

## Bamboo Species of District Bilaspur of Himachal Pradesh, India

### Research Article

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#### Abstract

Bamboos are the perennial woody grasses, belonging to the family Bambusaceae. They are the clump forming plants arising from the underground rhizomes. The stem (culm) is with distinct nodes and internodes. Bamboos are the fastest growing plants in the world. Himachal Pradesh is situated in the Western Himalayan region of India. The district Bilaspur is located in Shivalik Hills, also known as the Outer Himalayas or Sub-Himalayan zone of Himachal Pradesh. The climate of Shivalik Hills is suitable for the growth of different species of bamboos. Six species of bamboos viz. *Bambusa bambos*, *Bambusa nutans*, *Bambusa vulgaris*, *Dendrocalamus hamiltonii*, *Dendrocalamus parishii* and *Dendrocalamus strictus* are reported from the territory of Bilaspur. The aim of this paper is to identify the Bamboo Species of District Bilaspur of Himachal Pradesh.

**Keywords:** Bamboos; Bambusaceae; Culm; Western Himalaya; Shivalik Hills; Satluj (River)

#### Introduction

Bilaspur is the second smallest district of Himachal Pradesh, having an area of 1167 Sq. KM. As well as it is also one of the twelve districts of Himachal Pradesh. The altitude of Bilaspur varies from 290 metres to 1980 metres. It is surrounded by Hamirpur and Mandi districts on the North, Mandi and Solan on the East, Solan district and Punjab State on South while Una and Hamirpur districts on the West side. The river Satluj flows through the district Bilaspur for about 90 KM. This river enters the district Bilaspur at KARAH KA GHARAAT near the village Kasol (now-a-days famous for Koldam Hydropower Station of 800 MW) and leaving it at the village NEILA near the Bhakhra Dam (Hydropower Station have a total capacity of 1325 MW) [Mamgain M.D. 1975, Himachal Pradesh District Gazetteer- Bilaspur. Government of Himachal Pradesh, Shimla; Google Search][1].

The main objective of this paper is to identify the various species of Bamboos of the district Bilaspur of Himachal Pradesh. Their systematics, common names, vernacular names, citations,

morphological features, flowering and fruiting seasons, places of collection, habitat, their distribution in the World, India, and Himachal Pradesh along with economic and ethnobotanical uses are also included in this paper. Coloured photographs of these species are taken during the field survey. Bamboos species are abundantly present in the Sadar, Ghumarwin, Bharari and Jhandutta Forest Ranges of the district Bilaspur. While in Swarghat and Kalol Forest Ranges they are less abundant. This paper will motivate the people for the conservation of bamboos because of their diverse uses.

#### Materials and Methods

Extensive field survey of the district Bilaspur has been carried out in order to explore the different species of Bamboos. Standard Procedures are adopted for the collection, preservation and identification of various species of Bamboos. During the field survey, their vegetative and floral characteristics are noted. Coloured photographs of all the species are also taken in the field. Herbarium mounts of these species are also prepared for record and identification. While describing and identifying the different species



Figure 1: Map of Himachal Pradesh.

of Bamboos, we strictly adhered to the terminologies used by Haris and Haris (1994), Jain and Rao (1977), Polunin and Stainton (1984), Stainton (1988) and Womersley (1981)[2-6]. Their nomenclature is in accordance with the International Code of Nomenclature (ICN) or MELBOURNE CODE, 2012, International Plant Names Index (IPNI)[7], The Plant List (2013)[8] and Bannet (1987)[9]. The Natural System of Classification of plants with latest amendments has been followed in this paper.

**Observations**

In order to study the diversity of bamboos of the district Bilaspur, its survey has been carried out during different seasons. A total of six species belonging to two genera, all included in lone family i.e. Bambusaceae are reported from the territory of Bilaspur. All the species of bamboos are abundant in Sadar, Ghumarwin, Bharari and Jhandutta Forest Ranges. However the species of bamboos are less abundant in Swarghat and Kalol Forest Ranges. *Bambusa vulgaris* has been reported from the nursery garden of ACC Limited at Barmana.



Figure 2: Map of District Bilaspur of Himachal Pradesh.

