



Nutritional composition of traditional Thai foods used local vegetables

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ABSTRACT

Nutrient composition, total dietary fiber and minerals were analyzed in 10 local Thai foods. Five selected foods from Central Thailand were Kaeng Pa Gai, Kaengsom Phak Krachet (water mimosa), Tomkathi Saibua (lily stem), Kaeng Mu Chamuang (cowa), Kaeng Om Pladuk Bai Yor (noni leaf). The others are Southern foods, which were Kaeng Taipia, Kaeng Luk Riang Mu (nitta sprout), Kaeng Lueang Khun (giant taro stem), Kaeng Hoi Bai Chaplu (wild betel) and Phat Sator (petai bean). Content of protein, fat, total dietary fiber and energy ranged from 4.01 to 13.54, from 0.89 to 11.29 and from 1.34 to 6.16 g/100 g, and from 45.6 to 211.6 Kcal/100 g, respectively. This study showed that the selected traditional Thai foods contained good balance nutrient contents and energy for consumers. Content of Na, Fe, Ca, P, Cu and Zn presented from 1 to 33 % of Thai Recommended Daily Intake.

INTRODUCTION

In Thailand, vegetables include various wild greens, which are traditionally collected throughout the country, are consumed in various manners. Wild plants are indicated as significant nutritional sources of minerals (Kuhnlein, 1990). According to each region in the country, there are its own local foods and the recipes are likely to affect the nutritive value. The proximate composition and mineral content of 20 Northern and Northeastern Thai dishes were evaluated and published earlier (Tangkanakul et al., 2006). Ten local foods from Central and Southern Thailand were extended for nutritive value study. Major vegetable ingredients are cowa, wild betel, water mimosa, noni leaf, water lily stalk, nitta sprout, and petai bean.

METHODS

All foods were prepared according to their original recipes (Table 1). They were Kaeng Pa Gai (KPG, soup, no coconut milk, contains various kinds of vegetables), Kaengsom Phak Krachet (KPK, soup, contains water mimosa), Tomkathi Saibua (TS, soup with coconut milk, contains water lily stalk), Kaeng Mu Chamuang (KMC, soup, contains cowa leaves), Kaeng Om Pladuk Bai Yor (KOPBY, soup with coconut milk, contains noni leaves), Kaeng Taipia (KT, soup, contains fermented fish viscera and various kind of vegetables), Kaeng Luk Riang Mu (KLRM, soup with coconut milk, contains nitta sprout), Kaeng Lueang Khun (KLK, soup, contains giant taro stem), Kaeng Hoi Bai Chaplu (KHBC, soup with coconut milk, contains wild betel leaves), and Phat Sator (PS, stir-fried petai bean).

Proximate analysis of foods was determined following Association of Official Analytical Chemists (AOAC, 2000) procedures and carbohydrate calculated by difference. Sodium, calcium, phosphorus, iron, zinc and copper were analyzed followed AOAC (2000). The solutions were determined by using an Inductively Coupled Plasma Atomic Emission Spectrometer (ICP) (model Optima 2000DV, Perkin Elmer, USA).

Table 1 List of ingredients in the selected Central and Southern Thai foods.

