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Isabgol husk (*Plantago ovata*): A comprehensive review as *Dawa-e-Ghiza* (medicinal food)

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Abstract
Isabgol botanically named as *Plantago ovata*, has garnered attention for its extensive health benefits as a functional food ingredient. It is primarily known for its high fiber content, predominantly soluble fiber, which has been linked to various therapeutic effects. This review aims to evaluate the chemical composition, health benefits, and potential applications of psyllium husk in both traditional and modern medicine. A comprehensive literature review was conducted using databases such as PubMed, ScienceDirect, and Google Scholar and traditional Unani textbooks to gather data on psyllium's chemical composition, pharmacological properties, and clinical applications. Studies focusing on its bioactive components, mechanism of action, and therapeutic effects on conditions like constipation, diabetes, and cardiovascular health were included. Psyllium husk contains a high percentage of soluble fiber (mainly arabinoxylans), which forms a gel-like substance upon hydration, aiding in bowel regularity and alleviating constipation. The husk also exhibits hypoglycaemic effects by slowing glucose absorption, for managing type 2 diabetes. Additionally, its fiber content helps lower serum cholesterol levels, contributing to improved cardiovascular health. Bioactive compounds such as polyphenols, flavonoids, and tannins present in psyllium provide antioxidant and anti-inflammatory effects, potentially reducing the risk of chronic diseases. Its use in traditional medicine for gastrointestinal disorders aligns with modern findings on its effectiveness in regulating bowel movements and improving metabolic health. Psyllium husk is an effective medicinal food with significant potential for managing various health conditions, particularly related to digestive health, diabetes, and cardiovascular diseases. Further research should focus on its long-term effects, underlying mechanisms, and potential applications in chronic disease management.

Keywords: *Dawa-e-Ghiza*, *Isabgol*, medicinal food, *Plantago ovata*, psyllium husk

Introduction

Psyllium, commonly known as Isabgol or Ispaghula, refers to the seeds of certain species of the *Plantago* genus, primarily *Plantago ovata*, and *Plantago psyllium* of the Plantaginaceae family. The etymology of "Isabgol" is derived from the Persian words "asp" (horse) and "ghol" (ear), reflecting the seed's shape resembling a horse's ear. Psyllium is extensively cultivated in tropical regions such as India, Iran, Egypt, and China, and holds a significant place in traditional medicinal systems, including Unani, Ayurveda, and Traditional Chinese Medicine. Unani medicine recognizes psyllium for its cooling, diuretic, and anti-inflammatory effects, making it a versatile remedy for gastrointestinal disorders, febrile conditions, and urinary tract issues [1].

In traditional Indian medicine, psyllium has long been valued for its soothing and mucilaginous properties, effectively used to manage skin irritations, constipation, and diarrhoea. The World Health Organization (WHO) has endorsed its use as a natural laxative and for managing hypercholesterolemia and diabetes, highlighting its global acceptance as a medicinal agent [2]. Psyllium's health-promoting properties are primarily attributed to its husk, which is rich in soluble fiber, particularly alkali-extractable polysaccharides. The polysaccharide mucilage contains arabinose and xylose, contributing to its unique gel-forming capacity. This mucilaginous nature enhances its water-holding capacity, forming a gel that aids in the regulation of bowel movements, which makes it effective in treating constipation, diarrhoea, and irritable bowel syndrome (IBS). It also plays a significant role in modulating blood glucose levels, reducing hypercholesterolemia, and assisting in weight management, thus showcasing its potential in managing chronic metabolic disorders (CMDs) like diabetes, obesity, and non-alcoholic fatty liver disease (NAFLD) [3, 4].

In recent years, psyllium has found widespread applications beyond traditional medicine, being incorporated into various food products as a functional ingredient. Its high water-absorbing and gel-forming properties have made it a popular additive in bakery items, dairy-free products, beverages, and cereals. The growing interest in its use as a dietary supplement and a food product highlights its potential as a natural, therapeutic food [5, 6].

Aims and Objectives

This review aims to provide a comprehensive overview of the medicinal properties of psyllium, focusing on its application as a functional food and its therapeutic potential in managing various disorders. By examining existing research, the review seeks to underscore the importance of psyllium as a safe, effective, and multifunctional dietary supplement with significant health benefits.

Materials and Methods

A comprehensive literature review was conducted using databases such as PubMed, ScienceDirect, and Google Scholar and traditional Unani textbooks to gather data on psyllium's chemical composition, pharmacological properties, and clinical applications. Studies focusing on its bioactive components, mechanism of action, and therapeutic effects on conditions like constipation, diabetes, and cardiovascular health were included.

