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Development of Miang Kham (Savoury Leaf Wraps) Snack

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Processing ingredients could be used to improve the quality and longer shelf life of Miang Kham snack. Glucose syrup, maltodextrin and hydrocolloid were used to develop formula and process of Miang Kham snack to obtain new ready to eat products acceptable by the consumers. The quality of product containing glucose syrup (0, 3.3, 6.6% (w/w)) was found that the hedonic score in terms of odour, taste, texture and overall liking were different ($p<0.05$). For the effect of added maltodextrin (0, 1.6, 3.3% (w/w)), the samples with addition of maltodextrin had significant effect ($p<0.05$) on texture and overall liking score. The quality of the products containing both maltodextrin (3.3%) and hydrocolloid (binder) (0, 5, 10, 15% (w/w)) was tested. The results revealed that the samples with addition of binder had significant effect ($p<0.05$) on texture and overall liking score, product with 5% binder obtained the highest overall liking score. The sorption isotherm (30°C) of of Miang Kham snack containing both maltodextrin and binder exhibited the lower moisture content at the same aw than those of no containing product. The drying at 80°C for 1 h after product forming provided highest all sensory acceptability.

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Introduction

"Miang Kham" is a traditional snack translates to "one bite wrap" from Miang (food wrapped in leaves) and Kham (a bite). Mostly consists of roasted coconut, peanut, dried shrimp, ginger, shallot, lime, chili topped with the sauce wrapping into Chaplu leaves. Miang Kham is popularity not only for their taste but also for their bioactive components from herbs and spices. Ginger and shallot have been reported is an excellent source of pungent bioactive phenolic, much knowledge on the health beneficial biological activities and its bioactive constituents (Sekiwa et al., 2000; Leelarungrayub et al., 2006; Srinivasan, 2017). In addition, Chaplu leaves has been investigated for a number of pharmacological activities such as antiamoebic, antibacterial, antineoplastic, neuromuscular blocking, hypoglycemic, antimalarial, antioxidant, anti-tuberculosis and antiagiogenic (Hussain et al., 2009). However, social structure and lifestyle have changed to an urban society, resulting in the changes of eating patterns from a traditional Thai eating to the convenience foods. There are some commercially crispy Miang Kham produced in Thailand, but the problem is the products containing high sugar, stickiness and short-term of shelf life.

The application of a carbohydrate polymer in food products is another possible technique widely used in the food industry for retarding hygroscopicity (Telis and Martínez-Navarrete, 2009). Maltodextrin, a compounds derived from acid or enzymatic hydrolysis of starch containing oligomers or/and polymers of (1,4) D-glucose, with a dextrose equivalent (DE) less than 20 (Chronakis, 1998), is often used in dehydrated products to decrease the stickiness and increase product stability (Roos and Karel, 1991). Valenzuela and Aguilera (2015) reported that the addition of maltodextrin decreased the hygroscopicity of apple leather strips evaluated by sorption isotherms studies.

Sorption isotherms describe the relationship between water content and water activity. The knowledge of moisture sorption characteristics of products would allow correctly specifying the conditions of storage and packaging, predicting shelf life and understanding the physicochemical changes involved in products manufacturing processes (Tunc and Duman, 2007). Hydrocolloid is another processing ingredient to improve the functional properties like viscosity, water binding capacity and emulsion stability (Rimac et al., 2004). Armstrong and Barringer (2013) reported that hydrocolloids include gellan gum, kappa-carrageenan, methylcellulose, gum karaya, gum tragacanth, gum arabic, guar gum, modified starch, and maltodextrin can be used to replace oil and sugar to adhere powders and small particulates, such as seasonings to a cracker surface.

In this study, we applied processing ingredients to enhance the quality and longer shelf life of Miang Kham snack. Therefore, sorption isotherm has been studied of predicting shelf life of the products. The objectives of this study were to develop formula and process of Miang

Kham snack to obtain new ready to eat products acceptable by the consumers. The processing ingredients such as glucose syrup, maltodextrin and hydrocolloid were also investigated.

Materials and Methods

Materials

All ingredients were purchased from a local market in Pathum Thani province and stored at 4°C. Maltodextrin DE10 (Tate and Lyle, USA) and hydrocolloid (binder) (Add-Here®CSA; USA) and all other reagents used were of analytical grade.

