

Original article

Morphology of Some Bamboos Commonly Used in Lao PDR

Singkone Chaiyalad¹

Somkid Siripatanadilok²

Sarawood Sungkaew²

¹National Agriculture and Forestry Research Institute, Lao PDR

E-mail: gem.40@hotmail.com

²Faculty of Forestry, Kasetsart University, Chatuchak, Bangkok, 10900, Thailand

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ABSTRACT

Bamboos have provided a variety of raw materials and products widely used in Lao PDR for centuries. Their diversity often leads to confusion, particularly when discussing local and botanical names. This study aimed to use the morphological procedure to identify some bamboos commonly used in the country. Three study sites (Oudomxay province, the capital city of Vientiane, and Champasak province) representing the Northern, Central, and Southern regions, respectively, were chosen as representatives of the country. Ten species from six genera were found: *Bambusa blumeana*, *B. tulda*, *B. polymorpha*, *Dendrocalamus brandisii*, *D. membranaceus*, *Gigantochloa albociliata*, *Indosasa sinica*, *Schizostachyum* sp., *S. virgatum*, and *Thysostachys siamensis*. Their diagnostic morphological characters provide a potential reference source for the identification of bamboos with regard to their products and botanical names. Their diagnostic morphological characters, uses, and habitats were provided.

Keywords: bamboos, Lao PDR, morphology, uses

INTRODUCTION

More than 80% of the population of Lao PDR lives in rural areas, where non-timber forest products (NTFPs) are usually used for food security and a range of other uses (Vongkhamhor and Ketphanh, 2007; Greijmans *et al.*, 2007). These products are at the heart of many subjects including culture, tradition, religion, art, construction,

and daily life. Bamboos are collected to be used in a variety of ways such as: shoots for consumption; and culms for the construction of houses, rice stores, making rafts, mooring ropes, fences, bridges, animal and birds traps, fish traps, chicken cages, containers for steamed rice, sticks for roasting meat and vegetables, chopsticks, and toothpicks, and many others (Xaidara and Lamxay, 2000; Vongkhamhor and Ketphanh, 2007; Chaiyalad,

personal observation). The diversity of source is sometimes reflected in confusion regarding the use of both local names and botanical names (Ketphanh *et al.*, 1994). This study primarily aimed to overcome such a problem through the use of a morphological approach.

MATERIALS AND METHODS

The different regions of the country result in differing availability of the bamboos (Ketphanh *et al.*, 1994) and furthermore, the floristic work on bamboos in the Lao PDR has not yet been completed and for the purposes of this study it was not feasible to survey the complete bamboo resource for the whole country. Thus, in this study, between May, 2010 to April, 2011, where applicable, purposive visits were made to the wilds, as well as to local markets, shops and bamboo processing factories in three areas (Oudomxay province, the capital city of Vientiane, and Champasak province) representing the Northern, Central, and Southern regions of Lao PDR, respectively, to collect bamboo specimens and to study their morphology. This approach recognized that the ways to utilize the bamboos would differ region by region and also reflected the traditions of tribes, cultures, and societies. Morphological characteristics were studied using the specimens collected and by comparison with herbarium specimens and taxonomic books suggested by several previous works (*e.g.* Gamble, 1896; McClure, 1966; Ketphanh *et al.*, 1994; Dransfield and Widjaja, 1995;

Wong, 2004; Li *et al.*, 2006; Sungkaew, 2008). Not only the specimens collected from the fieldwork were examined, but also those deposited in the following herbaria: the Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation, Bangkok, Thailand; the Forest Biology Department, Faculty of Forestry, Kasetsart University, Thailand; the Faculty of Science, National University of Lao PDR; and the Forest Research Center, Lao PDR.

