ACTA SCIENTIFIC NUTRITIONAL HEALTH

Volume 3 Issue 3 March 2019

Review Article

Soyabean the Miracle Golden Bean in Indian Foods

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Received: January 18, 2019; **Published:** February 18, 2019

Abstract

The magnitude of imbalance in the nutritional well-being of diverse population in developing countries is eternal, and continually demands answers from the science of Food and Nutrition. Under nutrition, especially with respect to micro- nutrients, is a problem that persists in developing countries in spite of rapid leaps and bounds in the production of food grains and food availability. Tackling the problem of micronutrient malnutrition involves making use of all available natural resources which are abundant in vitamins and minerals. High in protein and used as a vegetarian and lactose alternative for many foods, soya has transcended its Asian origins to become the most widely cultivated legume across the globe. The key benefits of soya are its high protein content, vitamins, minerals and insoluble fiber. The soya bean has been transformed into a number of popular soya based foods used in daily life.

Keywords: *Soya Products; Malnutrition; Processing; Entrepreneur*

Introduction

Soya is one of the fastest growing crops in India. The top three soya bean growing states are Madhya Pradesh, Maharashtra and Rajasthan. Soya bean is grown as a karif crop in India.

The growth of interest in Soya foods during the year 1930s promoted Indian Nutritionists to initiate studies on the Nutritive value of Soya foods and to compare with the traditional Indian leagues and Grains. Since time immemorial, Soya bean has served as meat, milk, cheese, bread as well as oil for people of China and East Asia and the ancient literature of those countries called it Golden Bean or Miracle Bean. Due to its immense potential as food, feed, fuel and industrial production; Soya bean is said to have revolutionized the Agricultural economy of west particularly United States.

The Unique chemical composition of soya bean which includes the number of nutraceutical compounds such as iso flavones, tocopherols and lecithin besides 20% oil and 40% protein.

Throughout the world, Soya beans are cooked, fermented, germinated or processed by various means before consumption. The raw soya bean is not very palatable because of its texture and objectionable flavor. Precise control of heating and other processing variables ensures adequate destruction of the heat labile, anti-nutritional factors to achieve optimum protein quality [1,2].

There has been much progress in the fermentation technology and engineering of fermented foods over the last two decades. Fermented foods can make an important contribution to the diet as sources of protein, calories and some vitamins. Mature soya beans processed into flour, concentrates and isolates, which in turn are converted into a variety of non-fermented foods, are a primary international protein source. Technology for the utilization of soya flour in baking foods is well established and reasonably simple.

Development of food products from germinated soya beans may be another way of further increasing their versatility and utility. Germinated soya beans are receiving much attention because it is thought that flavor and nutritional quality may be improved. It is well known that the activities of certain enzymes like amylase present in seeds increase during germination [3]. As a result of enhanced enzymatic changes during germination, the seeds undergo pronounced metabolic changes and the structural profiles of the various organic components are altered [4].

Addition of Soya flour to the white flour in bread preparation improved the protein quality [5].

Soya bean is the world's leading grain legume crop. Conventionally, it has been exploited primarily as a source of edible oil for human food and of protein rich meal for livestock.

Soybean is hailed as the Miracle Golden Bean of the 20th century and it is rightly praised as treasure trove of many countries. It has highest protein content among the plant products protein is rich in lysine, which is deficient in cereals, but is somewhat deficient in the Sulphur-bearing amino acids that are contained in adequate quantifies in cereals. When Soy protein and cereal protein combined in appropriate proportions, the nutritional value of the product approaches that of milk protein casein.

Soybean contains 20 percent fat and it has number of poly unsaturated fatty acids which are anti-cholesteric. The oil mainly contains long chain fatty acids such as linoleic, oleic and linolenic acids which are good for health.

The soybean has 35 percent carbohydrates with major portion being polysaccharides. The galactosaccharides such as raffinose, stachyose and verbascose present in soybeans are also known as flatus factors. The soybean has 5 percent minerals and also the richest source of isoflavours.

It is well known that there are some anti-nutritional factors in soybean, as in other pulses. These are protease inhibitors (8.1 to 38.5 TUI/mg), haemagglutinins 3%, saponins 0.5%, goitrogens and phenolic compounds. However, most of these anti-nutritional factors are heat labile and can be eliminated by suitable heat treatment.

Processing of soybean

The characteristic beany flavor and the presence of anti-nutritional factors are the main reasons for the non-utilization of soybean at domestic level in rural and urban areas. It is evident that alternative approaches to soybean processing are needed in order to benefit the majority that need better nutrition. In this direction, as an effort to promote the use of soybean, the Department of Foods and Nutrition, Faculty of Home Science, ANGRAU conducted extensive research on processing and utilization of soybean. Appropriate heat treatment during processing greatly improves the nutritional value of soybean.