Preparation of ingredients

For dried ingredients, roasted coconut was prepared by cutting coconut meat into strips and drying at 170°C for 45 min. Roasted peanut was also drying at the same drying condition and grinding to obtain 5-7 mesh ground peanut. Ginger, shallot and hot chili was peeled and stem out, washed and diced into 0.5 cm^3 cubes and drying at 65°C for 70 min. Chaplu leaves was prepared by cutting into strips and drying at 60°C for 3 h and grinding to obtain 5-7 mesh flakes. Dried shrimp was soaked in 0.01% $NaHCO_3$ for 5 min and drying at 105°C for 30 min. All dried prepared was analyzed for moisture content and water activity (a_w).

Development of ready-to-eat Miang Kham

Completely randomized design (CRD) was used to study glucose syrup content (0, 3.3, 6.6 % (w/w)) to prepare Miang Kham sauce. The control formulation is presented in Table 1. The effect of maltodextrin (0, 1.6, 3.3% (w/w)) and hydrocolloid (binder) (0, 5, 10, 15% (w/w)) were also investigated by replacing in the sauce to improve the quality and longer shelf life. The forming ratio between dried ingredients and Miang Kham sauce was 1:1. After product forming, the effect of four levels of drying time (0, 1, 2, 3 h) at 80°C was also study. Miang Kham products were analyzed for moisture content, water activity (a_w), texture and sorption isotherm. Sensory evaluation in attributes of colour, odour, taste, texture and overall liking with a 9-point hedonic scale (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely) was performed by using 30 untrained panels to select the optimal formulation. The developed Miang Kham snack was finally analyzed for proximate and consumer acceptance test.

Quality determination

Moisture content and water activity

Moisture content and water activity of products were determined using hot air oven method (adapted from AOAC, 2000) at 105°C for 8 h or until constant weight was obtained. The water activity (a_w) of each sample was measured at 25°C using a water activity instrument (AquaLab Series 3; Pullman WA, USA).

Colour

The tridimensional *L*a*b** colour space was used as discussed in detail by Chaethong et al., (2012). Surface colours were measured as reflected colour in the CIE *L*a*b** using a Colour Reader (Minolta CR-10; Osaka, Japan) Measurements were performed in triplicate for each treatment.

Table 1. Composition of the control Miang Kham sauce

Ingredients	Control (%(w/w))
Palm sugar	58.7
Water	29.3
Fish sauce	4.2
Ginger	1.8
Galangal	1.8
Shrimp paste	1.8
Lemon grass	1.2
Shallot	0.8
Roasted peanut	0.5

Texture

Textural quality of the snack samples was examined for compression force by using a TA-XT plus texture analyzer (Stable micro system, UK). P/36R compression probe (36 mm i.d.) was applied to measure compression force required for samples breakage which indicates hardness. Testing condition was 2.0 mm/s test speed. Each measurement was conducted on 10.0 mm distance of individual piece and 10 pieces were measured for averaging.

Sorption isotherms

Sorption isotherms were prepared by equilibrating about 2.0 g samples at 30°C in air humidity tight plastic containers containing saturated salt solutions. The salts used were: LiCl (a_w, = 0.113), $MgCl_2$ (a_w, = 0.324), K_2C0_3 (a_w, = 0.432), $Mg(N0_3)_2$ (a_w, = 0.514), KI (a_w, = 0.679), NaCl (a_w, = 0.751), KCl (a_w, = 0.836) and K_2SO_4 (a_w, = 0.970) (Greenspan, 1977). The weight of each sample was checked using an analytical balance (with the precision of 0.001 g) at 2 day intervals until a constant weight was reached. The equilibrium moisture contents were reported on dry weight basis (g water/g dry solid).

Sensory acceptability

Sensory evaluation was undertaken 24 h after forming with thirty untrained panellists recruited from Rangsit University. They were briefly instructed on the testing procedure, each samples coded with a three-digit random codes and presented to consumers in a randomized order. Panellists were given water to rinse their palate, to reduce sensory fatigue. Panellists were instructed to evaluate product acceptability of colour, odour, taste,

texture, overall liking using a 9-point hedonic scale (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely) (Peryam and Pilgrim, 1957) for each sample was rated before proceeding to the next one.

