Distribution of bamboo in Kathmandu valley

Roshani Manandhar[1] and Tribikram Bhattarai[2]

Of the twenty-three species belonging to five genera of bamboo is recorded in Kathmandu valley, *Bambusa balcooa* is the most commonly grown species in. Except six species all other are cultivated. *Bambusa* is the largest genus which has ten species. Five categories of frequency class were identified as: A: abundant with more than 20 clumps; C: common with 10 to 19 clumps; F: few having 3 to 9 clumps; and R: rare with 1 to 2 clumps.

Keywords : Bamboo, Distribution, Nepal

Bamboo belongs to the family Gramineae (Poaceae) and form the tribe Bambuseae of the sub-family Bambusoideae. They have woody, usually hollow culms, complex rhizome and branch systems, petiole, leaf blade and prominent sheathing organs (Dransfield and Widjaja 1995). Bamboo in Kathmandu as in the other part of the country, are grown mostly on abandoned hill slopes and grooves near villages and on margins of farmland. Of the 1000 species of bamboo belonging to about 80 genera occurring in the world (Dransfield and Widjaja 1995), 32 species (of 11 genera) are reported from central and east Nepal (Stapleton 1994).

Bamboo are indispensable for Nepali people. The easy workability, straightness, high strength, comparative cheapness and short growth rotation have made it popular to the people (Sattar *et al.* 1994). Nonetheless, very little information is available on bamboo flora, their distribution and economical exploitation in Nepal.

Taxonomic study of bamboo is always difficult as flowering of most of the species are unpredictable. The flowering cycle of bamboo is of mysterious characteristics varying from 1 to 120 years (Gavinlertvatana 1992). However, the older belief that flowers were essential for taxonomic identification of bamboo, have now been changed, and it is accepted that vegetative parts are also important for bamboo classification (Stapleton 1994).

The present paper includes information on distribution, vegetative and floral characteristics and flowering behaviour of the bamboo growing in Kathmandu valley.

Methods

The study was conducted in 1996 at places shown in fig 1. Bamboo were identified mostly according to the vegetative characters following the method of Stapleton, 1994, and, floral characters of specimens those having flowers were also considered for identification. Herbaria of collected samples have been recorded for further study.

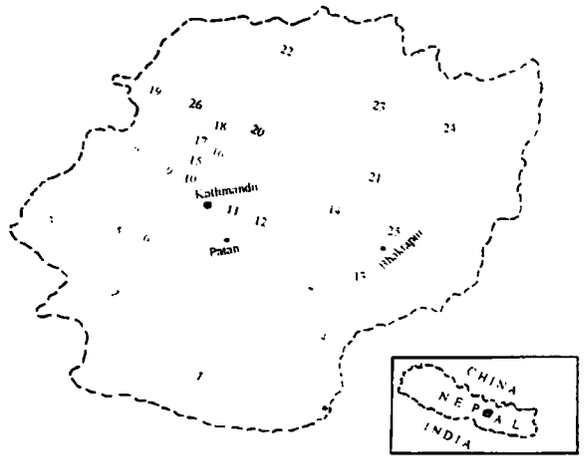

Fig. 1 : Map of Kathmandu valley showing study sites.
1. Chapagaon; 2. Chalnakhel; 3. Thankot; 4. Bisankhu; 5. Kirtipur; 6. Chovar; 7. Lubhu; 8. Ichangu; 9. Soyanbhu; 10 Dallu; 11. Kalikasthan; 12. Koteswor; 13. Suryabinayak; 14 Bode; 15. Maephii; 16. Ranibari; 17. Gongabu; 18. Dhapasi; 19. Dharmasthali; 20. Bansbari; 21. Chapagau; 22. Sivapuri; 23. Sundarijal; 24. Sankhu; 25. Bhaktapur; 26. Hiledol.

[1] and [2] Botany Department, Amrit Campus, PO Box 102, Kathmandu

Results

Twenty-three species of bamboo belonging to five genera are found growing in Kathmandu valley. Of them, six species belonging to four genera were found growing naturally in forest whereas remaining species were found mostly in the marginal land near agriculture field, on stream bank, and/or villages. They were planted either to reduce soil erosion or as ornamental plant in gardens. Species with their local names are presented in table 1.

