International Journal of Advanced Research and Development
ISSN: 2455-4030, Impact Factor: RJIF 5.24
www.advancedjournal.com
Volume 1; Issue 6; June 2016; Page No. 08-11

Development of Functional Biscuits from Soya Flour

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Abstract
The study was conducted to prepared protein enriched biscuits which could be used a protein incorporated snack food. The study evaluated the effect of substituting soya flour sample 1 10%, and sample 2 15% in biscuit production. Biscuits were enriched with soya biscuits were evaluated. Hedonic test of biscuits showed that with regard to flavour and taste, texture, colour, and appearance and over all acceptability. Sensory evaluations of sample 2 were found to be the best. The sample 2 is also acceptable. In nutrient estimation of biscuits protein content was maximum in sample 2, fat content was highest in sample2, and carbohydrate content was highest in sample 2, fibre content was in sample 2. The best treatment was sample 2 among sample 1soya flour is added product biscuits has good shelf life. It can be concluded that sensory scores indicated high acceptability for treated biscuits sample. They are high in carbohydrates, fat and calorie but low in fibre, vitamin, and mineral which make it unhealthy for daily use. Because of its acceptability in all age group, longer shelf life, better taste and its position as snacks it is consider as a good product of for protein fortification and other nutritional improvement. With all essential amino acids required for proper growth and maintenance of body.

Keywords: Soya flour, malnutrition, biscuits, hedonic score system

1. Introduction
The soya bean is the seed of the leguminous soya plants. Soy foods have been a staple part of the Chinese diet for over 4000 years but have only been widely consumed in western countries. Soya food include tofu tempeh textured vegetables protein, miso, soya sauces, soy oil and margarine and soy daily alternative.

The soybean is now produced in larger quantities than any other legume crop in the world and certainly the most important source of vegetable oil. Soybean is processed in a wide variety of ways to produce soy milk, flour and fermented soybean cake

Soybean is one of the nutritionally richest natural vegetables foods known because of its high protein and oil content. However, it has little direct use because of a high satiety value caused by high oil content, long cooking time and persistent bitterness. Fermentation has been proven to be one of the best method of improving the flavour, texture and nutritional quality of soy bean (Snyder and kwon, 1987). Efforts to increase the availability of protein in human diets have encouraged the use of high protein plant materials, particularly soybean as ingredients in a variety of foods. Soy flours, grits, concentrate and isolate have partially replaced wheat flour in some baked products. The major problems with soy enriched biscuits is the strong and unattractive flavour that soy bean impart Proteins contribute to cell growth, repair and maintenance, act as enzymes and hormones, maintain fluid, electrolyte and acid base balance and also maintain a strong immune system (Thompson *et al.* 2008).

In many countries of the world, biscuits are one of the most important popular bakery products for children and adults. They are high in carbohydrates, fat and calorie but low in fibre, vitamin, and mineral which make it unhealthy for daily use. It is an unleavened crisp, sweet pastry made from wheat flour, shortening (hydrogenated fat) and sugar, and is usually made light by the addition of baking powder (a mixture of sodium carbonate, sodium bi phosphate and cereal flour) (O'Brien *et al.* 2003)

Biscuit is most popular bakery product worldwide. They are high in carbohydrates, fat and calorie but low in fibre, vitamin, and mineral which make it unhealthy for daily use. Because of its acceptability in all age group, longer shelf life, better taste and its position as snacks it is consider as a good product of for protein fortification and other nutritional improvement. Soya bean is excellent sources of protein contain 35-45%. With all essential amino acids required for proper growth and maintenance of body. Beside this, it is high in vitamin, mineral and antioxidant like Isoflavones which helps in cholesterol reduction, preventing cancer and regulation of menopause. (Serrem C, Kock H, Taylor J (2011) [16].

