

POTENTIAL AND PROSPECT OF AROMATIC AND DYE-YIELDING PLANTS FOR SUSTAINABLE LIVELIHOOD ENHANCEMENT OF TRIBAL COMMUNITIES OF ARUNACHAL PRADESH

K.S. Kanwal and P.K. Samal

GBPIHED, North East Unit, Vivek Vihar, Itanagar-791 113, Arunachal Pradesh, India

Introduction

Arunachal Pradesh, known as the land of “dawn lit mountains” is situated between latitude 26° 30' N and 29° 30' N and longitude 91° 30' E and 97° 30' E in the North-Eastern part of India. It covers a geographical area of 83,743 km² which constitutes 2.54% of the total area of the country, 15.76% of the Indian Himalayan region and 43.62% of the Himalayan Biodiversity Hot Spot (Samal *et al.*, 2013a). The state is uniquely situated in the transition zone between the Himalayan and Indo-Burmese regions, being recognized as one of the 25 mega biodiversity hotspots of the world (Myers *et al.*, 2000). It is also among the 200 globally important ecoregions (Olson & Dinerstein, 1998). The recorded forest cover of the state is 67,410 km², which constitutes 80.50% of the geographical area of the state (SFR, 2011). Forest is the most important resource in the state with the predominantly tribal populations living in close association with forests and highly dependent on numerous forest products for their livelihood. Arunachal Pradesh is recognized as cradle of all flowering plants, contains nearly 50% of the total flowering plant species (about 5000 spp. of angiosperm) in India (Chowdhery, 2008). The flora of state comprises about 29 species of Gymnosperm, 452 species of Pteridophytes, 558 species of orchid, 57 species of bamboo, 61 species of *Rhododendron*, 18 species of *Hedychium*, 16 species of *Quercus* and large number of other lower plants species (Paul *et al.*, 2005; Sinha, 2008; Chowdhery, 2008; Bhuyan *et al.*, 2010; Rao, 2010). People use numerous plants species for ethnobotanical purpose, so far more than 500 species of medicinal plants recorded from the state (Sinha, 2008). The state is the home of more than 210 species of mammals out of which as many as 37 species are categorized under schedule-I of the Indian Wildlife (protection) Act, 1972. The state has amazingly rich avifauna with over 760 bird species, 213 species of fishes 49 species of amphibians, 113 species of reptilian and innumerable species of butterflies, moths, beetles, and other insects (Sinha, 2008). Culturally, the state is also quite rich being home to 26 major and more than 110 minor tribal communities (Samal *et al.*, 2013b). The ethnic groups inhabiting different areas of the state have unique indigenous knowledge systems and have evolved methods for utilizing the vast plant resources available. However, due to change in socio-economic and cultural dynamics, population increase and expansion of developmental process, the pressure on available biological and forest resources has increased in recent past.

As per the State Forest Report (SFR) 2011, there is total decrease of 7400 ha of forests as compared to 2009, which includes 500 ha of highly dense forests and 5500 ha of moderately dense forest. Shifting cultivation (*jhum*) is being practiced by most of the tribal communities since time immemorial. At present, shortening of *jhum* cycle (fallow period) has been one of the major reasons of depletion of rich biodiversity and deforestation in the state. In the absence of any alternative livelihood, shifting cultivation continues to be the main stay of sustenance for a vast majority of the tribal communities. Therefore, to minimize the dependence of local people on *jhum* cultivation and forest resources for the conservation of biodiversity, it is important to build up the capacity of the local communities to utilize mainly non-timber forest products (NTFPs) such as aromatic and dye yielding plants, available for their sustainable livelihood enhancement and socio-economic development.

Status and Potential of Aromatic and Dye-Yielding Plants in Arunachal Pradesh

The aromatic and dye yielding plants play a vital role in our day-to-day living. The use of aromatic plants have been practiced since ancient times as is evidenced by records of Chinese, Egyptian, Mesopotamian, Greek and Roman origin. Out of the 18,000 plant species found in India, 1300 are aromatic plants, of which about 65% have popular demand. Incense sticks also known as ‘Agarbathis’ are an essential part of the traditional practice of offering prayers in temples and other places. There are about 450 aromatic and medicinal plants in the state and out of these many plants are rare and endemic to this region (Bhuyan *et al.*, 2010). *Cymbopogon flexuosus*, *Cymbopogon winterianus*, *Pelargonium graveolens*, *Pogostemon cablin*, *Homalomena aromatic*, *Vetiver zizanoides*, *Cinnamomum bejolghota*, *Cinnamomum caudatum*, *Pinus roxburghii*, *Pinus wallichiana*, *Litsea sebifera*, *Homalomena aromatica*, *Aquilaria malaccensis*, *Artemisia nilagirica*, *Artemisia annua*, *Aquilaria agallocha*, *Aerides odoratum*, *Vanda bicolor*, *Cymbidium munronianum*, *Eria fragrans*, *Vanilla planifolia* are some important aromatic

