

# Studies on Development of Process Technology for Preparation of Multigrain Extruded Snacks

Kokani Ranjeet Chunilal (Pricipal), Shinde Gaurav Sanjay

College of Food Technology Saralgaon  
Tal.Murbad Dist.Thane-421401

Affiliated to Dr.B.S.K.K.V.Dapoli (Maharashtra)  
Email id-kokanirc.mitcft@gmail.com

**Abstract-** The aim to prepare Extruded snacks as a nutritional point of view and to provide convenience to the consumer. The main ingredients which were used for preparation of crackers were Soyabean flour, Ragi, Rice and Corn flours. All ingredients contain Energy, Protein, Carbohydrates, Fat and Vitamins such as vitamin A, Thiamin (B1), B3, vitamin C, Folate (B9) and Minerals such as Ca, K, Zn, Ph, Mg, etc. A snack was a good tea time snacks typically made from grain & flour and mixing of multi flours. Snacks are usually crispy, crunchy in taste, small in size. For preparation of multigrain extruded snacks ingredient used like Soya flour, Ragi Flour, Corn Flour and Rice Flour were mixed together with other ingredient. Then make a smooth dough after that filling it in hand extruder and frying at 120°C for 10 to 15min till golden brownish colour than cool it and packed it for further study. For standardization of recipe 3 trials had done T1, T2, T3, and from that trial T2 has selected according to sensory evaluation, among all the levels of Extruded snacks prepared trials T2 recorded highest score in all the quality attributes and good storage ability. Proximate composition of extruded multigrain snacks were Moisture content (12.75%), Ash (4.2%), Fat (4.6%), and Protein (16.9%), Carbohydrate (60.8%), Energy (352.65kcal) etc. It was concluded that the Extruded Snacks made from Multigrain can be store for three months in Low density polyethylene pouches at room temperature. So the Extruded Snacks made from Multigrain can be satisfy the consumer in acceptable.

**Keywords-** Extruded Snacks, Multigrain, sensory evaluation, Proximate Analysis, Packaging etc.

## I. INTRODUCTION

Most of the available snacks made from refined cereal flours that are rich in salt, saturated fats and easily digested carbohydrates. Cereals are the main source of carbohydrate in our diet. Rice, maize are rich source of protein, dietary fibers and lipids. Cereals are the main source of energy. It may be argued that the increase in consumption of snack food.

In terms of snack food products, it could be argued that legume grains and flours underutilized in the extrusion process. Cereal carbohydrates and frying oil are the main source of calories. Reasonably low protein content in market snack was reported by several workers. Thus high consumption of such snacks could lead to be malnutrition in children and obesity, which leads to several diseases in adult.

Extrusion is rather attractive process because of its versatility (wide range of food products applications), high productivity, relative low cost, energy efficiency and lack of effluents. The major role of these ingredients is to give structure, texture and mouth feel. (Barres.C., Vergnes, B, Tayeb, & Della Valle 1990).

Whole soybeans are a rich source of protein (35-45%), oil (16-25%) and energy (gross energy 23-24 MJ/kg). They

contain low amounts of fibre (NDF 13%, ADF 8% and less than 1.5% lignin in the).

Also notable is the lysine content of soybean protein (5.7-6.7% of the protein) (Liu.2016) Soybeans comprise approximately 8% seed coat or hull, 90% cotyledons and 2% hypocotylsaxisorgerm. Total production of soybean in India is 11.7 MT.

This study aimed to estimate the proximate, phenolic and flavonoids contents and phytochemicals present in seeds of soybeans (Manayet.al. 2014). Nutritional value of Soyabean per 100gm Such as Carbohydrate-20.9g, Protein-43.2g, Fat-19.5g, Energy-432kcal (Source- Nutritive value of Indian foods, National Institute of nutrition, ICMR, Hyderabad 2015).

Rice (*oryza sativa*.L) is rich in genetic diversity with thousands of varieties grown throughout the world. Rice (*Oryza sativa* L.) is one of the leading food crops of the world and is the staple food of over approximately one half of the world's population. (Singh ct al, 2003).Rice contains approximately 7.3% protein, 2.2% fat, 64.3% available carbohydrate, 0.8% fiber and 1.4% ash content (Zhoul et al., 2002).

Rice is the main source of nutrition for majority of people in India. Nutritional value of rice Per 100gm such as

Carbohydrate- 78.2g, Protein-6.8g, Fat-0.5g, Energy-344.5 kcal (National institute of nutrition ICMR Hyderabad).

Ragi is commonly called as "nutritious millet" as the grain is nutritionally superior to many cereals providing fair amount of proteins, minerals, calcium and vitamins. It is a humble grain with low glycemic index which makes it more suitable for diabetic patients (Pradhan et al., 2010).

