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Development of the Functional Food i.e. Beetroot Fortified Multi Grain Snacks

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Abstract: ***Beetroot fortified multigrain snacks was prepared from different proportions of refined wheat flour (Maida), wheat flour defatted soya flour and standardized with beetroot i.e. (A_1) 40:20:10:30 (refined wheat flour(Maida) : wheat flour : defatted soy flour : beetroot paste),(A_2) 40:25:05:30(refined wheat flour(Maida) : wheat flour : defatted soy flour : beetroot paste)and (A_3)40:30:30(refined wheat flour(Maida): wheat flour : beetroot paste).The overall acceptability of beetroot fortified multigrain snacks of treatments A_1, A_2 and A_3 were 8.26, 8.51 and 7.88, respectively determined by sensory evaluation. It was observed that the beetroot fortified multigrain snacks prepared from 40 parts of refined wheat flour(Maida), 20 parts of wheat flour, 10 parts of defatted soy flour and 30 parts of beetroot paste was most acceptable and ranked between like very much to dislike very much. The beetroot fortified multigrain snacks of treatment A_1 was most acceptable. Beetroot is not only blessed with a beautiful colour but also packed with nutrients. Beetroot contain different nutrients such as Vitamins, Minerals, Amino acids, Calories, Antioxidants, Anti-carcinogenic colour, Silica etc. Beets have long been known for its amazing health benefits for almost every part of the body such as, curing the anaemia, lowering high blood pressure or elevating low blood pressure, anti-cancer properties, and help to relieve chronic constipation, cholesterol lowering capabilities etc.***

Keywords: Beetroot, defatted soy flour, Wheat flour, Refined wheat flour (Maida), Sensory evaluation

1. Introduction

The fact that many people now work outside their homes and are becoming more dependent on snack for the supply of part of their daily nutritional requirement. Most often snack food does not provide adequate nutrient quantities needed by the body (Omueti and Morton, 1996). This may be due to their composition or due to the production process they went through. Whatever is responsible for the poor nutritional content, it is necessary to ensure that every food consume by an individual contains required nutrient in adequate amount. There for necessary to produce highly acceptable snack with high nutritional quality that could be useful in nutritional programs to combat malnutrition and nutrient deficiency. As a product that is consumed on such wide scale, it would be important to enhance its nutritional value. Addition of vegetable protein such as textured vegetable protein could be one way of raising the nutritional value of the product by introducing more protein into it (Rosa *et al.*, 2003).

Beetroot (*Beta vulgaris* L.) is crop belonging to the Chenopodiaceae family having, bright crimson colour. It is famous for its juice value and medicinal properties.Beetroot is a good tonic food for health(Boswell, 1967).These findings suggest that beetroot ingestion can be a useful means to prevent development and progression of cancer (Kapadia*et al*., 1996).

Today the beetroot is still championed as a universal panacea. One of the most controversial examples is the official position of the South African health minister on the treatment of AIDS. Dr MantoTshabalala-Msimang, health minister under Thabo Mbeki, had been nicknamed "Dr Beetroot" for promoting beets and other vegetables over antiretroviral AIDS medicines, which she considers toxic (Blandy, 2006). Beetroot is one of the original „super foods"(Kumar Y., 2011).

Beetroot contain the all nutrients per 100 gm such as, Carbohydrates (9.96g), Sugars (7.96g), Dietaryfibre (2.0g), Fat (0.18g), Protein (1.68g), Vitamin A equiv. (2µg), Thiamine (Vit. B1) (0.031mg), Riboflavin (Vit.B2) (0.027mg), Niacin (Vit.B3) (0.331mg), Pantothemic acid (B5) (0.145mg), Vitamin B6 (0.067mg), Folate (Vit. B9) (80 µg), Vitamin C (3.6mg), Calcium (16mg), Iron (0.79mg), Magnesium (23mg), Phosphorus (38mg), Potassium (305mg), Zinc (0.35mg), Sodium (77mg)(USDA Nutrient database, 2015).

