

## FOOD COMPOSITIONS OF SOME THAI BAMBOO SHOOTS\*

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## บทคัดย่อ

ได้เก็บหน่อไม้สดหลายชนิดที่บริเวณป่าธรรมชาติทางภาคเหนือ อีสาน และใต้ของไทย แล้วนำไปวิเคราะห์ ส่วนประกอบทางอาหาร การวิเคราะห์ได้กระทำตามวิธีของ FAO (1972) โดยห้องปฏิบัติการของแผนกอาหาร กรมวิทยาศาสตร์ การแพทย์ ผลการวิเคราะห์พบว่า คุณค่าทางโภชนาการของหน่อไม้สดจะแตกต่างกันไปตามชนิดของไม้ โดยไม้ส่วนที่บริเวณ ใต้ของหน่อไม้สดจะคั้นแปรไปไม้มาก คือ ๔๕ ถึง ๘๕% โดยน้ำหนัก ซึ่งขึ้นอยู่กับชนิดและช่วงระยะเวลาการเก็บหน่อ กล่าวคือ ไม้ชนิดที่มีหน่อใหญ่ เช่น ไผ่แดง และไผ่ป่า จะมีส่วนที่บริเวณใต้มากกว่าไม้ชนิดที่มีหน่อขนาดเล็ก เช่น ไผ่รวก การจุดเก็บหน่อ หน่อไม้ควรกระทำในระยะเวลาที่เหมาะสม หากเก็บล่าช้าไป หน่อจะแก่ ทำให้ส่วนที่บริเวณใต้ลดลงอย่างมาก ผลงานอาหาร หรือปริมาณเกลือแร่จากหน่อไม้ชนิดต่าง ๆ มีค่าอยู่ระหว่าง ๒๐ ถึง ๒๕ แคลอรี ต่อ ๑๐๐ กรัมของส่วนที่บริเวณใต้ แต่หน่อไม้เลี้ยง หน่อไม้ดีสีสุก และหน่อไม้ป่าได้ให้ค่าเกลือแร่ที่สูงมากกว่า ๕๐ แคลอรี ทั้งนี้เป็นเพราะว่าหน่อไม้ทั้งสามชนิดนี้มีการไปโคเวเรค ไซม์และโปรตีนอยู่มาก เมล็ดไม้หรือขุยใต้ให้ค่าเกลือแร่สูงถึง ๓๒๓ แคลอรี ซึ่งใกล้เคียงกับค่าแคลอรีของข้าว นอกจากนี้องค์ประกอบ อย่างอื่นทางอาหารของเมล็ดไม้ก็ใกล้เคียงกันกับของเมล็ดข้าวเช่นกัน แต่เมล็ดไม้มีค่าฟอสฟอรัสสูงกว่าเมล็ดข้าวถึง ๕ เท่า และ ไม้มีแคลเซียมในขุยไม่สูง กล่าวโดยสรุปแล้วหน่อไม้ไฟชนิดต่าง ๆ ให้คุณค่าทางโภชนาการได้ดีจึงเทียบเคียงได้เท่ากับผักสด ต่าง ๆ แต่ข้อได้เปรียบประการหนึ่งของหน่อไม้ไฟ คือได้หลายชนิดที่ขึ้นเองตามธรรมชาติในป่านั้น ชาวบ้านชนบทสามารถ จุดเก็บหน่อเป็นอาหารได้อย่างดีโดยไม่ต้องซื้อ และอาจเหลือกินจนส่งขายต่อไม้ซีกได้ด้วย

## ABSTRACT

Shoots of some edible Thai bamboos were collected from the natural forests in the north, the northeast, and the south of Thailand for their food composition analyses. They are conducted by the laboratories of the Food Division under the Department of Medical Sciences. The analyses were followed those standard methods of FAO (1972)-Food Composition Table For Use In East Asia. The results were tabulated. Compositions of some other vegetables and foods i.e. those of cabbage, cucumber, rice, egg, pork, and beef were also quoted and tabulated for comparison. The results showed that the nutritional values of the bamboo shoots are comparable to those of many vegetables. However, one of the greatest merits of the bamboo shoots is for they can be collected freely of charge by the poor rural people for their own daily consumption from the near by forests or from their own bamboo groves if they have in their own living areas. The bamboos produce a tremendous number of shoots during the raining season.

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### INTRODUCTION

Bamboo is one of the most widely used plants in the world. It supplies the necessities of the life for the great part of the world's population. Food, utensils, building materials -you name it and bamboo is used.

