

PROMISING FIBRE-YIELDING PLANTS OF THE INDIAN HIMALAYAN REGION



G.B. Pant Institute of Himalayan Environment & Development
Kosi-Katarmal, Almora-263 643, Uttarakhand

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G.B. Pant Institute of Himalayan Environment & Development

Compiled by

K. Chandrasekar

Indra D. Bhatt

Ranbeer S. Rawal

Shyamal K. Nandi

Pitamber P. Dhyani

Contributors

S.S. Samant

P.K. Samal

K.K. Singh

R.K. Maikhuri

S. Sharma

R.G. Singh

S. Airi

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Foreword



Recent resurgence in the use of natural fibres in place of synthetic counter parts is gaining momentum all across the world. This is due to the fact that natural fibres do not cause skin irritation/ diseases, e.g., rashes, allergy, itching and other skin problems, which are often associated with the use of synthetic fibres. In addition, natural fibres are eco-friendly and safe to the environment, and are biodegradable.

The Himalayan region has been bestowed with an enormous fibre wealth, which has been traditionally used by the locals for meeting their needs; the natural fibres can be exploited to improve the livelihood of hill people. While in some cases cottage level production units are already in operation, the potential of many species needs to be fully explored. This is evident from the fact that only a limited number of species are in commercial demand out of some 134 odd species known for fibre production.

During the International Year of Natural Fibres (2009), Scientists of this Institute (GBPIHED) had initiated the compilation of this booklet on natural fibres, to provide brief description of selected fibre yielding plants of the Himalayan region, the extraction procedure and uses. Thus, in view of the renewed global interest on natural fibres, and move towards enterprise based production of natural fibres, I hope this book will fill an important void and serve as a useful informative base.

5th April 2010

A handwritten signature in black ink, appearing to read 'L.M.S. Palni'. The signature is stylized and includes a horizontal line underneath.

L.M.S. Palni

Director



The Institute



G.B. Pant Institute of Himalayan Environment & Development (GBPIHED) was established in 1988 as an autonomous Research and Development Institute of the Ministry of Environment and Forests (MoEF), Govt of India. The Institute is mandated for sustainable development in the Indian Himalayan Region (IHR). Over the years, it has emerged as a leading institution for fostering scientific knowledge, formulation of policy guidelines and development of efficient strategies for conservation and management of natural resources in the region.

Institute's area of operation is spread over twelve states of India [viz., Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam and West Bengal hills]. The R&D activities of the Institute are multidisciplinary in nature, interlinking natural and social sciences. Through IERP (Integrated Ecodevelopment Research Programme), the Institute is also providing extramural funds for promotion of locations specific R&D activities. The Institute has a decentralized setup with its Headquarters located at Kosi-Katarmal, Almora (Uttarakhand) and four regional units located at Itanagar (NE Unit), Pangthang (Sikkim Unit), Srinagar (Garhwal Unit) and Mohal-Kullu (HP Unit).



SED: Socio Economic Development;

EAM: Environmental Assessment and Management;

WPM: Watershed Process and Management;

KCB: Knowledge Product & Capacity Building;

BCM: Biodiversity Conservation and Management;

BTA: Biotechnological Applications



Preface

The Indian Himalayan Region (IHR), with diverse bio-geographic and eco-climatic features, is known for richness of bio-physical resources and its indigenous cultural groups, which live in harmony with their natural surroundings. The unique practices of resource use and management developed by these groups, over time, have ensured long term sustenance of natural resources. Among others, products of plant-based fibres form such an example of judicious use of natural resources for meeting the needs, while having limited access to alternative material. The combination of strength with flexibility, inherent in many of the natural fibres, had attracted the attention of people for long. The fibre production contributes significantly to the economy of the region in various ways, including agricultural implements, clothing and products for other household operations.

Fibres, which constitute a class of material that possess continuous filaments or are arranged in discrete elongated pieces, similar to lengths of the thread, play very important role in the biology of both plants and animals in holding tissues together. Human dependence on plant fibres is manifested in a diverse range of products. This includes fibres as spun into filaments; string or rope; fibres forming a component of composite materials; fibres matted into sheets to make products such as paper or felt. As compared to synthetic fibres, which can be produced very cheaply and in large quantity, natural fibres enjoy major benefits, such as comfort and biodegradable.

During recent decades, man-made fibres namely, acrylic, nylon, polyester and polypropylene have displaced the natural fibres

used in our clothing, household furnishings, industries and agriculture, etc. This success of synthetics can be attributed to lower cost of production. Unlike low availability and great variability of natural fibres, commonly used synthetic fibres are produced in large quantities from petrochemicals to uniform strengths, lengths and colours, easily customized to specific applications. However, realizing the long term problems of synthetic products, the natural fibres are likely to play a key role in the emerging “green” economy.

In the Himalayan region, fibre-based products constitute a key component of village culture, albeit providing very limited income-generation opportunities to local inhabitants or artisans. However, considering that plant based natural fibre products are of high quality and durability, these products have the potential for promoting income generating cottage industries, which may support livelihood of a large number of indigenous people. Recognizing this need, “the International Year of Natural Fibres – 2009” aimed at raising global awareness on the importance of natural fibres not only to producers and industry but also to consumers and the environment. This understanding, it is hoped, would receive further impetus in the International Year of Biodiversity – 2010.

This information booklet mainly focuses on the diversity of fibre yielding plants of the IHR. While providing a summary table on 134 fibre yielding plant species of the region, the most important twenty five species have been enumerated in the light of information compiled from different areas of the IHR. The species have been arranged alphabetically, providing

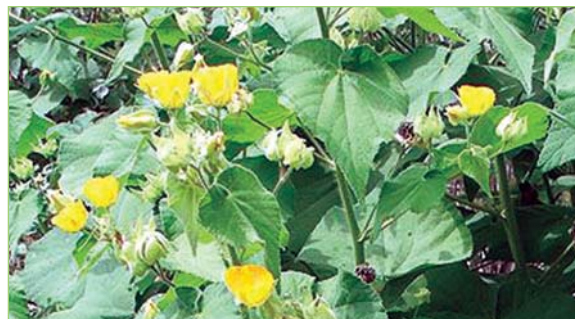
correct binomial followed by name of the family, vernacular name, plant part used for fibre extraction, use of fibre, brief description of plant species, phenology, distribution in the Himalayan region and the method of fibre extraction.

The inputs, suggestions and inspiration given by the Director of the Institute, Dr. L.M.S. Palni, FNASc for preparation of this booklet is gratefully acknowledged.



1. *Abutilon indicum* (L.) Sweet

Family	: Malvaceae
Vernacular name	: Kangiyo, Atibalu, Atibalaa, Soma ratsa, Kanghi, Khanghani
Part used	: Stem bark
Uses of fibre	: Rope, cordage and twine



Brief description

Undershrub, 1 - 3 m high. Branches usually green sometimes purplish. Leaves 2-18.5 cm x 1.5-16 cm, cordate at base, acute to long acuminate at apex, serrate to crenate, 7-9-nerved; stipule linear, 2-5 mm long. Flowers axillary, solitary; pedicel 1.5-8 cm long, jointed near the apex. Calyx 8-11 mm long, slightly accrescent in fruit, pubescent on both sides; lobes lanceolate-ovate, 4-5 mm broad, acute-acuminate. Corolla orange-yellow or yellow, 2.5-3.5 cm across; petals obovate, 1-1.5 cm long and broad, claw hairy on the margin. Fruit cylindric-truncate, 1.5-2 cm across; mericarps 15-20, 8-17 x 6-9 mm, acute.

Flowering & fruiting : August - March

Distribution : Occasionally found in the sub Himalayan tracts, grassy slopes, up to 1200 m.

Extraction method

The mature stems are selected from healthy growing plants. The stem is first retted in water for two weeks; the fibres are separated manually by hand, sun dried and stored in a cool dry place.

Other uses

1. An infusion of the root is employed as a remedy for leprosy and is also taken internally as a cooling medicine during fever.
2. The root is used to treat cough and fever.
3. The paste of the leaf and seeds is applied to wounds.

2. Agave cantula Roxb.

Family	: Agavaceae
Vernacular name	: Ram-Bans, Kandala
Part used	: Leaf
Uses of fibre	: Making ropes, mats, twines, nets, cordage, etc.



Brief description

Robust acaulescent shrubs. Leaves crowded in the basal part, thick, flat, 0.5-2.2 m long, oblong – lanceolate, margins upwardly directed spines. Flowering stem stout, up to 2 m high, covered with scales. Tepals oblong – lanceolate. Capsules ovoid, dehiscent. Bulbils present.

Flowering & fruiting : July - December

Distribution : Commonly grows in dry exposed waste places, edges of scrub jungles in Himalayan region mostly <1300 m.



Extraction method

Fresh leaves (3-4 years old) are cut from the base with the help of a sickle. After removing the terminal and marginal spines, the leaves are beaten with the help of a wooden hammer until the complete separation of fibres. After separation, the fibres are sun dried for one or two days and stored in a dry place. The dried fibres are used for making different products. Another method of fibre extraction follows the process of retting, wherein the leaves are kept in the open for two to four weeks for retting. Then the leaves are beaten with a wooden hammer until the separation of fibres. Combining the retting and beating method of fibre extraction is easier and less time consuming than only the beating method. However, the fibres obtained from the retting and beating method become brownish. On the other hand, fibres obtained from the beating method remain white in colour, and can be used for making diverse colorful products. Various products are then prepared from the fibre for household as well as other purposes.

Other uses

1. Checks soil erosion.
2. Used for bio-fencing.
3. Medicinal value (dropsy, boils, burn, cut, fever, goiter, etc.).
4. Pesticide.

3. *Agave sisalana* Perrine ex Engelm.

Family	: Agavaceae
Vernacular name	: Sotabdi goch, Sisal
Part used	: Leaf
Uses of fibre	: Rope, cap, bag, carpet, etc.



Brief description

Robust acaulescent shrub. Leaves crowded in the basal part, oblong – lanceolate, 1-2.5 m long, 10-30 cm wide, thick, flat, margins with upwardly directed spines. Flowering stem stout, up to 3 m high, covered with scales. Sepals oblong – lanceolate. Capsules ovoid.

Flowering & fruiting : July - December

Distribution : Commonly cultivated for fibre throughout Himalayan region, up to 1500m; native to Eastern Mexico.

Extraction method

The leaves are cropped off from the plant. The first harvesting is done when plant is 2-3 years old. After that, fresh leaves can be harvested for a period of another 4-6 years. After harvesting, the spines of leaves are removed and leaves are tied into bundles. The extraction process is known as decortication, where leaves are crushed and beaten by a rotating wheel set with blunt knives, so that only the fibres remain at the end. Then retting is done in water for several days (6-15 days) and finally fibres are removed either by hand or with the help of a *raspador*. The fibre is then dried, brushed and baled for export. Proper drying is important as fibre quality depends largely on moisture content. Artificial drying has been found to result in generally better grades of fibre than sun drying, but is not feasible for all. In the drier climate, the species is mainly grown by smallholders and fibre is extracted by teams using portable raspadores which do not use water. Removed fibres are washed thoroughly in clean water by brushing, dried in sun for 2 days and tied in bales. Dry fibres are machine combed and sorted into various grades.

