

OPEN ACCESS

Volume: 12

Special Issue: 2

Month: February

Year: 2024

E-ISSN: 2582-6190

Impact Factor: 4.118

Received: 07.12.2023

Accepted: 18.01.2024

Published: 14.02.2024

Citation:

Anitha, C., and S. Ramesh Raj. "Role of Soy in Enhancing the Performance of Sportsman." *ComFin Research*, vol. 12, no. S2, 2024, pp. 35–41.

DOI:

<https://doi.org/10.34293/commerce.v12iS2-Feb.7554>



This work is licensed under a Creative Commons Attribution-ShareAlike 4.0

Role of Soy in Enhancing the Performance of Sportsman

C. Anitha

Assistant Professor, Department of Home Science
Seethalakshmi Ramaswami College, Tiruchirappalli, Tamil Nadu, India

S. Ramesh Raj

Associate Professor & Head
Department of Hotel Management & Catering Science
Madurai Kamaraj University College, Madurai, Tamil Nadu, India

Abstract

The aim of the current study is to determine how soy products influence athletes performance in relation to their views of nutrition and health. Comparison of paneer, Bengal gram flour, Bengal gram and meat with the soy products, namely tofu, defatted soy flour, and soy chunks. The nutritional content of their products—paneer, Bengal gram flour, and Bengal gram—was reviewed and compared with that of tofu, defatted soy flour, and soy chunks. Success in sports is influenced by a variety of elements, and nutrition is one of them. The foods a sportsman needs to eat depend on a number of factors, such as the sport, goals, the surroundings, and pragmatic considerations. The significance of personalized nutrition counseling, encompassing daily nutritional guidance and targeted counseling prior to, during, and following training and/or competition, is becoming more widely acknowledged. Athletes employ many nutritional tactics to enhance their performance, with optimizing glycogen reserves being a crucial approach for numerous individuals. Consuming carbohydrates while exercising keeps blood sugar levels up, avoids hypoglycemia, and benefits the central nervous system. The advantages of consuming protein throughout the day after working out are now widely acknowledged.

Key words: Nutrition, Athletes, Soy, Tofu, Sport Activities

Introduction

A vital component of human nutrition are legumes, particularly for the poor people in developing nations. Known as “poor man’s meat,” beans are an excellent source of slow-releasing carbohydrates for energy and are rich in protein. Legume is often eaten after processing, which increases food palatability and increases the bioavailability of nutrients by deactivating trypsin inhibitors. The primary biopolymeric component of legumes, starch, undergoes partial modification during processing, turning into resistant starch. Dietary fiber is mostly found in legumes, especially in the husk portions of these legumes. It is a complex mixture of different polysaccharides. It is beneficial for therapeutic diets as well.

Legume is a nutrient-dense staple meal consumed all over the world. They are an excellent source of vitamins, fiber, protein, and complex carbohydrates. Any plant that is a member of the Fabaceae family of plants—leaves, stems, and pods—is termed a legume. The edible seed of a legume plant is called a pulse. Foods such as beans, lentils, and peas

are categorized as pulses. Pulses are made from a range of beans, including navy, black, kidney, and chickpeas.

A balanced diet should contain a variety of essential components, such as fiber, carbohydrates, fats, vitamins, and minerals, in addition to protein. The body uses proteins to fix the cellular damage that accumulates over time. Proteins are made up of nitrogen-containing amino acids. Protein intake must be sufficient for all body systems to operate at their best. A low-protein diet can lead to malnutrition in both adults and children.

Therefore, choosing a dependable, reasonably priced source of high-quality protein is essential for preserving excellent health. Meat is an expensive, high-protein, nutrient-dense diet. Of all the legumes, soybeans have the highest quantities of fat and protein. It has the lowest carbohydrate content of all the cereals. The English word “soy” comes from the Japanese pronunciation of “shoyu,” which is the word for soy sauce. The name for soya in Dutch was derived. It is often known that the most widely grown and financially successful legume in the world is the soybean (Glycinemax). Thirty-five percent of dry soybean is protein, nineteen percent is oil, twenty-eight percent is carbohydrate, five percent is minerals, and significant amounts of various vitamins are present. Thus, it is frequently used in the creation of meat alternatives.