Bambusa was the largest genus with 10 species. For some practical difficulties in identification, one species each of *Bambusa, Dendrocalamus, Drepanostachyum* and *Phyllostachys* could be identified only to generic level; their vegetative characters are given in the box:

Bambusa sp.
A dense clump forming species. Culms purplish green, 5 - 6.5 m tall, smooth with a ring of brown hairs at the base of node and a groove at the branching side. Comparatively uniform multiple branches arising from upper nodes. Culm wall 1 cm thick. Young culm have white waxy covering. The culm sheath is deciduous, size 22 x 11.5 cm. A patch of straight stiff dark brown hairs in triangular form persists at the central basal part of outer surface of the culm sheath. The inner surface is shiny. Auricles small or vestigial with few bristles. Ligule smooth and small. Culm sheath blade 9.5 x 5 cm, ovate and sharply pointed at the apex. Leaves 20 x 1.9 cm, linear, small, dull green, soft and leathery with white hairs on both surfaces. Leaf sheath smooth. Leaf auricles without bristles.

Dendrocalamus sp.
A large, dense clump forming bamboo, culms 10-14 m tall with dropping tips. Culms covered with whitish furs giving a dull green colour, diameter 4.5-5.5 cm, thickness 1.5 cm. Many small branches develop from each node of lower half of the culm, rarely with one large and other small branches. Culm sheaths large 10.5 x 13 cm, corasious, shiny and is covered by dense black hairs on the outer surface, inner surface shiny. Auricles represented by bristles only. Ligule smooth and pointed. Culm sheath blade 10 x 5 cm, ovate, reflexed and easily torn out. Leaves broadly lanceolate, 25 x 3 cm, rounded at the base and dropping. Mid rib shiny and distinct. The leaf sheath long, with white hairs. Leaf sheath ligule reddish .

Drepanostachyum sp.
Plants usually grow on steep mountain slopes. Culms 2-3 m tall, thin, yellow, smooth and shiny, 40-45 branches develop from each swollen node. Inner side of culm sheath tip is rough. Leaves 15 x 1.5 cm, long, linear to lanceolate, lamina base acuminate, prominent mid rib. Leaf sheath smooth with bristles at the apex.

Phyllostachys sp.
An ornamental species cultivated as hedge. Culms 5-6 m tall, dark green, glossy, usually two slightly unequal branches develop from each node. Internodes 30-35 cm long. Culms flattened at branching side. Culm sheath 6.8-7.2 X 1.2-1.5 cm. Culm sheath blade 0.6-0.8 cm, auricle absent. Leaves 10.5 x 1.4 cm, linear and hairy. Mid vein prominent from lower surface. Leaf sheath smooth.

Distribution

Of the 26 localities visited (see Fig. 1), five categories of frequency class were identified as: A: abundant with more than 20 clumps; C: common with 10 to 19 clumps; F: few having 3 to 9 clumps; and R: rare with 1 to 2 clumps (table 2).

Discussion

Bamboo are the most abundant species of Nepal. The identification of bamboo is difficult as their flowering is irregular and unpredictable. It is desirable to develop methods to identify bamboo considering vegetative characters. Such difficulties have drawn controversies in naming bamboo.

Hara *et al.* (1978) reported 10 species of bamboo belonging to 5 genera from east and central part of Nepal. Poudyal (1992) reported 33 species of 12 genera. Stapleton (1994) listed 32 species of 11 genera.

In the present study, 23 species of 5 genera were found growing in Kathmandu valley. One species each of the genera *Bambusa, Dendrocalamus, Drepanostachyum* and *Phyllostachys* could not be identified to species level. Further characterisation of the non-floral characters and if available, floral characters are necessary for their proper identification.