RESULTS AND DISCUSSION

From a morphological perspective, 10 bamboo species from six genera were found: three species of *Bambusa* (*B. blumeana*, *B. tulda*, *B. polymorpha*); two species of *Dendrocalamus* (*D. brandisii*, *D. membranaceus*); one species of *Gigantochloa* (*G. albociliata*); one species of *Indosasa* (*I. sinica*); two species of *Schizostachyum* (*Schizostachyum* sp., *S. virgatum*); and one species of *Thrysostachys* (*T. siamensis*). The diagnostic characters and habitats of these species are shown in Table 1 and they are illustrated in Figure 1. The uses of bamboos in the different three regions are compiled in Table 2. Some of their local names frequently used are also provided and the ones preferred to be used by this study are in bold (see Table 1). All of these bamboos possess a pachymorph rhizome system, except for *I. sinica* which is leptomorphic. A species of *Schizostachyum* was unable to be identified to the species level due to the lack of reproductive parts (flowers and fruits). It is not clear whether or not *B. blumeana* is native to the country because it

is usually found, even though in the wild, not very far from a village. *Dendrocalamus brandisii* was often misidentified as *D. hamiltonii* due to both species having the same local name 'Mai hok' and this problem also happens in Thailand. Differences between these two species have been discussed thoroughly by Sungkaew (2008) and Sungkaew *et al.* (2011). The easiest way to separate these two species is by looking at the culm-sheath auricles. The auricles of *D. brandisii* are lobe-like and have oral setae while those of *D. hamiltonii* comprise a triangular protuberance and have no oral setae.

In the Northern region, two species were commonly used; 'Noh khome' (*I. sinica*) and 'Mai hok' (*D. brandisii*). 'Noh khome' can primarily be found naturally in the Northern region and there is a preference for the consumption of its shoots which are sold in the Vientiane markets and are also exported to China. The species 'Mai hok' is also consumed and found in the Central region, but not in the Southern region. The many culm products found in the Northern region include chopsticks, toothpicks, roasting sticks, bamboo supports, mats, baskets, sticky rice containers, *etc.* However, these products, especially of other species, were generally transported in from other regions rather than being processed in the Northern region.

In the Central region, seven species were commonly utilized; 'Mai lai' (*G. albociliata*), 'Mai huak' (*T. siamensis*), 'Mai bong' (*B. tulda*), 'Mai sod' (*Schizostachyum* sp.), 'Mai hok' (*D. brandisii*), 'Mai sang' (*D.*

membranaceus) and 'Mai phai banh' (*B. blumeana*). The most popular species for consumption are 'Mai lai' and 'Mai hauk'. These species are collected in the region for sale as well as being brought in from other regions. In Vientiane, there are many traders selling bamboo products made from culms of 'Mai sang', 'Mai sod' and 'Mai phai banh'. These products include: bamboo beds, mats, cages, baskets, bamboo supports, chopsticks, toothpicks, roasting sticks, sticky rice containers, *etc.* Many products produced in the Central region are taken by traders to other regions for sale.

In the Southern region, two species were found. 'Mai poung' (*B. polymorpha*) and 'Mai hia' (*S. virgatum*). Culm mats made from 'Mai hia' are widely available, while 'Mai poung' is widely used for the production of sticky rice containers and lams.

Because the potential of the bamboo industry in the country looks promising, the selection of the most appropriate species to meet market demand is becoming increasingly important. The diversity of source is sometimes reflected in the confusion associated with the use of local and botanical names (Ketphanh *et al.* (1994). The most important problem mainly occurs after processing, when it can be very difficult to identify the raw materials which have been used for the manufacture of different products. It is hoped that the anatomical approach as suggested by several comprehensive works (*e.g.* Siripatanadilok, 1986; Wong, 1995; Liese, 1998) may solve this problem.

Table 1 Comparison of diagnostic morphological characters of bamboo species commonly used in Lao PDR.