Other uses

1. Ornamental plant grown in garden.
2. Leaves are used in making mattress and traditional mat, cap, etc.



4. *Bauhinia vahlii* Wight & Arn.

Family	: Caesalpiniaceae
Vernacular name	: Kariyala, Malu, Maljan
Part used	: Stem bark
Uses of fibre	: For making ropes, threads, etc.



Brief description

Woody climber, often climbing from one plant to other; branches densely pubescent, ending into circinate, rusty-tomentose tendrils. Leaves 10-40 cm long, cleft 2-8 cm deep, densely tomentose beneath. Flowers white, 2-3 cm long, in terminal corymbose racemes. Calyx cylindrical; limb splitting into 2-lobes. Petals 2-4cm long, ovate. Pod brown, 4-12 cm long. Seeds 8-12, flat, suborbicular, dark brown.

Flowering & fruiting : April - September

Distribution : Common in Oak and Pine forests of entire Himalayan region, up to 1300m altitude.

Extraction method

Fresh stems are cut and fibres are separated from the stem manually by hand. The fibres are sun/shade dried and stored in a dry place.

Other uses

1. Wood used as a fuel.
2. Leaves used as a fodder for cattle and making *Pattal* (Plate).
3. Seeds edible.
4. Bark used for dyeing and tanning.
5. Medicinal (stomachache, dysentery, tonic, etc.).



5. *Betula utilis* D. Don

Family	: Betulaceae
Vernacular name	: Bhojpatra, Birch
Part used	: Stem bark
Uses of fibre	: Stem bark used as paper for writing religious text



Brief description

Trees or shrubs, 2-15 m high. Bark peeling horizontally, white, brownish or reddish-white. Leaves ovate or rhomboid, 2.5-8.2 cm x 1.8-6.2 cm, rounded at base, subcordate or cuneate, margin doubly serrate to sub-serrate, the surface sparsely pilose, acute or acuminate at apex. Male flowers in catkins, 3-4 cm long. Bract broadly ovate-obtuse, 1-2 mm long. Filament inconspicuously forked, anthers c. 1.5 mm long, oblong, sometimes aristate at the tip. Strobili 2.5-4 x 1- 1.5 cm. Styles variable in size. Fruiting scale 8-9 mm long, woody, lobes minutely ciliate; median lobe 4-5 mm long, linear-lanceolate, longer than the 2 erect or outspread laterals. Nut elliptic-ovate, 2.5-3 mm long, as broad as or broader than the wing.

Flowering & fruiting : May – September

Distribution : Commonly found at the upper limit of trees, from 2800-4300 m, usually gregarious at places.

Extraction method

The bark is smooth and white and peels horizontally. The bark is removed from the stem. Fine quality of bark is selected, dried properly, cut as per requirement, and used directly as a substitute for writing paper.

Other uses

1. The bark is used for roofing and as umbrella covers.
2. The leaves are used as fodder for cattle.
3. The bark is also used as a spermicidal agent.
4. Sacred plant.



6. *Boehmeria nivea* Gaud.

Family	: Urticaceae
Vernacular name	: Ramie, Rhea
Part used	: Stem bark
Uses of fibre	: Industrial sewing thread, packing materials, fishing nets, filter cloths, paper making



Brief description

Shrubs or subshrubs, 0.5-1.5 m high; monoecious. Leaves alternate; stipules lanceolate, free or connate and 2-cleft, 7-11 mm long; petiole 2.5-10 cm; leaf blade often orbicular or ovate or elliptic-ovate, 5-15 × 3.5-13 cm, herbaceous, subtruncate at base, cordate or cuneate, margin dentate from base, cuspidate or acuminate at apex. Glomerules unisexual. Male glomerules few-flowered, 2-4 mm in diam.; female glomerules many-flowered, 2-3 mm in dia. Male flowers 4-merous, sessile; perianth lobes connate to middle, 1 - 1.5 mm long, pubescent. Female flowers rhomboid-ellipsoidal, 0.6-0.8 mm long; stigma 0.5 - 1 mm long. Fruiting perianth rhomboid-obovoid, compressed, 0.5 - 1 mm, constricted and stalklike at base, almost without neck at apex, 2-3-toothed; achenes subovoid.

Flowering & fruiting : May – November

Distribution : Occasionally found on forest margins, thickets, moist places along streams, roadsides of Eastern Himalayan states; often cultivated in between 500 - 1700m.

Extraction method

The extraction of the fibre follows three stages. First the cortex or bark is removed; this can be done by hand or by machine. This process is called de-cortication. At the second stage the cortex is scraped to remove most of the outer bark, the parenchyma in the bast layer and some of the gums and pectins. Finally, the residual cortex material is washed, dried, and de-gummed to extract the spinnable fibre.

Other uses

1. Ornamental plant.

7. *Bombax ceiba* L.

Family	: Bombacaceae
Vernacular name	: Sembal, Salmali
Part used	: Fruits
Uses of fibre	: Stuffing life-belts, cushions, mattresses and pillows; insulation for refrigerators and sound-proof covers; packing fragile goods; making padded surgical dressings



Brief description

Trees, 30-50m high; branches in whorls, spreading. Leaves digitate, 5-7 foliate; leaflets lanceolate to elliptic, 12-20 x 7-10 cm, tapering at base, entire. Flowers bright red to pinkish, showy. Calyx campanulate or cup-shaped; sepals 5, fleshy, thick. Petals 8-10 cm long, fleshy. Capsules oblong – ovoid, 8-15 cm long, woody, 5-valved. Seeds numerous, pyriform, dark brown.

Flowering & fruiting : January - May

Distribution : Commonly found as a roadside plantation and garden tree. Also, occasionally as wild in sub Himalayan tracts between 500 to 1200m.

Extraction method

Fibre is usually obtained from the fruits, fallen after ripening. For better quality fibre, the mature fruits are collected directly from the trees before their dehiscence and dried under sun for a week. Fibre is scooped out of the dry capsules and dried for about 5 days. The dried wool is stored in cool and dry places in jute bags.

Other uses

1. Timber (match industry, light plywood, packing cases, frames, coffins, etc.).
2. Roots and flowers are edible.
3. Bark is used as a famine food.
4. Medicinal (anaemia, asthma, atrophy, cough, fever, cholera, etc.).

8. *Broussonetia papyrifera* (L.) L'Her. ex Vent.

Family	: Moraceae
Vernacular name	: Jangli-Toot
Part used	: Stem bark
Uses of fibre	: Paper-making, high-grade leathery paper; umbrella covers, paper-lanterns, rope-making, etc.



Brief description

Tree, 5-15 m high; branches spreading, tomentose. Leaves obliquely ovate or oblong, 15-20 x 5-12 cm, lobed when young, dentate, membranous. Male spikes 5-8 cm long, cylindrical, pubescent; perianth 4-lobed, valvate; stamens 4, inflexed in bud. Female flowers in compact, long stalked heads, mixed with persistent bracts; perianth ovoid, tubular, 3-4 toothed, persistent. Achenes in small heads, surrounded by bracts and perianth.

Flowering & fruiting : March - June

Distribution : Planted as a roadside tree and naturalized in several parts of Himalaya; native to Japan, China and S.E. Asia.

Extraction method

Stems are soaked in hot water for 25-30 minutes. After soaking, the bark is separated from the stem and boiled in wood-ash to separate the fibres.

Other uses

1. Wood is made into packing cases, cheap furniture, pencils, etc.
2. Wood is suitable for production of mechanical pulp for paper-making.



9. Cannabis sativa L.

Family	: Cannabaceae
Vernacular name	: Bhang, Hemp
Part used	: Stem bark
Uses of fibre	: Textile industry; production of cordage; manufacturing sail-cloth; canvas goods and twines; making ropes, fishing nets and non-slippery shoes for use in snow-clad regions.



Brief description

Perennial aromatic herb or undershrub, to 2.8m high. Leaves palmately 3-7 partite; segments linear-lanceolate to elliptic, 2-11 x 0.2-2 cm, long acuminate at apex, coarsely serrate at margins. Plant dioecious. Male flowers in lax terminal paniced-cyme; perianth segments 5, oblong, obtuse. Female flowers solitary or clustered; perianth segment 1, leaf like. Achenes greenish-brown, ovoid. Seeds globose, 2-4 mm long.

Flowering & fruiting : May - October

Distribution : Cultivated and naturalized in the entire Himalayan region from 500-1400m altitude.

Extraction method

The plants are cut after maturation of seeds and kept in the open for dew retting for two 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. The fibres thus obtained are white or dark brown in color; 1-5 m in length; used for making ropes and *Pullas* – a traditional carpet.

Other uses

1. Medicinal (dyspepsia, diarrhoea, depression, high blood pressure, etc.).
2. Narcotic effect (i.e., *Charash* or *Hashish*).
3. Seeds are edible.



10. *Corchorus capsularis* L.

Family	: Tiliaceae
Vernacular name	: Narehha, Narcha, Kalasaka, Mora Pat, Jute
Part used	: Stem bark
Uses of fibre	: Making gunny bags, ropes, carpets, rugs, rough cloth and many other similar articles of daily use.



Brief description

Annual herb, to 3 m high. Leaves 3-5-costate, ovate-lanceolate or linear-lanceolate, 5-15 x 1.2-6 cm, acute at apex, coarsely serrate, basal serrations backwardly prolonged into setaceous appendages; stipules linear, 5-10 mm long. Cyme 1 or 2-flowered, axillary or antiphyllous. Flowers yellow, 8-10 mm across, pedicellate; bracts linear-ovate, 2-4 x 1-2 mm. Sepals linear oblong, 4-5 mm long. Petals obovate, 3-5 x 2-3 mm, notched at the apex. Capsule subglobose-globose, 10-12 mm in diameter, beakless and depressed at apex, scabrous, ridged, tuberculate or muricate, 5-loculed, locules aseptate. Seeds cuneiform, 1-2 mm long, brown.

Flowering & fruiting : July - November

Distribution : Cultivated throughout the subtropical belt in the Himalayan region, up to 1200m.

Extraction method

The plants are cut close to the ground with sickles. Cut plants are tied into bundles up to 23 cm in diameter. Jute is retted in any type of clean water that is available in the vicinity of the fields. In low-land areas it is retted in slow running water, and the fibre of very good quality is obtained. If water is stagnant it is usual to steep the bundles twice or thrice with short intervals between successive steeping. The fibre obtained is somewhat dark in colour. For steeping, the bundles are generally arranged in two or three layers. Each individual float is called *Jak*. The surface of the *Jak* is covered with weeds or other refuse and it is submerged by weighting it down with logs, banana stems or mud. Complete submersion is essential for uniform retting, but care should be taken that the *Jak* does not sink to the bottom. Retting results in the separation of fibre strands from the central woody portion due to the disintegration of soft tissues in which fibres are embedded. When retting is completed the bundles are removed for stripping the fibres. The retted stems are broken into two or three parts by a mallet, and the fibre is separated from the sticks by jerking and washing in water. The stripped fibres are washed and dried in the sun for two to three days. Dried fibres are made up in hanks or lots of about 4 kg each, tied at the top ends. In some parts, lots are given a slight twist and folded into small compact bundles, varying in weight from 40-50 kg each. The extracted fibre is weaved through machines and subsequently the products prepared for marketing.

