Potassium Contents of Northeastern Thai Foods

POTE SRIBOONLUE, M.Sc., M.C.H.*,
SUNTHON SUWANTRAI, B.Sc.*,
KRIANG TUNGSANGA, M.D.***,
VITOON PRASONGWATANA, M.Sc., M.D.*,
SOMBAT BOVORNPADUNGKITTI, M.D.**,
PIYARATANA TOSUKHOWONG, M.Sc.****,

Abstract

From our previous nutritional assessment, low potassium (K) intake among northeastern Thai males has been clearly demonstrated. This prompted us to undertake a survey of the K content of local foods. Food samples comprised of 57 animal and 142 plant products which were collected from various places in the northeast of Thailand. The dry ashing method was used to prepare the samples for K analysis using an atomic absorption spectrophotometer. Foods could be divided into 7 groups according to their K levels. Foods containing K $\geq$ 1000 mg per 100 g fresh food were categorized in group 1. These were mainly foods in the legume group, i.e., soybean, cowpea and mungbean. While rice (polished) and rice products, the main staple, were in group 7, the lowest K group of less than 100 mg per 100 g fresh food.

Comparison studies of the natural foods between those collected from the northeast and from the central regions of the country, and between the cooked foods purchased from the rural villages and from the urban areas of Khon Kaen municipality, showed that, for most food items, the K content was similar wherever it came from. However, when the K content in various parts or in different stages of growth of the same kind of plants or animals was compared, a great variation was clearly seen, for example, young tamarind leaves contained K in group 6 whereas ripe tamarind fruit contained K in group 1. According to our food consumption data, the analysis of food components of 48 meals taken during the hot season by 13 rural volunteers revealed that food items eaten with the highest frequencies and in the largest amount were those in the low K food groups, i.e., glutinous rice (group 7) and green papaya (group 6). Our results suggest that the low K intake of these northeast rural Thai people is not due to a low K content of foods in this region, but rather that their food habits and low socioeconomic status restricts consumption of those food items with higher K contents.

* Department of Biochemistry, Faculty of Medicine, Khon Kaen University, Khon Kaen 40002,
** Khon Kaen Provincial Hospital, Khon Kaen 40000,
*** Department of Internal Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok 10330,
**** Department of Biochemistry, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

Studies on blood and urine compositions revealed that people in rural areas of the northeast region of Thailand might be deficient in potassium (K) due to the findings of high prevalence in hypokalemia and hypokaliuria[1-3]. Recently we assessed the nutritional status of K among these rural subjects and found that their dietary intake was very low[3]. There are two possibilities causing their low intake of K. Firstly, foods produced in this region by themselves might contain low K and secondly, their food practices or socioeconomic problems caused them to take only or mostly food items of low K content. So far, there are no K values nor a recommended dietary allowance (RDA) in the Thai Food Table[4] and the few studies on the K contents of Thai foods available at the present are those only for foods of the central region of the country[5-7]. In the hope of finding out the real causes underlining the low dietary K intake of these people, we therefore were interested in the study of K contents of foods commonly consumed in the northeast region.

MATERIAL AND METHOD

Sources of foods and their preparation for K analysis

Raw foods: Foods comprised of 57 animal and 142 plant products were obtained from two sources, collected directly from their natural habitats and purchased from markets. Five local markets in the provinces of Khon Kaen, Loei, Udon Thani, Ubon Ratchathani and Si Sa Ket were the places of purchasing raw foods. In a comparison study of K contents in foods between the northeast and the central regions, vegetables and fruits gathered from their natural habitats in various areas of Phra Nakhon Si Ayutthaya (the Central) and Khon Kaen (the Northeast) provinces were analyzed and compared. Vegetables and fruits were thoroughly washed with drinking water and left to air-dry in the laboratory for 2-3 hours. About 200-300 g of edible parts were chopped into small pieces, minced in an electric blender and used for analysis.

Cooked foods: Commonly consumed cooked foods were obtained from various shops around Khon Kaen municipal area and also from small shops in rural villages. Some cooked foods were given free of charge from acquainted villagers. All food was homogenized in an electric blender for about 5 minutes or until the food texture became homogeneous. If foods were too dry, some known amount of distilled water was added before homogenization.

