Utilization of soyflour as a source of isoflavone in wheat paratha

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ABSTRACT

The research was conducted to develop soyflour and evaluate the quality characteristics of soyflour enriched paratha. In this study, wheat flour was replaced with soyflour at different levels i.e. 10, 15, 20, and 25%. Developed products were evaluated for their sensory attributes and chemical composition. Results showed that paratha incorporated with 20% soyflour was the most acceptable. Nutrient analysis showed soyflour contained 44.07g protein, 198 mg calcium and 131.55 mg isoflavone, whereas most acceptable paratha contained 18.39 g protein, 43.33 mg calcium and 19.94 mg isoflavone. Thus, the results indicated that by incorporating soyflour, it is possible to enhance the sensory and nutritional quality as well as isoflavone content of wheat paratha.

Key words: Acceptability, Food enrichment, Isoflavone, Nutrient composition, Sensory evaluation.

INTRODUCTION

Soybean (Glycine max) belongs to the family leguminosae and sub-family papilionnideae. The protein content of soybean has rich amino acids with a good balance. The quality of soybean proteins is comparable to that of animal proteins sources. The high lysine content of soy protein makes it a good complement to cereal proteins, which are low in lysine (Jooyandeh, 2011). Apart from its protein content, soybeans are exceptionally rich in isoflavones, with an average content of 1-2 mg/g (USDA, 2008) and constitute the major source for dietary isoflavones. The main isoflavones in soybeans, present in glycosylated form, are genistin, daidzin and glyceitin.

Traditional soy foods of East Asian countries such as tofu and miso have been widely used in various Western countries by health conscious individuals. Soy foods hold particular appeal for postmenopausal women because of its isoflavone content, one type of phytoestrogen. Isoflavones exhibit estrogen-like effects under certain experimental conditions and are posited to reduce risk of coronary heart disease, osteoporosis, certain forms of cancer, and to alleviate menopause related hot flashes (Kozlowska and Szostak-Wegierek, 2014). Consequently, many women view soy foods as natural alternatives to conventional hormone therapy.

Paratha is usually made from wheat flour, which is normally consumed by majority of Indian at breakfast, dinner and sometimes at lunch. Wheat flour contains negligible amount of isoflavones (USDA, 2008). So, the challenge of processing soybean for human consumption is to develop acceptable soy foods which are of high protein quality, high isoflavone content and thus to make them available to the nutritionally vulnerable groups. The development and consumption of such functional foods not only improves the nutritional status of the menopausal women but also helps those suffering from diseases associated with today’s changing life styles and environment. Therefore, an attempt was made in the present study to develop and evaluate the effect of soyflour at different replacing levels on sensory and nutritional content of paratha.

MATERIALS AND METHODS

Soybean, whole wheat flour and refined oil used for this study were purchased in a single lot from the local market of Udaipur, Rajasthan.

Preparation of soyflour: Soyflour was prepared using dry heat method (International Soybean Programme, 2009). Soybeans were cleaned by sorting out contaminants such as sand, sticks and leaves and were washed. Beans were covered with several times their volume of water and soaked for 8 hours. After draining water, they were spread in a single layer on a baking sheet and were baked at 175°C for 15 min in oven. After turning them, they were again baked for 10 min longer. Soaking and heat treatment is the most common method used to reduce any antinutritional factor present in raw soybeans (Ferrier and Lopez, 2006; Soetan and Oyewole, 2009). One of the extra advantages of using heat treatments on soybeans is that the process improves the taste of the end product. Dried beans were later milled using mini grain mill and sieved into fine flour (Fig. 1).

Product formulation: Paratha is an unleavened bread that is made with wheat flour. The dough is folded over a couple of times giving it a puffy, layered, and flaky texture. It is

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made by pan frying on a griddle. The recipe was cooked in the laboratory of Foods and Nutrition, College of Home Science, MPUAT, Udaipur. Ingredients required for recipe were weighed on an electronic food balance of 1 g accuracy. A series of preliminary trials for preparing recipe were carried out to standardize it. Wheat flour was replaced with soy flour in four preparations 10, 15, 20 and 25 % and designed as T1, T2, T3, and T4 respectively, whereas T0 (without soy flour) was kept control. The preparation of paratha is shown in Fig. 2. All the preparations were carried out in triplicate.