## Results and Discussions

Six species of bamboos viz. *Bambusa bambos*, *Bambusa nutans*, *Bambusa vulgaris*, *Dendrocalamus hamiltonii*, *Dendrocalamus parishii* and *Dendrocalamus strictus* are collected and identified during the field survey of the district Bilaspur of Himachal Pradesh. The various species of Bamboos have been described alphabetically as under:-

**1. *Bambusa bambos* (L.):** Voss. Vilm. Blumengärtn. ed. 3. 1: 1189 1895. *Bambusa arundinacea* Willd. Sp. Pl. 2: 245. 1799; Kanjilal, For. Fl. Chakrata, Dehradun & Saharanpur. 536. 1901; FF. 532. 1918. *Bambusa arundinacea* Retz. Stewart, PP.251. 1869. *Bambusa arundinacea* (Retz.) Willd. Polumin and Stainton, Fls. Himalaya.442. 1984. **Family Bambusaceae:** INDIAN THORNY BAMBOO, SPINY BAMBOO, THORNY BAMBOO. **Vern:** Bans, Kantabans, Kattang, Kirhya, Magae, Magarbans, Malbans. Nal. **Figure 3.**

It is a tall thorny bamboo with crowded culms arising from stout and branching rootstocks. Clump is graceful and curving. **Culms:** 20-30 m in height, 15-18 cm in diameter, bright green shining; nodes prominent, the lowest nodes rooting, the lower nodes with leafless, spinescent, zigzag horizontal branches; internodes up to 45 cm long, somewhat depressed near the base of the branches, 2.5-5 cm thick wall; cavity small. **Culm-sheaths:** 30-38x22-30 cm, striate, orange-yellow, thickly ciliated with golden hairs when young, otherwise glabrous, rounded at the apex; blade 5-10 cm long, triangular, acuminate, glabrous outside, matted with dark bristles within, margins wavy, involute, thickly ciliate, auriculate; ligule narrow, entire or fringed with pale hairs. **Leaves:** 18-20x2.5 cm, linear or linear-lanceolate, glabrous above, glabrous or puberulous beneath, margins scabrous, tip sharp and stiff, base rounded or oblique and ciliate near the petiole; secondary longitudinal nerves 4-6 on either side of midrib, with pellucid glands at intervals; petiole 2.5 mm long, swollen; leaf sheath with short auricles, thickly ciliate when young, ligule short. Inflorescence is an enormous panicle, occupying the whole culm.



**Figure 3:** *Bambusa bambos* (L.) VOSS. syn. *Arundo bambos* L., *Bambos arundinacea* Retz., *Bambusa arundinacea* Retz., *Bambusa arundinacea* Willd. INDIAN THORNY BAMBOO, SPINY BAMBOO, THORNY BAMBOO. Vern.: Bans, Kantabans, Kattang, Kirhya, Magae, Magarbans, Malbans. Nal..

Spikelets are glabrous, 1.3-2.5 cm long on branchlets, about 5 in a cluster, lanceolate, acute; the lower flowers are bisexual, the upper male and followed by 1-3 imperfect flowers. Involucral glumes 1-2 or sometimes absent, ovate-lanceolate, acute or mucronate, 5-8 mm long, many-nerved, empty. **Floral glumes** are 3-7. **Palea** is sub-acute with 2 ciliate keels. **Lodicules** are 3, ovate or sub-ovate, hyaline, ciliate, ciliate, 1- 3-nerved. **Stamens** are slender, drooping; anthers yellow, obtuse. **Style is short.** **Grains** are 5-8 mm long, oblong, ending in a short beak formed by the base of the style, grooved on one side. **Flowering and Fruiting:** Flower gregariously at intervals of 30-32 years.

**Specimens examined:** Chandpur, 12 July, 2010, Mahender. 48.

**Distribution:** Native of South India, Myanmar, Sri Lanka. **India:** Sub-Himalayan tract, Himachal Pradesh, Uttarakhand. **Himachal Pradesh:** Bilaspur. **Altitude:** up to 1200 m.

