Sustainability, Local Wisdom, Diversity and Some Analytical Phytochemistry of Economic Bamboos in Phatthalung Province, Southern Thailand

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Abstract

Regions of South-East Asia is the most important tropical economic bamboos. This monocotyledon plant often grows as undergrowth scattered or in patches in the forest. It does very well in a moist environment with a lot of rainfall. In addition, it is important to its environment. It can reduce soil erosion and sucks up water from heavy rains that might cause flooding also provides shelter for many animals. The sustainability, local wisdom and ethnophamacology of economic bamboos continues to be of great concern in Thailand. A total of 15 genera 82 species of economic bamboos have been documented of which 15 of the species are found in Phatthalung province. The biocultural diversity of the area is reflected in variability of local wisdom. The medicinal sustainability of economic bamboos is highly diverse but remains largely unexplored. Our study ongoing on some analytical phytochemistry of anthraquinone, coumarin and tannin in the parts of leaves and shoots of economic bamboos. We have examined by thin layer chromatography (TLC) technique by using aloin, coumarin and tannic acid as standard, in respectively. The benefits from this natural resource management research are in terms of maintained or improved agricultural productivity of economic bamboos from communities, we expect to report some data which are unexamined to lead to the innovative strategies in this plant.

1. Introduction

Bamboos are woody stemmed members of the grass family, Poeceae, which belong to the family Bambusoideae. All members of the subfamily can be distinguished from the other grasses by foliage leaf blades which are attached to their branchlets by slender leaf stalks or petioles. Other grasses like corn and sugar cane have leaves without petioles. Bamboos like most other flowering plants, have an aerial portion which is usually green in color. The shoot system which consists of the stem branches, leaves and inflorescences which bear the flowers of sexual reproduction.

The utility and impact of bamboo use is far reaching and can been seen throughout the world. The majority of today's bamboo products come from Asia, most notably China. Even in the United States, bamboo can be found in nearly every home. It is a versitile plant and we are only limited by are creativity in seeing bamboo reach its full potential such as flooring, house and kitchen ware, weapon, bio-diesel and biofuels.

Phatthalung is one of the oldest province in southern Thailand. The region is situated with two rainy seasons thus all edemic plants are evergreen tropical rain forest. Most local people have sustainable work in agriculture and highly skill in handicrafts. These indigenous people have an old traditional of plant usage that has been handed from generation to

generation; however, still very little is known about traditional bamboo handling and some chemical substances inside this plant. This presents study aimed to assess for economic bamboos used of native people in Phatthalung province also some anthraquinone, coumarin and tannin of economic bamboo locally.

2. Material and Methods

2.1 Research area

Phatthalung is a province located in South East Thailand located between 07°6′ and 07°53′ North latitude and 09°44′ East longtitude about 858 km from Bangkok, capital city. This province is limited in the north by Nakhon Si Thammarat and Songkhla provinces, in the south by Songkhla and Satun provinces, in the west by Trang province and in the east by Songkhla Lake, the largest natural lake in Thailand. This province is rich in natural resources such as Thale Noi Ramsar wetland (07°50′ North and 100°08′ East) created in 1975 (Fig. 1).

Upon high mountains punctuate lowlands of the region (mean sea level 50-1000 m), the tropical climate is non-arid with an overage temperature 26.7-29.3°C with 78.7% humidity. Rainfall is spread throughout the year (1854 mm) with a long rainy season from May to October, and short rainy season from November to December.

Phatthalung is ancient south region. It has been settled around 1400 BC in Srivijaya peroid (1300-1800 BC) and formally known as Mardelong in Malay. Phatthalung province is subdivided into 11 districts. The region is inhibited by 509,072 people (average density of 148.80 persons/km^2) Most of population are Thai Buddhists, even if Islamic faith is less than 12%. Many Muslims have some ethnic Malay ancestry and gradually intermarried with the Thais. The majority of people in this province practice living agriculture [3]. The economically most important plants are rice, rubber palm oil and coconut, generally produced in monoculture plantation sometime gathered with cattle farming also the local people could spend the rest of the day in handicraft productions [3].