Isabgol (*Plantago ovata*)

Scientific Classification of Isabgol (*Plantago ovata)*

- **Kingdom:** Plantae
- **Division:** Tracheophyta
- **Class:** Magnoliopsida
- **Order:** Lamiales
- **Family:** Plantaginaceae
- **Genus:** Plantago
- **Species:** *Plantago ovata* Forssk

Physical characteristics of psyllium husk

- **Nature:** Outer coating of a seed
- **Taste:** Bland or neutral
- **Colour:** Typically, light brown to off-white or translucent
- **Odour:** Odourless, it might have a faint, earthy scent when freshly processed
- **Consistency:** Very light and fibrous. It becomes gel-like when mixed with water due to its high mucilage content

Description according to Unani classical literature

Isabgol, also known as *Bazr-e-Qatuna*, is derived from a plant that grows to about one meter in height. Its leaves resemble those of rice (*dhan*), while its branches are thin, small, and long. There are three types of Isabgol, classified by color: white, red, and black. Among these, the white variety is considered the highest quality, while the black variety is regarded as the least beneficial. When the seeds are placed in water or in the mouth, they swell up. The outer coating of these seeds is called *saboos-e-Asapghol*, and it is mucilaginous in nature. The seeds themselves have a bland, insipid taste [7, 8].

It is an annual plant that is stemless and covered with soft, woolly hairs. The leaves are 7.5-23 cm in length, typically narrow, linear, or thread-like, with a width of just 6 mm. The leaves are finely pointed at the tip, either entire or sparsely toothed, and tapering at the base, usually with three prominent veins. The flowers grow in ovoid or cylindrical spikes ranging from 1.3 to 3.8 cm long. The bracts are about 4 mm long, roughly as wide as they are long, and are broadly ovate or nearly round. They are concave and membranous, except for the narrow central vein, and glabrous. The calyx is about 3 mm long, usually smooth, with elliptic, obtuse, and concave sepals that are thin, except for the midrib, which is equally broad (or nearly so) in both the inner and outer sepals. The corolla lobes are rounded, 3 mm long, concave, blunt at the tip, and smooth. The capsules are 8 mm long, ellipsoid, and obtuse, with the upper half opening as a blunt, cone-shaped lid. They are membranous and smooth. The seeds are 3 mm long, ovoid-oblong, boat-shaped, smooth, and yellowish-brown in colour [9].

Distribution

Isabgol is native to the Mediterranean region and West Asia. It was later introduced to India, where it is primarily cultivated in North Gujarat, Rajasthan, Punjab, Uttar Pradesh, and Haryana, with smaller cultivation areas in West Bengal, Karnataka, and along the Coromandal coast, particularly in Sidhpur, Baroda state. It is also commonly found in regions such as Punjab, Sind, and Persia [10, 11].

Cultivation of Isabgol husk

Isabgol (*Plantago ovata*) is an annual herb growing up to 30-40 cm, predominantly cultivated in Gujarat and Rajasthan, India, the largest exporter. It is valued for its husk, which is widely used in treating digestive issues like constipation, gastritis, and chronic diarrhoea, as well as in modern food products. Grows best in cool, dry climates. Optimal temperature ranges from 20-25°C for germination and 30-35°C for maturity. Requires 50-125 cm of annual rainfall. Prefers well-drained, sandy to sandy loam soils with pH 7.2-7.9. It can also grow in clay loam and black cotton soils with low salinity. Requires a fine tilth soil for better germination. Organic manure (10-15 tons/ha) is recommended during the last ploughing. Best sowing period is from late October to mid-November. Line sowing with 30×5 cm spacing ensures better yield. 4 kg seeds per hectare is optimal. High-yield varieties include Gujarat Isabgol 1, 2, 3, Jawahar Isabgol 4, and Haryana Isabgol. Requires minimal nitrogen (20-30 kg/ha) and phosphorous (15-25 kg/ha). Organic manure is preferred for better quality. Needs 3-7 irrigations depending on soil type. Last irrigation at the milk stage. Tolerates slightly saline water (up to 4 ds/m) [12, 13].

Hand weeding is essential within two months. Effective crop rotations include groundnut, soybean, maize, and leguminous crops. The major disease is downy mildew. Control involves seed treatment and fungicide sprays. Aphid is a common pest, controlled by neem-based sprays or specific insecticides. Harvesting is ready in 110-120 days when the spikes turn brown. Harvest during dry weather to ensure quality. Isabgol is a critical crop for its medicinal properties, with careful cultivation and management practices ensuring high yield and quality [14].