species and also used in incense industries in Arunachal Pradesh (Bhuyan *et al.*, 2010; Singh & Saha, 2013). Monpa community of Tawnag district of Arunachal has developed a traditional technique of Agarbathi production. They use the plant bark of *Cinnamomum* spp, leaf of *Aquilaria malaccensis*, bark of *Juniperus recurva* and rhizome of *Valeriana jatamansi* for Agarbathi making. These incense sticks are used in monasteries/Gompa during worship (Singh & Saha, 2013). The cultivation of aromatic plants can play a vital role in socio-economic upliftment of the community of the state as well as conservation of the plant biodiversity.

Natural dyes are also one of the most important use of the plants, as they relate with cultural practices, rituals, arts and craft, fabrics and satisfy personal embodiment. However, dye yielding plants have not received significant attention so far. In India, there are more than 450 plants that can yield dyes (Siva, 2007). Natural dyes are non problematic and eco-friendly in nature as compared to synthetic dyes (Gaur, 2008). For example, turmeric, the brightest of naturally occurring yellow dyes is a powerful antiseptic which revitalizes the skin, while indigo gives a cooling sensation. Natural dyes are commonly used in textiles, inks, cosmetics applications. Mahanta and Tiwari (2005) have recorded thirty-seven species of natural dye yielding plants species from five districts of the Arunachal Pradesh viz. Changlang, Lohit, Lower Subansiri, Tawang and West Kameng. The Apatanis, Khamptis, Tangsas, Wanchos and Monpas have been using species like *Daphne papyracea*, *Rubia cordifolia*, *Rubia sikkimensis*, *Woodfordia fruticosa*, *Juglans regia*, *Phaius tankervilleae*, *Pinus wallichiana*, *Hedychium spicatum*, *Punica granatum*, *Colquhounia coccinea*, etc. traditionally in combination with other plants for extraction and preparation of dyes utilizing indigenous processes. Various plants parts such as leaves, bark, flowers, fruits, seeds are utilized for preparation of natural dyes. In addition to natural dye preparation, dye yielding plant species are also used in other ethnobotanical purpose particularly traditional health care practices, rope-making, fish poisoning. Photographs of some aromatic and dye-yielding plants are presented in Fig. 1. Many of the aromatic and dye yielding important species are facing threat due to ecological and anthropogenic pressure viz. loss of natural habitat, habitat fragmentation and over-exploitation, etc. The government of Arunachal Pradesh has identified the NTFPs as one of the important sectors to boost the economic development of the state (Bhuyan *et al.*, 2010). A large number of aromatic and dye yielding plants are available in Arunachal Pradesh. Because of ideal agro climatic conditions coupled with diverse altitudinal zones in Arunachal Pradesh, there is a vast scope for cultivation of the aromatic and dye yielding plants for economic development of the rural people (Singh & Saha, 2013; Mahanta & Tiwari, 2005).