Analysis of K contents in prepared foods

About 3-15 g of prepared foods were weighed exactly (up to one-tenths of a gram) in crucible cups. The cups were placed on a hot plate under a fume-hood and the temperature was slowly increased until the samples became thoroughly charred. If the sample was a liquid, it was predried on a hot plate. The cups with charred samples were then placed inside the muffle furnace and burnt to ash overnight at 700°C. K contents in ash were analyzed by an atomic absorption spectrophotometer as described by Oiso and Yamaguchi[8]. Preparation of ash and analysis of each food sample was performed in triplicate.

RESULTS

K contents in Northeastern Thai foods

From the results of our analysis, all foods studied could be divided into 7 groups according to their K levels in mg per 100 g wet weight as shown in Table 1. While the highest K content group or group 1 was mainly foods in the group of legumes (soy bean, cowpea and mung bean), rice (polished) and rice products, the main staple and the main source of energy, were put in the lowest K content food group or group 7. Most meat and meat products contained moderate K (group 4 - 6). It should be noted that no animal or animal products had K contents high enough to be classified into the high K groups (group 1 and 2).

A comparison of K contents in foods of the Northeast and the Central regions

Geographically, most of the soil series in the northeast region are light-textured and unfertile, while in the central region they are heavy-textured and rich in organic matter. Therefore, soils of the central region have a higher cation exchange capacity (C.E.C.) and so contain more K as well as other cations[9]. However, the results of our analysis showed that foods from the two regions were similar with regard to their K contents (Table 2). This suggests that soil quality has no effect on K levels of the plants grown on them.

Table 1. Groups of Northeast Thai foods according to their K contents. Names of foods in each group are listed from the highest to the lowest K contents. P., stands for plants and plant products and A., stands for animals and animal products.

