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Review Article

Health benefits of MISO

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Abstract

Miso, a soybean fermented product most widely used in east Asian countries over the decades. It is plant based derived proteins produced through a two-step fermentation process involving Aspergillus oryzae and yeast and beneficial bacteria. It has beneficial effects on oxidative properties, supports gut health by enhancing the activity of good bacteria, improves digestion, and enhances the immune system. It also helps in improving skin moisture, stimulates ceramides and has an anti-hypertensive effect. It also shows positive effects on cardiovascular health, gut metabolism, cancer prevention, and has antioxidant and anti-inflammatory properties."This article discusses miso's many health advantages, including its effects on hormones, the heart, the gastrointestinal tract, the brain, diabetes, obesity, and cancer.

Keywords: Cardiovascular, Antidiabetics, Anti-cancer, Anti-obesity, Neuroprotective.

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1. Introduction

Soybeans is one of the most popular oilseed crops. It contributes to low cost and high biological value. It contains good quality vegetable protein which has a high composition of 40% protein, and 35% carbohydrate. Soybeans contain roughly the same amounts of fats, proteins, carbohydrates, and crude fibres as meat products. Thus, it is considered as one of the best alternatives to animal products. Products made from soybeans contain essential nutrients as well as a few other beneficial ingredients like isoflavones, bioactive peptides, saponins, and phytosterols. Because of their positive health effects, these functional components are typically employed as dietary supplements.[1,2] Fermentation is used since ages, as it changes the quality of foods and can be used for a long period of time. Fermented foods are popular throughout the world, every country has its unique product. Miso is a seasoning product of Japanese cuisine prepared from soybean paste. It is inexpensive and easy to prepare, currently it is becoming popular in other parts of the world. it is used in sweets, dressings, marinades, stews, caseerole and dips. Miso is classified based on the use of ingredients, barley, rice, soybean and also prepared by mixing rice and soybean. It is then fermented with mold koji. It has therapeutic value and is now considered as a functional food. The product gives a distinct mouthfeel.[11,12]

2. Health Benefits

2.1. Cardiovascular disease

Consuming plant-based protein, such as soy protein products, has been shown in studies to reduce cholesterol and provide other health advantages, especially lowering the risk factors for cardiovascular diseases. The reason for this is that a diet rich in plant-based protein is believed to be low in cholesterol and saturated fat, which reduces the risk of CVDs. Additionally, soy-based protein products were believed to have beneficial effects on cardiovascular health. According to recent studies, soy-based products contain isoflavone, which has strong antioxidant qualities that lower oxidative stress and cholesterol. Soy-based protein product therapy was linked to reductions in low-density lipoprotein cholesterol (LDL) and increases in high-density lipoprotein cholesterol (HDL) in a number of recent meta-analyses of randomized controlled trials, But according to other studies, eating soy protein high in isoflavones had no effect on lowering LDL.

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Clinical studies show that eating 13–58 g of soy per day lowers LDL. Furthermore, blood pressure decreased when more fermented soy protein products were consumed. A Japanese population-based cohort study found that consuming more fermented soybean protein products decreased the risk of CVD mortality. Although soy protein appears to have beneficial effects on vascular health, the evidence from clinical trials is inconclusive, and more epidemiological studies are needed to show the molecular rationale of soy protein on CVD risk factor prevention.[5]

3. Hormone and Menopausal symptoms

The isoflavone content of soy protein has long been the focus of concerns about potential adverse health effects as well as health promotion assertions. Lower estrogen levels in menopausal women can cause vaginal epithelial atrophy, osteoarthritis, and hot flashes. With estrogen therapy, the majority of menopausal symptoms can be reduced. Soybeans contain naturally occurring isoflavones that have a chemical structure similar to that of estrogen. Because soy's isoflavones have a poor affinity for binding to oestrogen receptors, they produce an action that is similar to that of oestrogen. This is the main underlying mechanism. It has been feared that soy isoflavones may have endocrine disrupting effects on reproductive hormones due to studies employing high doses of isoflavones in rodents or in vitro cell culture. However, over the last 15 years, several research lines have shown that the adverse hormonal effects of physiological intakes of soy products are largely unnecessary. The European Food Safety Authority conducted a comprehensive evaluation of the safety of isoflavone supplements for women who are or have experienced menopause. The evaluation found that daily doses of 35–150 mg of isoflavones in this population did not change thyroid hormone status, endometrial thickness, or uterine histopathological changes over a 30-month period (although there were some non-malignant changes at 60 months), nor did they increase the risk of breast cancer. A meta-analysis of 15 placebo-controlled studies involving men of various ages found no significant changes in testosterone, sex hormone-binding globulin, free testosterone, or free androgen index when soy protein consumption up to 60 g/day was involved. Similarly, Dillingham and associates observed that after 57 days of feeding, young, healthy men who ingested 32 g of protein daily from either low or high isoflavone soy protein had very minor changes in their levels of the reproductive hormones in their blood.[5,6]

3.1. Gastrointestinal effects

Consumption of miso regularly helps in protecting the stomach and digestive system. Studies show that regular consumption of miso are less likely to develop stomach problem such as ulcers, gastritis and duodenal ulcers compared to those eat rarely. This may be due to the beneficiary effects of miso helps to fight against helicobacter pylori, bacteria causing stomach infections and further causes cancer. Miso contains isoflavones like genistein and other active enzymes helps in digestion and nutrient absorption. During miso fermentation it forms natural antioxidants and microbes which cleans gut and reduces harmful bacteria, supporting healthy digestion, thus miso help in preventing gastrointestinal problems, still research studies being conducted to confirm these effects.[1]