One species which has thick culm wall with brownish fur on culm and shows uniform multiple branches on each node confirms that it belongs to genus *Bambusa*. Its characters such as the presence of groove on the culm at the branching side, smooth and shiny culm and linear leaf are similar to *B. nutans* sub sp. *nutans* (Stapleton 1994a). Their

Table 1 : Bamboo of Kathmandu valley and their local names

Species	Local name	Distribution
A. *Bambusa* Schreber		
1. *B. alamii* Stapleton	Mugi Bans	C
2. *B. balcooa* Roxburgh.	Dhanu Bans, Ban Bans, Ghana Bans, Linge Bans, Bhalu Bans .	CW
3. *B. multiplex* (Lour.) Raeusch. ex J.A.& J.H.Schult.	Bans	C
4. *B. multiplex* var *straita*	Pahelo Bans	C
5. *B. multiplex* var. **nana** Roxbergh	Thulo nigalo	C
6. *B. nepalensis* Stapleton	Tama Bans, Phusre Bans, Choya Bans	C
7. *B. nutans* Wallich ex Munro *sub sp. cupulata* Stapleton		C
8. *B. nutans* Wallich ex Munro *sub sp. nutans*	Tharu Bans ,Taru Bans	C
9. *B. tulda* Roxburghi	Kada Bans, Kor	CW
10. *Bambusa* sp.	Bans	CW
B. *Dendrocalamus* Nees		
11. *D. giganteus* Munr	Dhungre Bans, Bhalu Bans	C
12 *D. hamiltonii* Munro var. *hamiltonii*	Tama Bans, Choya Bans, Ban Bans, Dhungre Bans.	C
13. Den*drocalamus* sp.	Tama Bans	CW
C. *Drepanostachyum* Nees		
14. *D. falcatum* (Munro) Kengf	Tite nigalo, Diu nigalo	W
15. *D. intermedium* (Munro)Kengf	Tite nigalo, Nigalo	W
16. *Drepanostachyum* sp.	Nigalo	W
D. *Himalayaclamus* Kengf		
17. *H. brevinodus* Stapleton	Nigalo	C
18. *H. falconeri* (Munro) Kengf	Thudi nigalo, Singhane	W
. 19. *H. fimbriatus* Stapleton	Nigalo	C
20. *H. hookerianus* (Munro) Stapleton	Padang, Nibha	W
E. *Phyllostachys*		
21. *P. aurea* Car	Nigalo	C
22. *P. nigra* Munro	Kalo nigalo	C
23. *Phyllostachys* sp	Nigalo	C

C: cultivated; W: wild; CW: cultivated but now naturalised and growing as wild.

culm size is also similar. However, the characters like the presence of triangular jet black hairs on the outer surface of culm sheath, absence of fringed auricle, presence of ring of brown hairs at the base of node and hairy leaf are not found in *Bambusa nutans* sub sp *nutans*. The characters like hairy leaf, presence of ring of hairs at the base of node and the structure of culm sheath are different from the other species of *Bambusa* (Stapleton 1994a).

The other large clump forming bamboo locally called as Tama Bans showed many similar characters with the genus *Dendrocalamus*. The presence of white furs in young culm, unequal multiple branches originating from the node, thin culm wall, culm sheath auricle represented by bristles, presence of easily torn out small ovate culm sheath blade and broadly lanceolate dropping leaves confirms that it belongs to genus *Dendrocalamus* (Stapleton 1994) It differs with *D. gigantus* as it has culm with smaller diameter and long internode, and the smaller size of culm sheath (Stapleton 1994). Its characters like relatively thick culm wall, bristles representing auricle and the pointed narrow ligule differ it from *D. hamiltonii* (Hooker 1897)

The bamboo identified as *Drepanostachyum* sp. showed mixed characters of the two genus. Its small, smooth and shiny culms are similar to the genus *Himalayacalamus*. However, the characters like swollen node, more than 40 uniform branches from each node and rough inner side of culm sheath tip confirm it to be *Drepanostachyum* sp (Stapleton 1994, Stapleton 1994b).

