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Development of Value-Added Products by Utilization of Soya Okara

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ABSTRACT

Soybean meal serves as a high-protein meat substitute in many food products, including baby foods and vegetarian foods, and can be imparted with a meat like texture for increasing the cooked yield of ground meats.Okara,consisting of insoluble parts of the soybean that remain after pureed soybeans are filtered in the production of soy milk. It is generally white or yellowish in color. Okara is the oldest of three basic types of soy fiber. The other two are soy bran (finely ground soybean hulls) and soy cotyledon/isolate fiber (the fiber that remains after making isolated soy protein, also called "soy protein isolate").Okara that is firmly packed consists of 8-10% protein, 76 to 80% moisture and 20 to 24% of solids. When moisture free, the gritty okara contains 6-7% fats, 12 to 14.5% crude fiber and 24% protein, and contains 17% of the protein from the source soybeans. It also contains potassium, calcium, niacin.

Okara is extracted by soaking the soya beans overnight and grinding it in to paste. Heating at 98 degree for 5 minutes and filtering with muslin cloth and fresh okara is obtained.By using tray dryer, okara is dried to remove moisture content. By grinding it in to flour or powder type, dry okara is obtained. It is used for incorporation in biscuits in different proportions.

Key words: soyabeans,hot air oven, muffle furnace, desiccator, Soxhlet extractor, UV-visible spectrophotometer, tray dryer.

I. INTRODUCTION

Soyabeans is one of the richest and cheapest source of protein and fiber.

As mass waste, it is a potential environmental problem because it is highly susceptible to putrefaction.Fresh okara has a short life span needs to be refrigerated used within 2-3 days okara can be frozen for up to 6 months when sealed well.

Materials and Methods

Raw materials like soyabean were purchased from market, to prepare soy okara.Ingredients like Maida, sugar, whole milk powder, vanaspati, baking powder, salt, vanilla essence were used in the preparation of biscuits.

Extraction of okara:

Soyabean seeds
↓
Cleaning
↓
Washing
↓
Hydration (25degree Celsius/12 h)
↓
Grinding beans (500 g, 3.5 liters of water)
↓
Heating (98^{o} C/5 min)
↓
Filtering
↓
Fresh okara
↓
Drying
↓
Dried okara

Flow sheet for preparation of dry okara

Preparation of okara biscuits:

Weighing of Ingredients according to the set formulation
↓
Mix all dry ingredients flour and leavening agent
↓
Sieving
↓

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Creaming (fat and sugar)
↓
Mix cream with dry ingredients
↓
Kneading
↓
Rolling and sheeting
↓
Cutting
↓
Baking (160°C/ 15 min)
↓
Cooling and packing

Flow sheet for Preparation of okara biscuits

Formulation for okara biscuits:

S.No	Ingredients	S	S1	S2	S3
1	Flour (g)	50	49	47	45
2	Okara (g)	-	1	3	5
3	Shortening (g)	25	25	25	25g
4	Leavening agent (Baking Powder) (g)	0.25	0.25	0.25	0.25
5	Salt (g)	0.05	0.05	0.05	0.05
6	Flavour (vanilla essence) (g)	0.05	0.05	0.05	0.05
7	Sugar (g)	25	25	25	25
8	Milk Powder (g)	5	5	5	5

Determination of Moisture content:

Moisture is done by oven drying method (AOAC, 2005) . Weigh the empty Petri dish. Take 10 g of the sample and place in weighed empty Petri dish. Note the weight. (Petri dish + sample) (W1). Pre heat the oven to 100 °C. Now place the sample in the oven at 105 °C ± 2 °C for 4 to 5 hours. Take the sample from the hot air oven and place it in desiccators for some time. Weigh the sample (dried sample + Petri dish) (W2).

$$\% \text{ Moisture} = \frac{W2-W3}{W2-W1} \times 100$$

Determination of Protein content

The nitrogenous compounds of the material to be tested are converted into ammonium sulphate by boiling with con. H2SO4. It is subsequently decomposed by addition of excess of alkali and the liberated ammonia absorbed into a boric acid solution containing Bromocresol green indicator by steam distillation. Ammonia forms a loose compound, ammonium borate, with boric acid, which is titrated directly against standard hydrochloric acid.