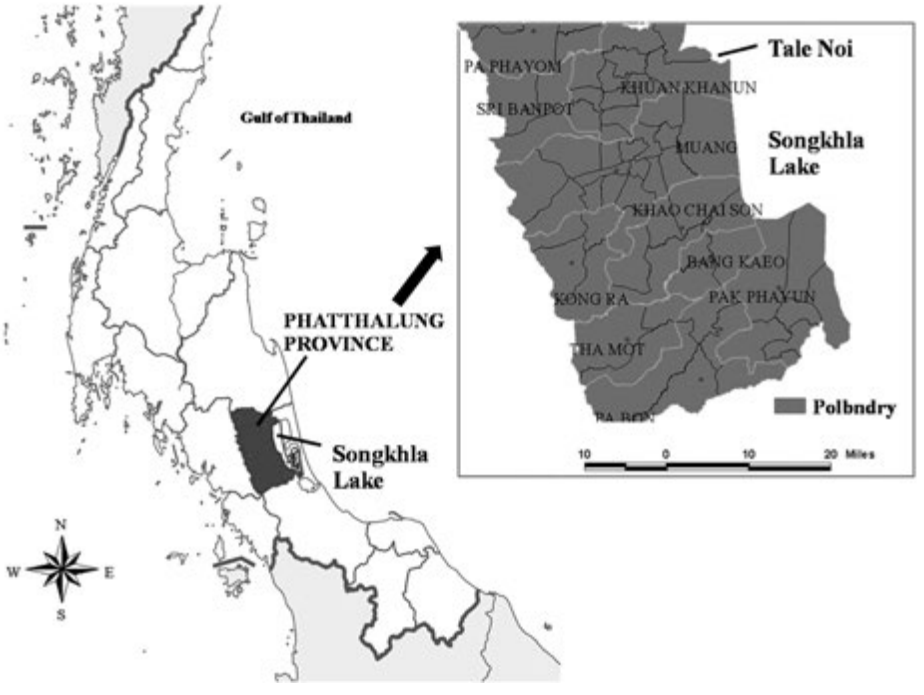

Fig. 1 Map of Phatthalung province, the study site.

2.2 Data collection

For data collection of economic bamboos, 100 traditional healers (65 females and 35 males) aged between 32 and 75 years, and 10-28 years skillful experience were surveyed. Direct interviews were interviewed between June to August 2011 using a semi-structured questionnaire. Questions asked about their local knowledge or wisdom used of the bamboos.

After interviews, the identification of economic bamboos in the fields was done. Afterwards, herbarium specimens were prepared and photographs were taken. Plant identities were confirmed by comparison with available voucher specimens in the Botanical Herbarium of Biology Department, Thaksin University using taxonomic keys (Fig. 2).

2.3 Analytical Phytochemistry

2.3.1 Extraction

Whole leaves and shoots of the identified economic bamboos were squeezed to prepare. Samples were dried in hot-air oven at 50°C for 72 h and powdered in a blender for 1 min at maximal speed then divided into smaller aliquots and frozen at -20°C until use. Samples (100 g) were extracted into hexane, dichloromethane, ethanol and at 25°C, 120 h. The extracts were evaporated, lyophilized and stored at -80°C for further investigation.

2.3.2 Thin layer chromatography (TLC)

This technique can be used to monitor some compounds present in each sample solvent.