Table 2: Frequency of bamboo at differeent localities of Kathmandu valley.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Species																						
Localities	Babusa alamii	B. balcooa	B.multiplex	B.multiplex var. straita	B. multiplex var. nana	B. nepalensis	B. nutans sub sp. nutans	B. tulda	Bambusa sps.	Dendrocalamus giganteus	D.hamiltonii	Dendrocalamus sps.	Drepanostachyum falcatum	D.intermedium	Drepanostachyum sps.	Himalayacalamus asper	H. brevinodus	H. falconeri	H. fimbriatus	H. hookerianus	Phyllostachys nigra	P. aurea	Phyllostachys sps.
Hile dole	–	A	–	–	–	C	A	–	–	–	–	–	–	–	–	–	–	–	C	–	–	–	–
Kirtipur	–	A	–	–	–	–	A	–	–	–	–	–	–	–	–	–	–	–	A	–	–	–	–
Bisankhu	–	A	–	–	–	C	A	–	–	–	A	F	–	–	–	–	–	–	A	–	–	–	–
Sundarijal	–	C	F	–	–	–	A	–	–	R	–	–	–	–	A	–	–	–	C	–	F	–	–
Maephii	–	A	–	–	R	C	A	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bansbari	–	C	–	–	–	C	A	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Suryabinayak	–	A	–	–	–	C	A	–	–	–	A	F	–	–	–	–	–	–	C	–	–	–	–
Bhaktapur	–	C	–	–	–	F	A	–	–	–	–	–	–	–	–	–	–	–	F	–	–	–	–
Ichangu	–	F	–	–	R	A	A	–	–	–	A	F	–	–	–	–	–	–	A	–	–	–	–
Koteshowr	–	F	–	–	–	–	C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Changu Narayan	–	R	–	–	–	C	A	–	–	–	F	–	–	–	–	–	–	–	F	–	–	–	–
Thankot	–	R	–	–	–	A	C	–	–	–	C	F	–	–	–	A	–	–	F	–	–	–	–
Lubu	–	A	–	–	–	A	C	–	–	–	F	–	–	–	–	–	–	–	C	–	–	–	–
Chapagau (Bungmati)	–	R	–	–	–	A	A	–	–	–	–	F	–	–	–	–	–	–	A	–	–	–	–
Dharmsthali	–	C	–	–	–	C	C	–	–	R	–	–	–	–	–	–	–	–	R	–	–	–	–
Ranibari	R	R	–	–	–	A	R	F	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Sankhu	–	C	–	–	–	C	A	–	–	–	F	–	–	–	–	–	–	–	R	–	–	–	–
Dallu (Kalimati)	–	R	–	R	–	F	R	–	–	–	–	–	–	–	–		R	–	R	–	–	–	–
Phulchoki (Godawai)	–	–	R	–	–	–	–	–	–	–	–	–	A	A	–	–	–	A	–	–	–	–	F
Chanlnikhel	–	R	–	–	–	–	R	–	–	–	–	–	–	–	–	–	–	–	F	–	–	–	–
Chovar	–	A	–	–	–	C	C	–	–	–	–	R	–	–	–	–	–	–	A	–	–	–	–
Dhapasi	–	A	–	–	–	C	A	–	–	–	–	–	–	–	–	–	–	–	F	–	F	–	–
Kalikasthan	–	A	–	R	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Gongabu (Lazimpat)	–	C	–	–	R	–	C	R	–	–	–	–	–	–	–	–	–	–	F	–	–	–	–
Soyanbhu	–	C	–	–	–	R	C	–	R	–	R	R	–	–	–		–	–	–	–	F	F	–
Shivapuri	–	R	–	–	–	–	R	–	–	–	–	R	C	C	–	–	–	–	F	C	–	–	–

Note : A= Abundant, F= Few, C= Common, R= Rare, - = Absent

One ornamental bamboo with flattened culm on branching site and presence of two slightly unequal branches from each node is similar to genus *Phyllostachys* (McClure 1966, Okamura and Tanaka 1986).

Genus *Bambusa* with 10 species was the largest and widely distributed genus of bamboo in Kathmandu valley. *Bambusa balcooa* was the most common bamboo. It was found in 25 localities out of 26 localities studied. Other common bamboo were *Bambusa nutans* sub sp. *nutans* and *Himalyacalamus fimbriatus* and *Bambusa nepalensis*. They were found at 24, 19 and 18 localities respectively. *Bambusa alamii*, *Drepanostachyum* sp., *Himalayacalamus falconeri*, *H. hookerianus*, *Phyllostachys aurea* and *Phyllostachys* sp. were found growing only at one spot.

