक्रांती नंतर पिकांच्या नवनवीन जाती, आधुनिक मशागत पद्धती, पीक संरक्षणाच्या नवीन पद्धती, वाढत्या जलसिंचन पद्धती यांचा अधिक प्रमाणात प्रसार झाला. संकरीत बियाणांचा तसेच खतांचा संतुलित वापर करून उत्पादन वाढत असले तरी किडींच्या समस्यांमुळे उत्पादन वाढीवर विपरीत परिणाम होऊन पिकांचे नुकसान होते. कीड प्रादुर्भावामुळे उत्पादनात सुमारे २५ ते ३० टक्के नुकसान होते असे संशोधनाअंती सिद्ध झाले आहे. साधारणतः विसाव्या शतकाच्या सुरवातीला कीड व्यवस्थापनासाठी पारंपारिक पद्धती ज्यामध्ये सेंद्रीय खते, पिकांची फेरपालट, निरोगी जातींचा वापर, योग्य वेळी पाणी इत्यादी. पद्धतींचा वापर करीत होते. परंतु कालांतराने नविन – नविन रासायनिक कीटनाशकांचा शोध लागला आणि त्यांचा वापर वाढू लागला. त्यामुळे कीट नाशक कंपन्यांनी सेंद्रिय कीटनाशक व इतर रासायनिक कीटनाशकांच्या संशोधनास सुरवात केली. त्यानंतर अत्यंत विषारी अशा ऑरगॅनोफोसफेट व पायरेथ्राड्स कीट नाशकांचा वापर होऊ लागला. ज्याचे दुष्परिणामही अतिशय घातक दिसून आले. जसे फळे, भाजी, अन्नधान्य यासारख्या खाद्य पदार्थातून कीट नाशकांचे विषारी अंश मानवी शरीरात साचू लागले त्यामुळे मनुष्य आज अनेक असाध्य रोगांना बळी पडत आहे. तसेच प्राणी, मासे आणि अन्य जिव यांच्यावरही दुष्परिणाम होत आहे. माती प्रदुषणाने वातावरणाचा समतोल बिघडून दुय्यम किडींचा मोठया प्रमाणावर उद्रेक होऊ लागला आणि किडींच्या प्रतिकार शक्तीतही वाढ झाली. किडींच्या नियंत्रणासाठी लागणाऱ्या कीटनाशकाचा खर्च मोठया प्रमाणात वाढून पीक उत्पादन खर्चात भर पडली आणि निसर्गातील किडींचे शत्रू, परोपजीवी व परभक्षी कीटक नाहीसे होऊ लागले. या सर्व बाबी लक्षात घेता पिकांचे उत्पादन वाढवणे तसेच कीट नाशकांच्या दुष्परिणामावर मर्यादा ठेवण्याच्या दृष्टीने कीड नियंत्रणाच्या उपलब्ध पर्यायांचा सुयोग्य व संतुलित वापर करणे आवश्यक आहे. त्यासाठी एकात्मिक कीड व्यवस्थापन हा एक उत्तम पर्याय आहे,आणि आज हे व्यवस्थापन शेती, वन, फलोत्पादन तसेच सामान्य कीटक नियंत्रणासाठी वापरले जाते.

एकात्मिक कीड व्यवस्थापन म्हणजे पीक संरक्षणाच्या पद्धतींचे व सहजशक्य बाबींचे आर्थिक, सामाजिक व भोवतालच्या वातावरणाचा विचार करून निवड करणे व त्यांचा समन्वयीत वापर करून किडींची संख्या आर्थिक नुकसानीच्या पातळीखाली ठेवणे होय. यामध्ये यांत्रिक, भौतिक, जैविक, रासायनिक, अनुवंशिक इत्यादी पद्धतींचा वापर करावयाचा असतो. एकात्मिक कीट व्यवस्थापनेत नैसर्गिक कीटक यंत्रणेला प्रोत्साहन दिले जाते. तसेच कीटक, वनस्पती रोग जनक आणि तणांचा या व्यवस्थापनेत समावेश होतो.

एकात्मिक कीड व्यवस्थापनेची मुल तत्वे

- शेतीचे नियमित सर्वेक्षण करणे. कीटकांच्या प्रजनन चक्राची नोंद ठेवणे आवश्यक आहे.
- किडींच्या तीव्रतेचे अनुमान काढून होणारया नुकसानीची पातळी ठरवणे.

- किडींची संख्या व प्रादुर्भावाची तीव्रता कमी करण्यासाठी एकात्मिक कीड नियंत्रणाच्या दृष्टीने योजना तयार करणे.
- आपत्कालीन परिस्थिती निर्माण झाल्यास निसर्गाचा समतोल किमान बिघडेल असे नियंत्रणाचे उपाय योजणे.
- आवश्यकतेनुसार कीटक नाशकांचा वापर करणे.

एकात्मिक कीड व्यवस्थापनाचे फायदे

१) पर्यावरण संतुलित ठेवण्यास मदत होते.

२) अन्न पदार्थातील किटकनाशकाच्या अंशाचे प्रमाण मनुष्याला हानिकारक पातळीपेक्षा कमी

३) ठेवण्यास मदत होते.

४) वातावरण निरोगी राहण्यास मदत होते.

५) उत्पादन वाढते तसेच मालाला बाजारपेठेत चंगली किंमत मिळते.

६) किडींच्या नैसर्गिक शत्रूंचे (मित्र कीटक) संवर्धन होते.

आर्थिक नुकसानीची पातळी ठरवणे

शेतात/रोपणीत आवश्कतेनुसार कीट नाशकांचा वापर करावा. यासाठी निरनिराळ्या किडींच्या नुकसानीची पातळी माहीत असणे आवश्यक आहे. ही माहिती उपलब्ध करण्यासाठी शेतात कोणती कीड आहे, किती प्रमाणात आहे व तिचे नुकसानीचे प्रमाण किती आहे या तीन बाबींची माहिती करून घेणे आवश्यक आहे. त्यासाठी किडींचे योग्य पद्धतीने सर्वेक्षण करणे गरजेचे आहे. उदा. सोयाबिनच्या नुकत्याच तयार झालेल्या रोपटयावरील लीफ बीटलच्या आस्तित्व व प्रादुर्भावा बाबत माहिती साठी शेतात संपूर्ण क्षेत्रात किमान पाच जागा निवडाव्या. प्रत्येक नमुना जागेवर प्रत्येक ओळीत ५ ते ६ मीटर पर्यंत सोयाबिन लीफ बीटल साठी निरीक्षण करावे व एकूण बीटल मोजावे. एक मीटर ओळीत सरासरी बीटलांच्या संखेची गणना करावी.जर एक मीटर ओळीत १६ बीटल गणले जात असतील आणि रोपटे कापलेले दिसत असतील तर निश्चित समजावे कि बिटलांचा प्रादुर्भाव सुरु झाला आहे आणि त्यानुसार नियंत्रण करणे आवश्यक आहे.

एकात्मिक कीड व्यवस्थापनाच्या उपलब्ध पद्धती

यांत्रिकी कीड / रोग व्यवस्थापन

किडींच्या प्रादुर्भावापासून यांत्रिकी पद्धतीने पिकांचे रक्षण करणे. यामधे विविध उपकरणांचा उपयोग करून किडींपासून पिकांचा बचाव करणे शक्य होते. वारंवार एकाच प्रकारच्या पिकांची लागवड केल्याने उदभवणाऱ्या समस्या टाळण्यासाठी पिकात फेरबदल करणे, सापळा पिकांचा वापर करणे फायदेशीर असते. पाने खाणारी अळी,बोंड अळी,फळे पोखरणाऱ्या अळ्या इत्यादी.पतंग वर्गीय किडींचे पतंग प्रकाशाकडे आकर्षित होतात त्यामुळे प्रकाश सापळ्यांचा वापर करून अशा पतंगांचा नाश करता येतो. ज्यामुळे किडींचे पुढील प्रजनन व प्रसार रोखणे शक्य होते. कामगंध सापळ्यांचाही उपयोग करून किडींचे प्रजनन व प्रसार रोखणे शक्य होते.

सांस्कृतीक पद्धती

किडी रोगांच्या नियंत्रणाच्या दृष्टीने प्रतीकारक्षम वाणांची निवड करणे, तण तसेच झाडांचे तुटलेले भाग नष्ट करणे, बीज प्रक्रिया करणे, पिकांच्या ओळी व रोपातील अंतर राखणे, पाणी व्यवस्थापन, पीक पालट करणे या बाबी महत्वाच्या ठरतात.

जैविक पद्धती

यामधे किडींचे त्यांच्या शत्रू द्वारा नियंत्रण केले जाते. 'जीवो जीवस्य जीवनम्' या उक्ती प्रमाणे शेतातील, वनातील किडींचे नैसर्गिक शत्रू जसे परभक्षी कीटक, लेडी बर्ड बीटल, क्रीपटोलीमनस बीटल, क्रायसोपरला इत्यादी व परजीवी कीटक ट्रायकोग्रामा, अपॅनटॅलस इत्यादी द्वारे किडींचे नैसर्गिक नियंत्रण होत असते. परंतु शेतातील पिकांचे तसेच रोपणी /रोपवनातील झाडांचे

नुकसान करणाऱ्या किडींच्या नियंत्रणासाठी कीट नाशकाच्या अवाजवी वापरामुळे या नैसर्गिक शत्रूंचा नाश होतो त्यामुळे वनस्पती जन्य व निवडक कीडनाशकांचा वापर करणे फायदेशीर ठरते.ज्यामुळे मित्र किडींच्या संवर्धनास मदत होईल.

