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Traditionally used common fibre plants in outer siraj area, Himachal Pradesh

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An ethonobotanical study was conducted to document the traditional use of fibre yielding plants used by the indigenous people of Outer Siraj area of district Kullu of Himachal Pradesh. Personal interviews and group discussions were conducted to gather information on the indigenous knowledge. A checklist of 'categories of plant use' was developed and used to identify, categorize and document fibre plant species in the area. The ethnobotanical fabrics/ articles, viz. *Pula*, *Mandri* of this region are rich in traditional practices and people living in the Outr Siraj area of Himachal Pradesh, India use natural fibre plants in various ways for their subsistence. Fifteen plants were identified as most commonly used fibre plants belonging to 10 families of which family Poaceae and Urticaceae are most important. 67.00 % of fibre is obtained from stem and bark. *Cannabis sativa* L. is used by 92.19 % people followed by *Grewia optiva* Drumm. (76.56 %). *Euphorbia royleana* Boiss. is the least used fibre plant (1.56 %). New ethnobotanical uses of *Agave cantula* Roxb. and *Urtica dioica* L. are reported for the first time.

Keywords: Fibre plants; Outer Siraj; Indigenous knowledge; District Kullu; Himachal Pradesh.

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Introduction

A complete record of many thousands of plant species used by human being during past shows their importance in health, economy, shelter, clothing and food[1]. Practically everywhere and in all countries natural fibres are produced and used to manufacture a wide range of traditional and novel products from textiles, ropes and nets, brushes, carpets and mats, mattresses to paper and board materials. The long fibres are transformed to threads or yarns that are used to join, connect or attach and to form bonds, networks or weaves. Presently, the production of natural fibres in India is more than 400 million tons[2]. Indigenous peoples and local community's reliance on plant resources account for anything up to 95% of their survival requirements[3,4]. Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine and general utility including tremendous botanical expertise[5].

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A total of 18,440 species of flora are known from the Indian Himalayan Region (IHR)[6,7]. Himachal Pradesh is one of the prime states in IHR supporting unique socio-economically important biodiversity. Being a hilly state, Himachal Pradesh has rich plant diversity due to varying degree of agro climatic zonation from subtropical to extreme cold[8]. Study area is present in the District Kullu in the North West Himalayas between 31°25′-32°35′ N Latitude and 76°09′-77°09′ E Longitude. Northern portion of Kullu district is divided into outer and inner Siraj by the Jalouri pass range. There are 58 panchayats notified as backward panchayats covering the remote area of outer Siraj[9] because this area is geographically isolated, lacking the basic facilities eg. road, communication, etc.

The aim of this survey is to describe the historical use of plant fibres, methods of extraction and/or separation and to discuss future end uses for these fibres.

Material and Methods

Comprehensive field studies were conducted throughout the outer Siraj area of Kullu district starting from May to the end of September, continuously for two years i.e., 2010-2012, eleven

localities named as Khnag, Kandugad, Dalash, Panjwi, Arsu, Nor, Deem, Bagasarahan, Jaon, Urtu, Nirmand, Kothi, Katrain, Rumsu, Gramag, Kukri Ser, Chhorang, Pulga, Bajaura, Sainj and Maraur were studied thoroughly. The emphasis was given to the inaccessible and previously non visited localities during long excursions of 7-10 days campaign in these areas. These excursions were conducted with the help of local guides and porters, using horses or sometimes yak for transportation of plants and plant pressers. Plant specimens were collected along with extensive field notes including habit, habitat, life form, phenological status, abundance, etc. In each smaller valley local inhabitants were interviewed regarding the local names and various indigenous uses. Importance was given to the educated or elderly people especially women and village leaders, as their knowledge and experience are considered as comparatively more authentic. For each plant, ethnobotanical information was collected from people of different ages belonging to different ethnic groups, because sometimes the information collected from different ethnic groups were different from each other. It was emphasized to collect as much information as possible so that the relatively most authentic and most reliable information could be screened by tallying them with the information collected from the other ethnic groups. During the interviews, semi-structured questionnaire was developed as per modification[10,11].

Majority of the informants were uneducated and reluctant to give information but with the passage of time they became used to it and gave complete information regarding the complete recipe preparation and procedures. All the collected plants were properly pressed, dried and mounted on standard herbarium sheets and the voucher specimens are deposited at National Bureau of Plant Genetic Resources Regional Station, Phagli, Shimla. Specimens were identified with the help of pertinent Floras[12-15].

Results and Discussion

15 plants were identified as most commonly used fibre plants by local people of the area including 7 species of herbs, 3 species of shrubs and 5 species of trees of total 10 families of angiosperms (Table 1). Plants belonging to family Poaceae and Urticaceae are chief fibre yielding plants in the region while members of 8 other families are also contributing (Table 1). Amongst plant parts, use of stem bark (67%) was most common, followed by leaves (27%) and fruits rarely used (6%).