Nutritional quality and consumer acceptability of soya cereal blends improves the nutritional status of vulnerable groups like pregnant woman, nursing mother, school going & young children Sobowale AA. 2010 [10]. Protein energy malnutrition (PEM) is one of the most serious health problems in many part of country esp. in developing countries like India FAO, (2007).High protein soya bakery product reduce incidence of malnutrition and encourage the farmers to grow more soya bean due to increasing demand in the market. The objective of this chapter is to briefly describe the quality attributes of soybean and the Potential use of its flour in food fortification. Islam S (2007).

Material and method

Raw Material

Following material has been collected to prepare biscuit, which is arranged from local market: Wheat flour, Soya flour, Maida flour, Cashew nut, Egg, Milk powder, Ammonium bicarbonate, and salt. Soya bean seed were milled to flour in local situated in Madurai, Tamil Nadu district.

Preparation of Composite Flour

Composite flour is prepared by substituting the wheat flour with soya flour and Maida flour in the ratio of 80:10:10, 70:15:15, as shown below:

Treatments

Sample 1 - 10% soy bean flour + 10% Maida flour + 80 % wheat flour.

Sample 2 -15% Soybean flour + 15 % Maida flour + 70% wheat flour.

Selection of processed soya bean flour for incorporation in biscuits

Processed soya bean flour was selected for the development of biscuits. 15 g of soya bean flour was incorporated in wheat flour to enrich protein content of the biscuits.

Biscuits making procedure

1. Wheat flour is passed through a sifter removes all the dirt, stones etc.
2. Sugar is ground and fat is incorporated in molten form
3. Mixing: Ammonium bicarbonate, sugar syrup and water are mixed thoroughly in a high-speed mixer for a couple of minutes. Shortening and flavour are creamed for a few minutes. In dry mixing, Maida, salt, sugar, and SMS paste, SMP and vitamins premix are mixed. The mixing time is about 3-5 minutes
4. Shaping and conveying to oven. The Rotary moulder is used for shaping operation.

This operation involved feed roll rubber roll and die roll and extraction belt and panning table belt.

5. Baking: The biscuits baked in an oven that has different temperature zone e.g. 1200C, 3500C and 150°C.
6. Cooling: In cooling, two cooling conveyors are used. The cooling time is around 4 minutes.

Packing: The biscuits are packed in BOPP or any other moisture proof packaging

Physical analysis

Soy-wheat flour supplemented biscuit was analyzed for width, thickness and spread factor by following the procedure of AOAC (2000).

A. Width (W)**:** Six biscuit were placed horizontally (edge to edge) in a row and taken their average diameter using digital venire caliper with 0.01 mm accuracy.
B. Thickness: Six biscuit were placed one another and taking their average thickness using digital venier calliper with 0.01 mm accuracy.
C. Spread factor: The spread factor (SF) were calculated using relationship between SM, W, T and correlation factor CF as shown in the formula given below SF= (W/T × CF) ×100.

Evaluation of biscuit quality

The biscuit quality measurements, including product weight, volume, specific volume, diameter, thickness, were conduced according to the AACC method 10-50D (1983). The biscuit shape factor (SF) was calculated as the quotient of the average diameter and average thickness. The relative shape factor (SF) (in relation to the control sample) was calculated with the use of a mathematic formula: (diameter – thickness)/ SF × 100%.

Sensory Evaluation of the Developed Products

The different biscuits samples were evaluated by 15 trained panel lists for appearance, texture, colour, flavour and overall acceptance using score points assigned to each quality parameter according to Larmond (1982). The sensory analysis of biscuits was carried out by a panel of six experienced judges assigning scores for various quality attributes such as surface appearance, Shape, size of gas cells, colour, flavour, texture, and mouth feel of a product Hoojjat & Zabik, 1984.

Sensory attributes like colour, flavour, taste, texture, crispness and overall acceptability were evaluated by trained judges using 9-Point Hedonic Score System. The panel list gives score 9-1 to the product, ranging from 'like extremely' to 'disliked extremely' to find out the most suitable composition of biscuit. The mean squares were analyzed using analysis of variance ('t') test method.

Nutritional analysis of composite biscuit

The moisture, fat, protein, crude fibre and mineral content of best rated composite flour is determined by standard AOAC (2000) methods.

