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Introductory Chapter: Soybean - Quality and Utilization

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1. Introduction

Customer requirements regarding safe product of high quality and nutritional value are increasing every day. These requirements are the results of today's life style, market globalization, food born outbreaks, etc. In order to fulfill those requirements, institutions in food chain (from field to table) are reaching for tools to enhance food quality as well as to ensure the safety of nutritious, functional, healthy and quality foods. As the food science in general has continued to evolve and as the scientific evidence on the health benefits of particular food attributes has become more familiar to consumer expectations and needs, the transfer of new research findings into applications has become more challenging for food producers. Taking into consideration physiological functions of some food constituents, as well as their nutritional implications, it is necessary to point towards better utilization of health promoting ingredients (natural antioxidants, phytochemicals, vitamins, fortification ingredients) The final aim of food scientist's activity in the future, is to connect further food product and process development with consumer physiological needs, based on research results obtained in respective fundamental disciplines [1].

Soybean (*Glycine max* (L.) Merr.) is a species of legume native of the Eastern Asia, widely grown for its edible bean, which has numerous uses. For many centuries, it was the main source of food for the people of the Far East (China, Japan, India). The ability of soybean for the food and non-food uses has been recognized for many years. Among available protein sources of plant origin, soybean protein is the closest to the optimum dietary essential amino profiles for human and animal nutrition. Therefore, soybean production, consumer acceptance and consumption in non-traditional regions of the world are on the rise. Increasing world population, constant need for animal feed and numerous different soybean products

contribute to the great demands for soybean seed in world market. Nowadays, soybean is the leading oil and protein crop, whose seed is used as a source of edible oil and protein for both human and livestock consumption and for various industrial purposes. Due to consumer's large interest in healthy food, soybean is grown more and more frequently under the organic system in which it produces satisfactory yield [2, 3].

2. Seed quality

The importance of soybean stems from the quality of its seed [4–6]. It contains about 35-50% proteins and 18-24% oils, depending of the variety and growing conditions. Soybean has the highest crude protein content and a balanced amino acid profile. Hence, soybeans have become a top choice for protein and as such, they are strategically traded around the world. The main protease inhibitors in soybean – Kunitz trypsin inhibitor and the Bowman-Birk inhibitor constitute the main anti-nutritional factors of soybean. Trypsin inhibitors contribute to reduce digestibility of seed protein. Nutritional and functional properties of the soya oils are determined by their fatty acid composition, the distribution pattern of the fatty acids within the triacylglycerols (TAGs) and the total content and composition of natural antioxidants [7]. Soybean is considered to be the most abundant natural source of isoflavones in the human and animal diet [8]. Isoflavones are the main components of flavonoids and the most common form of phytoestrogens [6]. Totally dry soybean seed contains 33% DW of carbohydrates on average, of which 16.6% DW is soluble sugars [9]. The significance of the soluble sugar profile is in its effect on quality, digestibility and nutritional value of soybean for food and feed. Soybean seed also contains vitamins (A, B, D and E), minerals (calcium, iron, and potassium) and phospholipids, such as lecithin.

3. Utilization

Soybean is used both for oil production and protein processing [5, 10]. Most of the produced soybean in the world is used for animal nutrition. Soybean meal is the highest quality plant protein nutrient that can serve as the basic source of protein for animal, especially all categories of pigs and poultry, then fish, fattening cattle, and is important in the diet of high-milking cows and sports horses. The use of raw soybean in the diet does not give satisfactory results due to trypsin inhibitors. Before using as food or animal feed, soybean seed must be heat-treated to break down trypsin inhibitor's activity. Processed soybean foods include various products such as tofu (bean curd), yuba (soy protein extracts from soy milk), kinako (roasted soy powder), nimané (cooked beans), bean sprouts, and soymilk as non-fermented food products and soy sauce, miso, and natto as fermented food products. Among these soy-based food products, tofu, soy sauce, miso, bean sprouts and natto are predominant. Soybean oil has been traditionally appreciated as a high quality commodity in the world oil market and due to widely has used in many food and non-food applications [10, 11]. Soybean oil is increasingly used in the food industry – for frying or baking foods, as a vegetable oil (table oil), as an ingredient in foods like salad dressings and margarins. The raw material is in the industry - soaps, creams,

detergents, paints and varnishes, plastics, cleaners, medical preparations, ink. Lecitin from soybean oil has applications in the bakery, confectionary, pharmaceutical, textile and chemical industries. Soybean is also used to produce biodiesel. Biodiesel “*methyl soyate*” is a renewable substitute for petroleum diesel with reduced greenhouse gas emissions. Results of numerous medical studies have indicated on the important role of soybean in the prevention and curing of chronic diseases. Healthy aspects of soyfoods go beyond the oil and protein and include minor compounds with nutraceutical properties [12, 13].

4. Perspectives

Soybean breeding has undoubtedly played a key role in production increases. The genetic improvement of soybean germplasm, based on conventional breeding strategies, contributes to advances in production and food processing industry by developing high-yielding and high-quality soybean varieties, hereby enhancing value-added, healthy and safe properties of final soy products. Recent advances in biotechnology, in particular the development of improved molecular marker technology, have made possible the genetic dissection and characterization of many quantitatively inherited seed quality traits in soybean [5, 14–17]. Therefore, genetic improvement of varieties could be characterized as an integral part of sustainable food production. The value of soya in livestock and human nutrition and industry has not yet been fully exploited. The processing methods in the animal feed industry and food, chemical, pharmaceutical and other industries are continuously improving.

Scientists look for opportunities to leverage research capabilities and commercialize promising new technologies by cooperating and collaborating with public and private sector interests. It is likely that these efforts will maintain a strong focus on soybean as a source of food and industrial products well into the future.

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