

Global Scenario of *Acrocarpus fraxinifolius* Wight & Arn. - A future tree of Agro forestry

Gayatri Mishra^{1,*}, Ashish Kumar Pandey², Muthu Kumar Arunachalam²,
Srinivasa Rao³

¹School of Forestry, University of Canterbury, Christchurch, New Zealand

²Forest and Wood Protection Division, Institute of Wood Science and Technology, ICFRE,
18th Cross, Malleshwaram, Bangalore - 560 003, India

³Forest Biometry Division, Institute of Wood Science and Technology, ICFRE,
18th Cross, Malleshwaram, Bangalore - 560 003, India

*E-mail address: gayatrimishra22@gmail.com

ABSTRACT

Acrocarpus fraxinifolius portrait one among the mainstay of agro forestry in Asian tropics. The lofty tree fortified a substantial impact in every horizon of life. The evergreen, deciduous tree of Fabaceae family stands tall about 30-60 m endowed with unique properties which idiosyncrasies it in the plant kingdom. Surpassing the adverse climatic conditions, *A. fraxinifolius* serves as a shade tree for tea and coffee plantation and epitomises as a multipurpose avenue tree culminating to the culture of agro forestry. Mundani in bloom is a spectacular appearance bestowed with scarlet crimson red flowers attracting infinite migratory birds and insects. The ancestral gene with indelible memory gravitate this extraordinary majestic tree to aestivate and adapt to strongest survive.

Keywords: *Acrocarpus fraxinifolius*; Shade tree; Agro forestry; exotic cum single species; ancestral gene; vernacular names

1. INTRODUCTION

Acrocarpus fraxinifolius Wight & Arn possessing a botanical synonym *Acrocarpus combreliflorus* Teysm & Binn emanates from the tropical regions of Asia and is known as the native of Asian tropics. Its natural and biological distribution covers India, China, Burma, Borneo, Sumatra, Indonesia, Vietnam, and Bangladesh. This exotic species is planted around the globe and is extensively known as acrcarpo, Mundane, Clapboard tree (Lorenzi et al., 2003).

In India is known as (Mundani or Balangi in Karnataka), tropical Africa (Pink Cedar), in Latin America (Cedro Rosado, Mundani, Lazcar). Other vernacular names of the tree include Australian ash, Indian ash, Shingle tree (Onyango et al., 2010), arbol guijarra, rojo cedar, pink decro, fresno, kenya tree shade, and lazcar Mundani (Rocas, 2010).

It is considered as one among the tallest trees in India. The Taxonomic Classification of *A. fraxinifolius* includes family Fabaceae and subfamily Caesalpinioideae.

Though *A. fraxinifolius* is a leguminous tree, but is devoid of nitrogen fixing ability in root nodules. It is a single species with molecular relatedness with *Cerotonia*. *Acrocarpus* is

a rapid growing, evergreen or deciduous tree. Pink Cedar is attributed with dense wood, resistance and maneuverability.

2. ECOLOGY AND HABITAT

a. Geographic Distribution

A. fraxinifolius is observed as a part of tropical evergreen and sub-evergreen forest. In India it covers the evergreen forests hill slopes (up to 1200 meters) of Western Ghats (Troup, 1921; Rai, 1976), tropical semi-evergreen forests of the eastern Himalayas and propounded as the dominant tree species (Puri, 1960).

Annually it grows up to 1.3-3 m and can reach to a height of 50-60 m with a diameter 0.90-2.40 meters (Whitemore and Otarola, 1976). A comprehensive distribution of *Acrocarpus* is monitored in Nilgiris, Coorg, North and South Kanara, Anamallis, Tirunelvi and Kerela in Southern India. The tree is also grown as a shade tree for coffee plantation in tropical Africa, in Coorg and south kanara districts of Karnataka. The lofty tree is also considered suitable for tea plantation.

