The Pharma Innovation

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Evaluation of proximate composition of soy flour samples prepared from different methods

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Abstract
The evaluation of proximate composition of soy flour samples prepared from different methods was carried out at the department of Agricultural Process Engineering, CAE & T, VNMKV, Parbhani (Maharashtra). Soybean variety JS -335 was selected for this study. Soybean was procured from Soybean Processing Center, VNMKV, Parbhani. Whole unbroken soybean free from infestations was selected for study purpose. Evaluation of proximate composition *viz.*, moisture content, protein content, fat content, fiber, ash and carbohydrate was performed as per the standard procedures. Significant difference was found within the treatments i.e. soy flour prepared from raw soybean, 45 min roasted soybean, 60 min boiled soybean and 4 hr soaked and 60 min boiled soybean. Roasting, boiling and soaking and boiling showed significant effect on the protein content of soy flour samples. The highest fat content observed in soy flour prepared from 45 min roasted soybean i.e. 19.48%. Statistical results also indicated that processing methods like boiling, roasting and soaking and boiling significantly affected the fiber content of soy flour samples. The ash content was found to be the highest in raw soy flour i.e. 5.46% and lowest for soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 4.83%. The carbohydrate content was highest for soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 29.46% and lowest for soy flour prepared from 45 min roasted soybean i.e. 26.06%.

Keywords: Soy flour, roasting, boiling, soaking

Introduction
Soybean is recognized as vital ingredient for protein enriched ready to eat food products. 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. Soy flour is most widely used in baked goods 2-15% is added to breads, crackers, muffins, donuts, cakes, rolls, cookies, tortillas, or chapattis. In baked goods, soy flour increases the storage life and nutritional value, while adding moisture as needed with little or no increase in cost. Also it is also used in pasta products, processed meats, gravies, sauces, soups, cereals, prepared mixes, dairy substitutes, candies, special diet foods and spice bases. In other products, it generally lowers the cost and improves the functional properties by serving as a conditioner, emulsifier, moisture retainer, antioxidant etc. (William *et al*, 2004) [14]. Hence the proximate composition of soy flour samples prepared from different methods were evaluated for soy flour prepared from different methods.

Materials and Methods
Procurement of Soybean
Soybean variety JS -335 was selected for the study on the basis of popularity and yield. Soybean was procured from Soybean processing center, VNMKV, Parbhani. Whole unbroken soybean free from infestations was selected for study purpose. Soy flour samples were prepared from raw, 45 min roasted soybean, 60 min boiled soybean, and 4 hr soaked and 60 min boiled soybean.

Moisture content
A 5 gm sample was taken in a tare moisture box and was weighed accurately using a single pan digital balance of 0.0001 g sensitivity to get the exact weight of the sample. It was kept in hot air electric oven maintained at temperature of 105 ± 1 ºC for 4 hours. The sample was taken out of oven, cooled in desiccators and weighed to determine the moisture content.

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$$\text{Moisture content (\%)} = \frac{\text{Wt. of original sample} - \text{Wt. of dried sample}}{\text{Wt. of original sample}} \times 100$$

Protein content
The protein content was determined by Micro- Kjeldahl's apparatus.

Fat content
The fat content was determined by the ether extraction using Soxhlets apparatus.

Fiber content

$$\text{Fibre (\%)} = \frac{W1 - W2}{\text{Weight of sample (g)}} \times 100$$

Where
W1 = Weight of material before ashing (g)
W2 = Weight of material after ashing (g)

Ash content

$$\text{Ash (\%)} = \frac{\text{Weight of ash (g)}}{\text{Weight of sample (g)}} \times 100$$

Carbohydrate content
Carbohydrate = (100 – Moisture + Fat + Protein + Ash + Crude fiber)%

Results and Discussion
On basis of results of anti-nutritional factors soy flour samples selected for proximate composition. The result of proximate composition of soy flour prepared from raw, 45 min roasted soybean, 60 min boiled soybean, and 4 hr soaked and 60 min boiled soybean are presented in table 1.

