

Chemical properties and sensory characteristics of tomyum puffed rice

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ABSTRACT: The present paper examines the chemical properties and sensory characteristics of a product made from glutinous rice flour. Tomyum puffed rice was made with glutinous rice flour and seasoned with tomyum powder. The purpose of this study was to investigate the quality characteristics of tomyum puffed rice. Four treatments consisted of a control with no tomyum flavor added (TYN), puffed rice with tomyum broth (TYB), puffed rice with tomyum powder (TYP) and puffed rice admixed with tomyum powder (TYM). Proximate analysis measured moisture, fat, protein and ash. Results showed no significant difference ($P < 0.05$) among the samples. The panelists evaluated each sensory characteristic of the samples using a 5-point hedonic scale. TYM had the highest score for overall acceptability. The acceptability of the remaining samples was in descending order, TYP > TYB > TYN. Color values were expressed as L^* , a^* , b^* . All samples had L^* values less than TYN. Additionally, all samples had a^* values higher than TYN. Lipid oxidation was evaluated through measurement of thiobarbituric acid (TBA) values. The values of TBA were not significantly different ($P < 0.05$) among all samples for the first 3 months of storage at 25°C. However, TYN parameters slowly increased after 5 and 6 months of storage.

Keywords: puffed rice, tomyum, chemical composition, sensory evaluation, glutinous rice flour

Introduction

Glutinous rice (*Oryza sativa*), also called waxy or sweet rice, is the staple food of Asian people. In Thailand, large quantities are consumed as principal food for daily meals in the north and northeastern parts of the country. Glutinous rice is cooked by steaming after overnight soaking instead of boiling. The long soaking time needed is due to less water uptake value determined in glutinous rice than in non-glutinous rice (Keeratipibul et al., 2008). Guha and Ali (2006) reported that the glutinous rice was suitable material to produce the expanded extrudate rice product such as ready-to-eat snacks and breakfast cereal with low bulk density, high expansion and low shear stress. However, rice has

relatively low protein content (6–8 g/100 g db) and an amino acid profile that is high in glutamic and aspartic acid while lysine is the limiting amino acid (Chaiyakul et al., 2009). Glutinous rice flour (GRF) is produced by soaked glutinous rice through grinding into powder. Due to the low content of amylase (0–2%, w/w) in GRF, GRF is not easily aged and the cooked glutinous rice is stickier softer and easier to adhere together (Goa et al., 2014).

Snack foods are foods which can be eaten in place of, or between meals. They are convenient because they are quick and easy to eat. The term 'snack food' does not only apply to some of the newer products such as potato crisps, but it also includes many traditional food items (Bawa and Sidhu, 2003). Puffed rice is commonly used in

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ready-to-eat breakfast cereals, cereal drinks, infant foods and snack product (Maisont and Narkrugsa, 2010). Recently, phytochemicals in food materials and their effects on health, especially the suppression of active oxygen species by natural antioxidants from teas, spices and herbs, have been extensively studied (Ho et al., 1994). Tomyum powder is a manufactured seasoning product made by evaporating tomyum soup to dryness. Mixture of Thai herbal as ingredients of tomyum powder includes lemongrass, kaffir lime leaves, Galangal etc. These have antioxidant properties. The effect of adding tomyum powder of puffed rice, it extends the shelf life longer.

Therefore, the purpose of this study was to compare the effect of three independent variable (puffed rice with tomyum broth (TYB), puffed rice with tomyum powder (TYP) and puffed rice ad-

mixed with tomyum powder (TYM)) on the puffed rice qualities.

Materials and Methods

Ingredients

Glutinous rice flour (Thai flour Industry CO, LTD., Bangkok, Thailand), soybean oil and tomyum powder (Atip, Bangkok, Thailand) were purchased in local shops.

Sample preparation

The puffed rice formulation containing 4 different treatments is shown in **Table 1** TYN (control samples) were also prepared and method likes other samples but without the addition of tomyum powder.

Table 1 Formulation for the puffed rice

Formulation	TYN	TYB	TYP	TYM
glutinous rice flour (cup)	3/4	3/4	3/4	3/4
soybean oil (tablespoon)	1	1	1	1
hot water (cup)	1/3	1/3	1/3	1/3
tomyum powder (tablespoon)	-	2	2	2

Puffed rice with tomyum broth (TYB)

Mix the tomyum powder with hot water until solution. Then, sift the glutinous rice flour into the bowl. Gradually add tomyum broth into the glutinous rice flour and thresh flour until the homogenous. Add soy bean and thresh the dough. Roll the dough into a sheet and press a round shape with mold (diameter 4 cm.). Steam for 15 minutes. Dry by hot air oven at 60 °C, 6 hours. After that,

bake the dough with electric oven (Zanussi, Model.ZOT105KX, Thailand) 200 °C, 10 minutes.

