

Exploring the Health Benefits of Psyllium: From Digestive to Drug Delivery

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ABSTRACT

A significant medicinal plant grown in India, Pakistan, and Iran is psyllium. The psyllium seed's husk, which is abundant in arabinoxylans, is used to treat some digestive problems. Additionally, it is added to meals to enhance their fiber content, appearance, mechanical properties, and sensory qualities. Psyllium used in large doses can cause bloating and gas. In rare instances, prolonged exposure to psyllium husk in sensitive people might result in skin irritation and respiratory allergies. Additionally, psyllium has been said to have wound-healing, cholesterol-lowering bladder problems, high blood pressure, hemorrhoids, constipation as well as diarrhea and for treatment of skin irritations. It is used in numerous elimination programs and even in the fight against colon cancer. The article will provide a thorough analysis of the range of contemporary psyllium applications. It will also be discussed whether psyllium can help with wound healing and whether it can be used in wound dressings. Therefore there is a need to elaborate health benefits of psyllium husk in terms of its nutritional quality to emanate the public health disorders and make food products at household level.

Keywords: Psyllium husk; Digestive problems; Fiber content; Wound healing; Nutritional quality

INTRODUCTION

Psyllium was introduced by Indian Muslims as a medicinal herb; the seeds were originally taken from wild plants. It was first grown in Pakistan in Lahore and moving from the Multan districts to Bengal, Mysore, and the Indian Coromandel coast after that. Originally from Persia, psyllium is currently produced in western India. The crust, seed, and entire plant are all referred to as "psyllium". It is believed to be an excellent source of both soluble and insoluble fiber. It has a nearly eight-fold higher soluble content than oat bran. The plant's diet fibers can be isolated for use in low-calorie food production and have medicinal properties (Figure 1) [1].

Psyllium or Ispaghula is the common name for a number of *Plantago* species whose seeds are used to make mucilage for commercial purposes. *Plantago ovata* seed is often referred to as

white or blonde psyllium, Indian plantago, or isabgol in trade circles. The popular name for *P. ovata* in India is Isabgol (also known as Ispaghol in Pakistan), which derives from the Sanskrit words asp and ghol and means "horse flower" (which describes the form of the seed). The husks of the blonde psyllium seed are a natural source of high soluble fiber [2]. The primary product of Isabgol is psyllium husk. The seed's outermost skin, known as the husk, is removed mechanically. Around 25% to 26% of the seed's husk is recovered in total. Under normal and customary storage circumstances, psyllium husk has a shelf life of only six months. On a dry weight basis, the husk makes up roughly 10%–25% of the seed. *P. ovata* is a crop that matures in 119 to 130 days and grows well in cool, dry weather. *P. ovata* is grown primarily in North Gujarat in India as a "Rabi" crop from October to March. Average temperatures during the monsoon-following season vary from 15°C to 30°C (59°F to 86°F), and levels of moisture are low [3].

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Received: 01-Sep-2023, Manuscript No. EOED-23-26111; **Editor assigned:** 04-Sep-2023, PreQC No. EOED-23-26111(PQ); **Reviewed:** 18-Sep-2023, QC No. EOED-23-26111; **Revised:** 25-Sep-2023, Manuscript No. EOED-23-26111 (R); **Published:** 03-Oct-2023, DOI: 10.35841/2329-6631.23.12.214.

Citation: Kousar S, Shahid A, Kausar Z, Ghaffar A, Ahsan A, Zainab Z, et al. (2023) Exploring the Health Benefits of Psyllium: From Digestive to Drug Delivery. J Develop Drugs. 12:214.

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Figure 1: Psyllium Husk also known as Isabgol.

The way soluble fiber from psyllium affects body proteins and lipids involved in metabolism. With particular reference to baked goods, yogurt, and beverages, the practical and nutraceutical foods containing fiber are being produced and investigated for their efficacy [4,5]. Different dosages of psyllium husk are used to manufacture bakery goods, and research has shown that replacing psyllium husk by up to 50% can be done without negatively impacting quality. Furthermore discussed the hypocholesterolemia value of psyllium in context of men's and women's pre- and postmenopausal hormonal states as well as their gender. After taking 15 grams of psyllium per day for six weeks, postmenopausal women's total cholesterol levels significantly decreased to 5.2%, and while premenopausal women's levels decreased to 1.3%. Triglycerides, apolipoprotein A1, and apolipoprotein B concentrations in pre- and postmenopausal women did not differ significantly. It was determined that including psyllium husk in the diet of postmenopausal women can help lower their risk of heart attacks [6].