Results and Discussion

Physical analysis of supplemented cookies

The result of the physical analysis of the functional biscuit produced from wheat, soya bean and Maida flour blends is shown in (Table1), which shows that the supplementation of various levels of composite flour has a significant effect on width, thickness and spread ratio of cookies. The result obtained agreed with result reported by Bunde MC et al. The width of biscuit decreases from 44 to 41.35 with increasing in the level of substitution of composite flour of wheat flour and soya flour. The result shows that control treatment sample 1 has the maximum width 44mm, followed by sample 2 (41.35) while minimum width. However, biscuit thickness increases from 9.2 to 9.35 with increasing level of substitution (Table 1). The result shows that sample 2 has maximum thickness 9.35 while minimum width was observed in control treatment sample 1 (9.2). The spread ratio was affected by the competition for the available water. The spread factor of biscuit decreases from 47.8 to 44.4 with increasing the supplementation. Spread ratio of biscuit decreases with increase in supplementation of soya flour and wheat flour. The result shows that control treatment sample 1 has the maximum spread factor 47.8mm, followed by sample 2 (44.2) while minimum width.

Table 1: Physical analysis of biscuits

Sample	Width	Thickness	Spread Ratio
Sample 1	44mm	9.2	47.8
Sample 2	41.35mm	9.35	44.2

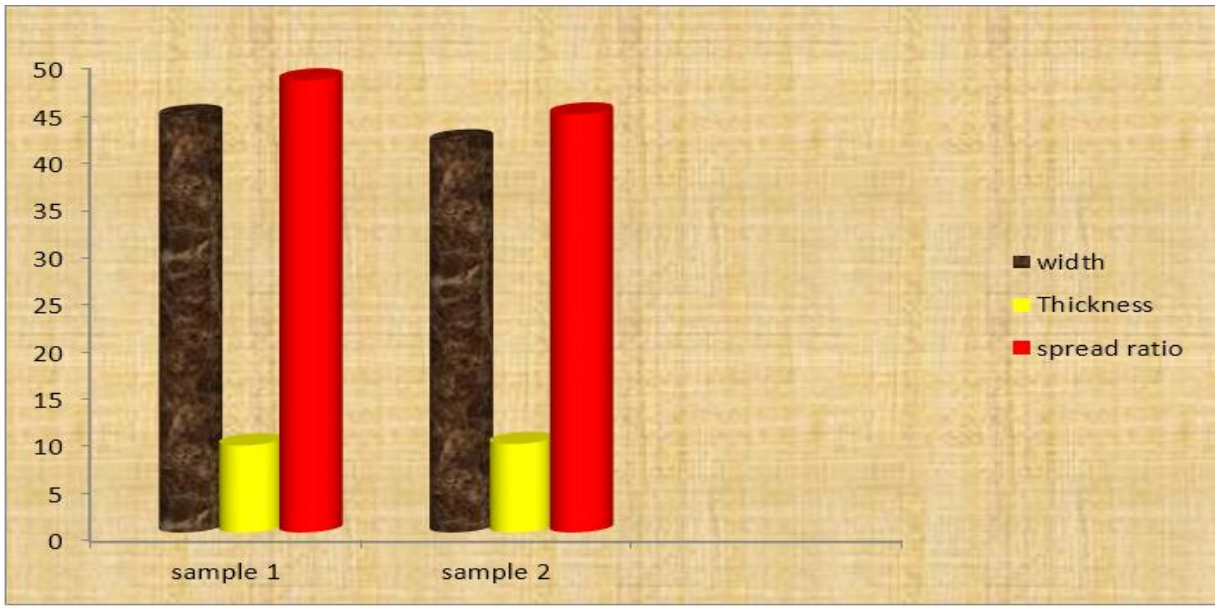

Fig 1: Physical analysis of biscuits

Nutritional analysis of composite biscuit

The result of proximate composition of 100 % Wheat and best rated composite biscuit was 70% Wheat + 15% Soya flour + 15% wheat flour.