**Economic and Ethnobotanical Uses:** **Root** is tonic; burnt and applied to ringworm, bleeding gums and joint pains. Roots are useful in skin diseases, burning sensations, strangury and general debility. **Stem and leaves** are acrid, bitter, sour; cooling, laxative; useful in burning sensations, blood diseases, biliousness, leucoderma, inflammations, strangury, wounds and piles. **Stem** is used for making rafters, poles, in mat making, domestic wares and for paper pulp; young shoots are edible and pickled. **Bamboo manna** or **Banslochan** or **Tabashir** is a silicious and crystalline substance found in the interior of stems. It is rich in calcium, given to pregnant women and children; sweet, cooling, acrid, with a flavor; aphrodisiac, tonic; constipating; useful in blood diseases, asthma, bronchitis, tuberculosis, fever, leprosy, jaundice, anaemia, strangury, burning sensations, biliousness, thirst, ophthalmia and stomatitis; the burnt powder is useful in syphilis. **Leaves** are sweet, astringent, cooling, emmenagogue, ophthalmic, vulnerary, constipating, febrifuge; useful in lumbago, haemorrhoids, diarrhoea, gonorrhoea, amenorrhoea, dysmenorrhoea, wounds, skin diseases and fever. Leaves are also used as fodder. **Sprouts** are pungent, acrid, laxative; useful in strangury; causes burning sensation, increase cough. **Seeds** are acrid, sweet, fattening, aphrodisiac, alexiteric; useful in biliousness, urinary discharges; eaten during times of scarcity. **Flower** juice is good for earache and deafness. (Watt, 1889-1893; Kirtikar and Basu, 1935; Singh et al., 1983; Ambasta, 1986; Nayar et al., 1989; Warriar et al., 1994; Joshi, 2000; Pullaiah, 2002; and Agarwal, 2003)[9-15].

**2. *Bambusa nutans*** Wall. ex Munro. Trans. Linn. Soc. London 26: 92. 1868; FHP. 3: 859. 1984; Polunin & Stainton, Fls. Himalaya. 442. 1984. *Bambusa nutans* Wall. Kanjilal, For. Fl. Chakrata, Dehradun & Saharanpur. 535. 1901; Brandis, Ind. Trees. 668. 1906; FF. 531. 1918. **Family Bambusaceae.** NODDING BAMBOO. **Vern.:** Chaw. **Figure 4.**

**Culms** rising from a creeping rhizome, distant (not crowded), 6-17 m long, 3-8 cm in diameter, straight, graceful, without spiny branches, bright green, glaucous when young; nodes not much raised, hairy; internodes 37-45 cm long, thick walled, not shining. **Culm sheaths** 15-23 cm long, roundedly truncate at top, with adpressed black hairs on the back, scabrid after the hairs have fallen. **Blade** varying in size, broad, acute, margins recurved, the base decurrent

on the sheath, black-hairy within, with two large wavy densely-bristly auricles; ligule narrow, dentate. **Leaves** 10-30 x 1.8-4 cm, scabrid at the top along the midrib and margins, tip twisted, base rounded or narrowed; secondary longitudinal nerves 7-10 on either side of midrib; petiole 2.5 -5 mm long; sheath striate, produced into a falcate auricle which is covered with long bristles. **Inflorescence** a stiff panicle of spike-like braches which bear interrupted clusters of spikelets. **Spikelets** are 1.8-2.5 cm long, glabrous, acute, empty glumes 2-3, fertile flowers 3-5, followed by 2-3 imperfect flowers; axis (rachillum) clavate; lodicules 3, fimbriate. **Anthers** are apiculate. **Stigmas** 2-3, twisted. **Grain** is oblong, hairy top. **Flowering and Fruiting:** August-October (Sporadically)

**Specimens examined:** Sungal, 22 Oct, 2012, Mahender. 347,348.

**Distribution:** Sub-Himalayan tract. **India:** Jammu to Assam **Himachal Pradesh:** Kangra (DD). **Altitude:** up to 1700 m.

**Economic and Ethnobotanical Uses:** **Leaves** are used as fodder. **Culms** are straight and strong; used for the production of mechanical pulp. They are used for building purposes, as rafters and as shafts. (Kanjilal, 1901; Parker, 1918; and Ambasta, 1986).