Soybeans are thought to be an excellent source of both oil and protein for diets. The only vegetarian dish that contains all of the essential amino acids in the right amounts for human health is soy. Soybeans are the only commonly consumed plant food that is full of protein. It has a high content of essential fatty acids and little saturated fat. In addition to being high in nutrients, soybeans also include additional healthy compounds including lecithin and phytosterols, often known as isoflavones.

Soybeans help to combat the widespread protein-calorie malnutrition that many people in India and other developing countries experience. Soybeans are among the healthiest foods available. Protein from soybeans is thrice that of eggs, over ten times that of milk, and twice that of groundnuts, meat, fish, pulses, and groundnuts.

The world’s most affordable source of protein for diet comes from soybeans. It is better than other plant-based proteins. Soybeans are a globally necessary crop for improved nutrition, even though they are a lactose-free, environmentally beneficial crop.

Literature Review

Soybeans are an excellent source of high-quality protein since they are high in fiber and low in saturated fat. The importance of soybeans as a functional food is demonstrated by the physiological makeup of its grain. Because Indonesians consistently consume large amounts of soy and its processed derivatives, which seem to lower the risk of cardiovascular disease, there is a significant probability that soy will be used as a functional food. Research suggests that isoflavones from soybeans may help prevent and treat degenerative organ diseases. In order to achieve sustainable national food security, research on the uses of soy as a food is crucial. (AydaKrisnawati, 2017)

The soybean crop, which is important both economically and nutritionally, originated in Asia. Because they are rich in folic acid and isoflavonoids, soybeans are widely used as a wholesome dietary source. Dietary soy products are garnering more and more scientific interest because of their possible health benefits. Protease inhibitors, isoflavones, proteins or peptides, and saponins are the key components of soy that exhibit biological activity. Soybeans and their components have anti-inflammatory, anti-diabetic, anti-proliferative, anti-obesity, and antioxidant properties. Consuming them has been associated with numerous potential health benefits and a decrease in a number of chronic illnesses, such as diabetes, obesity, immunological disorders, cardiovascular disease, and certain types of cancer. Several studies have shown that high-protein soy products can help lower cholesterol. This article focuses on soy, its derivatives, and its potential applications in treating and preventing chronic illnesses.

Functional Importance of Soybean

The term 'functional foods' was first used in Japan in the middle of the 1980s to describe processed foods that are not only nutritious but also contain ingredients that assist different biological functions. Globally, soybeans (*Glycine max* (L.)), which are of Chinese origin, are a significant source of oil and protein for food. Despite being a commodity that is widely farmed, most soybeans are used as the raw material for oil milling, and the waste product, soy meal, is mainly used as animal feed. 36% protein, 19% oil, 35% carbohydrates (dietary fiber making up 17% of the total), 5% minerals, and a host of other ingredients, including vitamins, are found in soybean flour. The majority of soy components have been shown through years of intensive scientific and clinical research to have favorable health impacts, including the ability to prevent illnesses thought to be related to lifestyle. Most of soy's physiologically and nutritionally beneficial ingredients have undergone extensive analysis.

Table 1 Functional Components of Soy and their Substances Impact in Health

No.	Components in Soy	Physiological Functions
1	Soybean-derived proteins	Reduce serum cholesterol, avoid cardiovascular disease, reduce body fat, and increase serum insulin
2	α -Linolenic acid	Hypotriglyceridemic essential fatty acid enhances heart health
3	Isoflavones	Estrogenic, hypocholesterolemic, improves digestive tract function, protects against breast, prostate, and colon cancer, promotes bone health, and enhances lipid metabolism. Anti-carcinogenic properties, cardiovascular disease prevention, osteoporosis prevention, antioxidant properties, and menopausal symptom relief
4	Lecithin's	Enhance lipid metabolism and memory and learning skills
5	Lectins (Hemagglutinin)	Anti-carcinogenic, immune stimulator Activation of lymphocytes (T cells) and tumor cell aggregation
6	Linoleic acid	Essential hypocholesterolemic fatty acid
7	Peptides Peptide from proteins	Rapidly absorbed, fat-reducing, anticancer Antioxidant properties, suppression of angiotensin-converting enzymes, and phagocytosis-promoting properties
8	Phytosterols	Lower cholesterol and reduce prostate cancer risk Anti-carcinogenic actions
9	Protein	Hypocholesterolemic, antiatherogenic, decreases body fat
10	Saponin	modulates lipid metabolism, anti-carcinogenic antioxidant activities, hypocholesterolemic effects, reduction of platelet aggregation, HIV-preventing effects, and antioxidant activities
11	Phytic acid	Anti-carcinogenic actions
12	Nicotianamine	Angiotensin-converting enzyme inhibitor
13	Protease inhibitors	With anticancer properties