**Organoleptic analysis:** The sensory evaluation of products were made by panel of ten judges using nine point Hedonic Rating Scale to test liking or disliking of the product. A 9-point Hedonic scale, where “1” representing “extremely dislike” and “9” representing “extremely like” was used (BIS 1971). The qualities assessed include colour, texture, flavour, taste and overall acceptability. Coded samples of the same size and temperature were served on a (white) coloured plate to judges in each panel. Most acceptable level of soy flour in paratha was further analyzed for its nutrient content.

**Chemical analysis:** The chemical analysis of prepared soy flour and most accepted paratha (blended with 20 % soy flour) was carried out in triplicate. Both were dried in hot air oven at 60°C for 48 h and ground to powder form followed by packing in air tight containers.

**Proximate composition:** Moisture, protein, crude fibre, total ash, crude fat in samples were determined according to AOAC (2000) procedures.

**Carbohydrates:** The carbohydrate content present in samples was expressed as per cent and calculated by subtracting the sum of per cent moisture, protein, fat, fibre and ash from 100 (Gopalan et al., 2010).

**Calorific value:** The calorific value (Kcal/100g) of products was calculated by summing up the products of multiplication of percent protein, fat and carbohydrate present in the samples by 4, 9 and 4, respectively.

**Calcium:** Calcium was determined by titrametric method (AOAC, 2000).

**Isoflavone:** Isoflavone content of developed products was estimated by using standard method given by Kao and Chen (2002) for the High Performance Liquid Chromatography.

**Statistical analysis:** All data were expressed as mean values ± SD. Statistical analysis was performed using one way analysis of variance (ANOVA) with p<0.05 and p<0.01 being considered statistically significant. All the analysis was carried out in triplicate.

**RESULTS AND DISCUSSION**

**Sensory evaluation:** Results of sensory evaluation of paratha samples containing different level of soy flour substitution as compared to the control is shown in Table 1, revealed that the overall acceptability of paratha substituted with soy flour ranged from 7.7 to 7.6. This indicated that the recipes were found to fall under the category of ‘liked very much to like moderately’. Control paratha (T0) exhibit highest scores for all sensory attributes i.e. 8.6±0.51 (colour), 8.6±0.51 (texture), 8.7±0.48 (flavor), 8.7±0.48 (taste) and 8.6±0.39 (overall acceptability) as compared to paratha prepared with 10, 15, 20 and 25% level of soy flour.

The incorporation of soy flour into wheat flour resulted in poor colour scores. This may be due to brownish appearance that could be directly related to the increase in fibre content. Moreover browning of the paratha could also occur due to caramelization and maillard reactions, as the

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**Fig 1:** Flow chart for the preparation of soy flour

**Fig 2:** Flow chart for the preparation of paratha
protein contributed by soyflour must have reacted with sugar during the baking process (Mohsen et al., 2009). The score for texture of the paratha samples, increase with increase in soyflour substitution, but were less in score when compared to paratha (control). The paratha with 20 % (T3) and 25% (T4) had the best texture score as compared to their counter part treatment group. Statistical data revealed that there was a significant difference in texture of paratha at p=0.01.

Results regarding flavour and taste of the soyflour incorporated products revealed increased in scores up to 20 % incorporation and then decreased. Paratha sample with 25 % (T4) soyflour recorded the lowest value. From the statistical data, it is clear that, there was a significant difference at p<0.01 in flavour and taste of paratha. Serrem et al., (2011) reported that substitutions of defatted soyflour into wheatbread and biscuits were associated with the roasted soybean flavour, aroma and after taste. The beany flavour is commonly associated with food legumes (Okoye and Okaka, 2009).

The sensory evaluation also revealed that paratha with soyflour substitution up to 20 % (T3) were overall highest acceptable, even though normal paratha was still preferred. The findings were in accordance with Aleem et al., (2012) who also reported similar results after replacing refined wheat flour with soyflour at 20 per cent level to prepare biscuits. Whereas, Kadam et al., (2012) reported lower incorporation level of soyflour and chickpea flour in equal quantities i.e. 10 % each in wheat paratha.