Puffed rice with tomyum powder (TYP)

Mix the tomyum powder with glutinous rice flour. Then, sift the glutinous rice flour into the bowl. Gradually add hot water into the glutinous rice flour and thresh flour until the homogenous. Add soy bean and thresh the dough. Roll the

dough into a sheet and press a round shape with mold (diameter 4 cm.). Steam for 15 minutes. Dry by hot air oven at 60 °C, 6 hours. After that, bake the dough with electric oven (Zanussi, Model. ZOT105KX, Thailand) 200 °C, 10 minutes.

Puffed rice admixed with tomyum powder (TYM)

The first, sift the glutinous rice flour into the bowl. Gradually add hot water into the glutinous rice flour and thresh flour until the homogenous. Add soy bean and thresh the dough. Roll the dough into a sheet and press a round shape with mold (diameter 4 cm.). Steam for 15 minutes. Dry by hot air oven at 60 °C, 6 hours. After that, bake the dough with electric oven (Zanussi, Model. ZOT105KX, Thailand) 200 °C, 10 minutes. Then, the puffed rice was placed in the bowl and admixed with tomyum powder.

Chemical properties

Proximate composition

Proximate composition analysis of the tomyum puffed rice was performed according to AOAC (AOAC, 2000). Moisture, protein, fat and ash parameters were determined in triplicate from product of puffed rice. The nitrogen conversion factor used for the cure protein calculation was 6.25.

TBA

The 2-thiobarbituric acid (TBA) assay was carried out according to the procedure of Schmedes and Holmer (1989). Puffed rice sample (0.15 g) was mixed with 25 ml. of trichloroacetic acid solution (0.2 g/l of TCA in 100 ml/l n-Butanol solution) and homogenized in a blender for 30 s.

After filtration, 5 ml of the filtrate was added to 5 ml TBA solution in a test tube. The test tubes were incubated at water bath 95 °C in the dark for 2 hrs; then the absorbance was measured at 530 nm by using UV-VIS spectrophotometer (model UV-1200, Shimadzu, Japan). TBA value was expressed as mg malonaldehyde per kg of snack. Bank was no sample.

Physical properties

Color measurement of products

The color of tomyum puffed rice was measured using a Miniscan EZ (Hunter Associates Laboratory Inc., USA) base on CIE system. The sample was taken in the sample holder and the surface color was measured at three different positions. The average value of three measurements was reported. Color reading was displayed as $L^*a^*b^*$ values (CIE, 1976) where L^* represents lightness/darkness dimension, positive and negative a^* value indicates redness and greenness, respectively and b^* indicates yellowness for positive and blueness for negative values (Huntchings, 1994).

Sensory properties

Sensory evaluation for tomyum puffed rice was determined according to the method of Shen et al. (2014). Thirty panelists are from students and staffs of Food and services, Faculty of Technology, Udon Thani Rajabhat University, Thailand. The panelists received 4 tomyum puffed rice samples (diameter 4 cm. x 2 pieces x 4 treatments) to evaluate their appearance, color, flavor, crispness and overall acceptance. All samples were coded and presented in a randomized arrangement. Sensory assessment was analyzed

using a five-point hedonic scale (1, dislike extremely; 2, dislike; 3, neither; 4, like; 5, like extremely).

Statistical analysis

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version 12.0 (SPSS Inc., Thailand). The differences among groups were evaluated by a one-way analysis of variance (ANOVA) and Duncan's multiple range tests. All data are reported as means \pm standard deviations (SD).

Results and discussion

Proximate compositions of tomyum puffed rice

Different proximate compositions were found among the tomyum puffed rice (Table 2). The addition of tomyum powder did not significantly affect ($P>0.05$) the moisture content, fat content, protein content and ash content of all samples ranged from 9.35-9.79%, 5.79-5.99%, 6.32-6.53% and 2.33-2.51%, respectively.

