

uninhabited islands are very rich in rattan resources, the inhabited ones also harbour several taxa of canes occurring along the boundaries of farms, roadsides and in fallow lands.

North and North-east India

Three genera (*Calamus*, *Daemonorops* and *Plectocomia*) with 20 species are reported from this region. Rattans are found in evergreen, sub-montane or the sub-Himalayan mixed forests of Assam, Arunachal Pradesh, Meghalaya, Manipur, Nagaland, Mizoram, Tripura, West Bengal and Sikkim. Other than these states, rattans are distributed in the coastal swamp forests of Orissa and in the moist deciduous forest patches in Orissa and Bihar

Ecology

Rattans are characteristic plant components of the evergreen, sub-montane and semi evergreen forests. Different species of rattans grow side by side in the same locality. They occur in various ecological as well as altitudinal ranges and are distributed from sea level to -2000m. Each species has its own ecological and altitudinal preferences. Most of the species are distributed below 1000 m. But certain species of *Calamus* and *Plectocomia* are seen only above 1500 m. With increasing altitude, the number of species of *Calamus* gradually decrease. In India only *C. acanthospathus* is seen above 1700 m. The only rattan growing at much higher altitudes is *Plectocomia himalayana*.

rattan cultivation did not begin in earnest until the mid-1970's when local shortage of rattan alerted the forest departments in South-east Asia to initiate action to safeguard the future of the resource. Since then a wide range of studies have been conducted on various aspects of growing of rattans.

Micropropagation

Many of the economically important rattan species have been depleted in the forests due to over-exploitation and this has led to the scarcity of mature plants and, thereby, the seeds. Being a monocot, it is obvious that conventional vegetative propagation techniques do not offer much potential for large-scale propagation of rattans. An alternative cloning method is, therefore, necessary both from the point of view of clonal propagation of superior selections and conservation of rare species where mature seed producing plants are not available in sufficient numbers. Micropropagation has been successfully applied in similar situations to overcome some of the hurdles in vegetative propagation.

Harvesting

Harvesting is usually done during dry months. The collector cuts the stem at the base and taking hold of the lower end, pulls the plant down from the supporting trees. The leaves are removed and the upper soft immature part of the stem is cut off.

Table 1 The rattan genera, number of species and their distribution

Genus	No. of Species	Distribution
<i>Calamus</i> L.	374	Tropical Africa, India, Srilanka, China, South and East to Fiji, Vanuatu and Eastern Australia
<i>Calospatha</i> Becc.	1	Endemic to Peninsular Malasia
<i>Ceratolobus</i> Bl.	6	Malay Peninsula, Sumatra, Borneo, Java
<i>Daemonorops</i> Bl.	102	India and China to Western most New Guinea
<i>Eremospatha</i> (Mann & Wedl.) Wendl.	10	Humid Tropical Africa
<i>Korthalsia</i> Bl.	27	Indo-China and Burma to New Guinea
<i>Laccosperma</i> (Mann & Wendl.) Drude	5	Humid Tropical Africa
<i>Myrialepis</i> Becc	1	Indo-China, Thailand, Burma, Peninsular Malasia and Sumatra
<i>Oncocalamus</i> (Wendl.) Wendl.	5	Humid Tropical Africa
<i>Plectocomia</i> Mart.	16	Himalayas and South china to Western Malasia
<i>Plectocomiopsis</i> Becc.	5	Laos, Thailand, Peninsular Malasia, Borneo, Sumatra
<i>Pogonotium</i> J. Dransf.	3	Two species endemic to Borneo, one species in both Peninsular Malaysia and Borneo
<i>Resitspatha</i> J. Dransf	1	Endemic to Borneo

Reproductive biology

Rattans are dioecious plants which flower annually. The genus *Korthalsia* is an exception being monoecious and bisexual. Two types of flowering are seen in rattans: hapaxanthic and pleoanthic. In hapaxanthic flowering the topmost nodes of a rattan stem produce inflorescences more or less simultaneously and in doing so, the apex becomes exhausted and the stem dies after flowering and fruiting, eg. *Korthalsia*. In pleoanthic flowering the stem continues to grow even after flowering, eg., *Calamus* and *Daemonorops*.

