

## Development of Laabplatong seasoning powder added with local herbs

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### Abstract

This study aimed to develop a seasoning powder for Laabplatong, the staple food in northeastern Thailand, made from *Notopterus chitala* using antioxidant local herbs. Eleven herbs were evaluated as potential sources of antioxidant. The total phenolic content (TPC) and antioxidant activity of the herbs after drying at different temperatures (55°C, 65°C, and 85°C) were measured to select the most appropriate temperature, and the products were formulated using a mixture-design experiment. Consumer acceptance was tested on a nine-point hedonic scale. Results showed that the most appropriate herbs were Vietnamese mint: phakphaew (*Persicariaodorata*) and wild cosmos: phak garn gong (*Cosmos caudatus*). The optimum condition for drying the herbs to obtain the highest TPC value was 55°C. The most acceptable formula for Laab seasoning powder mix was chili powder 2.5 g, salt 2.5 g, ground roasted glutinous rice 5.5 g, dried Vietnamese mint 3.5 g, and dried wild cosmos 1 g. This had an overall acceptance score from 25 consumers at 6.2±1.1. The seasoning powder mix had a moisture content of 9.55% and  $a_w$  equal to 0.43. The antioxidant as % DPPH radical scavenging activity and total phenolic content (mgGAE/g dry sample) of the formula were 92.67±0.39 and 5.10±0.01, respectively.

**Keywords:** seasoning powder, local herbs, Laabplatong

## Introduction

Laabplatong is the staple food in northeastern Thailand, made of platong (*Notopterus chitala*) ground meat, pickled fish, ground roasted glutinous rice, salt and mixed herbs such as chili, galangal, lemongrass, bergamot leaves, cilantro, garlic and spearmint. The mixture is formed into a rectangle shape, then wrapped in banana leaf and grilled. Platong is popular with consumers as a sticky and stiff fish meat. Laabplatong is usually eaten out or purchased as a take away. It is hardly ever cooked at home since the process is complicated and time-consuming. It would be very convenient for housewives if Laabplatong could be purchased as a ready to cook dish in paste and dried powder form. There would also be greater health benefits from adding herbal spices and leaves. Herbal spices such as Vietnamese mint: phakphaew (*Persicaria odorata*) and wild cosmos: phak garn gong (*Cosmos caudatus*) are used as condiments in flavoring Thai foods. Fresh and dry Vietnamese mint leaves contain antimicrobials [1] against both gram positive and gram negative bacteria [2]. The objective of this study was to develop a dry mixture for Laabplatong seasoning powder from local herbs, and analyzes the influence of drying temperature on the total polyphenolic content (TPC) and antioxidant capacity (DPPH) of the dry herbs used in the mixture. Consumer acceptance of the Laabplatong seasoning powder was also investigated.

## Material and Methods

### *Fish samples and preparation*

Clown feather back fish (*Notopterus chitala*) were purchased from Siam Makro Public Company Limited at MahaSarakhm branch. The fish were eviscerated, headed, washed and then filleted to scrap off the meat. The meat was blended with a food processor (Tefal, DPA130), wrapped with zip lock bags measuring 20×17 cm and then stored at -18°C.

### *Drying of fresh herbs*

Potential herbs were selected according to our previous study [3]. Vietnamese mint was purchased from the municipal market at Mahasarakham, Thailand. Wild cosmos was locally grown in Kantharawichai District, Mahasarakham. The fresh herbs were washed and leaved,

air dried for 5 min and finely shredded before drying in a hot air oven at 55°C, 65°C, and 85°C for 12 h, 8 h, and 6 h, respectively until the water activity ( $a_w$ ) reached 0.6 according to the Thai Standard [4]. They were then ground and sieved through 70 mesh.

### ***Preparation of Laabplatong***

The fish meat was thawed at room temperature for 15-20 min, and then blended in a food processor (DPA130, Tefal, China) at low speed for 1 min. A seasoning powder consisting of chili powder, salt, ground roasted glutinous rice, pickled fish powder, monosodium glutamate, dried Vietnamese mint, dried wild cosmos, finely shredded galangal, finely shredded lemongrass, finely shredded bergamot, finely shredded cilantro, finely shredded garlic, and finely shredded peppermint was mixed with the fish meat for 1-2 min. The product was then packed into aluminum trays 20×10×8 cm, covered with aluminum foil and roasted in an electric oven at 180°C for 20 min. The Laabplatong was finally cut into equal portions for further evaluation.