Beans that are grown in tropical Africa and Asia are eaten as food. A new market for soy-based products (such as tofu, soybean milk, and unusual foods) is emerging in Western countries. The beans are used to make milk, flour, tofu, and products that resemble tofu. They can be fermented to make tempeh, miso, yuba, and soy sauce, or they can be roasted and eaten as a snack. Because soybeans have a high oil (20%) and protein (40%) content, animals are also given them. Thirteen million tons of whole soybeans were reportedly used as feed in 2011. Of the common seeds used for animal feeding, soybeans have the highest protein content (FAO, 2015). In order to boost the nutritional value of raw soybeans, anti-nutritional components are usually removed or the protein is rendered less degradable by ruminants.

It has been said about soybeans since ancient times they are the “meat of the field.” A wide variety of well-balanced amino acids are present in soy protein. The grade of proteins derived from soybeans is on par with that of animal sources like milk and meat. Due to its high lysine content, soy protein is a great addition to cereal proteins, which are low in lysine. A non-pharmaceutical, safe, and efficient way to lower cholesterol is with soy protein. These microscopic elements consist of phytic acid, saponins, isoflavones, and trypsin inhibitors, and many others. Since soybean is the only significant dietary source of isoflavones (genistein and daidzein), isoflavone research is one of the hottest fields for functional food science. Jooyandeh Hossein (2011).

The biological value (BV) and the protein digestibility corrected amino acid score (PDCAAS) are the two most often used indicators for assessing the overall quality or efficacy of a protein source. The biological value (BV) of a supply of protein is a useful metric that evaluates how well an animal can use that protein. It is calculated by examining an animal’s nitrogen retention following ingestion of the protein source under investigation.

Based on the amino acid composition of the protein and the amount of amino acids that humans require, the PDCAAS is a number that ranges from 0 to 1. In general, an animal (affirmatively, humans are also animals) will utilize a protein more effectively the greater its BV and PDCAAS. An overview of the BV and PDCAAS of some popular human protein sources is presented in the Table 2 below:

PROTEINS	BV	PDCAAS
Whey Concentrate and Isolate	104 to 159	1.00
Whole Egg	100	1.00
Milk	91	1.00
Egg White	88	1.00
Cottage Cheese	84	1.00
Tuna	83	?
Fish	82	?
Beef	80	0.92
Chicken	79	?
Soy	74	0.91
Casein	71	1.00
Peanuts	68	0.52
Yogurt	68	?
Oatmeal	58	0.57
Wheat	54	0.42

The high-quality protein content of soybeans has been connected to their nutritional benefits, which has generated increasing interest in using soybeans in human diets. It is now known that soybeans are a rich source of phytochemicals, many of which have significant advantages for both human and animal health.

With the obvious exclusion of meat and animal products, a plant-based diet plan for endurance athletes is really not all that different from a typical (good) diet. All plant meals contain protein, but usually in smaller amounts. However, if you follow a well-balanced plant-based diet that includes a good variety of nuts, seeds, and beans, you should have no problem obtaining more than enough protein from vegan foods. The majority of endurance athletes can benefit from eating meals like protein powder and soy products like tempeh and tofu.

Plant-based protein sources for athletes eating a vegetarian or vegan diet include beans, lentils, split peas, quinoa, nuts, seeds, and soy products like tempeh, tofu, soybeans, soy milk, and dry-roasted edamame. Plant-based iron-rich foods include beans, lentils, spinach, tofu, tempeh, iron-fortified cereals and breads. Plant-based calcium-rich foods include dark green leafy vegetables, broccoli, fortified tofu, and almonds. Plant-based vitamin B12 sources include fortified foods like cereal, soy milk, and nutritional yeast.

Objectives

Therefore, the purpose of this study is to highlight the advantages of soy, which contains proteins-essential macromolecules that are vital to the growth and maintenance of muscles as well as many other physiological processes—for athletes. Amino acids are essentially the building blocks of proteins since they form peptide bonds and make up proteins. A diet rich in soy protein offers athletes several benefits by maintaining and enhancing bone health. Soy, a vegetarian food, is the only source of all eight essential amino acids. Soy beans are a good source of fiber, iron, calcium, zinc, and B vitamins. (Dudek, 2001). Comparing the quality and nutritional content of tofu and paneer, Bengal gram flour and defatted soybean flour (DFSF), and soy chunks with Bengal gram and animal product alternatives is made easier by the research investigations. The creation of functional meals that include high-protein foods may improve athletes' nutritional health. The study's conclusions help us understand why dietary products with added protein are necessary to satisfy the needs of athletes.