Food groups (K, mg/100 g fresh food)	Foods
Group 1 (≥1000)	P./- Soybean (seeds, dried). Chili pepper (dried). Cowpea (seeds, dried). Tamarind (ripe pods, both sweet and sour species). Wild yam (small, * Mun loog heb). Mungbean (seeds, dried).
	A./- Nil
Group 2 (500 - 999)	P./- *Pak krat. Garlic (bulb, dried). Coriander. *Pak chee lao. Ground nut. Pepper (young fruit). Leech lime (leaves). Horseradish (pods).
	A./-Nil
Group 3 (400 - 499)	P./-Mushroom (wild, small, yellow). Hog plum (ripe). Cassia (young leaves). Ginger (mature rhizome). Bamboo shoot (small type). *Pak koom. Neem (flower). Water fern (leaves). Mint. Carrot. *Bai ya nang. Cashew nut. Leadtree (young leaves). Pumpkin (flowers). Chili pepper (small, fresh). Sesame. Horseradish (young leaves).
	A./-Shrimp paste. Insect, black plant beetle. Fermented fish.
Group 4 (300 - 399)	P./- Celery. Banana (buds and flowers). Amaranth (spineless). Swamp cabbage (red stem). Galangal. Soybean sauce. *Pak kanjong. Mushroom (straw). *Pak sarb. Acacia insuavis (*Cha om). Leadtree (mature seeds). *Pak warn. Spinach. Shallot. Vine spinach. Egg plant (plate brush). Rattan shoot. Coconut (meat, mature).
	A./- Pork (medium fat). Beef (liver sausage). Beef (meat). Pork (kidney). Fish (snake-headed). Beef (heart). Pork (meat, wild species). Insect (*Mang ka chon). Pork (liver).
Group 5 (200 - 299)	P./- *Pak pang puay. Tropical almond. *Pak tiew. Amaranth (spiny). Indian penny wort. Egg plant. *Pak ilog. Sweet basil. Manila tamarind. Pumpkin. Jujube. Bastard mustard. Bitter cucumber (small). Leedtree (young pods). *Pak krajeow. Wild betal. Banana. Bamboo shoot (pickled). Shallot (bulb, dried). Garlic (young green). Chili pepper (medium, fresh). Sesbania (young leaves). Ivy gourd. *Pak pai. Bitter cucumber (large). *Pak linfa. Jack fruit (ripe). Cabbage. *Pak sameg. Mushroom (wild, big, white). Rambai. Swamp cabbage (white stem). Tamarind (young pods). Chinese leek. Papaya (ripe). Water mimosa. Cabbage (branches).
	A./- Beef (spleen). Fish sauce (good quality). Fish (cat fish). Insect (cricket). Rat. Silk worm (larva). Duck (egg preserved). Beef (stomach). Shrimp (small, fresh water). Beef (liver). Insect (water beetle). Fish (*Pla lode). Fish (*Pla bueg). Frog. Chicken (liver). Duck egg (salted). Crab (small, fresh). Duck (heart).
Group 6 (100 - 199)	P./- Chinese kale. Chinese cabbage. Crow daisy leaves. Star goosberry. Swamp algae. Sweet potato. Corn (boiled). Corn (young). Chinese white cabbage. Cucumber. Egg plant (long). Sapodilla. Mushroom (oyster). Lemon grass. Mushroom (wild, small, red). Bottle gourd. Mango (unripe, nonspecified). Onion. Tomato. Lettuce. Papaya (unripe). Guava. Cauliflower. String bean. Emblica. Water melon. Carambola, (sour). Hog plum (young leaves). Sugar pea. Governor plum. *Pak kradone. Rice (unpolished). Rice (glutinous, unpolished). Coconut juice. Taro. Four-angled bean. Mungbean sprout. Tamarind (young leaves) Pineapple. *Pak som mong. Water lily.
	A./- Fish sauce (low quality). Fish (climbing perch). Fish (carp). Duck (gizzard). Chicken (gizzard). Fish (swamp eel).Lizard (*Yae). Beef (lung). Beef (sausage). Chicken (heart). Lizard (* King ka). Fish (small, fresh water). Insect (grass hopper). Frog (small). Duck (intestine). Chicken (intestine). Insect (*Mang da na). Milk (cow). Pond snail (small). Duck egg (whole).
Group 7 (≤ 100)	P./- Shallot (flowers). Sesbania (flowers). Rice (polished). Sponge gourd. Rice (glutinous, polished). Malay apple. Bamboo shoot (nonspecified). Jack fruit (young). Carambola (sweet). Lime juice. *Pak khyang. Rice noodle (round). Rice noodle (flat). Yambean. Mushroom (Jew's ear)
	A./- Hen egg (whole). Ant egg. Pork (lard). Pond snail (large). Duck (blood). Chicken (blood). Pork (blood). Beef (blood)

* = Local names

Table 2. A comparison of K contents in some common foods (plants and plant products) between the Northeast and the Central regions. These foods were gathered from their natural habitats.

No.	Foods (no. of samples analyzed)	K contents (mg/100 g fresh food)	
		Northeast region	Central region
1	Leadtree (young leaves) (8)	414	444
2	Neem (young leaves) (8)	407	450
3	Ivy gourd (8)	300	362
4	Cassia (young leaves) (4)	471	329
5	*Pak kradone narm (3)	302	418
6	Swam cabbage (red stem) (12)	380	445
7	Rice (polished) (4)	97	116
8	Papaya (unripe) (8)	153	134
9	Star gooseberry (6)	194	214
10	Jujube (8)	273	311
11	Tamarind (young pods) (5)	228	255
12	Tamarind (sour, ripe pods) (5)	1210	1397
13	Manila tamarind (4)	276	188
14	Cassia (young leaves) (5)	350	400
15	Coconut (meat, mature) (4)	297	301

* = Local name

Table 3. K contents per serve in some dishes commonly consumed in the urban area around Khon Kaen city.