Botanical name (Local name)	Rhizome system	Culm	Culm sheath	Margin of culm-sheath ligule	Shape of culm-sheath auricles and presence of oral setae	Branch	Folige leaf-blade	Number of florets/ spikelet
1. <i>Bambusa blumeana</i> Schultes (Mai phai bank) Habitat : hills and in mixed forest in Central and Southern regions	pachymorph	densely tufted, 12-18 m high, ca. 10-15 cm in diameter; internodes 20-35 cm long; walls 1.5-2 cm thick	leathery, tardily deciduous, 32-35 cm long, 22-24 cm wide, covered with densely stiffly brown hairs	fringed	crecent-shaped to linear-oblong, slightly unequal; oral setae present	solitary on lower nodes, 3 to several on upper nodes, central one dominant, thorny	12-17 cm long, 1.5-2.5 cm wide	5-12
2. <i>B. polymorpha</i> Munro (Mai kern, Mai poung) Habitat : mixed forest, deciduous forest and evergreen forest in Southern region	pachymorph	densely tufted, 15-18 m high, ca. 10-12 cm in diameter; internodes 40-60 cm long; walls 1.2-1.5 cm thick	leathery but rigid, quite persistent, 18- 19 cm long, 24-25 cm wide, covered with densely stiffly brown hairs	irregularly dentate and ciliate	falcate to broadly belt-shaped, subequal, oral setae present	many, central 3 dominant, thornless	20-28 cm long, 3-4.5 cm wide	5-10
3. <i>B. tuldia</i> Roxb. (Mai bong, Mai bong khone) Habitat : hills or flat upland, and along watercourses in mixed forest in all three regions	pachymorph	loosely tufted, 10-12 m high, ca. 3-5 cm in diameter; internodes 30-35 cm long; walls 1.2-1.5 cm thick	leathery, deciduous, 13-15 cm long, 16-17 cm wide, covered with brown hairs	entire or minutely ciliolate	unequal, one tall and ovate, one low and oblong, oral setae present	many, central 3 dominant, thornless	17-18 cm long, 1.5-2.5 cm wide	4-8
4. <i>Dendrocalamus brandisii</i> (Munro) Kurz (Mai hang sang, Mai hok, Mai sang phai) Habitat : mixed forest, dry evergreen forest, and evergreen forest in Central and Southern regions	pachymorph	loosely tufted, 18-25 m high, ca. 13-17 cm in diameter; internodes 30-40 cm long; walls 1.3-2.4 cm thick	leathery, deciduous, 32-35 cm long, 21-22 cm wide, scattered by golden brown hairs	broadly lacerate	lobelike, oral setae present	several, middle on dominant, thornless	22-30 cm long, 3-5 cm wide	2-4
5. <i>D. membranaceus</i> Munro (Mai sang) Habitat : mixed forest and base of hills in all three regions	pachymorph	loosely tuft, 20-25 m high, ca. 10-15 cm in diameter; internodes 30-45 cm long; walls 1.1-2 cm thick	paper to sub-leathery, deciduous, 38-40 cm long, 17-18 cm wide, covered with appressed dark brown to black hairs	separate into broad lacer- ations	lobelike, oral setae present	3-several, middle one dominant, thornless	12-13 cm long, 1.2-2 cm wide	2-3

Table 1 (Cont.)

Botanical name (Local name)	Rhizome system	Culm	Culm sheath	Margin of culm-sheath ligule	Shape of culm-sheath auricles and presence of oral setae	Branch	Foliage leaf-blade	Number of florets/ spikelet
6. <i>Giantochloa albociliata</i> (Munro) Kurz (Mai lai, Mai lai khome) Habitat : along the river banks and mixed forest in Central and Southern regions	pachymorph	densely tufted, 8-13 m high, ca. 2-4 cm in diameter; internodes 25-30 cm long; walls 1-1.5 cm thick	leathery but rigid, deciduous, 12-14 cm long, 7-10 cm wide, covered with dense, appressed hairs	separate into broad lacerations and ciliate	absent	several, middle one dominant, thornless	18-19 cm long, 2-5 cm wide	1-2
7. <i>Indosasa sinica</i> C.D. Chou & C.S. Chao (Mai noh khome, Noh khome) Habitat : evergreen forest, dry evergreen forest, and mixed forest in Northern region	leptomorph	solitary, 8-12 m high, ca. 3-5 cm in diameter; internodes 22-30 cm long; walls 0.7-1.2 cm thick	leathery, deciduous, 19-20 cm long, 9-10 cm wide, covered with stiffly brown hairs	early deciduous	lobelike, oral setae present	3, subequal or central one dominant, thornless	10-15 cm long, 3-4 cm wide	many florets
8. <i>Schizostachyum virginatum</i> (Munro) H.B.Nathani & Bennet (Mai hia) Habitat : along the river banks, deciduous forest, evergreen forest, and mix forest in Central and Southern regions	pachymorph	densely tufted, with long pendulous whip-like tips 8-12 m high, ca. 2-4 cm in diameter; internodes 30-40 cm long; walls 0.4-1 cm thick	thinly leathery to leathery, deciduous, 23-24 cm long, 9-10 cm wide, covered by dark-brown hairs	irregularly dentate and bearing bristles	inconspicuous, oral setae developed	many, sub- equal, thornless	30-35 cm long, 3-4 cm wide	one floret
9. <i>Schizostachyum</i> sp. (Mai sod) Habitat : mixed forest, deforested areas in Central and Southern regions	pachymorph	densely tufted, 8-12 m high, ca. 2-6 cm in diameter; internodes 35-45 cm long; walls 0.5-0.8 cm thick	leathery but somewhat rigid, deciduous, 13-14 cm long, 11-12 cm wide, covered by black and pale yellow hairs	droopy	inconspicuous to absent, oral setae uncertain	many, sub- equal, thornless	20-25 cm long, 2-4 cm wide	unknown
10. <i>Thysostachys siamensis</i> Gamble (Mai hauk) Habitat : mixed forest, deciduous forest in Central region	pachymorph	densely tufted, 10-15 m high, ca. 3-5 cm in diameter; internodes 28 cm long, 8-10 cm wide, scattered with pale appressed hairs 2-2.5 cm thick	paper, permanent to hardly deciduous, 25- 30 cm long, walls very thick, about 2-2.5 cm thick	very short	inconspicuous to absent, oral setae absent	several, middle one dominant, thornless	8-9 cm long, 0.8-1 cm wide	2

