

## Production of Child Meal from Some Extruded Cereals

Ahmed Ramy M. Abd-Ellatif, Amir A. Ibrahim\* and Gamal H. Ragab

Food Science and Technology Department, National Research Centre, Dokki, Giza, Egypt

\*Corresponding Author: Amir A. Ibrahim, Food Science and Technology Department, National Research Centre, Dokki, Giza, Egypt.

Received: December 04, 2018; Published: January 28, 2019

### Abstract

Food extrusion is considered as one of the most important technologies in snack food industries. The objective of the present study was to use different blends of the extruded yellow corn grits, white corn grits, broken rice-flour and semolina to produce a differed extruded products.

According to chemical and physical evaluations of the extruded blends, it can fulfill about 35 - 40% of daily requirements of some minerals i.e. sodium, zinc and potassium for children (9 - 12 months age) when feed by 100g daily. Also extrusion process improves digestibility and palatability of these products.

**Keywords:** Food Extrusion; Sodium; Zinc; Potassium

### Introduction

Extrusion process has become an important technology in food industries, e.g. manufacture of pasta, ready to eat cereals, snacks and pet foods. Food extrusion is a process in which a food materials i.e. cereals or pre-ground and conditioned ingredients enter the extruder screw where they are conveyed, mixed and heated by a variety of processes. Extruded products are usually puffs and have changes in texture due to the release of steam and normal force to produce a light and crispy texture, porous structure and a pleasant taste. Products are almost sterile and have excellent shelf-life. In Egypt the first application of extrusion process was in 1978.

Imported yellow corn was the main raw material used in this technology. An attempt was carried out to use local white corn (maize) instead of imported yellow corn [1].

The aim of this investigation was to use different blends of the extruded yellow corn grits, white corn grits, broken rice-flour and semolina to produce a differed extruded products.

Physical and chemical evaluations of the blends were carried out.

### Materials and Methods

#### Materials

Extruded products prepared from; yellow corn grits, white corn grits, broken rice flour and semolina [1,2] were used together with different recipes according to their chemical and physical evaluations to prepare a new blend suitable and more palatable for child nutrition.

The suggested recipes were as follows:

- A- 25% extruded broken rice, 25% extruded yellow corn grits, 25% extruded white corn grits and 25% extruded semolina.
- B- 20% extruded broken rice, 50% extruded yellow corn grits, 20% extruded white corn grits and 10% extruded semolina.
- C- 20% extruded broken rice, 20% extruded yellow corn grits, 50% extruded white corn grits and 10% extruded semolina.
- D- 50% extruded broken rice, 20% extruded yellow corn grits, 20% extruded white corn grits and 10% extruded semolina.

**Methods of analyses**

**Chemical analysis**

Suggested extruded blends were chemically analyzed for moisture, protein, fat, curd fiber and ash content according to the methods described in the A.A.C.C [3]. Total carbohydrates were calculated by difference. Zinc, Iron, Calcium, Potassium and sodium were determined using atomic absorption spectroscopy technique as described by A.O.A.C [4].

**Physical properties**

Specific weight, water solubility index, water absorption index, cold- paste viscosity, hot-paste viscosity and cooked-paste viscosity were measured according to the methods recommended by Mercier and feillet [5], Breen., *et al.* [6] and Anderon [7].

**Results and Discussion**

Chemical analysis of the extruded suggested blends are shown in table 1. All blends were characterized by their high carbohydrates content which ranged between 87.39 and 89.41%. However, ether extract, fiber and ash contents, showed a reversible trend when compared with total carbohydrate in all tested samples. Protein content of extruded blend (C) was higher than the other blends.

Component %	Formula No			
	A	B	C	D
Moisture	5.15	5.51	5.26	5.86
Protein	9.13	9.10	9.51	8.09
Ash	0.59	0.55	0.58	0.54
Fiber	1.53	1.72	1.67	1.25
Ether extract	0.80	0.79	0.85	0.71
Carbohydrates	87.95	87.84	87.39	89.41

**Table 1:** Chemical composition of suggested formulas (calculated on dry weight basis).

Minerals content of the extruded suggested blends are given in table 2. Blends (A), (B), (C) and (D) had almost the same iron content which ranged between 3.12 and 3.23 mg/100 gm. Blend (A) had the highest content of calcium (14.77 mg/100 gm) in comparison with the other investigated blends. Results also showed that blends (B) and (C) contains higher amounts of sodium, zinc and potassium. These amount of minerals fulfill about 35 - 40% of daily requirements of sodium, zinc and potassium for children (9 - 12 months age) when feed by 100gm of the blends daily [8].

Mineral	Formula No			
	A	B	C	D
Iron	3.12	3.18	3.23	3.20
Sodium	23.38	24.66	24.22	22.63
Zinc	1.26	1.15	1.30	1.46
Potassium	172.26	173.89	175.53	165.64
Calcium	14.77	10.60	11.30	10.33

**Table 2:** Mineral contents of suggested formulas (calculated as mg/100gm dry sample).

Table 3 represents specific weight, water solubility, water absorption index, cold-paste viscosity, hot-paste viscosity and cooked-paste viscosity of suggested formulas.

