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## Inventory of Shade Trees in Tea Gardens of Sub-Himalayans Region of West Bengal, India

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### **Abstract:**

A floristic exploration on shade trees at different tea gardens of Sub-Himalayan Terai and Duars of West Bengal was carried out time since 2013. A total of 45 species of Angiosperm representing 34 genera of 15 families were recorded from the study areas. Leguminosae shows the highest number of shade trees comprising 13 genera and 22 species. For each and every species correct name, field status, flower & fruiting and necessary photographs has been given.

**Keywords:** Tea garden, shade trees, distribution.

### **1. Introduction**

Sub-Himalayan region of West Bengal is located within the Himalayan biodiversity Hotspot zone and is very rich in biodiversity. Darjeeling district of this state is also famous for three 'T' i.e. Tea, Timber and Tourism. Among these, Darjeeling Tea is the most famous in world due to its beautiful essence. Economical backbone of these areas also directly depends on huge amount of Tea production from different sub-Himalayan tea gardens that are also attracts the tourist from the different parts of the world.

Tea is grown under a canopy of trees which provide partial shade that is quite essential for good tea leaf production. High sunlight at sub-Himalayan areas burns or damages the young tea leaves and can abruptly reduces the leaf production because shed trees are directly related to total yield of tea production. A good number of Garden friendly tree species are planted in various tea garden for proving partial shades and also reduces soil erosion and the impact of rainfall drops, enrich soil fertility and organic matter content through leaf litter and support diverse flora and fauna, especially many bird species (Kalita *et. al*, 2014). The shade trees play an important role in increasing productivity of the tea bushes under the environment of sub-Himalayan regions of West Bengal. During summer, the temperature of the leaves of unshaded tea plants became very high and causes some damage. Without shade trees, yield of tea is limited. Thus to increase tea yields, a canopy of moderate shade is essential under the conditions of sub-Himalayan regions of West Bengal. The importance of shade pattern and selection of shade trees were carried out by several workers like Visser (1961), Hadfield (1974) and Mohotti (2004). Since the later part of 20<sup>th</sup> century planting of shade trees among tea bushes became a practice in plains of North East India, *Albizia chinensis* was the first tree used as shade tree. *Albizia odoratissima*, *Dalbergia sissoo*, *Erythrina indica* etc. were also introduced simultaneously in different tea gardens (Barua, 2007).

### **2. Materials and Methods**

#### *2.1. Study Area*

The present study was conducted in sub-Himalayan terai and duars regions that are situated at foothills of Himalayan Hotspot of West Bengal, India. Extensive surveys were conducted in different tea plantations areas of the study area. Among the various tea garden some repeatedly visited gardens are Matigara tea estate, Gaya Ganga tea garden, Hansqua tea garden, Dagapur tea estate, Gulma tea

estate, Kamalpur tea estate, Denguajhar tea estate, Damdim tea estate, Bagrakot tea estate, Batabari tea estate, Dyna tea estate, Kurti tea estate, Banarhat tea estate, Dalgaon tea estate etc.

## 2.2. Data Collection

The present data were collected from several tea estates during August 2013 to March 2015. During the field survey a large number of fertile specimens have been collected for genuine identification. Collected specimens were processed and herbarium specimens were prepared following standard herbarium techniques by Jain and Rao (1977). Identification has been made by matching with herbarium sheets of CAL and NBU Herbarium and also using different published literatures (Prain, 1903; Bose *et al.*, 1998). All the vouchers specimens of recorded species and field records are deposited at NBU herbarium.