N (g/Kg) = (mL of Hcl−mLof blank) ∗ normality∗14.01/weight of the sample taken

Crude protein (%) = N x 6.25

Determination of Ash content

Ash content was calculated by muffle furnace method (AOAC, 2000). The finely ground sample of 10 g was weighed (W1) in pre-weighed silica crucible (W2) and ignited till smokeless. Then it was transferred to muffle furnace and heated at 550 °C for 4 hours for complete oxidation of organic matter and resultant ash content was calculated by weighing the crucible after combustion (W3).

$$\text{Ash content (\%)} = \frac{W3-W2}{W1} \times 100$$

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Determination of Fat content

The fat content was estimated by using Soxhlet apparatus (AOAC, 2000).The powdered sample 10 g was weighed (A) accurately in thimble, weight of the flask before extraction (B) was noted and extracted with petroleum ether (60 - 80 ℃) in Soxhlet apparatus for 6-8 h. Weight of the flask after extraction was noted and calculated to get fat content.

$$\text{Fat content (\%)} = \frac{\text{Final weig ht of flask}}{\text{Initial weig ht of flask}} x100$$

Determination of Crude Fiber content:

Principle

Crude fiber is determined gravimetrically after chemical digestion and solubilization of other materials present. The fiber residue weight is then corrected for ash content after ignition. Crude fiber is known as the part of carbohydrate in food called non-soluble carbohydrate (Insoluble carbohydrates), which It's not digested by the digestive juices and do not degrade at the treatment by (acids and bases) diluted and in specific concentrations for a period of time is limited.

Procedure:

Steps involved are Boiling in Acid, Boiling in Base, Drying Fiber, Incineration of Fiber

$$\text{Crude fiber (\%)} = \frac{w_1 - w_2}{w_s} \times 100$$

Where, Ws- Weight of the sample

W1- Weight of crucible with fiber

W2- Weight of crucible with ash.

Determination of carbohydrate

Carbohydrates is done by difference method. Carbohydrates come in simple forms such as sugars and complex forms such as starches and fiber.

Carbohydrate =100- (% Moisture +% Ash +% Fat + % Protein)

Net carbohydrates= Total carbohydrates- Fiber

Determination of bulk density

Bulk density was determined by (WHO, 2012) method. Take a container of known volume and the weigh the amount of sample that can be filled in it. Mildly tapped 2-3 times on the bench. Weight of the sample was noted and calculated.

$$\text{Bulk density (g/cm3)} = \frac{\text{weig ht of the sample}}{\text{volume of the sample}}$$

True density:

The true density of grain is defined as the ratio of the mass of sample to the solid volume occupied by the sample.

$$\text{True density (g/cm3)} = \frac{\text{mass of the sample}}{\text{volume of the sample}}$$

Porosity:

It is defined as the percentage of volume of inter-grain space to the total volume of grain bulk. Porosity depends on (a) shape, (b) dimensions, and (c) roughness of the grain surface. Porosity is a property that depends on it bulk and kernel densities.

$$\text{Porosity} = \frac{\text{True Density} - \text{Bulk density}}{\text{True density}} X100$$

Sieve shaker:

A Sieve shaker is a device for separating wanted elements from unwanted material or for charactering the particle size distribution of sample using mesh or net or metal

$$\text{Sieve analysis (\%)} = \frac{w_t - w_1}{w_t} \times 100$$

where,

w_t- weight of total sample and w_1- weight of retained sample

II. RESULTS AND DISCUSSION

Physical Properties of dry okara

S. No	Parameter	G
1	Bulk density (g/cm3)	0.4
2	True density (g/cm3)	0.56
3	Porosity	28.5

Where G- granules size

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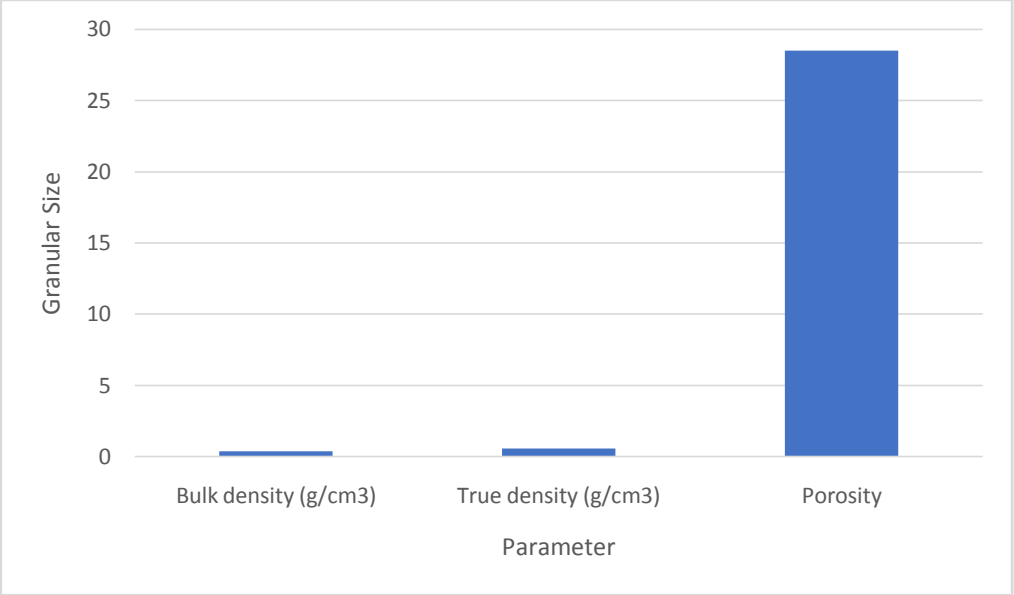
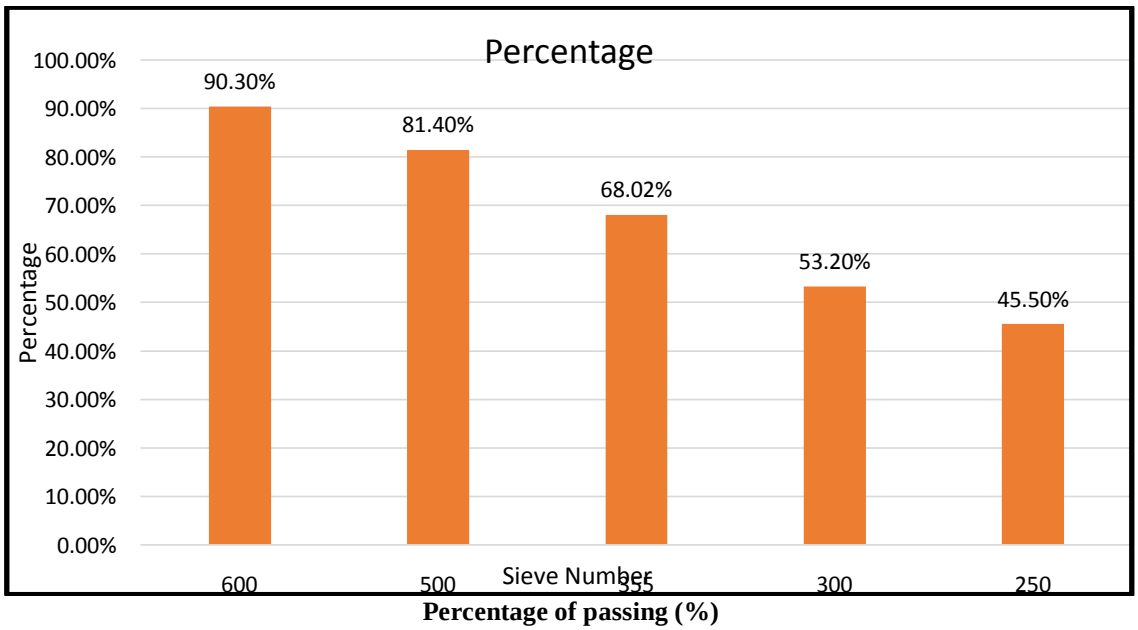