The Major Objectives of this Study are

1. To study the chemical composition of selected soy products and compare with other selected similar food products
2. To relate the enhancement of health by consuming soy products

Methods and Materials

The soy products—tofu, defatted soy flour, and soy chunks—as well as comparable food items—paneer, Bengal gram dhal flour, Bengal gram and mutton—were purchased from a local market so as to meet the study's goals. Analytical reagents (AR), laboratory reagents (LR), and guaranteed (GR) reagents were among the chemicals and reagents employed in the investigation. The items' nutritional elements, including moisture, energy, carbohydrates, protein, fat, iron, calcium, and fiber, were analyzed.

Results & Discussion

Due to its numerous health advantages, soybeans, also known as soya beans, are now among the most popular foods consumed worldwide. Soy is a great source of fiber and plant-based protein. Because soy products have a reduced saturated fat content, they offer a more affordable method

to consume a balanced diet. The most popular goods made from soybeans are tofu, soy milk, soy sauce, tempeh, TVP (textured vegetable protein), and soy flour. Soybeans are a common source of protein substitute for meat for people who follow a strict vegetarian diet. Soy products such as tofu, soy milk, and textured vegetable protein have helped to boost the appeal of soybeans in recent years. Soy-containing meals offer several health benefits. Indian traditional dishes have consistently included soybeans. It contains antioxidants and phytonutrients that have been linked to several health benefits. There are many delicious and enjoyable ways to prepare and eat soybeans. Evaluating the safety of eating tofu, defatted soy flour (DFSF), and soy chunks was the aim of the current study.

Table 3 The Nutritive Value of Paneer, Tofu, Bengal Gram Flour, DFSF, Bengal Gram, Soy Chunks and Meat

No	Nutrients	Values / 100g.		Values / 100g.		Values / 100g.		
		Paneer	Tofu	Bengal Gram Flour	Defatted Soy Flour (DFSF)	Bengal Gram	Soy Chunks	Meat
1.	Moisture (%)	70±3.12	82±2.7	8±0.98	7±0.12	10±1.14	8±1.73	75±6.32
2.	Energy (Kcal)	299±15.12	117±7.32	387±12.73	329±11.12	210±12.31	347±13.21	294±13.45
3.	Carbohydrate (g)	5.8±1.21	5.3±1.70	58±2.62	10.50±1.52	35±2.31	33.3±1.98	5±0.89
4.	Protein (g)	1.5±0.71	8±1.91	23.5±1.11	51.28±0.99	10.7±1.21	53.3±1.04	24±2.04
5.	Fat (g)	7.7±1.81	4.5±0.92	6.2±0.12	0.93±0.17	3.8±0.98	0.5±0.02	20±1.87
6.	Iron (mg)	1.35±0.03	5.4±0.51	4.86±0.14	9.2±0.08	6.2±1.08	20±1.23	6±0.98
7.	Calcium (mg)	216±4.20	162±3.81	45±2.12	241±1.52	202±3.21	350±3.42	18±0.89
8.	Fiber (g)	0	0.3±0.01	1.3±0.07	18±0.98	17.4±2.31	13±1.79	0

In comparison to paneer, tofu has higher protein due to its intricate manufacturing method; also, tofu has fewer calories and no additional fat calories stated by Rohini Nag (2017). The nutritional value of tofu and paneer was examined statistically in the current investigation. Sanjeev Neupane (2018) performed an analysis on raw soy milk and found that the contents of moisture, fat, protein, ash, and carbohydrates were, respectively, 89.6%, 2.28%, 4.03%, 0.58%, and 3.51%. Errors in processing or the source of the variance may be accountable. The results of the present study indicate that there are notable differences between the contents of paneer and tofu in terms of moisture, energy, carbohydrate, fat, protein, iron, calcium, and fiber.

A statistical analysis was carried out to determine the nutritional value of defatted soy flour (DFSF) and Bengal gram flour. When DFSF is compared to Bengal gram flour, it has nearly double the amount of protein and iron, less energy, less carbohydrates, and less fat, but it also has a higher calcium and fiber content.

