

Nutrient composition of commercially available extruded rice snacks

(Komposisi nutrien snek beras semprit yang terdapat di pasaran)

I. Khatijah*, J. S. Chia* and H. Patimah*

Key words: extruded rice snacks, nutrient composition, proximate, minerals, vitamins

Abstrak

Empat belas snek beras semprit yang terdapat di pasaran telah dianalisis untuk kandungan tenaga, lembapan, protein, lemak, gentian kasar, abu, kalsium, fosforus, zat besi, natrium, kalium, retinol, β -karoten, tiamina, riboflavin dan asid askorbik. Kiraan untuk kandungan karbohidrat dan vitamin A turut disertakan. Semua nutrien terdapat dalam sampel yang dikaji tetapi pada tahap yang berbeza-beza. Kandungan tenaga, lemak dan natrium dalam kesemua 14 snek beras semprit yang dianalisis tinggi. Penambahan bahan mentah seperti keju atau serbuk keju, tepung susu, serbuk sotong, serbuk kicap, protein sayuran hidrolisis, kacang hijau dan sayur-sayuran untuk meningkatkan perisa dan tekstur mengubah kandungan protein, mineral dan vitamin snek semprit.

Abstract

Fourteen commercially available extruded rice snacks were analysed for energy, moisture, protein, fat, crude fibre, ash, calcium, phosphorus, iron, sodium, potassium, retinol, β -carotene, thiamine, riboflavin and ascorbic acid. Calculated values for carbohydrate and vitamin A were also included. These nutrients were present in the samples studied but in varied amounts. The energy, fat and sodium contents were high in all the 14 samples analysed. The addition of various ingredients such as cheese or cheese powder, milk powder, cuttlefish powder, soy sauce powder, hydrolysed vegetable protein, green beans and vegetables for flavour and texture enhancement, changes the protein, mineral and vitamin contents of the extruded snacks.

Introduction

There has been a world wide increase in the consumption of extruded snacks. Due to the change in eating habits and the growing need of convenient foods, extruded snacks are popular amongst people of all ages. They can be consumed at anytime of the day.

In the world market, there has been a positive indication that extruded snacks will replace nuts in third place, behind chips and

“sticks” (pretzel-type) (Tettweiler 1991).

This forecast is due to the visual advantages and flavouring possibilities as well as the low fat content of the raw materials. This fits in well with the trend towards greater health consciousness.

In Malaysia, the concern about the nutritional content of extruded snacks are highlighted in several reports. Zanariah (1986) presented the nutritive values of several commercial extruded snacks while

*Food Technology Centre, MARDI Headquarters, P. O. Box 12301, 50774 Kuala Lumpur, Malaysia

Authors' full names: Khatijah Idris, Chia Joo Suan and Patimah Hasim

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Aminah et al. (1987) reported the consumption of snack foods by rural primary school children in Kedah. The nutrient content of extruded snacks has also been tabulated by Tee et al. (1988) and reported by Tee et al. (1989).

Extruded snacks are usually starch-based and are industrially processed. The starch-based materials are normally corn, potato, wheat, rice, oat and sweet potato. An extruder is used to process a mixture of one or more starch-based materials with added flavour. Under high pressure and temperature, the mixture is forced out through nozzles under sudden release of pressure. A combination of the amount of pressure and the shape of the expulsion nozzle determines the shape of the product. With rapid development of extruder technology, various sizes and shapes of products are produced, such as rings, stars, curls, lattices and balls. A wide range of flavours, including cheese, paprika, pizza, curry, chicken, fish, meat, cuttlefish, prawn and vegetable, incorporated to add more varieties to the extruded snacks.

This study reports the nutrient composition of 14 commercially available extruded rice snacks. These data can be used as basic information in the development of extruded snacks. In addition, they contribute to the knowledge on nutrient content of food consumed.

