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Morphological variation of *Bambusa tulda* Roxb. in seven districts of North Chota Nagpur division of Jharkhand

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Abstract

North Chota Nagpur is blessed with extraordinary vegetation of bamboo. *B. tulda* is distributed with wide local variations due to its edaphic and climatic factors. This area supports luxuriant growth of *Bambusa tulda* Roxb. Locally called Tokari bans. The *Bambusa tulda* is one of the important bamboo species of North Chota Nagpur which is distributed more or less in seven districts of North Chota Nagpur with wide variation. In this paper, the main aim is to find out the morphological variation in colour, height, diameter, internode length, wall thickness, length-breadth of culm sheath, blade and leaves etc.

Keywords: Bamboo, *Bambusa tulda*, Variation, North Chota Nagpur and Morphology.

1. Introduction

Bamboo is long and woody grass belongs to family Poaceae and sub-family Bambusoideae. Bamboo is the green gold of 21st century commonly called poor man's timber. In India, bamboos grow abundantly almost all over the country, except in Kashmir Valley and represented by 22 genera and 136 species (Bakshi, 2010) [2]. Bamboos help to meet the basic necessities of life i.e. food, fuel, clothing and shelter and also serve as a raw material for many industries such as paper (Negi, 1996) [3].

Bambusa tulda is extraordinary and unique plants that are sustainable, productive, versatile and fastest growing plant. It is distributed frequently in all seven districts of North Chota Nagpur. It is one of the most important plant species that is available at much lower price compared to wood as an alternative source of depleting and costly wood resources. *Bambusa tulda* can be grown in degraded and wastelands easily without much care.

The bamboo species (*Bambusa tulda*) was identified on the basis of morphological and anatomical descriptions of the plants (Vermah and Bahadur, 1980) [4] and culm sheath morphology (Chatterji and Raizada, 1963) [5].

The knowledge of *Bambusa tulda* on variability of morphological traits in different areas of North Chota Nagpur is far from satisfactory and there are many gaps in our knowledge. The present study aims at filling up this gap and assessing the variability of morphological traits in different areas of North Chota Nagpur division of Jharkhand.

2. Materials and Methods

The present research investigation was carried out in North Chota Nagpur division of Jharkhand that is lying between 23°37' N to 24°4' N latitude and 86°6' E to 86°1' E longitude. Several villages in different districts of North Chota Nagpur division were surveyed for the availability of *Bambusa tulda*. Simple random sampling procedure was adopted for selection of the villages where information collections about morphological traits of *Bambusa tulda* species have been carried out between 2012 and 2015 in North Chota Nagpur of Jharkhand. The ten villages were randomly selected from each district. Total 70 villages were selected from study area covering seven districts (Hazariabag, Chatra, Ramgarh, Bokaro, Giridih, Dhanbad & Koderma) represent the entire study sites. The bamboo *Bambusa tulda* species available in these villages were identified and data were recorded of different parameters. From each village, the information related to morphological traits like culm length (upto crown), diameter at breast height (DBH), Culm internodes length at breast height,

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Length of culm sheath, breadth of culm sheath at base, length of blade, breadth of blade at base, length of leaves and breadth of leaves at middle part were recorded. The sample culms were also selected randomly. The data were collected from the old culms (> 2 year) of bamboo.

The height (total culm length) of bamboo plant was measured by multiplying the number of internode with intermodal length at breast height or by measuring the length of felled bamboo plant. The diameter of bamboo culm was measured through digital calliper or vernier calliper at breast height. Internode distance, length & breadth of culm sheath, blade and leaves of bamboo were measured through measuring tape or scale. Height was measured in meter and rest of the parameters were measured in centimetre (cm). The digital calliper and vernier calliper were used for taking data of culm diameter at breast height (BH).

3. Results and Discussions

When comparing the *B. tulda* among seven districts of North Chota Nagpur, all figures from 1 to 6 and photographs from 1 to 11 show variation in morphological traits of *B. tulda* in seven districts of North Chota Nagpur. The culms of *B. tulda* are usually green, smooth and shining. The culms colour becomes reddish-yellow seen at Upari bodara village of Bishungarh block (Hazaribag) as shown in photograph-4. Culms are dark green in koderma district while light green colour in Dhanbad district. The culm colour was dark glabrous green in Bokaro district and light shiny green in Hazaribag district. As far as height was concern, the maximum mean culm height is 18.65 m found in Hazaribag district and shortest culm height is 15.95 m observed in

