PROXIMATE COMPOSITION OF REFORMED CHINESE SAUSAGE STYLE PORK SNACK ADDED WITH MANGOSTEEN RIND OR PULP AND SEED MIX

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I. INTRODUCTION

Kungchiang is a popular Chinese style sausage in Thailand produced from coarsely ground lean pork and backfat mixed together with ingredients before stuffing into natural or artificial casing and dried, but not fully cooked [1]. Despite the high fat content of Kunchiang, frying is required before consumption which is inconvenience and unhealthy for consumers. The sausage was therefore reformed into a jerky-like pork snack without stuffing into casing, fully cooked and ready-to-eat [2]. Dietary fiber components were added into meat products to improve their health and functional characteristics [3]. Mangosteen (*Garcinia mangostana* Linn.) and their byproducts have been long used as pharmaceutical products [4]. The fruit composed of a dark purple rind or pericarp, consisting of a hard outer and a softer inner layer, mainly composing of lignin [5]. Covered by the rind, there are 4-8 soft edible white arils or pulp segments, which surrounded the seeds and are rich sources of dietary fibers [6]. During harvesting, many mangosteen fruits drop on the ground and become unsalable as fresh fruits. The fallen, impacted, or wounded fruits were sold cheaply and used for making jam. For value adding, we added the inner layer of mangosteen rind or pulp and seed mix into ready-to-eat reformed Kunchiang pork snack to increase dietary fibers. The objective of this study was, therefore, to investigate proximate composition of ready-to-eat reformed Chinese style sausage pork snack added with inner layer mangosteen rind or pulp and seed mix powder.

II. MATERIALS AND METHODS

Mangosteen rinds and pulp-seed mix powder preparation

Mangosteen was obtained from an orchard in Chumporn, the south of Thailand, cleaned, and kept at -18°c until production. On the preparation day, frozen mangosteen fruits were thawed for 15-30 min in tab water, dried, cut into halves, and removed the pulps and seeds from the rinds. The outer rinds were removed by thinly sliced. The inner rinds were dried at 100°C in a tray dryer (D-73230, ABC elector) for 6 h, pulverized, and kept frozen until use. The pulps with seeds were immersed in 1% saline solution for 30 min, rinsed with water, squeezed to remove water, and cut into smaller portions. They were dried at 100°C in a tray dryer (D-73230, ABC elector) for 6 h, pulverized to make a powder mixture of pulps and seeds, and kept frozen until use.

Table 1 The formulation of reformed ready-to-eat Kunchiang pork snack produced without added mangosteen (T1), with 2.7% added mangosteen rind (T2), and with 2.7% added mangosteen pulp and seed mix (T3).

Ingredients	T1	T2	T3
Boneless pork *Semimembranosus* (g)	300.0	300.0	300.0
Pork back fat (g)	54.0	54.0	54.0
Sugar (g)	80.0	80.0	80.0
Salt (g)	7.0	7.0	7.0
Sodium nitrite (ppm)	0.04	0.04	0.04
Sodium erythorbate (g)	0.1	0.1	0.1
Mixed phosphate (g)	1.0	1.0	1.0
Mangosteen rind (g)	-	12.0	-
Mangosteen pulp and seed mix (g)	-	-	12.0

Formulation of reformed ready-to-eat Kunchiang and experimental setup

The formulation of reformed ready-to-eat Kunchiang meat snack (Table 1) was prepared as described by [2]. Three experimental treatments consisted of T1 (control without added mangosteen), T2 (2.7% added mangosteen rind), and T3 (2.7% added mangosteen pulp and seed mix). Meat snack processing was performed in three consecutive days. Upon completion of processing and cooling, six pieces of reformed rectangular meat snacks (2.5x4.0x0.6 cm^3) were packaged in a 10x15-cm^2 barrier bag (K-Nylon/LLDPE, Packmart, Thailand), placed with an oxygen absorber sachet (SATO, Keeptogether Co. Ltd., Bangkok,

Thailand), sealed, and kept frozen until proximate composition analysis [7]. The experiment was in Randomized Complete Block Design whereas each processing day is considered as a block. Analysis of Variances and Duncan Multiple Range Tests were performed [8].

