

## Potentiality in production of Khai Phran (water algae sheet), Luang PraBang, Lao PDR : to ASEAN community preparation

Sayamon Pariyajarn<sup>1</sup>, Akachai Jarunatvilat<sup>1</sup>, Ploenpit Jangphonak<sup>1</sup>,  
Tanawan Pengchai<sup>1</sup>, Souththanou Manysoat<sup>2</sup> and Khumla Duangvijit<sup>2</sup>

**ABSTRACT:** Khai Phran is a famous food product from Luang PraBang. It is made from green fresh water algae collected 1- 2 meters below the flowing streams. Khai (*Cladophora* spp.) is commonly found in the Mekong River and its tributaries. This study was observing production methods and interviewing some producers (11 from 42 families) in Muang Kham Village. Khai Phran production is the primary occupation of this village. It is made during the months of September - April. Furthermore, the process uses traditional knowledge to improve flavor and shelf-life. The main ingredients of Khai Phran are newly harvested Khai (fresh water algae), salt, and tamarind. The minor are olives, seasoning, tomato, garlic, and sesame. Khai Phran production processes involves (1) cleaning fresh Khai, (2) moulding Khai sheets, (3) adding seasonings and (4) drying and (5) packaging. Its proximate composition is 24.01% protein, 31.71% fat, 10.98% ash, 24.59% fiber, 8.71% carbohydrate and 8.11% moisture (dry basis). A questionnaire was administered to 100 Laotians and foreign tourists. To survey tourist opinions of Khai Phran, the questionnaire shows that 57% of the tourists were familiar with this product. On a scale of 1-5 (dislike very much-like very much), Khai Phran was assessed for its flavor, physical characteristics (color, shape and size), quality and safety, nutritional value, packaging, price, convenience, ease of eating and the total average attributes ( $\bar{x} .95 \pm 0.79$ ,  $\bar{x} .86 \pm 0.69$ ,  $\bar{x} .60 \pm 0.73$ ,  $\bar{x} .26 \pm 0.97$ ,  $\bar{x} .26 \pm 0.97$ ,  $\bar{x} .40 \pm 0.73$  and  $\bar{x} .89 \pm 0.92$  respectively). Khai Phran production in Luang PraBang has a great traditional process and provides a livelihood for many people. It is an attractive and pleasant product enjoyed by tourists.

**Keywords :** Khai Phran, Fresh Water Algae, Luang PraBang, traditional food product

### Introduction

Food products and tourism can complement each other. Because many food products have a historical background. They may reflect elder wisdom, a time in history, abundance of particular resources of a local, ancestral tales, popularity and food processing methods. Ancestors may have cleverly and wisely uses resource of their country to make food, using knowledge and technology of their developing country.

Local food products can be attractive and interesting to tourists. Suthinda et al. (2013) studied the potential of incorporating aboriginal foods into tourism in Luang PraBang (Lao PDR). They found that 87% of tourists have eaten aboriginal foods and certain groups of tourists interested in Luang PraBang's food may have all (100%) tried aboriginal foods. This indicated that Luang PraBang's traditional food has a very high potential for incorporation into tourism. The most noteworthy of these foods is Khai Phran (Udon thani Rajabhat University, 2013.).

<sup>1</sup> Department of Food Science and Technology, Faculty of Technology, Udon thani Rajabhat University, Thailand;

<sup>2</sup> Department of Food Science and Technology, Faculty of Agricultural and Forest Resource, Souphanouvong University, Luang PraBang, Lao PDR,

\* Corresponding author: spariyajarn@yahoo.com, akachai04@gmail.com, ploenpitjangphonak@gmail.com, tanawan28@yahoo.com and msouththanou@yahoo.com

Khai Phran is made from large sized fresh water green algae called Khai. Khai Phran production has several steps. These include: (1) washing to remove tiny of stones, soil and sand from fresh Khai and cleaning it with a lot of water, (2) seasoning involves mixing the Khai with tamarind or other sour tasting solutions containing ginger, tomato, garlic, onion, among other things, (3) sheeting by spreading Khai on a mould made of dried grass, liberally sprinkling it with sesame and decorating with thin slices of tomato and garlic, (4) drying and packaging is done by sun-drying and storing Khai Phran sheets in plastic bags.

### Materials and Methods

This research was divided into 3 parts. These were (1) surveying the target area of study, Muang Kham village to collect on-site data, (2) collecting data from 100 tourists about their opinions on Khai Phran using a survey questionnaire, and, (3) analysis of the generated about Khai Phran generated by the study.