No.	Name of dishes (Local names)	K, mg	
		per serve	per 100 g of fresh foods
1	Rice noodles with meat and meat balls (Kuay-tiew)	594	108
2	Cooked pork leg on rice (Kao-ka-moo)	504	63
3	Chicken rice and soup (Kao-man-kai)	476	69
4	Rice noodles with curried chicken sauce (Ka-nom-jeen-kang-kai)	409	56
5	Rice noodles with curried fish sauce (Ka-nom-jeen-nam-ya-pla)	652	128
6	Rice noodles with coconut curry (Mee-kra-ti)	522	116
7	Fried rice with some pork and egg (Kao-pad-sai-kai)	286	53
8	Fried rice noodles with some pork and vegetables (Kuay-tiew-rad-na)	290	66
9	Fried rice noodles with some pork, egg and vegetables (Pad-tai)	260	59
10	Rice with fried pork (Kao-rad-moo-gra-pao)	235	47

K contents in cooked foods

Table 3 shows K contents per serving of some dishes commonly consumed in the urban area. These foods were purchased from various food shops around Khon Kaen city. In a comparison study, we analyzed some cooked foods having the same names, but purchased from different places, i.e., from urban areas and rural villages. It is interesting to see that cooked foods of the same kinds, wherever they were from, had similar K contents (Table 4).

Table 4. A comparison of K contents in some common cooked foods between those purchased from the rural villages and the urban area of Khon Kaen city.

No.	Cooked foods (Local names)	K contents (mg/100 g fresh food)	
		purchased from villages	purchased from urban area
1	Papaya salad (Somtam)	244	219
2	Bamboo shoot salad (Soop-no-mai)	101	160
3	Egg plant salad (Soop-ma-kure)	261	250
4	Jack fruit salad (Soop-ka-noon)	171	235
5	Chicken curry with some vegetables (Om-kai-sai-pak)	170	144
6	Bamboo shoot curry (Khaeng-no-mai)	123	99
7	Cat fish sauce with chili (Pon-pla-duke)	297	186
8	Rice noodles with curried fish sauce (Ka-nom-jeen-nam-ya-pla)	112	128
9	Rice noodles with meat and meat balls (Kuay-tiew)	82	108
10	Small shrimp salad (Koy-koong)	280	340

Food ingredients and their frequencies of use in 48 meals

From the data on food records of 13 subjects studied in 8 provinces, we analyzed the food ingredients used in cooking their 48 meals consumed during the hot season[3]. Altogether, there were 44 kinds of food ingredients. As expected, polished glutinous rice (food group 7) had the highest frequency of consumption of 41 times per 48 meals (Table 5). It should also be noted that there were no legumes among their 48 meals. Although fermented fish (group 3) ranked the second in the frequency of consumption, the amount-consumed, however, was extremely small.

DISCUSSION

In 1989 and 1990 Sirichakwal et al[6] and Kongkachuichai[7] respectively reported the results of their studies on mineral contents of some Thai foods. With regards to the K contents, they found that foods in the group of legumes had the highest, rice and rice products and some sea foods were among the lowest, whereas, meat and most vegetables and fruits were in between. Our results in general in this report, though studied in a different region, agreed well with their findings. Thailand is a small country and its transportation network is in a very good condition, so it is possible that food available in different markets or regions may be transported from the same production places. Therefore, when analyzed, they all showed similar K contents as might be the case of ours studied in the northeast in this report when compared to those studied in the central region[6,7]. However, in a comparison study between the northeast (light-textured soils, low C.E.C.) and the central regions (heavy-textured soils, high C.E.C) when foods were gathered from their natural habitats, their K contents were also similar. The level of K in any food therefore does not depend on the quality of soil from where it is produced as observed for some other minerals[10], but rather depends on the parts of the particular food or stages of its growth. For instance in case of the tamarind plant, the K content of its young leaves, and young and ripe fruits were in groups 6, 5 and 1, respectively. Similarly, foods produced from various parts of an animal, for instance pig, have the K content which could vary from as small as group 7 (pig's blood) up to group 4 (pork, medium fat).