Soybean *(Glycine max)*, is known as the "Golden Bean" of the 20th century. Soybean is one of the nature"s wonderful nutritional gifts (Liu, 1997). Soybeans have served as a major source of dietary protein for many people throughout Asia for over 1,000years. Soybeans contain all the three-macro nutrients required for good nutrition, complete protein (40%), carbohydrate (18%), fat (18%) and moisture (9%) as well as vitamins and minerals (5%), including folic acid, calcium, potassium and iron. Soybean protein provides all the nine essential amino acids in the amounts needed for human health (Henkel, 2000; Federal Register, 1998). Fortification of cereals with soy will not only improve protein quantity but also improve the quality of food nutrients such as amino acid balance (National Soybean Research Laboratory, 2008).

In addition to soybeans supplying adequate protein to the diet, studies have shown that protein from soybeans may be beneficial to human health in other ways. A side form soy protein being low in saturated fat and cholesterol free; there may be many more advantages to consumption of soy in the diet (Drake *et al*., 2000 and 2001).

Research shows that, blending of soy flour with wheat flour will increase the recommended amino acid availability from40 to 80% (Khan *et al*., 2005). In addition to nutritional improvements, soy fortified wheat flour will improve the functional characteristics of the end products in terms of

better moisture retention and less oil absorption. It has-beens recognized for some time now that consumption of plant proteins often results in significant lowering of low density lipoproteins and total cholesterol levels, which are associated risk factors for cardiovascular disease(Friedman and Brandon, 2001; Krummel, 1996). Consumption of soybeans and foods made from them are increasing because of their desirable nutritional value. Effects of high and lowisoflavonesoy-protein foods on lipid and non-lipid risk factors for coronary artery disease were investigated (Massey *et al*., 2001).

Wheat is the most important stable food crop for more than one third of the world population and contributes more calories and proteins to the world diet than any other cereal crops(Alan,2000). Wheat is considered a good source of protein, minerals, B-group vitamins and dietary fiber although the environmental conditions can affect nutritional composition of wheat grains with its essential coating of bran, vitamins and minerals; it is an excellent health-building food(Topping, 2007).Luteinize the predominant carotenoids present in wheat and the bran germ fractions of wheat contained greater amounts of carotenoids and antioxidant activity than the endosperm fractions. Lutein, along with zeaxanthin, is important for the healthof skin and eyes in humans (White PJ *et al*., 2005).

The latest edition of the USDA"s Dietary Guidelines for Americans clearly states that all adults should eat at least three servings of whole grains every day. It helps in preventing both heart diseases and cancer, therefore, lower death rates. The protection against heart disease may stem from whole grains, antioxidants, vitamins and photochemical, fiber or trace minerals. Apparently, by improving insulin sensitivity and decreasing the disordered insulin function people experience with metabolic syndrome, whole grains help prevent diabetes. The same substances in whole grains that protect against heart disease also seem to help prevent several kinds of cancer. Fiber and certain starches in whole grains ferment in the colon and form substances that may block the cancer-promoting effects of bile acids. Moreover, scientists believe that other substances in whole grains may affect hormone levels and possibly lower the risk of hormone-related cancers like breast cancer(Jacobs *et al*., 1998).

Maida or refine wheat flour is the “heart” of the ingredients in making of the multifarious baked goods globally (AnkurRohilla*et al.,* 2012).

2. Materials and Methods

The raw materials used for preparation of beetroot snacks was Beetroot (*Beta vulgaris L.*),Defatted Soy flour*(Glycine max)*, Wheat flour (*Triticum durum*), Refined wheat flour*(Triticumaestivum)*, Ajwain*(Trachyspermumammi)*, Ginger*(Zingiberofficinale)*, Garlic*(Allium sativum)*,Cumin seed *(Cuminumcyminum), oil and other spices* purchased from local market of Sangamner, Dist- Ahmednagar. The snacks were fortified with beetroot and multigrain flours. The physic-chemicals properties of final product were determined in Food Chemistry and Nutrition laboratory of Shramshakti college of Food Technology, Maldad.