3. *Bambusa vulgaris* Schrad. Coll. Pl. 2: 26 1808; Brandis, Ind. Trees 670. 1906; FF. 532.1918. **Family Bambusaceae.** FEATHERY BAMBOO, GOLDEN BAMBOO, THE YELLOW & GREEN STRIPED BAMBOO. **Vern.:** Basine bans. **Figure 5.**

It is a large, tufted handsome bamboo, but clumps are not dense. **Culms** unarmed, bright-yellow with narrow green stripes running the length of the internodes and on alternate sides in adjacent internodes, 6-17 m high, internodes 25.4-45.2 cm long and 7.6-12.7 cm in diam., walls thin; culm sheaths 15-25 cm, brownish hairy outside; green and yellow streaked at younger stage, top concavely truncate, blade triangular and auricled at base. **Leaves** 30-41 x 2.5-5 cm; nerves 21-39, transverse veins visible on lower surface, leaf sheath appressed white hairy. **Spikelets** are compressed, palea thin. **Style** is long hairy. **Stigmas** are 3, plumose.

**Specimens examined:** Barmana, 22 June, 2009, Mahender. 43.



**India:** Cultivated in gardens and run wild over warmer parts of India, original home uncertain.

**Economic and Ethnobotanical Uses:** The bamboo is used for scaffolding, roofing etc. **Culms** are used for building and other purposes. Split culms are made into mats and baskets; also used for paper making. **Young buds** consumed as a vegetable. **Leaves** are cooling, their decoction is useful in fevers and sore throat. **Culm** is soft and long fibred; a valuable source of paper pulp. **Roots and young shoots** are emollient, diuretic and diaphoretic. **Bark** is astringent, useful in haemorrhage, excessive menstruation, nausea and vomiting (Singh et al., 1983; Ambasta, 1986; Agarwal, 2003; and Nautiyal and Kaul, 2003).

4. *Dendrocalamus hamiltonii* Nees & Arn. ex Munro. FBI. 7: 405. 1896; Kanjilal, For. Fl. Chakrata, Dehradun & Saharanpur. 538. 1901; FS. 636. 1902, 1921; Brandis, Ind. Trees. 676. 1906; FF. 533. 1918; Polunin & Stainton, Fls. Himal. 441. 1984; FHP. 3: 859. 1984. **Family Bambusaceae.** HAMILTONS BAMBOO. **Vern.:** Kaghshi bans, Maggar. **Figure 6.**

It has broader leaves than *Dendrocalamus strictus* and the globose heads of purple spikelets are not spinous. This bamboo forms impenetrable thickets of stems (culms) up to 26 m with over-hanging often horizontal branches. **Stem** (culm) 10-13 cm in diameter, dull-green, lower nodes marked with root-scars internodes 30-50 cm long; (culm) **stem-sheaths** triangular, persistent, up to 30 cm long. **Branches** on lower part of the stem seated on woody knobs the size of a fist, and on these may be half- developed swollen buds with brown sheaths. **Leaves** narrow-lanceolate, long-pointed, to 45 cm long by 13 cm wide, lanceolate, cuspidate, smooth above, rough beneath, main lateral nerves 6-17 pairs, base unequal sided; petiole short; ligule broad. **Leaf sheaths** with stiff hairs. **Spikelets** blunt, in dense, rounded axillary clusters, 1.5-4 cm across, on stout unbranched stems. **Bracts** are with ciliate margins. **Stamens** are 6. **Grain** is broadly ovoid, beaked. **Flowering and Fruiting:** Sporadically.

**Specimens examined:** Bharari, 29 March, 2013, Mahender. 396,397.





**Figure 6:** *Dendrocalamus hamiltonii* Nees & Arn. Ex Munro. HAMILTONS BAMBOO. Vern.: Kaghsi bans, Maggar.

**Habitat:** Wild or Cultivated. **Distribution:** Tropical Himalaya, India, Burma, SE. Asia, Nepal. **India:** Himachal Pradesh to Arunachal Pradesh, E. Himalaya, Assam. **Himachal Pradesh:** Hamirpur (DD), Kangra (DD). **Altitude:** Up to 2000 m.