The species are also cultivated in the high rainfall zone of Himachal Pradesh between 600-1200 m elevations (Ghildyal, 1989). The species also covers the eastern Himalayas, in West Bengal, Bhutan, Sikkim, Assam and Meghalaya between 600-1200 m.

b. Climatic factor

Mundani occurs at high rainfall, relatively cool highland areas (Laurie, 1974) and flourish at an altitude ranging from 0-2000 m, precipitation from 500-3000 mm and average temperatures 14-26 °C (Martinez et al, 2006). In India and Myanmar it occurs in regions with an annual precipitation of over 2000 mm. It is sensitive to drought and frost. Being a shade tree the temperature varies from 35 °C to 42.5 °C and the minimum from 2.5 °C to 17.5 °C. The tree adapts to wide variation in rainfall (1900-5000 mm).

c. Soil Type and pH

Acrocarpus grows best in deep, well-drained, clay-loam soils with a pH of 4-7 and also thrives in acid soils and limestone areas (Cheng, 1985). In Mexico Mundani grows in vertisol type soils with average drainage and a pH of 6.9-7.5

d. Associated vegetation

Mundani is associated with many dominant species found in the Western Ghats of Kerela. Species associated are *Acrocarpus hirsute*, *Veteria indica*, *Adina cordifolia*, *Sterculia guttata*, *Salmatia malabarica*, *Xylia xylocarpa*, *Hopea parviflora*, *Tetrameles nudiflora*, *Mesua ferrea* (Champion & Seth, 1968). Other associated species with mundani in the tropical forests of the Eastern Himalayas are *Shorea robusta*, *Albizzia marginata*, *Cedrela toona* (Puri, 1960).

3. BOTANY OF *ACROCARPUS FRAXINIFOLIUS*

Young leaves of Mundani are characterized by their bright red appearance. Flowering of trees occur after the shedding of leaves. The bark surface is rough, pale grey and brown in colour. The leaves are spirally arranged, bipinnately compound with 3-5 pairs of pinnae and 4-7 pairs of leaflets per pinna. Flowers are bisexual with pedicel 4-10 mm long flowers.

Flowers of *A.fraxinifolius* are petal free, oblong, 5-9mm long, dark red, short and hairy in appearance. Fruits contain elongated and flattened pod of 8-17 cm long. Epigeal germination is observed in seeds (Chavelas and Devall, 1988). Orthodox storage behavior at low temperature is exhibited by the seeds (Hong et al., 1996).

4. PROPERTIES OF *ACROCARPUS FRAXINIFOLIUS*

The heartwood of exotic tree is hard and strong attributed with pale, pinkish bright red to reddish brown colour having darker streaks which is well distinguished from the pale yellowish sapwood, adding to furniture and cellulose production (Lorenzi et al., 2003). The density of *Acrocarpus* varies from 0.44 to 0.68 g/cm³ according to the age, the site and the origin (Simpson, 1996; Carvalho, 1998; Honorato et al., 2005). It has physical resemblance with ash and walnut wood (Anibal et al.,) and is propagated as an ornamental tree (Whitmore and Otarola, 1976). In tropical Africa and India, grown as a shade tree for coffee plantation (Rocas, 2010). Mundani is attributed with inter locked grain and the wood texture is coarse.

5. GENETIC PROPAGATION OF *Acrocarpus*:

A germplasm bank and a seed orchard had been established by 1986 in Arunachal Pradesh in India. Kenya and India are the major seed-exporting countries.

6. XYLOPHAGES ORGANISMS INVADING *Acrocarpous fraxinifolius*:

Young trees of *Acrocarpus* are susceptible to biological invasion by termites. Serious defoliation of young seedlings is contributed by grasshoppers and caterpillars. Damping off is a prominent disease reported in *Acrocarpus*. It is also invaded by *Armillaria mellea*. High rainfall and dry season leads to mortality of these exotic trees. *Netria* species have a paramount impact on shoots attributing to the decay of trees. In Mexico trees are defoliated by leaf cutter ants (*Atta* sps). Trees are invaded by termites after being infected by unidentified fungi (Combe and Gewald, 1979).

7. ADVANTAGES AND USES OF *ACROCARPUS* PLANTATION:

1. *Acrocarpus* wood act as a source for fodder, firewood for charcoal production, apiculture, timber, furniture, gum and resin.
2. The wood is used to produce pulp for paper and has also been recommended for reinforcing river banks, stabilize terraces and used in agro forestry systems (Orwa et al., 2009).
3. Among different exotic shade tree species such as *Dalbergia latifolia* (Beeti), *Lagerstroemia microcarpa* (Nandi) and *Syzygium cumini* (Nerale), *A.fraxinifolius* possess a luxirous growth (Cheryl et al., 2011).
4. The lipoidal content of *A.fraxinifolius* leaves exhibit anti-inflammatory effect (Abou Zeid et al., 2011).

8. CONCLUSION

A. fraxinifolius can be termed as the tree for the future. The cultivation and plantation of this leguminous arboreal will contribute to wood necessary and will attribute to preserve the forest and thousands of habitat and vegetal species.