Product treatments: The defatted soy flour, wheat flour, refined wheat flour(Maida) and beetroot paste were as follows.

A_1 40 part of refined wheat flour(Maida)+ 20 part of wheat flour +10 parts of defatted soy flour +30 parts of beetroot paste.

A_2 40 part of refined wheat flour(Maida)+ 25 part of wheat flour +05 parts of defatted soy flour +10 parts of beetroot paste.

A3 40 part of refined wheat flour(Maida)+ 30 part of wheat flour +30 parts of beetroot paste.

3. Preparation of Beetroot Fortified Multigrain Snacks

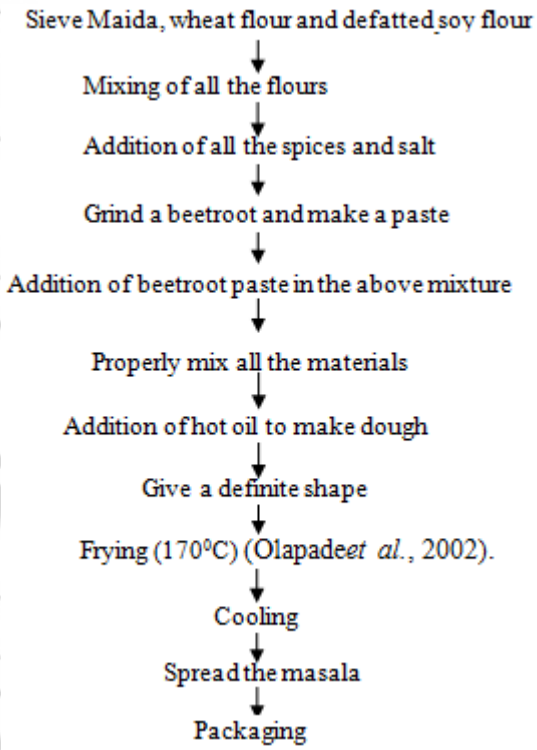

Figure 1: Flow sheet of preparation of beetroot fortified multigrain snacks:

4. Results and Discussion

Sensory evaluation: The sensory quality of product was evaluated by a panel of 10 judges selected from the staff of Department of Food Science and Technology, Food Chemistry and Nutrition, Food Engineering and Food Microbiology of Shramshakti College of Food Technology, Maldad, using 9 point Hedonic scale as described by Ranganna (1999).

Sensory evaluation of beetroot chips:

Sr. No.	*Sample*	*Colour*	*Taste*	*Texture*	*After taste*	*Overall acceptability*	*Mean*
1	Sample-1 (40:20:10:30)	8.5	9.0	9.0	9.0	8.8	8.86
2	Sample-2 (40:25:05:30)	8.0	8.5	8.5	8.0	8.2	8.24
3	Sample-3 (40:30:30.)	7.0	7.5	8.0	8.0	7.6	7.62

The beetroot snacks fortified with different proportion of different flours were subjected to sensory evaluation for overall acceptability i.e. colour, texture appearance, flavour, by trained judges, through 9 point hedonic scale.

It was observed from Table that the sample-1 got high sensorial score (8.8) for all parameters like colour (8.5), taste (9.0), flavour (9.0), after taste (9.0) and overall acceptability (8.8) than other samples. In this sample, 40 part of refined wheat flour (Maida) + 20 part of wheat flour +10 parts of defatted soy flour +30 parts of beetroot paste used. The selected sample was further taken for large scale production and analysis.

Physico-chemical evaluation:

shown in table.