Nutritional value of Finger millet per 100gm such as Carbohydrate- 59.9g, Protein-24.5, Fat-1.2g, Energy-348kcal. (National institute of nutrition ICMR Hyderabad).

Finger millet commonly known as Ragi [Eleusine coracana (L.) Ragi has also gained importance because of its functional components, such as slowly digestible starch and resistant starch. Ragi normal contain 81.5 % carbohydrate, 9.8 protein-4.3 crude fiber, 2.7 mineral, fat 1-2% etc. (Ahlawat 2016).

Corn (Zea Mays) is also called corn is to have originated in central Mexico 7000 years ago from a wild grass and native into a better source of food.

Maize contains approximately starch-72%, protein-10% and Fat-4% supplying an energy density of 365 Kca/100g and is grown throughout the world, the United States, China and Brazil being the top three maize production countries in the world, Maize can be processes into a variety of food and industrial products including starch beverages glue, industrial alcohol and fuel ethanol etc. (Peter Ranum & Maria Nieves Garcia- Casal).

Nutritional value of Corn Per 100gm Carbohydrate-66.2g, Protein-111.1g, Fat-3.6g, Energy-341.4 kcal (National institute of nutrition ICMR Hyderabad).

## II. MATERIALS AND METHODS

### 1. Procurement of Raw Material:

Raw materials required during present investigation were procured from local market of Saralgaon dist. Thane (MH) such as Soyabean flour, Ragi flour, Rice flour, Corn flours, Spices, oil, Salt etc.

Most of the chemicals and equipments used in this investigation were of analytical grade which are obtained from College of Food Technology Saralgaon, Thane (MH)

### 2. Physical Properties of Extruded multigrain Snacks:

The colour of Extruded multigrain Snacks was determined by visual observations, the length, breadth and width of Extruded multigrain Snacks was measured by vernier caliper. The weight of Extruded multigrain Snacks was measured on analytical weighing balance.

### 3. Chemical Properties of Extruded multigrain Snacks:

Proximate composition such as moisture, ash, crude fat, crude protein and crude fibre of all the Ingredients and Crackers was determined according to the procedures given in AOAC (2000). For moisture determination samples were dried in oven at 130°C for 60 minutes.

For ash determination samples were placed in muffle furnace at 550°C to burn out all carbon compounds leaving in organic part (ash). Fat was determined by fat extraction unit by using Hexane. For fibre determination, samples were treated with 1.25% Sulphuric acid and Sodium Hydroxide solution.

After filtration of digested material it was washed with hot water and then ignited. By calculating loss of weight after ignition, crude fiber contents were determined. Protein contents were determined by using Kjeldahl's unit.

### 4. Sensory Evaluation of Extruded multigrain Snacks:

Prepared product were evaluated for sensory characteristics in terms of appearance, color, flavor, after taste, texture and overall acceptability by 10 semi-trained panel members comprised of academic staff members using 9- point Hedonic scale. Judgments were made through rating the product on a 9 point Hedonic scale with corresponding descriptive terms ranging from 9 'like extremely' to 1 'dislike extremely'. The obtained results were recorded in sensory score card.

### 5. Statistical Analysis Extruded multigrain Snacks:

The analysis of variance of the data obtained was done by using completely randomized design (CRD) for different treatments as per the method given by Panse and Sukhatme (1967). The analysis of variance revealed at significance of  $p < 0.005$  level S.E and C.D. at 5 percent level is mentioned wherever required.

### 6. Formulation of Extruded multigrain Snacks:

Extruded multigrain Snacks prepared with incorporation varying levels of combination of multigrain flours were investigated.

The formulation was made by varying levels of multigrain flours including soya flour, Ragi flour, rice flour, corn flour and other ingredients, viz., 30:30:15:10:15g, 40:20:15:10:15g and 50:10:15:10:15g respectively. Sample T2 Extruded multigrain Snacks were organoleptically acceptable and used for further study.

### 7. Preparation of Extruded multigrain Snacks:

Process Flowsheet for Snacks made from Multigrain Flour  
Selection of raw material (Soya Flour, Ragi Flour, Rice Flour, Corn Flour) → Weighing, cleaning and sieving → Mixing of all Flours → Add spices or other ingredients (Salt, Turmeric Powder) → Mixing → Addition Sufficient amount of water → Preparation of Dough (Keep it for 15-20 min) → Filling Dough in the Hand extruder → Frying till Golden Brown Colour → Addition of Spices (Dry

Tomato Powder, Salt, Red chili powder) → Air Tight Packaging of Product.

### III. RESULTS AND DISCUSSION

Table 1. Physical Properties of Raw Materials.