Sieve analysis.

S. NO	Sieve size	Percentage of passing (%)
1	600	90.3%
2	500	81.4%
3	355	68.02%
4	300	53.2%
5	250	45.5%



Percentage of passing (%)

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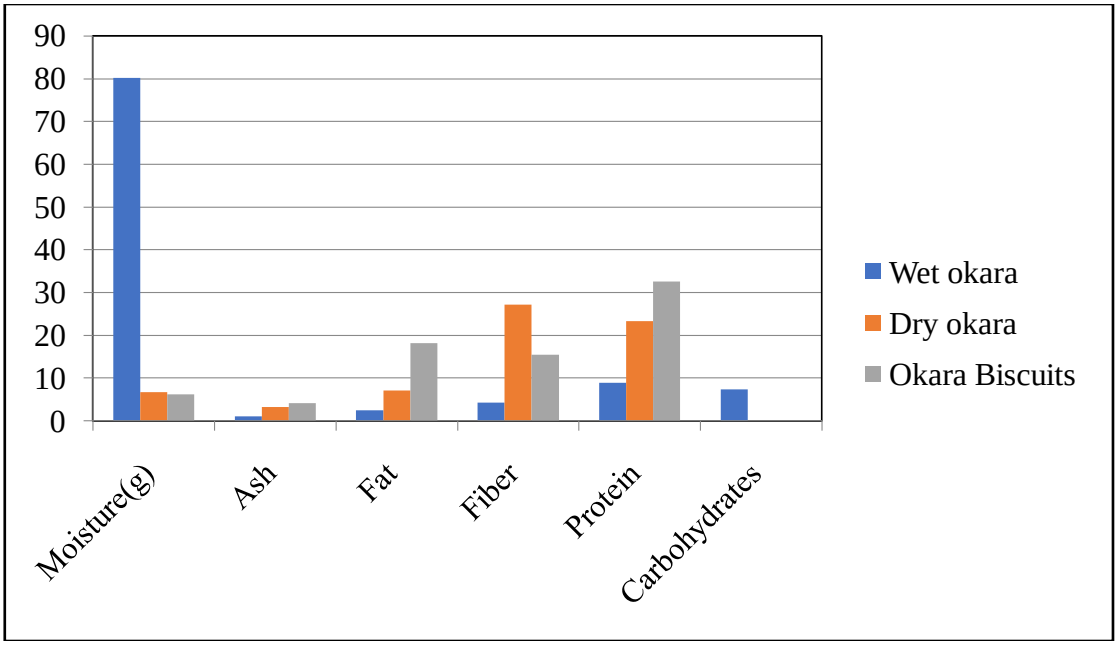
Physical Analysis of okara Biscuits

Parameter	S	S1	S2	S3
Diameter(mm)	48	50	47	35
Thickness(mm)	18	19	10	15
Spread Ratio(mm)	2.66	2.63	4.7	2.33
Spread Factor	266	263	470	233



III. CONCLUSION

The harvested soyabean should contain more protein and fiber that is required to extract byproducts... Fresh okara has less shelf life because of more moisture content, it should be stored under refrigerated conditions. By-products extracted from soybean that is okaracan be used for preparation of different confectioneryproducts. It will be helpful in product developing further that would be enriched with protein &fiber when compared with any other flour. Products developed with dry okara were also found to be quite acceptable in terms of taste and texture.

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