Foods	Major Ingredients (%)
Kaeng Pa Gai (KPG)	garlic (2.0), shallot (1.3), chili (2.8), lemon grass (1.3), galangal (0.8), fingerroot (3.6), kaffir lime peels (0.2), coriander root (0.3), pepper (1.2), coriander seeds (0.1), bamboo shoot (7.1), baby corn (6.1), winged beans (4.1), pea eggplant (3.6), holy basil (1.8), kaffir lime leaves (0.2), chicken meat (17.8), fish sauce (2.8), sugar palm (0.5), salt (0.3), shrimp paste (0.5), vegetable oil (2.0), water (40.8)
Kaengsom Phak Krachet (KPK)	water mimosa (23.1), shallot (3.8), fingerroot (0.8), dried chili (0.8), salt (0.4), shrimp paste (0.4), fish meat (1.9), tamarind paste (7.7), palm sugar (3.8), fish sauce (3.1), salt (0.4), water (53.8)
Tomkathi Saibua (TS)	water lily stalk (27.6), shallot (5.5), pepper (0.3), shrimp paste (0.7), salt (0.8), steamed shot bodied mackerel (13.8), coconut milk (27.6), palm sugar (4.8), tamarind paste (4.8), water (14.1)
Kaeng Mu Chamuang (KMC)	cowa leaves (4.7), shallot (2.3), garlic (2.3), galangal (1.2), lemon grass (1.4), coriander root (0.9), dried chili (0.5), dried shrimp (0.5), shrimp paste (0.7), salt (0.2), pork belly (11.7), pork (11.7), soy sauce (0.1), vegetable oil (1.4), palm sugar (4.7), fish sauce (1.9), water (53.8)
Kaeng Pladuk Bai Yor (KOPBY)	noni leaves (14.5), garlic (1.7), shallot (2.0), lemon grass (0.6), galangal (0.3), coriander roots (0.6), fingerroot (0.9), kaffir lime peels (0.1), salt (0.3), pepper (0.1), dried chili (0.6), shrimp paste (0.3), catfish (17.4), coconut milk (40.5), fish sauce (2.3), palm sugar (0.5), water (17.3)
Kaeng Taipia (KT)	fermented fish viscera (6.4), garlic (4.3), shallot (2.1), lemon grass (1.3), galangal (0.4), kaffir lime peels (0.2), chili (1.7), pepper (0.1), shrimp paste (1.4), turmeric (0.2), kaffir lime leaves (0.5), bamboo shoot (14.2), pea eggplant (5.3), cashew nut (5.3), tamarind paste (2.1), palm sugar (0.7), grilled fish (7.1), water (46.7)
Kaeng Luk Riang Mu (KLRM)	nitta sprout (22.5), garlic (1.7), shallot (1.1), lemon grass (0.8), galangal (0.3), chili (1.4), pepper (0.1), shrimp paste (0.8), turmeric (0.6), salt (0.3), pork (22.5), coconut milk (25.3), fish sauce (2.2), palm sugar (0.8), water (19.6)
Kaeng Lueang Khun (KLK)	giant taro stem (28.5), garlic (1.9), lemon grass (0.5), galangal (0.1), shrimp paste (0.7), chili (1.5), salt (0.4), turmeric (0.3), fish (12.8), tamarind paste (4.3), fish sauce (3.3), palm sugar (1.4), lime juice (1.4), water (42.8)
Kaeng Hoi Bai Chaplu (KHBC)	wild betel leaves (14.3), blood cockle (23.9), garlic (2.4), shallot (2.0), lemon grass (1.6), galangal (0.5), turmeric (0.5), shrimp paste (2.0), salt (0.4), pepper (0.1), dried chili (0.8), coconut milk (33.8), fish sauce (1.2), palm sugar (0.8), water (15.9)
Phat Sator (PS)	petai beans (37.2), garlic (3.7), chili (3.3), shrimp paste (2.2), prawn (14.9), minced pork (14.9), vegetable oil (3.0), soy sauce (1.8), fish sauce (1.8), palm sugar (1.5), lime juice (0.7), water (14.9)



RESULTS & DISCUSSION

Data on the proximate analysis of ten local Thai dishes are presented in Table 2. Total dietary fiber ranged from 1.34-6.16 g/100 g and eight out of ten dishes possessed more than 2.0 g/100 g. The highest level was in PS, in which petai bean is reported to contain a relatively high amount of dietary fiber, 2.7 g/100 g (Institute of Nutrition, 1999).

KMC provided the highest protein content (13.54 g/100 g) followed by PS (13.03 g/100 g). The main sources of protein in both dishes derived from pork and prawns (Table 1). The protein contents of the other dishes ranged from 4.01-9.71 g/100 g. Compared to local Thai food from other areas, the foods in the present study contained similar protein amounts to the Northern foods studied by Tangkanakul et al. (2006) and double those in Northeastern foods.

The fat content ranged from 0.89-11.29 g/100 g. The dish with the highest fat content is KMC, which typically uses pork belly. PS, a kind of stir-fried dish containing minced pork, provided fat 7.30 g/100 g. Other dishes, having coconut milk, provide relatively high fat content, ranging from 5.45-9.51 g/100 g, such as TS, KOPBY, KLRM, and KHBC. The dishes without coconut milk (KPG, KPK, KT, and KLK) presented lower fat contents ranging from 0.89-4.13 g/100 g. This is reflected in the energy content of these dishes, which ranged from 45.6-81.3 Kcal/100 g. Other Asian foods, i.e. Chinese and Indian, supplied more energy than the studied foods, around 98-263 and 110-337 Kcal, respectively, per 100 g (Greenfield et al., 1981; Prasad et al., 2000).

