HOW TO GROW MANGROVES

Introduction

Mangrove is a group of typical tropical and specialized trees growing in the saline and brackish water systems. The mangrove trees are highly productive and economical which also protect the shoreline from erosion and cyclonic conditions. These fragile and sensitive trees and their eco-system have been abused, neglected and overexploited in India. The major threats to mangroves are deforestation, reclamation and lately pollution also.

Why only mangroves?

The mangroves are angiosperms, with about 60 species in India. They have special characters like viviparous germination, pneumatophores, prop or knee roots and salt glands. These trees form a thick forest belt on the deltas, along the major estuaries, and fringe the estuarine banks, as well as backwaters. This unique tree resource is used for various purposes like tannin extraction, paper and pulp, firewood; timber, charcoal, fodder and several other by-products. The mangrove swamps are rich in the larvae of many economically important fishes, prawns, crabs and bivalves. These are the most suitable areas for feeding, breeding and nursery grounds of these marine organisms and hence important for aquaculture purposes.

Why mangrove afforestation?

Indian mangroves have been deforested and reclaimed to such an extent that the mangroves along the west coast are very much degraded. This has not only affected the coastline but also the fisheries to a large extent.

Afforestation of mangrove areas on a large scale is the most urgent need of today, if the coastal environments to be brought back again to its earlier pristine glory.

In the present note some information is given for undertaking the afforestation programme along the coastline.

Where mangroves grow?

Mangrove trees are found growing luxuriantly in the intertidal regions along the estuaries, backwaters, islands and other protected areas. . They generally prefer soft, clay mud for their, growth. These species show different salinity tolerant limits.

The expanse of mangrove forest depends on the intertidal expanse, substratum and salinity of soil as well, as water. The inundation of the mangrove region during floods or tides is also one of the important factors.

Which mangrove species to grow?

Out of 60 mangrove species occurring in India, some are true while others are considered as 'associated' flora. The most dominant mangrove species found along the Goa coast are listed below:

1. *Acanthus ilicifolius* L
2. *Aegiceras corniculatum* (L.) Blanco
3. *Avicennia marina* (Forsk.) Vierh
4. *Avicennia officinalis* L.
5. *Bruguiera cylindrica* (L.) Blume
6. *Bruguiera gymnorrhiza* (L.) Lam
7. *Ceriops tagal* (Perr.) C.B. Robinson
8. *Excoecaria agallocha* L.
9. *Kandelia candel* (L.) Druce
10. *Luminitzera racemosa* Willd
11. *Rhizophora apiculata* Blume
12. *Rhizophora mucronata* Lam
13. *Sonneratia alba* J.Smith
14. *Sonneratia caseolaris* (L.) Engl.
15. *Xylocarpus moluccensis* (Lamk.) Roem
16. *Acrostichum aureum* L.

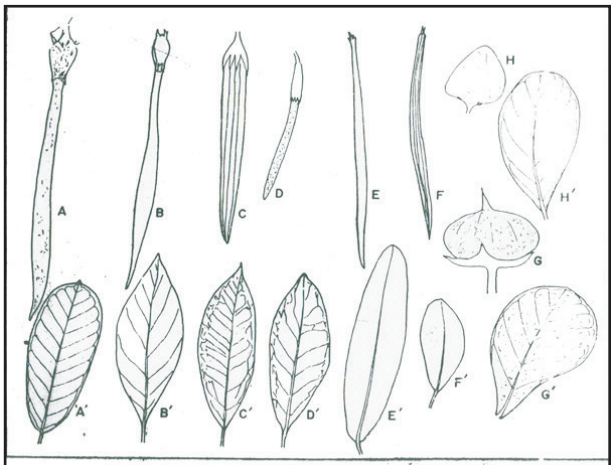

Fig. 1

How to identify the species?

For this purpose the leaf shape and details of the propagules (seedlings) of some mangrove spp. are shown in Fig 1.

For identification of mangroves with the help of leaves and seedlings following legends are given.

AA - *Rhizophora mucronata*
BB - *Rhizophora apiculata*
CC - *Bruguiera gymnorhiza*
DO - *Bruguiera cylindrica*
EE - *Kandelia candel*
FF - *Ceriops tagal*
GG - *Sonneratia alba*
HH - *Avicennia officinalis*

When seeds and seedlings are to be collected?