References

- [1] AbouZeid A.H., Soliman S.M., Mohammed R.S., Sleem A.A., and Dakrory Ely.M., (2011). Anti-inflammatory effect and lipoidal content of *Acrocarpus fraxinifolius* Wight & Arn leaves. *Planta Med* 2011; 77 - PL8. DOI: 10.1055/s-0031-1282657
- [2] Anibal Niembro and Rocas. *Acrocarpus fraxinifolius* Wight. and Arn. *Species Descriptions* part-II. Instituto de Ecología, A.C. Xalapa, Veracruz, México. 266-268.
- [3] Chavelas P.J., Devall S.M., (1988). *Brosimum malicastrum* Sw. In useful tropical trees of North America. Ed. por M.R Bums; M. Mosquera. Commission,) n América North Forest. Publication no.3. S. P.
- [4] Cheryl D. Nath., Raphael Pelissier., B. R. Ramesh., Claude Garcia., (2011). Promoting native trees in shade coffee plantations of southern India: comparison of growth rates with the exotic *Grevillea robusta*. *Agroforest Syst.* DOI 10.1007/s10457-011-9401-8
- [5] Carvalho E.P., (1998). Alternatives to the introduced species Pinus and Eucalyptus for reforestation in Center-south of Brazil. In: Galvao MPA coordinator. Non-traditional species for planting purposes with productive and environmental. Colombo: Embrapa forests.
- [6] Champion Sir Harry G., Seth S.K., (1968). A Revised survey of the forest types of India. Delhi: Manager of publications, Government of India. 404 p.
- [7] Cheng, W.J., (1985). Tree flora of china. Vol II. China Forest publishing co. 2398p.
- [8] Combe, J., Gewald N., (1979). Guia de campo de los ensayos forestales del CATIE en Turrialba, Costa Rica. Turrialba. Costa Rica: Centro Agronomico Tropical de Investigacion y Ensenanza. 378P.
- [9] Ghildyal B.N., *Indian Forester* 115(7) (1989) 455-458.
- [10] Hong T.D., Linington S., Ellis R.H., (1996). Seed storage behaviour: a compendium. Handbooks for Genebanks: No. 4. IPGRI.
- [11] Honorato S.J.A., Parraguirre L.J.F.C., OJ Quintanar., Rodriguez C.H.M., Pink Cedar (*Acrocarpus fraxinifolius*) an option to agroforestry Sierra Norte Puebla state. INIFAP 2005. Technical Leaflet, Vol. 1, 41 p.
- [12] Lorenzi M., Souza H.M., Torres M.A.V., (2003). Bacher exotic LB. Árvores in Brazil, timber, ornamental and aromatic. Nova Odessa, SP: Plantarum Institute.
- [13] Laurie M.V. (1974). Tree planting practices in African savannas (praticas de plantacion de arboles en la sabana Africana) FAO Forestry Development paper No.19. Rome: FAO.185P.
- [14] Martinez P.E., Garcia J.M.M., Sanchez M.L.H., Perez G.O., *UDO Magazine Agriculture* 6(1) (2006) 109-113.

-
- [15] Onyango G., Ekakoro E., Sang J., (2010). Emiti Nibwo Bulora wood lot technical specification. SCC-Vi Agroforestry.
- [16] Orwa C.A., Mutua Kindt R, Jamnadass R., S Anthony. (2009). Agroforestry Database: a tree reference and selection guide version 4.0 (<http://WWW.Worldagroforestry.org/sites/treedbs/treedatabases.asp>)
- [17] Puri G.S., (1960). Indian forest ecology. New Delhi: Oxford Book and Stationery Co. 318 p.
- [18] Rocas A.N., *Acrocarpus fraxinifolius* Wight & Arn. [online]. [cited_2010 Ago_6]. Available from: www.rngr.net/publications.
- [19] Rai S.N., *Indian forester* 102(8) (1979) 488-491.
- [20] Simpson W.T., (1996). *Method to estimate dry-kiln schedules and species groupings: Tropical and temperate hardwoods*. Madison: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory; Res. Pap. FPL–RP–548.
- [21] Troup R.S. (1921). *Silviculture of Indian trees*. Vol. I-III, Clarendon Press, Oxford.
- [22] Whitmore J.L., Otarola T.A., *Turrialba* 26(2) (1976) 201-204.

(Received 11 November 2014; accepted 24 November 2014)