

Ethnobotanical study and conservation status of trees in the district Sargodha, Punjab, Pakistan

Estudio etnobotánico y estado de conservación de los árboles en el Distrito Sargodha, Punjab, Pakistán

Shah A^{1*}, S Rahim^{1, 5}, KH Bhatti², A Khan¹, N Din¹, M Imran¹, M Mohsin³, M Ishtiaq⁴, A Nabila¹, A Ansari¹, S Hussain¹, M Zafar⁵, M Mushtaq⁵, E Mumtaz¹, J Iqbal⁶

Abstract. Sargodha district is one of the least studied regions of Pakistan regarding its ethnobotanical values. This paper is the first report related to the documentation and conservation status of the tree species in the Sargodha district, and their folk ethnobotanical uses. An interview base survey was conducted in the study area in 2010-2013. The ethnobotanical data revealed the use of 100 tree species (6 gymnosperms, 94 angiosperms) belonging to 77 genera (6 gymnosperms, 71 angiosperms) and 39 families (4 gymnosperms, 35 angiosperms), with the Fabaceae ranking first with 19 tree species, followed by the Moraceae (12 species). Tree species like *Aegle marmelos*, *Butea monosperma*, *Diospyrus malabarica*, *Gmelina arborea*, *Kigelia africana*, *Manilkara hexandra*, *Manilkara zapota*, *Mimusops elengi*, *Nyctanthes arbor-tristis*, *Putranjiva roxburghii*, *Terminalia arjuna* and *Terminalia bellerica* are not only unique in their medicinal value but also interesting because of their unusual occurrence here. *Thevetia peruviana*, *Cassia fistula*, *Celtis australis*, *Delonix regia*, *Diospyrus malabarica*, *Grevillea robusta*, *Haplophragma adenophyllum*, *Jacaranda mimosifolia*, *Lagerstroemia speciosa*, *Plumeria rubra*, *Pterospermum acerifolium*, *Roystonea regia*, *Taxodium distichum* and *Tectona grandis* are included among the worth looking ornamental tree species. *Capparis decidua*, *Dalbergia sissoo*, *Tamarix aphylla*, *Tamarix dioica*, *Prosopis cineraria* and *Ziziphus mauritiana* are the most commonly used timber species. Other common ethnobotanical utilization of these trees includes either sheltering or fuel or agricultural uses. Lack of awareness about the potential uses of these species, and particularly ignorance of the concerned authorities, have led to a decline in the population of this precious tree flora. Documentation of this tree flora, and as-

Resumen. El distrito de Sargodha es uno de los menos estudiados de Pakistán en lo que se refiere a sus valores etnobotánicos. Este paper es el primer informe con respecto a la documentación y estado de conservación de las especies arbóreas en el Distrito de Sargodha, y sus usos etnológicos vulgares. En el área de estudio se condujo un estudio de entrevistas durante 2010-2013. Los datos etnobotánicos revelaron el uso de 100 especies de árboles (6 gimnospermas, 94 angiospermas) pertenecientes a 77 géneros (6 gimnospermas, 71 angiospermas) y 39 familias (4 gimnospermas, 35 angiospermas). Las Fabaceae fueron primeras con 19 especies de árboles, seguidas por las Moraceae con 12 especies. Especies arbóreas como *Aegle marmelos*, *Butea monosperma*, *Diospyrus malabarica*, *Gmelina arborea*, *Kigelia africana*, *Manilkara hexandra*, *Manilkara zapota*, *Mimusops elengi*, *Nyctanthes arbor-tristis*, *Putranjiva roxburghii*, *Terminalia arjuna* y *Terminalia bellerica* no son solo únicas en su valor medicinal sino también interesantes debido a su ocurrencia inusual en el Distrito. *Thevetia peruviana*, *Cassia fistula*, *Celtis australis*, *Delonix regia*, *Diospyrus malabarica*, *Grevillea robusta*, *Haplophragma adenophyllum*, *Jacaranda mimosifolia*, *Lagerstroemia speciosa*, *Plumeria rubra*, *Pterospermum acerifolium*, *Roystonea regia*, *Taxodium distichum* y *Tectona grandis* están incluidas dentro de las especies leñosas ornamentales que vale la pena tener. Otros usos etnobotánicos comunes de estos árboles incluyen su utilidad como cobertura, combustible o usos agrícolas. La falta de conocimiento acerca de los usos potenciales de estas especies, y especialmente la ignorancia de las autoridades involucradas, han conducido a una reducción en las poblaciones de esta valiosa flora arbórea. La documentación de esta flora arbórea, y

¹ Department of Botany, University of Sargodha, Sargodha, Pakistan.

² Department of Botany, Institute of Life Sciences, University of Gujrat, Gujrat, Pakistan.

³ Department of Textile Engineering, UET Lahore, Faisalabad Campus, Pakistan.

⁴ Department of Botany, Mirpur University of Science & Technology (MUST), Bhimber Campus, Azad Kashmir, Pakistan.

⁵ Department of Plant Sciences, Quaid-e-Azam University Islamabad, Pakistan.

⁶ Department of Biology, Government College Mankera, Punjab, Pakistan.

Address Correspondence to: Amin Shah, e-mail: aminullahshah@gmail.com

Recibido / Received 2.II.2014. Aceptado / Accepted 31.III.2014.

sociated indigenous knowledge, can be used as a basis for developing management plans for conservation and sustainable use of this flora in the study area. A well-organized management is critical to restore and conserve this endangered natural resource in the District Sargodha, Pakistan. The immense medicinal and timber value of these tree species make it necessary to promote their conservation to simultaneously alleviate the poverty and improve the socio-economic status of the study area.