Other uses

1. The pith is used in paper industry and in preparation of alcohol.
2. Leaf and young shoots are used as vegetable.
3. The stalk after removal of fibre is used as firewood.
4. The fruit is used as medicine in the treatment of headache.
5. An infusion of leaves is a demulcent, stomachiac, carminative, laxative, stimulant and used to increase appetite. It is also given in dysentery, fever, dyspepsia and disorders of the liver.
6. Decoction of roots and unripe fruits is used in diarrhoea.
7. The leaves contain glucoside capsularin which is related to corchorin and chorchoritin, extracted from seeds and used in cardiac diseases.



11. *Crotalaria juncea* L.

Family	: Fabaceae
Vernacular name	: Shaan, Junjuni
Part used	: Stem bark
Uses of fibre	: Fishing nets, gunny bags, coarse cloths and mattress



Brief description

Undershrub, to 1.2 m high, erect; branches grooved, silky brown. Leaves sessile, oblong-lanceolate, 4.5-16 x 0.5-4 cm, mucronate. Flowers many, yellow, 1-2.3 cm long. Bracts lanceolate. Calyx 1.5-2cm long; segments linear-lanceolate. Corolla slightly exerted; vexillum ovate-oblong. Pods sessile, velvety, 10-20 seeded.

Flowering & fruiting : August – December

Distribution : Cultivated throughout the warmer parts of Himalayan region, rarely found in wild; between 500 -1200m.

Extraction method

For obtaining fibre, either the entire plant is pulled out or the stalks are cut close to the ground. The harvested plants are tied into bundles of 50-100 stems and left on the field for 2-3 days so that leaves may wither and drop off. Immediate retting is preferred in humid areas, although pre-drying is stated to yield fibre of better quality. Retting is carried out in clear, stagnant or slow flowing water. Before the bundles are immersed in water, the top and root portions are cut off. If roots are retained, retting will not be uniform, and the matted fibrous mass from the root portions affects the quality of the product.

The fibre is extracted by breaking the retted stalks near the root end and stripping the fibre upwards. If retting is satisfactory, the fibre peels off smoothly. After stripping, the fibre is washed by lashing in water and dried in the sun. The dried fibre is twisted and sometimes folded, and made into small bundles or hunks before storing or marketing.

Other uses

1. Mature stem is used as tooth brush.
2. Leaves and young shoots used as vegetable.
3. Fertilizer plant-used as biomanure.

12. *Daphne papyracea* Wall. ex Steud.

Family	: Thymelaeaceae
Vernacular name	: Ghandiri, Kagate, Lokto, Dhenok
Part used	: Stem bark
Uses of fibre	: Ropes, sacs, the paper <i>Satpura</i> made from this fibre is used for religious purposes and for making <i>janam-patris</i> . The trade <i>Nepal Paper</i> for legal documents and records.



Brief description

Much branched shrub, to 1 m high, with smooth, grey bark. Leaves shortly channeled to petiole, elliptic – lanceolate, 4-10 x 2-2.5 cm, obtuse or acute at apex, thick coriaceous, dark green. Flowers white, scented, tinged-purple outside, in terminal heads or spikes. Perianth tube 0.8-1.2 cm long, downy outside; lobes 4, 5-8 mm long, acute. Fruits subglobose, fleshy, shining red when ripe.

Flowering & fruiting : March – July

Distribution : Common in the Himalayan shrub forests, up to 3000m.

Extraction method

Soaking and rinsing: A bunch of bark is soaked in water for at least six hours then rinsed in cold water.

Pulping: Wood ash is mixed with water and allowed to percolate the bark for at least an hour. The softened bark is then beaten with a stone pestle until it is reduced to a homogeneous dough like pulp. It is placed in another vessel containing pure water and stirred until it loses all stringiness and will spread out quite easily when shaken under water.

Sheet formation: A wooden frame along with a finely knitted net is placed slightly below the surface of water, and the measured amount of pulp is poured into the frame. After agitating the pulp water mixture, the frame is gently lifted from the water, allowing excess water to run through the screen, forming the sheet of the paper. The pulp is then dried on the frame by being exposed at an angle inclined towards a big fire or under sun.

Irregular edges trimmed with a sharp knife and polishing accomplished by placing the sheets in a flat board and rubbing it vigorously with a smooth stone or similar object. Each sheet is then folded and paper is usually sold in bundles.

Other uses

1. Plant is used for intestinal complaints.
2. Ornamental.

13. *Edgeworthia gardneri* Meissn.

Family	: Myrsinaceae
Vernacular name	: Argheli, Dhenok
Part used	: Stem bark
Uses of fibre	: Handmade paper



Brief description

Small tree, to 4 m high. Stem brownish red. Leaf-blade narrowly elliptic to elliptic-lanceolate, 6-10 × 2.5-3.4 cm, acute at apex. Inflorescences terminal and axillary, capitate, 3.5-4 cm in dia., 30-50 flowered; peduncle pendulous, 2-2.5 cm, white sericeous at anthesis, glabrescent. Bracts caducous, leaflike, narrowly lanceolate. Calyx 10-15 mm long, exterior densely white sericeous; lobes 4, yellow adaxially, ovate, c. 3.5 × 2.5 mm, abaxially densely sericeous, apex acute or rounded. Disk scale lacerate. Drupe ovoid, densely sericeous.

Flowering & fruiting : September - June

Distribution : Common in Eastern Himalayan forests and grows well in moist places between 1000-2500 m elevation; native to China

Extraction method

Fresh stems are cut and fibres are separated from the stem manually by hand. The fibres are sun dried and stored in a dry place. For preparation of paper making the pulp needs to be boiled in a boiling oven. After boiling, the pulp is completely washed and placed in a pulp making machine for condensation. The condensed pulp is mixed with the desired organic dye for colouring. Then the coloured pulp is poured in to the paper making frame and paper is made by deposition from a dilute water suspension on the frame. The final product (paper) is ready after room drying and subsequently the products are prepared for marketing.

Other uses

1. As an avenue plant.



14. *Eulaliopsis binata* (Retz.) C.E. Hubbard

Family	: Poaceae
Vernacular name	: Sabai Grass, Bhabar Grass
Part used	: Leaf
Uses of fibre	: Making brooms, cordage, ropes, threads and matting.

Brief description

Perennial grass with woody base. Culms slender, erect, to 1m high, branched; nodes bearded. Leaves linear, narrow, convolute, 30 - 60 cm long; sheath glabrous; ligule a ring of hairs. Racemes 2-5 cm long, golden or rusty-villous, on filiform peduncles. Spikelets 2-nate, a sessile and a pedicelled, 6 mm long. Spikelets lanceolate, 2-3.5 mm long; glume lanceolate, 2-toothed, 2-3 mm long, ciliate; lemma 2-3 mm long, hyaline, with narrow ciliate palea.

Flowering & fruiting : June - November

Distribution : Occasionally found in dry mountain slopes; between 500-2400 m altitudes from Kashmir to Sikkim Himalayan ranges

Extraction method

Fine and matured leaves are selected from healthy growing grasses. Leaves including the small portion of culms are cut and then sun dried. The dried leaf-fibres are stored in a cool and dry place.

Other uses

1. Plant is used as fodder.
2. To check soil erosion.



15. *Girardinia diversifolia* (Link) Friis

Family	: Urticaceae
Vernacular name	: Jarahan
Part used	: Stem bark
Uses of fibre	: Making ropes, threads, <i>Pullas</i> (traditional carpet) and other items; mixed with wool to make various products



Brief description

Herb or undershrub, robust, suffruticose, with stinging hairs. Stem 0.5-2 m high, fibrous. Leaves broadly ovate, often palmately lobed, 10-26 x 7-15 cm, acuminate at apex, cordate or truncate at base; stipules forked at the tip. Flowers sessile, small, pale green, unisexual, crowded. Male flowers in much branched paniculate spikes, perianth 4-parted; stigma 4. Female flowers in short, thick, densely bristly spikes; perianth tubular, 3-lobed. Achenes ovoid, brown-black.

Flowering & fruiting : July - October

Distribution : Pantropic weed found in forest margins, shady moist places, along streams, disturbed places, near villages; between 500-2600 m altitude.

Extraction method

During October-November the stems of this plant are cut into pieces and dried. Subsequently they are kept for snow retting during winter (January-February). These are then sun dried. After that the brown coloured fibres are separated by beating and the fibres are sun dried and stored. Ropes and *Chhikari* are then made from this fibre by spinning.

Other uses

1. Leaves used as vegetable.
2. Extract of leaves used in headache, swollen joints and fever.



16. *Grewia optiva* J.R. Drumm. ex Burret

Family	: Tiliaceae
Vernacular name	: Bhimal
Part used	: Stem bark
Uses of fibre	: Used as orange cordage and in manufacturing paper



Brief description

Trees, to 12 m high. Leaves ovate-lanceolate, 5-15 x 4-7.5 cm, base rounded with prominent nerves, acuminate at apex, serrate at margins. Flowers in axillary or leaf opposed cymes, 1-8 together; pedicel 1-2 cm long. Sepals 0.5-1 cm long, tomentose. Petals pale-white, ovate. Stamens many. Drupes 5-10 mm across, 1-4 lobed, blue – black when ripe.

Flowering & fruiting : April - November

Distribution : Commonly associated with crop fields or open forests of sub Himalayan tracts of Western Himalaya, up to 1600 m altitude.

Extraction method

The branches or the stems are cut in the month of March and kept for cold water retting which lasts for 20-30 days. This was followed by scutching in which woody core of the stem is fragmented. Following beating, the stem is dried for few days. Finally, the bark of stem is extracted and yellow coloured fibres are separated from the bark. The fibres are sun dried and stored in a dry place and then made into ropes.

Other uses

1. Leaves are lopped for fodder.
2. Fruits edible.
3. Medicinal (fever, facilitates child birth, etc.).
4. Used as a detergent and dye.
5. Dried wood used as fuel.



17. Hibiscus cannabinus L.

Family	: Malvaceae
Vernacular name	: Sougri, Sann, Patsan
Part used	: Stem bark
Uses of fibre	: Ropes, mask, collar belt, carry bag and decorative items



Brief description

Annual herb, with scattered prickles. Leaves 5-10 cm across, 3-5- palmately lobed. Epicalyx segments 7-8. Flowers pale-yellow with a crimson centre. Calyx lobes lanceolate or linear, distinctly 3-nerved. Corolla yellow. Capsules globose. Seeds reniform, brownish.

Flowering & fruiting : September – December

Distribution : Cultivated throughout the Himalaya, some times found as a agricultural weed, up to 800m altitude; native of tropical America

Extraction method

The crop is ready for harvesting 3-5 month after sowing. For fibre purpose, harvesting is done at the flowering stage before seed setting; if delayed, the fibre obtained is coarse with little lustre.

