

Soybean: A Wonder Crop for Human Being

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Soybean is one of the major legume crops in the world, providing an abundant source of oil, protein, macronutrients and minerals. Soybean is a high value and profitable crops. The economic viability of soy production is determined by the commercial utilization of its sub product, meal and oil which respectively, account for about two thirds and one third of crops economic value. An important characteristic of the soybean plant is its nitrogen fixation capability through symbiosis with nodule forming-bacteria in the soil. It has been estimated that up to 50% of the total nitrogen of the plant may be supplied by the nitrogen fixing mechanism. Soybean oil is a good source of polyunsaturated fatty acids, such as linoleic acid and alpha linolenic acid which are good for human health. It is one of the best vegetarian sources of total protein containing all essential amino acids required in the human diet. Soybean based protein food are an important strategy to relieve to malnutrition and hunger problem. It contains 36.6 g of protein, 19.9 g of total fat, 30.2 g of carbohydrate, 9.3 g of dietary fibre and 15.7 mg of iron per 100 g of seed.

Botany

Soybean scientific name *Glycine max* and chromosome no. $2n=40$. Soybean basically pulse crop but in India mostly grown as oil seed crop. This crop originated in China. Soybean all known as wonder crop or yellow jewel. Soybean is world first rank crop as source of vegetable oil. Soybean belongs to family Leguminosae and it is C3 short day plant. This plant highly self-pollinated. Soybean has perfect flower consisting of calyx, corolla, pistil and stamens.

Area, production, productivity

Soybean occupies 5.52 million hectares in MP producing 5.23 million tonnes and yielding 939 kg/ha (Director's report, IISR) Soybean production in Madhya



Pradesh, the leading soybean producing state in the country. The maximum production of soybean in Madhya Pradesh is in Malwa. The

Malwa plateau region of western MP covers the districts of Dewas, Indore, Dhar, Ujjain, Jhabua, Ratlam, Mandsaur and Rajgarh. Soybeans are of crucial importance in India. They are a source of protein, minerals, and vitamins. Soybeans are also important for meeting the vegetable oil requirement of India's population and for contributing to the national economy through soy meal export. In general, soybean seeds contain 35%–40% protein, 30% carbohydrates, 20% lipids, 9% dietary fiber, and 9% moisture based on its dry weight and these values would slightly vary depending on variety, the location, and its climate.

Soybean is an important source of food, protein, and oil, and hence more research is essential to increase its yield under different conditions, including stress. The most important countries of the world with the highest rate of soybean production include the USA, Brazil, Argentina, China, and India.

Uses of Soybean

Soy flour- soybean flour has a nutty aroma and is similar to chickpea flour. It is usually mixed with wheat flour to make rotis, parathas or pancakes.

Soy sauce- Soy sauce is a condiment commonly used as an ingredient in Chinese fast food and other Asian cuisines. It is widely available in the market and is present in the ingredient racks of every fast-food centre. It gives food an intense, savoury and salty flavour. Soy sauce is a dark brown liquid that can enhance the aroma and taste of stir-fries, soups, fried rice and noodles.

Soy paneer (Tofu)-It is a great meat alternative for vegans and vegetarians. It can be used in dishes like: Tofu Rolls, Tofu Noddle's, Tofu Sand witch, Tofu Crispy bites & Tofu Salad.

Soy milk-Soy milk is a plant-based drink made from soybeans. Some uses of soy milk are;

- It can be used as an alternative to cow's milk, especially for lactose intolerant people.
- It can be flavoured with vanilla, chocolate, or other ingredients.
- It can lower the risk of some cancers, such as breast and prostate cancer.
- It can control cholesterol and blood pressure levels.
- It can help in arthritis, anaemia and weight loss.

Soy protein powder- It is a plant-based protein that comes from the soybean, which is a legume. This makes a great source of protein for both vegetarians and vegans alike, as well as those avoiding dairy, with no cholesterol and very little saturated fat.

Soybean oil -Soybean oil is the most widely consumed vegetable oil world- wide. Although it is used as cooking oil.

Soybean Meal -Livestock feed, aqua culture feed, poultry feed. Poultry and livestock feed make up 97 percent of soybean meal used in the U.S.

Industrial Uses - Paint, cleaner, cosmetics, soaps.

Biodiesel- Using biodiesel reduces life cycle emissions because carbon dioxide released from biodiesel combustion is offset by the carbon dioxide absorbed from growing soybeans or other feedstocks used to produce the fuel.

Mineral -The mineral content of soybeans, determined as ash, is about five percent. When soybeans are processed, most of the mineral constituents go with the meal and few with the oil. The major mineral constituents are potassium, calcium and magnesium. The minor constituents comprise trace elements of nutritional importance, such as iron, zinc, copper etc.

The biological availability of minerals may be impaired somewhat as a result of the presence

of phytates in soybeans and soybean products. The mineral composition of soybeans is affected by the composition of the soil. Thus, the contamination of soils with undesirable elements such as heavy metals, as a result of irrigation with poorly treated waste water, may be reflected in the composition of the soybeans.

Isolated soybean proteins, or soy protein as they are also called, are the most concentrated form of commercially available soybean protein products. They contain over 90% protein, on a moisture free basis.

Carbohydrate- Soybeans contain about 30% carbohydrates. These can be divided into two groups: soluble sugar (sucrose 5%, stachyose 4%, raffinose 1%) and insoluble "fibre" (20%). Raffinose is a trisaccharide composed of galactose, glucose and fructose linked in that order. Stachyose is a tetra saccharide with the following structure: galactose-galactose-glucose-fructose. Raffinose and stachyose are not broken down by the enzymes of the digestive track but are fermented by the microorganisms present in the intestine, with the formation of intestinal gas. Flatulence, an inconvenience associated with the ingestion of pulses in general, is a factor which must be considered, sometimes, in the use of soybean products in human nutrition.

The insoluble fraction is a complex mixture of polysaccharides and their derivatives. The major part of this fraction consists of cell wall carbohydrates: cellulose, hemicelluloses and pectic substances. The insoluble carbohydrates are not digested by the enzymes of the gastro-intestinal track and can be characterized as "dietary fibre". They absorb water and swell considerably. Unlike other legumes, soybeans contain very little starch (less than 1%).

Antinutritional factors- The main anti-nutritional factors in soybean that inhibit growth in animals are trypsin inhibitor and lectin. Many anti-nutrients like phytates, lectins, and glycosylates can be removed or deactivated by soaking, sprouting or boiling the food before eating.

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