Keywords: Ethnobotanical study; Medicinal plants; Sargodha; Pakistan.

INTRODUCTION

Trees are an important source of wood for timber and lumber, but also provide non-timber forest products (e.g., medicines, fuel, fodder, and ornamental and agricultural uses). The prosperity of any country might be partially determined by its forest and tree resources. In addition to their productive and protective benefits, tree species might play a vital role in ecosystem stability, providing of habitat to a large number of faunal diversity (Sheikh, 1993; Shah, 2005). Systematic explorations of the traditional use of plants are urgently needed to unravel the botanical species richness of an area. Pakistan is endowed with a rich plant biodiversity due to its unique geographic and climatic conditions, and the Sargodha District is one of such regions. Ethnobotany is a very important area of study all over the world (Singh & Singh, 2009). It is the study of how the people of a particular region and culture make use of indigenous plants. Ethnobotanists explore how plants might be used in medicine, food, fodder, timber, shelter and religious ceremonies (Badshah et al., 2012). In the context of a complex ethnobotany, there are people who identify plants that are used simultaneously with both food and therapeutic purposes (Hurrell & Albuquerque, 2012). This science provides the possibility of finding new medicines derived from plants (Heinrich, 2000). Ethnobotanical information is necessary to document plant life in any area, especially those which are unexplored. This preliminary taxonomic documentation, and the folk knowledge of indigenous people about the native flora, will serve as a guide for the next coming generations.

Sargodha district is one of the least studied regions of Pakistan regarding its ethnobotanical values. The objective of this study was to document the indigenous use of cultivated and wild trees of the study region.

MATERIALS AND METHODS

Sargodha district lies between 32° 51' N and 72° 40' 16 E in the northern part of Punjab, an east-central province of Pakistan. The climate is extreme; very hot in summer and very cold in winter. The hottest months are May, June and July

conocimiento indígena asociado, se puede usar como una base para el desarrollo de planes de manejo para la conservación y uso sustentable de esta flora en la región de estudio. Un manejo bien organizado es crítico para restaurar y conservar este recurso natural en peligro en el Distrito de Sargodha, Punjab, Pakistán. El inmenso valor que estos árboles tienen desde el punto de vista medicinal y como madera hace necesario promover su conservación, para simultáneamente aliviar la pobreza y mejorar el nivel socio-económico del área en estudio.

Palabras clave: Estudio etnobotánico; Plantas medicinales; Sargodha; Pakistán.

when temperatures reach 50 °C. Most of its area consists of smooth land, except some hilly areas (known as Kirana Hills) with an altitude of approximately 187 m.a.s.l. Two main rivers of Pakistan touch Sargodha, and make the land fertile. The River Jhelum flows on the western and northern sides, and the River Chenab flows on the eastern side of the city. The district includes villages and towns inhabited by a number of castes and ethnic groups (namely: Jats, Rajputs, Arayein, Qureshi, Cheenas, Awans, Tiwanas, Ranjhas, Sials, Gondals, Bhattis, Khokhar, Balochs, Kumhars, Naaii, etc.), each with its own religious, cultural and social traditions. The Sargodha district and its surrounding areas mainly constitute fertile and irrigated land. There is a rich diversity of cultivated and wild trees throughout the area. Local inhabitants of the area are very much close to this natural tree richness for their daily uses. There are diverse ethnic groups in the area having rich indigenous knowledge about the use of trees especially for medicines, non-timber forest products (NTFPs), fuel wood, timber, thatching and roofing, etc. In other parts of the country a lot of work has been reported by many other workers, particularly the documentation of indigenous uses of plants. In the Sargodha District, some studies have been conducted on trees, but their ethnobotanical importance has been neglected so far.

Field work was carried out in 2010-2013, working plan was prepared according to the life forms of the plants, and season of utilization of plant products by the local people. Several field trips were arranged for collecting the trees, especially the wild ones. Ethnobotanical information was collected through semi-structured interviews as described by Cotton (1996). Collected plants were dried, pressed and mounted properly following Carter et al. (2007). Plants were identified with help of the Flora of Pakistan (Nasir & Ali, 1970-1995; Stewart, 1972) and available literature. The voucher specimens were prepared and deposited in the Herbarium of the Department of Botany, University of Sargodha, Sargodha, Pakistan for future reference.

RESULTS AND DISCUSSION

In the study, 100 tree species (6 gymnosperms, 94 angiosperms) belonging to 77 genera (6 gymnosperms, 71 angiosperms)

sperms) and 39 families (4 gymnosperms, 35 angiosperms) were documented. Out of the 39 families, the Fabaceae ranked first with 19 tree species, followed by the Moraceae (12 species), Areaceae (5 species) and Bignoniaceae & Apocynaceae (4 species each). The flourishing of exotic tree species from the families Bignoniaceae, Boraginaceae, Cupressaceae, Ebenaceae, Platanaceae, Proteaceae, Putranjivaceae and Sapotaceae, although represented by a single or a few trees, was quite interesting. This is because they acclimated in the study region in spite of their strange habitat.

Most tree species were of exotic origin and showed multiple uses. An inventory of the ethnobotanical use of these tree species was prepared, and it is shown in Table 1 together with their family name, voucher number (collected by Erum), vernacular name and their traditional uses.