### ***Preparation of the seasoning powder***

The mixtures of the ingredients are shown in Table 1. Thirty grams of seasoning powder and chosen dried herbs at 55°C were packed into separate aluminum bags (5.5×8 cm), and then packed into a larger aluminum bag (11×20 cm) [5].

### ***Analysis for the antioxidant assay***

The dried herbal powders (1 g) were extracted for 3 h with 10 ml of 80% methanol at 37°C, with continuous shaking on an orbital shaker at 150 rpm. The determination of 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay was conducted as previously reported by [6]. DPPH reagent, consisting of DPPH (0.004%) in methanol, was freshly prepared. Three milliliters of DPPH reagent and 100 µl of extract were mixed in each tube and kept in a dark room to react. After 30 min, absorbance was tested (517 nm) on a spectrophotometer. The inhibition activity percentage was calculated as  $[(A_o - A_e)/A_o]*100$  ( $A_o$  = absorbance without extract;  $A_e$  = absorbance with extract).

### ***Total phenolics content***

The total phenolics content was determined using Folin-Ciocalteu reagent following the method of [5]. Briefly, 300 µl of extract was mixed with 2.25 ml of Folin-Ciocalteu reagent, diluted (1:10) in distilled water and allowed to stand at room temperature for 5 min; 2.25 ml of sodium carbonate (60 g/l) solution was added to the mixture. After 90 min at room temperature, the absorbance was measured at 725 nm with a spectrophotometer. The total phenolic content of the extracts was calculated and expressed as gallic acid equivalents per gram of dry weight (mg GAE/g DW) based on the Gallic acid standard curve.

### ***Physical qualities measurement***

#### *Color:*

Color was measured using the color profile system of lightness ( $L^*$ ), redness ( $a^*$ ), and yellowness ( $b^*$ ) by a color meter (Minolta CR 400, Japan). White ceramic tile was used as standard (white blank;  $L^* = 97.67$ ,  $a^* = -0.18$ ,  $b^* = +1.84$ ) for calibration and the experiment was repeated in triplicate [7].

#### *Moisture retention:*

The empty dish and lid were dried in an oven at 105°C for 3 h and transferred to a desiccator to cool. The empty dish and lid were weighed. Approximately 3 g of sample was placed in the dish and spread uniformly. The dish was then placed in the oven for 24 h at 105°C. After drying, the dish with partially covered lid was transferred to the desiccator to cool and reweighed.

### ***The optimum herbal formulation mixture and sensory acceptance test***

The ingredients were based on local commercial Laabplalong in Mahasarakham Province and determined by mixture design method [8]. Design-Expert program version 7.1.5 was used for the experimental design. For the formulation of the seasoning, chili powder was in the range of 2.5-4.0 g, salt 2.5-4.0 g, ground roasted glutinous rice 5.5-7.0 g, dried Vietnamese mint 1.0-1.5 g, and dried wild cosmos 1.0-1.5 g. All 15 formulae were tested for sensory acceptance by

25 consumer panelists using a 9-point hedonic scale. The differences between sensory attribute scores were calculated.