The plants are cut close to the ground with a sickle or pulled out by the roots, tied into bundles of 30 to 40 stalks, left on the field for the few days to dry and then steeped in water for retting.

For retting the leafy tops are cut off and the bundle steeped vertically in water for 2-3 days to soak the thick basal parts. They are then steeped in a horizontal position, after weighting with logs, stone, and clods of earth or grass. The period of retting varies from 6 to 10 days depending upon the temperature of water and the types of micro-organism present. The progress of retting requires close observation to avoid under- retting which do not facilitate the easy removal of fibre and thus the fibre obtained is harsh and brittle, or over-retting which weakens the strength of the fibre.

Once the material has retted completely the bundles are removed and the bark peeled off from the root upwards. The strips are gently beaten with a mallet or stick and rinsed in water to separate the fibre from adhering tissue. The clean fibre is washed, dried in the sun and made into bundles or hanks for marketing. Various rope products are made from this fibre.

Other uses

1. Leaf is used as vegetable.
2. Stem is used as firewood.
3. Medicinally it is used in the treatment of external inflammation, acts as an appetiser and enhances digestion.
4. The young leaves and tender stems are eaten raw in salads or cooked as greens alone or vegetable combination with other vegetables and/or with meat.



18. *Laportea crenulata* Gaudich.

Family	: Urticaceae
Vernacular name	: Morungay; Ongyalop
Part used	: Stem bark
Uses of fibre	: Making ropes



Brief description

Shrub, armed with stinging hairs, to 7 m high. Leaves alternate, petiolate; stipules deciduous, intrapetiolar, incompletely connate, apex 2-cleft; leaf blade papery, pinnately veined or 3-veined, often coarsely dentate at margin. Inflorescences solitary, axillary, pedunculate, loose glomerules forming spikes. Bracts present, very small. Male flowers: perianth lobes 4 or 5, slightly subvalvate, depressed, inflexed in bud; stamens 4 or 5; rudimentary ovary clavate or subglobose. Female flowers: perianth lobes 4, free or connate at base, strongly unequal, dorsal 2 unequal and smaller, lateral 2 equal and larger; staminodes absent. Achene ovoid to semicircular, often compressed, sessile or stipitate on oblique torus.

Flowering & fruiting : June – December

Distribution : Common in Eastern Himalaya between 1200-2000m altitude; endemic to Eastern Himalaya.

Extraction method

The fibres are extracted using either serrated or non serrated knives. The peel is clamped between the wooden plank and knife and hand-pulled by removing the white portion which will be processed into knotted fibres. The extracted fibres are sun-dried which whitens the fibre. Once dried, the fibres are ready for knotting. A bunch of fibres are mounted or clamped on a stick to facilitate segregation. Each fibre is separated according to fibre sizes and grouped accordingly. To knot the fibre, each fibre is separated and knotted to the end of another fibre manually. The separation and knotting is repeated until bunches of unknotted fibres are finished to form a long continuous strand. This fibre can now be used for making various products viz. mats, bags, floor and home furnishings etc. in attractive designs of various sizes out of these fibres.

Other uses

1. Juice of the root is used to cure chronic fevers.
2. Roots and leaves are applied to swellings and blind abscesses

19. Pandanus odoratissimus L.f.

Family	: Pandanaceae
Vernacular name	: Keura, Ketki, Ketaki
Part used	: Leaf
Uses of fibre	: Basket, decorative box, mat, sandal, eyeglass case, etc.



Brief description

Shrub or small tree, 2-6 m high; stem supported by basal stout. Leaves linear-ensiform, 60-120 x 4-10 cm, caudate, acuminate at apex, drooping, margins with up curved spines, glossy green. Flowers pale-yellow, in axillary clusters, sweet scented; spathe yellow, fragrant. Male flowers of numerous anthers, umbellate on the connate filaments. Carpels connate in groups, with sessile, lobulate stigma. Fruit strobiliform.

Flowering & fruiting : February – August

Distribution : Naturalised in aquatic habitats, nearby rivulets or moist localities; throughout the Himalayan region, ascending to 1200 m.

Extraction method

The leaves are cut from the Pandanus tree and carried to the village. The thin outer layer of the leaf is peeled off to remove the spines and sundried. Once it's dried, the leaves are stripped into fine strands. The strands can be dyed allowing a mixture of colours to be woven together. After drying the fibre is ready to use.

Other uses

1. Leaves used in leprosy and skin diseases.
2. Roots considered as antidote to snake bite.
3. Flowers are used for perfumes.
4. Juice of inflorescence used in rheumatic arthritis.

20. *Pueraria tuberosa* (Roxb. ex Willd.) DC.

Family	: Fabaceae
Vernacular name	: Bidarikand, Saral, Siralu
Part used	: Stem bark
Uses of fibre	: Rope-making



Brief description

Twining climbers; underground roots tuberous. Leaf rachis 8-22 cm long, leaflets broadly ovate, 8-18 x 5-12 cm, abruptly acuminate at apex; lateral leaflets oblique. Flowers blue-purple, in simple terminal raceme. Calyx 5-8 cm long, densely clothed with red-brown hairs; teeth subequal, shorter than tube. Vexillum and keel whitish blue; wings purple with white base. Pods 3-7 cm long, linear, clothed with silky-brown hairs.

Flowering & fruiting : March - December

Distribution : Commonly found at the edges of forest, usually in exposed localities, climbing on other plants; found throughout the Himalayan region, ascending up to 1200m.

Extraction method

The fresh stems are cut and fibres are separated manually by hand. The separated fibres are sun dried and stored in cool and dry places.

Other uses

1. Leaves lopped for fodder.
2. Tubers edible.
3. Flowers, an important source of bee-forage.
4. Medicinal (asthma, cholera, chest pain, rheumatism, ulcers, tonic, etc.).

21. *Saccharum spontaneum* L.

Family	: Poaceae
Vernacular name	: Bagdya, Munj, Kansh, Kasa
Part used	: Leaf
Uses of fibre	: Making <i>Pullas</i> (traditional carpet), thatching roofs and religious purposes.



Brief description

Perennial, with tufted rootstock. Culms erect, to 3 m high. Leaves linear, filiform, 15-18 cm long, margins convolute; ligule a scarious rim. Panicles silvery-white, 15-30cm long. Spikelets lanceolate, 2-3 mm long, awnless. Glume lanceolate, 2-2.8 mm long, acute, subkeeled. Lemma ovate-lanceolate, 1-2 mm long, subacute, ciliate, epaleate.

Flowering & fruiting : September – November

Distribution : Common grass in mountain slopes, gravelly river beds, low grassy places, below 2000 m.

Extraction method

The mature leaves are selected from the healthy growing grasses. The leaves including the small portion of culms are cut, sun dried and stored in a cool dry place.

Other uses

1. Medicinal (Refrigerant, diuretic, purgative, tonic, aphrodisiac, etc.).
2. Checks soil erosion.
3. Leaves for thatching roofs.



22. *Sarcococca saligna* (D. Don) Muell.- Arg.

Family	: Buxaceae
Vernacular name	: Chirbiri
Part used	: Stem bark
Uses of fibre	: Making ropes and mats



Brief description

Evergreen shrub, to 1.5 m high, with terete stem. Leaves alternate, shortly stalked, elliptic – lanceolate, 5 – 12 cm long, entire, acuminate at apex. Flowers pale-white, in dense axillary clusters; male towards apex, female a few, towards base. Bracts white. Sepals 4, in two series, oblong. Drupes 5-10 mm long, ovoid, dark-purple tipped.

Flowering & fruiting : March - August

Distribution : A common gregarious shrub found in moist and shady places of forest in eastern Himalaya, up to 3000 m altitude.

Extraction method

Fresh stems are cut and fibres are separated from the stem manually by hands. The fibres are sun/shade dried and stored in a dry place.

Other uses

1. Plant extract used for fever.
2. Stem used for making walking-sticks.

23. *Sterculia villosa* Roxb.

Family	: Sterculiaceae
Vernacular name	: OdaI, Kanhlyemkung
Part used	: Stem bark
Uses of fibre	: Making ropes



Brief description

Trees; bark gray-white. Leaves simple, palmately 3-7-lobed, 17-22 cm long, abaxially densely yellow-brown stellate tomentose, adaxially sparsely pubescent, caudate at apex, central lobe broadly ovate. Flowers yellow. Calyx campanulate, 0.5 - 1 cm long, tube 2- 4 mm long, abaxially pubescent; lobes lanceolate, acuminate at apex, spreading outward. Male flowers: androgynophore curved, glabrous; stamens 10. Female flowers: ovary globose; style curved downward, hairy. Follicles narrowly ellipsoid, 3-5 cm, both surfaces densely ferruginous villous, apex shortly beaked. Seeds black, oblong.

Flowering & fruiting : February – October

Distribution : Common in Eastern Himalayan mixed forest, also cultivated near villages at 500-1500 m altitudes.

Extraction method

The fibres are extracted through hand extraction by knives. The peel is clamped between the wood plank and knife and hand-pulled by removing the white portion which will be processed into knotted fibres. The extracted fibres are sun-dried and the bunch of fibres are clamped on a stick to facilitate segregation. Each fibre is separated according to fibre size and grouped accordingly. This fibre can now be used for making various products.

Other uses

1. Pulverized bark poultice applied externally over affected parts in arthritis.
2. Small quantity of gum mixed with honey taken in the morning is reported to be good for throat problems.
3. Root extract is taken as a source of vitamins.
4. Leaves are used for fodder.



24. *Triumfetta rhomboidea* Jacq.

Family	: Tiliaceae
Vernacular name	: Chiriyari, Agra, Sougri Ananbi
Part used	: Stem bark
Uses of fibre	: Ropes and decorative items



Brief description

Undershrub, to 80 cm high. Leaves ovate to rhomboid, palmately 3-lobed, acute at apex, irregularly serrate at margin, 3-7 nerved. Flowers in terminal or leaf opposed cymes, 4-7 mm across. Petals yellow, oblong – obovate. Capsules subglobose.

Flowering & fruiting : August – November

Distribution : A pantropical weed found in forest margins, open areas, wastelands at 500-1500m altitude; native to West Indies.

Extraction method

Plant is cultivated particularly in home garden. After attaining maturity, the plant is harvested from the field by cutting it in the lower part of the stem. The bark of the mature stem is peeled off and allowed to sun dry for two to three days. The dried bark may be used directly as rope. However, smooth fibres are obtained involving lengthy processing steps given below:

The process involves steeping and keeping the stems submerged in water for 4-5 days, but the number of days required depends on water temperature, locality, the time of year, weather conditions, depth and source of water, thickness of stalks and quantity of straw in relation to volume of water. Shallow water of about 1 m to 1.5 m is ideal depth for retting. If on testing of the retted stalks fibre is found loosening, it is considered ready for extraction. The fibre is removed from the stem by hand. Precautions must be taken against under-retting or over-retting of fibre. In under-rated condition, removal of fibres will be difficult as bark adheres to the extracted fibre. When over-retted condition, the micro-organisms break down the tissues surrounding the fibre and this results in weakening of the fibre.