Materials and methods

Types of extruded snacks

Fourteen types of commercially available extruded snacks were studied (*Table 1*). Rice was the main ingredient in nine (R1, R2, R3, R7, R8, R9, R11, R13 and R14) of the extruded snacks. The rest (R4, R5, R6, R10 and R12) listed rice as the second ingredient with wheat or corn as the major ingredient. The assumption was made that the first ingredient listed on the label was the main ingredient. Monosodium glutamate (MSG) was stated as an ingredient in seven of the extruded snacks (R1, R2, R3, R4, R7, R8 and R13) while four samples (R5, R6,

R10 and R12) stated the usage of flavour enhancer. The remaining three (R9, R11 and R14) did not mention any usage of MSG or flavour enhancer. Salt was used in 10 of the extruded snacks (R1, R2, R3, R4, R7, R8, R9, R11, R13 and R14).

Sampling

A sample of 500 g of each type of extruded snacks from 5–9 packages, depending on the weight of extruded snack per package, was blended and analysed for various nutrients. Each analysis was carried out in duplicates.

Proximate composition

Analyses for proximate composition were carried out according to the methods of the AOAC (1984) and Tee et al. (1986). Energy was determined by using an adiabatic bomb calorimeter (IKA C4000). Carbohydrate was calculated by difference.

Minerals

The ash residues were dissolved in 1 mL concentrated nitric acid and made up to 100 mL with distilled water for analysis of several mineral contents.

- Sodium and potassium – analysed by using the Technicon Auto-analyser II equipped with a flame photometer (Technicon Auto-analyser II Industrial Method No. 240-72W).
- Phosphorus – analysed by using the Technicon Auto-analyser II using a spectrophotometer as the detector (Technicon Auto-analyser II Industrial Method No. 144-71A).
- Calcium and iron – analysed by using the Varian Atomic Absorption spectrophotometer (Varian Techtron Analytical Methods for Flame Spectroscopy).

Table 1. Description and ingredients used in 14 commercially available extruded rice snacks

Extruded snack	Description#	Ingredients used#
R1	Barbeque and curry flavour, baked	Rice, vegetable oil, potato granules, natural cheese powder, milk powder, sugar, soy sauce powder, salt, whey powder, spices, artificial flavours, hydrolysed vegetable protein, monosodium glutamate, dextrin, citric acid, permitted anti-caking agent, natural flavours, permitted colouring (tartrazine CI No. 19140 and sunset yellow CI No. 15985) and permitted antioxidant
R2	Rice crackers, cuttlefish flavour	Rice, vegetable oil (palm oil), sugar, salt, spices, cuttlefish flavouring, permitted colouring and monosodium glutamate
R3	Barbeque flavour	Rice meal, corn meal, wheat flour, green bean, whole milk powder, salt, sugar, monosodium glutamate, curry powder, mixed flavour and permitted colouring
R4	Cuttlefish-flavoured snack	Wheat flour, rice, corn starch, vegetable oil (palm oil), salt, cuttlefish powder, permitted colouring and monosodium glutamate
R5	Cheese-flavoured snacks, baked	Corn, rice, edible vegetable oil, cheese, permitted flavours, colours E160(e), E160(a) and flavour enhancer
R6	Cheeseburger flavour, baked	Corn, rice, edible vegetable oil, cheese, flavour, colouring (sunset yellow E110 and tartrazine E102) and permitted flavour enhancer
R7	Cuttlefish flavour	Rice, vegetable oil (palm oil), salt, spices, cuttlefish flavouring, permitted colouring and monosodium glutamate
R8	Natural cheese flavour	Rice, vegetable oil, potato granules, natural cheese powder, milk powder, artificial flavours, monosodium glutamate as permitted flavour enhancer, sugar, salt, dextrin, permitted colouring (tartrazine CI No. 19140) and permitted antioxidant
R9	Vegetable flavour	Rice, salad oil, salt, green vegetable, pepper and soy sauce powder
R10	Chicken flavour	Corn, rice, edible vegetable oil, permitted artificial chicken flavour and flavour enhancer
R11	Crispy cheese	Rice, salad oil, salt, cheddar cheese, pepper and soy sauce powder
R12	Cheese snacks	Corn, rice, edible vegetable oil, cheese, permitted colouring (sunset yellow E110 and tartrazine E102) and flavour enhancer
R13	Vegetable flavour	Rice, vegetable oil, potato granules, sugar, salt, curry powder, onion powder, garlic powder, parsley powder, parsley flakes, celery powder, hydrolysed vegetable protein, monosodium glutamate, yeast extract, starch, pepper, spices, food acid and permitted antioxidant
R14	Crunchy rice crackers, cuttlefish flavour	Rice, salad oil, salt, cuttlefish flavour and spices

#Description and ingredients on the labels of the packaging materials

Vitamins

The vitamins were analysed according to the AOAC (1984) methods with slight modification (Tee et al. 1986).