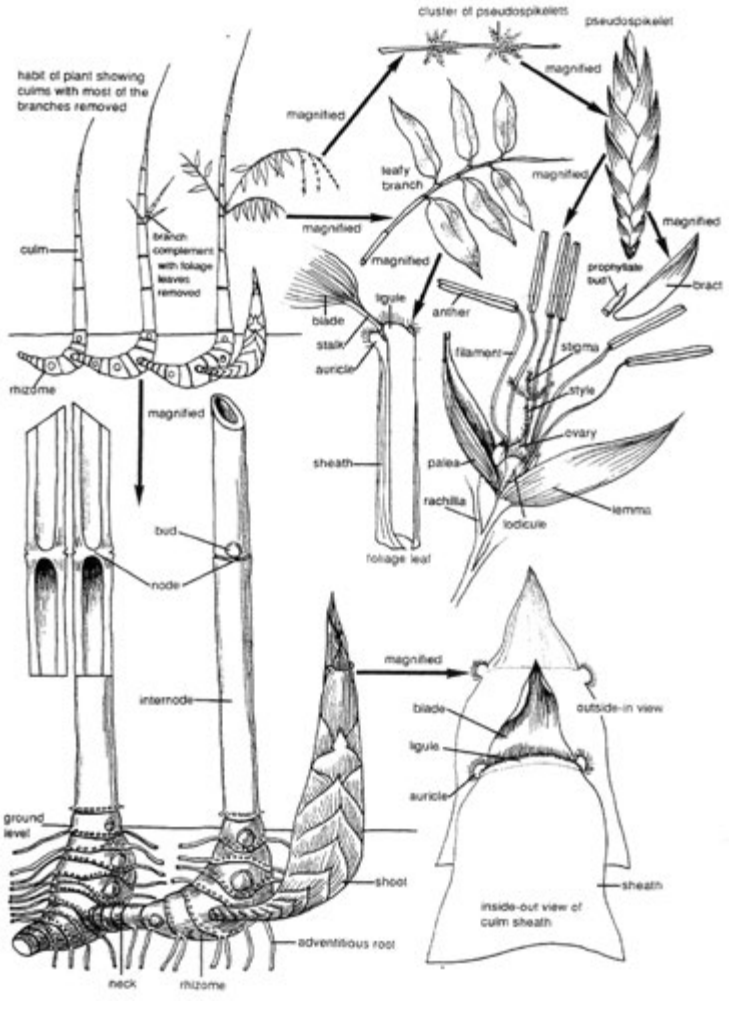

Fig. 2 Part of Bamboo plant

TLC plate (10 x 20 cm), sili gel 60G F_{254}, UV chamber cabinet 254 and 366 nm and spraying apparatus were prepared. The phytochemical substances of extracted samples were compare with standards, aloin, coumarin and tannic acid.

3. Results and discussion

The present study identified 15 species belonging to 6 genera. The most represented were genus *Bambusa* with 5 species, followed by *Dendrocalamus* (Fig. 3-4). Table 1 lists the recorded species, wisdom used and some detected substances from economic bamboos in Phatthalung province. According to our result, traditional healers spend the rest of the day in bamboo handicraft productions (20%), followed by furnitures (17%), utensils (14%), ornamental plant (11%), edible shoot (9%), construction materials (8%), cooking vessels and poles (6%), and parquets, satay sticks and medicines (3%) (Fig. 5 and Table 1).

Considering all the phytochemical study, aloin also known as Barbaloin is a bitter, yellow-brown colored compound noted in the exudate of at least 68 *Aloe* species. Aloin from aloe is a traditional medicinal plant used to alleviate pain from ulcers and burns. In particular, aloe-gel has been used as an ingredient in commercial wound care products, and it reportedly accelerates wound closure in chronic wounds and ulcers [2].

Cumarin derivatives are widely distributed in the plant kingdom, some of them are physiologically active and many of them are of great practical interest. They are widely used as laser dyes and, optical brighteners and and fluorescent markers. On the other hand, some of the cumarin derivatives possess antimicrobial properties and also employed in fluorometric assay of proteolytic enzymes in biological fluids, in fluorescent immunoassays, in brainintracellular pH measurements and as a powerful drug in skin diseases [1].

Tannins (polyphenols) are produced via condensation of simple phenolics that are secondary metabolites and are widespread in the plant kingdom. Tannins are biologically active compounds and may have beneficial or adverse nutritional effects. Endogenous tannins protect unharvested seeds from attack by insects, birds and herbivores, as well as certain diseases and untimely germination. Possible harmful effects of certain biological compounds, such as phenolics, trypsin inhibitors and phytates, have received considerable attention. These compounds occur naturally in the seeds of legumes and cereals and, if present in sufficient quantities, may lower nutritional value and biological availability of dietary proteins and minerals [4].