In the process of steeping, the bundles are arranged side by side preferably in single layer in the water. The bundles are weighted down to a depth of 10 to 15cm in the water. The weighted materials which release tannins (such as banana logs) should not be used. Generally steeping takes 3-5 days. After extraction, the fibre is washed in water and dried under the sun. Under sunny conditions, one day is sufficient for the fibres. Bundles of fibre are made by twisting the fibres in convenient sizes before sending it to market.

Other uses

1. The plant is used as fire wood.
2. Leaves and young shoots are used as vegetable
3. Juice extracted from above ground part is used in the treatment of stomach-ache.

25. *Wikstroemia canescens* Meissn.

Family	: Thymelaeaceae
Vernacular name	: Dhawe, Chamliya
Part used	: Stem bark
Uses of fibre	: Strong cordage material; manufacturing of rice-paper



Brief description

Shrub, 1-2.5 m high, with slender branches. Leaves opposite or alternate, elliptic – oblong, 3.5-7.5 x 1.4-2.5 cm, acute at apex, membranous; petioles short. Flowers subsessile, yellowish, in few-flowered, axillary or terminal heads or spikes. Perianth tube 8-12 mm long; lobes 4, short, obtuse. Fruits ovoid, 3-5 mm long, silky, pale brown to black.

Flowering & fruiting : April – November

Distribution : Occasionally found in shrubby slopes, among rocks at 1000-2800 m altitude in the entire Himalayan region.

Extraction method

Good quality stems need to be selected from healthy 2-4 years old plants. The fresh green stems are cut and fibres peeled off manually by hand or using small knife. Strong and flexible fibres obtained are sun dried and stored in a dry place. This fibre can now be used for making ropes.

Other uses

1. Used as an insecticide and pesticide.



Inventory of fibre yielding plants of the Indian Himalayan region (IHR)

S.No.	Name of the species	Family	Vernacular name	Habit	Flowering & Fruiting time	Altitude (m asl)	Part used	Uses of fibre	Other Uses
1	<i>Abelmoschus esculentus</i> (L.) Moench	Malvaceae	Bhindi	H	Jun-Nov	Upto 1800	St, Bk	Rope	Fruit is used as vegetable, decoction of dried capsules given in fever and dysentery, seeds yield fatty acid
2	<i>Abelmoschus moschatus</i> Medik.	Malvaceae	Muskdana	H, US	Jul-Nov	Upto 2000	St, Bk	Rope	Seed oil used in perfumery
3	<i>Abroma angusta</i> (L.) L.f.	Sterculiaceae	Sanu Kapase, Shringraj	S	Jul-Oct	500-1200	St, Bk	Rope, Cordage	Juice of the bark is used to cure irregular menstruation.
4	<i>Abrus precatorius</i> L.	Fabaceae	Ratti, Ratigiri, Gaunchhi, Kamboji	Cl	Jul-Mar	500-1100	Bk	Rope	The seeds are valued in native jewelry for their bright coloration
5	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Kangiyo, Atibalu, Atibalaa, Soma ratsa	US	Aug-Mar	Upto 1200	St, Bk	Rope, Twine, Cordage	An infusion of the root is employed as a remedy for leprosy and is also taken internally as a cooling medicine for fever, root is used to treat cough and fever, paste of the leaf and seeds is applied to wounds
6	<i>Abutilon persicum</i> (Burm. f.) Merr.	Malvaceae	Tepari	US	Mar-Oct	Upto 1100	Bk	Rope	Leaf juice used to cure jaundice
7	<i>Abutilon ramosum</i> (Cav.) Guill. & Perr.	Malvaceae	Kanghe, Atibala	H, US	Aug-Mar	Upto 1200	St, Bk	Rope	Decoction of leaf is used for fever
8	<i>Aechmanthera gossypina</i> Nees	Acanthaceae	Jaundela, Bairara, Latghan	S	Apr-Dec	500-2400	St, Bk	Rope, Net	Flowers are used for bee- forage

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9	<i>Agave americana</i> L.	Agavaceae	Ram bans, Bans Keora, Kantala	S	Oct-May	Upto 1300	L	Rope, Mat, Twine, Net, Cordage	Plant used as biological fence, leaf extract used as fish poison, check land slide and soil erosion
10	<i>Agave cantula</i> Roxb.	Agavaceae	Ram-Bans, Kandala	S	Jul-Dec	<1300	L	Rope, Mat, Twine, Net, Cordage	Checks soil erosion, used for bio-fencing, medicinal value (dropsy, boils, burn, cut, fever, goiter, etc.) and pesticide
11	<i>Agave sisalana</i> Perr. ex Engelm.	Agavaceae	Sotabdi goch, Sisal	S	Jul-Dec	Upto 1500	L	Rope	Ornamental plant grown in garden, leaves are used in preparation of traditional mat
12	<i>Anaphalis busua</i> (Buch. – Ham ex D. Don) DC.	Asteraceae	Bugla, Buglya	H	Jan-Dec	600-1500	St	Rope	Leaf juice applied on bruises, wounds and cuts
13	<i>Annona squamosa</i> L.	Annonaceae	Sitaphal, Sharifa, Gandhgram	T, S	Mar-Sep	Upto 1200	St, Bk	Rope	Cultivated for edible fruits, bark used for skin ailments
14	<i>Artocarpus lacucha</i> Buch.-Ham.	Moraceae	Dhau, Barhal, Lakuchi	T	Apr-Jun	Upto 1200	St, Bk	Rope, Cordage	Wood used for making boat, furniture, cabinet, the wood and roots yield a lavish color dye, seeds and milky latex are purgative.
15	<i>Arundinaria callosa</i> Munro	Poaceae	Ringal	S	Apr-Oct	Upto 2500	C	Mat, Basket	Leaves used as fodder
16	<i>Arundo donax</i> L.	Poaceae	Tina, Nar, Baranal, Narsal	S	Sep-Dec	Upto 200	C	Mat, Basket	Leaves used as fodder, brooms are prepared from the panicles, culms used for thatching
17	<i>Bauhinia vahlii</i> Wight & Arn.	Caesalpiniaceae	Kariyala, Malu, Maljan	Cl	Apr-Sep	Upto 1300	St, Bk	Rope, Thread	Wood used as a fuel, leaves used as a fodder for cattle and making patta (plate), bark used for dyeing and tanning, medicinal properties (stomachache, dysentery, tonic, etc.)
18	<i>Betula alnoides</i> Buch. – Ham. ex D. Don	Betulaceae	Saur, Kath-bhuj	S,T	Mar-Jun	2000-3000	St, Bk	Paper	Wood also used for cabinet work, leaves are used for fodder

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19	<i>Betula utilis</i> D. Don	Betulaceae	Bhojpatra	T	Mar-Aug	2800-4300	St, Bk	Paper	Bark used as spermicidal
20	<i>Boehmeria nivea</i> Gaud.	Urticaceae	Ramie, Rhea	S	May-Nov	500 -1700	St, Bk	Thread, Packing, Fishing net, Filter cloth, Paper	Used as a ornamental plant
21	<i>Boehmeria macrophylla</i> Hornem.	Urticaceae	Bara, Siauru, Kamli, Pua	H	Jun-Jan	600 -3000	St, Bk	Rope	Leaves used as fodder
22	<i>Boehmeria malabarica</i> Wedd.	Urticaceae	Bong, Takbriet kung	S	Aug-Jan	850-1500	St, Bk	Rope	Used as a ornamental plant
23	<i>Boehmeria platyphylla</i> Don	Urticaceae	Khagsa, Taksur	US, S	Aug-Jan	Upto 2000	St, Bk	Fishing net, Rope,	Plant used as fodder
24	<i>Bombax ceiba</i> L.	Bombacaceae	Sembal, Salmali	T	Jan-May	500-1200	Fr	Stuffing life-belts, Cushion, Mattresses, Pillow, Insulation for refrigerator, Packing material	Timber (match industry, light plywood, packing cases, frames, coffins, etc.), bark is used as a famine food, medicinal (anaemia, asthma, atrophy, cough, fever, cholera, etc.)
25	<i>Borassus flabellifer</i> L.	Arecaceae	Tari	T	Apr-Aug	Upto 700	L, Tr	Cordage, Brush	Fruit is edible; plant is used for biofencing
26	<i>Broussonetia papyrifera</i> (L.) L'Her. ex Vent.	Moraceae	Jangli-Toot	T	Mar-Jun	500-1100	St, Bk	Paper, High grade leathery paper, Umbrella covers, Paper lantern, Rope	Wood is made into packing cases, cheap furniture, pencils, etc. and is suitable for production of mechanical pulp for paper-making
27	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Dhak, Tesu, Palas, Brahm-briksh	T	Mar-Jun	Upto 1800	St, Bk	Rope	Leaves used as fodder, flowers yield yellow dye, gum exudes used as tonic for indigestion

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28	<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	Tor, Arhar, Adhaki, Tuvasika	S	Jul-Nov	Upto 1500	St, Bk	Rope	Stem used to make basket, seeds edible
29	<i>Calamus jenkinsianus</i> Griff.	Arecaceae	Rattan Palm	T	Apr-Aug	Upto 800	L, Tr	Cordage, Brush	Avenue tree
30	<i>Calotropis gigantea</i> (L.) W.T. Aiton	Apocynaceae	Aak, Safed aak, Madar, Mandara	S	Sep-May	Upto 600	St, Bk	Fine rope	Bark is used as a medicine for the treatment of neurodermatitis and syphilis; leaves are used as a poultice; juice is used in making a yellow dye and in tanning
31	<i>Calotropis procera</i> (Aiton) W.T. Aiton	Apocynaceae	Aak, Madar, Alarka, Sadapushpa	S	Dec-Aug	Upto 600	St, Bk	Rope, Net	Soft floss of the seeds used for stuffing pillows and cushions, latex and root bark used as an expectorant
32	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	H, US	May-Oct	500-1400	St, Bk	Textile industry, Cordage, Sail cloth, Canvas goods, Twine, Rope, Fishing net, Non slippery shoes	Medicinal (dyspepsia, colic, diarrhoea, depression, high blood pressure, etc.), narcotic effect (<i>charash</i> or <i>hashish</i>)
33	<i>Careya arborea</i> Roxb.	Lecythidaceae	Kumbi	T	Mar-Jul	Upto 600	St, Bk	Cordage, Rope, Sacking cloth	Wood used for charcoal, fuel and construction, leaves used in sericulture
34	<i>Chonemorpha fragrans</i> (Moon) Alston	Apocynaceae	Moorva	S	Jun-Nov	500-800	St, Bk	Rope	Leaf paste useful in bone injuries
35	<i>Cissampelos pareira</i> L.	Menispermaceae	Pahre, Parha, Akaudi	CI	Apr-Nov	Upto 2000	Bk	Rope	Root extract used in cough, cold, constipation and gastric troubles
36	<i>Cissus repanda</i> Vahl	Vitaceae	Bhel-Chapru, Pani-bel	CI	May-Sep	Upto 1500	St, Bk	Rope	Sap of stem used to wash sores and wounds, fruits edible, leaves as fodder