Importantly, it was found that, *Cannabis sativa* L. is most promising fibre used by 92.19% people followed by *Grewia optiva* Drumm. (76.56 %) and *Euphorbia royleana* Boiss. is the least used fibre plant (1.56 %).

However, new ethnobotanical uses of *Agave cantula* Roxb. and *Urtica dioica* L. have been reported from studied area. Previously, *A. cantula* is reported to be used as to cure many liver diseases, Jaundice and sprain and *U. dioica* used against rheumatism in different area of Himachal Pradesh[16].

Fibres originating from the bast stem, leaf and fruit are naturally organized into bundles and are therefore, called fibre bundles, whereas fibres originating from seed are single cells and are referred to as fibres[17,18]. The processes used to separate fibre bundles from the bast stem and leaf is quite similar. Retting is defined as the subjection of crop or deseeded straw to chemical or biological treatment to make the fibre bundles more easily separable from the woody part of the stem[17] to facilitate the removal of fibre bundles. There are two traditional types of retting namely dew and water retting. Dew retting entails leaving the plant stem in the field to rot.

Extraction mechanism for *A. cantula* and *E. royleana* includes removal of spines and then leaves are crushed and beaten, so that only the fibres remain at the end. After this retting is done in water for several days and finally fibres are removed[19].

For *Betula utilis* D. Don the bark is peeled horizontally then dried properly and used directly as a substitute for writing paper to write religious texts. *Bombax ceiba* L. fibre is usually obtained from the fruits, fallen after ripening. Fibre is scooped out of the dry capsules and dried for few days before use. Mature plants of *Cannabis sativa* are cut and kept in the open for dew retting for three to five weeks. The bundle of the stem is placed in the small water tanks / ponds. After that the scotching procedure starts and the fibres are separated either manually by hands or the woody core is fragmented, crushed and beaten to separate it from the fibres. The fibres are sun dried and stored in a dry place then making shoes which locally called '*Pula*' (Plate 1a). Similarly, many parts of world, fibers of *C. sativa* L. are used for making many household things[20]. For obtaining *Debregeasia hypoleuca* Wedd. Fibres, twigs are sun dried and stem bark is peeled vertically. Fibre is hand spinned and used to make baskets and ropes. *Eriphorum comosum* Nees and *Hedychium spicatum* Sm. are firstly cut and

Table 1—Traditional uses of plant species in Outer Siraj area of Kullu district in Himachal Pradesh