Ethnobotanical knowledge is transmitted from one generation to next. However, this knowledge is liable to be lost

under the influence of modernization and rapid urbanization, expansion of agriculture and acculturation of indigenous people (Dixit & Pandey, 1984). Life on planet earth is possible due to plants. Plants play a vital role in the behavior and mental resurgence of people. In Pakistan, there are about 1500 species of medicinal plants that are vital to cure various human ailments (Chaudhary, 1961). In Pakistan, there are more than 430 tree species, distributed over 82 families and 226 genera. Out of these tree species, 22 belong to gymnosperms, distributed over 5 families and 11 genera (Stewart, 1972). Present data are the general results of the ethnobotanical survey conducted from March 2010 to September 2013. Recorded data reveal that there were a great diversity of life forms regarding tree species of the prevailing flora, represented by 100 tree species distributed over 39 families. Out of these tree species, 6 belong to gymnosperms, distributed over 4 families and 6 genera. Because of adverse climatic conditions and especially

Table 1. Documentation and ethnobotanical use of trees of Sargodha District, Pakistan.

Tabla 1. Documentación y uso etnobotánico de los árboles en el Distrito de Sargodha, Pakistán.

Sr No.	Species / Family Name / Voucher No.	Vernacular Name	Ethnobotanical Uses
1	<i>Acacia modesta</i> Wall. / Fabaceae / 60587	Phulahi	Young twigs are used as natural teeth cleaner and are best treatment of gummosis. Gum is best tonic. Timber; Fuel; apicultural plant.
2	<i>Acacia nilotica</i> (L.) Delile / Fabaceae / 60602	Kikar, Babool	Bark decoction is used to cure intestinal pains. Chewing of young leaves is quite effective against nausea. Young twigs are used as teeth cleaner and are used to cure gummosis and toothache. Pod's decoction is best expectorant. Forage of camels; timber; fuel; apicultural plant.
3	<i>Aegle marmelos</i> (L.) Corrêa. / Rutaceae / 60548	Bael Pathar	A confection of fruit is used as an effective remedy of tuberculosis. Near Hindus, the tree is very sacred. Pulp juice powder is used as treatment of rheumatism especially for backache. Powder of dried leaves is used in the treatment of diabetes; ornamental; best apicultural plant.
4	<i>Albizia lebbek</i> (L.) Benth. / Fabaceae / 60604	Kala Shrin	Stem is astringent, anti-allergic and cardio tonic. Decoction of the leaves is useful against diarrhea. Seeds are aphrodisiac; ornamental; fuel; apicultural plant. A spoon of powdered seeds taken along with water early in the morning for three weeks is best remedy of diabetes.
5	<i>Albizia procera</i> (Roxb.) Benth. / Fabaceae / 60581	Safed shrin	Plant possesses insecticidal properties; ornamental; apicultural plant.
6	<i>Alstonia scholaris</i> (L.) R.Br. / Apocynaceae / 60555	Alstonia	Young leaves roasted and then their paste as poultice is useful to ulcers. Decoction of bark is useful treatment of chronic dysentery and diarrhea, while decoction of bark, used as green tea, is effective remedy of malaria; ornamental.
7	<i>Araucaria cunninghamii</i> Aiton ex A. Cunn. / Araucariaceae / 60436	Araucaria	Ornamental.
8	<i>Azadirachta indica</i> A. Juss. / Meliaceae / 60595	Neem	Seeds are anthelmintic, antifungal and antibacterial. Branches are chewed for cleaning teeth. Fruit is anti-diabetic. Infusion of leaves is used against chronic malaria. Fruits along with water are taken to cure piles. Smoke of leaves is effective against chicken pox; ornamental.
9	<i>Bauhinia purpurea</i> L. / Fabaceae / 60567	Gulabi kachnar	Root is carminative; bark is astringent and flowers are laxative in nature. Decoction of root is useful to wash ulcers. Floral buds along with minced meat are cooked as delicious dish that is effective to lower the blood sugar level; ornamental.
10	<i>Bauhinia variegata</i> L. / Fabaceae / 60568	Safaid Kachnar	Bark is alterative. Root and flower are used as an antidote to snake bite. Juice of flowers is used for diarrhoea and dysentery. Root decoction of is used to treat dyspepsia. Infusion of flower is used as best laxative; ornamental.

