

## **ETHNO-BOTANICAL EXPLORATION OF PLANT SPECIES USED IN DISTRICT MANDI, HIMACHAL PRADESH (INDIA)**

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### **ABSTRACT**

A total of 167 species from 140 genera and 55 families were used by the inhabitants for various purposes. These include agriculture crops, cosmetics, dye, fencing, fibers, fuel, medicines, repellent, spices, timber, vegetables *etc.* The members of family Fabaceae has contributed the most followed by Poaceae, Rosaceae, Apiaceae, Lamiaceae *etc.* to meet the day to day requirements. Herbaceous species were most commonly used (38.92%) than trees (31.13%), shrubs (23.95%), climbers (5.38%) and lianas (0.59%). Majority of the plant species (94) were growing in their wild habitats. Maximum species (48) were cultivated as cereals followed by (28) timber, (25) condiments, (18) for grain protection, (17) for dyes *etc.*

**Keywords:** Agriculture, diversity, families, flora, timber, tools, wild

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### **INTRODUCTION**

Ethnobotany is an interdisciplinary science which deals with the use of plant species in cultural, social and economic aspects (Austin, 2004). The utilization of cultivated and wild plant species has formed a decisive bond between the inhabitants and local vegetation. An ethnobotanical survey accounts the floristic diversity and awareness of common people about their applications and conservation. Ethnobotanical knowledge has constructed a bridge between social and scientific inventions (Jain and Dam, 1979; Parada et al., 2009).

Himachal Pradesh is a mountainous state located in north-west India and comprised of 12 districts. District Mandi lies between 31°13'50" and 32°04'30"N latitude and between 76°37'20" and 77°23'15"E longitude. The average annual rainfall generally varies from place to place and is about 1331.50 mm (Central Ground Water Board, 2013). Maximum rainfall (about 63%) occurs in the monsoon season. Studies

related to the use of plants for various purposes have been carried out in various parts of the world (Bahru, et al., 2014; Parada, et al., 2011; Murad, et al., 2013; Ibrar, et al., 2007; Sharma and Pegu, 2011; Yadav et al., 2012; Kimondo, et al., 2015; Jost et al., 2016; Rai and Bhujel, 2007; Swarnkar and Katewa, 2008).

The use of plant diversity depends upon its availability in the area under investigation. Some species are growing in their wild habitats and easily available to the native without any cost. People have inherited the traditional knowledge related to the significance of plant species from their ancestors. This knowledge has not been fully documented and passed on through word of mouth from one generation to the next. Due to ongoing development activities and recent advancements in technologies, the dependence of people on plants has decreased. It has threatened the treasure of traditional knowledge which may be lost if not recorded well in time. Keeping this in

view, the present ethnobotanical survey has been conducted in district Mandi of Himachal Pradesh. Till date, ethnobotanical studies have not been carried out in detail for this area.

## MATERIAL AND METHODS

The present study has been undertaken in district Mandi having a total geographical area 3951km<sup>2</sup> which is 7.1% of the area of state. There are 10 tehsils in this district viz. Joginder Nagar, Lad Bharol, Padhar, Sarkaghat, Baldwara, Sunder Nagar, Mandi, Chachyot, Thunag and Karsog. Field surveys were conducted in 10 tehsils (selecting 10 villages in each tehsil) of district Mandi to collect the required information. Field visits were planned in such a way that it covers the whole district. The respondents were interacted by using a semi-structured questionnaire. The questionnaire was finalised according to the response of respondents. For the ease of data collection, village panchayat/ward members were contacted first. The aims and objectives of study were explained to the respondents who were selected randomly but above the age of 30 years. The interviews were conducted preferably in local dialect *i.e.* Mandyali and Hindi for the convenience of the respondents so that they can easily understand and discuss. They were interviewed for the use of plants for different aspects of ethnobotany such as cereals and other crops, condiments, cosmetics, drinks, dyes, fencing purposes, fibers, green manure, perfumery, piscicidal, repellents, grain protection, timber and miscellaneous. Information regarding local name of the plants, their habit, part used, mode of utilization were recorded. Field visits were undertaken with the local inhabitants to identify the plants. The photographs and specimens were compared with the floras and books (Chowdhary and Wadhwa, 1984; Dhaliwal and Sharma, 1999; Chauhan, 1999), online herbaria (Janaki Ammal Herbarium, Indian Institute of Integrative Medicine; Kew Herbarium

Catalogue-Royal Botanic Garden; Herbarium Kerala Forest Research Institute) and internet sites ([www.missouribotanicalgarden.org](http://www.missouribotanicalgarden.org); [www.flowersofindia.net](http://www.flowersofindia.net) and [www.theplantlist.org](http://www.theplantlist.org)). The identified species were later compared with specimens available in the herbarium of Department of Botany, Panjab University, Chandigarh and Herbal Garden and Herbarium, Research Institute in Indian System of Medicine, Joginder Nagar.

## RESULTS AND DISCUSSION

A total of 167 species (94 wild, 62 cultivated, four both wild as well as cultivated and seven purchased from the market) from 140 genera and 55 families were used for various ethnobotanical purposes. The botanical names, family, local names, habit, source and significance have been listed in Table 1. Majority of the documented species were herbaceous (38.92 %), followed by trees (31.13%), shrubs (23.95%) and climbers (5.38%). Lianas were represented by only one species (0.59%). The preference of herbs for medicinal purpose was likely due to their easy availability in the forests, waste and farm lands. Better knowledge and use of wild species revealed interaction of the respondents with nature (Nath and Khatri, 2010). Fabaceae was the most dominating family with 14 genera and 17 species, followed by Poaceae (12 genera, 12 species), Rosaceae (8 genera, 10 species), Apiaceae (8 genera, 8 species), Lamiaceae (7 genera, 8 species) *etc.*