कीडींवर जीवाणू, विषाणू तसेच बुरशीजन्य सूक्ष्म जीवांचा प्रादुर्भाव होऊन त्यांचे नैसर्गिक नियंत्रण होते. अशा नैसर्गिक सूक्ष्म जीवांचा किडींच्या व्यवस्थापनासाठी वापर फायदेशीर ठरतो. सध्या व्हूटीसिलीअम, मेटॅरायझियम, बॅसिलस थुरीन्जीन्सीस, एन.पी.व्ही.इत्यादी पर्याय उपलब्ध आहेत. त्यांचा उपयोग करून जैविक कीड नियंत्रण करणे आवश्यक आहे.

रासायनिक कीड व्यवस्थापन

या मधे रसायनांचा प्रयोग कीड नियंत्रणासाठी केला जातो. किडींचा प्रादुर्भाव ओळखून योग्य कीड नाशकाची निवड करणे आवश्यक आहे . किडींच्या प्रादुर्भावाच्या प्रमाणानुसार प्रथमतः निवडक व सुरक्षित किडनाशकाचा वापर करणे क्रम प्राप्त ठरते. किडनाशकाचे उर्वरित अंश अन्न पदार्थात राहू नयेत या दृष्टीने पिकांच्या काढणीपूर्वी किडनाशके फवारणीचा प्रतीक्षा कालावधी पाळणे आवश्यक आहे.

एकात्मिक कीड व्यवस्थापनातील समाविष्ट प्रॅक्टीसेस

कीट/रोग प्रतिकारक जातींचा वापर

परभक्षी कीटक (नैसर्गिक नियंत्रण)

मशागतीचीपद्धती

निवडक व सुरक्षित कीट नाशकांचा वापर

कीडींचे सर्वेक्षण तसेच निरीक्षण

एकंदरीत एकात्मिक किड व्यवस्थापन म्हणजे वरील सर्व पध्दतींचा एकत्रित वापर करून किड नियंत्रण करणे होय. या व्यवस्थापन पध्दतीत नैसर्गिक शत्रुंची (मित्र किटक) वाढ करणे,

रासायनिक किडनाशकाचा शक्यतोवर कमीतकमी वापर व पर्यावरण प्रदूषण कमी करण्यावर भर देण्यात येतो. किड प्रादुर्भाव टाळण्यायासाठी प्रतिकारक्षम वाणांचा वापर व योग्य मशागतीच्या पध्दतींचा अवलंब करावा. शक्यतोवर प्रादुर्भावाच्या सुरवातीच्या अवस्थेत वनस्पतीजन्य व जैविक किडनाशकाचा उपयोग करावा.किड नियंत्रणासाठी पक्षी थांबे उभारणे, सापळा पीके लावणे, पीक फेरपालट करणे फायदेशीर ठरते. एकात्मिक किड व्यवस्थापन संकल्पनेत रासायनिक किडनाशकाचा वापर वर्ज्य नाही तथापि उपलब्ध पर्यायांचा सुयोग्य वापर केल्या नंतर शेवटचा पर्याय म्हणून रासायनिक किडनाशकाचा संतुलित वापर अपेक्षित आहे.

Kitul palm (*Caryota urens*): A potential agroforestry species

R. Deepak Kumar[1], S. Suresh Ramanan[1] and E. Sabari[2]
[1]College of Forestry, Kerala Agricultural University, Thrissur, Kerala – 680 656
[2]Forest College and Research Institute, Tamil Nadu Agricultural University, Mettupalayam, Tamil Nadu - 637408.

Introduction

Palms are one of most useful flowering plants to after the grass mankind from time immemorial. The palms were originated in the era upper Mesozoic of Cretaceous Period, when flowering plants were believed to be originated on the earth (Mahabale, 1982). India has 20 genera and about 96 species of palms among 24 palm species are endemics (Kulkarni and Mulani, 2004). Among Indian palms, *Caryota urens* has important role in livelihood of tribal and forest fringes communities (Renuka *et al*., 1996; Kumar *et al*., 2012). *Caryota urens* are considered to be *kalpvriskha* in baster region of Chhattisgarh (Kumar *et al*., 2012; AICRP, 2014). The term *Caryota* from the Greek word *karyotes*, meaning "nutlike." *Urens* means "burning," due to calcium oxalate in skin membrane (Everett 1995; Kumar *et al*., 2012). *Caryota urens* L. is belongs to the family Arecaceae/ Palmaceae (Renuka 1996; Loftus, 2014; AICRP, 2014). It is popularly known as Fish tail palm, Toddy palm, Jaggery palm, Indian sago palm, Kitul palm, Sulphi palm, etc., (Renuka 1996; Kumar *et al*., 2012; Loftus, 2014; AICRP, 2014). They form a vital component of forest and agricultural ecosystems, providing greater range of economic value by providing a significant source of income at local level (Dissanayake, 1977; Kulkarni and Mulani, 2004; Ranasinghe *et al*., 2012; AICRP, 2014).

Distribution and ecology

Kitul Palm is also called as Kundalpanai or Thippali or choondapana in south India. It is widely occurs across South Asia i.e., India, Sri Lanka, Malaysia and Indonesia to Philippines from upto 2,000 MSL (Ranasinghe *et al*., 2012; AICRP, 2014). It is indigenous to Indian subcontinent and also introduced in Papua New Guinea, Vietnam and Thailand. Scattered wild populations of Sulphi palm is commonly seen in under storey and open patches of evergreen, semi evergreen and moist deciduous forests. However more natural populations seen in Indian states like Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Chhattisgarh, Orissa, West Bengal, Maharashtra Bihar and Assam (Renuka 1996; AICRP, 2014). *Caryota urens* is a multipurpose palm tree which is extensively cultivated plains, agricultural and agroforestry systems like home steads (Renuka *et al*., 1996). It has long tradition with resource poor farmer due of their multiple uses. It is rated as least concern by IUCN (Loftus, 2014).

Botanical description

Sulphi Palm is a woody unbranched medium sized palm upto 20 m in height and 30-50 cm in diameter (Loftus, 2004). *Caryota urens* can be seen either solidary or clustered tree with smooth predominant leaf scar on the trunk (Sasidharan, 2006). Leaflets are bipinnate 4-6 m in length and 1-2 m width (Mahabale, 1982). 5-7 pairs of pinnae upto 1.5 m in length. Leaves are glabrous, shiny and green (Sasidharan and

Sivarajan, 1996). Cuneate fan-shaped resembles like lower fin of fish. Leaves are 12-20 cm in length and 7-10 cm in width (Renuka, 1996). Leaves are premorse at apex many ribbed. Interfoliared spadix in 40-50 cm length. Short peduncle and branched up to 4 m length pendulous. Basipetal flower in nature (Uhl, and Dransfield, 1987; Sasidharan and Sivarajan, 1996). Many unisexual flowers in triads with female flower at centre (Sasidharan, 2006). Male flower with free of petals. Many Stamens. Valvate, linear oblong and three sepals rounded imbricate. 3-celled and 3-gonous ovary; ovule 1-per locule. Reddish purple globose fruit. Endosperm ruminate (Renuka *et al.*, 1996). Berry stalked Seeds are plano-convex and subreniform. Double seeded with fruit size 5-5.5 cm length 3.8-4.0 cm breath (Mahabale, 1982).

Phenology

After completion of vegetative stage it starts flowering i.e around 10-15 years (Uhl, and Dransfield, 1987; Kulkarni and Mulani, 2004). Then producing 5-10 inflorescence and start dies. Sulphi palm starts flowering in September – October continues upto 3-4 months (Everett, 1995). Fruiting will mature in the months of April – March (Murali, 1997; Charles *et al*., 2011). Fruitswere feed by animals and dispersed (Zona and Henderson, 1989).

Fodder

Terminal bud or cabbage of Caryota urens is one of the favourite foods of elephants in Kerala (Everett, 1995; Renuka *et al* 1996) and ponies in North East India (Kulkarni and Mulani, 2004). The leaves of palms are used to as fodder for cattle which contains 2% crude protein and 9.3% crude fibre (Hedge, 1992; Wijesinghe *et al*., 2015).

Biofuels

Seeds have oil content which can be extracted by bullock ghani like techniques which can be effective utilised for biodiesel production (Karthika *et al*., 2012; Girisha *et al*., 2014).

Apiculture

Opening of the inflorescences ooze out from sweet sap which attracts the honey bee. Flowers of *Caryota urens* also offers pollen to honey bees. This will helps in honey production (Boelen, 1989; Hegde, 1992; Charles *et al*., 2011)

Medicine

Bastar beer or Fermented beverage (Toddy) is traditionally believed to be health benefits as anti-ageing, anti-hyperglycemic in nature due to antioxidant properties (Kumar *et al*., 2007; Ranasinghe *et al*., 2012; Wimalasiria *et al*., 2016). Toddy or fermented beverages is widely used in Ayurvedic and folkfore medicines in Sri Lanka and India (Manithottam and Francis, 2007; Wimalasiria *et al*., 2016). Sap is used as medicinal for stonic poison (AICRP, 2014; Charles *et al*., 2011; Kumar *et al*., 2012). Sap is also used to treat the gastric, stomach and urinary problems (AICRP, 2014). Seminal weakness and urinary disorders, the juice is applied on the forehead for hemicranias (Karthika *et al*., 2007; Charles *et al*., 2011). Sulphi sap and toddy is consumed to control the body temperature during hot summer month (AICRP, 2014). Starch or Kitul flour which is used to control diabetics in Ayurvedic medicines of Sri Lanka and India (Everett, 1995). In traditional medicine, porridge prepared from kitul flour or starch is used to cure the malaria, migraine headaches, catarrh, gastric ulcer, fatigue, snake bite poisoning, as well as rheumatic swellings (Everett, 1995; Karthika *et al*., 2007; Orwa *et al*.,

2009; Charles *et al*., 2011). Tender flowers are used as a home remedy to promote hair growth (Orwa *et al*., 2009; Charles *et al*., 2011). The root is used for tooth ailments (Orwa *et al*., 2009; Charles *et al*., 2011). The leaves are used to control insects during rainy season (AICRP, 2014).