The versatile benefits of Isabgol (Psyllium husk) as a therapeutic agent

As a medicinal agent, Isabgol is widely used to treat a variety of conditions, including diabetes, hypercholesterolemia, irritable syndrome, ulcerative colitis, inflammatory bowel disease, constipation, and diarrhea. Digestion is facilitated by psyllium husk, which is regarded as a moderate and natural laxative. When it comes into contact with water, it becomes sticky and gelatinous, absorbing water to carry out its typical functions. It is believed that the dietary fiber found in psyllium husk, which functions as a bulking agent, can aid with weight management and fat loss. Increasing satiety, lowering calorie intake, ingestion rate, and nutrient absorption are important variables in such circumstances [3]. It enhances the lipid and lipoprotein profile and glucose homeostasis in hypercholesterolemia and obese individuals [7]. It has been stated that hemorrhoids, constipation, diabetes, and ulcerative colitis can be treated with isabgol (psyllium) husk, a naturally occurring edible polymer. Apart from its conventional application in constipation, husk has the ability to restore normal levels of Low-Density Lipoprotein (LDL), which is the root cause of other health issues such as high blood pressure, hypercholesterolemia, and low energy levels. Additionally, some studies have demonstrated its

ability to prevent cancer. There are very few negative effects or side effects from any of the medicinal uses for isabgol husk. However, the benefits of lowering blood sugar levels in some situations remain debatable and have not been thoroughly investigated or adequately demonstrated in type II diabetes. Thus, in a definite sense, it is a source of soluble dietary fiber that is hypoglycemic and hypocholesterolemia in addition to being a laxative [8-10]. When combined with a nutritious diet, or on their own, psyllium fiber supplements dramatically decreased BMI, body weight, and the percentage of total body fat. Moreover, after 12 weeks of psyllium consumption, it significantly reduces insulin and triglycerides in comparison to the control group. However, a diet rich in fiber dramatically lowered LDL and total cholesterol, which in turn decreased the risk factors for metabolic syndrome [11]. Various soluble and insoluble fibers derived from cereals and vegetables are utilized to combat the threat of elevated cholesterol and glycemic diseases. Psyllium husk, oats, guar gum, and several other cereals are the main sources of fiber. Psyllium husk fiber, on the other hand, seems to be one of the less harmful sources and most effective [12]. Due to its high water soluble fiber content, it helps those with hypercholesterolemia by lowering their glycemic and lipid responses. The anti-obesity benefits of psyllium husk stem from its neutral and acid polysaccharides that contain galacturonic acid and have the right amount of soluble/insoluble fiber. Numerous studies have shown that supplementing with psyllium husk lowers postprandial glucose levels in diabetic patients by 12.2 to 20.2%. Psyllium reduces serum LDL and triglyceride concentrations in children with high cholesterol to 22.81% and 19.54%, respectively, while increasing HDL to 3.05% [7]. Some of the laxative effects may be attributed to its bioactive constituents, specifically phenolic molecules like isoacetoside and acetoside. Their biological actions include antidotal and antioxidant activities in addition to pain relief [13]. Because of these purported benefits, psyllium is now a viable functional dietetic fiber that may be included in a variety of food products. It has probiotic qualities and can be utilized as a bioactive oligosaccharide [2]. Psyllium is widely recognized as a safe and efficient bulk laxative that can be used as a supplement to diet therapy for people who not respond well to a low-fat, low-cholesterol diet (Figure 2).

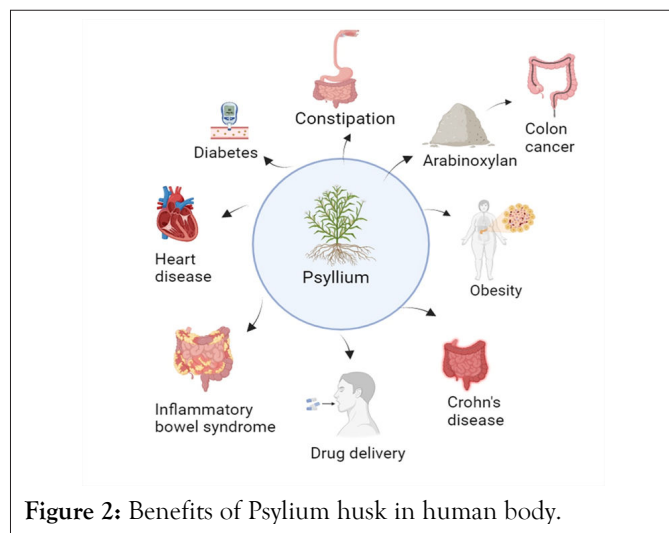


Figure 2: Benefits of Psyllium husk in human body.