## 3. Result and Discussion

During the present study, a total of 45 species representing 34 genera of 15 families of angiosperms were enlisted (Table 1). Among the collected species Leguminosae shows highest percentage with 22 species comprising 13 genera (38%) followed by 5 species of Meliaceae (14%) comprising 5 genera. Phyllanthaceae, Lythraceae and Myrtaceae each family show the 2 species of 2 genera (Fig.1). Apocynaceae, Rubiaceae, Anacardiaceae, Cannabaceae, Boraginaceae, Moraceae, Euphorbiaceae, Malvaceae, Simaroubaceae and Lauraceae shows 3% generic components of the entire tree flora of the tea plantations areas (Fig.2). It was noticed during survey that the legume trees are most dominating because of its compound leaf and bushy appearance in tea plantations areas. The popular permanent shade trees among the farmers and gardeners of this sub-Himalayan region include *Albizia odoratissima*, *Albizia chinensis*, *Albizia lebbeck*, *Albizia procera*, *Erythrina indica*, *Dalbergia sissoo*, *Melia azedarach* etc.

Since shade tree species used in the tea plantations have to protect the tea plants from detrimental effects of direct sun, the plant must have a single layered canopy with small leaves. Moreover, the leafless period of the plant should not coincide with the drought period of the tea growing areas. Due to increasing popularity of tea as beverage, the tea industry faced tremendous pressure for higher production to meet the demand of consumers. Under the present situation, the scope of extending plantation area becomes limited. Gradually, other leguminous species with pinnately compound small leaves and shorter leafless period like *Albizia odoratissima*, *Erythrina variegata*, *Albizia procera*, *Dalbergia sissoo* etc. were tried with varying degrees of success.

Now, a day's some spice plants like *Cinnamomum verum*, *Piper nigrum* are also planted within the tea gardens of this region as alternative crops. Some medicinal or cereal plants like *Justicia adhatoda*, *Cajanus cajan*, *Jatropha curcas* etc. are planted as fencing along with roadsides or marginal areas. The waste lands of tea gardens are very rich in dense bushes with various weeds and important wild medicinal plants that are frequently used treat various diseases by tribal tea garden workers (Orao. Munda, Santal etc).

Scientific Name	Vernacular Name	Fertile	Status
<i>Acacia auriculiformis</i> Benth. [Leguminosae]	Akash mani/ Sonajhuri	March-February	Less common
<i>Acacia myrtifolia</i> (Sm.) Willd. [Leguminosae]	-	March- December	Less common
<i>Acacia lenticularis</i> Benth.[Leguminosae]	Kakur	April-October	Less common
<i>Leucaena leucocephala</i> (Lam.) de Wit[Leguminosae]	-	April-October	Less common
<i>Adenanthera pavonina</i> L. [Leguminosae]	Rakta Kambal	March-September	Rare
<i>Ailanthus integrifolia</i> (Pierre) Noot.[Leguminosae]	Gokul	March-April	Rare
<i>Albizia chinensis</i> (Osbeck) Merr. [Leguminosae]	Chakua	March-July	Abundant
<i>Albizia lebbeck</i> (L.) Benth.[Leguminosae]	Sirish	June-September	Abundant
<i>Albizia schimperiana</i> Oliv.[Leguminosae]	-		Common
<i>Albizia odoratissima</i> (L.f.) Benth.[Leguminosae]	Kakur Sirish	May-July	Very common
<i>Albizia procera</i> (Roxb.) Benth.[Leguminosae]	Koroi	May-August	Abundant
<i>Albizia richardiana</i> (Voigt) King & Prain[Leguminosae]	-	August-October	Less common
<i>Albizia saman</i> (Jacq.) Merr.[Leguminosae]	-	May-August	Very common
<i>Alstonia scholaris</i> (L.) R. Br.[Apocynaceae]	Chattim	October-December	Common
<i>Artocarpus chaplasha</i> Roxb.[Moraceae]	Chaplash	March-April	Rare
<i>Artocarpus lacucha</i> Buch.-Ham.[Moraceae]	Dahua	March-August	Rare
<i>Azadirachta indica</i> A.Juss.[Meliaceae]	Neem	April-June	Common
<i>Bauhinia purpurea</i> L. [Leguminosae]	Rakta kanchan	October-February	Rare
<i>Bischofia javanica</i> Bl. [Phyllanthaceae]	Kainjal	February-April	Rare
<i>Eucalyptus robusta</i> Sm. [Myrtaceae]	Eucalyptus	August-March	Rare
<i>Lagerstroemia speciosa</i> (L.) Pers.[Lythraceae]	Jarul	August-October	Common
<i>Butea monosperma</i> (Lam.) Taub. [Leguminosae]	Palas	January-April	Less common
<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby[Leguminosae]	Manjuri	June-December	Abundant
<i>Cassia fistula</i> L. [Leguminosae]	Badar lathi	March-May	Abundant
<i>Chukrasia tabularis</i> A.Juss.[Meliaceae]	Chikrassi	May-July	Common
<i>Dalbergia sericea</i> G.Don[Leguminosae]	-	April-May	Abundant
<i>Dalbergia sissoo</i> DC.[Leguminosae]	Shisu	March-May	Abundant