Cereal flour	Size	Angle of repose	Bulk Density	Water Absorption Capacity
Soyabean	8.7 $\mu$ m	31.81°	753.5kg/m <sup>3</sup>	10%
Finger millet	5.13 $\mu$ m	34.10°	993.6 kg/m <sup>3</sup>	1.22%
Rice	6.99 $\mu$ m	25.30°	765.2kg/m <sup>3</sup>	8%
Corn	7.11 $\mu$ m	27.10°	742.1kg/m <sup>3</sup>	2.44%

The physical parameters of multigrain was shows to be bulk density, angle of repose, water absorption capacity (%) and size ( $\mu$ m) were more or less similar accordingly S.S Swami et.al., (2010), Jorge F Toro et.al., (2012), S.D Deshpande et.al., (2010), H.Kibar et.al., respectively.

Table 2. Chemical Properties of multigrain.

Cereal Flour	Moisture Content	Ash	Fat	Protein
Soyabean	16%	2.66%	18.5%	43.2%
Finger Millet	12.06%	2.66%	24.5%	1.2%
Rice	8%	0.34%	0.6%	6.6%
Corn	14.91%	1.25%	3.5%	111.1%

The chemical parameters of wheat flour was found to be moisture content, fat, protein and ash were more or less similar accordingly yinyuan et.al. (2009) Gonzalo Gonzalez et.al. (2013), Abida Ali et.al. (2013) respectively.

Table 3. Physical Properties Extruded multigrain Snacks.

Physical Properties	Crackers
Colour	Golden brownish
Shape	Irregular stick
Diameter	4.5cm
Thickness	2.55mm

It was evident from above table that colour of Snacks was golden brownish which was determined by visual observation. Shape of Snacks was straight stick determined by visual observation.

The diameter of the Crackers was 4.5cm determined by centimeter scale. Thickness of Snacks was 2.55mm which was determined by Vernier Caliper.

Table 4. Chemical Properties Extruded multigrain Snacks.

Chemical Parameter	Selected sample
Ash	4.2 $\pm$ 0.02%
Moisture	12.75 $\pm$ 0.4%
Fat	4.6 $\pm$ 0.02%
Protein	16.9 $\pm$ 0.01%
Carbohydrate	60.8 $\pm$ 0.11%
Energy	352.2 $\pm$ 0.04kcal

It was evident from above table chemical properties Extruded multigrain Snacks were Ash Content (4.2 $\pm$ 0.02%), Moisture content (12.75 $\pm$ 0.4%), Fat content concentration (4.6 $\pm$ 0.02%), Protein content (16.9 $\pm$ 0.01%), carbohydrate (60.8 $\pm$ 0.11%) and energy value 352.2 $\pm$ 0.04 kcal respectively. According to proximate analysis it was concluded that Extruded multigrain Snacks was good nutritional value than other snacks products.

#### 1. Sensory evaluation:

Table 5. Sensory evaluation of Extruded multigrain Snacks

Sample	Color	Flavour	Appearance	Texture	Taste	Overall Acceptability
Control	08	07	7.5	07	08	08
T1	7.3	07	7.1	06	07	7.3
<b>T2</b>	<b>T2</b>	<b>8.3</b>	<b>08</b>	<b>08</b>	<b>07</b>	<b>8.3</b>
T3	7.6	7.6	7.3	08	7.3	7.6

It was evident from above tabled that Extruded multigrain Snacks concludes that sample T2 has highest score as compare to the other samples. The colour of T2 sample as per graph is 8.3 point while samples T0 (08), T1 (7.3), T3 (7.6). The flavor of sample T2 was acceptable with 8 while samples T0 (07), T1 (07), T3 (7.6).

The texture of sample T2 was selected by 8.3 points while other samples points are T0 (08), T1 (7), T3 (7.3). The appearance of sample T2 was selected by 8 while other samples points are T0 (7.5), T1 (7.1), T3 (7.3). The overall acceptability of sample T2 was selected by 8.3 points while other samples points are T0 (08), T1 (7.3), T3 (7.6).according to sensory evaluation sample T2 best in all the quality attributes and more acceptable than other one.

#### IV. CONCLUSION

In the present study finally concluded that Extruded multigrain Snacks prepared from different Variations of flour such as whole Soy a flour, Rice flour, corn flour and Finger millet have high Nutrition quality and rich in Protein, carbohydrates and some vital minerals such as calcium and iron in proper amount and has great health benefits.

The present investigation carried out for information of Extruded multigrain Snacks in which T2 sample found more superior than sample T1 and T3 so, T2 sample is more acceptable on its sensory attributes and consumer acceptance.

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