Sr No.	Species / Family Name / Voucher No.	Vernacular Name	Ethnobotanical Uses
11	<i>Bombax ceiba</i> L. / Malvaceae / 60563	Simbal	Gum is aphrodisiac in nature as well as has cooling effect and is effective against malaria and acute dysentery. Decoction of flowers is used to treat hemorrhoids. Bark is tonic. Seeds are used as a treatment of gonorrhoea. Decoction of young fruit is effective to remove kidney calculus; fuel; ornamental.
12	<i>Broussonetia papyrifera</i> (L.) Vent. / Moraceae / 60610	Kagazi toot	Bark has haemostatic nature. Leaf juice is diaphoretic. Root is cooked with other foods as a galactagogue
13	<i>Butea monosperma</i> (Lam.) Taub. / Fabaceae / 60569	Dhak	Gum is used to treat diarrhoea and dysentery. Infusion or decoction of gum is effective against rectal anemia. Powdered seeds mixed in lemon juice are used to treat skin disorders like pimples, ring worm and even piles. Seeds powder is also used to cure chronic wounds. Infusion or decoction of leaves is effective against leucorrhoea. Leaves are useful to cure diabetes. Leaves decoction is also used as mouth wash; ornamental.
14	<i>Callistemon viminalis</i> (Sol. ex Gaertn.) G. Don. / Myrtaceae / 60617	Bottle brush	Ornamental; apicultural plant.
15	<i>Capparis decidua</i> (Forssk.) Edgew. / Capparaceae / 60573	Karein	Bark's decoction is effective against bronchitis. Fruit is astringent in nature and un-ripened fruit is frequently used in pickles; fuel; timber; best apicultural plant; best fuel; wood is used to make agricultural tools.
16	<i>Caryota urens</i> L. / Arecaceae / 60637	Sago palm	Young leaves are sweet and have cooling effect and are useful to treat gall bladder stones. The pulp of the fruit is good remedy of hyperplasia and fatigue. A paste made from the nut is good for migraine; ornamental.
17	<i>Cassia fistula</i> L. / Fabaceae / 60570	Gurr di nail	Fruit pulp is laxative and purgative and useful treatment of infant's constipation, colic, nausea and flatulence. Root smoke is inhaled to treat cold. Leaves decoction is effective remedy of cold and bronchitis; ornamental.
18	<i>Casuarina equisetifolia</i> L. / Casuarinaceae / 60575	Casuarina	A decoction from the astringent bark has been used as a remedy for diarrhoea, sore throat, cough and swellings; ornamental.
19	<i>Celtis australis</i> L. / Cannabaceae / 60634	Karr	Fruit is useful in amenorrhoea; bark is used as remedy for urticaria and as poultice for swellings and also as a treatment in epilepsy; ornamental.
20	<i>Ceratonia siliqua</i> L. / Fabaceae / 60559	Carob	Fruit is used as aphrodisiac in the form of decoction; ornamental.
21	<i>Conocarpus erectus</i> L. / Combretaceae		Wind breaker; fodder; ornamental.
22	<i>Cordia dichotoma</i> G. Frost. / Boraginaceae / 60565	Lasura	Bark serves as febrifuge. Dried fruit as expectorant and its decoction is quite effective against cough and chest ailments. An infusion of the bark is used as gargle. Bark is rubbed on teeth to strengthen them; ornamental.
23	<i>Cordia myxa</i> C.B. Clarke / Boraginaceae / 60566	Lasuri	Mucilaginous pulp is demulcent and anthelmintic. Powdered bark is applied to skin in case of broken bone before a plaster is applied to improve healing. Bark juice together with coconut oil is taken to treat colic; from un-ripened best kind of pickles is prepared; ornamental.
24	<i>Cupressus sempervirens</i> L. / Cupressaceae / 60549	Saroo	Fruit and wood are anthelmintic and astringent; ornamental.
25	<i>Cycas revoluta</i> Thunb. / Cycadaceae / 60590	English palm	Ornamental.
26	<i>Dalbergia sissoo</i> Roxb. / Fabaceae / 60606	Shisham, Tahli	Powdered bark is used to cure gonorrhoea. Leaf juice for eye ailments. Wood is used to cure scabies. It is useful against acne; best timber plant; fuel.
27	<i>Delonix regia</i> (Bojer) Raf. / Fabaceae / 60571	Gul -e- mohr	Ornamental; useful apicultural plant.
28	<i>Dendrocalamus hamiltonii</i> Nees & Arn ex. Munro / Poaceae / 60594	Bans	Used in thatching, different domestic utility articles are formed it; ornamental.

Sr No.	Species / Family Name / Voucher No.	Vernacular Name	Ethnobotanical Uses
29	<i>Dendrocalamus strictus</i> (Roxb.) Nees / Poaceae / 60564	Baid	Ornamental; timber; used for making chair, sofas; hedge plant.
30	<i>Diospyros malabarica</i> (Desr.) Kostel. [Syn. <i>D. peregrina</i> (Gaertn.) Gurke / Ebenaceae / 60578	Jangli lokat / Gab	Ornamental; bark is depurative, febrifuge, anti-inflammatory. Leaves are laxative. Flowers are aphrodisiac and diuretic; fruit are anti-diabetic.
31	<i>Dyopsis decaryi</i> (Jum.) Beentje & J. Dransf. / Arecaceae / 60638	Chinese palm	Ornamental; leaves are used for thatching. Fruits are edible.
32	<i>Ehretia acuminata</i> R. Br. / Boragi- naceae / 60435	Jangli kali mirch	Usually grown in gardens as ornamental tree; bark decoction is used to cure fever.
33	<i>Erythrina subrosa</i> Roxb. / Faba- ceae / 60623	Gul-e- nashtar	Ornamental; Bark is laxative and febrifuge; leaves are used as cathartic and galactagogue.
34	<i>Eucalyptus camaldulensis</i> Dehnh. / Myrtaceae / 60618	Sufeda	Leaves decoction along with sugar are best treatment of cold and flu; ornamental.
35	<i>Euphorbia tirucalli</i> L. / Euphor- biaceae / 60579	Pencil tree	Wood decoction is quite effective against leprosy and paralysis of the hands and feet after childbirth; ornamental.
36	<i>Ficus auriculata</i> Lour. / Moraceae / 60603	Maxican fig	Ornamental.
37	<i>Ficus benjamina</i> L. / Moraceae/60434	Weeping fig	Ornamental.
38	<i>Ficus benghalensis</i> L./ Moraceae / 60611	Borrh	Bark is astringent to bowels, latex is aphrodisiac also useful in dysentery and inflammation of liver; ornamental.
39	<i>Ficus elastica</i> Roxb. ex Hornem. / Moraceae / 60605	Rubber plant	Ornamental.
40	<i>Ficus palmata</i> Forssk. / Moraceae / 60619	Anjeer	Dried fruit are tonic and laxative and are effective treatment of constipation and pile. Along with milk, enhances sexual power; ornamental.
41	<i>Ficus racemosa</i> L. / Moraceae / 60433	Gularrh	Galls of the tree are coked as delicious dish and are best treatment of leucorrhoea; decoction of bark is used as gargle; ornamental.
42	<i>Ficus religiosa</i> L. (Erum 60612) / Moraceae / 60432	Peepal	Tender leaves mixed with coriander leaves and sugar are used against dysentery. Infusion of leaves is effective against palpitation of heart and cardiac weakness; fruit edible; ornamental.
43	<i>Ficus virens</i> Aiton / Moraceae / 60628	Pilkan	Ornamental.
44	<i>Gmelina arborea</i> Roxb. / Lamiac- eae / 60636	Kumbar	Fruit is edible. Juice of young leaves is useful against gonorrhoea; roots are effective remedy for epilepsy; fruit decoction is used to cure fever. Best bee keeping plant; best quality wood for furniture; timber; ornamental.
45	<i>Grevillea robusta</i> A. Cunn. ex R. Br. / Proteaceae / 60641	Silver baloot	Ornamental plant; best bee keeping plant.
46	<i>Grewia asiatica</i> L. / Tiliaceae / 60633	Falsa	Fruit has cooling nature and its juice is quite effective against jaundice. Decoction of leaves also have cooling effect. The concentrated paste is applied to cure joint pains; ornamental.
47	<i>Haplophragma adenophyllum</i> (Wall. ex G. Don) Dop / Bigno- niaceae / 60561	Maror phalli	Used for furniture and ornamental purposes.
48	<i>Jacaranda mimosifolia</i> D. Don. / Bignoniaceae/ 60607	Nilli gul-e- mohr	Ornamental.

