SURVEY OF POTENTIAL TREE SPECIES FOR REVEGETATION OF IRON ORE MINE WASTELANDS IN GOA

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Abstract

Vegetation survey of various iron ore mine reject dumps was carried out. The paper enlists 64 tree species belonging to 52 genera distributed among 27 families. The list includes both naturally occurring and cultivated tree species. The former species in particular have survived and grown over the years on the once disturbed and degraded mine lands and hence show a tremendous potential in revegetation programmes of iron ore mine wastelands in the state.

The families recorded are Mimosaceae (7 spp.), Apocynaceae (2 spp.), Ulmaceae (1 sp.), Anacardiaceae (4 spp.), Myrtaceae (3 spp.), Casuarinaceae (1 sp.), Rhamnaceae (2 spp.), Caesalpiniaceae (6 spp.), Bignoniaceae (1 sp.), Euphorbiaceae (4 spp.), Moraceae (5 spp.), Fabaceae (5 spp.), Annonaceae (3 spp.), Bombacaceae (1 sp.), Rutaceae (1 sp.), Arecaceae (2 spp.), Combretaceae (4 spp.), Verbenaceae (2 spp.), Flacourtiaceae (1 sp.), Clusiaceae (1 sp.), Malvaceae (1 sp.), Sterculiaceae (2 spp.), Lecythidaceae (1 sp.), Rubiaceae (1 sp.), Sapotaceae (1 sp.), Loganiaceae (1 sp.) and Musaceae (1 sp.) with the total number of species given in the brackets.

Introduction

The process of mining is known to leave behind an environmentally and ecologically unpleasant landscape. It causes disturbance to the natural landform, and creates an artificial landform which is prone to erosion. The best approach to stabilization is to provide a protective cover to the dump surface through vegetation. The establishment of a permanent cover of vegetation involves not only growing plants. It necessitates bringing into being a plant community that will maintain itself indefinitely without attention or artificial aid, which will in turn support native fauna. Such permanence could be achieved by selecting species adapted to growth, spread and reproduction under the severe conditions provided both by nature of the dump material and the exposed situation on the dump surface.

This survey study was conducted with an aim to identify the tree species that are found growing on once disturbed and degraded land. These species could then be extensively used in revegetation programmes of iron ore mine lands in the state.

Materials and Methods

Vegetation survey was conducted at two iron ore mining sites, viz., Sanquelim (with an area of approximately 300 hectares) and Assonora (with an area of approximately 100 hectares) owned by Sesa Goa Ltd. The tree species collected were identified by using local floras.

Results and Discussion

Sixty four tree species belonging to 52 genera and distributed among 27 families have been listed in Table-1. The list includes both naturally occurring and cultivated tree species.

It was observed that all the naturally occurring tree species survived under the inhospitable conditions of the mine lands and hence show promise as potential tree species for revegetation programmes of iron ore mine wastelands of Goa.

Table-1: List of tree species found growing on iron ore mine wastelands in Goa

Plant species	Family	N.O./C	Abundance
Acacia auriculiformis A. Cunn. ex Benth.	Mimosaceae	C	8
Alstonia scholaris (L.)R. Br.	Apocynaceae	N.O.	8
Trema orientalis (L.) Blume	Ulmaceae	N.O.	8
Anacardium occidentale L.	Anacardiaceae	C	7
Syzygium jambolanum (Lam.) DC.	Myrtaceae	C	7
Casuarina equisetifolia Forster & Forster f.	Casuarinaceae	C	7
Acacia mangium Willd.	Mimosaceae	C	6
Zizyphus jujuba (L.) Gaertner non Miller	Rhamnaceae	N.O.	5
Delonix regia (Hook.) Raf.	Caesalpiniaceae	C	5
Eucalyptus tereticornis Smith	Myrtaceae	C	5
Psidium guajava L.	Myrtaceae	C	5
Jacaranda mimosaefolia D. Don	Bignoniaceae	C	5
Sapium insigne (Royle) Trimen	Euphorbiaceae	N.O.	5
Ficus glomerata Roxb.	Moraceae	N.O.	5
Ficus hispida L.f.	Moraceae	N.O.	5
Zizyphus glaberrima (Sedgew.) Sant.	Rhamnaceae	N.O.	4
Dalbergia sympathetica Nimmo.	Fabaceae	N.O.	4
Cassia fistula L.	Caesalpiniaceae	C	4
Leucaena glauca Benth.	Mimosaceae	C	4
Macaranga peltata (Roxb.) Muell. Arg.	Euphorbiaceae	C	4
Annona squamosa L.	Annonaceae	C	3
Bombax malabaricum DC.	Bombacaceae	C	3
Zanthoxylum rhetsa DC.	Rutaceae	C	3
Mangifera indica L.	Anacardiaceae	C	3
Gliricidia maculata (Steudel) Kunth ex Walp.	Fabaceae	C	3
Bauhinia purpurea L.	Caesalpiniaceae	C	3
Artocarpus integrifolius auct. non L.f.	Moraceae	C	3
Caryota urens L.	Arecaceae	N.O.	3
Odina wodier Roxb.	Anacardiaceae	N.O.	2
Ficus religiosa L.	Moraceae	C	2
Dalbergia sissoo Roxb.	Fabaceae	C	2
Erythrina indica Lam.	Fabaceae	C	2
Pongamia glabra Vent.	Fabaceae	C	2
Tamarindus indica L.	Caesalpiniaceae	C	2
Acacia arabica (Lam.)Willd.	Mimosaceae	C	2
Enterolobium saman (Jacq.) Prain	Mimosaceae	C	2
Terminalia crenulata Roth.	Combretaceae	C	2
Vitex altissima L.f.	Verbenaceae	N.O.	2
Ficus benghalensis L.	Moraceae	N.O.	2
Michelia champaca L.	Annonaceae	C	1
Polyalthia longifolia (Sonn.) Thwaites	Annonaceae	C	1
Flacourtia montana Grah.	Flacourtiaceae	N.O.	1
Garcinia indica Choiss.	Clusiaceae	C	1
Thespesia populnea (L.) Sol. ex Corr. Serr.	Malvaceae	C	1
Sterculia urens Roxb.	Sterculiaceae	N.O.	1
Sterculia foetida L.	Sterculiaceae	N.O.	1