**Table 1.** Optimum formulation of herbs for Laabplatong

Formula	Ingredients (g)												
	c	s	g	v	co	p	mo	fg	fl	fb	fc	fd	fp
1	4	2.5	5.5	1	2	2.5	1	1	1	0.5	0.3	1	0.3
2	2.5	3	6.7	1.8	1	2.5	1	1	1	0.5	0.3	1	0.3
3	2.5	2.5	5.5	3.5	1	2.5	1	1	1	0.5	0.3	1	0.3
4	2.5	3.5	6.6	1	1.3	2.5	1	1	1	0.5	0.3	1	0.3
5	4	2.5	5.5	2	1	2.5	1	1	1	0.5	0.3	1	0.3
6	2.5	4	6.5	1	1	2.5	1	1	1	0.5	0.3	1	0.3
7	2.5	3.5	7	1	1	2.5	1	1	1	0.5	0.3	1	0.3
8	3	3	6	1.3	1.3	2.5	1	1	1	0.5	0.3	1	0.3
9	4	3.5	5.5	1	1	2.5	1	1	1	0.5	0.3	1	0.3
10	2.5	2.5	5.5	1	3.5	2.5	1	1	1	0.5	0.3	1	0.3
11	3.5	4	5.5	1	1	2.5	1	1	1	0.5	0.3	1	0.3
12	3.5	2.5	7	1	1	2.5	1	1	1	0.5	0.3	1	0.3
13	4	2.5	6.5	1	1	2.5	1	1	1	0.5	0.3	1	0.3
14	2.5	4	5.5	2	1	2.5	1	1	1	0.5	0.3	1	0.3
15	2.5	4	5.5	1	2	2.5	1	1	1	0.5	0.3	1	0.3

\* Abbreviations c: chili powder, s: salt, g: ground roasted glutinous rice, v: dried Vietnamese mint, co: dried wild cosmos, p: pickled fish powder, mo: monosodium glutamate, fg: finely shredded galangal, fl: finely shredded lemon grass, fb: finely shredded bergamot, fc: finely shredded cilantro, fd: finely shredded garlic, fp: finely shredded peppermint

### ***Statistical analysis***

Data from the three replications were analyzed using ANOVA and Randomized Complete Block Design (RCBD) of the Statistical Package for the Social Sciences version 11.5.

## Results and Discussion

The results of antioxidant activities determined by DPPH methods and total phenolic content (TPC) of the dried herbs are shown in Table 2. DPPH radical scavenging of dried samples at 55°C and 85°C showed that wild cosmos was the highest, followed by Vietnamese mint and peppermint. At 65°C Vietnamese mint was higher than the other herbs. TPC of the dried samples at 55°C gave wild cosmos as the highest, followed by peppermint and Vietnamese mint. Opposite results were found for dried samples at 65 °C and 85 °C with Vietnamese mint having the highest value. Chunthanom et al. [9] studied the effect of drying Mao berry variety Fapraton at 50°C and 60°C. Results showed that TPC ( $13.55 \pm 0.10$  and  $28.85 \pm 2.80$  mg Gallic acid/g) and DPPH ( $68.31 \pm 9.28$  and  $76.13 \pm 8.09$  %) values significantly ( $p > 0.05$ ) increased. However, variety Yaykhamta values decreased. Thus, heat affected antioxidant capacities.

A previous study [3], investigated drying herbs at different temperatures (55°C, 65°C, and 85°C) with consumer testing. A sensory evaluation found that drying herbs at 55°C was the most acceptable. The consumer samplings gave scores for appearance, order, color, and overall acceptance for herbs dried at 55°C as 8.50, 8.47, 8.33, and 8.50, respectively. Thus, 55°C were selected as the best drying temperature for the herbs.

### *Sensory acceptance of Laabplatong*

The sensory attributes of chili powder, salt, ground roasted glutinous rice, dried Vietnamese mint, and dried wild cosmos were evaluated for warm Laab by a 25 member panel using a 9-point hedonic scale for color, appearance, order, saltiness, overall taste, and overall acceptance. Formula 6 of Laabplatong was the most accepted with scores of 6.4, 6.2, 6.4, 6.0, 6.7, and 7.0 followed by formulae 3 and 12 (5.9, 5.4, 5.6, 5.3, 6.0, 6.2, and 6.2, 5.6, 5.8, 5.4, 6.1, and 6.3 points, respectively (Table 3).

The moisture contents of formulae 3, 6, and 12 were 9.55, 9.37, and 9.62%, respectively. Water activity ( $a_w$ ) was 0.43, 0.43, and 0.44.  $L^*$ ,  $a^*$ , and  $b^*$  values were  $L^*$  (Lightness) 46.36, 48.74, and 48.92,  $a^*$  (Red) -0.28, -0.03, and -0.03, and  $b^*$  (Yellow) 22.45, 24.42, and 24.63, respectively (Table 4).