Sr No.	Species / Family Name / Voucher No.	Vernacular Name	Ethnobotanical Uses
49	<i>Kigelia africana</i> (Lam.) Benth. / Bignoniaceae / 60642	Gul-e-fanoos	Decoction of bark is useful treatment of male sexual impotency. Concoction of fruit along with lime is taken to treat rheumatism, diabetes while infusion of root or bark is effective remedy against pneumonia. Fruit powder is effective against leprosy, syphilis and skin cancer, fruit is aphrodisiac; powdered fruit is quite useful in healing ulcerous wounds; ornamental.
50	<i>Lagerstroemia indica</i> L. / Lythraceae / 60592	Lagestomia	Tea of leaves is therapeutic against ailments such as diabetes. Fresh leaves are used as emergency tincture for wounds. Leaves are diuretic and purgative; ornamental.
51	<i>Lagerstroemia speciosa</i> (L.) Pers. / Lythraceae / 60593	Legestomia tree	Leaves are purgative, diuretic and febrifuge; ornamental.
52	<i>Leucaena leucocephala</i> (Lam.) de Wit. / Fabaceae / 60431	Ipil Ipil / Kikar-shareen	Fuel; fodder.
53	<i>Livistona chinensis</i> (Jacq.) R.Br. ex Mart. / Areaceae / 60639	Fan palm	Ornamental cultivated; powdered fruit is effective against the prostrate gland inflammation; ornamental.
54	<i>Magnolia grandiflora</i> L. / Magnoliaceae / 60429	Bara champa	Ornamental.
55	<i>Mangifera indica</i> L. / Anacardiaceae / 60552	Aam	Fruit is laxative. Kernel decoction and powder are used as vermifuge and as astringent in diarrhea. Decoction of root is considered diuretic. Hot decoction is used as mouthwash. Juice of leaves for dysentery. Powdered dried leaves are useful for diabetes; ornamental.
56	<i>Manilkara hexandra</i> (Roxb.) Dubard / Sapotaceae / 60644	Khirni	Fruit is delicious and edible. Stem bark decoction is effectively used against diarrhea and dysentery; ornamental.
57	<i>Manilkara zapota</i> (L.) P. Royen / Sapotaceae / 60645	Cheekoo	Fruit is very delicious with laxative nature. Leave decoction is effective against fever. Seeds are antipyretic and diuretic in nature. Fruit when unripe is used for treatment of diarrhea and dysentery; ornamental.
58	<i>Melia azedarach</i> L. / Meliaceae / 60598	Dhrek	Leaves are anthelmintic and diuretic in nature. Leaves are used as insect repellent in wheat. Seed oil is antiseptic and is used for malaria fever and leprosy. Seed pulp is used as an ointment for destroying lice. Fruit pulp is an excellent worm repellent; ornamental.
59	<i>Millettia pinnata</i> (L.) Panigrahi / Fabaceae / 60646	Sukhchain	Seed oil is antiseptic and analgesic; blood purifier. In children, the seed powder is given in whooping cough for quick relief. Bath of the bark is effective for the patients of arthritis. Paste of seeds stimulates the glandular and scrotal swellings; twigs serve as best teeth cleaner; ornamental.
60	<i>Mimusops elengi</i> L. / Sapotaceae / 60647	Maulsari	Flower extract is tonic for brain. Also serve as perfume. Chewing of fruit is quite effective for any kind of teeth ailments. Bark is used to treat leucorrhea; ornamental.
61	<i>Moringa oleifera</i> Lam. / Moringaceae / 60616	Sohanjna	Floral buds along with minced meat are cooked as delicious dish that is effective treatment against diabetes and bladder stone. Seeds are antibacterial and antiviral; ornamental.
62	<i>Morus alba</i> L. / Moraceae / 60613	Safaid toot	Fruit is laxative. Fruit extract is best expectorant having antibacterial and fungicidal activity; timber; fuel; ornamental.
63	<i>Morus macroura</i> Miq. / Moraceae / 60614	Shah toot	Fruit is laxative. Fruit extract is best expectorant having antibacterial and fungicidal activity; timber; fuel; ornamental
64	<i>Morus nigra</i> L. / Moraceae / 60615	Toot siah	Fruit is laxative. Fruit extract is best expectorant having antibacterial and fungicidal activity; timber; fuel; ornamental.
65	<i>Nyctanthes arbor-tristis</i> L. / Oleaceae / 60649	Harsinghar	Infusion of leaves is effective against piles. Juice of leaves is good as laxative for infants; ornamental.
66	<i>Olea ferruginea</i> Royle / Oleaceae / 60428	Kahu	Fruit are anthelmintic; fuel; tool handles; construction.