Plant species	Family	N.O./C	Abundance
Holigarna arnottiana Hook. f.	Anacardiaceae	N.O.	1
Cassia siamea Lam.	Caesalpiniaceae	C	1
Peltophorum ferrugineum Benth.	Caesalpiniaceae	C	1
Parkia biglandulosa Wight & Arn.	Mimosaceae	C	1
Pithecellobium dulce (Roxb.) Benth.	Mimosaceae	C	1
Terminalia bellirica (Gaertner) Roxb.	Combretaceae	C	1
Terminalia catappa L.	Combretaceae	C	1
Terminalia paniculata Roth.	Combretaceae	C	1
Careya arborea Roxb.	Lecythidaceae	N.O.	1
Tamilnadia ulginosa (Retz.) Tirvengadum & Sastre	Rubiaceae	C	1
Achras sapota L.	Sapotaceae	C	1
Cocos nucifera L.	Arecaceae	C	1
Ervatamia heyneana Cooke	Apocynaceae	N.O.	1
Strychnos nux-vomica L.	Loganiaceae	C	1
Tectona grandis L.f.	Verbenaceae	C	1
Bridelia retusa Spreng.	Euphorbiaceae	N.O.	1
Emblica officinalis Gaertner	Euphorbiaceae	C	1
Musa paradisiaca L.	Musaceae	C	1

N.O. = Naturally occurring
C = Cultivated

Among the cultivated species, viz., *Acacia auriculiformis, A. mangium, A. arabica, Casuarina equisetifolia, Eucalyptus tereticornis, Leucaena glauca, Parkia biglandulosa, Syzygium jambolanum, Peltophorum ferrugineum,* grafts of *Mangifera indica, Cocos nucifera* and *Musa paradisiaca* showed good growth while all the remaining species, although survived showed poor growth. The later three above mentioned species, viz., grafts of *Mangifera indica, Cocos nucifera* and *Musa paradisiaca* survived as they were irrigated throughout the year and fertilized.

The poor survival of some of the cultivated species may be attributed to the nutrient deficient conditions, lack of organic matter, lack of suitable microflora and microfauna, besides other stress conditions. Smith and Bradshaw (1970) stated that nutrient deficiencies are frequently encountered in the mine wastes. Cope (1962) reported that deficiency of phosphorus as a common feature of mine wastes. Wong *et al.* (1983) showed that the tailings lacked organic matter. Wilson (1965) has postulated that the lack of suitable micro-organisms might be deterrent to the development of vegetation of mine tailings.

Conclusions

From the present study, the following conclusions can be drawn:

1. There is need for mass multiplication of the naturally occurring tree species and their plantation on the mine dumps. This would help the production of organic matter, establishment of microflora and microfauna, thereby changing the soil status and thus hastening the process of plant succession.

2. The introduction of exotic species, viz., *Acacia auriculiformis, A. mangium, Casuarina equisetifolia* and *Eucalyptus tereticornis* should be done with great care and after consultation, as these species may turn out

to be a nuisance. The exotic legume species may be used as nurse plants as they would help in nitrogen fixation, protect the land against erosion and help in soil stabilization. However, it is essential to replace these species by native ones in the later stages.

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