Mangrove seeds (fruits and seedlings) are always available in small quantity throughout the year. The main fruiting or seedling season, however, start from June to September, when plenty of seedlings of all the *Rhizophoraceae, Avicennia* and others can be collected.

Which seedlings?

Only mature seedlings of these mangrove species should be collected for afforestation or nursery purposes. The seedlings of *Rhizophoraceae* trees have pod like structure with tapering end of varying sizes and with typical morphological characters. *Avicennia* fruits are triangular in shape while *Sonneratia* is globular.

Fruits or seedlings which are not fully mature or ripe may not grow further, resulting into high mortality rate.

How to store?

Different mangrove propagules or seedlings have varying sensitivity for the period of storing.

Species of *Rhizophora*, *Avicennia, Bruguiera* and *Ceriops* can be stored for 6-7 days in brackish water. However, seedlings of *Kandelia* were observed to be very sensitive. Such seedlings are to be transplanted in the natural swamps or in polyethylene bags in the nursery immediately, where sufficient moisture or tidal water is available. *Sonneratia* fruits can be stored for a longer period.

It is, however, always advisable to store these seedlings partially immersed (pointed end in water) in seawater.

How to plant?

There are two ways of planting the mangrove seedlings.

a. Direct planting in the swamp or soft mud.
b. Raising seedlings in the nursery

a) Direct planting: When seedlings are collected, check these for any insect borer or other infections and injuries. Discard such seedlings. Select only healthy non-infected and fully matured seedlings.

Any intertidal area (between the high tide and low tide) where mangroves are absent and the substratum is of soft clay or mud and inundated by regular tidal waters everyday are suitable for direct mangrove planting. Select the sites where intertidal expanse is more. Along the Gujarat coast and West Bengal, where intertidal expanse is very large with highest tidal amplitude of 6 to 8 m, the upper limit of 1 m tide water level has to be selected.

Planning: Before starting actual planting, it is essential to make a tentative plan of the operation. How much area is available?, which species to be planted and at what position or zonation pattern?

Make suitable plots depending on the availability of the area. There should be a distance of about 10 m in between two plots. In case of fringing mangroves, where intertidal expanse is narrow, plots may be parallel to the shoreline. In large areas, plots may be either rectangular or square with gap in between two plots (Fig. 2).

Planting of different species has also to be decided. Plantation of seedlings may be undertaken according to the length of the propagules. *Rhizophora*

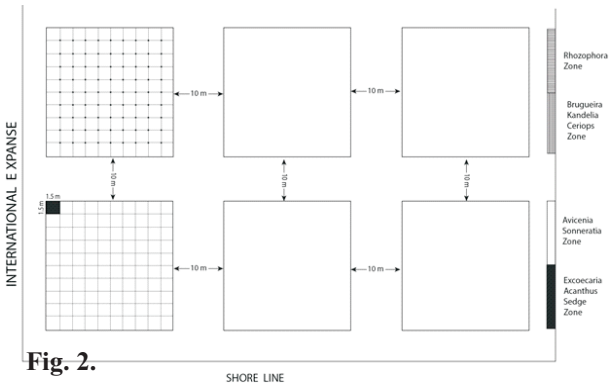

Fig. 2.

mucronata or *Rhizophora apiculata* whose seedlings are the longest should always be planted towards the waterfront, this can be followed by *Kandelia, Ceriops, Bruguiera, Avicennia, Lumnitzera* etc. Species with smaller seeds like *Sonneratia* will come to the landward side of the intertidal expanse, followed by species of grasses and sedges (Fig. 3).

Direct planting method has to be used in open areas. The selected propagules or seedlings are transported to the site and planted. Care has to be taken that the pointed end of *Rhizophora, Ceriops, Bruguiera* and *Kandelia* seedlings should always be planted into the mud (Fig.4) and the other blunt end, which is a shoot portion should always be 6 – 8 inches above the soil level. *Avicennia* seeds are to be pressed gently into the soil surface.

b) Nursery technique: This method is useful where the mangrove species are not available in plenty. This also has many advantages like selected species are available in large quantities. Mangrove nurseries can be developed in the upper part of the intertidal regions where seedlings can be grown in polyethylene bags supported with bamboos.