The Thai people, as well as the Chinese and the Japanese know very well to cook young bamboo shoots for their meals. Many typical Thai dishes are composed of the young bamboo shoots in different forms i.e. fresh, boiled, or pickled. Shoots of some species are bitter and needed some special cooking (-boiling for some hours) but shoots of many species do not required to do so. Shoots of *Dendrocalamus giganteus*, for example, are very sweet and can be eaten when they are fresh without any cooking. Shoots of *D. asper*, *Thyrsostachys siamensis*, and *Bambusa arundinaceae* are common in the Thai markets. Although shoots of the latest one are rather bitter, pickling makes them very tasty to the Thais.

In this paper, therefore, shoots of some edible Thai bamboos were analysed for their compositions. Moreover, those of some common vegetables and foods i.e. cabbage, cucumber, rice, egg, pork, and beef were also quoted for comparison in their nutritional values.

### METHOD

Fresh shoots of some edible Thai bamboo species were collected from the natural

forests of the north, the northeast, and the south of Thailand. They were kept in big plastic bags and sent directly to the laboratories within 36-48 hours for analyses. The analyses were followed those standard methods of FAO (1972) -Food Composition Table For Use In East Asia. They were collaborated and conducted by the Laboratories of the Food Analysis Division under the Department of Medical Sciences.

### RESULTS and DISCUSSION

The food compositions of the bamboo shoots were analysed. The results were given in Tables 1 and 2. The food compositions of cabbage, cucumber, rice, egg, pork, and beef were also quoted and shown in Table 2 for comparing to those of bamboo shoots.

The edible portion was also figured out but was not included in the Tables because the results varied greatly -from 45 to 83 percent by weight and depended very much on the conditions of the shoots samples and the bamboo species. If the shoots were sampled few days late the percent of edible part dropped greatly. On the other hand, when they were collected earlier, they were very young, their edible portion is high. For the species, those which have big shoots such as those of *Dendrocalamus asper*, the edible percent is high, but species such as *Thyrsostachys siamensis* which has small shoots, their edible portion is low.

Table 1. Food compositions of some Thai bamboo shoots.

No.	Species of bamboo shoot	Composition of bamboo shoot, - per 100 grams of edible portion													
		Calories	Moisture	Protein	Fat	Carbohydrate	Fiber	Ash	Calcium	Iron	Phosphorus	Vitamin A	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin C
1	<i>Dendrocalamus strictus</i> Nees	21.76	92.80	2.86	0.78	1.95	1.14	0.97	14.7	0.53	45.9	133.3	0.06	0.06	0.33
2	<i>Diglossanthus heterophyllus</i> Baker	22.73	93.95	2.1	0.31	2.11	0.66	0.87	9.22	0.34	86.76	415.89	0.06	0.11	1.38
3	<i>Schizostachyus</i> sp.	23.6	92.43	2.81	0.20	2.64	1.13	0.79	11.48	0.93	53.76	95.17	0.06	0.13	0.15
4	<i>Bambusa</i> sp.	18.83	93.51	2.68	0.27	1.42	1.37	0.65	13.21	0.74	64.8	294.3	0.06	0.07	0.34
5	<i>Bambusa</i> sp.	15.91	94.38	2.51	0.23	0.95	1.10	0.83	13.56	0.4	47.59	37.16	0.06	0.12	0.15
6	<i>B. nana</i> Kurz	40.7	88.03	3.79	0.30	5.71	1.24	0.93	20.82	0.78	50.33	64.83	0.14	0.06	3.15
7	<i>B. blumeana</i> Schult	40.88	90.45	3.69	0.30	3.30	1.3	0.76	27.23	0.29	32.82	110.16	0.06	0.07	2.26
8	<i>P. arundinacea</i> (Nees) Willd.	44.43	87.65	4.18	0.55	5.49	0.97	0.95	24.23	0.45	38.05	76.33	0.16	0.05	0.27
9	<i>Bambusa</i> sp.	16.74	93.2	2.3	0.22	0.49	1.44	1.05	38.51	0.54	52.09	89.37	0.11	0.09	tr
10	(Kam-Han)	21.56	92.54	3.42	0.27	1.26	1.49	0.92	35.19	2.38	89.19	66.67	--	0.12	tr
11	<i>B. aspera</i> Kurz	23.00	91.01	3.26	0.18	2.	1.49	0.94	14.9	0.58	55.27	--	--	0.12	--

tr = trace, -- = undetectable, all are fresh shoots.

(continued on page 2)

Table 2. Food compositions of some Thai bamboo shoots compared to those of some common foods.

