



WILD RELATIVES OF AGROFORESTRY SPECIES FOUND IN INDIA

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ABSTRACT

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Agroforestry practices are traditional method for providing livelihood and sustainable management of resources. It is a management of trees and crops for light, water and nutrients in favour of farmer. Cultivation of indigenous trees with high-value products enhances profitability and provides economic security. Wild relatives of crops are genetic resources of desirable characters which may be utilized in the plant breeding for increase in productivity, disease resistance, management insect and pest, etc. In present study, 98 crops with their wild relatives of agroforestry species are enumerated. This may be utilized for plant breeding programmes.

KEYWORDS: Agroforestry, Wild relatives, Genetic resources, Plant breeding.

INTRODUCTION

Agroforestry involves cultivation of trees with agricultural crop and/or animal husbandry. Usually, woody perennials (tree, shrubs etc.) are grown in association with herbaceous plants (crops, pastures) or livestock in spatial arrangement. Basically, it keeps both ecological and economic benefits together. The land and time management options increase livelihood security and reduce vulnerability to climate and environmental change. It is a traditional method of resource management, pollen records suggested existence for at least 1300 years, the agroforestry systems may potentially provide options for improvement in livelihoods through simultaneous production of food, fodder and firewood as well as mitigation of the impact of climate change (Brookfield and Padoch, 1994; Lundgren, 1982). In agroforestry, productivity of cultivation increased due to the capture of more light and water. It will increase more if cash crop will be introduced in intercropping (Tokey, 1997). It also conserve soil on arable land because trees are soil binders especially when planted on terrace risers, terrace edges, field bunds as intercrops and as alley cropping in the shape of hedge row plantation (Singh, 1988). Agroforestry enhance water use efficiency through a combination of mulching and water conservation, trees in agro-ecosystems may directly enhance crop yields of coarse grains (Kumar et al. 1998). In the areas experience high wind or sand movement, the trees (i.e. *Acacia nilotica* and *Dalbergia sissoo*) are act as shelterbelts (Venkateshwaralu, 1993; Fanish and Priya, 2012).

Germplasm is the basic material for crop improvement programme, it includes both cultivated and wild species and their relatives. The future of agriculture is dependent on agricultural biodiversity, however, bio-diversity are depleting at the global, regional and local levels. The plant genetic resources are the raw materials to improve the capacity of crops to respond to new pathogens, climate change and change in physiological conditions. Further, threat of climate change is severe on farming and creating unique and difficult challenges for agriculture. Therefore, it is necessary to secure wild relatives of crops and intensive plant breeding programme must be initiated to tackle food insecurity and environment protection. (Halewood *et al.*, 2018).

The enlisting of agro-forestry species and their wild relatives will offer new genes and allelic variability, as well as several other economic and environmental benefits that may be harnessed with their conservation and cultivation.

METHODOLOGY

The list of species used in agroforestry and their wild relatives has been compiled from the relevant literatures like, Inventory of cultivated plants species and their wild relatives in India (Singh *et al.*, 2013), Wild relatives of Crop plants in India: collection and conservation (Pandey *et al.*, 2005), Wild relatives of crop plants in India (Arora and Nayar, 1984). Scientific names of the species have been updated with help of online databases such as <https://plants.usda.gov/>, <https://powo.science>.

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Table 1. Agroforestry species and their wild relatives