Nutritional composition of Isabgol

Psyllium, obtained from the seeds of *Plantago ovata*, is

highly valued for its fiber content, consisting mainly of both soluble and insoluble polysaccharides. Soluble Fiber primarily comprises arabinoxylans, complex carbohydrates consisting of xylose and arabinose sugars. The psyllium husk contains a higher proportion of this soluble fiber, accounting for about 70% of its fiber composition. When mixed with water, it forms a gel-like substance contributing various health benefits. Insoluble Fiber includes components like hemicellulose, cellulose, and lignin, making up approximately 30% of the fiber. These insoluble fibers help promote regular bowel movements and support digestive health [15, 16, 17]. The polysaccharides derived from psyllium seeds include various sugars such as xylose, arabinose, galactose, rhamnose, glucose, and mannose in differing ratios. The extraction process and conditions like temperature and duration can significantly influence their composition and properties [18].

Tannins, Phenols, and flavonoid compounds are abundant in psyllium and, are known for their antioxidant effects, helping to neutralize reactive oxygen species (ROS) and reduce oxidative stress, potentially preventing diseases triggered by excess ROS (16). Fatty Acids and Amino Acids in Psyllium seeds and husks are also rich in essential fatty acids and amino acids, enhancing their nutritional profile [19].

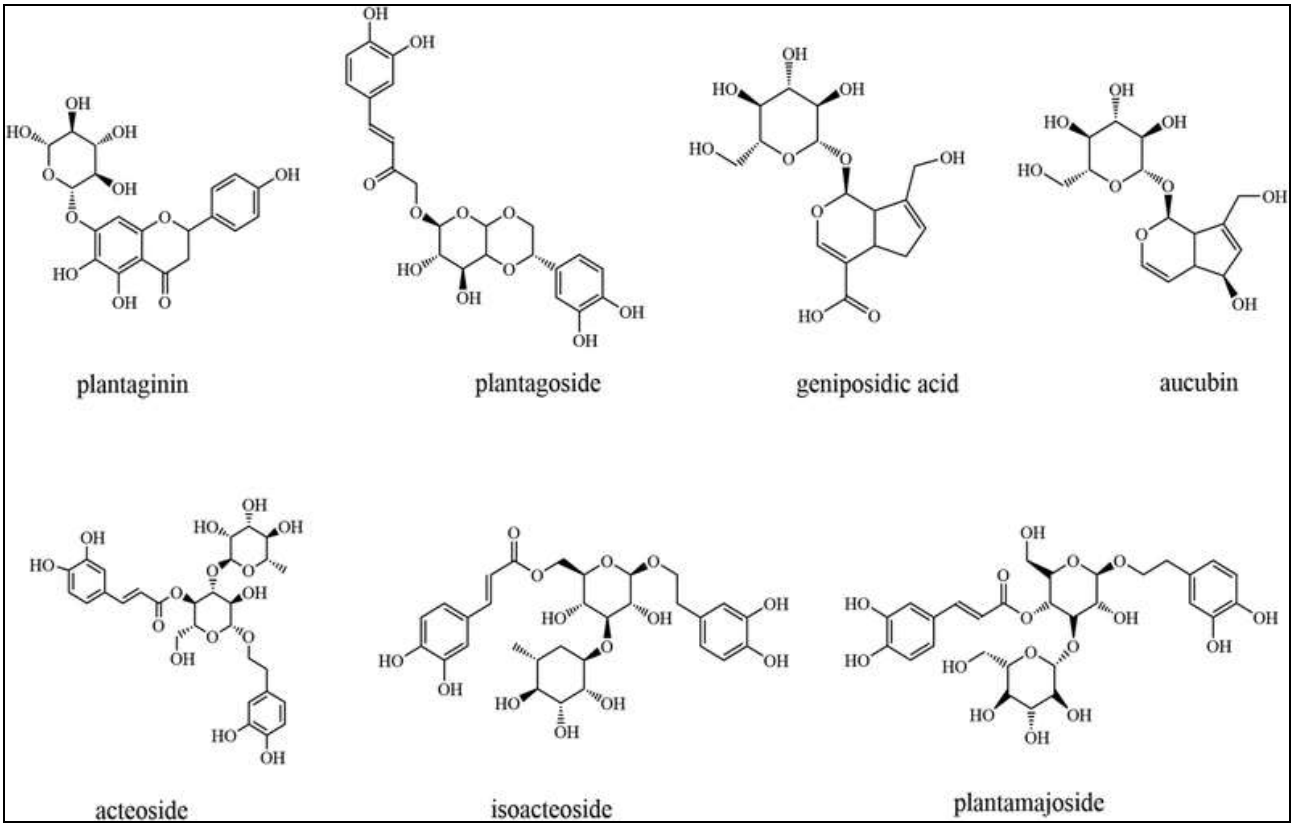

Fig 1: Chemical compositions of Isabgol

Temperament (*Mizaj*)