<i>Derris robusta</i> (DC.) Benth.[Leguminosae]	-	April-May	Common
<i>Delonix regia</i> (Hook.) Raf.[Leguminosae]	Gulmohar	April-July	Abundant
<i>Duabanga grandiflora</i> (DC.) Walp.[Lythraceae]	Bandorhulla	February-July	Common
<i>Phyllanthus emblica</i> L.[Phyllanthaceae]	Amlaki	July-December	Common
<i>Ehretia acuminata</i> R.Br.[Boraginaceae]	Kula-aja	March-July	Common
<i>Erythrina variegata</i> L. [Leguminosae]	Madar	February-April	Common
<i>Firmiana colorata</i> (Roxb.) R.Br.[Malvaceae]	Mula	March-July	Rare
<i>Litsea glutinosa</i> (Lour.) C.B.Rob. [Lauraceae]	Kukur	March-July	Less common
<i>Litsea monopetala</i> (Roxb.) Pers. [Lauraceae]	Bara Kukur	May-August	Less common
<i>Mangifera indica</i> L. [Anacardiaceae]	Aam	February-May	Common
<i>Melia azedarach</i> L. [Meliaceae]	Ghora neem	Februay-April	Abundant
<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Bol Kadam	June-August	Common
<i>Psidium guajava</i> L. [Rubiaceae]	Piara	Throughout the year	Rare
<i>Parkia timoriana</i> (DC.) Merr. [Leguminosae]	Supota	November-March	Rare
<i>Swietenia macrophylla</i> King [Meliaceae]	Mahagoni	May-October	Common
<i>Toona ciliata</i> M.Roem. [Meliaceae]	Tun	March-June	Common
<i>Trema orientalis</i> (L.) Bl. [Cannabaceae]	Jibon	Throughout the year	Abundant
<i>Trewia nudiflora</i> L. [Euphorbiaceae]	Pituli	October-January	Common