Construction material

A very fine, soft, strong and durable fibre is obtained from the bases of the leaves is known as Kitul fibre (Hedge, 1992; Everett, 1995; Wijesinghe *et al*., 2015). Kitul fibres is widely used in making high value brushes for brushing velvets, for polishing linen and cotton yarns, for cleaning flax fibre after it is scotched. It is often being exported to England from Sri Lanka. It is also used to make a wide range of products, especially brooms, brushes, ropes, baskets and stuffing cushions etc. (Hegde, 1992; Kumar *et al*., 2012; AICRP, 2014).

The leaves of tree are used for thatching the huts of tribal and local villages (AICRP, 2014). Outer portion of the mature wood is very strong, heavy and durable. It can be used for various purposes such as planking, scaffolding, flooring, rafters, roofing, partitioning and fencing, and also for making spears. Polished stems are used as monoliths in modern houses woody stems for building materials. It is an excellent tool handles, plows, and mortars for pounding grains.

The wood is cutted in lengthways and its centre is outflanked which is used for gutters and drains, or to convey water over long distances **(**Kulkarni and Mulani, 2004; Wimalasiria *et al*., 2016). The hollow tree bole or centre outflanked is used for as pipe to irrigating field in undulating terrains (AICRP, 2014).

Food

Sweet sap is tapped from young phloem inflorescence of kitul palm (Zoysa, 1992; Everett, 1995; Renuka *et al*., 1996; Kulkarni and Mulani, 2004; Manithottam and Francis, 2007; Ranasinghe *et al*., 2012; Nath *et al*., 2015). Kitul or Sulphi palm sap is known as Salap in Odisha (Kumar *et al*., 2012). It is consumed directly as treacle or keeps for fermentation to make beverages. Fermented sap (Toddy) is called as Baster Beer in Chhattisgarh (Shukla and Viswakarma, 2011; AICRP, 2014). People of Bastar used as energetic, revitalize, soft drink before sunrise it act as medicine (Kumar *et al*., 2012; AICRP, 2014). Viscous golden syrup (treacle) with delicious flavour often served with buffalo milk curd in Sri Lanka (Dissanayake, 1977; Zoysa, 1992). Sweet sap and fermented beverages are predominant drink in all social and ritual functions such as temple festival, birthdays, marriages, and other meetings etc. by the tribal and forest fringes people (Manithottam and Francis, 2007; Kumar *et al*., 2012; Wimalasiria *et al*., 2016). Sap is boiled and make as jaggery or brown sugar (Zoysa, 1992; Kulkarni and Mulani, 2004; Manithottam and Francis, 2007; Ranasinghe *et al*., 2012; Nath *et al*., 2015). It has huge export potential in Australian and western consumer markets (AICRP, 2014). Sap contains 16% sugar an adult tree can produce 110 kg of sugar /year (Dalibard, C. 1999; Kumar *et al*., 2012). When sap is mixed with chilies and spices, it will turns into vinegar in 2-3 weeks (Everett, 1995; Manithottam and Francis, 2007; Rodrigo *et al*., 2012). If farmer has 1 to 2 Sulphi tree in their field, they could earn income an average Rs. 40, 000 to

50,000 annum in Chhattisgarh region (Kumar *et al*., 2012).

Pith of young tree contains starch. This starch is extracted destructively. Palm tree is felled and then pith is extracted by removing outer covering. The single palm yields around 100 kg -150 kg of pith (CSIR, 1992). Pith is made is known as "Kitul flour" which is boiled and produced locally esteemed porridge and sweetmeats eaten as food during festival season and also tribals of Sri Lanka and India (Dissanayake, 1977; Everett, 1995; Manithottam and Francis, 2007; Wimalasiria *et al*., 2016). Kitul flour products are stable food during the off seasons or during drought (AICRP, 2014). Tribals in Andhra Pradesh using this starch year around as the food in the form of adda, roti, and gruel etc., (Rajyalaksmi, 2004). Starch can be extracted from the kitul palms which can be effectively used in sago industry (Hegde, 1992; Rajyalaksmi, 2004; Manithottam and Francis, 2007; Wijesinghe *et al*., 2015). According to the Rajalakshmi (2004) and Wijesinghe *et. al.*, (2015) *Caryota urens* is producing best quality sago in equal to *Metroxylonsagurottb*. *Caryota* sago is successfully utilised for production of biscuits, noodles, sago pearl and desserts in Malaysia (Rajyalaksmi, 2004). Yield of sago is higher in palm than any other starch sources (Jong, 2000).

Seeds of kitul palm are used for masticatory purpose instead of betel nut (*Areca catechu*). Stem apices of Sulphi palm is chewed raw or cooked as a delicacy by the natives of Chhattisgarh (Orwa et al., 2014).

Suitability in Agroforestry system

Fibrous root of *Caryota urens* will bind the soil and thereby reduce the soil erosion (Aweto, 2013). So, it is very advantageous to plant in the bund in order to protect the bund from soil erosion. Kitul palm have deep root will pump moisture from deeper layer and maintain uniform moisture throughout root zone. So this will help the understorey crops to withstand drought during summer season. It will also observe the nutrients from deeper layer and helps in nutrient cycling. Because of fibrous root ploughing very easy. *Caryota urens* will sequester carbon. Leaving main sprout remaining leaflets can be cut (May disturb the agricultural operation) and it can used as fodder for farm animals. It also needs minimum care. It can be effectively used to train vines of pepper (Piper nigrum) and betel (*Piper betle*). It will give partial shade which is amenable for understorey shade tolerant crops such as cardamom, coffee, cloves, nutmeg, turmeric, cinnamon, and other fruit trees. *Caryota urens* have been already incorporated with coconut, betul palm, cinnamon, mango, nutmeg, citrus, bread fruit, jack fruit, rambutan, etc in agroforestry of kandy gardens of central Sri Lanka (Dissanayake, 1977; Everett, 1995). In India, kitul palm witnessed in home gardens of Kerala and Chhattisgarh (Renuka, 1996; Kumar *et al*., 2012).

References

All India Co-ordinated Research Project on Palms (AICRP) (2014). Annual Report 2013-14- All India Co-ordinated Research Project on Palms. Central Plantation Crops Research Institute, Kasargod. 136 p.

Aweto, A.O. (2013). Shifting Cultivation and Secondary Succession in the Tropics. CAB international, Wallingford, 216p.

Boelen, M. (1989). Utilization of Tropical Foods: Trees: Compendium on Technological and Nutritional Aspects of Processing and Utilization of Tropical Foods, Both Animal and Plant, for

Purposes of Training and Field Reference. Food and Agriculture Organization, Rome 52p.

Charles, A., Joseph, M. and Ramani, A.V. (2011). Quantitative estimation of primary and secondary metabolites on flowers of *Caryota urens* L. Int. J. of Appl. Biol. and Pharma. Tech., 2(3): 431-436.

Council of Scientific and Industrial Research (CSIR). (1992). Wealth of India - A dictionary of Indian raw materials and industrial product. Directorate of Publications and Information Council of Scientific and Industrial Research, New Delhi, India pp 321-324.

Dalibard, C. (1999). Overall view on the tradition of tapping palm trees and prospects for animal production. *Livest. Res. for Rural Dev.* 11 (1):1-9. Available at http://www.lrrd.org /lrrd11/1/dali111. htm assessed on 10 April 2016.

Dissanayake, B. W. (1997). Use of *Caryota urens* in Sri Lanka. In: Sarawak, T. K.(ed.) Proceedings of the First International Sago Symposium. The Equatorial Swamp as a Natural Resource Kuala Lumpur, pp. 84– 90.

Everett, Y. (1995). The kitul palm: ethno botany of *Caryota urens* L. In highland Sri Lanka. J. of Ethnobiol. 15 (2): 161-176.

Hegde, N. G. (1992). Multipurpose tree species for minor forest produce in India. In: Hegde, N.G., Daniel, J.N., (Eds). Proceedings of A National Workshop ``promotion of non-wood Forest produce through Social forestry``. BAIF Development Research Foundation. India. pp. 1-14.

Jong, S. (2000). Rainforests gifts: Sago and sago grubs. www2000szgdocent. org/ff/f-sago.htm.

Karthika, K., Jamuna, S. and Thenmozhi, K. (2013). Evaluation of phytochemicals and in vitro antioxidant activities of some selected Indian medicinal fruits from kannur city, kerala. World J. of Pharmacy and Pharma. Sci.2 (5): 4121-4138.

Kulkarni, A. R. and Mulani, R. M. (2004). Indigenous palms of India. Curr. Sci. 86 (12): 1598- 1603.

Kumar, S. J., Poya, K., Soni, V. K. and Nema, S. (2012). Caryota urens: a potential species for livelihood support of rural people in bastar region of Chhattisgarh. Life Sci. Leaflets 7: 34-40.

Loftus, C. 2014. *Caryota urens*. The IUCN Red List of Threatened Species 2014:e.T44393459A44452629. http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T44393459A44452629.en

Mahabale, T. S. (1982). Palms of India, M.A.C.S. Research Institute, Pune. 459p.

Manithottam, J.and Francis, M. S. 2007. Arengawightii Graff- a unique source of starch and beverage for muthuvan tribe of Idukki district, Kerala. Ind. J. of Tradit.Knowl. 6 (1): 195-198.

Murali, K. S. (1997). Patterns of seed size, germination and seed viability of tropical tree species in southern India. Biotropica 29 (3): 271-279.