Nutrient analysis: The chemical composition of soyflour are shown in Table 2. The moisture content of flour determines its storage stability as lower the flour moisture, longer will be its storage stability. It was observed that soyflour recorded a moisture content of 4.23 %. The flour quality is also assessed by the quantity and quality of protein in flour. The result of the proximate composition of the soyflour showed a high amount of protein (44.07 %). Soyflour being a product of soybean which is an oilseed contained about 19.14 % fat. The ash content in the food stuff represents inorganic matters remaining after the organic matters have been burnt. The total mineral content was 4.70 % and the crude fibre content was 5.25 %. The computed carbohydrate content of soyflour was 26.82 % and the calorific value was 455.89 kcal/100g. The calcium content was evaluated to be 198 mg/100g in soyflour. These findings are in agreement with those reported by Famurewa and Raja (2011) and Mishra et al., (2012). In the present study, the isoflavone content was abundant in soybean flour i.e. 131.55 mg/100 g. Edina et al., (2012) reported the total isoflavone content in seven cultivators of soybean was in range from 71.2 to 133.8 mg/100g.

The nutritional composition of paratha substituted with 20 % (T3) soyflour contained moisture 26.96±0.46 g, protein 18.39±1.51 g, fat 2.98±0.39 g, ash 3.26±0.10 g, crude fibre 1.62±0.33 g, carbohydrate 73.75±1.11 g, energy 395.38±2.20 kcal and calcium 43.33±1.15 mg (Table 2). The protein, fat, ash and crude fibre content of paratha were more or less comparable as reported by Mishra et al., (2012). The isoflavone content of paratha was found to be 19.94 mg/100 g on fresh weight basis. In the present study, the isoflavone content was abundant in soyflour but was in less concentration in its products. Apart from incorporation level of soyflour at different level in developed product, the difference in isoflavone content between the products may be due to cooking methods and exposure to heat. Isoflavone content and its distribution in soybased foods have been reported to depend on the variety of soybean, methods of processing, and addition of other components (Yaqiong et al., 2009).

### Table 1: Mean±SD of acceptability scores of paratha.

| Treatments | Colour   | Texture | Flavor   | Taste   | Over all acceptability |
|------------|----------|---------|----------|---------|------------------------|
| T0 (control) | 8.6±0.51 | 8.6±0.51 | 8.7±0.48 | 8.7±0.48 | 8.6±0.59               |
| T1 (10%)   | 7.9±0.87 | 7.5±0.71 | 7.8±0.78 | 7.5±0.84 | 7.7±0.70               |
| T2 (15%)   | 7.9±0.87 | 7.7±0.67 | 7.8±0.91 | 7.6±1.07 | 7.7±0.79               |
| T3 (20%)   | 8.0±0.47 | 7.9±0.73 | 7.9±0.73 | 7.9±0.73 | 7.9±0.42               |
| T4 (25%)   | 7.8±1.61 | 7.9±0.56 | 7.2±0.63 | 7.1±0.87 | 7.6±0.57               |
| General Mean | 8.0±0.96 | 7.9±0.72 | 7.8±0.84 | 7.7±0.95 | 8.2±0.80               |
| CD5%       | 0.86     | 0.58    | 0.65     | 0.74     | 0.72                   |
| CD1%       | 1.15     | 0.77**  | 0.87**   | 0.99**   | 0.96                   |

Values are mean ±SD of three replicates
*,** Significant at 5% and 1% respectively

### Table 2: Nutritional composition of soyflour and selected paratha (on dry weight basis).

| Nutrients | Soyflour (Mean±SD) | Paratha (SF-20%) (Mean±SD) |
|-----------|--------------------|-----------------------------|
| Moisture  (g) | 4.23±0.24          | 26.96±0.46                  |
| Protein (g)  | 44.07±0.50         | 18.39±1.51                  |
| Fat (g)      | 19.14±1.15         | 2.98±0.39                   |
| Ash (g)      | 4.70±0.10          | 3.26±0.10                   |
| Crude fiber (g) | 5.25±0.01       | 1.62±0.33                   |
| Carbohydrate (g) | 26.82±1.49      | 73.75±1.11                  |
| Energy (kcal) | 455.89±5.74      | 395.38±2.20                 |
| Calcium (mg) | 198±2             | 43.33±1.15                  |
| Isoflavone* (mg) | 131.55            | 19.94                       |

- SF – Soyflour
- All the values are the average of three observations
- *Isoflavone content of products (per 100g) on fresh weight basis
CONCLUSION
Based on the above results, it could be concluded that soyflour incorporation up to the level of 20% increased the overall acceptability and nutrient characteristics of paratha. The enhancement of the protein, calcium and isoflavone content of paratha with the addition of soyflour, could help to alleviate the problem during menopause and thus improve their quality of life. Also, further studies should be performed on soyflour blended other local and traditional products for menopause women.

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