**Economic and Ethnobotanical Uses:** Employed for paper making. **Young culms** used as vegetable in Assam, Bhutan and Sikkim. Because of long internodes and large lumen, this bamboo is particularly suitable for water conduits. It is also used for making baskets, mats, screens. Stems are rather soft for building purposes, as rafters and as shafts. (Kanjilal, 1901; Parker, 1918; and Ambasta, 1986).

**5. *Dendrocalamus parishii*** Munro. Trans. Linn. Soc. London 26: 149. 1868. **Family Bambusaceae.** Vern.: Faglu. **Figure 7.**

A perennial and caespitose bamboo; **culms** woody, erect with terete internodes. Lateral branches dendroid. Ligule an eciliate membrane. **Inflorescence** synflorescence and bractiferous, globose, clustered at the nodes, dense, 1.5- 3 cm long, with glumaceous subtending 6- 10 mm long bracts; buds axillary at the base of spikelets; prophyllate below lateral spikelets; leafless between clusters. Fertile spikelets sessile. **Glumes** 1- 2 empty, similar, persistent, shorter than spikelet; lower glume 4 mm long, ovate, acute, coriaceous, without keels, puberulous with hairy apex and ciliate margins; upper glumes 4 mm long, ovate, acute, chartaceous, with keels, puberulous with hairy apex and ciliate margins. **Florets** 6 mm long, fertile lemma ovate, chartaceous, without keel, 11-13 veined; lateral veins of lemma cross-veined; ciliate margins, acute apex, mucronate. **Palea** chartaceous; 2- keeled, uppermost without keels, keels ciliate with pilose surface. **Lodicules** are absent. Stamens 6; anthers tip with extended connective; filaments united in a tube. **Ovary** is pubescent; stigma 1. **Fruits** caryopsis, ovovoid. **Flowering and Fruiting:** March to June.

**Specimens examined:** Mihare, 21 April, 2012, Mahender. 398,399.

**Habitat:** Common in forest and waste land. **Distribution:** Native to Kerala. Tropical and Temperate Asia.

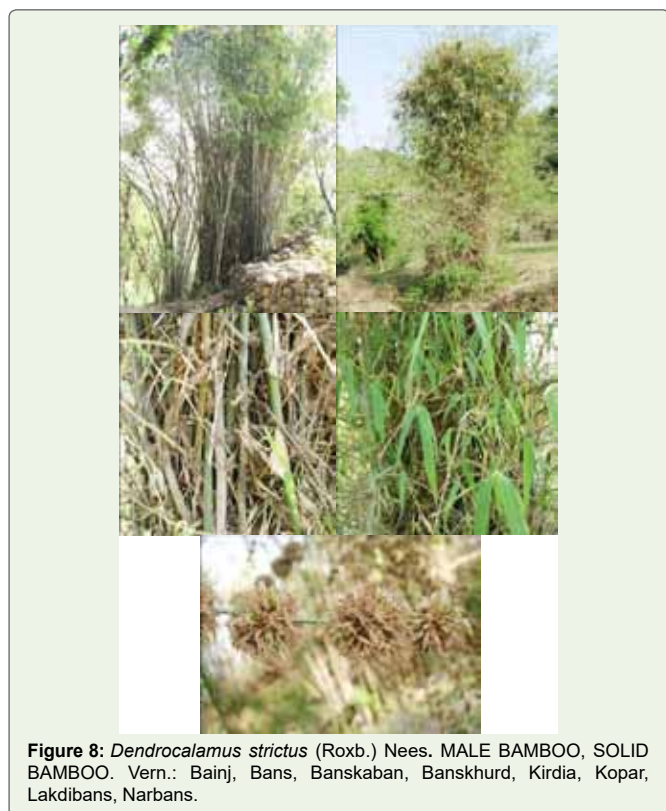
**Economic and Ethnobotanical Uses:** Bamboo is used as **biofence** around the fields in those areas affected by wild animals. Mature **culms** are rich in calcium that is used in pharmaceutical industry. **Leaves** yield a high quality fodder for cattle.