**Table 2.** DPPH radical scavenging activity (%) and total phenolic content (TPC; mgGAE/g dry sample) of local herbs at various drying temperatures

Herbs	Fresh herbs		55°C		65°C		85°C	
	DPPH	TPC	DPPH	TPC	DPPH	TPC	DPPH	TPC
Vietnamese mint	91.02±0.65 <sup>Ab</sup>	3.43±0.13 <sup>Ad</sup>	82.29 ± 0.46 <sup>Cc</sup>	23.14 ± 0.03 <sup>Cc</sup>	92.11 ± 0.82 <sup>Aa</sup>	41.02 ± 0.07 <sup>Aa</sup>	70.81 ± 0.04 <sup>Cd</sup>	37.09 ± 0.04 <sup>Ab</sup>
Cosmos	85.51±1.34 <sup>Bb</sup>	3.12±0.12 <sup>Bd</sup>	89.65 ± 0.49 <sup>Aa</sup>	40.65 ± 0.07 <sup>Aa</sup>	70.38 ± 0.17 <sup>Bd</sup>	27.39 ± 0.05 <sup>Bb</sup>	72.28 ± 1.06 <sup>Bc</sup>	13.63 ± .09 <sup>Dc</sup>
Peppermint	48.65±1.57 <sup>Cc</sup>	1.34±0.07 <sup>Cd</sup>	87.04 ± 0.33 <sup>Ba</sup>	28.57 ± 0.07 <sup>Ba</sup>	59.33 ± 0.48 <sup>Cb</sup>	16.35 ± 0.07 <sup>Cb</sup>	4.89 ± 0.91 <sup>Hd</sup>	11.25 ± 0.03 <sup>Ec</sup>
Green shallot	13.81±0.78 <sup>Hd</sup>	0.33±0.00 <sup>Hd</sup>	34.44 ± 0.51 <sup>Gc</sup>	9.32 ± 0.09 <sup>Hb</sup>	36.08 ± 0.83 <sup>Ib</sup>	8.79 ± 0.07 <sup>Gc</sup>	42.96 ± 0.79 <sup>Fa</sup>	13.77 ± 0.07 <sup>Ca</sup>
Galangal	30.14±0.65 <sup>Ed</sup>	0.54±0.01 <sup>Gd</sup>	32.82 ± 0.51 <sup>Hc</sup>	6.45 ± 0.05 <sup>Ib</sup>	39.74 ± 0.88 <sup>Hb</sup>	7.22 ± 0.07 <sup>Ha</sup>	47.72 ± 0.92 <sup>Ea</sup>	0.84 ± 0.01 <sup>Ic</sup>
Culantro	23.66±0.56 <sup>Fc</sup>	0.68±0.09 <sup>Fd</sup>	73.06 ± 1.19 <sup>Da</sup>	9.29 ± 0.03 <sup>Ha</sup>	39.69 ± 1.00 <sup>Hb</sup>	6.09 ± 0.03 <sup>Ic</sup>	23.14 ± 1.25 <sup>Gc</sup>	6.47 ± 0.05 <sup>Fb</sup>
Lemongrass	19.14±0.72 <sup>Gd</sup>	0.28±0.01 <sup>Id</sup>	41.86 ± 0.32 <sup>Fb</sup>	10.35 ± 0.07 <sup>Fa</sup>	54.59 ± 1.43 <sup>Ea</sup>	5.2 ± 0.05 <sup>Jb</sup>	42.53 ± 1.18 <sup>Fb</sup>	5.13 ± 0.03 <sup>Gb</sup>
Bergamot	32.98±0.84 <sup>Dd</sup>	1.12±0.04 <sup>Dd</sup>	48.76 ± 0.57 <sup>Ec</sup>	16.04 ± 0.07 <sup>Da</sup>	55.80 ± 0.73 <sup>Da</sup>	14.47 ± 0.07 <sup>Db</sup>	51.79 ± 0.34 <sup>Db</sup>	15.98 ± 0.03 <sup>Ba</sup>
Chili	32.46±0.92 <sup>Dc</sup>	0.22±0.01 <sup>Id</sup>	3.45 ± 0.17 <sup>Kd</sup>	12.49 ± 0.07 <sup>Eb</sup>	49.79 ± 1.08 <sup>Gb</sup>	10.2 ± 0.07 <sup>Ec</sup>	72.91 ± 1.02 <sup>Ba</sup>	13.63 ± 0.05 <sup>Da</sup>
Garlic	11.98±1.21 <sup>Ic</sup>	0.81±0.02 <sup>Ed</sup>	28.14 ± 0.81 <sup>Ia</sup>	2.28 ± 0.07 <sup>Jc</sup>	18.56 ± 0.90 <sup>Jb</sup>	2.77 ± 0.07 <sup>Kb</sup>	5.19 ± 0.27 <sup>Hd</sup>	3.23 ± 0.05 <sup>Ha</sup>
Cilantro	23.54±0.79 <sup>Fc</sup>	0.4±0.01 <sup>Hd</sup>	17.82 ± 0.57 <sup>Jd</sup>	9.49 ± 0.03 <sup>Gb</sup>	52.04 ± 0.62 <sup>Fb</sup>	9.46 ± 0.05 <sup>Fb</sup>	74.84 ± 0.42 <sup>Aa</sup>	11.31 ± .05 <sup>Ea</sup>