Nath, A., Dutta, D., Kumar, P.and Singh, J. P. (2015). Review on Recent Advances in Value Addition of Jaggery based Products. J. of Food Processing Tech. 6: 440 - 446. doi: 10.4172/ 2157-7110. 1000440

Orwa, C., Mutua, A., Kindt, R., Jamnadass, R. and Anthony, S. (2009). Agroforestry Database: a tree reference and selection guide version 4.0 (http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp)

Prusti, A. B. and Behera, K. K. (2007). Ethno botanical exploration of malkangiri district of Orissa, India. Ethnobot. Leaflets 11:122-140.

Rajyalaksmi, P. (2004). Caryota palm sago a potential underutilised natural resource for modern starch industry, Nat. Prod. Radiance 3 (3): 144-150.

Ranasinghe, P., Premakumara, G. A. S., Wijayarathna, C. D.and Ratnasooriya, W. D. (2012). Antioxidant Activity of Caryota urens L. (Kithul) Sap. Trop. Agric. Res. 23(2): 117– 125.

Renuka, C. (1999). Palms of Kerala. Kerala Forest Research Institute, Peechi, Kerala, 44p.

Renuka, C. (2008). KFRI Palmetum. KFRI Research Report No: 302. Kerala Forest Research Institute. Peechi. 205p.

Renuka, C.and Sreekumar, V. B. 2012. A Field Guide to the Palms of India. Kerala Forest Research Institute, Peechi, Kerala. 256p

Rodrigo, W. D. R. J., Nilanthi, D. and Senanayake, S. G. J. N. (2012). Germination potential of toddy palm (Caryota urens), Cardamom (Elettaria cardamomum) and nutmeg (Myristica Fragrans) seeds under in vivo conditions. Trop. Agric. Res. and Ext. 15 (4): 1-6.

Sasidharan, N. (2006). Flowering plants of Kerala: A Checklist (CD) KFRI-CD-7. Peechi: Kerala Forest Research Institute.

Sasidharan, N.andSivarajan V.V. (1996). Flowering Plants of Thrissur Forest (Western Ghats, Kerala, India) Scientific Publishers, Jodhpur 579p.

Shukla, P. and Vishwakarma, P. (2011). Biochemical and microbial examination of sulphi and cheend: two alcoholic beverages from central India. J. of Nutr. and Food Sci. 1:105. doi:10.4172/2155-9600.1000105

Uhl, N. W. and Dransfield, J. (1987). Genera Palmarum – Classification of Palms Based on the Work of Harold E. Moore, Jr. Bailey Hortorum and International Palm Society, Allen Press, USA. 610p.

Wijesinghe, J. A. A. C., Wicramasinghe, I. and Saranandha, K. H. (2015). Kithul flour (*Caryota urens*) as a potential flour source for food industry. Am. J. of Food Sci. and Tech. 3(1): 10-18. doi: 10.12691/ajfst-3-1-2.

Wimalasiria, G. E. M., Ranasinghe, P., Gunaratnec, D. M. A. and Arachchi, L. P. V. (2016). Antioxidant and anti-diabetic properties of Caryota urens (Kithul) flour. Procedia Food Sci. 1 (6): 181 – 185. doi:10.1016/j.profoo.2016.02.044

Zona, S. and Henderson, A. (1989). A review of animal-mediated seed dispersal of palms. Selbyana 11: 6-21.

Zoysa, N. D. (1992). Tapping patterns of the kitul palm (Caryota urens) in the sinharaja area, Sri Lanka.*Principes* 36(l): 28-36.

Importance of motha (*Cyperus rotundus* Linn.) and its management

Vikas Kumar
Department of Silviculture and Agroforestry
College of Forestry, Kerala Agricultural University, KAU, Thrissur, Kerala-680656 (India)

Abstract
Motha (*Cyperus rotundus*) is a perennial plant and is one of the most invasive weeds known, having spread tropical, subtropical and temperate regions. Thorough screening of literature available on motha depicted the fact that it is a popular remedy among the various ethnic groups, Ayurvedic and traditional practitioners for treatment of ailments such as antibacterial, antimalarial, anti inflammatory, antidiarrhoeal, antmutagenic, antimicrobial, antioxidant, cytotoxic and various activities.

Key words: *Cyperus rotundus*, motha, management, traditional medicine.

Introduction

The biogeographic position of India is unique which makes India rich in all the three levels of biodiversitysuch as species diversity, genetic diversity and habitat diversity (Krishnaraju *et al*., 2005). A survey conducted by the All India Coordinated Research Project on Ethnobiology (AICRPE) during the last decade recorded over 8000 species of wild plants used by the tribals and other traditional communities in India for treating various health problems (Laloo *et al*., 2006). Number of herbal drugs and their compositions are recommended for combating human ailments in the ancient texts as well as in modern medicine (Katewa et al., 2004).

Cyperus rotundus Linn. (Family: Cyperaceae) is a multivalent plant widely used in traditional medicine around the world for treatment of various diseases (Singh *et al*., 2012; Kumar and Desai, 2004; Kumar, 2015). This plant is also known as purple nutsedge or nutgrass (English), Arabic: Soad, Soadekufi; Bangali: Nagarmotha; Burma: Vomonniu; Hindi: Motha; Malaya: Mushkezamin; Gujarat: Nagaramothaya; English: Nut grass; Sanskrit: Chakranksha, Charukesara; Urdu: Saad kufi (www.plantzafrica.com; Imama *et al*., 2014). The genus name *Cyperus* is derived from *Cypeiros*, which was the ancient Greek name for the genus, *rotundus* is Latin word for round and refers to the Tuber (David *et al*., 2000). The family comprises about 104 genera and more than 5000 species world-wide, although number varies greatly due to differing taxonomic concepts of individual researchers. The largest genus is *Carex* with about 2000 species world-wide, followed by *Cyperus* with about 550 species (www.plantzafrica.com). It was formally described by De Jussieu in 1789; the name is derived from the genus name *Cyperus*, originally from the Greek *kupeiros*, meaning sedge. It's indigenous to India, but now it is found in tropical, subtropical and temperate regions from Asia, South Africa, Soth America, etc. (Uddin *et al*., 2006; Kumar, 2016), causing large losses in cop yield (Holm *et al*., 1977). It has become a major weed of vegetable, row, and plantation crops and it's very difficult

to manage with either organic or conventional weed control strategies (Wang *et al*., 2008), and has been called the world's worst weed (Holm *et al*., 1977; Kadir *et al*., 2000). Motha is one of the most extensively researched non cultivated plant species on the planet, yet the complexities of its life cycle, and its multiple adaptations to environmental extremes and weed control tactics are as yet incompletely understood.

Botanical Description

C. rotundus is a grass like weed dark green glabrous culms, arising from underground tubers (Riemens *et al*., 2008). Its top growth 4-30 inches tall, an extensive underground network of basal bulbs, fibrous roots, below ground and rosettes of leaves, scapes and umbels above ground (Isman *et al*., 2014) and thin wiry rhizomes, and tubers borne in chains of 2-6 or more on rhizomes, with tubers spaced 210 inches apart. The leaves are mostly basal, dark green, 0.1 - 0.25 inches wide with a prominent midrib, and abruptly tapered at the tips. Leaves long, often overlapping stem. Flowers borne in compound umbel, spikes loosely spicate of 3‑8 spixelets (Chatterjee and Pakrashi, 2009). The purplish to red brown inflorescence is borne on a culm (stem) that is triangular in cross section and usually taller than the foliage (Bryson and DeFelice, 2009). The inflorescence itself consists of an umbel of spikes, some of which are sessile, and others are borne on stalks of unequal length. The subtending leaves like bracts are usually shorter than the longest spikes. Seeds in the form of trigonous nuts, flowers and fruits almost throughout the year, but chiefly during rainy season (Chatterjee and Pakrashi, 2009) but the bulk of the seeds will most likely be non-viable (Riemens *et al*., 2008).

Fig. 1: Invasive weeds Motha (*Cyperus rotundus* Linn.): A. Phenology; B. Flower of motha and C. Rhizome of motha

Phytochemistry

Phytochemical studies have shown that the major chemical components of motha herb are essential oils, flavonoids, terpenoids, and mono sesquiterpenes. The plant contains the following chemical constituents; cyprotene, acopaene, cyperene, aselinene, rotundene, valencene, cyperol, gurjunene, trans-calamenene, dcadinene, gcalacorene, cadalene, amuurolene, gmuurolene, cyperotundone, mustakone, isocyperol, acyperone (Meena et al., 2010). 4, 11- selinnadien-3-one and 1, 8- cineole (Visetson *et al*., 2001). The oil of *C. rotundus* was mainly composed of cyperol, α-cyperene, rotundine, α-cyperone, α-copaene, valerenal, myrtenol, β-pinene, α-pinene and α-Selinene, sesquiterpene hydrocarbons (Caryophyllene) (Bisht *et al*., 2011).

Biological Activity

C. rotundus is a traditional medicinal plant appearing among Indian, Chinese and Japanese natural drugs used against spasms, stomach and bowel disorders and menstrual irregularities (Sharif Ali *et al*., 2008). Motha with a large number of biologically active phytochemicals has diverse variety of pharmacological

properties, as described below, has been found effective in the treatment of chronic disorders (Singh *et al*., 2012). The essential oil of *C. rotundus* is reported posses antibacterial activity (Ghedira *et al*., 2008), antioxidant activity (Kilani-Jaziri *et al*., 2009), antimutagenic activity (Kilani, *et al*., 2007), antidiabetic activity (Raut and Gaikwad, 2006), antidiarrhoeal (Uddin *et al*., 2006), anti-malarial activity (Weenen *et al*., 2009), anti-inflammatory, anti-pyretic and analgesic activities (Gupta *et al*., 1971), hepatoprotective (Kumar and Mishra, 2005), protective effects against free radical-mediated protein oxidation (Bahramikia *et al*., 2009) and inhibitory effects against superoxide and nitric oxide production (Seo *et al*., 2001). However, allelopathic effects and competing for growth resources with crops in farmland are claimed as most important of disadvantages of *C. rotundus*, that causes heavy loss to crops and reduce the yield (Gilreath and Santos, 2004). The rhizome part of *C. rotundus* is one of the oldest known medicinal plants used for treatment of dysmenorrheal and menstrual irregularities (Bhattarai, 1993).