Consumer acceptance test of developed Miang Kham snack was performed using consumers (n = 100) randomly recruited from Rangsit University and population in Pathum Thani, Thailand at Central Location Test (CLT). Panelists were 18-65 years old, had ever eaten Miang Kham. Panelists rated 5 attributes consist of colour, odour, taste, texture, overall liking using a 9-point hedonic scale and were asked buying decision.

Nutritional analysis

Nutritional composition was determined for developed Miang Kham product including protein, fat, total dietary fiber and ash using AOAC (2000).

Statistical analysis

The results were reported as the mean value ± standard deviation. The data were subjected to analysis of variance (ANOVA) using the SPSS V.12 statistical software package (SPSS (Thailand) Co., Ltd., Bangkok). Duncan's multiple range test at 5% probability was applied to determine significant differences among the means of treatment parameters.

Results and Discussion

Physico-chemical properties of dried ingredients

Moisture content, water activity and color of prepared dried ingredients, such as roasted coconut, roasted peanut, dried ginger, dried shallot, dried hot chili, dried Chaplu leaves and dried shrimp are shown in Table 2. The moisture content and water activity of dried Miang Kham ingredients were in the range of 0.7–6.5% and 0.20–0.39, respectively.

Table 2. Physico-chemical properties of dried prepared ingredients of Miang Kham

Physico-chemical properties	Roasted coconut	Roasted peanut	Dried Ginger	Dried shallot	Dried chili	Dried Chaplu leaves	Dried shrimp
MC (%, wb)	1.22±0.01	0.77±1.85	6.53±0.05	1.14±0.13	4.49±0.19	6.32±0.97	6.15±0.82
a_w	0.38±0.03	0.24±0.01	0.26±0.00	0.22±0.01	0.20±0.00	0.39±0.03	0.30±0.03
*L**	57.1±1.1	62.2±0.9	58.7±1.1	57.6±0.8	43.1±0.6	46.1±0.6	56.3±1.2
*a**	6.9±1.4	5.2 ±0.3	58. ±1.1	6.1±0.2	-4.5±0.1	-5.2±0.6	5.5±0.6
*b**	19.3±0.2	19.5±0.6	11.8±0.6	7.6±0.9	9.9±0.6	7.8±0.6	15.7±0.8

* Means in the same row with different lower-case letters are significantly different (P≤0.05)

Development of ready-to-eat Miang Kham

The ingredients affecting product qualities and to develop product to meet consumer acceptance were investigated. The results revealed that the hedonic score in terms of odor, taste, texture and overall liking of Miang Kham product containing glucose syrup (0, 3.3, 6.6% (w/w)) were different (P<0.05). The product adding 3.3% glucose syrup showed the highest overall liking score of like moderately (7.4). For the effect of added maltodextrin, Miang Kham snack was formed by syrup containing 0, 1.6, 3.3% (w/w) maltodextrin.

Table 3. Sensory acceptability of Miang Kham obtained from different binder concentration

Sensory acceptability	0%	5%	10%	15%
Colour	5.93 ± 1.04a	6.43 ± 0.81a	6.33±0.80a	6.13 ± 0.97a
Odour	6.03 ± 1.12a	6.47 ± 1.22a	6.00±1.31a	6.67 ± 1.21a
Taste	6.40 ± 1.00b	7.07 ± 1.20a	6.60 ± 1.16ab	6.93 ± 1.29ab
Texture	6.47 ± 0.93b	7.40 ± 1.22a	7.03 ± 0.80ab	6.77 ± 1.33b
Overall liking	6.37 ± 0.80b	7.40 ± 1.10a	6.60±1.03b	6.67 ± 1.18b

* Means in the same row with different lower-case letters are significantly different (P≤0.05)

The samples with addition of maltodextrin had significant effect (P<0.05) on texture and overall liking score while product with 3.3%maltodextrin obtained the highest overall liking score of like moderately (7.7). The sensory acceptability of the products containing glucose syrup (3.3%), maltodextrin (3.3%) and with varied hydrocolloid (binder) contents (0, 5, 10, 15% (w/w)) are shown in Table 3. The results revealed that the samples with addition of binder had significant effect (P<0.05) on texture and overall liking score, product with 5% binder obtained the highest overall liking score.