Koderma district. There was more branching system at lower nodes in Dhanbad district as compared to other districts of North Chota Nagpur. In respect to internode length, the longest internodes having mean internode length at breast height is 56.1 cm found in Hazaribag whereas shortest internodes having mean internode length at breast height is 41.95 cm found in Dhanbad district. The least diameter of *B. tulda* having mean diameter at breast height is 4.415 cm found in Dhanbad district and maximum mean diameter at breast height is 8.373 cm investigated from Hazaribag district. This bamboo species of Hazaribag district has thickest culm whereas the bamboo of Dhanbad district has thinnest culm. There was only slight difference in culm wall thickness in the different districts of North Chota Nagpur division. The maximum culm wall thickness having mean value is 1.38 cm investigated from Hazaribag district and least wall thickness having mean value is 1.305 cm investigated from Koderma district. In respect to length and breadth of culm sheath, longest culm sheath having mean length is 22.0 cm noted from Chatra district while shortest having mean length is 16.6 cm noted from Dhanbad district. Broadest culm sheath having mean breadth at base is 16.5 cm noted from Hazaribag district and shortest breadth having mean breadth at base is 15.5 cm noted from Dhanbad district. The maximum length (7.49 cm) of blade noted from Ramgarh district and breadth (7.17 cm) from Bokaro district while minimum length (7.03 cm) from Koderma district and breadth (6.56 cm) from Chatra district. The longest leaves (21.5cm) observed from Ramgarh and Bokaro districts and broadest (3.14 cm) leaves from Bokaro district.

Table 1: The genetic variability in term of morphological characters observed in seven districts is as follows (*Bambusa tulda*).

District		Height (m)	Diameter (cm)	Internode Length (cm)	Wall Thickness (cm)	Culm Sheath		Blade		Leaves	
						Length	Breadth	Length	Breadth	Length	Breadth
Bokaro	Mean	18.2	7.646	54.8	1.353	19	16.4	7.23	7.17	21.5	3.14
	Stdev	1.971	1.495	12.23	0.130	2.82	2.53	0.78	0.87	3.87	0.73
Chatra	Mean	17	7.506	45.8	1.333	22.0	16.4	7.37	6.56	21.2	2.74
	Stdev	1.603	1.283	5.401	0.117	2.71	2.02	0.50	0.84	4.07	0.65
Dhanbad	Mean	16.65	4.415	41.95	1.37	16.6	15.5	7.31	6.88	20.6	3.01
	Stdev	1.348	0.742	3.203	0.145	1.90	2.35	0.73	0.92	3.11	0.59
Giridih	Mean	18.45	7.034	49.8	1.365	19.6	16.3	7.31	6.88	20.7	3.08
	Stdev	2.874	2.052	7.452	0.118	3.21	2.30	0.73	0.92	4.01	0.71
Hazaribag	Mean	18.65	8.373	56.1	1.38	20.7	16.5	7.18	6.86	20.5	2.91
	Stdev	2.084	1.478	11.11	0.095	2.69	2.03	0.80	0.82	3.05	0.59
Koderma	Mean	15.95	6.605	46.2	1.305	19.3	16.0	7.03	6.64	20.4	2.93
	Stdev	1.571	1.192	4.606	0.119	2.77	1.98	0.60	0.76	3.44	0.55
Ramgarh	Mean	17.6	7.710	49.11	1.328	20.6	16.0	7.49	6.70	21.5	2.94
	Stdev	1.723	1.553	6.552	0.132	2.84	1.97	0.42	0.73	3.25	0.62

According to Singh, P. K. *et al.* (2010) ^[1], *Bambusa tulda* is a moderate sized, densely tufted, sympodial type bamboo. Culms are usually green, glabrous when young, culm height 8-20 m, 5-10 cm in diameter, branches starts from the upper nodes, lower nodes bear horizontal branches, lower ones having fibrous roots; internodes 30-60 cm; culm sheaths 15-

25 cm long and 18-30 cm broad, rounded at base or triangularly at top, blades are triangular with hairy outer surface. Leaves are linear-oblong or linear-lanceolate with usually rounded at the base, 15-25 cm long and 2-4 cm broad.