All the three species of *Drepanostachyum* (*D. falcatum*, *D. intermedium* and *Drepanostachyum* sp.) and two species of *Himalayacalamus* (*H. falconeri*, *H. hookerianus*) were found growing abundantly in the forest around Kathmandu valley. They were growing as under story vegetation. *H. falconeri* was found luxuriantly growing in Phulchoki at above 2000 m. All other species are cultivated bamboo found in gardens or around villages. However, species like *Bambusa balcooa*, *B. nutans* sub sp *nutans*, *B. tulda* and *Dendrocalamus hamiltonii* are growing well in Kathmandu valley and seems like wild species slowly entering in the adjoining forest of villages. Bansbari, Ranibari and Kalikasthan are the only areas in Kathmandu city where bamboo are found in pure stands. In Bansbari the bamboo clumps are continuously cleared for construction of official buildings. If it is continued there will be no Bansghari (bamboo forest) in few years. Sundarijal, Ichangu, Thankot, Soyambhu and Shivapuri area are rich for the bamboo with seven or more than seven species.

Kathmandu valley is rich in bamboo species. Different species are cultivated as they have various uses. *Phyllostachys* species are cultivated as garden ornament. The large bamboo of *Bambusa* sp. and *Dendrocalamus* sp. have different uses like scaffolding, furniture making, handicraft industries and are the best species to reduce soil erosion. The wild species have also many uses like roof thatching and to make many house hold objects (woven products like mats, baskets, trays, winnows etc.) for rural as well as urban life.

Due to the multiple uses of bamboo and increase of its demand for rapid urbanization of Kathmandu valley huge amount of bamboo clumps are removed from forest and cultivated area every year. This will affect the bamboo population of the valley. Traditional bamboo pockets like Bansbari, Ranibari, Kalikasthan should be conserved from government level where many species of bamboo are growing. These areas are suitable for bamboo arboretum.

Acknowledgments

Authors would like to thank the Research Division of Tribhuvan University, Kathmandu, Nepal for the partial financial support for this research.

References

Dransfield S. and Widjaja E. A. (eds.) 1995. **Plant resources of South-East Asia.** Backhuys Publishers, Leiden.

Gavinlertvatana, P. 1992. Micropropagation of bamboo. *Forest News* 6(1): 1-16.

McClure E. A. 1966. **The bamboo: a fresh perspective.** Harvard University Press, Cambridge, Massachusetts.

Hara H.; Stearn W. T. and Williams L. H. J. 1978. An enumeration of the flowering plants of Nepal. British Museum (National History) London.

Hooker J. D. 1897. **Flora of India** Vol. 7. L. Reeve and Co. Ltd. London.

Okamura, H. and Tanaka Y. 1986. The horticultural bamboo sps. in Japan. Meijio University.

Poudyal P. 1992. Bamboo: Field document No. 20. HMG\FAO\UNDP Community Forestry Development Project, Kathmandu.

Sattar M. A. et al. 1994. Physical and mechanical properties of *Bambusa* sps. and *Dendrocalamus gigantus*. *Bangladesh J. Sc.* 23(2): 20-25.

Stapleton C. A. M. 1994. **Bamboo of Nepal.** Royal Botanical Gardens, Kew.

Stapleton C. A. M. 1994 a. The bamboo of Nepal and Bhutan Part I: *Bambusa*, *Dendrocalamus*, *Melocanna*, *Cephalostachyum*, *Teinostachyum* and *Pseudostachyum* (Gramineae:Poaceae, Bambusoideae) *Edinb. J. Bot.* 51(1):1-32.

Stapleton C. A. M. 1994 b. The bamboo of Nepal and Bhutan Part III: *Drepanostachyum*, *Himalayacalamus*. *Ampelocalamus*, *Neomicrocalamus* and *Chimonobambusa* (Gramineae: Poaceae, Bambusoideae) Edinb. J. Bot. 51(3): 301-330.