The equilibrium moisture contents of the samples without additives and with maltodextrin and binder at 30°C are presented in Fig. 1. The equilibrium water contents of almost Miang Kham products containing both maltodextrin and binder at a given water activity were lower than those of no containing product which supports the work of Valenzuela and Aguilera (2015) who observed a similar decrease in the hygroscopicity of apple leather strips with the addition of maltodextrin and evaluated by sorption isotherms studies. Farahnaky et al., (2016) reported similar result of date syrup powder, due to the fact that maltodextrin can contribute to reduce the hygroscopic behavior. The presence of maltodextrin in date syrup powder probably modified the balance hydrophilic/hydrophobic sites, promoting a less amount of absorbed water. Considering the added biopolymers, the water sorption process also involves structural changes of the polymer matrix due to swelling (Peírez-Alonso et al., 2006).

Table 4. Consumer acceptability score of developed Miang Kham snacks (*n* = 100)

Sensory attributes	Mean ± SD	Liking score
Colour	7.09±1.10	Like moderately
Odour	7.23±1.17	Like moderately
Taste	7.41±1.16	Like moderately
Texture	7.11±1.20	Like moderately
Overall liking	7.19±1.08	Like moderately

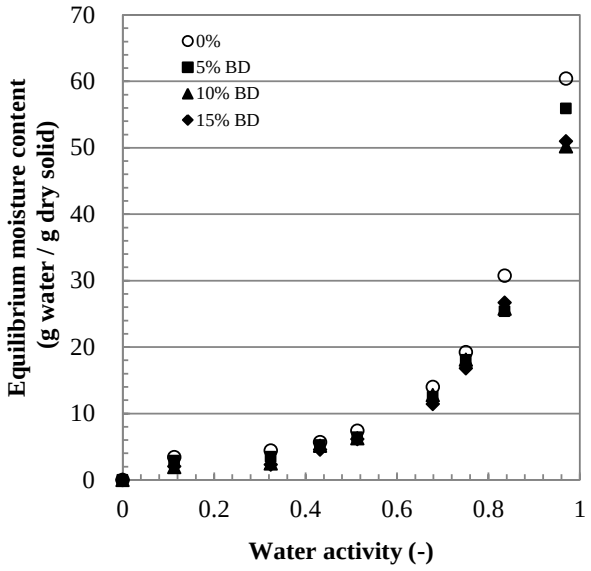

Fig. **1.** Equilibrium moisture content of Miang Kham products without (0%) and with glucose (3.3%), maltodextrin (3.3%) and binder (5, 10, 15% (w/w)) at 30°C

The study of optimal drying time at 80°C for 0, 1, 2, 3 h after product forming showed that 1 h drying provided highest all sensory acceptability and with 191.25 N of product hardness. The chemical composition of developed Miang Kham product were 5.22% of moisture, 0.37 a_w, 17.80% protein, 9.85% fat, 8.71% total dietary fiber and 2.25% ash.

For consumer acceptance test of developed Miang Kham snack was performed using consumers (*n* = 100). Results for consumer acceptance as recorded on a 9-point hedonic scale consist of colour, odour, taste, texture, overall liking are presented in Table 4. All product attributes of the developed Miang Kham snack were all above 7.0 on the 9-point scale, indicating like moderately in product acceptance. Consumers were asked to make a buying decision which at least 78% of consumers would possibly purchase the product.

Conclusions

The developed Miang Kham snack was formed with 1:1 ratio between dried ingredients and Miang Kham sauce with addition of 3.3%glucose syrup, 3.3%maltodextrin and 5%binder. Processing ingredients such as glucose syrup, maltodextrin and hydrocolloid could be used to improve the product quality and longer shelf life for lower water content and water activity. However, shelf life test should be study to compare the product stability of with and without processing ingredients. The information gained in this study could be applied for product development in snack food industry.

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Conflict of Interest

All the authors declare that they have no conflict of interest.

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