Sr No.	Species / Family Name / Voucher No.	Vernacular Name	Ethnobotanical Uses
67	<i>Parkinsonia aculeata</i> L. / Fabaceae / 60582	Vilayati kikar	Ornamental; fuel; grown for the purpose of erosion control.
68	<i>Phoenix dactylifera</i> L. / Arecaceae / 60650	Khajoor	Fruit is edible, tonic, aphrodisiac, expectorant and digestive. Fruit along with milk is effective treatment of debility and gonorrhoea; ornamental.
69	<i>Phyllanthus emblica</i> L. / Phyllanthaceae / 60651	Amla	Ornamental; fruit is edible with laxative properties.
70	<i>Pinus longifolia</i> Roxb. ex Lamb. / Pinaceae / 60550	Chir	Wood is used as timber; ornamental.
71	<i>Platanus orientalis</i> L./Platanaceae / 60420	Chinar	Ornamental.
72	<i>Platyclusus orientalis</i> (L.) Franco / Cupressaceae / 60652	Mor pankh	Ornamental.
73	<i>Plumeria obtusa</i> L. / Apocynaceae / 60556	Gul-e-cheen	Decoction of bark is used as purgative. Mix the latex with coconut oil, warm and apply on affected area for the treatment of arthritis, rheumatism, skin lesions. Infusion of leaves is used for asthma; ornamental with fragrant white flowers.
74	<i>Plumeria rubra</i> L. / Apocynaceae / 60557	Red Gul-e-cheen	Latex is used to treat leprosy. Bark and leaves are used to treat abdominal tumors, inflammations, and rheumatism and skin diseases. Flower and shoot are used for the treatment of malaria; decoction of bark is effective against venereal affection; ornamental with red flowers.
75	<i>Polyalthia longifolia</i> (Sonn.) Thwaites. / Annonaceae / 60654	Ulta ashok	Ornamental.
76	<i>Populus nigra</i> L. / Salicaceae / 60628	Poplar	Grown along canal banks and water ways to control water logging; fuel; ornamental.
77	<i>Prosopis cineraria</i> (L.) Druce / Fabaceae / 60609	Jand, Jandi	Bark exhibits anti-inflammatory properties. Smoke of the leaf is good for ear troubles. Timber; fuel; wood is used to make agricultural implements.
78	<i>Prosopis glandulosa</i> Torr. / Fabaceae / 60630	Mesquite	Fuel
79	<i>Prosopis juliflora</i> (Sw.) DC. / Fabaceae / 60608	Angraizi kikar	Used as fuel. Poultice of leaves is effective against red ant stings. Decoction of pods is taken against animal stings; hedges; pods are eaten by goats very keenly as fodder.
80	<i>Pterospermum acertifolium</i> (L.) Willd. / Malvaceae / 60631	Kanak champa	Flower is used for inflammation, ulcers, blood problems and even tumors. Dried flower powder is mixed with coconut oil (<i>Cocos nucifera</i>) and applied on head for killing of hair lice; ornamental.
81	<i>Putranjiva roxburghii</i> Wall. / Putranjivaceae / 60580	Jia puta	Seeds are aphrodisiac; if taken by infertile woman, their infertility is broken. A garland of its fruit is put around neck of pregnant lady to produce healthy baby; ornamental.
82	<i>Roystonea regia</i> (Kunth.) O.F. Cook / Arecaceae / 60658	Royal plam	Ornamental.
83	<i>Salix babylonica</i> L. / Salicaceae / 60629	Willow tree	Ornamental.
84	<i>Salix tetrasperma</i> Roxb. / Salicaceae / 60425	Lela/ Baid	Ornamental.
85	<i>Salvadora oleoides</i> Decne / Salvadoraceae / 60424	Peelo	Fruit extract is used to cure enlarge spleen; leaves decoction is used to treat cough; root bark is vesicant but used as best teeth cleaner; fuel; fodder.
86	<i>Schinus molle</i> L. / Anacardiaceae / 60553	False pepper	Leaf decoction is useful for cold, hypertension, depression and irregular heart beat. Bark tea is laxative, bark and leaf tea is stimulant and antidepressant. Decoction of dried leaves is useful for menstrual disorders; ornamental.