Soybean in therapeutics: Soybean has great potential in solving the problems of protein energy malnutrition. Soybean, a high protein and a low carbohydrate legume would be of great use in the formulation of therapeutics.

a) **Soybean for diabetics**: The glycemic response of soy incorporated (40%) recipes namely Roti, Upma, Dhokla and Chole was assessed in normal subjects. The percent glycemic response of soy incorporated recipes was significantly higher than control recipes.

   Since Chloe was found to have the least glycemic response, this way tested in non-insulin dependent diabetic subjects. The glycemic response of the diabetic subjects with soy Chloe was lower than that with Bengal gram Chloe [6].

b) **Soybean safeguards the cardio vascular health:** Natural Soybean oil has highly unsaturated fatty acids and contains approximately 7% of omega-3, alfa linolenic fatty acids. Research indicates that omega 3 poly unsaturated fatty acids in the diet are beneficial to cardiac health. Generally populations that have higher intake levels of Isoflavones have lower rates of cardio vascular disorders. The isoflavones present in soybean possess antioxidant activity and there is evidence that several flavonoids can inhibit oxidative modification of law density lipoproteins (LDL) and raises the High Density Lipoprotein (HDL) levels and this reduces cardio vascular disorders.

c) **Soybean saves the risk of cancer:** Soybeans are the richest known sources of isoflavones and they also known as phytoestrogens. Depending on the biological environment and their chemical structures, phytoestrogens can function either as estrogens or as anti-estrogens. Due to their phenolic structure isoflavones have antioxidant property and may prevent conversion of pre-carcinogens to carcinogens. They possess antioxidant, anti-inflammatory, anti-proliferative and anti-estrogenic properties. They are reported to be responsible for reducing the risk of breast, prostate and colorectal cancer and also reduces bone density in women after menopause.

   It is estimated that the human beings would need to consume flavones as 1.5 to 2.0 mg/kg body weight per day to provide an ';anti-carcinogenic dose' of these compounds. This level of isoflavones intake could be met by consuming 120 - 360g of several soy products.

Food application of soy products

A large number of functional properties are attributed to soy protein. There are no standard test available for measuring functional properties of soy proteins. Functional properties of soy proteins are listed below.

Property	Food system
Emulsification	Bread Cakes
Emulsion formation	Whipped topping Frozen desserts
Emulsion stabilization	Sausages Soups
Fat absorption promotion	Meat Doughnuts
Prevention of excess fat absorption	Cereal foods
Water absorption promotion and retention	Cereal products, meat patties, pan cakes, bread cakes
Gelation	Coagulated products (paneer) thickening agents in soups and gravies
Fiber formation	Simulated meats
Dough formation, adhesion	Baked goods, sausages, meat rolls and meat loaves
Elasticity	Baked goods, simulated meat
Colour control bleaching	Breads
Aeration	Whipped toppings, confectionary items

Table 1: Functional properties of soy bean proteins.

Soya protein in foods has wide applications in cereal foods: Some of these are Traditional foods, Beaked Foods, Breakfast cereals and Fermented foods.

Fermented soybean products are Tofu and Fried tofu, Miso, Natto, Kori tofu (dried or frozen tofu) and Shoyu (Soy sauce).

Defatted soybean products such as Shoyu, Tofu and fried tofu, and Miso.

Opportunities for soy based food enterprises

Soybean has majorly utilized to extract oil in several parts of the world. The by- products have been used for cattle/poultry feeds. The untiring research efforts of the Scientists all over the world have led to the development of several products from soybean. Soybean can be used in several forms in establishing enterprises as follows.

a) Whole soybean
b) Soy dhal
c) Defatted soy flour and Soy protein
d) Soy isolates.

Items with whole Soybean:

a) Soy Milk
b) Yoghurt
c) Tofu
d) Okara
e) Soy Milk Powder
f) Soy Cow Project
g) Soy Cow
h) Soy Dhal
i) Dal Analogue
j) Soy papad.

Energy protein rich food (EPRF) [7]

Ingredients	Amount
Dehusked roasted horse gram flour	40g
Dehusked roasted soybean flour	20g
Jaggery powder	20g
Crude Red palm oil	20g

Table 2: Energy protein rich Food (EPRF) Composition.

Soya bean flour is prepared as follows

Soya bean; cleaned (removal of foreign material); Size graded (by passing through a grader to obtain uniform sized grains); Conditioned (Steeped in water for 30 minutes); Sundried for six hour; Dehulled; Roasted at 150°C for 10 minutes and powdered.

Simple technologies for making soya products

Soya beans are typically processed to extract oil and to produce a variety of high protein products from the defatted flakes. These products are classified into meal, flour, grits, concentrates and isolates based primarily on their protein content. Soybean meal, flour and grits are the commercial products with protein content ranging from 45 to 55%.