3.2. Anti-cancer effects

Cancer is a type of disease affects the body by mutation of cell uncontrollably and spread to other parts of body. consumption of fermented food products help in reducing the risk of cancer. Studies shows the effects of korean fermented food products like chungkookjang made by fermenting soybeans with certain bacteria which helps in reducing the risk of stomach cancer, they reducing the activity of genes that help cancer cells to survive (bcl - 2) and further increasing the activity of genes that helps in death of cancer cells (bax). Studies shows miso consumption hinders hepatocellular carcinoma, caused by viral infections, hormonal carnages or genetic mutations. It can be prevented by by blocking the formations of new tumor blood vessels and stop cancer cell growth (Sharp et al., 2005).[1]

3.3. Anti-obesity effects

By interacting with intracellular estrogen receptors, the isoflavones present in soy meals may reduce the distribution of adipose tissue and the formation of fat. Numerous studies have demonstrated the anti-obesity qualities of soy meals and their ingredients. Soy isoflavones and their derivatives have been shown to have estrogenic activity and a tendency to bind to estrogen receptors due to their structural similarity to 17-estradiol (E2). Estrogen receptors, which are essential for the distribution and metabolism of fat, may be found in a variety of cells and organs, including adipose tissues. Hypertrophy (increased adipocyte size) and hyperplasia (increased adipocyte quantity) are two significant features of adipose tissue that contribute to obesity (increased adipocyte number). Soy isoflavone consumption slows the progression of obesity. Daidzein has been demonstrated to decrease total fat mass in vivo by lowering adipocyte numbers, while genistein has been demonstrated to decrease adipose tissue in vivo by lowering adipocyte counts in mice. Numerous studies have demonstrated that the active components in soy protein and peptides reduce triacylglycerol and LDL in the human body. In a study on mice, miso consumption significantly decreased white adipose tissue, adipocyte size, and visceral fat when compared to a modern 2010 diet (1.6% miso), especially when consumed at levels typical of the traditional 1975 Japanese diet (2.6%). Polyunsaturated fats, isoflavones, and key components of miso soy proteins work together to prevent fat from accumulating, with potential inputs from alterations in the gut microbiota. Miso, when paired with moderate exercise, further improved fat reduction in the liver and white adipose tissue, boosted the expression of genes involved in fat metabolism, decreased blood glucose,

improved glucose metabolism, and decreased liver fat by inhibiting the expression of Acetyl CoA carboxylase. Overall, eating miso and exercising together had significant anti-obesity effects that mirrored the traditional Japanese diet's health benefits.[4]

3.4. Anti-diabetic effects

Obesity significantly increases the risk of type 2 diabetes mellitus (DM2), and being overweight increases the risk of developing DM2. Despite strict management of blood pressure, cholesterol, and glucose, people with type 2 diabetes mellitus are more likely to develop cardiovascular disease. Due to mitochondrial and cellular damage, oxidative stress (OS), which is fuelled by an excess of free fatty acids and reactive oxygen species (ROS), is intimately associated with obesity, insulin resistance, and diabetes. Chronic exposure to ROS disrupts insulin signalling, which causes β-cell dysfunction, glucose intolerance, and the advancement of diabetes. Soy contains isoflavones like genistein and daidzein, which have therapeutic potential by lowering inflammation, scavenging reactive oxygen species, increasing insulin sensitivity, and strengthening insulin signalling pathways (IRS1, GLUT1/4). Furthermore, genistein boosts the activity of antioxidant enzymes and reduces lipid peroxidation. The clinical trial involved 120 postmenopausal women with metabolic syndrome, 60 of whom received a placebo and 60 of whom received 54 mg of genistein daily for a year. The results showed that genistein could significantly reduce the risk of diabetes. Other authors have suggested that antioxidants, like genistein, may protect retinal cells in patients with pre-retinopathic diabetes. However, there was no appreciable improvement in metabolic parameters when postmenopausal women of normal weight were given a high-dose isoflavone supplement. This implies that genistein might benefit obese and insulin-resistant patients. Lipid metabolism may be impacted by genistein. Okamura et al.[10,13]conducted a clinical study to investigate how phytoestrogens, such as genistein, affect lipid metabolism. The findings indicated that by raising HDL and apolipoprotein A-1 and lowering LDL and apolipoprotein B, phytoestrogens improve lipid metabolism in postmenopausal women. Spermidine, a polyamine found in fermented soy products, is also a promising additive in the treatment of diabetes and obesity because it promotes the metabolism of fats and carbohydrates, guards against diet-induced obesity, and is associated with a lower risk of cardiovascular disease.[7,9]

3.5. Neuroprotective effects

The human brain consist of high amount of PUFA content which is easily get damaged by oxidation. since brain uses lots of oxygen and antioxidant causes oxidative stress, as higher amount of oxygen causes ROS (reactive oxygen species). higher amount of ROS can leads to inflammation, nerve cell damage causing alzheimers and parkinson disease. Studies revealed that soy isoflavone may help in protecting brain cells, by reducing inflammation, control oxidative stress and prevent cell death. Isoflavone like genistein also help in nerve regeneration and improve brain function[8,14,15] because of these benefits, consumption of soy isoflavone rich fermented soy products helps in maintaining brain health and preventing neurodegenerative disease.

4. Conclusion

Miso is a fermented and traditional food of Japnese. The consumption dates back to 700 AD. It is fermented for months and eaten as soup, as coating for meat and vegetable product. It act as digestive supplement, prevents gastric ulcer, ageing, cancer, helps to maintain cholesterol and blood pressure levels. Thus consumption will help to alleviate the disease condition of the population.

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None.

6. Conflict of Interest

None.

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