Our previous study showed that K intake of rural dwellers in the northeast region was very low when compared with the people living in the western hemisphere[3,11]. Their low K intake was clearly not due to the low K contents of foods produced in the region. Furthermore, in another comparison study of the K content of the same cooked food purchased from the urban and the rural areas, the results were similar. These results suggest that the low K intake among these rural people was probably due to their food practices or socio-economic problem allowing them to consume food items in the groups of low K or consumed cooked foods made from food ingredients in these groups more often. This is clearly seen from the results of food ingredient analysis of 48 meals consumed by the 13 rural subjects. Their daily intake of

Table 5. A list of food ingredients and their frequencies of use in the preparation of 48 meals consumed by 13 subjects during the hot season.

No.	Ingredient	Frequency (per 48 meals)	Amount per meal (g)	Food group	No.	Ingredient	Frequency (per 48 meals)	Amount per meal (g)	Food group
1	Rice (glutinous, polished)	41	248	7	26	*Pak chee lao	3	25	2
2	Fermented fish (*Pla ra)	26	8	3	27	Jak fruit (young)	3	68	7
3	Papaya (unripe)	20	80	6	28	Ivy gourd	3	15	5
4	Chili pepper (fresh)	20	3	3 & 5	29	Cassia (flower)	3	25	7
5	Carp fish	19	65	6	30	Shrimp paste	3	12	3
6	Beef	13	85	4	31	Beef sausage	3	35	6
7	Chicken	9	55	6	32	Rice noodle (flat)	3	39	7
8	Vegetable oil	8	5	7	33	Neem (flower)	3	15	3
9	Chinese cabbage	8	85	6	34	Snake gourd	2	45	6
10	Duck (egg)	8	53	7	35	Cucumber	2	80	6
11	Fish (*Platoo)	8	53	ND	36	String bean	2	60	6
12	Snake-headed fish	7	60	4	37	Chicken,liver	2	15	5
13	Rice noodle (round)	7	300	7	38	Frog	2	18	5
14	Chinese cabbage (pickled)	6	40	6	39	Rat	2	24	5
15	Bamboo shoot	6	110	7	40	Mango (unripe)	2	60	6
16	Swamp cabbage (red stem)	6	45	4	41	Pond snail (small)	2	45	7
17	Cabbage	5	90	5	42	Canned fish	2	60	ND
18	Egg plant (medium)	5	53	5	43	Banana	2	60	5
19	Pork (medium fat)	5	65	4	44	Jujube	2	25	5
20	Small fish	4	40	6					
21	Shrimp (fresh water, small)	4	40	5					
22	Bamboo shoot (pickled)	4	25	5					
23	Meat ball	4	24	4					
24	*Bai ya nang	3	3	3					
25	Shallot	3	21	4					

ND = not determined, * = local name

polished glutinous rice (group 7) was the highest in frequency and the amount was as high as 248 g per meal or 744 g per day, an equivalent to K intake of 642 mg. Since the daily K intake of rural people in the northeast region was reported to be only 800 - 900 mg[3], it meant that they obtained K mostly from the consumption of glutinous rice alone. In other words, their daily meal contained mostly glutinous rice. This seems to be true when looking at its energy contents. This amount of glutinuous rice could give 2976 kcal in energy, an amount equivalent to the RDA of energy for active Thai males aged 20 - 50 years old (2800 kcal)[4]. This pattern of food consumption is probably responsible for the low levels of K found in blood and urine of the rural northeast Thai population[1-3]. Moreover, it should be noted that there was no food group 1 among 44 food ingredients consumed.

Due to an extraordinarily high prevalence of some metabolic diseases in this region[12-15], K deficiency is believed to be an important cause of these diseases[16,17], yet, their true mechanisms are waiting to be elucidated. Furthermore, growth retardation among preschool children is also commonly seen in remote villages of the northeast region[18]. Though the direct cause of this abnormality is protein energy malnutrition as a consequence of poverty[19], K depletion is also probably attributed to the growth retardation seen in these children. This is because it has been shown in both animals and humans that K also plays an important role in the processes of protein biosynthesis and utilization[20,21]. Furthermore, K deficiency seems not only to be a human health problem, animals in this region such as water buffalo have been reported to be affected as well[22].