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37	<i>Corchorus aestuans</i> L.	Tiliaceae	Titpatti, Chench, Chunchu	H	May-Nov	Upto 1000	St, Bk	Rope	Seeds given in dyspepsia
38	<i>Corchorus capsularis</i> L.	Tiliaceae	Narehha, Narcha, Kalasaka, Mora Pat	H	Jul-Nov	Upto 1200	St, Bk	Gunny bags, Rope, Carpets, Rugs, Rough cloth	The pith used in preparation of alcohol, fruit is used as medicine in the treatment of headache, an infusion of leaves is a demulcent, stomachiac, carminative, laxative, it is also given in dysentery, fever, dyspepsia and disorders of the liver
39	<i>Corchorus olitorius</i> L.	Tiliaceae	Kosta	H	Jul-Dec	Upto 1000	St, Bk	Rope	Decoction of leaves given in fever
40	<i>Cordia dichotoma</i> Forst.	Boraginaceae	Lasora, Lisora, Koda, Bahuvaranka	T	Mar-Jul	Upto 1200	St, Bk	Cordage	Wood used for agricultural implements, fruits edible, pulp used as gum, leaves as fodder
41	<i>Cordia vestita</i> (L.) Hook. f. & Thomson	Boraginaceae	Bairolu, Baurala	T	Mar-Nov	Upto 1000	St, Bk	Rope	Wood used for agricultural implements, fruits edible and expectorant, leaves fodder
42	<i>Coriaria nepalensis</i> Wall.	Coriariaceae	Makroli, Masuri, Gangara	S	Mar-Aug	1100-1300	St	Basket	Fruits are edible and anti-emetic properties
43	<i>Crotalaria assamica</i> Benth.	Fabaceae	Sissai	US	Nov-Jan	Upto 1100	St, Bk	Rope	Alkaloids of the plant effective against cervical cancer
44	<i>Crotalaria juncea</i> L.	Fabaceae	Shaan, Junjuni	US	Aug-Dec	500-1200	St, Bk	Fishing nets, Gunny bags, Coarse cloth, Mattress	Mature stem is used as tooth brush, leaves and young shoots used as vegetable, plant used as a biomanure
45	<i>Cryptolepis buchananii</i> Roem. & Schult.	Apocynaceae	Dudhi-bel, Meda-Singhi, Teela-bakhi bel, Karanta	S	Mar-Dec	Upto 1400	St, Bk	Rope	Leaves known to be toxic to cattle

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46	<i>Daphne papyracea</i> Wall. ex Steud.	Thymelaeaceae	Ghandiri Kagate, Lokto, Dhenok	S	Mar-Jul	Upto 3000	St, Bk	Rope, Sacs, Satpura paper for religious purposes, Nepal Paper for legal documents and records	Medicinal (intestinal complaints), ornamental
47	<i>Daphne sureil</i> W.W.Sm. & Cave	Thymelaeaceae	Toru zu	S	Oct-Jan	1200-1400	St, Bk	Rope	Ornamental
48	<i>Debregeasia longifolia</i> (Burm. f.) Wedd.	Urticaceae	Tusara, Sausaru	S	Feb-Jul	500-1800	St, Bk	Rope	Leaves are good fodder
49	<i>Debregeasia salicifolia</i> (D. Don) Rendle	Urticaceae	Syanru, Tushaira	S	Feb-Aug	Upto 2000	St, Bk	Rope, Cordage	Leaves are good fodder; fruits edible, plaster made from the bark for bone-fracture
50	<i>Dendrocalamus hemiltonii</i> Nees. & Arn. ex Munro	Poaceae	Ban	S	Mar-Nov	500- 2000	C	Mat	Plant used for thatching and roofing; leaves are good fodder
51	<i>Dendrocalamus strictus</i> (Roxb.) Nees	Poaceae	Bans	S	Mar-Nov	Upto 1800	C	Basket, Mat, Container	Plant used for thatching, roofing, walking sticks, furniture, bows, arrows, agricultural implements, musical instruments, leaves are good fodder
52	<i>Desmodium elegans</i> DC.	Fabaceae	Chamlai, Sambar	S	Apr-Oct	Upto 1800	St, Bk	Rope	Roots used as carminatives
53	<i>Desmostachya bipinnata</i> (L.) Stapf	Poaceae	Doab, Durva, Dabhena	H	Aug-Nov	Upto 800	C	Rope, Mat	Considered as a soil binding grass
54	<i>Dillenia pentagyna</i> Roxb.	Dilleniaceae	Tantari, Ram phal	T	Apr-Jul	500-1500	St, Bk	Rope	Fruits are edible
55	<i>Edgeworthia gardneri</i> Meissn.	Myrsinaceae	Argheli, Dhenok	T	Sep-Jun	1000- 2500	St, Bk	Hand made paper	Avenue plant

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56	<i>Eriophorum comosum</i> (Wall.) Wall. ex Nees.	Cyperaceae	Babula	H	Jul-Dec	Upto 2500	C	Rope	Considered as a soil binding grass
57	<i>Eulaliopsis binata</i> (Retz.) C.E. Hubbard	Poaceae	Sabai Gross, Bhabar Grass	H	Jun-Nov	500-2400	L	Brooms, Cordage, Rope, Thread, Matting	Fodder, used to check soil erosion
58	<i>Ficus auriculata</i> Lour.	Moraceae	Paras-pipal	T	Jul-Nov	Upto 600	St, Bk	Rope	Leaves used as fodder
59	<i>Ficus benghalensis</i> L.	Moraceae	Bargad, Bahupada	T	Mar-Oct	Upto 1200	St, Bk	Rope	Leaves as fodder, fruits edible, wood used for tent poles, cart-yokes, boats, etc., latex used as antidiabetic, considered as a sacred tree
60	<i>Ficus racemosa</i> L.	Moraceae	Umra, Gular, Udumber	T	Mar-Aug	Upto 900	St, Bk	Rope	Leaves used as fodder, fruits are edible
61	<i>Ficus semicordata</i> Buch.-Ham. ex J.E. Smith	Moraceae	Kahaina, Jharphali	T	May-Oct	Upto 1400	St, Bk	Rope	Leaves used as fodder
62	<i>Ficus virens</i> Aiton	Moraceae	Pakhar, Pilkhan, Kahimal	T	Feb-May	Upto 600	St, Bk	Rope	Leaves used as fodder
63	<i>Firmiana colorata</i> (Roxb.) R. Br.	Sterculiaceae	Kaushi	T	Mar-Jul	Upto 700	St, Bk	Rope	Ornamental plant
64	<i>Firmiana fulgens</i> (Wall. ex Masters) Corner	Sterculiaceae	Budella, Budulu, Kardala	T	Mar-Jul	Upto 1000	St, Bk	Rope	Leaves used as fodder, gum from the bark used in indigenous medicine as tonic, seeds edible
65	<i>Girardinia diversifolia</i> (Link) Friis	Urticaceae	Jarahan	H, US	Jul-Oct	500-2600	St, Bk	Rope, Thread, <i>Pullae</i>	Leaves used as vegetable, extract of leaves used in headache, swollen joints and fever
66	<i>Gossypium hirsutum</i> L.	Malvaceae	Kapas	US	May-Jul	Upto 1000	Fr	Thread, Cloth	Ornamental
67	<i>Grewia asiatica</i> L.	Tiliaceae	Pharsula, Bhyunl, Dhaman	S, T	Apr-Aug	Upto 1000	St, Bk	Rope	Leaves used as fodder

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68	<i>Grewia eriocarpa</i> A.L. Juss.	Tiliaceae	Pharasain, Bhimla, Phalsa	T	May-Aug	Upto 800	St, Bk	Rope	Leaves used as fodder, wood used for agricultural implements
69	<i>Grewia hirsuta</i> Vahl	Tiliaceae	Bhiunal	S, T	Jun-Sep	Upto 2000	St, Bk	Rope	Leaves used as fodder
70	<i>Grewia optiva</i> J.R. Drumm. ex Burrett	Tiliaceae	Bhimal, Bhiul	T	Apr-Nov	Upto 1600	St, Bk	Rope, Cordage, Paper	Leaves are lopped for fodder, fruits edible, medicinal (fever, facilitates child birth, etc.), used as a detergent and dye, dried wood used as fuel
71	<i>Grewia sapida</i> Roxb. ex DC.	Tiliaceae	Pharsa	S	Mar-Dec	500-1300	St, Bk	Rope	Leaves used as fodder
72	<i>Grewia sclerophylla</i> Roxb. ex G. Don	Tiliaceae	Phrsia, Garbheli	S	Jul-Dec	Upto 800	St, Bk	Rope	Fruits edible
73	<i>Grewia serrulata</i> DC.	Tiliaceae	Gar-bhimali, Kath bhimla	T	Jun-Mar	Upto 800	St, Bk	Rope	Leaves used as fodder, fruits edible
74	<i>Helicteres isora</i> L.	Sterculiaceae	Mororphali, Bhendu, Avartani, Mrigasingha	S, T	Mar-Jan	Upto 1500	St, Bk	Rope	Fruits given in diarrhea and spasmodic pain
75	<i>Heterostemma alatum</i> Wight	Apocynaceae	Heterostemma	S	Mar-Dec	1200-1800	St	Rope	Leaves are antiseptic and roots as emetic
76	<i>Hibiscus cannabinus</i> L.	Malvaceae	Sougri, Sann	H	Sep-Dec	Upto 800	St, Bk	Rope, Mask, Collar belt, Carry bag, Decorative items	Leaf is used as vegetable, stem used as firewood, used in treatment of external inflammation, acts as an appetiser and enhances digestion, young leaves and tender stems are eaten raw in salads or cooked as greens alone or in combination with other vegetables and/or with meat.
77	<i>Hibiscus vitifolius</i> L.	Malvaceae	Hibiscus	H, US	Apr-Oct	Upto 900	St, Bk	Rope	Ornamental plant
78	<i>Hiptage benghalensis</i> (L.) Kurz	Malpighiaceae	Aita-lagula	Cl	Mar-Jun	Upto 1000	Bk	Rope	Leaves used in skin diseases