Physical properties: Physical properties of beetroot fortified multigrain snacks as follows:

1. Weight: The average weight of one piece of beetroot chips was 1.84gm (AOAC 2000).

2. Diameter: The average diameter of beetroot chips was 4.5 cm (Sujitha, 2014).

3. Thickness: The average thickness of beetroot chips was 0.35 cm (Sujitha, 2014).

4. Height: The height of the one piece of sample was0.7 cm (Sujitha, 2014).

Chemical properties: A chemical property of i.e. beet root fortified multigrain snacks was prepared from different proportions of refined wheat flour, wheat flour, defatted soya flour and standardized with beetroot was studied and is

1. Moisture content: The crispiness of beetroot fortified multigrain snacks will be determined by moisture content.

$$\%\ \text{Moisture} = \frac{\text{Initial weight} - \text{Final Weight}}{\text{Weight of sample}} \times 100$$

(Ranganna, 1999)

2.Protein: The protein will be carried out by micro Kjeldhal method.

$$\%\ \text{Nitrogen} = \frac{(\text{sample} - \text{blank}) \times \text{Nof Hcl} \times 0.014 \times 25}{\text{Aliquite taken} \times \text{Weight of sample taken for distillation (g)}} \times 100$$

% Protein=% nitrogen ×6.25

(Where as 6.25 is conversion factor)

(Ranganna, 1999)

3. Fat: Fat content in terms of free lipids/ petroleum ether extractable lipid will be estimated using Soxhelt apparatus.

$$\%\ \text{Fat} = \frac{\text{Weight of sample with oil (W2)} - \text{Weight of empty round bottom flask(W1)}}{\text{Weight of sample}} \times 100$$

(Ranganna, 1999)

4. Carbohydrate: Carbohydrate will be determined by different total soluble sugar present in the beetroot fortified multigrain snacks by using phenol sulphuric acid method.

$$\%\ \text{Carbohydrate} = \frac{\text{Sugar value from graph (µg)}}{\text{Aliquot sample used (0.1 or o. 2 ml)}} \times \frac{\text{Total Vol. of extract (1ooml)}}{\text{Weight of sample (100mg)} \times 1000}$$

(Thimmaiah, 2012)

5. Ash content: Ash will be determined by different minerals contents present in the snacks.

$$\%\ \text{Ash} = \frac{\text{Weight of crucible} - \text{Weight of empty crucible}}{\text{Weight of sample}} \times 100$$

(Ranganna, 1999)

6. Crude fibre: Crude fibre of beetroot chips will be determined by alkali treatment method .

$$\%\ \text{Crude fiber} = \frac{\text{On ignition}}{\text{Weight of sample (gm)}} \times 100$$

(Thimmaiah, 2012)

Table of Analysis

Sr. No.	*Physicochemical analysis*	*Results*
1.	Weight	1.84gm
2.	Diameter	4.5 cm
3.	Thickness	0.35 cm
4.	Height	0.7 cm
5.	Moisture	3.6%
6.	Ash	0.4 %
7.	Fat	22.5 %
8.	Protein	36.25 %
9.	Crude fibre	0.7%
10.	Total Carbohydrate	8.7%

5. Conclusion

Beetroot fortified multigrain snacks having balanced nutritional value of different nutrients such as protein, carbohydrate, dietary fibre etc. The chemical analysis of beetroot fortified multigrain snacks confirms that the presence of large amount of protein (36.25%), carbohydrate (8.7%), fat (22.5%), ash (0.4%), moisture (3.6%), and fibre (0.7%) gives higher nutritional value.

From the present study the following conclusion have been drawn:

- Beetroot fortified multigrain snacks were economically available rich source of protein, carbohydrate.
- For the fortification of beetroot and multigrain flour, the chemical compositions of beetroot fortified multigrain snack were increased.
- To prepare a beetroot fortified multigrain snacks having high economical or market value.
- The development of value added product with the fortification of beetroot and multigrain flours.

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