Sr No.	Species / Family Name / Voucher No.	Vernacular Name	Ethnobotanical Uses
87	<i>Sapindus trifoliatus</i> L. / Sapindaceae / 60423	Reetha	Fruit juice is used as cleaning agent; ornamental.
88	<i>Syzygium cumini</i> (L.) Skeels. / Myrtaceae / 60621	Jaman	Fruit is stomachic and has cooling properties. Bark ashes are effective against local inflammations. Powdered seeds taken thrice a day are useful against diabetes; ornamental.
89	<i>Tamarindus indica</i> L. / Fabaceae / 60572	Imli	Decoction of ash is used for colic, indigestion and as gargle for sore throats. Decoction of fresh stem bark and leaves together with potash is effective against jaundice.
90	<i>Tamarix aphylla</i> (L.) H. Karst. / Tamaricaceae / 60632	Khaggal	Powdered bark in combination with oil and canola is used as aphrodisiac. Smoke of leaves is effective against measles; fuel; furniture; timber; hedge plant.
91	<i>Tamarix dioica</i> Roxb. ex Roth. / Tamaricaceae / 60659	Khaggal	Smoke of leaves is effective against measles; fuel; furniture; timber; hedges; young shoots are used as broom.
92	<i>Taxodium distichum</i> (L.) Rich. / Cupressaceae / 60660	Taxodium	Ornamental.
93	<i>Tecomella undulata</i> (Sm.) Seem. / Bignoniaceae / 60562	Desert teak	Stem extract is antibacterial. Bark is cardio-tonic. Flower is used to treat hepatitis, seeds are used against abscesses. Bark is used for the treatment of syphilis, urinary disorders, and enlargement of spleen, gonorrhoea, leucorrhoea and liver diseases.
94	<i>Tectona grandis</i> L.f. / Lamiaceae / 60661	Sagwan	Roots are antidote to snake bite. Flower's decoction is useful for bronchitis; timber; wood is best for cabinet work; ornamental; apicultural plant.
95	<i>Terminalia arjuna</i> (Roxb. Ex DC.) Wight & Arn. / Combretaceae / 60576	Arjun	Bark infusion left throughout night and then its decoction taken early in the morning is useful against any kind of cardiac problems; ornamental; fodder for goats.
96	<i>Terminalia bellerica</i> (Gaertn.) Roxb. / Combretaceae / 60662	Baherra	Fruit pulp against chest and throat infections and also for piles; ornamental.
97	<i>Thevetia peruviana</i> (Pers.) K. Schum. / Apocynaceae / 60558	Yellow kanair	Seed are used as purgative. Leaf juice is used as an eye drop and ear drop and to cure violent headaches. An infusion of root is used against snake bite; ornamental.
98	<i>Toona ciliata</i> M. Roem. / Meliaceae / 60597	Tun	Bark is crushed and the paste is applied to cure ulcers. Chewing of flower like bubble is effective to promote menstrual discharges. Decoction of bark is used as a gargle. Dried leaf powder along with table salt is taken orally with water once daily for treating diabetes; ornamental; apicultural plant.
99	<i>Zizyphus mauritiana</i> Lam. / Rhamnaceae / 60625	Beri	Decoction of root is used to cure fever; dried ripe fruit is used as mild laxative. Decoction of root is emmenagogue. An infusion of flowers is used as eye lotion; best for apiculture; fodder for goats; fuel; timber; dried shoots are used as hedges.
100	<i>Zizyphus nummularia</i> (Burm.f.) Whigt. & Arn / Rhamnaceae / 60625	Karkinna	Fruit is eaten that is tonic and laxative in nature. Best bee keeping plant. Wood is used for making agricultural tools. Also as best fuel. Leaves are used as fodder for goats that are quite nutritious; hedge plant.

low altitude (187 m above the sea level), gymnosperms are found here in meager number, while angiosperms constitute the dominate tree flora of the region with the family Fabaceae at the top with 19 tree species. Plants of this family have ethnobotanical uses in all aspects of life, e.g., *Dalbergia sissoo*, *Acacia modesta*, *Acacia nilotica* and *Albizia lebeck* are used as best timber plant and contributes to a huge income of the area. *Delonix regia*, *Cassia fistula*, *Erythrina subrosa*, *Butea monosperma*, *Bauhinia variegata* and *Bauhinia purpurea* of this

family are included among the tree species that are unique in their ornamental value. Fabaceae trees species like *Albizia lebeck* (cure diabetes), *Cassia fistula* (cure constipation), *Butea monosperma* (diarrhea, dysentery, diabetes, leucorrhoea, skin disorders, piles and healing of chronic wounds) and *Milletia pinnata* (cure whooping cough) have immense medicinal value as well (Table 1). The Moraceae family ranks second in the area with representation of 12 tree species, all tree species of this family are very well acclimated to Sargodha district.





Thevetia peruviana



Haplophragma adenophyllum



Delonix regia



Mimusops elengi

Most tree species of Moraceae are flourishing here as ornamentals like *Ficus benjamina*, *Ficus virens*, *Ficus religiosa* etc., but species like *Ficus benghalensis*, *Morus alba* and *Morus nigra* are known for their best medicinal value (Table 1).

The genus *Kigelia* belongs to the family Bignoniaceae with about 120 genera and 800 species, mostly native to tropical Africa (Ali & Nasir, 1990-1991). *Kigelia africana* (Gul-e- Fanoos) is included among those tree species that are quite rare in Pakistan. However, trees here are waiting for their extinction due to cutting and misuse despite they are useful to treat various human ailments (e.g., leprosy, skin cancer, diabetes, pneumonia, malaria and rheumatism). *Kigelia africana* (Gul-e- Fanoos) is a worth looking ornamental species because of having charming chandelier-like inflorescences, and it also provides fruits up to 2 ½ kg/ fruit; additionally, it is a medicinal plant species.

In the family Euphorbiaceae, tree species are uncommon (Ali & Qaiser, 1993-2009), and a representative of this family in this study is *Putranjiva roxburghii* (Jia puta), now placed in the family Putranjivaceae (Table 1). This evergreen tree species not only makes the eyes look greenish, but also its seeds are ethnobotanically used as a best treatment against male impotency; this is why it is named as Jia Puta in Hindi.



Mimusops elengi fruit

This tree species is also of exotic origin, and was brought here by the Hindus and English plant lovers, becoming fully acclimated. These tree species were once the sign of beauty of the area; they are now struggling for their survival, and waiting for the day when their name is recognized in papers (Sheikh, 1993).

