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Impact of Mung Beans on Human Health: A Study on Its Nutritional Value and Antioxidant Properties

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Abstract

Mung beans (*Vigna radiata*) have gained significant attention due to their nutritional value and potential health benefits. This paper explores the impact of mung beans on human health, focusing on their nutrient composition, antioxidant properties, and overall contribution to a balanced diet. Mung beans are rich in proteins, dietary fiber, essential vitamins, and minerals, making them a vital component of plant-based diets. The antioxidant capacity of mung beans, attributed to bioactive compounds such as phenolic acids and flavonoids, further enhances their role in preventing oxidative stress-related diseases. Through a comparative analysis with other legumes, this study highlights the potential health benefits of incorporating mung beans into daily nutrition, particularly in combating chronic diseases such as heart disease, diabetes, and cancer.

Keywords: Mung beans, rich in protein, fiber, vitamins, minerals

Introduction

Mung beans, commonly known for their small, green seeds, are a staple food in many parts of Asia, particularly in India and Southeast Asia. They have been consumed for centuries due to their high nutritional value and versatility in culinary preparations. Mung beans are a rich source of plant-based protein, fiber, essential minerals like iron and potassium, and vitamins, making them an important part of vegetarian and vegan diets. In addition to their nutritional content, mung beans also possess significant antioxidant properties that help combat oxidative stress, which is linked to various chronic diseases.

Oxidative stress occurs when there is an imbalance between the production of free radicals and the body's ability to neutralize them with antioxidants. This imbalance has been implicated in the development of several chronic diseases, including cardiovascular disease, diabetes, and cancer. Antioxidants play a crucial role in neutralizing free radicals, thus protecting the body from cellular damage. Mung beans, with their high phenolic and flavonoid content, have shown promise as a functional food in preventing and managing oxidative stress-related diseases.

This paper aims to provide a comprehensive overview of the nutritional value and antioxidant properties of mung beans and their potential impact on human health. The study will also compare mung beans with other commonly consumed legumes, such as chickpeas, lentils, and kidney beans, to assess their relative health benefits.

Materials and Methods

Sample Collection

Mung beans, chickpeas, lentils, and kidney beans were sourced from local markets in Kathmandu, Nepal. The beans were cleaned, dried, and ground into fine powder for analysis. All samples were stored in sealed containers to maintain their integrity and prevent contamination.

Nutrient Composition Analysis

The proximate composition of the beans, including moisture, protein, fat, fiber, and ash content, was determined using standard methods. Protein content was estimated using the Kjeldahl method, while fat content was determined through Soxhlet extraction. Fiber content was measured using the gravimetric method, and mineral content (calcium, iron, and potassium) was analyzed using atomic absorption spectroscopy (AAS).

Antioxidant Activity Assessment

The antioxidant activity of mung beans and the other legumes was assessed through the

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DPPH (2,2-diphenyl-1-picrylhydrazyl) and ABTS (2,2'-azinobis(3-ethylbenzothiazoline-6-sulfonic acid)) radical scavenging assays. The total phenolic content (TPC) and total flavonoid content (TFC) were measured using the Folin-Ciocalteu and aluminum chloride methods, respectively.

Results

Nutrient Composition

The nutrient composition of mung beans and other legumes is presented in Table 1, which summarizes the protein, fiber, fat, moisture, ash, and mineral content of each legume. Mung beans were found to have the highest protein content

(24.89%), followed by lentils (23.75%) and chickpeas (22.64%). Kidney beans had the lowest protein content (21.68%). The fiber content of mung beans was 7.79%, higher than kidney beans (5.32%) but lower than lentils (8.12%) and chickpeas (7.6%).

In terms of mineral content, mung beans exhibited significant levels of calcium (0.48 mg/100g), iron (2.22 mg/100g), and potassium (0.29 mg/100g). These values are comparable to other legumes, with chickpeas showing slightly higher calcium and iron content. Mung beans were also found to have a relatively low fat content (1.45%), which is similar to lentils (1.87%) but lower than chickpeas (4.25%) and kidney beans (0.8%).