The list of recorded species (167) includes: *Abelmoschus esculentus* (L.) Moench, *Abrus precatorius* L., *Acacia catechu* (L. f.) Willd., *Acacia nilotica* (L.) Delile, *Acorus calamus* L., *Aegle marmelos* (L.) Correa., *Aesculus indica* (Wall. ex Cambess.) Hook., *Agave americana* L., *Ageratina adenophora* (Spreng.) R. M. King & H. Rob., *Albizia chinensis* (Osbeck) Merr., *Albizia lebbeck* (L.) Benth., *Allium cepa* L., *Allium sativum* L., *Amaranthus cruentus* L., *Amaranthus hypochondriacus* L., *Amomum subulatum* Roxb., *Amorphophallus paeoniifolius*

(Dennst.) Nicolson, *Anethum graveolens* L., *Angelica glauca* Edgew., *Apium graveolens* L., *Azadirachta indica* A. Juss., *Bauhinia vahlii* Wight & Arn., *Benincasa hispida* (Thunb.) Cogn., *Berberis aristata* DC., *Berberis lycium* Royle, *Boenninghausenia albiflora* (Hook.) Rchb. ex Meisn., *Bombax ceiba* L., *Brassica juncea* (L.) Czern., *Brassica oleracea* var. *botrytis* L., *Brassica oleracea* var. *capitata* L., *Brassica oleracea* var. *italica* Plenck, *Brassica rapa* L., *Butea monosperma* (Lam.) Taub., *Calamagrostis pseudophragmites* (Haller f.) Koeler, *Calotropis procera* (Aiton) Dryand., *Cannabis sativa* L., *Capillipedium assimile* (Steud.) A. Camus, *Capsicum annuum* L., *Carissa spinarum* L., *Cassia fistula* L., *Cassia tora* (L.) Roxb., *Catunaregam spinosa* (Thunb.) Tirveng., *Celtis australis* L., *Chenopodium album* L., *Cicer arietinum* L., *Cinnamomum tamala* (Buch. –Ham.) T. Nees & Eberm., *Citrus limon* (L.) Osbeck, *Citrus pseudolimon* Tanaka, *Colebrookea oppositifolia* Sm., *Colocasia esculenta* (L.) Schott, *Coriandrum sativum* L., *Cotoneaster obtusus* Wall. ex Lindl., *Cucumis sativus* L., *Cucurbita maxima* Duchense, *Cucurbita pepo* var. *medullosa* Alef., *Curcuma longa* L., *Dalbergia sissoo* DC., *Dendrocalamus strictus* (Roxb.) Nees, *Diospyros kaki* L. f., *Dolichos biflorus* L., *Drepanostachyum falcatum* (Nees) Keng f., *Duranta erecta* L., *Ehretia acuminata* R. Br., *Elettaria cardamomum* (L.) Maton, *Eleusine coracana* (L.) Gaertn., *Elsholtzia fruticosa* (D. Don) Rehder, *Engelhardtia spicata* var. *integra* (Kurz) W. E. Manning ex Steenis, *Eucalyptus globulus* Labill., *Eulaliopsis binata* (Retz.) C. E. Hubb., *Euphorbia royleana* Boiss., *Fagopyrum acutatum* (Lehm.) Mansf. Ex K. Hammer, *Fagopyrum esculentum* Moench, *Falconeria insignis* Royle, *Ferula assa-foetida* L., *Ficus auriculata* Lour., *Foeniculum vulgare* Mill., *Gerbera gossypina* (Royle) Beauverd, *Girardinia diversifolia* (Link) Friis, *Glycine max* (L.) Merr., *Gossypium hirsutum* L., *Grewia optiva* J. R. Drumm. ex Burret, *Hedychium spicatum* Sm., *Hibiscus cannabinus* L., *Hordeum vulgare* L., *Impatiens balsamina* L., *Indigofera heterantha* Brandis, *Ipomoea carnea* Jacq., *Jatropha curcas* L., *Juglans regia* L., *Justicia adhatoda* L., *Lagenaria siceraria* (Molina) Standl., *Lawsonia inermis* L., *Lens culinaris* Medik., *Linum usitatissimum* L., *Litsea glutinosa* (Lour.) C. B. Rob., *Litsea monopetala* (Roxb.) Pers., *Lycopersicon esculentum* Mill., *Mallotus philippensis* (Lam.) Mull. Arg., *Malus domestica* Borkh., *Mangifera indica* L., *Melia azedarach* L., *Mentha arvensis* L., *Mentha longifolia* (L.) L., *Millettia extensa* (Benth.) Baker, *Mirabilis jalapa* L., *Momordica charantia* L., *Morus alba* L., *Morus serrata* Roxb., *Murraya koenigii* (L.) Spreng., *Myristica fragrans* Houtt., *Myrsine africana* L., *Ocimum basilicum* L., *Oryza sativa* L., *Persicaria hydropiper* (L.) Delarbe, *Phaseolus coccineus* L., *Phaseolus vulgaris* L., *Phoenix sylvestris* (L.) Roxb., *Pistacia chinensis* subsp. *integerrima* (J. L. Stewart ex Brandis) Rech. F., *Pisum sativum* L., *Plumbago zeylanica* L., *Populus ciliata* Wall. ex Royle, *Prinsepia utilis* Royle, *Prunus cerasoides* Buch.-Ham. ex D. Don, *Prunus domestica* L., *Prunus dulcis* (Mill.) D. A. Webb, *Punica granatum* L., *Pyrus pashia* Buch. –Ham. ex D. Don, *Quercus floribunda* Lindl. ex A. Camus, *Quercus incana* Bartram, *Quercus semecarpifolia* Sm., *Reinwardtia indica* Dumort., *Rhododendron arboreum* Sm., *Rosa moschata* Herrm., *Roylea cinerea* (D. Don) Baill., *Rubus ellipticus* Sm., *Saccharum officinarum* L., *Salix denticulata* Andersson, *Salix tetrasperma* Roxb., *Sapindus mukorossi* Gaertn., *Sarcococca pruniformis* Lindl., *Scutellaria scandens* D. Don, *Selinum vaginatum* C. B. Clarke, *Sesamum indicum* L., *Setaria glauca* (L.) P. Beauv., *Solanum melongena* L., *Solanum tuberosum* L., *Spiraea canescens* D. Don, *Syzygium aromaticum* (L.) Merr. & L. M. Perry, *Syzygium cumini* (L.) Skeels, *Tagetes minuta* L., *Tagetes patula* L., *Thymus linearis* Benth., *Toona ciliata* M. Roem., *Trachyspermum ammi* (L.) Sprague,