Changing the food habits of these rural dwellers is probably the best recommendation to improve their K status. For instance, by the frequent taking of common dishes consumed by urban residents No. 1-6 listed in Table 3, one should expect to increase by about half their usual daily dietary K intake[3]. Another alternative is to include soybean, the highest K content food, in their daily meals. Promvanich et al[5] have shown that one of the best sources for K is fruit juice. From our data of food analysis, we found that ripe tamarind fruit contained very high K (group 1, Table 1). Since tamarind is a plant found abundantly in the northeast region, taking a glass of fruit juice made from tamarind, from time-to-time, is probably the best and most suitable recommendation to increase the K intake for the poor rural people in the northeast region of Thailand.

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ปริมาณแร่ธาตุโพแทสเซียม (K) ในอาหารของชาวภาคตะวันออกเฉียงเหนือ

พจน์ ศรีบุญลือ, วท.ม (ชีวเคมี), M.C.H., วิทูรย์ ประสงค์วัฒนา, วท.ม (ชีวเคมี), พ.บ.*,*
สุนทร สุวรรณไตรย์, วท.บ (ชีววิทยา), สมบัติ บวรผดุงกิตติ, พ.บ.**,*
*เกรียง ตั้งสง่า, พ.บ.***, ปิยะรัตน์ โตสุโขวงศ์****,*

จากการประเมินภาวะโภชนาการของแร่ธาตุโพแทสเซียมในผู้ชายชาวชนบทภาคตะวันออกเฉียงเหนือ ทำให้ทราบว่าประชากรกลุ่มนี้ได้รับโพแทสเซียมในอาหารต่ำมาก คณะวิจัยจึงมีความสนใจที่จะศึกษาปริมาณแร่ธาตุนี้ในอาหารชนิดต่าง ๆ ว่าเป็นอย่างไร วิธีการศึกษาโดยการนำตัวอย่างอาหารจากแหล่งต่างๆ ในภาคตะวันออกเฉียงเหนือ ซึ่งประกอบด้วยผลิตภัณฑ์จากสัตว์ 57 ชนิด และผลิตภัณฑ์จากพืช 142 ชนิด มาเตรียมเถ้าโดยการขจัดสารอินทรีย์ออกก่อนแล้วนำไปเผาที่อุณหภูมิสูง จากนั้นวิเคราะห์หาโพแทสเซียมด้วยเครื่อง atomic absorption spectrophotometer ผลการศึกษาพบว่าสามารถแบ่งอาหารออกได้เป็น 7 กลุ่มตามปริมาณโพแทสเซียม โดยกลุ่มที่มีโพแทสเซียมสูงตั้งแต่ 1000 มิลลิกรัมต่อน้ำหนักอาหารสด 100 กรัมขึ้นไป จัดเป็นกลุ่มที่ 1 ซึ่งได้แก่อาหารประเภทถั่วต่างๆ เช่น ถั่วเหลือง ถั่วดำ และถั่วเขียว ในขณะที่อาหารประเภทข้าวและผลิตภัณฑ์จากข้าวซึ่งเป็นอาหารหลักสำคัญ กลับมีโพแทสเซียมต่ำสุดอยู่ในกลุ่มที่ 7 (K ต่ำกว่า 100 มิลลิกรัม) เมื่อทำการเปรียบเทียบปริมาณโพแทสเซียมในอาหารตามธรรมชาติระหว่างภาคกลางกับภาคตะวันออกเฉียงเหนือและในอาหารที่ปรุงแล้วระหว่างที่ซื้อจากหมู่บ้านชนบทกับที่ซื้อจากในเมือง จังหวัดขอนแก่น พบว่าไม่มีความแตกต่างกันมากนัก ในขณะที่ระดับโพแทสเซียมในส่วนต่าง ๆ หรือระยะต่าง ๆ ของการเจริญเติบโตของพืชและสัตว์ที่ใช้เป็นอาหาร บางชนิดกลับมีความแตกต่างในปริมาณโพแทสเซียมเป็นอย่างมาก เช่น ในใบมะขามอ่อนมีโพแทสเซียมอยู่ในระดับ 6 ในขณะที่ผลมะขามสุกกลับมีโพแทสเซียมสูงมากอยู่ในระดับ 1 นอกจากนี้จากการวิเคราะห์ความถี่และปริมาณของการบริโภคอาหารแต่ละชนิดในอาหาร 48 มื้อ ของประชากร 13 คน ที่บริโภคในช่วงฤดูร้อน พบว่าอาหารที่มีความถี่และปริมาณของการบริโภคสูงสุดกลับเป็นอาหารอยู่ในกลุ่มที่มีโพแทสเซียมต่ำมาก ซึ่งได้แก่ข้าวเหนียว (ระดับ 7) และมะละกอดิบ(ระดับ 6) ผลจากการศึกษาครั้งนี้ชี้ให้เห็นว่าสาเหตุของการได้รับโพแทสเซียมต่ำของชาวชนบทภาคตะวันออกเฉียงเหนือ คงไม่ใช่เป็นเพราะอาหารชนิดต่าง ๆ ที่มีอยู่ในภูมิภาคนี้มีโพแทสเซียมต่ำกว่า อาหารของภูมิภาคอื่นแต่น่าจะเป็นเพราะบริโภคนิสัย ตลอดจนเศรษฐานะของชาวชนบทเหล่านี้เอื้ออำนวยให้ได้มีโอกาสบริโภคเฉพาะอาหารในกลุ่มที่มีโพแทสเซียมต่ำ