- Vitamin A (retinol) and β -carotene (pro-vitamin A) – analysed by using a spectrophotometer after chromatography on a column of alumina and anhydrous sodium sulphate.
- Total vitamin A activity – by calculation (total vitamin A = μg retinol + μg β -carotene/6) and expressed as retinol equivalents.
- Thiamine (B1) – by using the thiochrome fluorometric method.
- Riboflavin (B2) – analysed by using the fluorometric method.
- Ascorbic acid (C) – analysed by using the indophenol-dye titration method.

Results and discussion

Proximate composition

The energy content of the analysed extruded snacks ranged from 437 to 508 kcal/100 g (Table 2). Lower energy content in R9 was probably due to its low fat content. Being a crispy product, the moisture level of the extruded snacks was expectedly low (0.6–4.5%) except for R7 and R8 which contained slightly more moisture (>5.0%). With the exception of R2, R3 and R6, the protein levels varied within a narrow range

(6.1–8.9%). The cuttlefish flavouring used as an ingredient in R2 might be prepared from raw cuttlefish which contained an appreciable amount of protein. The green bean and whole milk powder in R3 might contribute to its appreciable amount of protein (11.8%). The fat content of these snacks varied from 13.9% to 28.6% while their carbohydrate level was high (57.0–72.7%). Ten of the extruded snacks (Table 2) had more than 20% fat. Besides R2 which contained 1.2% crude fibre, the other 13 extruded snacks had less than 1% crude fibre. The ash content ranged from 2.0% to 5.2%. The high ash content in R14 contributed to its high mineral content (Table 3).

Minerals

The minerals were present in varied amounts. Except for R4 (10 mg sodium/100 g sample), the major mineral in the products was sodium which ranged from 575 to 1 246 mg/100 g sample (Table 3). The extremely large amount of sodium in R13 and R14 could be due to the addition of large quantity of salt (sodium chloride) into the products. Potassium was present within a range of 88 to 264 mg/100 g sample while phosphorus was found to be 53–148 mg/100 g sample. The levels of calcium at 255 mg/100 g sample and iron at 5 mg/100 g

Table 2. Proximate composition of extruded rice snacks

Extruded snack	Energy (kcal/100 g)	Moisture (g/100 g)	Protein (g/100 g)	Fat (g/100 g)	Carbohydrate (g/100 g)	Crude fibre (g/100 g)	Ash (g/100 g)
R1	501	0.6	6.1	21.2	69.9	0.2	2.0
R2	482	1.1	11.6	25.7	57.0	1.2	3.4
R3	473	0.8	11.8	18.1	65.4	0.3	3.6
R4	479	0.7	7.1	16.1	72.7	0.4	3.0
R5	473	2.2	7.2	28.6	59.3	0.1	2.6
R6	482	0.9	4.4	28.6	63.5	0.4	2.2
R7	489	6.9	7.5	21.4	62.1	0.4	2.0
R8	466	5.1	7.4	21.3	63.7	0.1	2.4
R9	437	4.5	7.9	13.9	69.9	0.3	3.5
R10	494	1.2	6.4	26.4	62.6	0.8	2.6
R11	501	2.7	8.1	23.4	62.2	0.1	3.5
R12	508	1.9	6.9	27.7	60.7	0.2	2.6
R13	475	1.4	6.8	23.8	65.4	0.6	2.0
R14	485	2.4	8.9	15.2	67.8	0.5	5.2