*Trigonella foenum-graceum* L., *Triticum aestivum* L., *Ulmus laevigata* Royle, *Valeriana hardwickii* Wall., *Vicia faba* L., *Vigna mungo* (L.) Hepper, *Vigna radiata* (L.) R. Wilczek, *Vigna unguiculata* (L.) Walp., *Vitex negundo* L., *Zanthoxylum armatum* DC., *Zea mays* L., *Zingiber officinale* Roscoe, *Ziziphus mauritiana* Lam.

### Cereals and Other Crops

A total of 48 crops are being cultivated in the study area. *Apium graveolens*, *Cucurbita pepo* var. *medullosa*, *Diospyros kaki* and *Malus domestica* were the famous cash crops of Karsog tehsil. These crops or their products were consumed as salad, fruit, popped, roasted, cooked *etc.* Besides their nutritive value, many of these plant species were used in traditional medicines. Such plant species were referred as nutraceuticals, functional foods and health foods (International Life Sciences Institute, 1998; Vaughan and Judd 2003; Trottier et al., 2009).

### Timber Species

There were 28 timber species which belongs to 22 genera and 17 families. Wood obtained from *Quercus floribunda*, *Q. incana* and *Q. semecarpifolia* was preferred in construction, furniture and to manufacture agricultural tools. Seven species (*Acacia catechu*, *A. nilotica*, *Syzygium cumini*, *Prunus cerasoides*, *Quercus incana*, *Grewia optiva* and *Pyrus pashia*) were used to manufacture ploughs, handles of different axes and sickles. The preferred use of these species may be due to their durability and resistance to insects.

### Spices and Condiments

A total of 25 species were used for flavoring and enhancement of aroma. *Angelica glauca*, *Cinnamomum tamala*, *Elsholtzia fruticosa*, *Murraya koenigii*, *Punica granatum* and *Thymus linearis* were growing wild whereas, *Mentha arvensis* was cultivated as well as wild in occurrence. Some of these were medicinal but not discussed here. Herbal tea was prepared from the leaves of *Cinnamomum tamala*, *Thymus linearis* and seeds of *Trachyspermum ammi*. The plant

species were used both in fresh as well as dry forms. Singh and Sundriyal (2003) reported the use of 23 spices in the treatment of 21 diseases by the ethnic groups of Manipur. Singh *et al.* (2012) also described the medicinal importance of 11 spices from India.

### Stored Grain Protection

The respondents have shared the use of 18 plant species from 17 genera and 14 families to protect the stored grains from the insects (beetles, moths and weevils). These were considered safe and preferred over the chemical control. Three species each of families Lamiaceae and Meliaceae were commonly used for this purpose. The use of Lamiaceae species may be due to their specific aroma. The species of families Lamiaceae, Meliaceae, Fabaceae and Euphorbiaceae had also been reported as grain protectants in previous studies (Mwine et al., 2011; Adebayo et al., 2014). *Coriandrum sativum*, *Eucalyptus globulus*, *Juglans regia* and *Mentha longifolia* are the most commonly used species. Leaves, fruits and rhizome of these species were used as such, crushed or in powder form. Species such as *Acorus calamus*, *Azadirachta indica*, *Curcuma longa*, *Capsicum annum*, *Eucalyptus globulus*, *Juglans regia*, *Mentha arvensis* and *Mentha longifolia* had been used for the same purpose in different parts of India (Thakur and Damitaand 2011; Mehta et al., 2012; Negi and Solanki, 2015). *Acorus calamus*, *Ageratina adenophora*, *Azadirachta indica*, *Capsicum annum*, *Coriandrum sativum*, *Curcuma longa*, *Eucalyptus globulus*, *Melia azeadarach*, *Mentha arvensis*, *Mentha longifolia*, *Murraya koenigii*, *Polygonum hydropiper* and *Vitex negundo* had been reported as insecticidal (Tewary, 2001; Li and Zou, 2001; Kundu et al., 2007; Kumar et al., 2009a; Iqbal et al., 2010; Manzoor et al., 2011; Rani and Devanand, 2011; Khani and Rahdari, 2012; Mishra, et al., 2012). *Juglans regia*, *Roylea cinerea*, *Toona ciliata* were widely used by the natives but experimental

evidences of their insecticidal properties are yet not known.

#### **Dyes/Color**

There were 17 plant species from 13 families that have dye or color yielding properties. Different plant parts contain special shades of dyes or color. Due to the availability of synthetic dyes, the use of plant based dyes has decreased. Kar and Borthakur (2008) enlisted 47 dye yielding plants in Assam which were used for dyeing fabrics. Most of the species were from family Euphorbiaceae. Sharma *et al.* (2012) recorded 46 dye yielding plant species in Garhwal, six of these species (*Adhatoda vasica*, *Berberis* sp., *Butea monosperma*, *Curcuma longa*, *Mallotus philippensis* and *Toona ciliata*) have also been used by natives of the present study. The use of same plant species for the common purpose by the people in different parts of the country suggest that ethnobotanical knowledge has travelled a long way.