In this study, we examined that the detected standard, Anthraquinon, showed R_f = 0.43-0.45, 0.63-0.90. The maximal detected extracted was found in leave crudes with dichloromethane solvent (R_f= 0.87, orange color) and in shoot crudes with methanol (R_f = 0.43, 0.87, 0.90, yellow color). The present study also showed that cumarin was found in leave crudes of dichloromethane maximizely (R_f = 0.81, 0.87, purple color) as well as methanolic shoot extracts (R_f = 0.87, purple color). In part of tannin, we found this substance in every extracted leave solvents (Rf = 0.87 and 0.93, dark green color) and in ethanolic shoot crudes maximizely (R_f = 0.87, dark green color) However, the study must be extend to the whole southern to lead to innovatiove strategies in traditional medicine from bamboos that have not yet screened for any pharmacological property.

With development of technology and further research, a new understanding and approach can be taken so that new uses of bamboos may be discovered to serve modern needs. Particularly, there is the great challenge of minimizing pollution in the environment and conservation of natural resources. Bamboo timber is particularly valuable nowadays it is a renewable resource that is faster to replace than hard- and softwood timber from angiosperms or gymnosperms. Bamboo material is biodegradable unlike many man-made plastics or polymers.

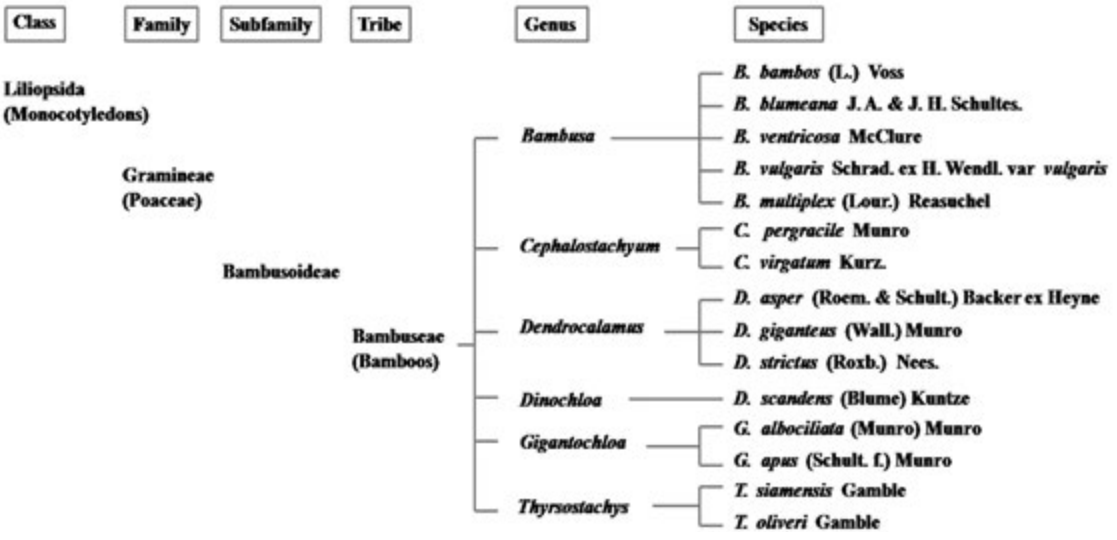

Fig. 3 The classification of economic bamboos in Phatthalung province

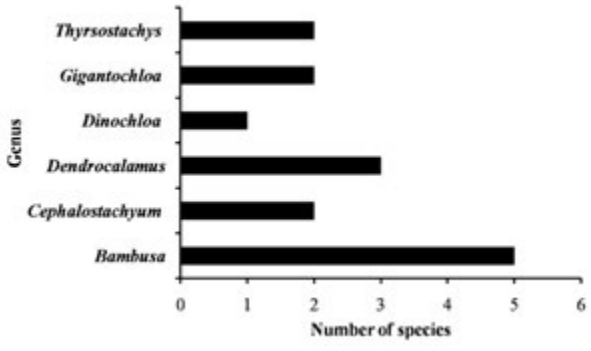

Fig. 4 The economic bamboo species distribution among genus in Phatthalung province