Cultural control methods

Hand-weeding

When hand-weeding, the wiry connections between tubers make them easier to remove than if the connections have been severed by soil cultivation. The tuber, or basal bulb, of an emerged shoot must be removed to control motha. Simply removing the top growth is ineffective, and an inch or so of new growth will emerge the following day. Hence, dig up and remove tubers from the soil to greatly reduce the populations of motha.

Mulching ornamental areas

Mechanical control of an invasive perennial weed infestation begins with an initial vigorous tillage to fragment the weed, followed by additional cultivations whenever fragments have regenerated new shoots with 3-4 leaves, at which time the weed's underground reserves have been drawn down to their lowest point (Mohler and DiTommaso, 2012). Motha will not be controlled with organic mulches. Sheet mulches also are ineffective against this species. Black plastic sheet mulch is not effective because the sharp, pointed shoot tip of the motha plant can easily penetrate it. Weed cloth, or woven black polypropylene weed mat, can be effective in suppressing motha when used properly. It is porous to air and water and can be an effective tool for reducing underground tubers without the use of chemicals or tedious hand-weeding.

Chemical control methods

Non-selective herbicides

One of the most effective herbicides for non-selective control of motha is glyphosate (several products with this active ingredient are commercially available). Glyphosate is translocated throughout the entire plant, allowing it to eradicate the underground tubers connected to the leaves. Application of timing play important role to control motha. To obtain maximum control, motha flowers should be present before herbicide application.

Selective herbicides

There are many selective herbicides that can be used effectively to control motha in warm-season turfgrasses. Herbicide applications are most effective when applied to motha plants having at least three to eight leaves. Suggested application rates for these herbicides are presented in Table 1.

Table 1. Herbicides for selective control of motha in warm season of turfgrass

Product	Active ingredient	Turfgrasses on which the product is safe to use	Application rate
Certainty	Sulfosulfuron	Bahiagrass	1.25 oz per acre
		Buffalograss	
		Common bermudagrass	
		Hybrid bermudagrass	
		Centipedegrass	
		Kikuyugrass	
		Seashore paspalum	
		St. Augustinegrass	
		Zoysiagrass (*Zoysia japonica*)	
Monument	Trifloxysulfuron sodium	Common bermudagrass	20 grams per hectare
		Hybrid bermudagrass	
		Zoysiagrass (*Zoysia japonica*)	
MSMA	Monosodium methyl arsenate	Common bermudagrass	2.0 lb a.i per acre
		Hybrid bermudagrass	
Sedge-Hammer	Halosulfuron	Bahiagrass	1.333 oz per acre (0.062 lb a.i. per acre)
		Buffalograss	
		Common bermudagrass	
		Hybrid bermudagrass	
		Centipedegrass	
		Kikuyugrass	
		Seashore paspalum	
		St. Augustinegrass	
		Zoysiagrass (*Zoysia japonica*)	

Caution: Read the pesticide label to ensure that the intended use is included on it, and follow all label directions. Test pesticides on a small area before making large-scale applications.

To control an existing stand of motha in an actively growing warm-season turfgrass, at least two applications of most herbicides will usually be required. Four to six weeks after making an initial herbicide application, new motha shoots will emerge. The plants arise from dormant tubers that were not connected to motha shoots when the initial herbicide application was made. This new stand of motha must be treated to prevent new tubers from repopulating the soil. If possible, wait 2-3 months between herbicide applications to allow the entire population of motha shoots to emerge before reapplication.

Positive economic impact

There are no known modern positive economic impacts of motha.

Negative economic impact

A variety of crops other than cotton have seen loss of yields ranging up to 75% in sugar cane (Skinner, 2007). Approximate quantities of fertilizer that may be mobilized and stored in motha equal 815 kilograms of ammonium sulfate, 320 kilograms of potash, and 200 kilograms of phosphate per hectare (Skinner, 2007).

Ecological impacts

Many noxious annual and perennial weeds have been regarded as species with allelopathic potential and can severely affect crop survival and productivity (Qasem, 2001). Motha contains allelopathic chemicals that inhibit the growth of surrounding vegetation, giving it a competitive edge that can crucially impact native ecosystems. The inhibitory compounds are *C. rotundus* are released through root exudation, volatilization and decaying of plant residues (Alsaadawi and Salih, 2009). The release of volatile and non-volatile compounds into the environment inhibits the growth of surrounding plant species, particularly impacting the development of seedlings. The impact of phytotoxicity resulting from the allelopathic depends on the receptor plant species (Alsaadawi and Salih, 2009). Motha compete for moisture, nutrient and sunlight resources, and can produce up to 40,000 kilograms of subterranean plant material per hectare (Skinner, 2007).

References

Alsaadawi, I. S. and Salih, N. M. H. (2009). Allelopathic potential of *Cyperus rotundus* L. II. Isolation and identification of Phytotoxins. Allelopathy journal 23(2): 85-90).

Bhattarai, N.K. (1993). Folk herbal remedies for diarrhea and dysentery in central Nepal. Fitoterapia 64: 243-250.

Bisht, A., Bisht, G.R., Singh, M., Gupta, R. and Singh, V. (2011). Chemical composition and antimicrobial activity of essential oil of tubers of *Cyperus rotundus* Linn. collected from Dehradun (Uttarakhand). Int. J. Res. Pharm. Biomed. Sci 2: 661- 665.

Bryson, C.T. and DeFelice, M. S. (2009). Weeds of the South. University of Georgia Press, Athens, GA.

Chatterjee, A. and Pakrashi, S. C. (2009). The Treatise on Indian Medicinal Plants. Vol.VI. New Delhi: National Institute of Science Communication (CSIR), p. 809-1250.

David, W. H., Vernon, V. V. and Jason, A. F. (2012). Purple nutsedge (*Cyperus rotundus* L.). Florida (U.S.A): Institute of Food and Agricultural Sciences, University of Florida, p. 02-15.

Ghedira, K., Sghaier, M.B., Kilani, S., Limem, I., Bouhlel, I., Boubaker, J., Bhouri, W., Skandrani, I., Neffatti, A., Ammar, R.B., Dijoux-Franca, M.G. and Chekir-Ghedira, L. (2008). In vitro evaluation of antibacterial, antioxidant, cytotoxic and apoptotic activities of the tubers infusion and extracts of *Cyperus rotundus*. Bioresour. Technol. 99: 9004-9008.

Gilreath, J.P. and Santos, B.M. (2004). Herbicide dose and incorporation depth in combination with 1, 3-dichloropropene plus chloropicrin for *Cyperus rotundus* control in tomato and pepper. Crop Prot. 23: 205-210.

Gupta, M.B., Palit, T.K., Singh, N. And Bhargava, K.P. (1971). Pharmacological study to isolate the active constitutents of Cyperus rotundus responsible for anti-flammatory, antipyretic and analgestic activity. Indian J Med Res 59: 76-82

Holm, L.G., Plucknett, D.L., Pancho, J.V. and Herberger, J.P. (1977). The World's Worst Weeds, In: Distribution and Biology, University Press of Hawaii, Honolulu.

Holm, L.G., Plucknett, D.L., Pancho, J.V. and Herberger, J.P. (1991). The world's worst weeds. Kriegar Publishing Company, Malabar, FL.

Imam, H., Zarnigar, Sofi, G., Aziz, S. and Lone, A. (2014). The incredible benefits of Nagarmotha (*Cyperus rotundus*).

International Journal of Nutrition, Pharmacology, Neurological Diseases. 4(1): 23-27.

Kadir, J. and R. Charudattan, R. (2000). Dactylaria higginsii, a fungal bioherbicide agent for purple nutsedge (*Cyperus rotundus)*. Biological control: theory and applications in pest management 17: 113-124.

Katewa, S. S., Choudhari, B. L. and Jain, A. (2004). Folk herbal medicines from tribal areas of Rajasthan, India. J. Ethnopharmacol 92: 41–46.

Kilani, S., Bouhlel, I., Ammar, R.B., Sghair, M.B., Skandrani, I., Boubaker, J., Mahmoud, A., Dijoux-Franca, M.G., Ghedira, K. and Chekir-Ghedira, L. (2007). Chemical investigation of different extracts and essential oil from the tubers of (Tunisian) *Cyperus rotundus*. Correlation with their antiradical and antimutagenic properties. Ann. Microbiol. 57: 657-664.

Kilani-Jaziri, S., Neffati, A., Limem, I., Boubaker, J., Skandrani, I., Sghair, M.B., Bouhlel, I., Bhouri, W., Mariotte, A.M., Ghedira, K., Dijoux Franca, M.G. and Chekir-Ghedira, L. (2009). Relationship correlation of antioxidant and antiproliferative capacity of *Cyperus rotundus* products towards K562 erythroleukemia cells. Chem.-Biolo. Interact. 181: 85-94.

Krishnaraju, A.V., Rao, T.V.N., Sundararaju, D., Vanisree, M., Tsay, H.S. and Subbaraju, G.V. (2005). Assessment of bioactivity of Indian medicinal plants using brine shrimp (*Artemia salina*) lethality assay. Int. J. App. Sci. Engg. 2: 125-134.