#### **Fencing**

A total of 17 plant species or their different parts were used for hedge or making fence around the houses and agricultural crops to prevent the entry of livestock, cattles or wild animals. Due to thick leaves and spines at the edges of leaves, *Agave americana* was preferred for this purpose. The enlisted species were effective because of the presence of spines, thorns, profuse branching and thick foliages that can act as mechanical barrier. The plantation of *Jatropha curcas*, *Morus alba* and *Vitex negundo* around the field prevent soil erosion due to strong soil binding properties of their roots. Borkataki *et al.* (2008) discussed the use of 27 plant species for fencing around teagarden and ex-teagarden communities of Nagaon district of Assam. Five of these species *i. e.* *Agave americana*, *Duranta erecta*, *Ipomoea carnea*, *Jatropha curcas* and *Vitex negundo* were also recorded during the present study. Similarly, Bhattarai *et al.* (2007) reported *Berberis aristata* and *Berberis lycium*, for the same purpose which were to the tune of our findings. The difference in number of

species used for the same purpose at different locations is likely be due to their requirements and availability.

#### **Green Manure**

Selected plant species were cultivated as green manure to increase the productivity of soil. The collected leaves were used as bedding for domestic animals and then directly used as manure or allowed to decompose with cow dung before use. The cow dung was also mixed in soil individually as manure. Presently, 16 plant species were used as manure in agricultural practices. Easily decomposable leaves and twigs were preferred for this purpose. All these species were wild except *Mangifera indica*. The selection of species depends upon the availability in a particular area. The leaves of *Quercus incana* and *Justicia adhatoda* were most commonly used. Kannan *et al.* (2016) suggested the use of 13 plant species as green manure in Salem district (Tamil Nadu). The species selected for this purpose bears larger leaves without spines or thorns.

#### **Cosmetics**

Present survey has revealed the use of 14 plant species (individually or in combinations) from 12 families in various cosmetic preparations. Different plant parts such as rhizome, leaves, twigs, fruits, seeds and latex were used. The use of herbal cosmetics has decreased gradually because of the availability of alternative products in the market. *Citrus pseudolimon* and *Curcuma longa* were mixed to prepare red pigments called 'Sindhur'. It is useful in various cultural and religious ceremonies. It was also prepared from the glandular hairs on fruits of *Mallotus philippensis*. These preparations were considered pure and sacred. 'Kohl' is other famous preparation made from different parts of *Euphorbia royleana*, *Myristica fragrans* and *Prunus dulcis*. It is considered good for eyesight with no side effects.

#### **Piscicidal Plant Species**

Nine wild plant species belonging to nine genera and eight families were categorised as piscicidal. Leaves from seven species were

most commonly used for this purpose. Other parts such as fruits, seeds and latex were also effective. The practice of using plant as piscicidal is very rare these days but people know about it. The use of plant species for this purpose may be harmful for the non-targeted organisms as well. Thus, the practice is now being prohibited legally. The piscicidal plants does not cause any harm to the consumers health. These species were earlier reported by Joshi and Joshi (2006) and Negi and Kanwal (2009) from Nepal and Garhwal region of Uttarakhand, respectively.

#### **Fiber for Ropes**

The fibers obtained from six plant species were used for making ropes for agricultural and domestic purposes (Fig. 1). The twigs of *Grewia optiva* and *Hibiscus cannabinus* were immersed for 1-2 months in water tanks or pools for retting where the water flow is medium. Later on, the retted twigs were beaten to remove the hard core. They were sun dried and the fibers separated from the bark were woven into ropes. The thick and fleshy leaves of *Agave americana* were crushed and beaten to the fibers. They were cleaned to remove the extra matter and pigments, sun dried and used to make ropes. The culms of *Eulaliopsis binata* were harvested, sun dried for 4-5 days and stored. They were made into ropes by applying small amount of water and allowed to dry completely. The stem and twigs of *Cannabis sativa* and *Girardinia diversifolia* were cut and allowed to undergo retting during winter. They were sun dried, beaten to separate the fibers which were again sun dried and cleaned to make ropes. The use of wild species *Agave americana* and *Girardinia diversifolia* for the same purpose should be encouraged for economic benefits. All the species were wild in occurrence except *Hibiscus cannabinus*. It was cultivated widely in the past but now grown very rarely. The cultivation of this plant species needs to be practiced. Bhardwaj *et al.* (2014) reported 11 fiber yielding plant species and their use in making ropes in outer Siraj area of district Kullu, Himachal Pradesh. The

utilization of *Cannabis sativa*, *Girardinia diversifolia* and *Grewia optiva* is to the tune of present findings.

#### **Repellents**

Five plant species or their parts were used as repellents. *Angelica glauca* was exclusively used as snake repellent. The smoke of burnt roots keeps the snakes away. Similar use of this species was reported in Kishtwar, Jammu and Kashmir (Kumar *et al.*, 2009b). The dry leaves and aerial parts of *Azadirachta indica*, *Boenninghausenia albiflora*, *Selinum vaginatum* and *Valeriana jatamansi* were kept in woolen clothes and below beds to protect them from insects such as mites, silverfish *etc.* The identity and uses of *Boenninghausenia albiflora*, *Selinum vaginatum* and *Valeriana jatamansi* was known to very few people.

#### **Drinks**

Juices of medicinal importance were prepared from six plant species including a popular drink from the petals of *Rhododendron arboreum*. Similarly, fruit juices of five wild plant species were consumed in Kara and Kwego region of Ethiopia (Teklehaymanot and Giday, 2010).

#### **Perfumery**

Oil was extracted from the roots of cultivated *Valeriana hardwickii*. *Tagetes minuta* growing wild was collected and sold for extraction of oil in Karsog tehsil of district Mandi.