Results showed that specific weight values ranged between 25.11 to 34.03. The best (lowest) value was obtained in formula (C) when compared with A, B and D formulas. Water solubility index and water absorption index of formula C were higher than the other formulas given in the same table. This is mainly due to the presence of high level of the white corn grits extrudate in this formula (C). The increase in complete Water solubility index for snack food mixture is a desirable characteristic, because it reflects the easy and high digestibility for those products. Such findings were found in agreement with those reported by Spriet and Mercier [9], who concluded that extrusion process improves solubilization of cereal starches.

Also, results in table 3 and figure shows that the formula (c) had the highest value of cold-paste viscosity when compared with, A, B and D formulas. This indicates that snack food mixtures which have high cold-paste viscosity are more suitable for preparing an instant gruel food for preschool children without any further heating. For the hot-paste viscosity and cooked-paste viscosity, the formula (A) had the highest value, followed by formulas D, B and C.

Physical properties	Formula No			
	A	B	C	D
Specific weight	34.03	26.31	25.11	28.11
Water solubility Index (WSI)	15.97	17.89	19.10	17.21
Water absorption Index (WSI)	6.67	7.45	7.65	7.40
<b>Viscosity (B.U.)</b>				
Cold-paste	252.00	281.00	305.00	286.00
Hot-paste	255.00	204.00	175.00	227.00
Cooked-paste	385.00	257.00	251.00	266.00

Table 3: Physical properties of suggested formula.

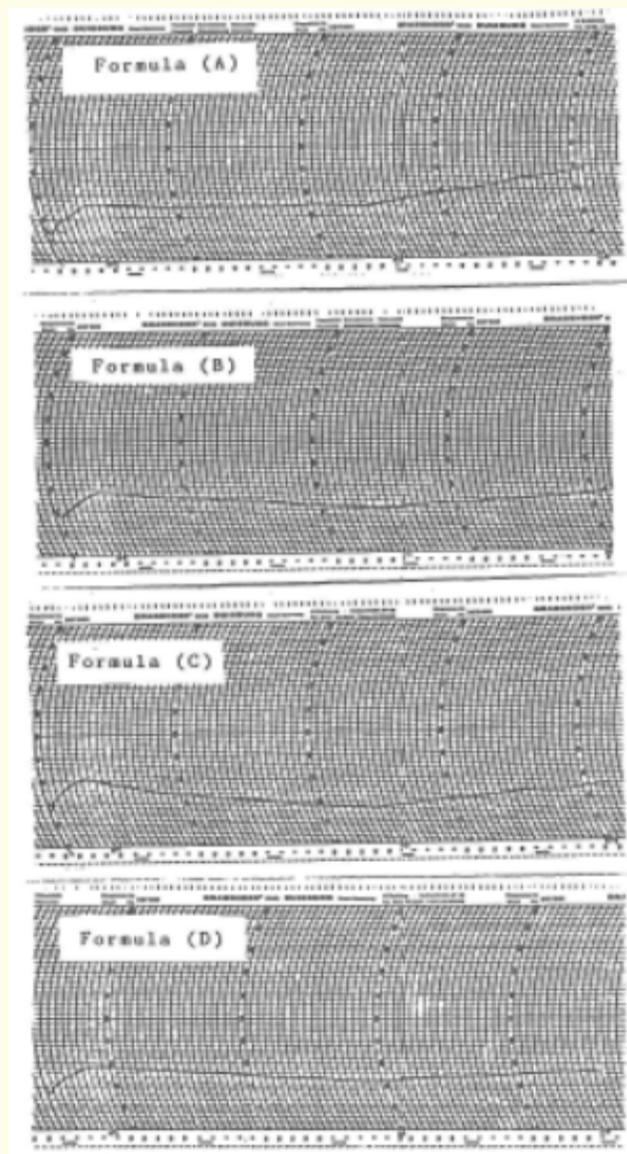


Figure : Effect of various extrusion- cooking conditions on viscosity of blends.

From these results it could be concluded that the formula (C) containing (20% broken rice, 20% yellow corn grits, 50% white corn grits and 10% semolina) is considered the good instant gruel snack food mixture according to its chemical and physical characteristics, which showed best values of water solubility index, water absorption index. Low-specific weight and high value of cold-paste viscosity.

### Conclusion

According to the previous physical and chemical evaluations of the extruded products. Four snack foods mixture were formulated for feeding children. The obtained results indicated that there was no significant differences between chemical composition and mineral contents of the suggested blends.

Specific weight values ranged from 34,03 to 25,11. The best value was obtained in formula (C) when compared with A, B and D. Water solubility index and water absorption index of formula C were higher than the other formulas. This is mainly due to the presence of high level of white corn grits extrudate of the formula. The increase in WSI for snack food mixture is a desirable characteristic, because it reflects the easy and high digestibility for those materials. Also, results showed that the formula (C) had the highest value of cold-paste viscosity when compared with, A, B and D formulas. This indicates that snack food mixtures those have high cold-paste viscosity are more suitable for preparing an instant gruel food for preschool children without any further heating. From these results it could be concluded that the formula (C) is considered the good instant gruel snack food mixture according to its chemical and physical characteristics, which showed best values of water solubility index, water absorption index. Low-specific weight and high value of cold-paste viscosity.

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**Volume 14 Issue 2 February 2019**

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