Cultivation

The dwindling population of rattans in their natural habitats and the high demand from the handicrafts industry warrants large-scale cultivation of this group of plants. Research on

Socio-economics

The socio-economic conditions of the rattan workers, economic aspects of harvesting, processing and marketing in Kerala (India) was analyzed by Muraleedharan (1992), Muraleedharan and Anjana (1994), Muraleedharan et al. (1996); Muraleedharan and Anitha (1999). Out of the reported species about 25 percent are commercially important. Certain species like *Calamus metzianus* and *C. lacciferus* are not at all used because of their inferior quality (Bhat and Thulasidad, 1993). A study of the availability of the commercially important species is essential for a safeguarding the genetic wealth of rattans in India (Renuka, 1997)

Marketing

Before 1991, the marketing of rattan products was confined

to within the state, but now about 55 per cent of the manufacturers export their products to other states and 20 per cent of them export to other countries also, aiming to get a higher price for their products. In addition, product diversification, sales promotion activities like publicity through media and quality control are being undertaken to capture the market. While globalization opens up new opportunities for the rattan industrialists, it has had an adverse impact on the worker community who are still trying hard to strengthen their livelihood security (Muraleedharan *et al.*, 2006).

Present Status of Rattans

An analysis of distribution of rattans in the three different major areas in India shows that much change has taken place in their distribution over the years because of the shrinkage of the natural forest cover. The major reasons for the depletion of cane resources in India are the following

1. Decreasing natural forest cover leading to natural habitat depletion.
2. Selective exploitation of stems for the furniture and handicraft industries
3. Unscientific exploitation due to the imbalance between demand and supply

Of the approximately 556 species of rattans in the world, 117 are recorded as being threatened to some degree (Walter and Gillet, 1998). Of these, 21 are endangered, 38 regarded as vulnerable, 28 as being rare and 30 as indeterminate (IUCN Red List Categories). In India, of the 160 species reported, 6 are critically endangered; 13, endangered and 27 are vulnerable (Renuka, 2005). Hence conservation measures need to be mobilized for this valuable group of palms.

Conservation

If the depletion of rattans continues at the present pace, the natural rattan resources will be almost totally decimated in a few years except in strictly controlled National Parks and thus we are likely to lose the rattan gene pool necessary for the selection of species with silvicultural potential. Considering the rate at which tropical forests, the habitat of rattans, are being destroyed, effective measures are to be taken to conserve and propagate the endangered species. Hence there is an urgent need for both *ex situ* and *in situ* conservation.

Habitat preservation in the form of National Parks, strict nature reserves or managed nature reserve can lead to *in situ* conservation. Effective control over the exploitation of the rattans may also help in this matter. State forest departments of Kerala, Karnataka, Tamil Nadu and Goa have started large scale plantations of rattans for *ex situ* conservation.

Uses

The most important product is the stem. The stem is solid, strong and uniform, yet is highly flexible. The stem is used either in round form especially for furniture frames, or split, peeled or cored for matting and basketry. The range of indigenous uses of rattan is vast, from bridges to baskets, from fish trap to furniture, from crossbow strings to handicraft items. Other plant parts are also utilized and contribute to the indigenous survival strategies of many forest based communities.

CONCLUSION

Rattan is one of the most important non-timber forest produce in India. Recently these have gained greater popularity because of increased awareness of their importance in socio-economic development. The potential of rattan is very high but it remains largely unrealized in India. The root cause of the problem is the increasing scarcity of the raw material, which is aggravated by the gross inefficiency in management, harvesting, storage and processing. There is no accurate assessment of the demand and supply position of the resources, which results in considerable uncertainties in the industrial and business operations. Over-exploitation of the existing forests is threatening the very existence of important genetic resources of these species. Very little attention has been paid to improve the supply of raw material by encouraging the growers to cultivate rattan on private lands although the demand of better quality raw material is increasing among those who are involved in rattan based industry, and trade. Proper linkages between private growers, cottage industries/artisans and marketing agencies need to be created.

Considering the potential of rattan for socio-economic development, especially in rural areas, there is an immediate need to carry out their massive plantations in forests, farms and vacant community lands. It is also necessary to boost research and development activities for genetic improvement in rattans, development of efficient methods for mass production of superior quality planting stock, and conservation of the genetic resources. Since a limited number of species produce most of the products, basic research should be directed towards minor but potentially useful species. Improved silvicultural practices and methods for harvesting, storage and processing need to be devised and marketing forces to be activated and organised. Creation of an effecting national network for faster exchange of technical information and establishment of linkages between producers and marketing agencies will go a long way in boosting rattan production and trade in India

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