#### **Miscellaneous Uses**

Present study has revealed the use of 20 plant species for manufacturing baskets, containers, brooms, mats, musical instruments, kiltas and plates (Figs 2 and 3). Leaves of *Justicia adhatoda* and *Colebrookea oppositifolia* were used to ripen the banana fruits. The leaves of *Gerbera gossypina* catch fire due to hairy and cottony covering on their lower surface. Different articles made by people from plant species were sold in the market for economic benefits. Previously, Carvalho *et al.* (2006) recorded the use of 28 plant species for making mats, baskets and brooms in northeastern region of Portugal. A similar

study conducted in Chanda forest of Madhya Pradesh has revealed the use of plants in making baskets (5 species), brooms (3 species), mats (2 species) and raw material for many cottage industries (Prana and Ahirwar, 2013).

**Table 1: List of Plant Species with Ethnobotanical Uses**

<b>Botanical Name [Family]</b>	<b>Local Name</b>	<b>LF/So</b>	<b>Mode of utilization</b>
<i>Justicia adhatoda</i> [Acanthaceae]	Basuti	S/W	Unripe banana are covered with its leaves for early ripening; leaves are used to dye ropes and as green manure.
<i>Acorus calamus</i> [Acoraceae]	Bare	H/W	Rhizomes are used to protect stored grains from insects attack.
<i>Agave americana</i> [Agavaceae]	Ranbaan	H/W	As fence; leaf juice is piscicidal*; rope is made from fiber.
<i>Amaranthus cruentus</i> [Amaranthaceae]	Bithu	H/C	Plant is grown as pseudocereal.
<i>A. hypochondriacus</i> [Amaranthaceae]	Saryara	S/C	Plant is grown as pseudocereal.
<i>Chenopodium album</i> [Amaranthaceae]	Kunnah bithu	H/W	Plant is grown as green manure.
<i>Mangifera indica</i> [Anacardiaceae]	Aamb	T/C	As green manure; timber is used to make instruments.
<i>Pistacia chinensis</i> subsp. <i>integerrima</i> [Anacardiaceae]	Kakrasing i	T/W	Wood is used as timber.
<i>Anethum graveolens</i> [Apiaceae]	Kadvi saunf	H/M	Fruits are used as condiment.
<i>Angelica glauca</i> [Apiaceae]	Chora	H/W	Roots are condiments and also burnt to repel the snakes.
<i>Apium graveolens</i> [Apiaceae]	Celery	H/C	Grown as crop.
<i>Coriandrum sativum</i> [Apiaceae]	Been	H/C	As spice/condiment; Crushed seeds protect grains from insects.
<i>Ferula assa-foetida</i> [Apiaceae]	Heeng	H/M	Gum-resin is used as condiment.
<i>Foeniculum vulgare</i> [Apiaceae]	Saunf	H/C	Used as spice and condiment.
<i>Selinum vaginatum</i> [Apiaceae]	Bhutkeshi	H/W	Dry leaves and roots kept in woolen to protect from insects.
<i>Trachyspermum ammi</i> [Apiaceae]	Ajwain	H/M	As condiment.
<i>Carissa spinarum</i> [Apocynaceae]	Garna	S/W	For fencing; fruit peel is used in cosmetics for coloration.
<i>Amorphophallus paeoniifolius</i> [Araceae]	Jimikand	H/C	Grown as vegetable crop.

<i>Colocasia esculenta</i> [Araceae]	Beju	H/C	Grown as vegetable crop.
<i>Phoenix sylvestris</i> [Arecaceae]	Khajjra	T/W	Leaves are used to make mats and brooms.
<i>Calotropis procera</i> [Asclepiadaceae]	Aak	S/W	Plant is used as piscicidal*.
<i>Ageratina adenophora</i> [Asteraceae]	Baslo ghaas	S/W	Leaves protect stored grains from the attack of insects.
<i>Gerbera gossypina</i> [Asteraceae]	Baacha	H/W	The leaves influences ignition of fire.
<i>Tagetes minuta</i> [Asteraceae]	Marua	S/W	Oil is used in perfumery.
<i>Tagetes patula</i> [Asteraceae]	Sutajri	S/C	Green color is obtained from leaves.
<i>Impatiens balsamina</i> [Balsaminaceae]	Dioond	H/W	Leaf paste is used as cosmetics (to color hands).
<i>Berberis aristata</i> [Berberidaceae]	Kashmal	S/W	For fencing; roots are source of yellow dye.
<i>Berberis lycium</i> [Berberidaceae]	Kashmal	S/W	For fencing; twigs to make 'kiltas'; roots yield yellow dye.
<i>Ehretia acuminata</i> [Boraginaceae]	Punna	T/W	Good is used as timber.
<i>Brassica juncea</i> [Brassicaceae]	Rai	H/C	Seeds are used as condiment.
<i>B. oleracea</i> var. <i>botrytis</i> [Brassicaceae]	Gobhi	H/C	Grown as vegetable crop.
<i>B. oleracea</i> var. <i>capitata</i> [Brassicaceae]	Pattagobhi	H/C	Grown as vegetable crop.
<i>B. oleracea</i> var. <i>italica</i> [Brassicaceae]	Broccoli	H/C	Grown as vegetable crop.
<i>Brassica rapa</i> [Brassicaceae]	Saron	H/C	Grown as vegetable, oil and as condiment.
<i>Sarcococca pruniformis</i> [Buxaceae]	Charabdi	S/W	As green manure.
<i>Bauhinia vahlii</i> [Caesalpinaceae]	Taur	CI/W	Leaves are used to make plates.
<i>Cassia fistula</i> [Caesalpinaceae]	Aali	T/W	Leaves are used as green manure.
<i>Cassia tora</i> [Caesalpinaceae]	Reli	H/W	Used as green manure, flowers yield a dye.
<i>Cannabis sativa</i> [Cannabaceae]	Bhaang	H/W	Ropes are made from fiber.
<i>Celtis australis</i> [Cannabaceae]	Khirak	T/W	Wood is used as timber and leaves as green manure.
<i>Ipomoea carnea</i> [Convolvulaceae]	Besharm booti	S/W	Used for fencing.
<i>Benincasa hispida</i>	Dhuda-	CI/C	Grown as vegetable crop.