S. No	Scientific name/ Local name/ Family	Habit	Habitat/Distribution	Part used	Mode of utilization/Uses	Number of people using the particular plant in 2010-2012 (% Frequency)	Number of people using the particular plant in 1970-1975 (% Frequency)
1.	*Agave cantula* Roxb./ Ram-Ban/ Agavaceae	Shrub	Planted on bare hills/ Mexico, naturalized in Mediterranean region, India and Pakistan	Leaf	Making ropes and mats	5(7.35%)	63 (92.64%)
2.	*Betula utilis* D. Don/ Bhuj, Bhoj patra/ Betulaceae	Tree	On hilly slopes/ The temperate Himalaya, from Kashmir to Bhutan and Afghanistan	Stem, bark	Stem bark used as paper for writing religious text	6 (8.82%)	62(91.17)
3.	*Bombax ceiba* L./Sembal/ Bombacaceae	Tree	Grows on sunny hilly sides/ India, Australia and China	Fruits	Stuffing cushions, mattresses and pillows	2 (2.94%)	66 (97.05%)
4.	*Cannabis sativa* L./ Bhang/ Cannabinaceae	Herb	Grows abundantly on roadside,/ China, India, Pakistan, Iran	Stem, bark	Making ropes, *Pula* (traditional slippers), tying ropes for cattle	63 (92.65%)	92(92.00%)
5.	*Debregeasia hypoleuca* (Steud.) Wedd./Sreu/ Urticaceae	Shrub	Common in moist places/India, Pakistan Afghanistan, Africa	Stem, bark	Making ropes and baskets	20 (29.41%)	48(70.58%)
6.	*Drepanostachyum falcatum* (Nees) Keng. f./ Firl, Tarni/ Poaceae	Herb	Common in sunny hilly slopes/ India, China and Tropical countries	Stem, leaves	Making baskets, pipes and *Kalams* for writing	42(61.76%)	26(38.23%)
7.	*Eriophorum comosum* Nees/ Munji/ Cyperaceae	Grass	Crevices on rocks; grassland slopes; 500-2800 m. Afghanistan, Bangladesh, Bhutan, North India, Kashmir, Myanmar, Nepal and Pakistan	Leaf	Making *Pullas* (traditional slippers), *Mandris* (traditional carpet) and ropes having religious importance (Chuddi and Bandh)	52 (76.47%)	16(23.52%)
8.	*Euphorbia royleana* Boiss./Suru/ Cactaceae	Shrub	Subtropical rain shadow valleys, forming its own communities on rocky slopes./ Taiwan, Yunnan, India, Nepal, Myanmar, Pakistan	Stem	Rope making	1 (1.47%)	89 (89.00%)
9.	*Girardinia diversifolia* (Link) Fries/ Karl/ Urticaceae	Under shrub or herb	Forest margins, shady moist places, along streams, disturbed places, near villages./ Taiwan, Bhutan, India, Indonesia, Sikkim, Sri Lanka, Africa	Stem, bark	Making ropes, *Mandri* (traditional carpet), *Bzetas* (net mask for bullocks)	21(30.88%)	47(69.11%)
10.	*Grewia optiva* J. R. Drumm. ex Burret/ Bheol/ Tiliaceae	Tree	Distributed near villages./ Himalayan regions in Pakistan, Nepal, India, usually between 500 and 2500 m	Stem, bark	Making ropes and baskets.	61 (89.71%)	68 (100%)
11.	*Hedychium spicatum* Sm./ Shdui, Janglihaldi/ Zingiberaceae	Herb	Boundaries of Forests; 1200-3200m /Yunnan, Bhutan, India, Nepal, Myanmar, Sikkim	Leaf, Stem	Making ropes, *Mandri* (traditional carpet).	45 (66.18%)	65(95.58%)
12.	*Morus serrata* Wall./Chimu/ Moraceae	Tree	Around the boundaries of villages/ Confined to Indo-Pakistan subcontinent	Bark	Making ropes	4 (5.88%)	42 (61.76%)
13	*Populus deltoides* W. Bartram ex Marshall/ Poplar/Moraceae	Tree	Plains, valleys, basins; 200-2400 m/ India, China, Pakistan	Stem, Bark	Stem fibres used to make *Nuwar* (rope) which is used to make *Charpai* (bed), Making boxes	13 (19.12%)	36 (52.94%)
14	*Thamnocalamus spathiflorus* Munro/ Garu/ Poaceae	Herb	Coniferous and mixed subalpine forests; 2500-2900 m/ India, Nepal.	Stem	Making baskets, *Kilta*, Traditional basket) and *Kalams* for writing	30 (44.12%)	56 (82.35%)
15.	*Urtica dioica* L./ Kungshi, Chiunshi/ Urticaceae	Herb	Near road sides /widespread in the temperate regions of both hemispheres.	Stem, Bark	Making ropes, mats and threads	17 (25.00%)	52 (76.47%)

Plate 1—Various processes and products of plant fibers used in the study area

then dried for six to eight weeks. Before spinning into ropes or threads water retting is done for three to five hours and a holy rope which locally called as '*Band'* is prepared (Plate 1b). While the bast fibres of *G. optiva* Drumm. are extracted by keeping the twigs for water retting for four to six weeks. This is followed by scotching in which woody core of the stem is fragmented. Following beating, the stem is dried for few days. Finally, fibres are separated from the bark. The fibres are sun dried and stored in a dry place and then made into ropes called '*Shel'* (Plate 1c). In case of *Drepanostachyum falcatum* (Nees) Keng. f., *Morus serrata* Wall. and *Thamnocalamus spathiflorus* Munro, green stem is cut into two halves and because of easy molding property, baskets are directly made and then sun dried for seven to ten days before use. These baskets locally called as '*Kilta'* (Plate 1d). Bast fibres of *Girardinia diversifolia* (Link.) Fries and *U. dioica* L. are extracted by firstly drying the plants, subsequently keeping them for retting during winter (Plate 1e & f). These are then sun dried. Fibres are separated by beating and then are sun dried. Fibre extraction from *Populus deltoides* W. Bart. ex Marshall is quite different; firstly the outer bark is removed from the freshly felled stem and fibres are peeled from the inner bark in the form of long threads and spinned to make *nwar*.

Conclusion

Finding alternative sources for the natural and synthetic fibres in current use is essential to have adequate supply of fibres at affordable prices in future. The increasing cost and decreasing availability of petroleum resources and limitations in the availability of land, water and other resources required to grow natural fibers could restrict the availability and/or increase the price of common fibers making them unaffordable for commodity applications. Therefore, efforts to find alternative fibre sources, especially from the inexpensive, abundantly available and renewable byproducts are highly valuable and they are also environment friendly.

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