Table 2: Nutrient analysis of soya flour and wheat flour

S. no	Nutrient analysis	Soya flour	Wheat flour
1	Carbohydrate (g)	44	76
2	Protein (g)	42.2	12.1
3	Fat (g)	20	22
4	Fibre (g)	8	15

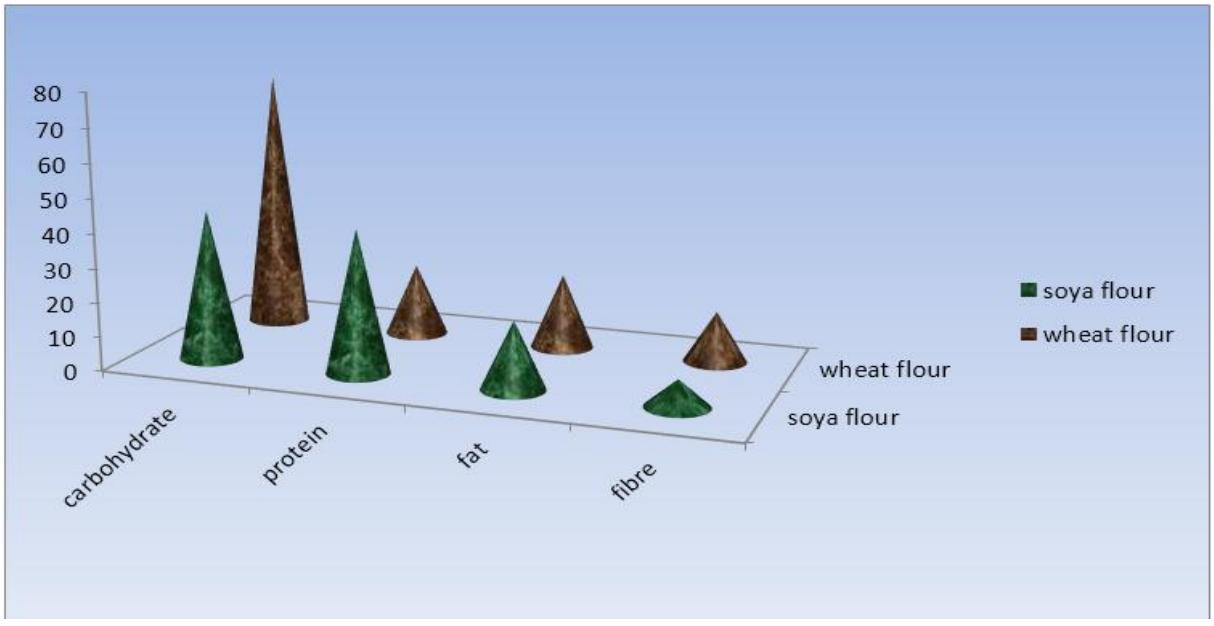

Fig 2: Nutrient analysis of soya flour and wheat flour

Conclusion

Soybean has a good balance of the essential amino acids and is excellent dietary source of calories, minerals and vitamins. The soybean is now produced in larger quantities than any other legume crop in the world and certainly the most important source of vegetable oil. Soy bean proteins are relatively high in essential amino acids, in particular lysine, threonine, isoleucine, leucine, phenylalanine and valine.

It is evident from the experiment that gluten-free biscuits can be made by mixing different non-wheat flours such as: maize flour and soy flours. This type of biscuits is useful in the gluten-free diets therefore require good nutritional and sensory quality**.** Soybean flour has huge potentials of being used to enrich foods in order to provide adequate nutrients for individuals not meeting daily needs. Based on the available information on the nutrients profile of soybean including the amino profiles, human consumption of soybean flour can be promoted because of its positive effect on nutritional enhancement on different fortified food products

It is evident from the experiment that biscuit can be made with substitution of soy flour & wheat flour up to 15 % each without adversely affecting the sensory characteristic of biscuit. This functional biscuit is nutritionally more superior to that of whole wheat flour biscuit. It can be used as a vehicle for protein fortification and other nutritional improvement as biscuit is widely accepted bakery product in India.

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