[Cucurbitaceae]	paitha		
<i>Cucumis sativus</i> [Cucurbitaceae]	Kakdi	Cl/C	Grown as vegetable crop.
<i>Cucurbita maxima</i> [Cucurbitaceae]	Kaddu	Cl/C	Grown as vegetable crop.
<i>C. pepo</i> var. <i>medullosa</i> [Cucurbitaceae]	Jugni	H/C	Grown as vegetable crop.
<i>Lagenaria siceraria</i> [Cucurbitaceae]	Ghiya	Cl/C	Grown as vegetable crop.
<i>Momordica charantia</i> [Cucurbitaceae]	Karela	Cl/C	Grown as vegetable crop.
<i>Diospyros kaki</i> [Ebenaceae]	Japani phal	T/C	Grown as fruit crop.
<i>Rhododendron arboreum</i> [Ericaceae]	Buraas	T/W	Petals are used to flavor drinks.
<i>Euphorbia royleana</i> [Euphorbiaceae]	Chhunha	S/W	Latex as piscicidal*; seeds of <i>Myristica fragrans</i> , kernel of <i>Prunus dulcis</i> are kept in a cotton clothes and dipped in latex. It is burnt and black residue of smoke is collected in a steel plate. The smoke is used as 'kohl' for cosmetic purposes.
<i>Falconeria insignis</i> [Euphorbiaceae]	Balodhar	T/W	Leaves are piscicidal*.
<i>Jatropha curcas</i> [Euphorbiaceae]	Japhlota	S/W	Used for fencing.
<i>Mallotus philippensis</i> [Euphorbiaceae]	Kamahl	T/W	As green manure; fruits yield red dye or 'Sindhur' for cosmetics.
<i>Abrus precatorius</i> [Fabaceae]	Chadainu	Cl/W	Seeds are used to make necklace.
<i>Butea monosperma</i> [Fabaceae]	Palah	T/W	Herbal colors are made from flowers.
<i>Cicer arietinum</i> [Fabaceae]	Channa	H/C	Grown as pulse crop.
<i>Dalbergia sissoo</i> [Fabaceae]	Tahli	T/W	As green manure and for timber.
<i>Dolichos biflorus</i> [Fabaceae]	Kulth	H/C	Grown as pulse crop.
<i>Glycine max</i> [Fabaceae]	Soyabean	H/C	Grown as pulse crop.
<i>Indigofera heterantha</i> [Fabaceae]	Kaathi	S/W	Used for fencing.
<i>Lens culinaris</i> [Fabaceae]	Massar	H/C	Grown as pulse crop.
<i>Millettia extensa</i> [Fabaceae]	Sulaangi	L/W	Leaf juice is piscicidal*.
<i>Phaseolus coccineus</i> [Fabaceae]	Frasbeen	Cl/C	Grown as vegetable crop.
<i>Phaseolus vulgaris</i>	Rajma	Cl/C	Grown as pulse crop.

[Fabaceae]			
<i>Pisum sativum</i> [Fabaceae]	Matar	H/C	Grown as vegetable crop.
<i>Trigonella foenum-graceum</i> [Fabaceae]	Methi	H/C	As condiment; leaves protect stored grains from insects
<i>Vicia faba</i> [Fabaceae]	Kyeu	H/C	Grown as pulse crop.
<i>Vigna mungo</i> [Fabaceae]	Maah	H/C	Grown as pulse crop.
<i>Vigna radiata</i> [Fabaceae]	Moongi	H/C	Grown as pulse crop.
<i>Vigna unguiculata</i> [Fabaceae]	Raungi	H/C	Grown as pulse crop.
<i>Quercus floribunda</i> [Fagaceae]	Mohru	T/W	Wood is used as timber.
<i>Quercus incana</i> [Fagaceae]	Baan	T/W	As green manure; agricultural tools made from timber; yield dye which is used as writing ink.
<i>Quercus semecarpifolia</i> [Fagaceae]	Kharsu	T/W	As green manure and timber.
<i>Engelhardtia spicata</i> var. <i>integra</i> ([Juglandaceae])	Saama	T/W	Bark for leather dyeing; leaves as piscicidal and to color lips.
<i>Juglans regia</i> [Juglandaceae]	Akhrot	T/W/C	As timber; grown for seeds as crop; leaves chewed to color lips; leaves and fruit covering are used to protect the grains from the attack of insects; fruit covering is used to dye fibers.
<i>Colebrookea oppositifolia</i> [Lamiaceae]	Gadoosa	S/W	As green manure; leaves to cover banana for quick ripening.
<i>Elsholtzia fruticosa</i> [Lamiaceae]	Pothi	S/W	As condiment.
<i>Mentha arvensis</i> [Lamiaceae]	Pudina	H/W/ C	As condiment, leaves are kept in grains to protect from insects.
<i>Mentha longifolia</i> . [Lamiaceae]	Chachri	H/W	Dried leaves protect stored grains from insect attack.
<i>Ocimum basilicum</i> [Lamiaceae]	Bhavri	S/C	As condiment.
<i>Roylea cinerea</i> [Lamiaceae]	Kadkoi	S/W	Leaves are used to protect grains from the attack of insects.
<i>Scutellaria scandens</i> [Lamiaceae]	Chhichad	S/W	Used to make broom.
<i>Thymus linearis</i> [Lamiaceae]	Mundrosh o	H/W	As condiment.
<i>Cinnamomum tamala</i> [Lauraceae]	Gudpatraj	T/W	As condiment.
<i>Litsea glutinosa</i> [Lauraceae]	Riyaan	T/W	Wood is used as timber.
<i>Litsea monopetala</i>	Gwaun	T/W	Wood is used as timber.