III. RESULTS AND DISCUSSION

Proximate composition of reformed ready-to-eat Kunchiang pork snack produced without added mangosteen (T1), with 2.7% added mangosteen rind (T2), and with 2.7% added mangosteen pulp and seed mix (T3) are present in Table 2. There was no effect ($p>0.05$) of added mangosteen rind or pulp and seed mix on ash and crude protein contents of Kunchiang pork snack. But moisture, crude fat, and crude fiber percentages are different ($p<0.05$) among treatments. Reformed ready-to-eat Kunchiang pork snack added with 2.7% mangosteen pulp and seed mix powder (T3) had the highest ($p<0.05$) moisture percentage compared to T1 and T2. As expected, T1 had the highest fat content, while T2 and T3 had slightly lower ($p<0.05$) fat content than T1. In addition, treatments added with mangosteen rind and pulp-seed mix resulted in similar ($p>0.05$) crude fiber contents (1.5% and 1.23%, resepectively), but both treatments resulted in more ($p<0.05$) crude fiber than the control treatment (0.61%). According to [9], increasing dietary fiber of at least 3% in meat products is of interest for the industries in order to meet a nutritional claim as “source of dietary fiber”.

Table 2 Proximate composition of reformed ready-to-eat Kunchiang pork snack produced without added mangosteen (T1), with 4% added mangosteen rind (T2), and with 4% added mangosteen pulp and seed mix (T3).

Chemical composition (%)	T1 (n=3)	T2 (n=3)	T3 (n=3)	SEM[1]	p-value
moisture	27.13[b]	26.47 [b]	28.06[a]	0.15	**0.002**
crude protein	23.54	23.14	23.03	0.17	0.450
crude fat	17.54[a]	16.53[b]	16.18[b]	0.11	**0.001**
crude fiber	0.61[b]	1.50[a]	1.23[a]	0.06	**0.000**
ash	3.59	3.44	3.59	0.03	0.131

[a b] Means in a row with different superscripts differ ($p<0.05$).

1 SEM = standard error of mean

IV. CONCLUSION

The addition of either mangosteen rind or a mixture of pulp and seed at 2.7% of the formula resulted in lower fat content, but increased crude fiber in reformed ready-to-eat Kunchiang pork snack. Although, the increased levels of crude fiber are not high enough to meet the nutritional claim as “source of dietary fiber”. These results showed their potential as functional ingredients in this product for improving health benefit. However, product functional and sensory qualities should be investigated.

REFERENCES

1. Thai Industrial Standards Institute. (1996). Industrial Product Standards: Kunchiang. TIS 914-2539, Effective date May 14, 1996. 9 p.
2. Limsupavanich, R., Manawattanawong, J. & Jitwattanathaworn, P. (2015). Effects of drying temperatures and fat levels on yield and quality of reformed ready-to-eat Chinese sausage style meat snack. In Proceedings of the 61st International Congress of Meat Science and Technology, 23-28 August 2015, Clermont-Ferrand, France.
3. Mehta, N., Ahlawat, S.S., Sharma, D.P. & Dabur, R.S. (2015). Novel trends in development of dietary fiber rich meat products - a critical review. Journal of Food Science and Technology 52(2): 633-647.
4. Yukihiro A., Yoshihito, N., Munekazu, I. & Yoshinori, N. (2008). Anti-cancer effects of xanthones from pericarps of mangosteen. International Journal of Molecular Sciences 9: 355-370.
5. Bunsiri, A., Ketsa, S. & Paull, R.E. (2003.) Phenolic metabolism and lignin synthesis in damaged pericarp of mangosteen fruit after impact. Postharvest Biology and Technology 29: 61-71.
6. Anonymous. (n.d.). Mangosteen nutrition facts. Available online: https://www.nutrition-and-you.com/mangosteen.html. 15 April 2018.
7. AOAC International. (2000). Official methods of analysis. 17th ed. AOAC Inc., Washington, DC.
8. SPSS Inc. (2005). SPSS Statistics 13.0. for Windows, SPSS Inc., Deleware, USA.
9. Kehlet, U., Pagter, M., Aaslyng, M.D., and Raben,A. (2017). Meatballs with 3% and 6% dietary fibre from rye bran or pea fibre - Effects on sensory quality and subjective appetite sensations. Meat Science 125: 66-75.