Population and sampling: The aim of this study was to investigate Khai Phran production in Muang Kham village outside of Luang PraBang. Tourists who enjoy eating Khai Phran were surveyed after consuming Khai Phran donated by distributors in Luang PraBang. The sample size was 100 people.

Methodology for collecting data: A difference method was used to collect data in this study. It is described as follows: 1) Unstructured interviews were conducted to learn the dimensions of the opinions of the members of the Muang Kham community about Khai Phran production.

This was to learn their concerns about raw material sources, processing steps, and product distribution in Luang PraBang. ; 2) Non-participating observation was done to learn about raw material sources, processing steps, and product distribution. ; 3) Survey questionnaires were used to learn the opinions of foreigners and domestic tourists. Our questionnaire was divided into three parts. Parts (1) and (2) gathered personal demographic data and history of consuming Khai Phran. Part (3) of the questionnaire asked the subject to rate Khai Phran by the 5-point Likert scale or 5-point hedonic scale. And the finally, 4) Nutritional analysis of Khai Phran was done to determine of moisture, protein, lipid, fiber and ash contents by standard (AOAC, 1990). This analysis was done at the Laboratory of Food Science and Technology, Faculty of Technology, Udon Thani Rajabhat University in Udon Thani, Thailand.

Collecting and analysis of data : Information was gathered from several sources in formulating the research question of the current study. These sources included : 1) Collecting from published sources, such as peer reviewed literature, websites, technical book, journals, and theses, as well as foreign and domestic databases. 2) Field data was collected from Muang Kham village. Residents of this village were interviewed about production practices. Tourists in Luang PraBang were surveyed by questionnaire about their impression of Khai Phran.

Interview data and questionnaire responses were rechecked for completeness before data analysis. Nutritional analysis was done in our laboratory. Statistical analysis determined parameter values for percentage, mean, and standard deviation of each of these data types.

## Results and Discussion

Muang Kham village is one of two villages in Luang PraBang where the majority of the population engages in commercial Khai Phran production. Their products are later sold to shops, markets, restaurants or local food shops, or other distributors in Luang PraBang. The population village consists of 107 families (5,029 people) of which 42 families engaged in commercial Khai Phran production. The group producing Khai Phran in Muang Kham village was operated by housewives. This large group consists of 4 subgroups. Subgroup 1 has 11 members, Subgroup 2 has 12 members, Subgroup 3 has 15 members and the last Subgroup 4 has 4 members.

Khai is a green fresh water algae that is grown on rocky reefs and in the Mekong River where sunlight can shine directly upon the algae (Taveesak and Trichaiyaporn, 2010; Wanpen, 2006). This includes many branches of the Mekong River including Nam-Ou, Naam-Bark, Nam-Seung, Nam-Khan and Nam-Kan streams. These small rivers are the raw material source of Khai Phran production. Khai or fresh water algae can be divided into 2 types. The first type is called slimy/crispy/tasty/valuable stone Khai in which the surface slime gives its dominant characteristics. The second type of algae is called sticky touch

Khai. This type is used in cooking traditional Luang PraBang foods ("Ourkhai" = It is food that is made by roasting Khai to give good flavor before cooking and seasoning with fermented fish sauce and young rattan or ear mushroom and "Mok Khai" = It is Lao food that is composed of many spices: for example chili pepper, shallots, lemon grass, parley, spring onions and sweet basil leaves must be wrapped in banana leaves and cooked by steaming or grilling) (Udon thani Rajabhat University, 2013) The best Khai for Khai Phran production is slimy Khai. Its characteristics include light colored, long, green, slime. The second type of Khai is optimum for making traditional local foods. The season for harvesting fresh Khai is October to May (TABI, 2014). The method of harvesting Khai is by pulling and sweeping of Khai from the rocks to which it adheres at a depth of about 1-2 meters below the surface of the water.

Khai Phran has several ingredients as the following: 1) 30 kg of Khai/fresh water algae, 2) 60 kg tamarind, 3) 1 kg salt, 4) ½ kg seasoning, 5) ½ kg garlic, 6) 200-300 g ginger, and 7) 2-3 kg sesame. Often a small onion is added to these ingredients.

Results of a questionnaire survey of opinions of 100 Laotians and foreign tourists about Khai Phran are shown in Table 1 below.