Table 2 Bamboos commonly used in various regions of Lao PDR and their utilization based on observations and interviews: N=Northern; C=Central; S=Southern.

No	Species	Uses				
		Housing	Handicraft	Furniture	Culm product	Shoot (for food)
1	<i>Bambusa blumeana</i>	C, S	C, S	C, S	C, S	C, S
2	<i>B. polymorpha</i>	S	S		S	
3	<i>B. tulda</i>		N, C, S			N, C, S
4	<i>Dendrocalamus brandisii</i>	N, C	N, C	N, C		N, C
5	<i>D. membranaceus</i>	N, C	N, C	N, C	N, C	C
6	<i>Gigantochloa albociliata</i>		N, C, S			N, C, S
7	<i>Indosasa sinica</i>		N			N, C
8	<i>Schizostachyum virgatum</i>	C, S	C, S			
9	<i>Schizostachyum</i> sp.		N, C, S	N, C		C
10	<i>Thrysostachys siamensis</i>	C	C			C



Figure 1 Some bamboos commonly used in Lao PDR: 1=Clump habit of *Bambusa blumeana*; 2=Culm sheath of *B. polymorpha*; 3=Shoot of *B. tulda*; 4=Shoots of *Dendrocalamus brandisii*; 5=Culms and clump habit of *D. membranaceus*; 6=Cluster of pseudospikelets of *G. albociliata*; 7=Shoots of *Indosasa sinica*; 8=Young culm and part of culm sheath of *Schizostachyum virgatum*; 9=Shoot of *Schizostachyum* sp.; 10=Clump habit of *Thrysostachys siamensis*.

CONCLUSION

Morphological characters together with the utilization of some bamboos commonly used in Lao PDR were presented. Ten bamboo species from six genera have been taxonomically identified: three species of *Bambusa* (*B. blumeana*, *B. tulda*, *B. polymorpha*); two species of *Dendrocalamus* (*D. brandisii*, *D. membranaceus*); one species of *Gigantochloa* (*G. albociliata*); one species of *Indosasa* (*I. sinica*); two species of *Schizostachyum* (*Schizostachyum* sp., *S. virgatum*); and one species of *Thyrsostachys* (*T. siamensis*). The information given by this study is based primarily on the species that are commonly used in particular regions of the country. Some species can be found naturally in all regions but it does not follow that the species occurring in the wild of that region will always be commonly or popularly used there too.

Different regions of the country have different bamboo species naturally available. This reflects the different uses, tribal traditions, cultures, and societies. However, the products of others bamboos which are not available naturally in a particular region could be transported from other regions.

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