Techniques for processing soybean at rural level: Cleaning and grading of soybean, Dehulling of soybean and Detoxification of soybean.

During sprouting the storage materials are converted into simpler substances that are more readily usable to plants and animals. The starch break down during germination may be attributed to the increase in amylase and phosphorylase activity in respiratory metabolism. These changes promote digestibility of sprouted legumes in the uncooked state.

Introduction of soya fortified flour into baked products requires very little changes in baking technology and no changes in bakery equipment. Three minor changes from normal baking procedure will result in optimum breads from soya fortified flour. Firstly the increased absorption of soya requires that three quarters to one part water be added for every part soya flour. Secondly less mixing than normal dough is needed for optimal bread quality. Third a shorter fermentation time is best for soya fortified flour bread.

Due to its low cost and familiarity, fermented foods have great potential as key protein sources and as basic ingredients for food supplementation. Processed soya bean products appear to be the best vehicle for protein improvement in the diets of many parts of the world.

Industrial Applications

Though soya products have potential for several industrial applications like in tanning, wall board, mortar cement, pesticides, herbicides, wall paper gloves, paint, shoe polish, lamination, printing ink surfactants, plasticizer etc. at present except industrial application of lecithin and use of plant stem as fuel source in rural areas, not much has been exploited in India. Even in U.S. the industrial uses of protein concentrates is in lesser quantity.

Constituent (g/100g)	Defatted flour	Protein concentrate	Protein isolate
Moisture	6.5	5.8	5.2
Protein	51.6	67.8	87.8
Fat	0.9	0.9	3.0
Crude Fiber	2.9	3.7	0.2
Ash	6.1	4.7	3.6
Carbohydrate	32.0	17.2	0.2

Table 3: Proximate comparison of commercial edible soya bean products.

Ready to eat Dhal: Soy dhal normally takes very long cooking time for complete tenderization. Beans were cracked in blower mill and water was added in the ratio of 4:1, sufficient quantities of turmeric, salt, starch additives were added and cooked in pressure cooker for 30 to 45 minutes. The dhal was grounded in a wet grinder till slurry was obtained. The slurry was dried in tray dryer/drum dryer. The product is milled.

Dal Analogue: A nutritious, high protein processed food made from defatted soya flour, wheat and red gram has more protein and is much cheaper than traditional dals.

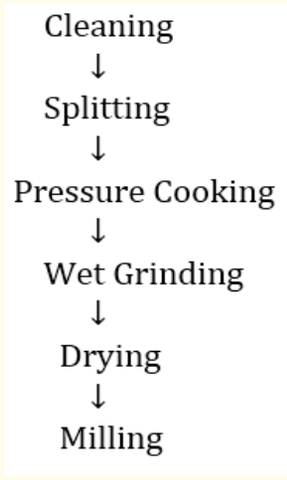

Figure 1: Preparation of ready to eat dhal.

Soya Papad: Soya flour can replace 30% of black gram without compromising taste, texture and increased the protein content and reduces raw material cost considerably.

Composite Riti Blend: There is a need to promote the products developed in the laboratory for the wide use of the community. To popularize soybean, sorghum - soya roti blend of 3:2 proportion was developed and evaluated for consumer acceptability in rural and urban area. It was found that the majority of the rural people (65%) were not interested to substitute sorghum - soya roti for sorghum roti due to the difference in flavor while 80% of the urban consumers accepted sorghum soya blend in place of wheat roti [8].

Full fat soya flour: The process for production of full fat soya flour developed at CIAE-Bhopal and which is recommended for commercial use. Soya bean (8% moisture content) was freed from dirt, foreign matter and brokens. The cleaned beans were cracked with a hand stone grinder of a capacity of 10 kg/hr and the hulls were removed by winnowing. The split beans were filled in cloth bags and soaked in water containing 1% (w/v) $NaHCO_3$ at room temperature for 4 hrs. The beans to water ratio was 1:3 and the beans were conditioned to 52% moisture. The cloth bags along with split pulse were kept in boiling water (100°C) for 20 minutes. The excess water was drained. Sundry the seeds till 8% moisture level. Beans to flour by grinding in a hand stone grinder. The product is now ready for human consumption after blending with cereal/millet/pulse products at 10 - 20% level. The flour may be stored in metallic tins/cloth bags for a period of six months.

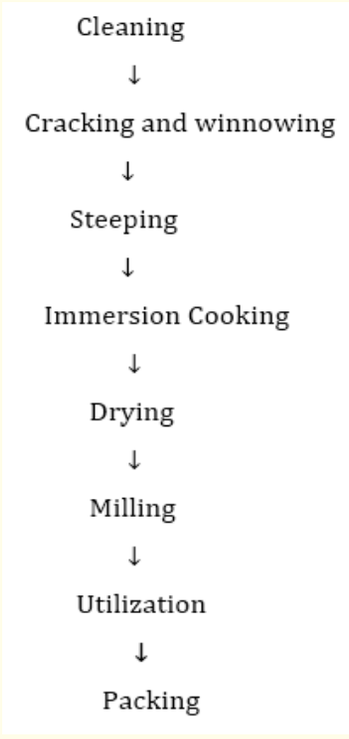

Figure 2: Production of full fat soya flour.