Table 2 Proximate compositions of tomyum puffed rice

Samples ^A	Composition (% by dry basis)			
	Moisture (ns)	Fat (ns)	Protein (ns)	Ash (ns)
TYN	9.35 \pm 0.11	5.84 \pm 0.13	6.43 \pm 0.04	2.46 \pm 0.01
TYB	9.36 \pm 0.08	5.79 \pm 0.08	6.53 \pm 0.04	2.33 \pm 0.04
TYP	9.79 \pm 0.05	5.89 \pm 0.08	6.36 \pm 0.06	2.51 \pm 0.08
TYM	9.64 \pm 0.02	5.99 \pm 0.06	6.32 \pm 0.05	2.41 \pm 0.06

Mean values and standard deviations with different letters (^{a,b,c,...}) in the same column indicate significant differences ($P<0.05$)

ns : not significant differences

^A TYN: control with no tomyum flavor added, TYB: puffed rice with tomyum broth, TYP: puffed rice with tomyum powder, TYM: puffed rice admixed with tomyum powder

Measurement of TBA value

TBA value has been used as an indicator of the extent of oxidative rancidity. It is affected by the age of raw material as well as oxidation of fats during processing and storage (AOCS, 1993). Figure 1 showed the effect of different forms of tomyum powder on TBA values in the puffed rice during storage at 25 °C. The values of TBA were not significantly different ($P>0.05$) among all

samples for the first 3 months of storage at 25°C. The TBA values of all samples were constant at first 3 months, ranging from 0.20 in tomyum powder added puffed rice to 0.47 in the control puffed rice. 4 months of storage, TYN (0.50 \pm 0.09) and TYP (0.49 \pm 0.11) have the highest for the TBA values followed by TYB (0.45 \pm 0.06) and TYM (0.39 \pm 0.12), respectively. The results are similar to 5 and 6 months of storage. However, all

samples slowly increased after 5 and 6 months of storage. TYN (0.85 ± 0.09) has the highest for the TBA values followed by TYP (0.79 ± 0.11). TYB and TYM have the least of the TBA values (0.74 ± 0.06)

in the 6 months of storage. The last month of this research found that all the samples start a rancid odor.

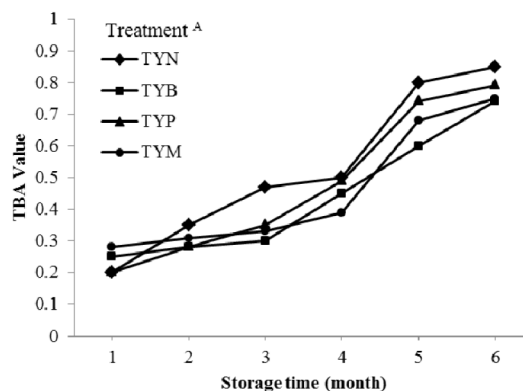


Figure 1 The 2-thiobarbituric acid (TBA) during storage at 25 °C of the experimental tomyum puffed rice for 6 months.

^A The same as **Table 2**.

Table 3 Color values of tomyum puffed rice

Samples ^A	<i>L</i> [*]	<i>a</i> [*]	<i>b</i> [*]
TYN	74.02±0.53 ^a	0.25±0.10 ^c	15.11±0.44 ^d
TYB	55.33±0.67 ^b	18.8±0.34 ^a	37.84±0.37 ^a
TYP	50.48±0.02 ^b	17.41±0.05 ^a	36.14±0.11 ^b
TYM	52.16±0.43 ^b	9.38±0.82 ^b	24.04±0.51 ^c

Mean values and standard deviations with different letters (^{a,b,c,...}) in the same column indicate significant differences ($P<0.05$)

^A The same as **Table 2**

Color values of tomyum puffed rice

Color is one of the most important factors in the quality of food product (Senthil et al., 2002). Result from color evaluation showed that there was a variation in the lightness values among the tomyum puffed rice samples as shown by *L*^{*} values of 50.48 to 74.02. TYN has the most light-

ness values because this treatment was not added the tomyum powder as ingredient. TYB, TYP and TYM were the lightness values was not significant ($P>0.05$). TYB and TYP have the highest for *a*^{*} values, followed by TYM and TYN, respectively. *b*^{*} values ranged from 15.11 to 37.84. Maximum *b*^{*} values was TYB (37.84 ± 0.37)

followed by TYP, TYM and TYN, respectively. The effects of the addition of tomyum powder on the a^* values and b^* values were higher than control because colored of tomyum powder is orange-red. When adding to the sample was made, the color of the samples was orange-red. Therefore, The a^* values and b^* values of TYB, TYP and TYM were higher than TYN. It can be seen from the result given in Table 3.

Sensory evaluation

The sensory panels were convened to compare the features of the tomyum puffed rice on the color, flavor, taste, texture and overall acceptability. Figure 2 and Table 4 show the re-

sults of the sensory evaluation score of tomyum puffed rice. All sensory attributes were significantly different ($P < 0.05$). The scores for color were ranged from 3.87 to 3.10 being highest in TYP. TYN has the lowest score color. TYM (3.87 ± 0.11) gave the highest score for the flavor, followed by TYB and TYP whereas TYN has the least score. TYB and TYM have the highest score for the texture contrast TYN and TYP have the least score. TYM has the highest score taste. The overall acceptability scores ranged from 4.13 to 3.18. Maximum acceptability obtained at TYM (4.13 ± 0.19) followed by TYB, TYP and TYN, respectively.