Kumar, S.V.S. and Mishra, H.S. (2005). Hepatoprotective activity of rhizomes of Cyperus rotundus linn. against carban tetrachloride induced hepatotoxicity. Ind J pharm. Sci. 671: 84-88.

Kumar, V. (2015). Ethno-Medicinal plants in five forest ranges in Dangs district, South Gujarat. Indian J Trop Biodiv 23(2): 148-156.

Kumar, V. (2016). Weeds in Tropics: Problems and prospects. Van Sangyan 3(2): 1-6.

Kumar, V. and Desai, B.S. (2014). Indigenous Knowledge of wild plant species of South Gujarat. In: Sanjeev Kumar, Ethnobotanical Studies in India. Deep Publication, p-303-310.

Laloo, R.C., Kharlukhi, L., Jeeva, S. and Mishra, B.P. (2006). Status of medicinal plants in the disturbed and the undisturbed sacred forests of Meghalaya, northeast India: population structure and regeneration efficacy of some important species. Curr. Sci. 90: 225-232.

Meena, A.K., Yadav, A.K., Niranjan, U.S., Singh, B., Nagariya, A.K. and Verma, M. (2010). Review on *Cyperus rotundus*- A potential herb. Int J Pharm Clin Res 2: 20-22.

Mohler, C.A. and DiTommaso, A. (2012). Unpublished. Manage weeds on your farm: A guide to ecological strategies. Department of Crop and Soil Sciences, Cornell University. Prepublication draft, version 5.1 (2008). Publication through SARE expected in 2012.

Qasem, J.R. (2001). Allelopathic potential of white top and Syrian sage on vegetable crops. Agron. J. 93(1): 64-71.

Raut, N.A. and Gaikwad, N.J. (2006). Antidiabetic activity of hydro-ethanolic extract of Cyperus rotundus in alloxan induced diabetes in rats. Fitoterapia 77: 585-588.

Riemens, M.M., van der Weide, R.Y. and Runia, W.T. (2008). Biology and Control of *Cyperus rotundus* and *Cyperus esculentus*, review of a literature survey. Plant Research International 1-18.

Sharif Ali, S., Kasoju, N., Luthra, A., Singh, A., Sharanabasava, H., Sahu A., and Bora, U. (2008). Indian medicinal herbs as sources of antioxidants. Food Res. Int. 41: 1-15.

Singh, N., Pandey, B.R., Verma, P., Bhalla, M. and Gilca, M. (2012). Pytopharmacotherapeutics of *Cyperus rotundus* Linn. (Motha): An overview. Indian Journal of Natural Products and Resources 3(4): 467-476.

Skinner, M. (2007). United States of America. Plant Guide: Purple Nutsedge. USDA.

Uddin, S.J., Mondal, K., Shilpi, J.A. and Rahnan, M.T. (2006). Antidiarrhoeal activity of *Cyperus rotundus*. Fitoterapia. 77(2): 134-138.

Wang, G., McGiffen Jr. M.E. and Ogbuchiekwe, E.J. (2008). Crop rotation effects on *Cyperus rotundus* and *C. esculentus* population dynamics in southern California vegetable production. Weed Research 48: 420-428.

Weenen, H., Nkunya, M.H.H., Bray, D.H., Mwasumbi, L.B., Kinabo, L.S., Kilimali, V.A.E.B. (1990). Antimalarial activity of Tanzanian medicinal plants. Planta Med. 56: 368-370.

Root distribution assessment methods in agroforestry

S. Suresh Ramanan[1], R. Deepak Kumar[2]
[1]Department of Silviculture and Agroforestry,
[2]Department of Forest Management and Utilization,
College of Forestry, Kerala Agricultural University

Root activity patterns of woody perennials in different ecosystems are the research gap in the field of agroforestry. Knowledge on the rooting patterns is an essential pre-requisite for determining optimum spacing between different components of the agroforestry system. So as to utilizes the available resource so as to achieve sustainability in production.

The peculiarity in studying root distribution methods is to find a suitable method such the roots that are not visible to the human eye as most of them are below the soil have to be studied. Among various criteria that are taken into consideration in methodology selection is that the method should have a minimum impact on the natural environment or without destruction of the field. Some of the classical methods that are used are

- Excavation method
- Monolith method
- Auger sampling
- Profile wall method
- Radiotracer method
- Glass wall method

Among the above said methods, radioisotope method is pretty quick and less destructive in respect to the experimental unit. The radio isotope- aided method employed can be grouped into three major groups as

- Neutron moderation
- Plant injection
- Soil injection

The latter are much direct method than the former which is indirect method of estimat ion.

Neutron moderation method

Soil moisture includes level of capillary water that is available to the plant. The roots are the major organs that are used for absorbing the available water. The main principle behind this method is that the percentage of available soil moisture is greatly influenced by the root distribution. So by estimating the soil moisture through neutron moisture probes at different depths and different lateral distances, we can calibrate a graph. This method was first formulated and successfully used by Cahoon and Stolzy (1959) in citrus orchard.

Advantages

- Less damage to the experimental unit
- Repeatability of the experiment which is most not possible in any other methods

Disadvantages

- The moisture level may be influenced by other factors like wind movement, humidity, temperature, etc.,
- Non- Uniform soil profile might may lead to variation in moisture estimation

Plant injection method

It was initially used by Racz *et. al.* (1964) and subsequently modified by Rennie and Halstead (1965). In this method the radionuclide is inserted into the plant, which translocate and distribute in the plant system and then subsequent soil

coring is done at different lateral as well as depth around the plant for determining the radioactivity. The radioactive proportion found in different sampling location indirectly indicates the root distribution levels. Tree species like Douglas fir (*Pseudotsugataxifolia*), Coconut (*Cocus-nucifera*) and Rubber (*Heveabrasiliensis).*

Advantage

Relatively simple and does not require any expensive instrument

Disadvantage

Not suitable for trees because the radioactive substance injected into the system may be negligible.

Soil injection method

This method is highly suitable for trees and short duration plants. Assessing the radioactive substance in a suitable plant part, the radioactive substance generally will be 32P at fixed soil depth- lateral distance combinations. It's assumed that the concentration of the radioactive substance in the plant par that was analyzed is directly proportional to the root activity in that respective zone.

This system is most dominating system that has been used. Some of the works that have been by Dhander and Singh (1989) in *Citrusparadise*, Purohit and Mukherjee (1974) in *Psidiumguajava*and in oil palm (Omoti, 1982).

References

Cahoon, G. A., Stolzy, L.H. (1959). Estimating root density and distribution in citrus orchards by the neutron moderation method. Proc. Am. Soc. Hortic. Sci. 74, 322–327.

Dhandar, D.G., Singh, R. (1989). Root studies in grapefruit (*Citrus paradise* Macf.) using radio tracer technique. Sci.Hortic. 40, 13–118.

Omoti, U. (1982). Studies using 32P to determine the distribution and activity patterns of the oil palm root system in Nigeria. Proceedings of the Consultants Meeting on The Use of Nuclear Techniques in Improving Fertilizer and Water Management Practice for Tree Crops. International Atomic Energy Agency, Vienna, pp. 37–60.

Purohit, A.G., Mukherjee, S.K. (1974). Characterizing root activity of guava trees by radiotracer technique. Indian J. Agric. Sci. 44, 575–581.

Racz, G. J., Rennie, D. A., Hutcheon, W.L. (1964). The 32P injection method for studying the root system of wheat. Can. J. Soil Sci. 44, 100.

Rennie, D. A., Halstead, E.H. (1965). A 32P injection method for quantitative estimation of the distribution and extent of cereal grain roots. In: Isotopes and Radiation in Soil–plant Nutrition Studies. Proceedings of the Ankara Symposium, (1965). International Atomic Energy Agency, Vienna, p. 489.

पृथ्वी दिवस की वर्तमान समय में प्रासंगिकता

(22 अप्रैल, 2016 पृथ्वी दिवस पर)

डॉ. राजेश कुमार मिश्र

संगणक एवं सूचना प्रौद्योगिकी अनुभाग

उष्णकटिबंधीय वन अनुसंधान संस्थान, जबलपुर- 482 021 (म.प्र.)

पृथ्वी बहुत व्यापक शब्द है जिसमें जल, हरियाली, वन्यप्राणी, प्रदूषण और इससे जुड़े अन्य कारक भी हैं। धरती को बचाने का आशय है इसकी रक्षा के लिए पहल करना। पृथ्वी एक बहुत व्यापक शब्द है, इसमें जल, हरियाली, वन्यप्राणी, प्रदूषण और इससे जुड़े अन्य कारक भी शामिल हैं। धरती को बचाने का आशय है इन सभी की रक्षा के लिए पहल करना। लेकिन इसके लिए किसी एक दिन को ही माध्यम बनाया जाए, क्या यह उचित है? हमें हर दिन को पृथ्वी दिवस मानकर उसके बचाव के लिए कुछ न कुछ उपाय करते रहना चाहिए। जब पूरी दुनिया 22 अप्रैल को पृथ्वी दिवस मनाती है, अमेरिका में इसे वृक्ष दिवस के रूप में मनाया जाता है। पहले पूरी दुनिया में साल में दो दिन (21 मार्च और 22 अप्रैल) पृथ्वी दिवस मनाया जाता था। लेकिन 1970 से 22 अप्रैल को मनाया जाना तय किया गया।

21 मार्च को मनाए जाने वाले 'इंटरनेशनल अर्थ डे' को संयुक्त राष्ट्र का समर्थन है, पर इसका महत्व वैज्ञानिक तथा पर्यावरणीय ज्यादा है। इसे उत्तरी गोलार्ध के वसंत तथा दक्षिणी गोलार्ध के