**6. *Dendrocalamus strictus*** (Roxb.) Nees. Linnaea 9: 476. 1834; Stewart, PP. 251. 1869; FBI. 7: 404. 1896; Kanjilal, For. Fl. Chakrata, Dehradun & Saharanpur. 537. 1901; FS. 635. 1902, 1921; Brandis, Ind. Trees. 675. 1906; FF. 533. 1918; Polunin & Stainton, Fls. Himal. 441. 1984; FHP. 3: 860. 1984; FSIR. 663. 2004. **Bambos stricta** Roxb. Pl. Corom. 1: 58. t.80. 1798. **Family Bambusaceae.** MALE BAMBOO, SOLID BAMBOO. **Vern.:** Bainj, Bans, Banskaban, Banskurd, Kirdia, Kopar, Lakdibans, Narbans. **Figure 8.**

Erect, arborescent bamboo, forms dense packed clumps, 7-14 m high. **Rootstock** much branched. **Culms** greyish-green, often blotched, 5-8 cm in diameter, occasionally solid or with only a small cavity (fistular), spinescent, internodes 10-25 cm long, swollen nodes branched at nodes; rooting at the joints near the base. **Branches** stiff, spreading, clustered, horizontal or curving downwards. **Stem sheaths** stiff, shining, papery, very deciduous on swollen joints; little shorter than the internodes, 7-30 cm long, narrowed upwards to a rounded top; blade triangular, hairless or with greyish- brown hairs; ligule short, narrow. **Leaves** 10-20 x 2-3 cm, linear-lanceolate, not net- veined, finely pointed, base constricted, sub-cordate or rounded, upper surface rough, lower softly hairy; ligule narrow, membranous,  $\pm$  1 mm long, toothed; sheaths hairy, mouth bristly. **Spikelets** spinulose, terete, 0.6-1.2 cm (fertile and smaller sterile ones intermixed), 2-3 flowered, crowded in large, globose (2.5 cm across), sessile heads disposed at intervals along the branches of a long panicle. **Bracts** hairy and with distinctive spiny tips. **Glumes** boat-shaped, 1-2, 5-6 mm long, mucronate, many-nerved, hairy at top. **Empty glumes** 2, sometimes more, acute. **Flowering glumes** spine-tipped. **Lemma**  $\pm$  1 cm long, keel prolonged into sharp spine. **Paleas** 0.8-1 cm long, 2- keeled, truncate. **Stamens** 6, far protruding, anthers apiculate. **Lodicules** absent. **Ovary** hairy; style single or branching near the feathery tip, thread-like, very long. **Grains** free within the persistent glumes, ovoid, hairy, beaked with the persistent style- base. **Flowering and Fruiting:** sporadically or November-January. Flowers



**Figure 7:** *Dendrocalamus parishii* Munro. Vern.: Faglu.



gregariously at intervals of several years, but a clump may here and there be found in flowering during the cold season of almost any year.

**Specimens examined:** Amarpur, 24 June, 2011, Mahender. 236, 237.

**Habitat:** Very common around villages in lower dry hills.  
**Distribution:** Pakistan, Nepal, India to Myanmar, Singapore, Java, India, Shivalik Hills, **Himachal Pradesh:** Bilaspur, Mandi (BSD), Sirmaur (Paonta Sahib, Renuka), Kuniyar, Nurpur and Una.  
**Altitude:** 400-1500 m [37-42].

**Economic and Ethnobotanical Uses:** Stems highly valued for building purposes, also employed for lance-shafts, rafters, battens, scaffolding, mats, baskets, sticks, furniture, tent-poles, bamboo-bridges, musical instruments, swings, water pipes, fishing rods and masts for country boats; also used for paper-pulp. Pulp is also suitable for rayon industry. The silicious matter found near the joints is used as a cooling, tonic and astringent medicine. Bamboo has been employed in the preparation of activated carbon, valuable for metal-smith's work. **Leaves** are used as fodder; also given to animals during parturition for rapid expulsion of the placenta. A decoction of the leaves is given to women after delivery to put the uterus in order. The decoction of the nodes of culms are used to procure abortion (Watt, 1889-1893; Collett, 1902, 1921; Kirtikar and Basu, 1935; Ambasta, 1986; and Polunin and Stainton, 1984).

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