Table 3. Mineral composition of extruded rice snacks

Extruded snack	Calcium (mg/100 g)	Phosphorus (mg/100 g)	Iron (mg/100 g)	Sodium (mg/100 g)	Potassium (mg/100 g)
R1	29	98	1.0	636	149
R2	88	42	3.7	768	130
R3	30	105	1.4	810	264
R4	36	136	1.9	10	134
R5	59	111	0.5	807	197
R6	44	95	1.0	671	141
R7	11	140	1.1	–	88
R8	57	142	0.3	679	202
R9	41	130	2.8	575	202
R10	9	53	0.7	–	103
R11	102	148	2.0	685	197
R12	84	118	1.3	883	233
R13	21	95	1.2	1 077	161
R14	255	147	5.0	1 246	159

– Not analysed

Table 4. Vitamin composition of extruded rice snacks

Extruded snack	Retinol ($\mu\text{g}/100\text{ g}$)	β -carotene ($\mu\text{g}/100\text{ g}$)	Vitamin A ($\mu\text{g RE}^*/100\text{ g}$)	Thiamine (mg/100 g)	Riboflavin (mg/100 g)	Ascorbic acid (mg/100 g)
R1	42	38	48	0.1	0.1	19.4
R2	29	23	33	0.1	0.1	8.4
R3	67	65	78	0.5	0.4	7.3
R4	30	23	34	0.1	0.2	9.3
R5	65	55	74	0.2	0.7	11.3
R6	72	83	86	0.5	0.4	17.5
R7	29	63	40	0.1	0.1	14.2
R8	65	45	73	0.1	0.4	9.6
R9	45	24	49	0.5	0.3	14.2
R10	66	110	84	0.4	4.3	8.7
R11	42	61	52	0.1	0.3	13.4
R12	61	70	73	0.2	0.6	13.6
R13	30	35	36	0.5	0.3	22.5
R14	42	60	52	0.2	0.2	12.5

*Retinol equivalent

sample in R14 were of considerable nutritional significance. Besides R14, the other extruded snacks studied contained 9–102 mg calcium per 100 g sample and 0.3–3.7 mg iron per 100 g sample. The high level of calcium in R11 could be due to the addition of cheddar cheese which has a high calcium content. Sample R14 possibly contained other high calcium ingredients which were not listed on the packaging label of the product.

Vitamins

The vitamin A content of the extruded snacks ranged from 33 to 86 $\mu\text{g RE}/100\text{ g}$ sample (Table 4). Both retinol and β -carotene contributed to the total vitamin A activity. The thiamine levels were varied (0.1–0.5 mg/100 g) and four samples (R3, R6, R9 and R13) had 0.5 mg thiamine per 100 g sample. Except R10 which contained 4.3 mg riboflavin per 100 g sample, the level of riboflavin in the other extruded

snacks ranged from 0.1 to 0.7 mg/100 g. The high riboflavin level in R10 could probably be due to the addition of riboflavin or artificial chicken flavour. The chicken flavour might contain substances which could contribute to the measured fluorescence. An appreciable amount of ascorbic acid was also present in the samples analysed (7.3–22.5 mg/100 g sample). The large amount of ascorbic acid in R13 could probably be due to the addition of food acid.

Conclusion

The nutrient contents of the 14 extruded snacks studied showed considerable variations. However, they contained appreciable amounts of nutrients and energy levels. These levels depend on the ingredients used, processing, storage and handling techniques as well as the types of packaging materials used.

With the growing awareness of the nutritional value of foods among consumers, manufacturers of extruded snacks have also realised their responsibilities to produce snacks with some nutritional significance. Thus, some of them resort to fortification of their products with milk powder or hydrolysed vegetable protein to increase the protein content or likewise with various minerals and vitamins.

However, extruded snacks contain high levels of sodium, fat and energy. Therefore, consumers should be made aware of their levels with nutritional labelling on packaging of the products. High intake of sodium is inadvisable as it leads to several health diseases such as hypertension and cardiovascular diseases. Similarly, high intake of fat and hence energy causes obesity. Thus, manufacturers of extruded snacks should be more conscious and make an effort to reduce the fat and sodium content of their products.

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