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79	<i>Ichnocarpus frutescens</i> (L.) R. Br.	Apocynaceae	Dudhe lahara, Dudhlatti, Dudilata, Sukhnia	CI	May-Oct	500-900	Bk	Rope, Sack	Seeds are used for the treatment of rheumatism
80	<i>Imperata cylindrica</i> (L.) Rausch.	Poaceae	Sauraun, Sirau, Siru	H	Jun-Dec	Upto 2000	C	Paper	Used in mixture with long fibred paper pulp, roots used as a tonic
81	<i>Kydia calycina</i> Roxb.	Malvaceae	Phuilau, Pulao, Puli	T	Jul-Mar	Upto 1200	St, Bk	Rope	Leaves lopped for fodder, wood used for construction purposes
82	<i>Laportea crenulata</i> Gaudich.	Urticaceae	Morongay, Ongyalop	S	Jun-Dec	1200-2000	St, Bk	Rope	Juice of the root is used to cure chronic fevers, roots and leaves are applied to swellings and blind abscesses
83	<i>Linum usitatissimum</i> L.	Linaceae	Alsi, Atasi	H	Feb-Jul	1200-2000	St, Bk	Cloth, Rope	Linseed oil is extracted from the seeds which are also medicinal, while the "seed-cake" is used for feeding cattle
84	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	Suchi	H, US	Round the year	Upto 1200	St, Bk	Rope	Leaf decoction used for dysentery and the paste applied on wounds
85	<i>Maoutia puya</i> (Hook.) Wedd.	Urticaceae	Phur-khagsa, Safed-khagsa, Puya	S	Jun-Dec	Upto 1400	St, Bk	Rope, Fishing net	Leaves used for fodder
86	<i>Marsdenia lucida</i> Edgew. ex Madden	Apocynaceae	Murkula, Marua-bel	CI	Jul-Apr	1500-2000	Bk	Rope	Ornamental plant
87	<i>Marsdenia roylei</i> Wight & Arn.	Apocynaceae	Murkula	S	May-Nov	Upto 2500	St, Bk	Rope	Juice of the stem is used in the treatment of gastric troubles and peptic ulcers
88	<i>Marsdenia tenacissima</i> (Roxb.) Moon	Apocynaceae	Marua-bel, Jiti	S	Jul-Feb	Upto 800	St, Bk	Rope, Cordage, Strings	Latex (coagulated milky sap) is obtained from the stem used like India-rubber
89	<i>Mastersia assamica</i> Benth.	Fabaceae	Remter	S	Jun-Oct	Upto 2000	St, Bk	Rope	Wood used for fuel
90	<i>Millettia cinerea</i> Benth.	Fabaceae	Millettia	S	Jul-Dec	400-500	St, Bk	Rope	Wood used for fuel
91	<i>Millettia extensa</i> (Benth.) Baker	Fabaceae	Gauju, Gauj, Gonj	CI	Apr-Sep	Upto 1500	Bk	Rope, Cordage	Leaves lopped for fodder; root paste applied on eruptions

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92	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Rubiaceae	Phaldu, Kadam, Kaim	T	Jun-Jan	Upto 800	St, Bk	Rope	Leaves used as fodder, wood used for carved articles, agricultural implements, furniture, etc., avenue tree
93	<i>Mucuna pruriens</i> (L.) DC.	Fabaceae	Gaunchhi, Konch, Dakli	Cl	Aug-Jan	Upto 1300	Bk	Rope	Seed powder used in diabetes
94	<i>Murraya paniculata</i> (L.) Jack.	Rutaceae	Machula, Jai	S	Mar-Nov	Upto 1400	Bk	Rope	Leaf powder used in cough and cold, a ornamental hedge
95	<i>Opuntia elatior</i> Mill.	Cactaceae	Nagphani	S	Jan-Sep	Upto 1400	St	Rope	Fruits edible
96	<i>Oreocnide frutescens</i> (Thunb.) Miq.	Urticaceae	Sianru	S	Feb-Dec	400-2500	St, Bk	Rope, Net	Leaves used as fodder, fruits are edible
97	<i>Oreocnide integrifolia</i> (Gaudich.) Miq.	Urticaceae	Yuan zima	S, T	Mar- Sep	400-1400	St, Bk	Rope	Wood used for fuel
98	<i>Pandanus odoratissimus</i> L.f.	Pandanaceae	Keura, Ketki, Ketaki	S, T	Feb-Aug	Upto 1200	L	Basket, Decorative box, Mat, Sandal, Eyeglass case	Flowers used as perfumes, root considered as antidote to snake bite
99	<i>Parkinsonia aculeata</i> L.	Caesalpiniaceae	Vilyati Babul	S, T	Apr-Sep	Upto 800	St, Bk	Rope	Wood used for fuel
100	<i>Pergularia daemia</i> (Forssk.) Chiov.	Apocynaceae	Utraun, Sagovani, Aksand, Phala	S	Mar-Oct	Upto 500	St, Bk	Rope	Leaf juice used in asthma, bronchitis and antidote to snake bite
101	<i>Phoenix humilis</i> Royle	Arecaceae	Khajoor, Thakal	T	Mar-Jun	Upto 900	L	Rope, Mat, Hat, Broom	Fruits are edible
102	<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Poaceae	Khailwa, Narkul, Narkat	H	Jul-Nov	400-1000	C, Ps	Paper, Cordage	Plant used for fodder
103	<i>Polyalthia simiarum</i> (Buch. – Ham. ex Hook. f. & Thomson) Benth.	Annonaceae	Ojhar, Monghai, Wojarh	T	Mar-Sep	Upto 2000	St, Bk	Rope	Wood suitable for tool-handles, sports goods, matchboxes and splints, veneers, tea chests, and electric transmission poles

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104	<i>Pterygota alata</i> (Roxb.) R.Br.	Sterculiaceae	Bandha Narikella	T	Feb-Jun	Upto 500	St, Bk	Rope	Seeds are said to be edible, avenue tree
105	<i>Pueraria tuberosa</i> (Roxb. ex Willd.) DC.	Fabaceae	Bidarikand, Saral, Siralu	Cl	Mar-Dec	Upto 1200	St, Bk	Rope	Leaves lopped for fodder, flowers an important source of bee-forage and medicinally important for asthma, cholera, chest pain, rheumatism, ulcers, tonic, etc.
106	<i>Saccharum bengalense</i> Retz.	Poaceae	Munja, Sarkanda, Sara	H	Oct-Jan	Upto 1800	L	Rope, Cordage, Mat, Basket	Young leaves used as fodder
107	<i>Saccharum spontaneum</i> L.	Poaceae	Munj, Kansh, Kusha	H	Sep-Nov	Upto 1800	L	Rope	Leaves used in asthma and cholera
108	<i>Sarcococca saligna</i> (D. Don.) Muell.- Arg.	Buxaceae	Chirbiri	S	Mar-Aug	Upto 3000	St, Bk	Rope, Mat	Medicinal (fever, rheumatism, etc.), stem used for making walking-sticks
109	<i>Scindapsus officinalis</i> (Roxb.) Schott	Araceae	Gaj-peepal, Hthkaul, Gaja-pippali	Cl	Sept-Dec	Upto 1900	St, Bk	Rope	Wood used for fuel
110	<i>Sesbania bispinosa</i> (Jacq.) W. Wight	Fabaceae	Dhaincha	S	Sep-Jan	Upto 500	St, Bk	Rope	Leaves used as fodder and manure
111	<i>Sesbania sesban</i> (L.) Merr.	Fabaceae	Jainti, Rawasan, Jayantika	S	Sep-Mar	Upto 1200	St, Bk	Rope, Cordage	Leaves used as fodder and manure
112	<i>Sida acuta</i> Burm. f.	Malvaceae	Karenti, Bariara	H, US	Sep-Mar	Upto 1000	St, Bk	Rope	Leaves said to be demulcent and diuretic, root extract given in leucorrhoea
113	<i>Sida cordata</i> (Burm. f.) Borss.	Malvaceae	Bhiyli, Kharenti	H	Jun-Nov	Upto 1000	St, Bk	Rope	Leaves and root bark used in traditional medicine against gonorrhoea and spermatorrhoea
114	<i>Sida cordifolia</i> L.	Malvaceae	Balu, Barialas	US	Jun-Nov	Upto 1000	St, Bk	Rope	Seed powder given in dyspepsia, root astringent and diuretic

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115	<i>Sida rhombifolia</i> L.	Malvaceae	Bhiunli, Sahdevi	H, US	Jun-Dec	Upto 1200	St, Bk	Rope	Leaf paste applied externally on boils and joints to reduce pain
116	<i>Smilax ovalifolia</i> Roxb.	Smilacaceae	Ram dana, Jangli aushbah	S	Jun-Oct	Upto 1800	St, Bk	Rope	Roots effective to cure venereal diseases and also applied in rheumatic swellings
117	<i>Spatholobus parviflorus</i> (Roxb. ex DC.) Kuntze	Fabaceae	Malini, Maula, Bando	CI	Nov-Mar	Upto 600	St, Bk	Rope	Leaves used as fodder
118	<i>Stephania elegans</i> Hook. f. & Thomson	Menispermaceae	Gindaru	CI	Aug-Dec	Upto 1800	St, Bk	Rope	Wood used for fuel
119	<i>Stephania glabra</i> (Roxb.) Miers.	Menispermaceae	Raj patta	CI	Jul-Oct	Upto 2200	St, Bk	Rope	Tubers are used in asthma, dysentery and fever
120	<i>Sterculia villosa</i> Roxb.	Sterculiaceae	Udala, Udar	T	Feb-Jul	Upto 800	St, Bk	Rope	Gum obtained from the stem called ' <i>Katila</i> ' is medicinal
121	<i>Streblus asper</i> Lour.	Moraceae	Dahia, Siora	S, T	Feb-Jul	Upto 600	St, Bk	Rope	Leaf paste applied for skin ailments, fruits edible, wood used for household articles
122	<i>Tetrastigma lanceolarium</i> (Roxb.) Planch.	Vitaceae	Malkiya	CI	Feb-Mar	Upto 1200	St, Bk	Rope	Leaves used as fodder
123	<i>Themeda arundinacea</i> (Roxb.) Ridley	Poaceae	Kulpura, Kapurghas	H	Sep-Dec	Upto 600	C	Rope for thatching	Root extract used for fever
124	<i>Thespesia lampas</i> (Cav.) Dalzell & Gibson	Malvaceae	Ban kapasi, Jangli Bhindi	US	Aug-Jan	Upto 1200	St, Bk	Rope	Root decoction given in gonorrhoea
125	<i>Trema orientalis</i> (L.) Blume	Ulmaceae	Jivan, Gio, Jiwanti	S, T	Mar-Jul	Upto 700	St, Bk	Rope	Leaves used as fodder, fruits edible, wood used for charcoal