Digestive health benefits

Psyllium husk is well known for its ability to relieve constipation. By acting as a mild, natural laxative, it encourages regular, relaxing bowel movements. Psyllium's high fiber content makes it easier to pass by softening and bulking up the feces. In gastrointestinal management psyllium is mainly used to cure constipation, although it can also be useful in the treatment of diarrhea. In order to help manage loose stools, the soluble fiber in psyllium absorbs extra water in the intestines. The production of gel for psyllium takes on the shape of a gel when combined with water. This gel helps lessen discomfort and inflammation by protecting and soothing the gastrointestinal tract. Managing appetite and preserving weight the stomach-filling action of psyllium can promote satiety, making people feel fuller for longer. This can help with weight management and fat loss by reducing caloric consumption. Psyllium can help create a regular, healthy bowel habit that lowers the risk of constipation and improves overall digestive regularity.

Psyllium is generally well-tolerated and has few side effects, which makes it a preferred option for many people, unlike certain synthetic laxatives that may have negative effects. Traditional medicine has been using psyllium for digestive problems for generations. Recent studies have produced empirical data substantiating its efficacy in this context [14].

Psyllium and wheat bran effects on gastrointestinal transit time and stool parameters are compared. The study examined the gastrointestinal transit time, frequency of bowel movements, stool weight, and stool consistency in twelve participants who administered fiber supplements for two weeks that contained either psyllium gum, wheat bran, psyllium gum plus wheat bran, or psyllium gum and low-fiber control. Four distinct markers were used to quantify the intestinal transit time: Terbium oxide, cobalt-ethylenediamine-tetraacetic acid, plastic pellets, and bran treated with chromium. Stool weights, both wet and dry, were assessed, and participants' opinions of the consistency of their stools were obtained via a questionnaire. Supplementing with fiber shortened the transit time, increased the quantity of bowel movements per day, and increased the weight of both wet and dry stools. psyllium has less of an impact on transit time than bran.

Psyllium was more effective in reducing the total weight of the feces and the amount of water included in them. 50% of the daily stool ratings on the days when stools were passed were rated as "hard" when the subjects were given the control supplement. When the subjects were given the high-fiber supplements, less than 10% of the assessments were classified as "hard." The transit time assessed was not considerably impacted by the type of marker utilized [15].

Dried fruits have dietary fiber, which has laxative qualities, as well as other substances including sorbitol and polyphenols. This is why they are frequently recommended as a treatment for constipation. There is little information available about the effectiveness and possible mechanisms of action of dried fruit on gastrointestinal health, despite their potentially beneficial

nutritional content. The study looks at how dietary interventions, particularly fruit products with different nutritional contents, affect the motility and function of the gastrointestinal tract in healthy individuals who have functional constipation. Further evidence is provided by the findings of a systematic review and meta-analysis on the impact of meals, beverages, herbs, and spices on constipation [16].

In comparison to psyllium, fruits increased the frequency and consistency of bowel movements; rye bread produced more weekly bowel movements and a shorter gastrointestinal transit time than white bread, and mineral water produced better treatment response and more frequent bowel movements than plain water. Additionally, this other reports on a 3-arm, parallel, randomized, placebo-controlled trial that examined the effects of three daily servings of dried fruits (dried apricots, raisins, and prunes), which is an intervention rich in sorbitol and fiber, in comparison to three servings of fruit juices made from the same fruits, which is an intervention high in sorbitol but low in fiber, and three servings of a fruit-flavored cordial that is a control that has no fiber or sorbitol for four weeks in healthy individuals with functional constipation. Changes in faeces weight were the main result, while quality of life, gastrointestinal symptoms severity and frequency, gut transit times in the whole and regional gut, bowel movement frequency, stool consistency, faecal moisture, pH, and contractibility were the secondary outcomes [17,18].