\*Means with different capital letters among columns are significantly different (p<0.05). Means with different smallletters among rows are significantly different (p<0.05)

**Table 3.** Sensory evaluation of Laabplatong for all 15 formulae

Formula	Sensory evaluation					
	Color	Appearance	Order	Saltiness	Overall taste	Overall acceptance
1	3.2±1.8 <sup>a</sup>	5.1±1.5 <sup>bcd</sup>	5.6±1.6 <sup>bc</sup>	4.4±1.8 <sup>abc</sup>	5.1±1.2 <sup>bcd</sup>	5.1±1.0 <sup>bc</sup>
2	3.2±1.6 <sup>a</sup>	3.2±1.7 <sup>a</sup>	3.5±2.0 <sup>a</sup>	3.6±2.1 <sup>a</sup>	3.2±1.5 <sup>a</sup>	3.5±1.6 <sup>a</sup>
3	5.9±1.3 <sup>de</sup>	5.4±1.4 <sup>cde</sup>	5.6±1.4 <sup>bc</sup>	5.3±1.3 <sup>bc</sup>	6.0±1.4 <sup>def</sup>	6.2±1.1 <sup>def</sup>
4	4.4±1.3 <sup>bc</sup>	4.4±1.3 <sup>b</sup>	4.6±1.3 <sup>b</sup>	4.4±1.3 <sup>ab</sup>	4.5±1.2 <sup>b</sup>	5.0±1.6 <sup>bc</sup>
5	5.0±1.2 <sup>c</sup>	4.7±1.5 <sup>bc</sup>	5.3±1.8 <sup>bc</sup>	5.2±1.3 <sup>bc</sup>	5.6±1.6 <sup>cde</sup>	5.6±1.6 <sup>bcd</sup>
6	6.4±1.2 <sup>d</sup>	6.2±1.3 <sup>e</sup>	6.4±1.2 <sup>d</sup>	6.0±1.4 <sup>d</sup>	6.7±1.0 <sup>e</sup>	7.0±0.9 <sup>def</sup>
7	5.0±1.2 <sup>c</sup>	5.2±1.7 <sup>bcd</sup>	5.8±1.4 <sup>cd</sup>	4.9±1.5 <sup>bc</sup>	5.3±1.5 <sup>bcd</sup>	5.3±1.2 <sup>bcd</sup>
8	5.9±1.4 <sup>cd</sup>	5.8±1.2 <sup>de</sup>	5.3±1.5 <sup>bc</sup>	5.4±1.3 <sup>c</sup>	5.6±1.4 <sup>cde</sup>	5.7±1.8 <sup>bcd</sup>
9	5.1±1.1 <sup>cd</sup>	5.4±1.7 <sup>cde</sup>	4.9±1.8 <sup>bc</sup>	5.0±1.3 <sup>bc</sup>	5.8±1.3 <sup>cde</sup>	5.8±1.0 <sup>cde</sup>
10	4.1±0.8 <sup>b</sup>	4.4±1.5 <sup>b</sup>	5.1±1.4 <sup>bc</sup>	4.6±1.4 <sup>abc</sup>	5.0±1.5 <sup>bc</sup>	5.0±1.6 <sup>bc</sup>
11	5.2±1.6 <sup>cd</sup>	5.3±1.1 <sup>bcd</sup>	5.0±1.1 <sup>bc</sup>	5.2±1.4 <sup>bc</sup>	5.2±1.4 <sup>bcd</sup>	5.7±1.3 <sup>bcd</sup>
12	6.2±1.2 <sup>d</sup>	5.6±1.5 <sup>cde</sup>	5.8±1.4 <sup>cd</sup>	5.4±1.4 <sup>c</sup>	6.1±1.4 <sup>ef</sup>	6.3±1.4 <sup>def</sup>
13	5.9±1.2 <sup>de</sup>	6.0±1.3 <sup>de</sup>	4.8±2 <sup>bc</sup>	5.0±1.6 <sup>bc</sup>	6.0±1.2 <sup>def</sup>	5.6±1.4 <sup>bcd</sup>
14	4.8±1.5 <sup>bc</sup>	5.0±1.4 <sup>bcd</sup>	5.2±1.9 <sup>bc</sup>	4.5±1.5 <sup>abc</sup>	5.0±1.5 <sup>bc</sup>	4.8±1.1 <sup>b</sup>
15	3.2±1.8 <sup>a</sup>	3.0±1.6 <sup>a</sup>	3.1±1.5 <sup>a</sup>	4.3±1.8 <sup>a</sup>	3.5±1.6 <sup>a</sup>	3.4±1.6 <sup>a</sup>