Table 1: Analytical Data of the Collected Specimens with Their Field Status

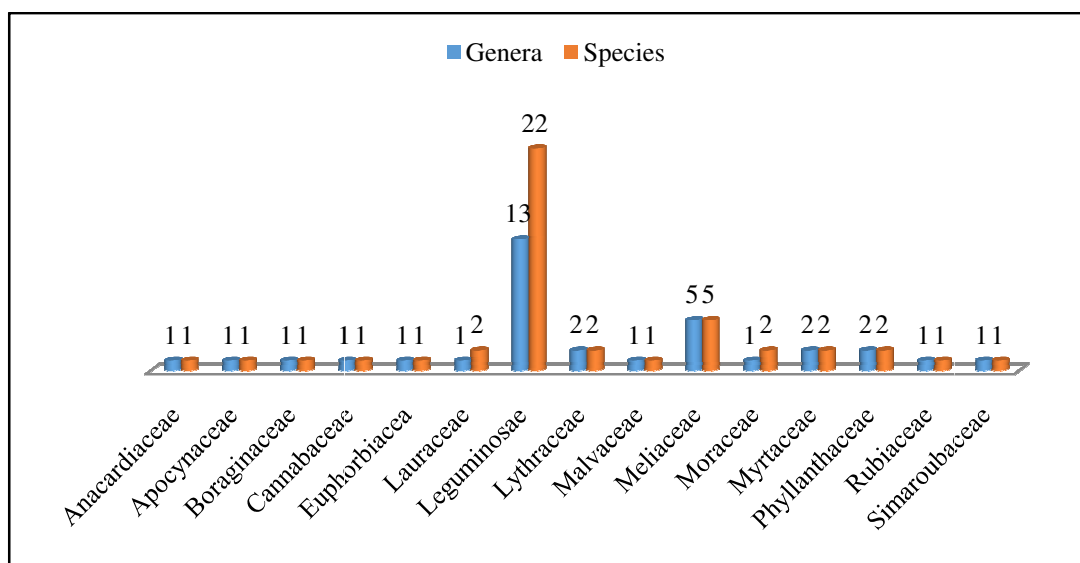


Figure 1: Family showing the number of genera and species

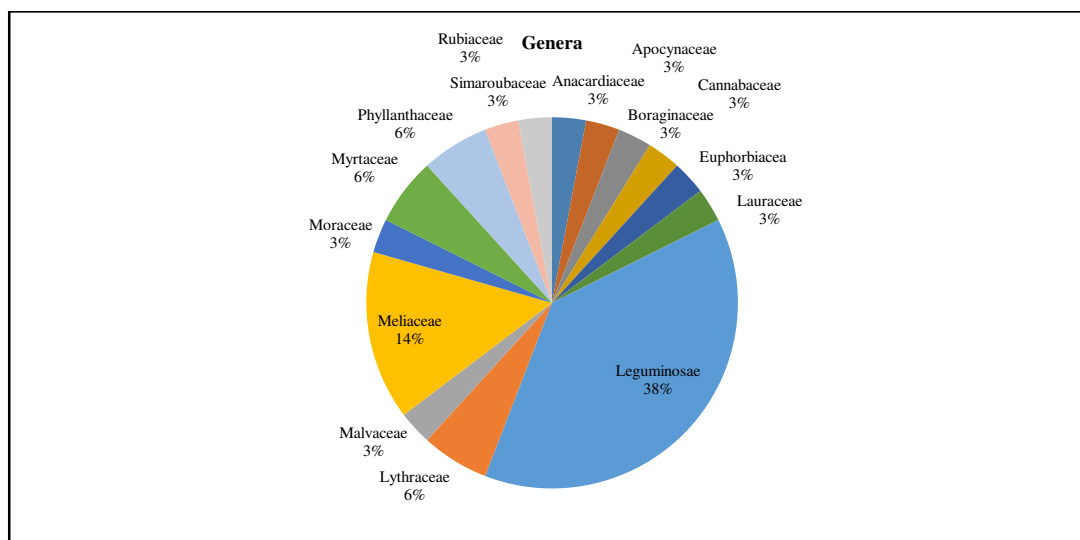


Figure 2: Family wise generic percentage of available trees of the study areas

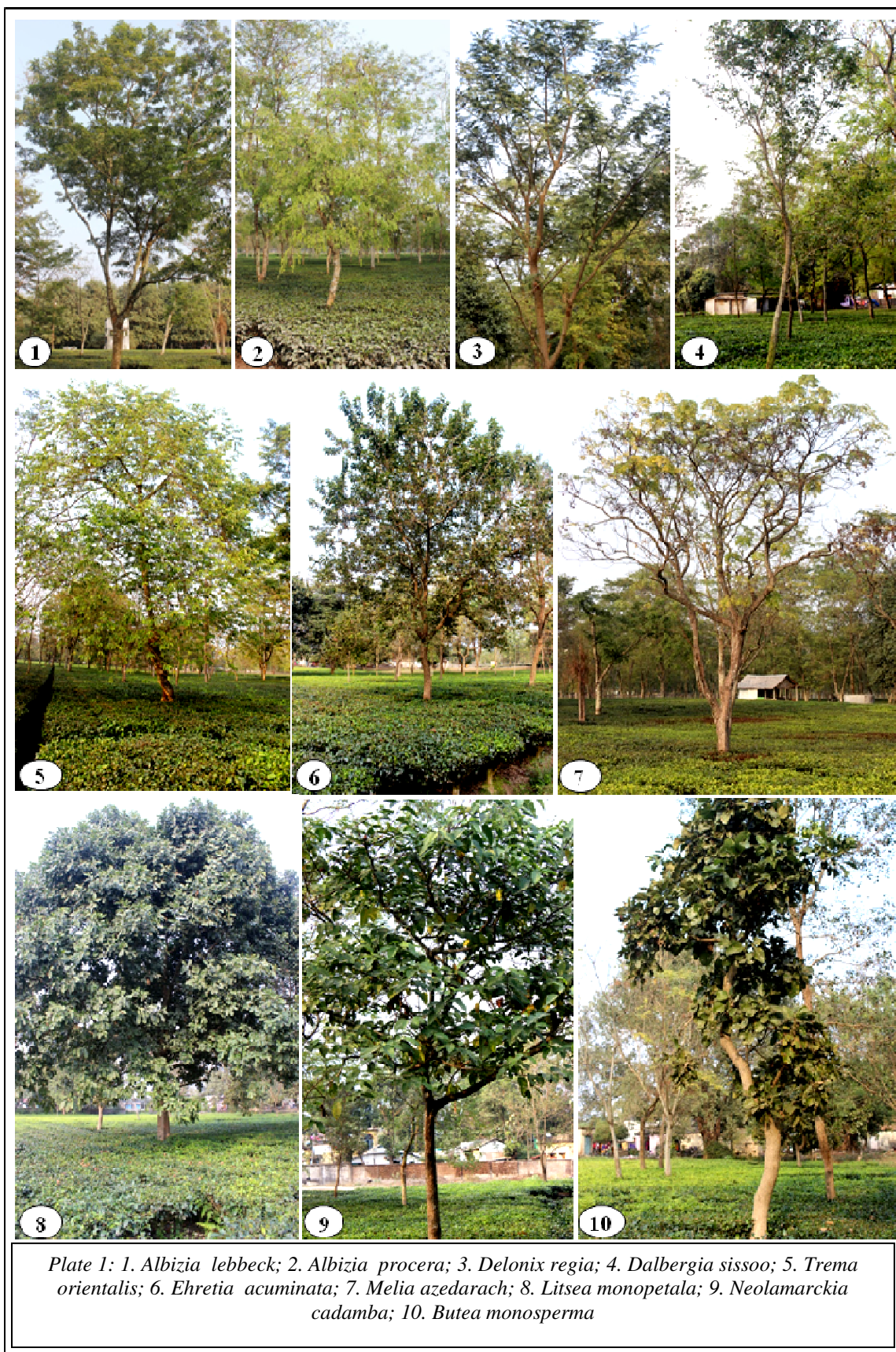


Figure 3

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#### 5. References

- i. Barua D.N. (2007). Science and Practice in Tea culture. 1 Edn. Tea Research Association, Assam.
- ii. Bose, K., Das, P. & Maity, G. G. (1998). Trees of the World. Regional plant Resource Centre, Orissa. Pp. 506.
- iii. Hadfield, W. (1974). Shade in north-east Indian tea plantations I. The shade pattern. J. Appl. Ecd. 11: 151-178.
- iv. Kalita M.R., Das K. A. & Nath J. A. (2014). Comparative study on growth performance of two shade trees in tea agro forestry system. J. Environ. Biol.35: 699-702.
- v. Jain, S. K. & Rao, R.R. (1977). A handbook of Field and Herbarium Methods. Today & Tomorrows Printers and Publishers, New Delhi.
- vi. Mohotti A.J. (2004). Shade in Tea: Is it beneficial? Sri Lanka. J. Tea Sci. 69: 27-39.
- vii. Prain, D. (1903).Bengal Plants. 1 & 2 vols. Govt. Press. Messrs. West, Newman & Co. London.
- viii. Visser, T. (1961). Interplanting in Tea 1. Effect of shade trees, weeds and bush crops. Tea Quart. 32: 69-82.