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126	<i>Trema politoria</i> (Planch.) Blume	Ulmaceae	Koeli, Khagshi	S, T	Jul-Dec	Upto 900	St, Bk	Rope	Leaves used as fodder, fruits edible and used for preparation of jam, wood used for charcoal
127	<i>Triumfetta rhomboidea</i> Jacq.	Tiliaceae	Chiryari, Agra, Sougri Ananbi	US	Aug-Nov	500-1500	St, Bk	Rope, Decorative items	The plant is used as fire wood, leaves and young shoots are used as vegetable, juice extracted from above ground part is used in the treatment of stomachache
128	<i>Typha angustata</i> Bor & Chaub.	Typhaceae	Gon, Patera, Mothitrina	US	Apr-Dec	Upto 1000	St, Bk	Rope for thatching, Cordage, Net	Plant used as fuel wood
129	<i>Ulmus wallichiana</i> Planch.	Ulmaceae	Chamarmora, Mairu, Hemar	T	Mar-Jul	Upto 1800	St, Bk	Rope	Leaves used as fodder, plaster used for fractured bones is made by boiling the bark in water
130	<i>Urena lobata</i> L.	Malvaceae	Chatkura, Unga, Bachita, Lapetua	US	Aug-Dec	Upto 1500	St, Bk	Rope	Root paste applied on body pain and rheumatism
131	<i>Urtica ardens</i> Link.	Urticaceae	Bicchu ghas	H, S	Aug-Jan	Upto 1800	St, Bk	Rope, Mat, Sac	Seed oil edible as well as medicinal in sciatica, rheumatism
132	<i>Urtica dioica</i> L.	Urticaceae	Kandali, Bicchu grass	H, S	Aug-Apr	Upto 3000	St, Bk	Rope, Mat, Sac	Seed oil used for rheumatism
133	<i>Ventilago denticulata</i> Willd.	Rhamnaceae	Kali bel, Keonti, Raidhani	Cl	Feb-Jul	Upto 800	St, Bk	Rope	Root paste with mustard oil massaged in paralytic affected parts
134	<i>Wikstroemia canescens</i> Meissn.	Thymelaeaceae	Dhawe, Chamliya	S	Apr-Nov	1000-2800	St, Bk	Strong cordage material, Rice paper	Used as an insecticide and pesticide

Abbreviations used:

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|-----------------------|---------------------|
| 1. C – Culm | 7. S – Shrub |
| 2. Bk – Bark | 8. St – Stem |
| 3. Fr – Fruit | 9. T – Tree |
| 4. H – Herb | 10. Tr – Trunk |
| 5. L – Leaf | 11. US – Undershrub |
| 6. Ps – Panicle stalk | |

Summary

United Nations had declared 2009 as the International Year of Natural Fibres with the main aim of raising global awareness and providing a new dimension to the fibre sector. The natural fibres are an important source of livelihood of the people in the Indian Himalayan Region (IHR). Realizing its importance, the Institute has compiled this booklet, which contains information on 134 species of fibre yielding plants; belonging to 95 genera and 39 families of angiosperms. Out of these, top ranking 25 species have been enumerated in the light of information procured from different pockets of the IHR, with a brief description of its use value. Of the total fibre yielding plants, the dicots include 113 species (31 families) and the monocots 21 species (8 families). Analysis across various habit/life form categories reveal herbs (18), undershrubs (10), shrubs (40), climbers (16), trees (29), herbs/shrubs (2), herbs/undershrubs (8) and shrubs/trees (11). While considering the other direct use values, a total of 36 other uses were recorded for these 134 species. Amongst listed species, 110 are used for rope; 16 for cordage; 11 for twine/thread; 10 for net, mat; 9 for paper; 5 for decorative items; 4 for basket, packing materials, mattress, cushion; 3 for carpets, gunny bags, thatching; 2 for brush, brooms, collar belts; *Bombax ceiba* and *Broussonetia papyrifera* are used for refrigerator insulation and umbrella covers, respectively. Altitudinal distribution of the listed 134 fibre yielding plants revealed occurrence of 117 species below 1000 m, and this may be considered rich zone for fibre yielding plants. However, 87 species occur in between 1000-2000 m and 14 species between 2000-3000 m. Only 1 species (*Betula*

utilis) is commonly found above 3000 m.

In spite of huge diversity (134 species enumerated here), only a limited species have been so far been utilized and evaluated for their true economic potential. Therefore, further studies need to be carried out on other species to determine the potential of commercial production so that actual benefits can reach the rural inhabitants. In view of the importance as well as the need for natural plant products, concerted efforts are also needed for creation of awareness, dissemination of knowledge for multiplication and plantation, and subsequent linking up with the potential markets so as to accrue long-term benefits. We hope that the celebrations during the International Year of Biodiversity - 2010 would contribute significantly in this direction.

In order to promote the use of natural fibres in this region as well as to create awareness about this resource, G.B. Pant Institute of Himalayan Environment and Development, a nodal organization for Research and Development in the Himalayan region had organized an exhibition from 10-12th September, 2009 on natural fibres with special reference to plant based products. Also, the Uttarakhand Bamboo & Fibre Development Board came up with a book, comprising 70 fibre yielding plants of Uttarakhand. In the series of such contributions, it is hoped that this publication will contribute in building knowledge and awareness, and pave the way for commercial applications of natural fibres from the region.

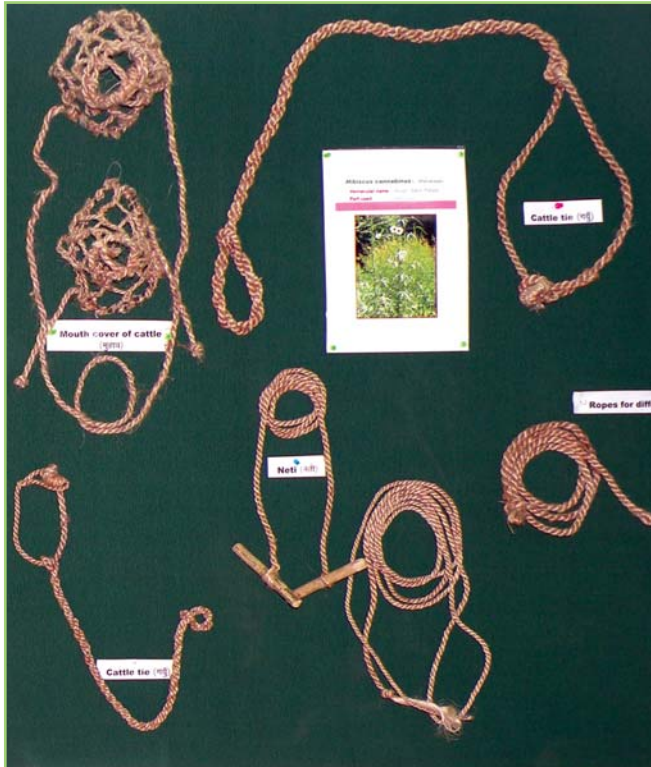
Fibre Products



Agave sisalana Perrine ex Engelm. (Sisal)



Edgeworthia gardneri Meissn. (Arghehi, Dhenok)



Hibiscus cannabinus L. (Sougri, Patsan)



Urtica ardens Link. (Bichhu ghas)



Corchorus capsularis L. (Jute)



Cannabis sativa L. (Bhang)

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The idea of a United Nations International Year dedicated to natural fibres arose in December 2004 from a meeting of FAO's Intergovernmental Groups on Hard Fibres and on Jute, Kenaf and Allied Fibres. In November 2005, the proposal was endorsed by a resolution of FAO's biennial Conference, which sought to focus world attention on the role that natural fibres play in contributing to food security and poverty alleviation. The resolution was transmitted to the Secretary-General of the United Nations, with the aim of having the UN General Assembly declare 2009 the International Year of Natural Fibres.

In December 2006, the 61st Session of the General Assembly declared the International Year and invited FAO to facilitate its observance, in collaboration with governments, regional and international organizations, non-governmental organizations, the private sector and relevant organizations of the United Nations system. Each year, farmers harvest around 35 million tonnes of natural fibres from a wide range of plants and animals – from sheep, rabbits, goats, camels and alpacas, from cotton bolls, abaca and sisal leaves and coconut husks, and from the stalks of jute, hemp, flax and ramie plants. Those fibres form fabrics, ropes and twines that have been fundamental to society since the dawn of civilization.

But over the past half century, natural fibres have been displaced in our clothing, household furnishings, industries and agriculture by man-made fibres with names like acrylic, nylon, polyester and polypropylene. The success of synthetics is due mainly to cost. Unlike natural fibres harvested by farmers, commonly used synthetic fibres are mass produced from petrochemicals to uniform strengths, lengths and colours, easily customized to specific applications. Relentless competition from synthetics and the current global economic downturn impact the livelihoods of millions of people who depend on natural fibre production and processing. That is why the International Year of Natural Fibres 2009 aims at raising global awareness of the importance of natural fibres not only to producers and industry, but also to consumers and the environment.

Source: <http://www.naturalfibres2009.org>.

Fibre Exhibition

Natural Fibres of the Indian Himalayan Region (September 10-12, 2009)

On the occasion of its Annual Day, and considering the importance of International Year of Natural Fibres, the Institute organized an exhibition at its Headquarters, from 10-12th September 2009 on Natural Fibres in order to create awareness among the masses on the use of natural fibres in the Indian Himalayan region (IHR). The exhibition was inaugurated by Prof. V.K. Gaur, Distinguished Professor in the Indian Institute of Astrophysics and Centre for Mathematical Modelling and Computer Simulation, Bangalore on 10th September, 2009.

Over 100 natural fibre products derived from 13 plant species were displayed in the exhibition hall. The materials were acquired by staff of GBPIHED working at the Headquarters and in different units. The exhibition was self explanatory and the visitors took keen interest and were enthusiastic about various products displayed in the hall. During the exhibition, representatives of the Institute clearly explained the need and importance of natural fibres in the context of health and sustainability.





Biodiversity is life
Biodiversity is our life

International Year of Biodiversity (IYB)

The United Nations General Assembly has declared 2010 as the International Year of Biodiversity (IYB) with the aim of safeguarding the variety of life on earth and to increase understanding of the vital role that biodiversity plays in sustaining life.

The year 2010 while gives us an opportunity to reflect on our achievements toward safeguarding biodiversity, it also alerts us on the urgency for action on challenges so as to secure the future.

Objectives of IYB

- ❖ Raise awareness of the importance of conserving biodiversity for human well-being and promote understanding of the economic value of biodiversity
- ❖ Enhance public knowledge of the threats to biodiversity and means to conserve it
- ❖ Encourage organizations (and through them individuals) to take direct or indirect biodiversity conservation activities
- ❖ Celebrate the achievements of Countdown 2010 partners and other stakeholders
- ❖ Reporting on the possible failures for not achieving the Target
- ❖ Prepare the ground for communicating the post-2010 target(s)

Countdown 2010 celebrates IYB

Countdown 2010 is one of the largest multi-stakeholder networks for biodiversity conservation and for promoting the

2010 Biodiversity Target. The Countdown 2010 initiative has built a network of nearly 1,000 partners from all sectors of society. The year 2010 is a milestone for biodiversity. The 2010 Biodiversity Target expires and a new international commitment will be agreed by world leaders; 2010 is also the United Nations International Year of Biodiversity, the greatest opportunity ever for biodiversity to position itself on the international agenda.

Yet, that's not all. The year 2010 also marks the final year for the Countdown 2010 initiative which was set up to help governments achieve the 2010 Target by mobilizing local actors towards biodiversity conservation. This threefold scenario offers an unprecedented opportunity for biodiversity, but at the same time it presents a great challenge. The momentum achieved in the years after the Target was set made it possible to unite the efforts of hundreds of actors worldwide. This momentum not only has to be kept up in 2010, but boosted so that the impact of our, and your, efforts is even greater.

So...roll up your sleeves! We have lots to do to make this happen!

(Text source: www.cbd.int/2010)