पतझड़ के प्रतीक स्वरूप मनाया जाता है। 22 अप्रैल को ही विश्व पृथ्वी दिवस मनाए जाने के पीछे अमेरिकी सीनेटर गेलार्ड नेल्सन रहे हैं। वे पर्यावरण को लेकर चिंतित रहते थे और लोगों में जागरूकता जगाने के लिए कोई राह बनाने के प्रयास करते रहते थे।

इस बात से इंकार नहीं किया जा सकता कि पृथ्वी दिवस को लेकर देश और दुनिया में जागरूकता का भारी अभाव है। कुछ पर्यावरण प्रेमी अपने स्तर पर कोशिश करते रहे हैं, किंतु यह किसी एक व्यक्ति, संस्था या समाज की चिंता तक सीमित विषय नहीं होना चाहिए। सभी को इसमें कुछ न कुछ आहुति देना पड़ेगी तभी बात बनेगी।

पृथ्वी के पर्यावरण को बचाने के लिए हम ज्यादा कुछ नहीं कर सकते, तो कम से कम इतना तो करें कि पॉलिथीन के उपयोग को नकारें, कागज का

इस्तेमाल कम करें और रिसाइकल प्रक्रिया को बढ़ावा दें। क्योंकि जितनी ज्यादा खराब सामग्री पुनःचक्रित (रिसाइकल) होगी, उतना ही पृथ्वी का कचरा कम होगा।

हर साल पूरे विश्व में पृथ्वी दिवस 22 अप्रैल को मनाया जाता है। पृथ्वी दिवस की स्थापना अमेरिकी सीनेटर जेराल्ड नेल्सन के द्वारा 1970 में एक पर्यावरण शिक्षा के रूप में की गयी थी। 22 अप्रैल 1970 को पृथ्वी दिवस के रूप में आधुनिक पर्यावरण आंदोलन की शुरुआत हुई। इस आंदोलन में संकल्प लिया गया कि पृथ्वी को नष्ट होने से बचाया जायेगा और कोई ऐसा काम नहीं किया जायेगा जिससे पर्यावरण को नुकसान पहुंचे। इस आंदोलन का उद्देश्य धरती को प्रदूषण मुक्त रखना है। यह अभियान साल 2000 में विश्वव्यापी हो गया क्योंकि इस समय लोग इंटरनेट के माध्यम से पृथ्वी दिवस से जुड़ गये। अमेरिका पृथ्वी दिवस को वृक्ष दिवस के रूप में मनाता है जिसका उद्देश्य धरा को हरा-भरा रखने से है। पहले पूरी दुनिया में साल में दो दिन (21 मार्च और 22 अप्रैल) को पृथ्वी दिवस मनाया जाता था। 21 मार्च को मनाए जाने वाले 'इंटरनेशनल अर्थ डे' को संयुक्त राष्ट्र का समर्थन है, पर इसका महत्व वैज्ञानिक तथा पर्यावरणीय ज्यादा है। पृथ्वी दिवस का उद्देश्य आम इंसान को यह समझाना है कि वो पॉलिथीन और कागज का इस्तेमाल ना करे, पौधे लगाये क्योंकि धरा है तो जीवन है।

विज्ञान के अब तक के सभी प्रयासों के बावजूद पृथ्वी के बाहर किसी स्थान पर जीवन होने की पुष्टि अभी तक नहीं हो पाई है। पृथ्वी पर एक कोशिकीय, बहुकोशिकीय, कवक, पादप, जन्तु आदि लाखों प्रकार के जीव पाए जाते हैं मगर वैज्ञानिक इस बात पर सहमत हैं कि इन सब का प्रथम पूर्वज एक ही था। आज भी इस प्रश्न का उत्तर जानना शेष है कि सभी जीवों का प्रथम पूर्वज पृथ्वी पर ही जन्मा था या किसी अन्य खगोलीय पिण्ड से पृथ्वी पर आया? प्रथम जीव की उत्पत्ति में ईश्वर जैसी किसी शक्ति की कोई भूमिका रही है या यह मात्र प्राकृतिक संयोग की देन है? प्रथम जीव के अजीवातजनन को समझाने वाले ओपेरिन व हाल्डेन के विचारों को भी जोरदार चुनौति दी जा रही है।

नए अनुसंधानों से प्रथम जीव की उत्पत्ति के इतिहास की खोज में एक रणनितिक बदलाव आया है। न्यूयार्क के खगोलजैविकी केन्द्र के वैज्ञानिकों ने प्राप्त प्राचीनतम खनिजों के आधार पर पृथ्वी के प्रारम्भिक वायुमण्डल का जो संघटनात्मक चित्र तैयार किया है वह प्रचलित धारणाओं से मेल नहीं खाता। अब तक यह माना जाता रहा है कि पृथ्वी के प्रारम्भिक वायुमण्डल में मिथेन, कार्बन मोनो आक्साइड, हाइड्रोजन

सल्फाइड, अमोनिया जैसी जीवन विरोधी गैसों का प्रभुत्व था । ऑक्सीजन की कमी के कारण पृथ्वी का प्रारम्भिक वायुमण्डल घोर अपचायक था । र्जिकोन्स के अध्ययन से प्राप्त जानकारी के आधार पर वैज्ञानिकों का कहना है कि पृथ्वी की उत्पत्ति के बाद मात्र 50 करोड़ वर्ष की अवधि में ही वर्तमान वायुमण्डल बन गया था । कुछ वैज्ञानिक इस सीमा तक तो आगे नहीं बढ़ते हैं मगर वे भी मानते है कि वायु मण्डल में ऑक्सीजन युक्त गैसों जैसे कार्बन डाई आक्साइड, सल्फर डाई आक्साइड, जल वाष्प आदि का प्रभुत्व अवश्य था । यदि इस बात को स्वीकार किया जाता है तो जीव की प्रथम उत्पत्ति के विषय में अब तक दिए गए सिद्वान्तों को छोड़ना होगा क्योंकि वे अपचायक वायुमण्डल को ध्यान में रख कर दिए गए है ।

पृथ्वी पर जीवन की उत्पत्ति को लेकर विभिन्न प्रकार के विचार प्रकट किए जाते रहे हैं मगर अभी किसी एक के पक्ष में आम सहमति नहीं बन पाई है । अभी तक "जितने मुँह उतनी बातें" जैसी स्थिति बनी हुई है । कुछ वैज्ञानिक जीव की उत्पत्ति को विशुद्ध प्राकृतिक संयोग मानते हैं तो ऐसे वैज्ञानिकों की भी कमी नहीं है जो जीवन की उत्पत्ति में ईश्वरीय योगदान की सम्भावना को नकारने के लिए तैयार नहीं है । अनुसंधानों का दौर अभी जारी है । बहुत सम्भव है कि जल्दी हमें किसी नए सिद्धान्त के प्रतिपादन की सूचना मिले।

इस धरती पर भांति-भांति का जीवन अपने रंग-बिरंगे रूपों में खिलखिला रहा है और मानव को सबसे बुद्धिमान जीव का खिताब हासिल है । लेकिन ज्यों-ज्यों मानव ने सभ्यता की सीढ़िया चढ़ी हैं, त्यों-त्यों उसकी आवश्यकताएं बढ़ीं हैं । अपनी आवश्यकताओं को पूरा करने की खातिर मानव ने जरूरत से ज्यादा प्राकृतिक संपदा का दोहन करके इस ग्रह के नाजुक संतुलन को ही गड़बड़ा दिया है ।

यह बात विचारणीय है कि बेलगाम दोहन के बावजूद आदमी पहले से ज्यादा सुखी नहीं हुआ है, ज्यादा दुखी हो गया है । बीसवीं सदी में जब दुनिया विकास की अंधी दौड़ लगा रही थी तब हमारा पर्यावरण किसी की चिन्ता का विषय नहीं था। सबकी निगाह अंतिम विकास पर टिकी थी । आज जब हम इक्कीसवीं सदी में जी रहे हैं मगर शुद्ध वातावरण में श्वांस नहीं ले पा रहे हैं । हमने पिछली शताब्दी में पर्यावरण की कीमत पर विकास हासिल किया है । विकास के लिए हमने अपने पर्यावरण और जैव विविधता को नजर-अंदाज किया है तो आज हमें ग्लोबल वार्मिंग जैसी वैश्विक चुनौती का भी सामना करना पड़ रहा है। ग्लोबल वार्मिंग आज पूरी दुनिया के लिए एक भयावह चुनौती बन गई है । ग्लोबल वार्मिंग एवं इससे संबंधित विभिन्न समस्याओं जैसे प्रदूषित होता पर्यावरण, जीवों व वनस्पतियों की प्रजातियों का विलुप्त होना, उपजाऊ भूमि में होती कमी, खाद्यान्न संकट, तटवर्ती क्षेत्रों का क्षरण, ऊर्जा के स्रोतों का कम होना और नयी-

नयी बीमारियों का फैलना आदि संकटों से पृथ्वी ग्रह पर विनाश के बादल मंडरा रहे हैं।

आज मानव अधिकाधिक भौतिक सुविधाएं जुटाकर आरामदायक और वैभवशाली जिन्दगी बिताने की इच्छा रखता है । और इस राह में चलते हुए विकास और प्रगति की दौड़ में हर कोई आगे निकलना चाहता है जिससे प्राकृतिक संसाधनों का अंधाधुंध दोहन करना आम बात हो गई है। आज शुद्ध जल, शुद्ध मिट्टी और शुद्ध वायु हमारे लिए अपरिचित हो गए हैं। आज विकास की राह सिर्फ इंसान के लिए राह बनाई जा रही है, इसमें प्रकृति कहीं नहीं है।