Sacred tree species here are *Aegle marmelos* (Pathar Bael) and *Ficus religiosa* (Peepal) near Hindus and Muslims. The Sapotaceae family is represented by three tree species: *Manilkara hexan-*

dra (Khirmi), *Manilkara zapota* (Chikoo) and *Mimusops elengi* (Maulsari). This is considered a rare plant family in Pakistan (Ali & Qaiser, 1993-2009). These tree species not only have fragrant flowers and are grown as ornamentals, but also known for their delicious fruits. See Table 1 for medicinal value of these species. The family Combretaceae is represented by three tree species [i.e., *Conocarpus erectus*, *Terminalia arjuna* (Arjun) and *Terminalia bellerica* (Baherra)], which are included among the most adapted and flourishing tree species here. *Conocarpus erectus* is a beautiful evergreen hedge tree. The bark of *Terminalia arjuna* (Arjun) is used as the best treatment of all sorts of cardiac problems. *Terminalia bellerica* (Baherra) is included among the gigantic trees whose fruits are eaten as an alternative of *Juglan regia* (Akhrot) and is a beautiful ornamental tree; its fruit pulp is a useful treatment of throat and chest infections. The Meliaceae family contributes to the richness of the flora of the region by three tree species. Sargodha soil and habitat are perhaps the most suitable for *Azadirachta indica* (neem) in whole Pakistan. Lush green trees can be seen throughout the district. This tree species is not only ornamental, but it may be included among the most medicinally-demanded tree species. If proper amount of work is concentrated in this species, a huge amount of money can be earned.

Topographic and demographic conditions of Sargodha district are not suitable for Gymnosperms. Only six gymnosperm species occur here. Among them, *Taxodium distichum* is unique because of its unusual occurrence here. *Pinus longifolia* is the representative of gymnosperms that is flourishing here as an ornamental tree.

Salvadora oleoides, *Tamarix aphylla*, *Tamarix dioica*, *Prosopis cineraria*, *Kigelia africana*, *Butea monosperma*, *Ficus recemosa*, *Nyctanthes arbor-tristis*, *Manilkara zapota* and *Terminalia bellerica* are included among those valuable tree species whose populations are rapidly declining. This is because of their misuse and over-exploitation. Proper management and strategies are urgently needed to conserve this unique flora. The documentation of knowledge is necessary for sustainable use of plants. The results of this ethnobotanical research will further serve as a guide to study biodiversity, conservation and community development (see Martin, 1995).

This paper will contribute to the awareness among the people about the importance of conserving the flora shown in Table 1. Therefore, suitable conservation strategies can be made in this regard, and plant species which are at the verge of extinction due to misuse of people can be conserved. So that next coming generations can use these plants to fulfill their basic needs.

Lack of people awareness about the botanical use of this precious tree flora led to a decline in their population. Many workers also reported ethnobotanical documentation of plant resources in various parts of the country including Punjab salt range, Himalayan and temperate ranges. Trees included in Table 1 could be cultivated along road sides, railway tracks and barren lands. A well-organized management is an urgent need to conserve and/or restore this natural resource of the area.

The populations of those tree species should be promoted because they have an immense medicinal and timber value, and their appropriate use will contribute to alleviate poverty and improve the socio-economic status of the area.

ACKNOWLEDGEMENTS

This study was supported by the Higher Education Commission of Pakistan (Project No. 20-1599/R&D/09 3007). The authors thank to an anonymous reviewer for his fruitful comments.

REFERENCES

- Ali, S.I. & Y.J. Nasir (eds.). (1989-1992). Flora of Pakistan. Islamabad, Pakistan.
- Ali, S.I. & Y.J. Nasir (eds.). (1990-1991). Flora of Pakistan. Islamabad, Pakistan.
- Ali, S.I. & M. Qaiser (eds.). (1993-2009). Flora of Pakistan. Islamabad, Pakistan.
- Badshah, L., F. Hussain & Z. Sher (2012). An overview of people plant interaction in the range land of District Tank, Pakistan. *Journal of Medicinal Plants Research* 6: 2820-2826.
- Carter, R., C.T. Bryson & S.J. Darbyshire (2007). Preparation and use of voucher specimens for documenting research in weed Science. *Weed Technology* 21: 1101-1108.
- Chaudhary, I.I. (1961). Distribution of some important medicinal plants of West Pakistan. *Pakistan Journal of Science & Research* 4: 207-211.
- Cotton, C.M. (1996). Ethnobotany: Principles and applications. John Wiley and Sons Ltd. Chichester, NY.
- Dixit, R.S. & H.C. Pandey (1984). Plants used in folk medicine in Jhansi and Lalitpur sections of Bundelkhand, Uttar Pradesh India. *International Journal of Crude Drugs Resources* 22: 47-50.
- Heinrich, M. (2000). Ethnobotany and its role in drug development. *Phytotherapy Research* 14: 479-488.
- Hurrell, J.A. & U.P. de Albuquerque (2012). Is Ethnobotany an Ecological Science? Steps towards a complex Ethnobotany. *Ethnobiology and Conservation* 1: 4.
- Martin, G.J. (1995). Ethnobotany, A people and plants conservation manual. Chapman and Hall London. New York. Tokyo. pp: 23-29.
- Nasir, E. & S.I. Ali (eds.) (1970-1995). Flora of West Pakistan and Kashmir. National Herbarium, Islamabad. pp: 1-150.
- Shah, M.A. (2005). Ethnomedicinal study of the plants of Tehsil Bhakkar, Punjab, Pakistan. *Ethnobotany* 17: 171-175.
- Sheikh, M.I. (1993). Trees of Pakistan. Winrock International Institute for Agricultural Development GOP-UAID. Pictorial Printers (Pvt.) Ltd., Islamabad, Pakistan.
- Singh, A. & P.K. Singh (2009). An ethnobotanical study of medicinal plants in Chandauli District of Uttar Pradesh, India. *Journal of Ethnopharmacology* 121: 324-329.
- Stewart, R.R. (1972). An annotated catalogue of the vascular plants of West Pakistan and Kashmir. In: E. Nasir & S.I. Ali (eds.). Flora of West Pakistan. Fakhari Printing Press, Karachi, Pakistan.