S. No.	Scientific name	Family
1	<i>Acacia concinna</i> (Willd.) DC.	Fabaceae
2	<i>Acacia donaldii</i> Haines	Fabaceae
3	<i>Acacia eburnea</i> (L.f.) Willd.	Fabaceae
4	<i>Acacia farnesiana</i> (L.) Willd.	Fabaceae
5	<i>Acacia jacquemontii</i> Benth.	Fabaceae
6	<i>Acacia leucophloea</i> var. <i>leucophloea</i> (Roxb.) Willd.	Fabaceae
7	<i>Acacia mearnsii</i> De Wild.	Fabaceae
8	<i>Acacia nilotica</i> subsp. <i>indica</i> (Benth.) Brenan	Fabaceae
9	<i>Acacia senegal</i> (L.) Willd.	Fabaceae
10	<i>Acer acuminatum</i> Wall. ex D.Don	Sapindaceae
11	<i>Acer oblongum</i> Wall. ex DC.	Sapindaceae
12	<i>Acer sikkimense</i> var. <i>serrulatum</i> Pax	Sapindaceae
13	<i>Adansonia digitata</i> L.	Malvaceae
14	<i>Agathis robusta</i> (C.Moore ex F.Muell.) F.M.Bailey	Araucariaceae
15	<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae
16	<i>Albizia chinensis</i> (Osbeck.) Merr.	Fabaceae
17	<i>Albizia kalkora</i> (Roxb.) Prain	Fabaceae
18	<i>Albizia lebbek</i> (L.) Benth.	Fabaceae
19	<i>Albizia orissensis</i> Sahni & Bennet	Fabaceae
20	<i>Albizia procera</i> (Roxb.) Benth.	Fabaceae
21	<i>Albizia thompsonii</i> Brandis	Fabaceae
22	<i>Albizia thompsonii</i> var. <i>galbana</i> Haines	Fabaceae
23	<i>Alstonia venenata</i> R.Br.	Apocynaceae
24	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Bedd.	Combretaceae
25	<i>Anogeissus pendula</i> Edgew.	Combretaceae
26	<i>Anogeissus sericea</i> var. <i>nummularia</i> King ex Duthie	Combretaceae
27	<i>Azadirachta indica</i> A. Juss.	Meliaceae
28	<i>Barringtonia acutangula</i> (L.) Gaertn.	Lecythidaceae
29	<i>Barringtonia racemosa</i> (L.) Spreng.	Lecythidaceae
30	<i>Bauhinia acuminata</i> L.	Fabaceae
31	<i>Bauhinia purpurea</i> L.	Fabaceae
32	<i>Bauhinia racemosa</i> Lam.	Fabaceae
33	<i>Bauhinia tomentosa</i> L.	Fabaceae
34	<i>Bauhinia vahlii</i> Wight & Arn.	Fabaceae
35	<i>Bauhinia variegata</i> L.	Fabaceae
36	<i>Betula utilis</i> D. Don	Betulaceae
37	<i>Bridelia retusa</i> A. Juss.	Phyllanthaceae
38	<i>Bridelia stipularis</i> Blume	Phyllanthaceae
39	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae
40	<i>Caesalpinia pulcherrima</i> (L.) Swartz	Fabaceae
41	<i>Caesalpinia crista</i> L.	Fabaceae
42	<i>Caesalpinia decapetala</i> (Roth) Alston	Fabaceae
43	<i>Caesalpinia sappan</i> L.	Fabaceae
44	<i>Callicarpa macrophylla</i> Vahl.	Lamiaceae
45	<i>Cassia fistula</i> L.	Fabaceae
46	<i>Casuarina equisetifolia</i> L.	Casuarinaceae
47	<i>Cedrus deodara</i> (Roxb. ex Lamb.) G.Don	Meliaceae
48	<i>Cordia obliqua</i> Willd.	Boraginaceae
49	<i>Dalbergia lanceolaria</i> L.f. subsp. <i>paniculata</i> (Roxb.) Thoth.	Fabaceae

Cont...

Table 1. Cont...