Cold 3^0 and Wet in 2^0 [7, 8]

Pharmacological Actions and Therapeutic Uses

Mushil (Purgative), *Mulayyin* (Laxative), *Qabz* (Constipation), *Zaheer* (Dysentery), *Muhallil-e-Auram* (Antiinflammatory), *Iltehab* (Inflammation), *Mubarrid* (Refrigerant), *Mujaffif (*Desiccant) *Mulatiff* (Demulcent), *Mugharri* (Emollient), *Qabiz* (Astringent), *Is'hal* (Diarrhoea), *Mumallis* (Lubricant), *Muddir-e-Baul* (Diuretic), *Naffakh* (Flatulent), *Munawwim* (Hypnotic), *Muhallil* (Resolvent), *Musakkin-e-Atash wa Hararat* (Thirst and heat relaxant), *Khashunat-e-Halaq-wa-Zaban* (Dryness of larynx & tongue), *Musakkin-e-Alam* (Analgesic/Anodyne), *Suda* (Headache), *Dafa-e-Humma* (Antipyretic/Febrifuge), *Humma* (Fever), *Munafa-e-Amraz-e-Damviya* (Useful in blood disorders), *Muqawwi-e-Sha'ar* (Hair tonic), *Sual* (Cough), *Waram-e-Rahem* (Metritis), *Waja-ul-Mafasil* (Arthritis), *Niqras* (Gout), and *Bawaseer* (Haemorrhoids) [8, 20, 21, 22, 23,24].

Pharmacological Studies

Constipation

Jalanka *et al* (2019) carried out a study on the effect of Psyllium husk on intestinal Microbiota in constipated patients and healthy controls. The results of the study showed that Psyllium is a widely used treatment for constipation. It traps water in the intestine increasing stool water, easing defaecation and altering the colonic environment. This study aimed to assess the impact of psyllium on faecal microbiota, whose key role in gut physiology is being increasingly recognised. They performed two randomised, placebo-controlled, double-blinded trials comparing 7 days of psyllium with a placebo (maltodextrin) in 8 healthy volunteers and 16 constipated patients respectively. They measured the patients' gastrointestinal (GI) transit, faecal water content, short chain fatty acid (SCFA) and the stool microbiota compositions. While psyllium supplement had a small but significant effect on the microbial composition of healthy adults, in constipated subjects there were greater effects on the microbial composition and alterations in the levels of

acetate and propionate. They found several taxa to be associated with altered GI transit, SCFAs and faecal water content in these patients. Significant increases in three genera known to produce butyrate, lachnospira, roseburia and faecalibacterium, correlated with increased faecal water. In summary, psyllium supplementation increased stool water and this was associated with significant changes in microbiota, most marked in constipated patients [25].

Keller *et al* (2024) carried out a study on Psyllium husk powder increases defecation frequency and faecal score, bulk and moisture in healthy cats. Study on healthy neutered adults' cats compared the effect of a diet containing 6% psyllium (test diet) to one with 6% cellulose (control diet) over 10 days. Cats on the psyllium diet showed significantly more bowel movements, softer stools (higher faecal scores), greater faecal wet weight, and increases faecal moisture compared to the control diet. The results align with earlier findings in constipated cats, supporting psyllium's effectiveness in promoting bowel health and managing feline constipation [26].

Yang *et al* (2021) carried out a study on the effects of psyllium husk on gut microbiota composition and function in chronically constipated women of reproductive age using 16S rRNA gene sequencing analysis. A study using 16S r RNA gene sequencing compared faecal microbiota in constipated women treated with psyllium husk (n=25) or placebo (n=29). Psyllium husk alleviated constipation symptoms and significantly altered gut microbiota composition compared to placebo. Network analysis revealed stronger correlations and clustering of microbial taxa in the psyllium group. KEGG pathway analysis showed enriched metabolism-related pathways in the psyllium group. These findings suggest that psyllium alleviates constipation by altering gut microbiota and metabolic functions [27].