Psyllium's weight-loss mechanisms: Insights and implications

By slowing down the absorption of glucose, psyllium can help people lose weight. It can also increase feelings of satiety and satiation, which can help people eat less. Additionally, psyllium can help produce short-chain fatty acids, which are produced by gut microbes and have anti-inflammatory and immunomodulatory effects. It can also trap bile acids and carcinogens, as well as increase the intake of biologically active compounds like antioxidants and phytochemicals [19-20]. It has a linear correlation with decreases in body mass in addition to blood pressure [17]. An additional mechanism involves the impact on gut hormones including cholecystokinin, satiety, gastric emptying, and an altered glycemic index or insulin response. Increased chewing time while eating foods high in fiber can boost the fullness and possibly result in reduced meal portions. This is one method that psyllium may help with satiety. Dietary fibers can also reduce a food's energy density, which lowers appetite and calorie consumption. Furthermore, the fiber in psyllium slows down intestinal passage rates, which can improve satiety by delaying the absorption of nutrients. Additionally, by lowering the bioavailability of proteins and fatty acids, diets high in fiber may reduce energy absorption. It seems that physical properties of fiber, such as its solubility, viscosity, water-holding capacity, and ferment ability, as well as its chemical structure, are more important in controlling starvation, energy intake, and body weight than is the quantity of fiber consumed [21].

DISCUSSION

Digestive health benefits

The well-known benefits of psyllium for supporting intestinal health cannot be overstated. It is a readily available remedy for common gastrointestinal issues like constipation and diarrhea because of its function as a mild and natural laxative [16]. Psyllium's soluble fiber content helps to control bowel motions and ease discomfort associated with the digestive system. Its ability to combine with water to form a gel-like substance also has historic and contemporary uses in the treatment of various problems. When it comes to managing weight, psyllium's capacity to boost fullness and lower calorie consumption is very noteworthy. It should be noted that it is gentle, well-tolerated, and has few adverse effects emphasizes this comprehensive approach to gut health and increases its usefulness as a therapeutic agent [22,23].

Metabolic benefits

There is strong evidence to support the inclusion of psyllium in dietary and health treatments due to its benefits for metabolism. Studies have shown that psyllium can have a beneficial effect on glucose homeostasis, which may help those with diabetes or those who are at risk. It is notably remarkable how well it can enhance lipoprotein and lipid profiles, particularly in individuals who are obese and have high cholesterol. Psyllium helps lower the risk factors linked to hypercholesterolemia and hypertension by lowering abnormal LDL levels. Supplementing with psyllium has the ability to help manage weight and regulate metabolic syndrome risk factors, which emphasizes its importance in modern healthcare practices [24].

Prospective drug delivery

The use of psyllium in medication delivery systems is one of the newest and most interesting fields. Novel approaches to regulated drug release are provided by the special qualities of psyllium, such as its capacity to create gel. Psyllium has the ability to improve the safety and effectiveness of drug delivery by encapsulating and releasing medications in a regulated manner. psyllium research in this context demonstrates how versatile and inventive this natural material is outside of its conventional use [25].

Implications for future research

Even though this analysis provides a thorough overview of the health benefits of psyllium, more research is clearly needed. Especially, further research is necessary to determine the precise processes underlying psyllium's effects on satiety, glucose control, and medication delivery. Furthermore, further comprehensive research on the use of psyllium in the treatment of particular medical disorders like diabetes and hypercholesterolemia would be beneficial. These kinds of studies will help to strengthen the scientific underpinnings for the application of psyllium in various health scenarios. psyllium, in summary, is a diverse and promising natural ingredient that offers a wide range of health advantages. Its significance in

healthcare and research is further demonstrated by its ability to treat issues related to digestive health, impact metabolic parameters, and contribute to novel medication delivery methods. Future research and applications in this interesting field of study and possible health and well-being enhancement are likely to be spurred by the growing body of knowledge around psyllium.

CONCLUSION

The therapeutic herb psyllium has a long history of traditional use and a good future in contemporary nutrition and healthcare. In our extensive evaluation, we have looked at every aspect of it. Psyllium is important as a source of energy and good health in regions like Iran, Pakistan, and India, according to a thorough analysis of its numerous applications. Modern medicine still uses psyllium, which begs intriguing questions regarding potential use for the material in areas like wound healing and medication delivery. When we consider how psyllium affects blood pressure, cholesterol, bladder problems, and even the prevention of colon cancer, we can see the possibility for revolutionary medical advancements. Finally, the wide range of uses for psyllium in nutrition and health emphasizes its enduring importance in complementary and alternative medicine. Although psyllium is still very useful for its traditional uses, new research routes could be quite interesting due to its adaptability in solving modern problems and its potential for innovative medicinal applications. The health benefits of psyllium are clearly going to have a lasting impact on and advancement in the medical and nutritional areas in the years to come.

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