Spacing between plants

This is another important factor. Spacing differs according to the purpose for which the plants are grown and also depends on the mangrove species grown. However, for the plants suggested above the spacing between two plants may be 2 m.

Aftercare:

Once the plantation is established, then there is not much to be done. Only these plantations are to be protected from the grazing cattle, goats, sheep and camels.

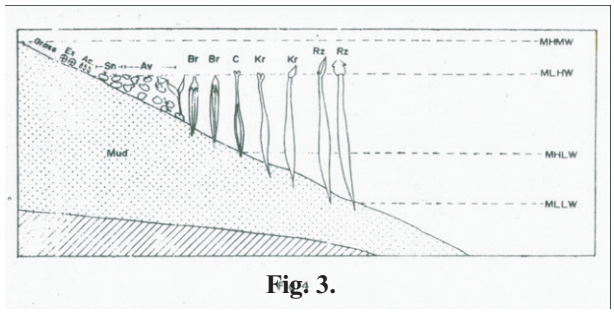

Fig. 3.

Where to plant?

The mangrove nursery may be located near the estuary or sea where seawater or estuarine water is available. The nursery may be on the open ground or in the low lying protected areas where seawater reaches.

The collected and selected seedlings are inserted in the polyethylene bags (4" x 10" size) filled with mangrove soil. If the nursery is on the raised ground then the perforations in the bags are not needed, but the nurseries in the low lying are need the perforations in the polyethylene bags. The seedlings thus grown, in different size of plots anywhere else need watering every day. However, the low lying intertidal areas get natural tidal waters twice every day.

These seedlings may be allowed to grow up to the period of 6 months to 1 year and then depending on the

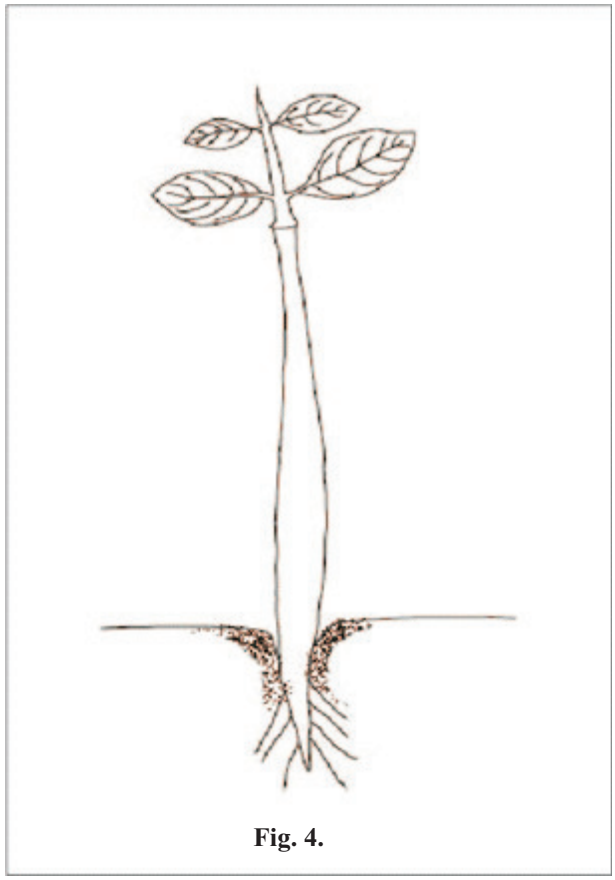

Fig. 4.

requirement of species of the region, these can be transferred to the site in a boat or cart.

The transplantation techniques may be same as indicated for direct planting. Only care should be taken to cut open the polythene bags at the base. Spacing may be the same depending on the purpose.

Any poisonous plants?

There are no poisonous plants in mangroves. However, while handling *Excoecaria agallocha* care should be taken not to touch the milky juice to the eyes. This is harmful and sometimes leads to blindness.

What is the survival rate?

If due care is taken in selecting the seedlings used for plantation, then the survival rate is very high (about 90 to 95%). However, in polluted areas the mortality may be high because of toxic substances discharged from the industries. Therefore, it will be advisable to avoid such polluted area. Sewage pollution or low level nontoxic pollutants may not have harmful effect on mangrove plants. On the other hand it has been found that mangrove trees can reduce the pollution by absorbing certain chemicals. Very high sediment load with fast current may also some time pose little problem.