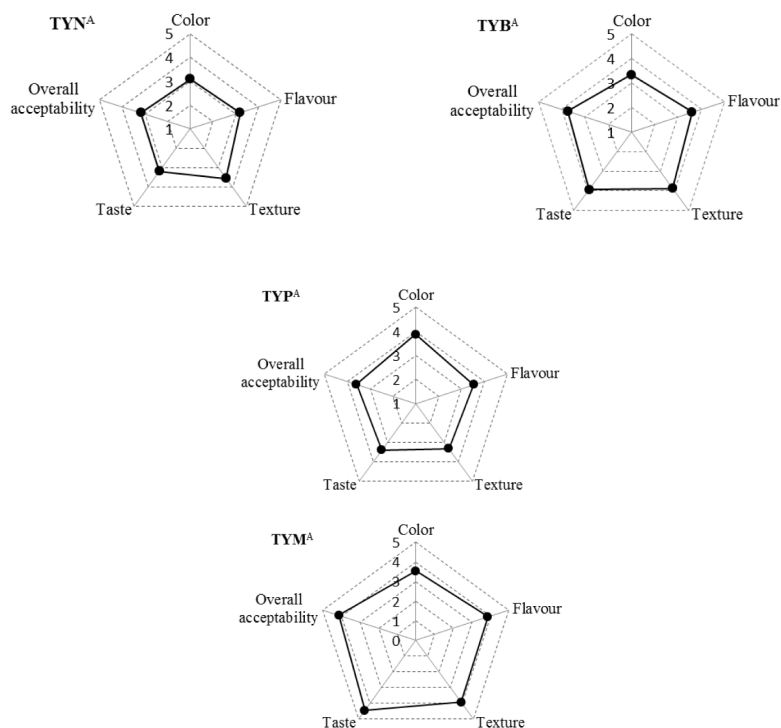


Figure 2 Sensory evaluation score of tomyum puffed rice. The panelists evaluated each characteristic of the sample using a 5-point hedonic scale ($n = 30$; mean \pm SD).

^A The same as Table 2

Table 4 Sensory evaluation score of tomyum puffed rice

Samples ^A	Sensory characteristics				
	Color	Flavour	Texture	Taste	Overall accept- ability
TYN	3.10±0.11 ^d	3.20±0.03 ^c	3.56±0.04 ^b	3.22±0.06 ^d	3.18±0.01 ^d
TYB	3.33±0.09 ^c	3.61±0.10 ^b	3.87±0.04 ^a	3.93±0.04 ^b	3.73±0.04 ^b
TYP	3.87±0.09 ^a	3.53±0.08 ^b	3.33±0.06 ^c	3.40±0.08 ^c	3.62±0.05 ^c
TYM	3.53±0.02 ^b	3.87±0.06 ^a	3.93±0.10 ^a	4.44±0.06 ^a	4.13±0.07 ^a

The panelists evaluated each characteristic of the sample using a 5-point hedonic scale

(n = 30; mean± SD).

Mean values and standard deviations with different letters (^{a,b,c,...}) in the same column indicate significant differences ($P<0.05$)

^A The same as **Table 2**

Conclusion

This study concluded that added tomyum powder had no effect on nutrient composition of puffed rice. All sample was not significantly affect ($P>0.05$). The addition of tomyum powder had no the effect on proximate composition of puffed rice because amount of tomyum powder was too small. But the addition of tomyum powder has the effect on color values of tomyum puffed rice. After, added tomyum powder was found reddish more than control (no added tomyum powder). The effects of the addition of tomyum powder on the a^* values and b^* values were higher than control because colored of tomyum powder is orange-red. When adding to the sample was made, the color of the samples was orange-red. Therefore, The a^* values and b^* values of TYB, TYP and TYM were higher than TYN. The panelists evaluated each sensory characteristic of the samples using a

5-point hedonic scale. Puffed rice admixed with tomyum powder had the highest score for overall acceptability. Moreover, it could also extend the shelf-life of the product up to 6 month. Because the last month of this research found that all the samples start a rancid odor. This is a rancid odor was unwanted by consumers. Therefore, it is suggested that tomyum powder and packing with nitrogen could be used to extend the shelf-life of food products more than 6 months, providing the consumer with food containing natural additives, which might be seen more healthful than those of synthetic origin.

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