\*Means with different letters among columns are significantly different (p<0.05).

**Table 4.** Moisture retention  $a_w$  and color of the three most acceptable formulae

Formula	Moisture retention	$a_w$	Color		
			L*	a*	b*
3	9.55 ± 0.36	0.43 ± 0.03	46.36 ± 0.14	-0.28 ± 0.03	22.45 ± 0.12
6	9.37 ± 0.12	0.43 ± 0.01	48.74 ± 0.19	-0.03 ± 0.02	24.42 ± 0.07
12	9.62 ± 0.22	0.44 ± 0.02	48.92 ± 0.12	-0.06 ± 0.04	24.63 ± 0.09

**Table 5.** DPPH radical scavenging activity (%) and total phenolic content (mg GAE/g dry sample)

Formula	DPPH (%)	TPC (mg GAE/g dry sample)
3	92.67±0.39 <sup>a</sup>	5.10±0.01 <sup>a</sup>
6	91.69±0.35 <sup>b</sup>	3.69±0.04 <sup>b</sup>
12	91.17±0.36 <sup>b</sup>	3.65±0.17 <sup>b</sup>

\*Means with different letters among columns are significantly different (p<0.05)

DPPH radical scavenging and total phenolic content (TPC) of the most acceptable formulae (3, 6, and 12) are shown in Table 5. The DPPH value and TPC of formula 3 were  $92.67 \pm 0.39\%$  and  $5.10 \pm 0.01$  mg GAE/g dry sample respectively, higher than that both formulae 6 and 12.

## Conclusions

The most acceptable herbs were found to be Vietnamese mint: phakphaew and wild cosmos: phak garn gong (*Cosmos caudatus*). Drying at  $55^\circ\text{C}$  gave the highest TPC value. The most acceptable formula for Laab seasoning powder mix was fish meat containing chili powder 2.5 g, salt 2.5 g, ground roasted glutinous rice 5.5 g, dried Vietnamese mint 3.5 g, and dried wild cosmos 1 g which gave an overall acceptance score from 25 consumers at  $6.2 \pm 1.1$ . The seasoning powder mix had a moisture content of 9.55% and  $a_w$  equal to 0.43. Antioxidant as % DPPH radical scavenging activity and total phenolic content (mg GAE/g dry sample) were  $92.67 \pm 0.39$  and  $5.10 \pm 0.01$ , respectively.

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