[Lauraceae]			
<i>Allium cepa</i> [Liliaceae]	Pyaz	H/C	Plant is grown as crop and eaten as condiment.
<i>Allium sativum</i> [Liliaceae]	Lahsun	H/C	Plant is grown as crop and eaten as condiment.
<i>Linum usitatissimum</i> [Linaceae]	Alsi	H/C	Grown as oil crop.
<i>Reinwardtia indica</i> [Linaceae]	Piyein-re-phool	H/W	Flowers are used to make yellow color.
<i>Lawsonia inermis</i> [Lythraceae]	Mehndi	T/M	Leaves are used in cosmetics (to color hands, hair).
<i>Punica granatum</i> [Lythraceae]	Daru	S/W	As condiment.
<i>Abelmoschus esculentus</i> [Malvaceae]	Bhindi	H/C	Grown as vegetable crop.
<i>Bombax ceiba</i> [Malvaceae]	Semul	T/W	As timber; seed hairs are used to stuff the pillows.
<i>Gossypium hirsutum</i> [Malvaceae]	Kapas	S/C	As fiber.
<i>Grewia optiva</i> [Malvaceae]	Byul	T/W	Timber used for agricultural tools and branch fiber for ropes
<i>Hibiscus cannabinus</i> [Malvaceae]	Byuli, Sunn	S/C	Ropes are made from fibers.
<i>Azadirachta indica</i> [Meliaceae]	Neem	T/C	Dry leaves protect stored grains and clothes from insects.
<i>Melia azedarach</i> [Meliaceae]	Darek	T/W	As timber; leaves protect grains; seeds to make black color.
<i>Toona ciliata</i> [Meliaceae]	Tooni	T/W	As timber; green manure; leaves ash protects stored grains from insects; seeds powder used as yellow color.
<i>Acacia catechu</i> [Mimosaceae]	Khair	T/W	Timber is used to make agricultural tools.
<i>Acacia nilotica</i> [Mimosaceae]	Babul	T/W	Timber is used to make agricultural tools.
<i>Albizia chinensis</i> [Mimosaceae]	Oyi, Chuli	T/W	Wood is used as timber.
<i>Albizia lebbek</i> [Mimosaceae]	Siris	T/W	Wood is used as timber.
<i>Ficus auriculata</i> [Moraceae]	Tryambla	T/W	Leaves are used to make plates.
<i>Morus alba</i> [Moraceae]	Toot	T/W	Plant is used as timber and for fencing.
<i>Morus serrata</i> [Moraceae]	Cheemu	T/W	Wood is used as timber.
<i>Myristica fragrans</i> [Myristicaceae]	Jaiphal	T/W	Cosmetic purposes and as condiment.
<i>Eucalyptus globulus</i> [Myrtaceae]	Safeda	T/W	Leaves protect grains from insects; color is made from flowers.
<i>Syzygium aromaticum</i>	Laung	T/M	As condiment.

[Myrtaceae]			
<i>Syzygium cumini</i> [Myrtaceae]	Jaman	T/W	Agricultural tools are made from timber; black color from bark.
<i>Mirabilis jalapa</i> [Nyctaginaceae]	Daini-phool	S/W	Seeds are used to make necklace.
<i>Sesamum indicum</i> [Pedaliaceae]	Til	S/C	Grown as oil crop.
<i>Plumbago zeylanica</i> [Plumbaginaceae]	Chitra	S/W	Young twigs chewed for coloring lips.
<i>Calamagrostis pseudophragmites</i> [Poaceae]	Tanoori	H/W	Used to make brooms.
<i>Capillipedium assimile</i> [Poaceae]	Tullighaas	H/W	Used to make brooms.
<i>Dendrocalamus strictus</i> [Poaceae]	Magar Baans	H/W	As fence; stem timber to make utensils, baskets, containers.
<i>Drepanostachyum falcatum</i> [Poaceae]	Dhadhanj	H/W	As fence; to make items like brooms, baskets and 'kiltas'.
<i>Eleusine coracana</i> [Poaceae]	Kodra, Mandal	H/C	Grown as crop.
<i>Eulaliopsis binata</i> ( [Poaceae]	Bagre	H/W	To make brooms; ropes are made from fibers.
<i>Hordeum vulgare</i> [Poaceae]	Jaun	H/C	Grown as crop.
<i>Oryza sativa</i> [Poaceae]	Dhaan	H/C	Grown as cereal crop.
<i>Saccharum officinarum</i> [Poaceae]	Ganna	H/C	Grown as crop and juice to drink.
<i>Setaria glauca</i> [Poaceae]	Kangni	H/C	Grown as crop.
<i>Triticum aestivum</i> [Poaceae]	Kanak	H/C	Cereal crop; grains powder used as color for decoration.
<i>Zea mays</i> [Poaceae]	Chhalli	H/C	Grown as cereal crop; dry leaves are used to make mats
<i>Fagopyrum acutatum</i> [Polygonaceae]	Phaphru	H/W/ C	Pseudocereal crop.
<i>Fagopyrum esculentum</i> [Polygonaceae]	Kathu	H/C	Pseudocereal crop.
<i>Persicaria hydropiper</i> [Polygonaceae]	Ghniri	H/W	As piscicidal; leaves protect stored grains from insect attack.
<i>Myrsine africana</i> [Primulaceae]	-----	S/W	For fencing.
<i>Ziziphus mauritiana</i> [Rhamnaceae]	Barad	S/W	For fencing purposes.
<i>Cotoneaster obtusus</i> [Rosaceae]	Riunsh	S/W	Walking sticks are made from wood.
<i>Malus domestica</i> [Rosaceae]	Seb	T/C	Grown as fruit crop.
<i>Prinsepia utilis</i>	Bhekhal	S/W	For fencing purposes and to make musical