Diabetes

Bacha *et al* (2022) carried out a study on effect of psyllium husk fiber and lifestyle modification on human body insulin resistance. This 16 week interventional study investigated the effects of psyllium husk fiber (PSH) and lifestyle modification (LSM) on insulin resistance and fasting blood glucose in 120 centrally obese school teachers ages 40-60 years in Malakand, Khyber Pakhtunkhwa. Participants were divided into four groups: control, LSM only, PSH only, and combined LSM, PSH. The combined group showed the greater improvement, with fasting blood glucose reduced by 9% and HOMA-IR (insulin resistance) by 58%. The PSH only group also showed significant reductions, with blood glucose lowered by 7% and HOMA-IR by 33%. These findings highlight the effectiveness of combining PSH with lifestyle changes in managing insulin. [28].

Diez-Laiz *et al* (2015) carried out a study on evaluation of the association Metformin: *Plantago ovata* husk in Diabetes rabbits. This study examined the effects of psyllium as a dietary fiber supplement in combination with metformin on glucose and insulin levels in diabetic rabbits. Six groups of rabbits were fed either standard chow or chow supplemented with psyllium (3.5 mg/kg/day), with some groups receiving metformin or a combination of metformin and psyllium. Rabbits fed psyllium had lower plasma glucose levels, while insulin levels showed variability among individuals. Psyllium significantly influenced glucose pharmacokinetics, reducing Cmax (maximum concentration) and t(max) (time to reach maximum concentration). In metformin treated rabbits, psyllium increased insulin pharmacokinetics parameters, including Cmax, AUC, and t (max). the finding suggest that psyllium can enhance the effectiveness of oral antihyperglycemic treatments for type 2 diabetes [29].

Cardiovascular Health

Zhu *et al* (2024) carried out a meta-analysis of 29 randomized controlled trials (RCTs) with 2,769 participants evaluated the effects of psyllium on blood lipid levels. Plantago consumption significantly reduced total cholesterol (TC) by 0.28 mmol/L and low-density lipoprotein cholesterol (LDL-C) by 0.35 mmol/L, corresponding to a 7% reduction in cardiovascular event risk. No, significant effects were observed on high-density lipoprotein cholesterol (HDL-C) or triglycerides. Subgroup analyses showed TC and LDL-C reductions were more pronounced in male participants, those with lipid disorders, and those consuming Plantago husk or psyllium. Soluble fiber intake was particularly effective in lowering TC, LDL-C, and triglycerides. These findings highlight Plantago's potential in managing blood lipid levels and reducing cardiovascular risk [30].

Gonzalez *et al* (2021) carried out a double blind, randomized clinical trial evaluated the effects of psyllium (10g/ day for 7 weeks) versus placebo on 100 obese adolescents (BMI 29-34, aged 15-19). Psyllium significantly reduced small dense LDL by 2.0 mg/dl vs. 1.0 mg/dl (p = 0.004) and IL-6 levels by 3.32 vs. 1.76 pg/ml (p<0.0001), with no changes in HDL subclasses or adverse effects. These findings suggest psyllium as an effective early intervention to reduce cardiovascular disease risk in obese adolescents by lowering small dense LDL and inflammation [31].

Conclusion

Traditional Unani medicine describes Isabgol as a versatile remedy with cooling, mucilaginous, and anti-inflammatory properties, aligning closely with contemporary research. Scientific studies reviewed in this article have further validated these applications, offering evidence of its efficacy in diverse settings. Despite its broad applicability and safety profile, certain areas require further exploration. Long-term studies on Isabgol's effectiveness, its impact on chronic diseases, and detailed mechanisms of action will provide deeper insights and bolster its integration into preventive and therapeutic healthcare strategies. Additionally, exploring its synergistic effects with other dietary components and medications could open new avenues for its utilization. In conclusion, Isabgol husk exemplifies the concept of "*Dawa-e-Ghiza*," or medicinal food, bridging the gap between traditional remedies and modern healthcare needs. Its multifaceted benefits, from digestive regulation to metabolic health and cardiovascular support, make it a cornerstone of holistic well-being. As a safe, natural, and versatile supplement, Isabgol holds significant promise in enhancing human health, offering a sustainable and effective approach to managing modern lifestyle-related diseases. With continued research and awareness, it has the potential to become a staple in both traditional and contemporary medicine.

Conflict of interest

There was no conflict of interest

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