Table 1: Proximate analysis of soy flour prepared from raw, 45 min roasted, 60 min boiled and 4 hr soaked and 60 min boiled soybean

Parameter/Treatment	Moisture content (%)	Protein (%)	Fat (%)	Fiber (%)	Ash (%)	Carbohydrate (%)
T (control)	5.04	38.82	18.22	4.55	5.46	27.91
R3	3.53	41.19	19.48	4.42	5.32	26.06
B4	5.58	37.87	17.86	4.72	5.24	28.73
S4b4	5.97	37.45	17.38	5.06	4.83	29.41
SE±	0.094	0.428	0.107	0.053	0.091	0.471
CD	0.310	1.419	0.355	0.175	0.302	1.559

Where
T = Control (Unprocessed)
B4 = Soy flour prepared from 60 min boiled soybean
R3 = Soy flour prepared from 45 min roasted soybean
S4B4 = Soy flour prepared from 4 hr soaked and 60 min boiled soybean

Moisture content
From table 1 it was observed that there was significant difference within the treatments i.e. soy flour prepared from raw soybean, 45 min roasted soybean, 60 min boiled soybean and 4 hr soaked and 60 min boiled soybean. The highest moisture content was found in soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 5.97% followed soy flour prepared from raw soybean and soy flour prepared from 60 min boiled soybean and lowest for soy flour prepared from 45 min roasted soybean i.e. 3.53%. The moisture content 5.04% and 5.58% was found in soy flour prepared from raw and boiled soybean respectively.

Protein content
The quality of soy flour was assessed by the quantity of protein in flour. The protein content of soy flour samples is given in table 1. Roasting, boiling and soaking and boiling showed significant effect on the protein content of soy flour samples. It was observed from table 1, that the lowest protein content i.e. 37.45% was found in soy flour prepared from 4 hr soaked and 60 min boiled soybean and highest protein content i.e. 41.19% for soy flour prepared from 45 min roasted soybean. The protein content 38.82% and 37.86% were found in soy flour prepared from raw and 60 min boiled soybean respectively. However, flour prepared from 4 hr soaked and 60 min boiled soybean and 60 min boiled soybean showed nearly same protein content.

Fat content
The data regarding fat content of soy flour samples prepared from raw, 45 min roasted, 60 min boiled and 4 hr soaked and 60 min boiled soybean is given in table 1. The fat content decreased significantly in case of soy flour prepared from 4 hr soaked and 60 min boiled soybean and only 60 min boiled soybean i.e. 17.38% and 17.86% respectively. Cooking treatments significantly decreased fat content. These decreases might be attributed to their diffusion into cooking water. It is supported by the findings of Mubarak (2004) for mung bean seeds. The fat content in raw soy flour was found as 18.22%. The highest fat content observed in soy flour prepared from 45 min roasted soybean i.e. 19.48%.

Fiber content
The results pertaining to analysis of variance of soy flour samples for fiber content is given in table 1. Statistical results indicated that processing methods like boiling, roasting and soaking and boiling significantly affected the fiber content of soy flour samples. From table 1 it reveals that, the fiber content of raw soy flour was found to be 4.55%. The fiber content was found to be lowest for soy flour prepared from roasted soybean i.e. 4.42% and highest for soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 5.06%. This increase in fiber content could have been due to protein fiber complexes formed after possible chemical codifications induced by the soaking and cooking of dry seeds. The results of the present study regarding fiber content are in line with the results of previous study done by Alajaji et al., (2006) [2].

Ash Content
Table 1 represents that, the ash content was highest in raw soy flour i.e. 5.46% and lowest for soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 4.83%. The decrease in

ash content might be attributed to their diffusion into cooking water which agreed with the findings of Hefnawy (2011) [7] for lentils.

Carbohydrate content
Table 1 reveals that, carbohydrate content was highest for soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 29.46% and lowest for soy flour prepared from 45 min roasted soybean i.e. 26.06%. It may be due to high protein content in soy flour prepared from roasted soybean.

Conclusion
The study revealed that there was significant difference within the treatments i.e. soy flour prepared from raw soybean, 45 min roasted soybean, 60 min boiled soybean and 4 hr soaked and 60 min boiled soybean. The flour prepared from 4 hr soaked and 60 min boiled soybean and 60 min boiled soybean showed nearly same protein content. The highest fat content observed in soy flour prepared from 45 min roasted soybean i.e. 19.48%. The fiber content was found to be lowest for soy flour prepared from roasted soybean i.e. 4.42% and highest for soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 5.06%. The ash content was highest in raw soy flour i.e. 5.46% and lowest for soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 4.83%. The carbohydrate content was found to be highest for soy flour prepared from 4 hr soaked and 60 min boiled soybean i.e. 29.46% and lowest for soy flour prepared from 45 min roasted soybean i.e. 26.06%.

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