Opportunities and Challenges in Aromatic and Natural Dye-yielding Plants

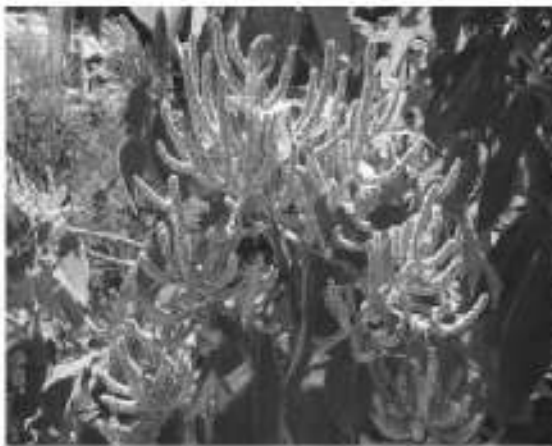
From the foregoing discussion it is emerged that Arunachal Pradesh is an abode for a wide array of aromatic and dye yielding plants. The cultivation and sustainable use of aromatic and dye yielding plants can play a vital role in socio-economic upliftment of the community and conservation of biodiversity as well. It would minimize the pressure on forests there by conserving the native biodiversity and also reducing the impact resulted by climate change. In Arunachal Pradesh where practice of shifting cultivation (*Jhum kheti*) continues to be practiced, there is scope to get more land for plantation of aromatic and dye yielding in the *Jhum* fallow land. They can be grown as cash crop in various agro-forestry-horticulture models such as the agri-silvicultural system, agri-horti-silvicultural system and silvi-pastoral system within the state. At present, these valuable and aromatic and dye yielding plant species are facing threat in their natural habitat due to deforestation, shifting cultivation, over-exploitation, over-grazing, habitat fragmentation, development projects, biotic interferences and unscientific utilization. However, detail scientific information on status of aromatic and dye yielding plants has not been documented in the state so far. Therefore, there is urgent need to study and assess the status of aromatic and dye yielding plants, utilization pattern, commercial potential and conservation status for sustainable livelihood enhancement of tribal community of Arunachal Pradesh. In addition to this, the traditional indigenous techniques for preparation of dye and aroma may also be documented for strengthening/validating the indigenous knowledge system of tribal communities of the state. Attempts can also be made to formulate strategies for the conservation and protection of rare, endangered and threatened (RET) aromatic and dye yielding plants of the state. Capacity building and knowledge enhancement of tribal communities through educational, awareness and training program can help to sensitize the cultivation of aromatic and dye yielding plant species. These programs can be undertaken with the help of different govt. departments such as horticulture, agriculture, medicinal plants board, environment and forest and national and state research institutions, universities etc.



Phaius tankervilleae



Hedychium spicatum



Woodfordia fruticosa



Pinus roxburghii

Fig. 1: Some valuable aromatic and dye yielding plants of Arunachal Pradesh

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References

- Bhuyan LR, Rao AN & Chaudhry P. 2010. Non timber forest products of Arunachal Pradesh-scope, prospects and problems. *Bulletin of Arunachal Forest Research* 27: 47-53.
- Chowdhery HJ. 2008. Arunachal Pradesh-The cradle of flowering plants. In: GS Rawat(Ed.), 2008. Special habitats and threatened plants of India. *ENVIS Bulletin: Wildlife and Protected Areas*, 11(1). Wildlife Institute of India, Dehradun, India.
- Gaur RD. 2008. Traditional dye yielding plants of Uttarakhand, India. *Natural product Radianc* 7(2):154-165.
- Mahanta D & Tiwari SC. 2005. Natural dye-yielding plants and indigenous knowledge on dye preparation in Arunachal Pradesh, Northeast India. *Current Science* 88:1474-1480.
- Myers N, Mittermeier RA, Mittermeier, CG, da Fonseca GAB & Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858.

- Olson DM & Dinerstein E. 1998. The global 200: a representation approach to conserving the Earth's most biologically valuable ecoregions. *Conservation Biology* 12: 502–515.
- Paul A, Khan ML, Arunachalam A, & Arunachalam K. 2005. Biodiversity and conservation of Rhododendrons in Arunachal Pradesh in the Indo-Burma biodiversity hotspot. *Current Science* 89(4): 623–634.
- Rao NA. 2010. Orchid flora of Arunachal Pradesh an update. *Bulletin of Arunachal Forest Research* 26 (1&2): 82-110.
- Samal PK, Dollo M, Singh LJ, Lodhi MS, Arya SC, Dhyani PP & Palni LMS. 2013a. *Biodiversity conservation through community based natural resource management: An approach*. G.B. Pant Institute of Himalayan Environment and Development, Almora, Uttarakhand, India.
- Singh SP & Saha D. 2013. Status of aromatic plants and their prospects in incense sticks industries of Arunachal Pradesh, India. *Journal of Natural Sciences* 1(1): 53-65.
- Sinha GN. 2008. Forests and forestry in Arunachal Pradesh (SFRI). *Information Bulletin No. (27)* State Forest Research Institute, Itanagar.
- Siva R. 2007. Status of natural dyes and dye-yielding plants in India. *Current Science* 92 (7): 916-925.
- State Forest Report 2011. Forest Survey of India, Dehradun, Ministry of Environment and Forest. Govt. of India.