आज पृथ्वी के जीवनदायी स्वरूप को बनाए रखने की सर्वाधिक जिम्मेदारी मानव के कंधों पर ही है । ऐसे में मानव को ऐसे व्यक्ति या उसके विचारों का अनुसरण करने की आवश्यकता है, जिसनें प्रकृति को करीब से जाना-समझा हो और सदैव प्रकृति का सम्मान किया हो। दुनिया में प्रकृति के साथ कदम से कदम मिलाकर चलने वाले लोगों में कुछ भारतीय नाम जैसे महात्मा गांधी, सुंदरलाल बहुगुणा, बाबा आम्टे, का नाम भी शामिल है।

आज सभी को मानवीय मूल्यों और पर्यावरण में होते ह्रास के कारण पृथ्वी और यहां उपस्थित जीवन के खुशहाल भविष्य को लेकर चिंता होने लगी है । ऐसे समय में महात्मा गांधी के विचार हमारा विश्वास कायम रख सकते हैं। इस समय गांधीजी के "सादा जीवन उच्च विचार" वाली विचारधारा को अपनाने की आवश्यकता है । गांधीजी के विचारों का अनुकरण करने पर मानव प्रकृति के साथ प्रेममयी संबंध स्थापित करते हुए इस पृथ्वी ग्रह की सुंदरता को बरकरार रख सकता है।

पृथ्वी दिवस के अवसर पर प्रत्येक व्यक्ति को प्राकृतिक संसाधनों का किफायत से उपयोग करना सीखना होगा तभी यह धरती हमारी आवश्यकताओं को पूरा करती हुई जीवन के विविध रूपों के साथ मुस्कुराती रहेगी।

सन्दर्भ

http://hindi.oneindia.com/news/features/earth-day-2016-do-not-use-plastics-avoid-papers-22-april-378424.html

चतुर्वेदी, व्ही. पी., साइंटिफ़िक वर्ल्ड, बुधवार, जून, 25, 2014.

गुप्ता, एन. के., साइंटिफ़िक वर्ल्ड, बुधवार, अप्रैल, 22, 2015.

http://www.nayaindia.com/youth-news/

http://www.newstracklive.com/uploads/taja-khabar/news-track-special/Apr/22/big_thumb/Presentation1_553732868aa07.jpg

Know Your Biodiversity

Dr. Swaran Lata and Dr. Ranjeet Kumar
Himalayan Forest Research Institute
Shimla (Himachal Pradesh)

***Lophophorus impejanus* (Monal)**

The Himalayan Monal is large size bird commonly known as Impeyan Monal and Impeyan Pheasant. It belongs to order Galliformis and family Phasianidae. It is distributed in Afghanistan, Bhutan, Nepal, Myanmar Pakistan and Tibet. In India it is found in Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Uttarakhand and Sikkim. In Himachal Pradesh it is found in temperate oak forest, conifer forest, grasslands and alpine meadows at altitude of 2400-4500 m but mostly concentrating in narrow belt of 2700-3700 m. They show altitudinal migration and in winter it migrates up to 2000 m.

It is one of the most beautiful bird of the Western Himalaya and because of the metallic, rainbow coloured plumage and iridescent blue head crust it is given the status of state bird of Uttrakhand and Himachal Pradesh. It is also national bird of Nepal. Scientific name *'Lophophorus impejanus'* is given in the honour of Lady Mary Impey the wife of British Chief Justice Sir Elijah Impey.

In comparision to female, male is brighter in appearance. Most distinguish feature of male is its long crust which is metallic green changeable reddish copper in the back and the side of the neck. Female is dark brown and prominent white patch on the throat and strip on the tail. Beak curved and legs very strong. First year male and juvenile resembles male.

Monal exhibits a special flight during the breeding season, consisting of extended gliding with the tail fanned and the wings held well above the level of the body and with a repeated piping call that varies from fairly soft to strident. Breeding season is April-August. It lays 3-5 eggs, female incubates the eggs alone and incubation period is 27 days. It feeds on leaves, shoots, tubers, berries, moss and insects. Some other preferred food plants are *Picrorhiza kurroa, Aconitum heterophyllum, Potentilla fulgens, Hedychium spicatum, Gaultheria nummularioides and Jatamansi*.

This species has a very large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence < 20,000 km^2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). Despite the fact that the population trend appears to be decreasing, the decline is not believed to be sufficiently rapid to approach the thresholds for Vulnerable under the population trend criterion (>30%

decline over ten years or three generations).

The global population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern and given status "Least Concern" in IUCN Red List category and also listed in Appendix I of the Convention on International Trade in Endangered Species of Fauna and Flora.

Population of this species most of the range is threatened because of Hunting & poaching for their crests and meat. Beside this grazing, human encroachment and development activities in their habitat are also responsible for their decline. Similar to the other beautiful birds the Himalayan Monal is usually captured by local people for their own purpose e.g food, rituals, local ceremonies and status symbol.

Monals are vulnerable in some part of Himachal Pradesh especially Kullu valley because of hunting for its beautiful crest feathers used to decorate man's hat as a high social status symbol. Till 1982 hunting pressure was very high but after the putting ban on hunting by state government the hunting pressure is much reduced in this area. Although it is given the status of Least Concern in IUCN Red list category but general public awareness and conservation of its habitat is needed to keep the species safe in future.

Fritillaria roylei

Fritillaria roylei is a high altitude medicinal plant of the Ashtavarga group endangered and endemic to Western Himalaya. It is commonly known as Yellow Himalayan Fritillary, Kakoli. It belongs to order Liliales and family Liliaceae. *Fritillaria cirrhosa* is its synonym. It is widely spread throughout Europe, NW. Africa, Temperate Asia and Western North America. In India it is found in Himachal Pradesh, Jammu & Kashmir, Uttarakhand and Uttar Pradesh in sunny slopes of temperate and alpine regions at altitude of 3000-4200 m.

It is perennial herb about 60 cm tall. Bulbs 2-3 cm in diameter 5-7.5 cm below the ground. Leaves linear lance like, many nerved, pointed arrange oppositely or in whorls of 2-6 on the stems. Petals narrow ovate. Flowers are bell shaped, yellowish green or brownish purple borne singly on stems but sometimes in group of 2-4 pollinated by insects. Ovary is sessile. Fruit is erect, three valved capsule. Seeds are many. Flowering and fruiting period is May-September.

It contains photochemicals alkaloids, tannins and saponns e.g Verticine, Verticinone, Isoverticine, imperialine, ebeiedine, ebeienine, peiminine, sterol etc. Because of its antioxidant potential it has potential to treat many diseases and disorders. It is traditionally used as herbal remedy for lungs and heart problems in Nepal and China.

Bulbs are an important constituent of many medicines in Indian system of medicine and health tonics as a member of

Ashtaverga group. It is also used in the preparation of Ayurvedic tonic Chyawanprash. It is useful in the treatment of TB, fever, low blood pressure, cough, antipyretic, antiasthmatic, antirheumatic, febrifuge, galactogogue, ophthalmic, oxytocytic, haemostatic.

The collection of bulb for the medicinal use from the natural habitat is creating heavy pressure on its natural population and over exploitation for medicinal use has decreased the availability of *F. roylei* in natural habitats and brought this species into endangered category. Habitat degradation and other biotic interferences e.g grazing, fire, tourism activities etc are also supporting its decline.

The International Union for Conservation of Nature (IUCN) categorised the species as Critically Endangered for Uttrakhand and Endangered for Himachal Pradesh and Jammu Kashmir of Western Himalaya. Market demand of this plant is increasing day by day and its supply is decreasing continuously. Hence formulation of appropriate conservation measures and awareness campaign among the local communities is very necessary for protection of this valuable medicinal plant. Besides this development of suitable agro techniques is needed for its cultivation and to improve the livelihood of dependent families.

Reference

Birdlife International (2012). Lophophorous impejanus. IUCN Red List of Threatened Species. Version 2013.2. International Union for Conservtaion of Nature. Retrieved 26 November 2013.

Husain, M.S. and Sultana, A. (2013). Diet of Threatened Pheasant Species in Himalayas, India- A Faecal Analysis Approach. Ecologia Balkanica.5 (1).57-68.

Xiaochun, M.A., Junfeng, G.U.O and Xiaoping, Y.U. (2011). Himalayan Monal (Lophophorus impejanus): distribution, habitat and population status in Tibet, China. Chinese birds. 2 (3).157-162.

Ramesh, K., Sathyakumar, S and Rawat, G.S. (1999). Ecology and Conservation status of the Pheasants of Great Himalayan National Park, Western Himalaya. Wildlife Institute of India, Post Box # 18, Chandrabani, Dehra Dun - 248001, U.P., INDIA. FREEP-GHNP03/11.1-60.

Chauhan, R.S., Nautiyal, M.C., Jaime, A., Silva, T., Prasad, P and Purohit, H. (2011) Habitat Preference, Ecological parameters and conservation of Fritillaria roylei Hook, an Endangered medicinal herb of the Ashtaverga Group. Bioremediation, Biodiversity and Bioavailability. 5 (1):73-76.

Shah, W.A., Mir, T.A and Ahmed, A. (2014). Antiproliferative and antioxidant potential of different extracts of Fritillaria roylei. World Journal of Pharmaceutical Science. 2 (4):386-389.

Tropical Forest Research Institute

Published by:

Tropical Forest Research Institute
(Indian Council of Forestry Research & Education)
(An autonomous council under Ministry of Environmnet, Forests and Climate Change)
P.O. RFRC, Mandla Road
Jabalpur – 482021 M.P. India
Phone: 91-761-2840484
Fax: 91-761-2840484
E-mail: vansangyan_tfri@icfre.org
Visit us at: http://tfri.icfre.org or http://tfri.icfre.gov.in