* ภาควิชาชีวเคมี, คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น, ขอนแก่น 40002
** โรงพยาบาลศูนย์ขอนแก่น, ขอนแก่น 40000
*** ภาควิชาอายุรศาสตร์, คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพ ฯ 10330
**** ภาควิชาชีวเคมี, คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพ ฯ 10330

Appendix : Thai name of foods in Table 1.

English	Thai	English	Thai
Acacia insuavis (*Cha-om)	ชะอม	(swamp eel)	ปลาไหล
Amaranth	ผักขม	(small, fresh water)	ปลาซิวและปลาน้ำจืดตัวเล็ก
(spiny)	ชนิดมีหนาม	Fish sauce	น้ำปลา
(spineless)	ชนิดไม่มีหนาม	Frog	กบ
Ant-egg	ไข่มดแดง	Garlic	หัวกระเทียบแห้ง
Bamboo shoot	หน่อไม้	Garangal	หัวข่า
*Bai ya nang	ใบย่านาง	Governor plum	ลูกตะขบสุก
Banana	กล้วยน้ำว้า	Ground nut	ถั่วลิสง
(buds and flowers)	ปีกล้วย	Guava	ฝรั่ง
Bastard mustard	ผักกาดเขียว	Hen	ไก่
Bitter cucumber	มะระ	Horse radish	มะรุม
Bottle gourd	น้ำเต้า	Hog plum	มะกอก
Beef	เนื้อ	Indian penny wort	ใบบัวบก
Cabbage	กะหล่ำปลี	Ivy gourd	ตำลึง
Carambola	มะเฟือง	Insect	แมลง
Carrot	หัวแครอท	(black plant beetle)	แมลงกี่นูน
Cashew nut	เม็ดมะม่วงหิมพานต์	(cricket)	จิ้งหรีด
Cassia	ขี้เหล็ก	(*Mang ka chon)	แมลงกระชอน
Cauliflower	ดอกกะหล่ำ	(water beetle)	แมลงตับเต่า
Chinese kale	คะน้า	(*Mang da na)	แมงดานา
Celery	คื่นฉ่าย	(grass hopper)	ตั๊กแตน
Chili pepper	พริก (รวมชนิด)	Jack fruit	ขนุน
Chinese cabbage	ผักกวางตุ้ง	Jujube	พุทราไทย
Chinese white cabbage	ผักกาดขาว	Lead tree	กระถิน
Chinese leek	กุยฉ่าย	Leech lime	มะกรูด
Corn	ข้าวโพด	Lemon grass	ตะไคร้
Coriander	ผักชี	Lettuce	ผักกาดหอม
Cowpea	ถั่วดำ	Lime juice	น้ำมะนาว
Coconut	มะพร้าว	Lizard	สัตว์เลื้อยคลาน
Crow daisy leaves	ผักตั้งโอ๋	(*Yae)	แย้
Cucumber	แตงกวา	(*King ka)	กิ้งก่า
Chicken	ไก่	Malay apple	ชมพู่
Crab	ปู	Mango	มะม่วงแก้วดิบ
Duck	เป็ด	Manila tarmarind	มะขามเทศ
Egg plant	มะเขือเปราะ	Mint	สะระแหน่
(long)	มะเขือยาว	Mungbean	ถั่วเขียว
(plate brush)	มะเขือพวง	Mung bean sprout	ถั่วงอก
Emblica	มะขามป้อม	Mushroom	เห็ด
Four-angled bean	ถั่วพู	(oyster)	เห็ดนางรม
Fish	ปลา	(straw)	เห็ดฟาง
(fermented)	ปลาร้า	(Jew's ear)	เห็ดหูหนู
(carp)	ปลานิล/ปลาไน	(wild, small, yellow)	เห็ดมันปู
(climbing perch)	ปลาหมอ	(wild, small, red)	เห็ดแดง
(snake-headed)	ปลาช่อน	(wild, big, white)	เห็ดระโงก
(cat fish)	ปลาดุก	Milk	น้ำนม
(*Pla lode)	ปลาหลด	Neem	สะเดา
(*Pla bueg)	ปลาบึก	Onion	หัวหอมแห้ง