S. No.	Scientific name	Family
50	<i>Dalbergia latifolia</i> Roxb.	Fabaceae
51	<i>Dalbergia sissoo</i> Roxb. ex DC.	Fabaceae
52	<i>Dalbergia wattii</i> C.B. Clarke	Fabaceae
53	<i>Delonix elata</i> (L.) Gamble	Fabaceae
54	<i>Delonix regia</i> (Bojer ex Hook.) Raf.	Fabaceae
55	<i>Dendrocalamus giganteus</i> Clump.	Poaceae
56	<i>Erythrina variegata</i> L.	Fabaceae
57	<i>Eucalyptus citriodora</i> Hook.	Myrtaceae
58	<i>Eucalyptus globulus</i> Labill	Myrtaceae
59	<i>Falcataria moluccana</i> (Miq.) Barneby & J W Grimes	Fabaceae
60	<i>Garcinia andamanica</i> King var. <i>andamanica</i>	Clusiaceae
61	<i>Garcinia mangostana</i> L.	Clusiaceae
62	<i>Hardwickia binata</i> Roxb	Fabaceae
63	<i>Hibiscus cannabinus</i> L.	Malvaceae
64	<i>Hopea glabra</i> Wt and Arn.	Dipterocarpaceae
65	<i>Hopea parviflora</i> Bedd.	Dipterocarpaceae
66	<i>Hopea shingkeng</i> (Dunn) Bor	Dipterocarpaceae
67	<i>Hopea wightiana</i> Wall.	Dipterocarpaceae
68	<i>Jacaranda acutifolia</i> Humb. & Bonpl.	Bignoniaceae
69	<i>Litsea lancifolia</i> Roxb. var. <i>alternifolia</i> Meissn	Lauraceae
70	<i>Madhuca diplostemon</i> (C.B. Clarke) van Royen	Sapotaceae
71	<i>Mesua ferrea</i> L.	Calophyllaceae
72	<i>Olea dioica</i> Roxb.	Oleaceae
73	<i>Olea ferruginea</i> Royle	Oleaceae
74	<i>Olea gamblei</i> C. B. Clarke	Oleaceae
75	<i>Olea glandulifera</i> Wall. ex G. Don	Oleaceae
76	<i>Pinus kesiya</i> Royle ex Gordon	Pinaceae
77	<i>Pinus roxburghii</i> Sarg.	Pinaceae
78	<i>Pinus sylvestris</i> L.	Pinaceae
79	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Fabaceae
80	<i>Polyalthia fragrans</i> (Dalz.) Bedd	Annonaceae
81	<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae
82	<i>Prosopis juliflora</i> (Sw.) DC.	Fabaceae
83	<i>Putranjiva roxburghii</i> Wall.	Putranjivaceae
84	<i>Salix radinostachya</i> Schneider	Salicaceae
85	<i>Salix stomatophora</i> Floderus	Salicaceae
86	<i>Salix wallichiana</i> Anderss.	Salicaceae
87	<i>Salvadora oleoides</i> Decae	Salvadoraceae
88	<i>Salvadora persica</i> L.	Salvadoraceae
89	<i>Sapindus trifoliatus</i> L.	Sapindaceae
90	<i>Senna montana</i> (Roth) V. Singh	Fabaceae
91	<i>Sesbania bispinosa</i> (Jacq.) W. Wight	Fabaceae
92	<i>Sesbania cannabina</i> (Retz.) Pers.	Fabaceae
93	<i>Sesbania concolor</i> Gillett	Fabaceae
94	<i>Sesbania sesban</i> (L.) Merr.	Fabaceae
95	<i>Tecomella undulata</i> (Sm.) Seem.	Bignoniaceae
96	<i>Tectona grandis</i> L.	Lamiaceae
97	<i>Terminalia alata</i> Herb. Madr. ex Wall	Combretaceae
98	<i>Ulmus wallichiana</i> Planch.	Ulmaceae

kew.org/ and <http://www.tropicos.org/>. The families of respective species are according to the APG IV system of classification.

RESULTS AND DISCUSSION

A total 98 taxon has been documented in the present study, it includes 90 species, 2 subsp. and 6 varieties (table 1). The family Fabaceae is represented by 45 taxon, followed by Combretaceae, Dipterocarpaceae, Oleaceae, Sapindaceae (4 taxon each), Pinaceae, Salicaceae (3 taxon each), Bignoniaceae, Clusiaceae, Lamiaceae, Lecythidaceae, Malvaceae, Meliaceae, Myrtaceae, Phyllanthaceae, Salvadoraceae (2 taxon each), Annonaceae, Apocynaceae, Araucariaceae, Betulaceae,

Boraginaceae, Calophyllaceae, Casuarinaceae, Lauraceae, Poaceae, Putranjivaceae, Sapotaceae, Simaroubaceae and Ulmaceae (1 taxon each) (Fig. 1).

The agroforestry trees valuable resources for timber, fuel, nitrogen fixation (legumes), fruits, etc. however, some of species like *Ailanthus excels*, *Alstonia venenata*, *Azadirachta indica*, *Betua utilis*, *Callicarpa macrophylla* and *Erythrina variegata* are medicinally important whereas, *Acacia nilotica* subsp. *Indica*, *Albizia chinensis*, *Albizia procera*, *Sesbania bispinosa*, *Sesbania cannabina* and *Sesbania sesban* have very high fodder value.

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