Sodium content ranged from 380 to 637 mg/100 g. Sodium was derived mainly from table salt, shrimp paste, and fish sauce. The sodium content of foods in the present work is considered as normal compared to Chinese foods, which ranged from 230-800mg/100 g, (Wills et al., 1981).

The calcium content of all the dishes varied from 26-89 mg/100 g. The high levels observed in KHBC (89 mg/100 g) and KOPBY (79 mg/100 g) may be attributed to wild betel leaf and noni leaf in the recipes. Both are known to be high in calcium, at 420 and 350 mg/100 g, respectively (Institute of Nutrition, 1999). The phosphorus contents in the dishes ranged from 48 to 142 mg/100 g, being more than 100 mg/100 g in PS, followed by KLRM, KMC and KHBC. Phosphorus is an essential mineral for bones, where the mass ratio of calcium to phosphorus is 2:1. The level of phosphorus can affect calcium metabolism and requirements in the body. Hence, the ratio of Ca to P in the diet becomes important. The Ca:P ratios of the different dishes varied from 1:1 to 1:2.2. The best Ca:P ratio in this study, 1:1, is obtained from KOPBY.

Among three microelements, iron, zinc and copper the results showed that iron was predominant in all dishes except in KMC, PS, and TS. The tested foods which provided more than 1 mg iron per 100 g were KHBC (4.97), KPG (4.02), KLRM (3.39), and KOPBY (3.19). These four foods contained iron levels greater than the meat foods studied by Wills et al. (1981), such as beef in oyster sauce (2.2 mg/100 g), barbecued pork (1.6 mg/100 g) and sausage (2.3 mg/100 g). However, although the vegetable foods contained more iron than the meat foods, the latter are considered to be more bioavailable since the iron is present in heme form, unlike in vegetable foods in which it is present as inorganic salts.

The zinc and copper contents of the tested foods varied within a narrow range of 0.25-0.99 mg/100 g and 0.03-0.22 mg/100 g, respectively. These rather low contents are because the major portions of most of the foods were vegetables, which are not a good source of zinc and copper. In Thai meat-based foods, greater zinc content has been previously reported such as in garlic prawns (7.1 mg/100 g), beef satay (5.6 mg/100g), chicken basil (4.5 mg/100g) and chicken ginger (4.6 mg/100g) (Veerothai and Greenfield, 1989).

CONCLUSIONS

The nutritive value of the foods in this study demonstrated as low in fat and energy level. Thus, consuming these foods is one way to meet the recommended by the nutritionists to decrease the intake high fat diet. They, as well, provided iron, calcium and phosphorus in some extent.

Table 2 Proximate composition of ten foods per 100 g edible portion

Foods	Moist (g)	(Kcal)	Prot (g)	Fat (g)	CHO (g)	TDF (g)	Ash (g)	Na (mg)	Ca (mg)	P (mg)	Fe (mg)	Zn (mg)	Cu (mg)	Ca:P
KPG	82.55	66.6	6.59	2.87	3.61	2.52	1.86	449	33	71	4.02	0.40	0.06	1:2.2
KPK	84.66	49.7	5.15	0.89	5.27	1.88	2.15	572	26	48	1.93	0.32	0.03	1:1.8
TS	78.65	95.5	5.19	5.45	6.43	2.05	2.23	544	78	97	0.97	0.49	0.11	1:1.2
KMC	52.87	211.6	13.54	11.29	13.97	5.52	2.81	637	76	104	0.09	0.78	0.09	1:1.4
KOPBY	74.42	132.6	6.61	9.51	5.15	2.40	1.91	380	79	80	3.19	0.34	0.12	1:1
KT	79.80	81.3	6.05	4.13	4.98	2.71	2.33	615	53	97	2.71	0.93	0.22	1:1.8
KLRM	69.15	137.2	9.71	7.15	8.52	3.15	2.32	508	66	109	3.39	0.64	0.17	1:1.6
KLK	86.87	45.6	4.01	1.28	4.52	1.34	1.98	537	49	55	1.35	0.25	0.04	1:1.1
KHBC	77.16	106.4	6.46	6.83	4.77	2.32	2.46	526	89	101	4.97	0.66	0.18	1:1.1
PS	56.32	175.0	13.03	7.30	14.29	6.16	2.90	590	73	142	0.80	0.99	0.21	1:1.9

%Thai Recommended Daily Intakes for Na = 2400 mg, Ca = 800 mg, P = 800 mg, Fe = 15 mg, Zn = 15 mg, Cu = 2 mg

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