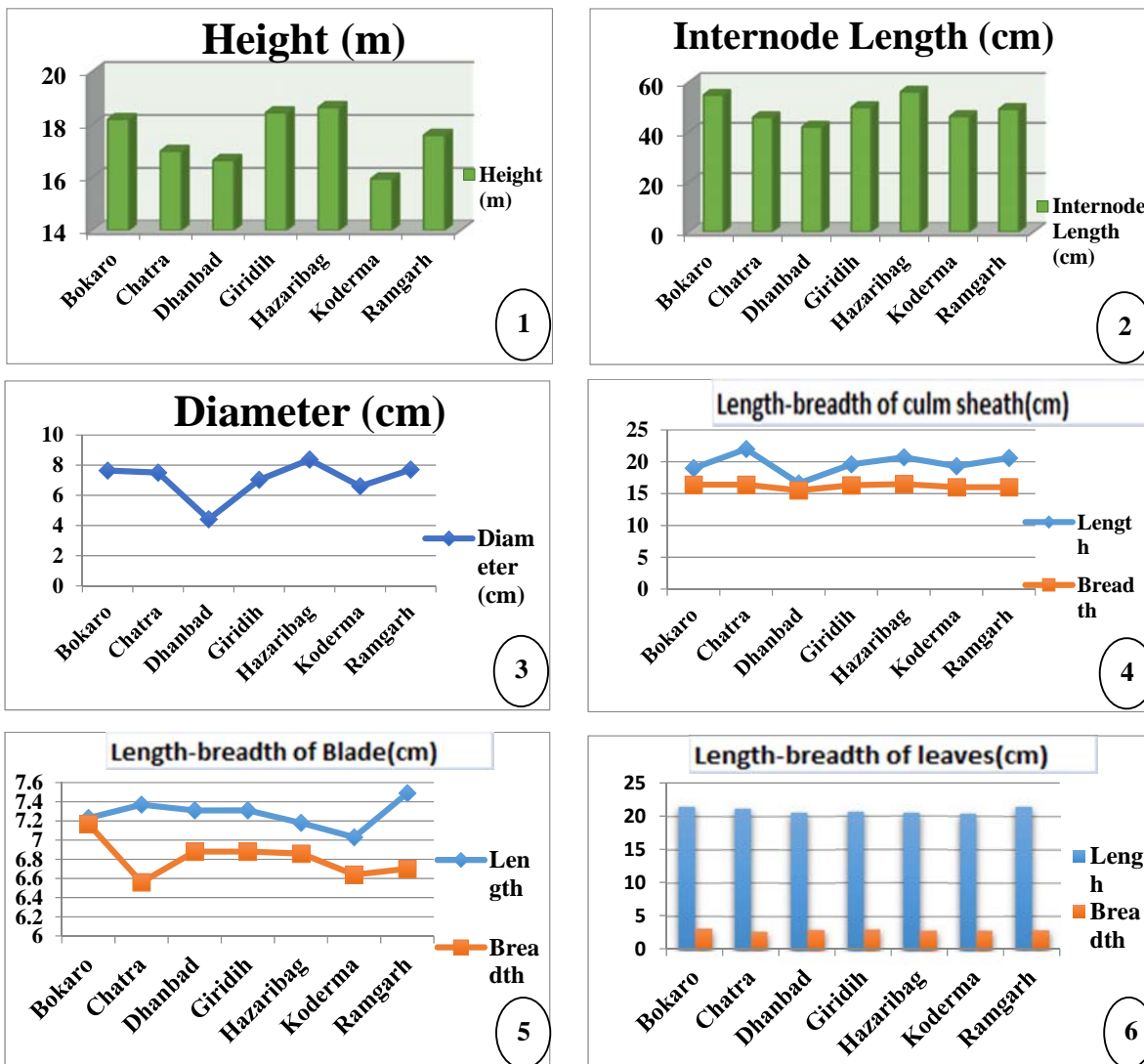


Fig 1: (1) Height of *B. tulda* in seven district of North Chota Nagpur (2) Internode length at breast height of *B. tulda* in seven district of North Chota Nagpur (3) Diameter at breast height of *B. tulda* in seven district of North Chota Nagpur (4) Length-breadth of culm sheath of *B. tulda* in seven district of North Chota Nagpur (5) Length-breadth of blade of *B. tulda* in seven district of North Chota Nagpur (6) Length-breadth of leaves of *B. tulda* in seven district of North Chota Nagpur

4. Conclusion

The longest culm with longest internode length and thickest *Bambusa tulda* species was found in Hazaribag district while shortest culm height in Koderma district. Shortest internode length and thinnest *Bambusa tulda* species was found in Dhanbad district. Well-developed culm sheath length occurs in Chatra district while shortest length-breadth of culm

sheath occurs in Dhanbad district. The dimension of blades and leaves was almost similar in all districts of North Chota Nagpur. The longest leaves were found in Bokaro and Ramgarh districts. *B. tulda* of Hazaribag district showed luxurious growth than other districts of North Chota Nagpur division of Jharkhand.

Field photographs of various parts of *Bambusa tulda* (Vulki bans)





Fig 2: (1) *Bambusa tulda* at Bhelwaparri village of Rajdhanwar block (Giridih) (2) *Bambusa tulda* at Kashwagard village of Gomia block of Bokaro district (3) *Bambusa tulda* at Uranwa village of Chanwara block (Koderma) (4) *Bambusa tulda* at Upari bodara village of Bishungarh block (Hazaribag) (5) *Bambusa tulda* at Lachhuryaydih of Tundi block of Dhanbad district showing thin culm (6) *Bambusa tulda* at Kathara of Bermo block of Bokaro district showing long & thick culm (7) Young culm (8) Culm sheath (9) Wall thickness (10) Node part of *Bambusa tulda* (11) Node with slight whitish stripes on internode.

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