**Table 1** Demographic information about Khai Phran consumers

Data of	Used to eating 57 adults	Not used to eating
43 adults                      Total		
1. Gender		
Male	39 (68.42%)	19 (44.19%) 58
Female	18(31.58%)	24 (55.81%) 42
2. Age		
1) Under 15 years	1 (1.75%)	- 1
2) 15-30 years	37 (64.91%)	28 (65.12%) 65
3) 31-45 years	15 (26.32%)	14 (32.56%) 29
4) 46-60	years 2 (3.51%)	1 (2.33%) 3
5) More than 60 years	2 (3.51%) - 2	
3. Country Group		
1) Asia group	37 (64.91%)	12 (27.91%) 49
1) Non-Asia group	20 (35.09%)	31 (72.09%) 51
4. Occupation		
1) Employee	16 (28.07%)	12 (27.91%) 28
2) Government official	6 (10.53%)	6 (13.95%) 12
3) Business person	4 (7.02%)	3 (6.98%) 7
4) Housewife	-	- -
5) Student	22 (38.60%)	17 (39.53%) 39
6) Other 9	(15.79%)	5 (11.63%) 14
5. Income Per Person		
1) Less than 10,000 Baht	13 (22.81%)	10 (23.26%) 23
2) 10,000 - 20,000 Baht	12 (21.05%)	6 (13.95%) 18
3) 20,001 - 30,000 Baht	6 (10.53%)	9 (20.93%) 15
4) 30,001 - 40,000 Baht	9 (15.79%)	9 (20.93%) 18
5) More than 40,000 Baht	17 (29.82%)	9 (20.93%) 26

**Table 2** Consumer acceptance of Khai Phran

Characteristic	Mean $\pm$ S.D.
1.Flavor	3.95 $\pm$ 0.79
2.Physical characteristics (color, shape, and size) 3.Quality and safety	3.86 $\pm$ 0.69
4. Nutritional value	3.60 $\pm$ 0.73
5. Packaging	3.46 $\pm$ 0.80
6. Price	3.26 $\pm$ 0.97
7. Convenience	3.40 $\pm$ 0.73
8. Ease of Eating	3.93 $\pm$ 0.82
Average of Attributes	3.89 $\pm$ 0.92
	3.66 $\pm$ 0.26

NB: On a Likert scale of 1-5 (very much dislike - very much like)

### Consumer Acceptance of Khai Phran and General Behavior of Eating

Demographic information about Khai Phran consumers is given in Table 1. It shows that among 100 foreign tourists, 57 tourists that consumed Khai Phran were mostly male (68.42%) and 15-30 years old (64.91%). The remaining 43 tourists did not eat this product. Among those that consumed Khai Phran, 64.91% were Asian. Most of these were students or employees, 38.60% and 28.07%, respectively. Their income per person was mostly more than 40,000 Baht per month (29.82%). These data suggest that Khai Phran is more appealing to younger males than females. This particular group of students and employees told us that they like to tour undeveloped countries

and would buy unique products if they can. Table 2 shows the potential of Khai Phran. Several characteristics such as flavor, physical characteristics, quality and safety, convenience and ease of eating had scores in the range of 3.60-3.95, which suggests that consumer acceptance. Nutritional value, packaging and price (which were moderately liked) show a good opportunity for development. Improved nutritional value may expand its appeal to other groups. There should be further types of packaging to give more choices for buying, selecting, and distributing this product. Price is correlated with nutritional value and packaging. Improvement of these two parameters is a marketing opportunity.

**Table 3** Demographic data and general behavior of foreign tourists who consume Khai Phran

Data of	Consumers of Khai Phran adults
1. Resident	
1) Hotel	12 (21.05%)
2) Guest House	30 (52.63%)
3) Rented Apartment	9 (15.79%)
4) Private Resident	6 (10.53%)
2. Where do you get Khai Phran?	
At Home	
At Social Event	7 (12.28%)
At a Market	11 (19.30%)
Street Vendor	33 (57.89%)
5) Others	4 (7.02%)
3. Why did you choose to buy Khai Phran?	2 (3.51%)
To Eat	
Souvenir	41 (71.93%)
To Distribution	12 (21.05%)
4) Others	2 (3.51%)
	2 (3.51%)

## 4. Most often, which type do you like to eat?

Fried	(80.70%)
Grilled	6 (10.53%)
Baked	3 (7.02%)
4) Others	1 (1.75%)