Appendix : Thai name of foods in Table 1.

English	Thai	English	Thai
Papaya	มะละกอ	(larva)	ดักแด้
Pepper	พริกไทย	Sapodilla	ละมุด
Pineapple	สับปะรด	Sesbania	แค
*Pak chee lao	ผักชีลาว	Sesame	งา
*Pak krat	ผักคราด	Shallot	หอมแดง
*Pak koom	ผักกุ่ม	Soybean sauce	ซีอสถั่วเหลืองตราภูเขาทอง
*Pak kanjong	ผักคันจอง	Soybean	ถั่วเหลือง
*Pak sarb	ผักสาบ	Spinach	ผักป่วยเล้ง
*Pak som mong	ผักส้มโมง	Swamp cabbage	ผักบุ้ง
*Pak linfa	ผักลิ้นฟ้า	Sweet basil	ใบแมงลัก
*Pak pai	ผักพาย	Sugar pea	ถั่วลันเตา
*Pak kradone	ผักกระโดน	Sponge gourd	บวบหอม
*Pak krajeow	ผักกระเจียว	Star gooseberry	มะยม
*Pak khyang	ผักแขยง	String bean	ถั่วฝักยาว
*Pak clog	ผักอีลอก	Swamp algae	ผักยำ
*Pak tiew	ผักตี้ว	Sweet potato	มันเทศ
*Pak pang puay	ผักแพงพวย	Shrimp	กุ้ง
*Pak sameg	ผักสะเม็ก	Shrimp paste	กระปิ
*Pak warn	ผักหวาน	Taro	เผือก
Pumpkin	ฟักทอง	Tamarind	มะขาม
Pork	เนื้อหมู	Tomato	มะเขือเทศ
Pond snail	หอยนา	Tropical almond	สมอไทย
Rambai	มะไฟ	Vine spinach	ผักปลัง
Rattan shoot	หน่อหวาย	Water melon	แตงโมสุก
Rice	ข้าว	Water lily	สายบัว
(glutinuous)	ข้าวเหนียว	Water mimosa	ผักกระเฉด
Rice noodle	เส้นทำจากข้าว	Water fern	ผักแว่น
(flat)	เส้นก๋วยเตี๋ยว	Wild betal	ใบชะพลู
(round)	เส้นขนมจีน	Wild yam	หัวมันป่า
Rat	หนูนา	(small,*Mun loog heb)	มันลูกเห็บ
Silk worm	ตัวไหม	Yambean	มันแกว

* Local name