[Rosaceae]			instruments.
<i>Prunus cerasoides</i> [Rosaceae]	Pajja	T/W	Agricultural tools are made from timber.
<i>Prunus domestica</i> [Rosaceae]	Palum	T/C	Grown as crop.
<i>Prunus dulcis</i> [Rosaceae]	Badam	T/C	Cosmetic purposes.
<i>Pyrus pashia</i> [Rosaceae]	Kainth, Shegal	T/W	Agricultural tools are made from timber.
<i>Rosa moschata</i> [Rosaceae]	Kujjai, Khajih	S/W	For fencing; flower juices as flavoring agent in drinks.
<i>Rubus ellipticus</i> [Rosaceae]	Aakhe, Heer	S/W	Used for fencing.
<i>Spiraea canescens</i> [Rosaceae]	Chakhu	S/W	For making broom sticks.
<i>Catunaregam spinosa</i> [Rubiaceae]	Raada	S/W	Fruits as piscicidal.
<i>Aegle marmelos</i> [Rutaceae]	Bil	T/W/C	Fruit juice in drinks.
<i>Boenninghausenia albiflora</i> [Rutaceae]	Pissumar buti	H/W	Aerial parts are kept in room as an insect repellent.
<i>Citrus limon</i> [Rutaceae]	Nimbu	T/C	Fruit juice is used in drink.
<i>Citrus pseudolimon</i> [Rutaceae]	Khatta	T/C	Fruits are used in cosmetics.
<i>Murraya koenigii</i> [Rutaceae]	Gandhelu	S/W	Protect grains from insects; as green manure and condiment.
<i>Zanthoxylum armatum</i> [Rutaceae]	Tirmir	T/W	Leaves and seeds as piscicidal*; wood to make walking sticks.
<i>Populus ciliata</i> [Salicaceae]	Poplar	T/W	As green manure.
<i>Salix denticulata</i> [Salicaceae]	Bhashal	T/W	Used to make 'kiltas'.
<i>Salix tetrasperma</i> [Salicaceae]	Biuns	T/W	Wood is used as timber.
<i>Aesculus indica</i> [Sapindaceae]	Kanor	T/W	Wood is used as timber.
<i>Sapindus mukorossi</i> [Sapindaceae]	Dodae, Ritha	T/W	Leaves protect the stored grains from insects attack.
<i>Capsicum annuum</i> [Solanaceae]	Peepli	H/C	As condiment; dry ripened fruits protect grains from insects.
<i>Lycopersicon esculentum</i> [Solanaceae]	Tamatar	S/C	Fruits are used as vegetable.
<i>Solanum melongena</i> [Solanaceae]	Baingan	S/C	Grown as vegetable crop.
<i>Solanum tuberosum</i> [Solanaceae]	Aalu	H/C	Grown as vegetable crop.
<i>Ulmus laevigata</i> [Ulmaceae]	Marinu	T/W	Wood is used as timber.

<i>Girardinia diversifolia</i> [Urticaceae]	Kaarl	S/W	Ropes are made from its fiber.
<i>Valeriana hardwickii</i> [Valerianaceae]	Mushkbal a	H/W	Roots are used in perfumes, dry leaves protect woolen from insects.
<i>Duranta erecta</i> [Verbenaceae]	Neelkanta	S/C	For fencing.
<i>Vitex negundo</i> [Verbenaceae]	Sura, Bnah	S/W	Used as fence, green manure and leaves to protect grains..
<i>Amomum subulatum</i> [Zingiberaceae]	Bari elaichi	S/M	As condiment.
<i>Curcuma longa</i> [Zingiberaceae]	Haldi	H/C	Fruit juice of <i>Citrus pseudolimon</i> is mixed with its powder to make red pigment called 'sindhur'. It is used in cosmetics; dye to color the fibre; rhizome protect grains from insects; mats are made from leaves; grown condiment crop.
<i>Elettaria cardamomum</i> [Zingiberaceae]	Elaichi	H/M	As condiment.
<i>Hedychium spicatum</i> [Zingiberaceae]	Shati, Shroli	H/W	Mats are made from leaves.
<i>Zingiber officinale</i> [Zingiberaceae]	Adrak	H/C	Grown as condiment crop.

Where, LF= Life form; So= Source; H= Herb; S= Shrub; T=Tree; Cl= Climber; L= Liana; W= Wild; C=Cultivated; M= Market

\*Piscicidal, the practice is now being prohibited legally.



Fig. 1: Ropes made from different plant species



Fig. 2: Storage articles made from plants: (a-d) Baskets, containers and kiltas; (e) Agricultural tools



**Fig. 3:** a-e Brooms made from (a) *Calamagrostis pseudophragmites* (b) *Capillepidium assimile* (c) *Drepanostachyum falcatum* (d) *Eulaliopsis binata* (e) *Phoenix sylvestris*; f-i Mats made from (f & h) *Hedychium spicatum* (g & i) *Zea mays*; (j) Plates made from *Bauhinia variegata*; and (k) Fiber from *Bombax ceiba*

## CONCLUSION

Present study has highlighted the use of plant species for different ethnobotanical purposes. The availability of alternate resources may reduce the stress on over exploited plant species. This approach may directly or indirectly improve the conservation of floristics especially where the species are uprooted to meet the requirements. Based on the ethnobotanical use of species and their availability, further conservation strategies may be planned. Present study was an attempt to compile the valuable ethnobotanical traditional knowledge. The common names and identifying features of the plant species provided by the natives are highly useful for their taxonomic studies and phylogenetic relationships. Further, studies

are required to work out the possible use of these species at the commercial level without compromising their conservation.

**CONFLICT OF INTEREST:** The authors declare that they have no conflict of interest.

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