## 5. Would you like to buy some Khai Phran?

## 1. please give the reason why

-Convenience	52 (91.23%)
-Souvenir	34 (59.65%)
-Local Identity	12 (21.05%)
-Others	5 (8.77%)

## 2. Not buy

-Not Standard	1 (1.75%)
-Not Delicious	5 (8.77%)
-Not Try/Taste	1 (1.75%)
-Not Try/Taste	2 (3.51%)
-Others	2 (3.51%)

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NB: 43 adults were not consumers of Khai Phran. Population Total = 100

Most tourists interviewed reported the current trip to Luang PraBang as their first. They stayed at guesthouses and their length of stay was 1-3 days. They reported that they consume Khai Phran less than 1 time per week (47.37%). They bought Khai Phran from local markets (57.89%) and the purpose was for immediate consumption (71.93%). They preferred fried Khai Phran

(80.70%). In the future ready-to-eat Khai Phran might be of interest (91.23%) or more comfortable products (59.65%). Possibilities include crispy, seasoned or low fat Khai Phran. Another objective is to develop ready-to-eat Khai Phran that can be sold as souvenirs (21.05%) and unique local products (8.77%).

### Result of Nutritional Analysis of Dried Khai Phran from Luang PraBang, Lao PDR.

**Table 4** Result from nutritional analysis of eleven dried Khai Phran samples from Luang PraBang, Lao PDR

Nutritional Components	% of dry basis (Mean $\pm$ S.D.)
1. Moisture	8.11 $\pm$ 1.52
2. Protein	24.01 $\pm$ 4.20
3. Lipid	31.71 $\pm$ 3.17
4. Ash	10.98 $\pm$ 0.70
5. Crude fiber	24.59 $\pm$ 1.16
6. Carbohydrate(by difference)	8.71 $\pm$ 2.78

From Table 4 it can be seen that Khai Phran was composed of high levels of protein (24.01%) and fiber (24.59%) which is good for promoting the health of children, working people and the elderly. Unfortunately, Khai Phran has a high amount in lipid. This is likely the result of adding sesame, which is high in oil. Most of the oil is unsaturated and more healthy but it increases the caloric content of the product. Production of reduced oil Khai Phran is possible by using other production methods or formulations. Ready-to-eat Khai Phran can be made by reducing the amount of sesame, baking, roasting, or preheating to

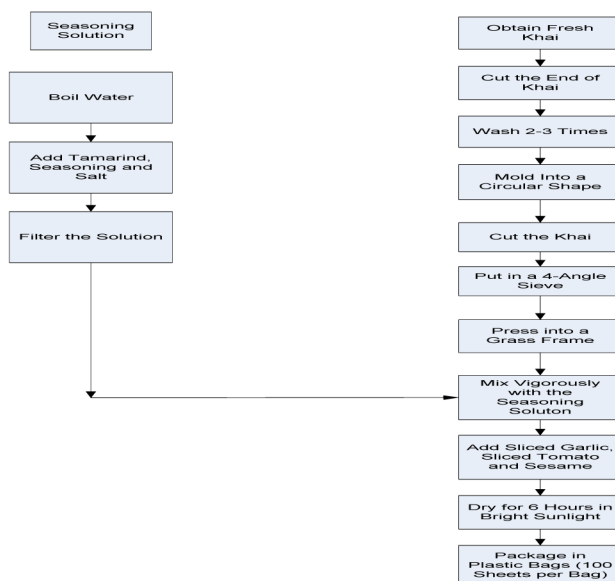
make it easier to cook. Alternatively, Khai Phran can be coated with flour, vegetables, or the other low calorie ingredients.

#### Author Artwork



**Figure 1** Sign on the outskirts of Muang Kham village (Left) and a view of household

Observed in the production of Khai Phran production (Right)



**Figure 2** Khai Phran Production Process in Muang Kham, Luang PraBang, Lao PDR.

#### Conclusion

Khai is a fresh water algae that is found naturally. It is a raw material in the local area of Luang PraBang. Production of Khai Phran uses

local knowledge to help to keep Khai fresh for long periods of time (up to 1 year or more). It also tastes good. Khai Phran is a unique food product in Luang PraBang which foreign tourists like to experience. Additionally, Khai Phran is a good

source of protein and fiber. For these reasons, Khai Phran has a great potential for market expansion with improving production systems and technology.

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