No.	Food	Composition of bamboo shoot, - per 100 grams of edible portion													
		Calories	Moisture	Protein	Fat	Carbohydrate	Fiber	ASH	Calcium	Iron	Phosphorus	Vitamin A	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin C
	Unit	calories	g	g	g	g	g	g	g	g	g	μg	mg	mg	mg
1	Bambusa nana - fresh	22.1	92.9	1.7	0.1	3.9	0.4	0.8	24.2	44.0	0.7	—	0.04	0.07	4.3
2	Bambusa arundinacea (L.) Willd. - fresh	27.7	91.5	2.0	0.1	4.2	0.7	1.0	24.4	54.2	0.9	—	0.17	0.15	4.2
3	Bambusa nana - boiled	22.1	90.4	2.3	0.1	4.1	0.7	1.0	13.9	42.2	0.2	—	—	—	—
4	Bambusa nana - boiled	22.6	93.2	2.5	0.4	2.5	0.8	0.4	11.9	39.9	1.1	—	0.01	0.09	3
5	Bamboo shoot (pickled)	22.3	92.1	1.4	0.2	3.5	1.4	1.3	23.4	12.9	0.1	—	0.02	0.04	3
6	Bamboo seeds	305.9	20.7	10.9	0.9	77.2	0.1	0.1	0	11.0	256.6	1.1	0.15	0.04	1.1
7	Cabbage	32.4	88.6	1.0	0.2	4.7	2.6	0.9	33.1	0.7	20.9	—	—	—	—
8	Cucumber	40.1	94.8	0.7	1.1	9.7	2.1	1.2	44.0	3.9	52.0	27	0.05	0.02	—
9	Rice	157.5	10.5	7.2	0.3	82.5	0.1	0.4	25.5	1.1	72.6	1.1	0.26	0.01	1.1
10	Egg, Hen	146.8	72.0	12.7	11.8	0.4	0	1.1	57.5	2.8	191.0	1.1	0.15	0.33	1.1
11	Beef	142.8	71.7	16.9	6.8	1.7	0	1.0	8.2	1.4	48.7	1.1	0.36	0.10	2.0
12	Pork	96.0	76.0	20.2	0.8	2.0	0	1.0	4.7	2.0	105.0	1.1	0.05	0.19	1.1

Note: \* From Food Analysis Edition (1972), -- = undetectable, ND = trace.

Bamboo shoot (pickled)

Most bamboo shoots give rise to the food energy in nearly the same magnitude of 20-25 calories per 100 grams. However, shoots of *Bambusa nana*, *B. blumena*, and *B. arundinacea* have high calories of more than 40 per 100 grams, simply because they contain high amount of carbohydrate, fat, and protein. The bamboo seeds also give high energy of 361 calories per 100 grams -the same magnitude to that of rice. Other compositions of the seeds are also at the same level to those of rice, but the phosphorus content in the bamboo seeds is about five times higher than that in rice, and calcium is very rare in the bamboo seeds.

The protein contents are including those of amino acids, purine bases, and any nitrogen compounds. Their contents in the shoots varied and ranged from 1.7 grams in *D. asper* to 4.4 grams in *B. arundinacea*.

Fats are those materials dissolved in petroleum ether which are including fats, fatty acids, sterols, and other pigments. Their contents in the shoots and in many vegetables are very low -less than 1 percent, comparing to those in eggs and pork.

The carbohydrate content is calculated by subtraction the summation of the contents of protein, fat, ash, fiber, and moisture from 100. The contents mostly are those of sugar, and starch. However, those of pentosan and some organic acids such as tartaric and citric acids may be included.

Fibers in the tables mean crude fibers.

They are those materials cannot be digested by weak acids for weak bases, which are similar to the acid-base conditions in human stomach. The fibers are mainly cellulose, hemicellulose, and lignin. Their contents depend very much on the age of the shoots; old shoots contain more crude fibers than young ones do. However, the analyses of the shoots are in the range of 1.1 percent.

Contents of vitamins varied greatly and depended very much not only on the species but the freshness and the age of the shoots and the storing method as well.

The bamboo shoots are classified as one of vegetables. In general, the analyses showed their nutritional values which are comparable to those of many vegetables (Table 2). However, the greatest merit of the bamboo shoots is for they are collected freely of charge by poor rural people from their nearby natural forests or from their own bamboo groves. Some rural people plant the bamboos as a living fence. It does not only delineate the boundary and provide a windbreak, but also provides the owner with high nutritional values of shoots which can be collected freely of charge particularly during the raining season the plants produce a tremendous number of shoots.

## CONCLUSIONS

The nutritional values of bamboo shoots varied with the species of the bamboos.

Because of higher contents of carbohydrate, fat, and protein in the shoots of *B. nana*, *B. blumeana*, and *B. arundinacea*, their shoots contained higher food energy than 40 calories per 100 grams, while those of other species generally ranged 20 to 25 calories. The edible portion of the shoots also varied greatly, from 45 to 83 percent by weight, depending very much upon the shoot size of the individual species and the time of harvesting. The greater the size and the earlier the harvest-

ing, the greater was the relative edible portion. Other nutritional values of bamboo shoots were comparable to those of many vegetables.

#### REFERENCES

- FAO. 1972. Food composition Table For Use In East Asia.
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