Soya Flakes: Soya flakes are another popular dietary item which falls within the existing food habits. A simple process was developed for making soya flakes at rural level. Sound soybeans were first cleaned, the dust, dirt foreign matter were removed. Cleaned dhal was blanched in boiling water for 60 min so as to reduce anti-nutritional factors. The balanced dhal contains 60% moisture. The balanced dhal was dried in a natural conventional tray drier. The soya dhal was flaked in a specially developed soya bean flaking machine and further dried to 8% moisture for safe storage.

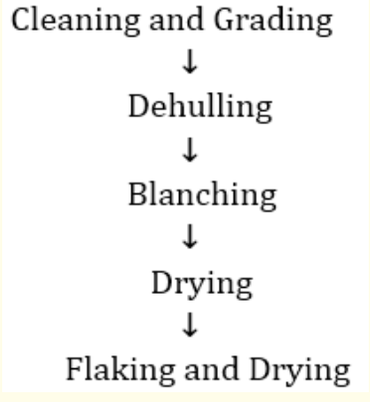

Figure 3: Preparation of soy flakes.

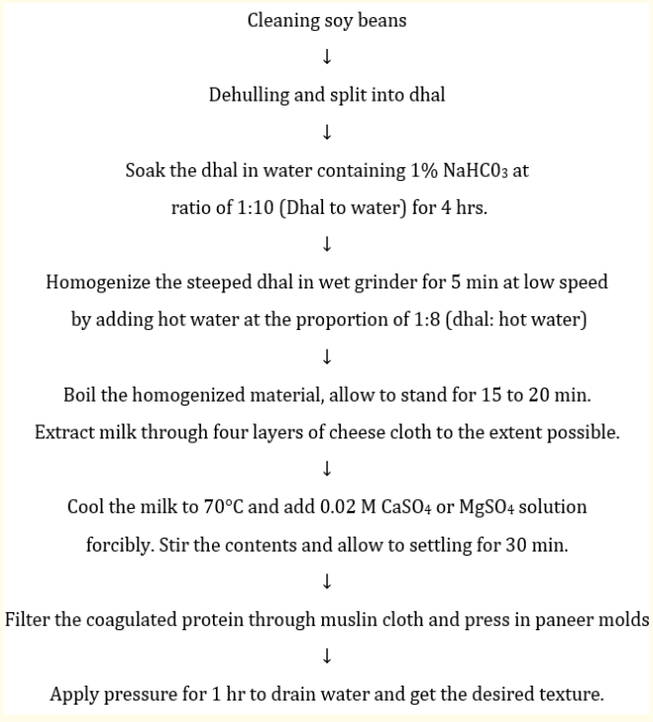

Figure 4: Preparation of soy paneer.

Other products such as ice cream and ice-cream mixes, coffee whiteners, beverages, extruded products etc. also can be prepared.

Conclusion

Soybeans are members of the pea (legume) family of vegetables. Eating soybean-based foods may reduce the risk of a range of health problems, including coronary heart disease. More research is needed, but the evidence so far suggests that it is wise to include whole soy (or soya) foods in daily diet. It is estimated that the human beings would need to consume flavones as 1.5 to 2.0 mg/kg body weight per day to provide an 'anti- carcinogenic dose' of these compounds. This level of isoflavones intake could be met by consuming 120 - 360 gram of several soya products.

Bibliography

1. American Soya Bean Association. "Proceedings of the World Soya Protein Conference, Munich, Germany". *Journal of the American Oil Chemists' Society* 51.1 (1974).

2. Smith AK and Cisrcle SJ. "Proteins, Soya beans; chemistry and technology". Volume 1 (1972).

3. Young OL and Verner OE. "Enzymatic activity of germinating pea seeds" (1959).

4. Kollar D., *et al*. "Seed germination". *Annual Review of Plant Physiology* 13 (1962): 437.

5. Hoover W. "Use of soy proteins in baked foods". *Journal of the American Oil Chemists' Society* 56.3 (1979): 301-303.

6. Ramanichar and K Krishna Kumari. "Food And Nutrition News". Editor, Vijayakhader 4.1 (1999): 4.

7. Vijaya Khader and P Aslesha. Acceptability studies on red Palm Journal 46 (1998): 13-17.

8. Shobha Reddy A., *et al*. "Food And Nutrition News". Editor, Vijayakhader 4.1 (1999): 2.

Volume 3 Issue 3 March 2019

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