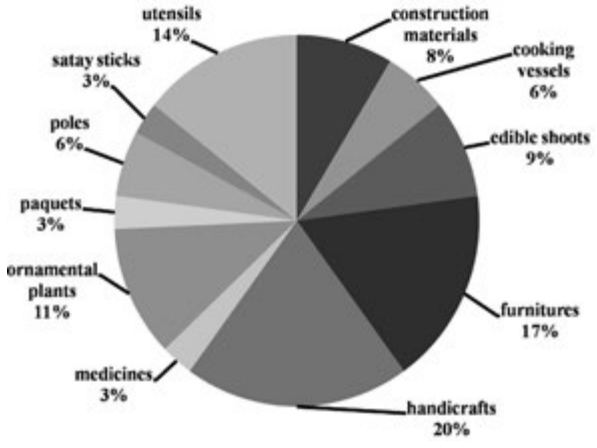

Fig. 5 The economic bamboo parts used in Phatthalung province

Table 1 The Economic bamboos used an d some detected phytochemistry

No.	Genus	Species	Use	Phytochemistry (R_f)					
				Anthraquinon		Cumarin		Tannin	
				L	S	L	S	L	S
1	*Bambusa*	*B. bambos* (L.) Voss	Utensils	-	0.90*	0.87	0.97, 0.87*	0.87, 0.93	-
		B. blumeana J. A. & J. H. Schultes.	Edible shoot, Medicine, Ornamental plants	-	0.90	0.81	0.87, 0.97*	0.87,0.93	-
		B. multiplex (Lour.) Reasuchel	Furnitures, Poles	-	0.90*	0.87	0.87, 0.97	0.87, 0.93	0.87
		B. ventricosa McClure	Ornamental plants	0.87	0.90*	-	0.78, 0.87, 0.97*	0.87, 0.93	0.87
		B. vulgaris Schrad. ex H. Wendl. var *vulgaris*	Edible shoot, Furnitures, Handicrafts, Utensils	0.87	0.87, 0.90*	0.81	0.97*	0.87, 0.93	-
2	*Cephalostachyum*	*C. pergracile* Munro	Construction materials, Cooking vessels	0.87	0.90*	0.81	0.78, 0.87, 0.97*	0.87, 0.93	-
		C. virgatum Kurz.	Handicrafts, Paquets	0.78*	0.78, 0.87*	0.87	0.78, 0.97	0.87, 0.93	-
3	*Dendrocalamus*	*D. asper* (Roem. & Schult.) Backer ex Heyne	Construction materials, Edible shoot, Furnitures, Satay sticks	0.77, 0.87	0.90*	0.77, 0.87	0.78, 0.87, 0.90, 0.97*	0.87, 0.93	-
		D. giganteus (Wall.) Munro	Cooking vessels	0.87*	0.85, 0.90*	-	0.87, 0.97*	0.87, 0.93	-
		D. strictus (Roxb.) Nees.	Furnitures, Handicrafts, Poles, Utensils	0.87*	0.43	0.87	0.78, 0.87, 0.97*	0.87, 0.93	-
4	*Dinochloa*	*D. scandens* (Blume) Kuntze	Handicrafts	-	0.83, 0.87, 0.90	0.87	0.87, 0.97*	0.87, 0.93	-
5	*Gigantochloa*	*G. albociliata* (Munro) Munro	Furnitures, Handicrafts, Utensils	0.87*	0.78, 0.87*	0.87	0.78, 0.87, 0.97*	0.87, 0.93	-
		G. apus (Schult. f.) Munro	Furnitures, Handicrafts	0.87*	0.90*	0.87	0.87, 0.97*	0.87, 0.93	-
6	*Thyrsostachys*	*T. oliveri* Gamble	Construction materials, Ornamental plants	0.87*	0.43, 0.90*	0.87	0.97*	0.81, 0.87, 0.93	-
		T. siamensis Gamble	Handicrafts, Ornamental plants	0.87	0.85, 0.90*	0.87	0.78, 0.87, 0.97*	0.87, 0.93	0.87
Standard				0.56, 0.81, 0.87	0.43, 0.45, 0.63, 0.68, 0.85, 0.87, 0.90*	0.77, 0.79, 0.81, 0.87	0.78, 0.87, 0.97, 0.90*	0.81, 0.87	0.81, 0.87

* = unlike standard color, L = leaves, S = shoot

4. Acknowledgments

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