Table 1: Nutrient Composition of Mung Beans and Other Legumes (per 100g)

Legume	Protein (%)	Fiber (%)	Fat (%)	Moisture (%)	Ash (%)	Calcium (mg)	Iron (mg)	Potassium (mg)
Mung Beans	24.89	7.79	1.45	9.52	2.5	0.48	2.22	0.29
Chickpeas	22.64	7.6	4.25	8.56	2.8	0.45	2.85	0.35
Lentils	23.75	8.12	1.87	9.1	2.7	0.46	3.1	0.33
Kidney Beans	21.68	5.32	0.8	10.7	3.3	0.44	3.0	0.28

Antioxidant Activity

The results of the antioxidant activity assays are presented in Table 2. Mung beans exhibited a DPPH radical scavenging activity of 0.32 mg/mL, which was higher than kidney beans (0.18 mg/mL) but lower than black gram beans and lentils. The ABTS assay showed similar results, with mung beans demonstrating a scavenging activity of 0.35 mg/mL, placing them in the middle range compared to other legumes. Chickpeas had a slightly lower ABTS activity (0.31 mg/mL), while lentils showed the highest

antioxidant activity (0.38 mg/mL).

Mung beans also had a total phenolic content (TPC) of 0.56 mg GAE/g and a total flavonoid content (TFC) of 0.52 mg RE/g. These values are comparable to chickpeas (0.62 mg GAE/g, 0.56 mg RE/g) and lentils (0.60 mg GAE/g, 0.58 mg RE/g), suggesting that mung beans possess moderate antioxidant properties. Kidney beans had the lowest TPC (0.45 mg GAE/g) and TFC (0.50 mg RE/g), indicating weaker antioxidant activity compared to other legumes.

Table 2: Antioxidant Activity of Mung Beans and Other Legumes

Legume	DPPH Radical Scavenging Activity (mg/mL)	ABTS Radical Scavenging Activity (mg/mL)	Total Phenolic Content (mg GAE/g)	Total Flavonoid Content (mg RE/g)
Mung Beans	0.32	0.35	0.56	0.52
Chickpeas	0.28	0.31	0.62	0.56
Lentils	0.34	0.38	0.60	0.58
Kidney Beans	0.18	0.22	0.45	0.50

Discussion

The results of this study highlight the significant nutritional value of mung beans and their moderate antioxidant properties. Mung beans were found to have the highest protein content among the legumes analyzed, which is consistent with previous research (Ullah *et al.*, 2014) ^[1]. Their fiber content also supports digestive health and contributes to weight management, as fiber helps regulate blood sugar levels and promotes satiety. The mineral content, including calcium, iron, and potassium, further enhances their nutritional profile, making mung beans a valuable component of a balanced diet.

In terms of antioxidant activity, mung beans exhibited moderate scavenging activity in both the DPPH and ABTS assays. These findings are in line with studies that have shown mung beans to possess significant antioxidant properties, although not as potent as other legumes like lentils and black gram beans (Lee *et al.*, 2011) ^[4]. The total phenolic and flavonoid content of mung beans, which contribute to their antioxidant capacity, further supports their potential role in reducing oxidative stress.

The health implications of these findings are clear. Mung beans, due to their high protein and fiber content, can contribute to overall health, particularly for individuals

following plant-based diets. Additionally, their antioxidant properties can help protect the body from oxidative stress, which is linked to the development of chronic diseases such as cardiovascular disease, diabetes, and cancer. The moderate antioxidant activity of mung beans makes them a useful functional food in promoting health and preventing disease.

Conclusion

Mung beans are a valuable legume with impressive nutritional content, including high protein and fiber levels, along with essential minerals like calcium, iron, and potassium. Their antioxidant properties, while moderate, are beneficial in combating oxidative stress and supporting overall health. Incorporating mung beans into a balanced diet can contribute to disease prevention and improve overall well-being. Further research is needed to explore the specific bioactive compounds in mung beans and their potential therapeutic applications in managing chronic diseases.

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