Roasted soybeans are ground into soy flour, a high-protein flour. This bean flour is high in protein, but it also contains calcium, iron, B vitamins, and isoflavones, especially from soy. Even though it is made from defatted soybeans, the defatted soy flour still contains fat. To optimize its longevity, the flour can be refrigerated or frozen when stored in an airtight container. The soy flour will remain fresh for up to a year, according to Kevin Richard (2021). According to Kitchen Habit Blog (2021), chickpea flour—also referred to as besan, garbanzo bean flour, or gram flour—is a popular high-fiber, gluten-free ingredient in Indian cookery. Soy flour can be used in place of conventional flours in baking and cooking.

The Table 3 provides the nutritional makeup of soy chunks and white Bengal gram. Elen Khachatryan (2021) reports that chickpeas are lower in calories than soybeans. Soybeans have less sugar and a higher protein and fat content. On the other hand, chickpeas have more fiber and

carbohydrates than soybeans. There is no cholesterol in either bean. Chickpeas are not as mineral-rich as soybeans. It has twice the amount of magnesium, iron, and calcium and three times the amount of calcium compared to chickpeas. In the current investigation, the nutritional value of soy chunks and Bengal gram (white) was examined by statistical analysis.

The information on the nutritional content of soy chunks and meat is provided in Table 3. Meat is necessary to gain proteins and other nutrients. The emergence of meat substitutes or alternatives arose in response to the excessive demand for red meat. Analogs of meat are becoming more popular due to their inexpensive cost, safe consumption, and meat-like structure and texture. The majority of meat alternatives are plant-based foods that also include flavorings and fillers. They are made up of proteins from grains, legumes, bacteria, and other sources.

Conclusion

When paneer and tofu's nutritional values were evaluated, statistical analysis of the data showed a significant difference ($p < 0.05$) in the nutritional values of the two foods. The results of the statistical study showed a significant difference ($p < 0.05$) between the nutritional value of defatted soy flour (DFSF) and Bengal gram flour. DFSF contains nearly twice as much protein and iron than Bengal gram flour. The nutritional value of soy chunks and Bengal gram (white) varied significantly ($p < 0.05$) based on their proximate makeup. After a study was conducted on the approximate compositions of meat and soy chunks, it was concluded that soy was a great alternative to animal protein. The results of this investigation show that soy chunks and meat have similar nutritional values and can be utilized as a substitute for animal foods.

Based on the Results of the Study the Following Conclusions are Drawn

1. The Soy products namely Tofu, Defatted soy flour and Soy chunks are nutritious and loaded with numerous health benefits when compared with paneer, Bengal gram flour, Bengal gram and meat.
2. The defatted soy flour incorporated products are having high potential for commercialization and marketability in India.
3. Soy chunks, a meat-free alternative for vegetarian offers positive health benefits.

References

1. AydaKrisnawati (2017) Soybean as Source of Functional Food IptekTanamanPanganVol 12, No 1 June 2017 ISSN: 1907-4263
2. Dudek SG (2001) Nutrition Essentials for Nursing Practice. 4th ed. Philadelphia: Lippincott Williams and Wilkins.
3. ElenKhachatryan (2021) SoybeanS vs Chickpea - Health impact and Nutrition Comparison, Advanced Nutrition Search | Diet Analysis | Glycemic index chart | Insulin index chart | Blog
4. FAO, (2015). Grassland Index. A searchable catalogue of grass and forage legumes. FAO, Rome, Italy
5. Hossein Jooyandeh, (2011). Soy Products as Healthy and Functional Foods, Middle-East Journal of Scientific Research 7 (1): 71-80, ISSN 1990-9233 © IDOSI Publications.
6. Kevin Richard (2021) List of Substitutes for Soy Flour for Your Perfect Cooking Recipes, Richard's Pantry <https://richardpantry.com/soy-flour-substitute/>
7. Kitchen Habit Blog (2021)
8. Rohini Nag (2017) Tofu Vs Paneer – Which Is Healthier? Healthka Balanced Diet Weight Management <https://www.healthkart.com/connect/tofu-vs-paneer-which-is-healthier/bid-6670>
9. Sanjeev Neupane (2018) Effect of Addition of Soy Milk on the Preparation of Paneer, Department of Food Technology, Central Campus of Technology, Institute of Science and Technology, Tribhuvan University, Nepal.