Egypt. J. Chem. **Vol. 65**, No. 5 pp. 313 – 318 (2022)

Egyptian Journal of Chemistry

http://ejchem.journals.ekb.eg/

Therapeutic Applications and Health-Promoting Properties of Plantago Ovate Review

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Abstract

This review evaluates psyllium *(Plantago ovate)* nutritional properties and health benefits. its applications in food products. It contains many antioxidants that prevent the attack of free radicals. It is a great source of unsaturated fatty acids, especially polyunsaturated fatty acids, such as omega-3 and omega-6, The main functional benefits of psyllium are included cholesterol control, obesity satiety, and diabetes, and on. Plantago ovate can be used in the manufacture of several pharmaceutical products.

Key words :Psyllium, chemical, antioxidant activity, and Nutritional properties

Introduction

Psyllium is a major source of soluble and insoluble fiber, as well as a medicinally active natural polysaccharide that forms a gel. (Singh, 2007). Psyllium is used in the food and pharmaceutical industries and has possible health advantages (Singh,2007; Yu, Lutterodt & Cheng, 2009). It's used to treat constipation, IBS symptoms, and other digestive issues. Obesity, diabetes, and hypercholesterolemia are all associated with stomach pain, cancer prevention, diarrhea, and inflammatory bowel disease-ulcerative colitis. It also has satiety, cholesterol-lowering, and prebiotic properties (Brum, et al, 2016, Sierra et al., 2002). It is used as a dietary supplement for its laxative, insulin sensitivity, and cholesterol-lowering qualities, among other things (Fischer et al., 2004). The high water absorption capacity and ability to create viscous gels of Psyllium fiber have a physiological effect (Farahnaky, et al., 2010; Guo et al., 2008).

Psyllium is a prominent ingredient in traditional Indian medicine for treating skin irritations, hemorrhoids, constipation, and diarrhea. Its popularity has grown in Europe in recent years, and it is now also popular in the United States **(Fradinho, et al., 2015)**. Psyllium products are thought to be a good way to increase functionality and produce healthy foods. Psyllium is added to food (dairy, meat, baked goods, and gluten-free products). it may allow consumers to ingest adequate amounts of fiber without increasing calorie intake, as well as contributing to other health benefits such as glycemic, control, cholesterol control, satiety, among others. Psyllium can be used in food recipes without altering the taste. As a result, when psyllium is used in food items, the food sector plays a significant role in chronic illness prevention **(Franco, et al., 2020)**.

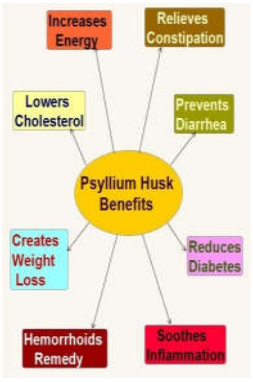

Photo (1) Psyllium seeds

Photo (2) Psyllium Seeds

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Receive Date: 11 October 2021, Revise Date: 22 October 2021, Accept Date: 02 November 2021

DOI: 10.21608/ejchem.2021.100582.4673

Photochemistry properties of psyllium seeds:

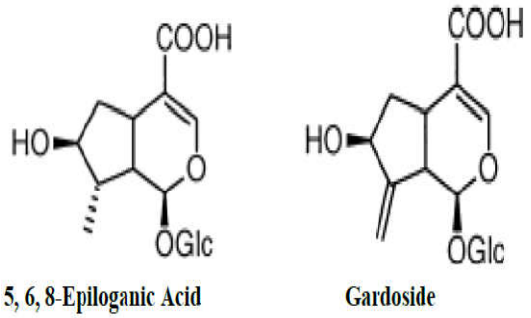

Photo (3) phytochemistry of Psyllium seeds

Psyllium is high in hemicellulose, which is made up of a xylan backbone coupled to arabinose, galacturonic, and rhamnose acid. A phytochemical analysis found that they have a strong potential for producing a diverse range of secondary bioactive compounds. iridoids, phenols, sterols, polysaccharides, alkaloids, and cumatines are compounds that can be used as a food supplement or medicine.Carbohydrates made up the majority of psyllium seeds. It was monosaccharides, which had the greatest xylose and arabinose. 85 percent of the fiber in psyllium husk is water-soluble. 20 % L-arabinose, 65 percent D-xylose, 9 percent D-galacturonic acid, and 6% rhamnose make up the poly saccharidic fraction. According to, **Talukder et al. 2016**.

Amino acids, fatty acids, polyphenols, and flavonoids are the most prevalent bioactive chemicals in *P. ovata* husks and seeds. **Patel et al., 2016** . Among the fatty acids identified in *P. ovata*, are oleic acid, linoleic acid, and palmitic acid. Psyllium contains phenolic chemicals that have antioxidant propertiesTerpenes and saponins were found in the extracts. 6.83 percent moisture, 0.94 percent protein, 4.07 percent ash, and 84.98 percent total carbohydrates are found in the husk. (**Guo et al., 2008)**.Psyllium is utilized in the pharmaceutical, cosmetic, and culinary industries. Breakfast cereals, ice cream, quick drinks, and bread products all contain it.cakes, biscuits, muffins, and bread, all of which have different functions and health benefits (**Ziai et al., 2005**). Psyllium has a 6.83 % protein content, 0.94 % protein, 84.98 % total carbs, and 4.07 % ash content (Guo et al., 2008; Yu et al., 2009). Albumin was 35.8%, globulin 23.9 %, and prolamin 11.7 % after Osborne fractionation. Linoleic acid (40.6 %) and oleic acid were both abundant in Plantago seed oil (39.1 %) **Talukder et al., 2016 Kotwal, Kaul, &Dhar 2019** P. ovata seeds are high in bioactive chemicals, with amino acids, fatty acids, and phenolic compounds, as well as antioxidant activity, being the most prevalent. Flavonoids and polyphenols, for example. Terpenes, such as saponins. Because of its antioxidant and anticancer properties, psyllium husk should be investigated further for formulation development **Patel et al., 2019.**

Therapeutic applications of psyllium seeds hypercholesterolemic and Hyperlipidemic effects.

The most common soluble fiber is psyllium, which is derived from the husk of the Plantago ovate seed. Due to its high fiber content, it can lower high cholesterol levels (**Brown et al., 1999**).It was reported in 17 clinical trials, psyllium fiber resulted in a considerable reduction of LDL cholesterol, according to a prior systematic review and metanalysis (**Wei et al., 2009**). Psyllium has been found to help lower plasma LDL-C levels in recent trials. It can be used as an additional therapy for hypercholesterolemic patients, decreasing LDL-C by 7%. Another study found that psyllium is safe and beneficial for people with type 2 diabetes, lowering LDLC by 13% with no side effects. **(Anderson, et al., 1999) (Anderson, et al., 2000) (Fernandez, 1995, Horton, et al., 1994)** Psyllium ingestion lowers plasma LDL-C.Men with hypercholesterolemia who drank psyllium showed a significant drop in LDL levels from 10% to 24%. This is because bittering acids bond in the stomach lumen, lowering the risk of coronary heart disease. **(Chourasia et al., 2003; Singh et al., 2014).**

Dietary fiber consumption is typically substantially lower than recommended, resulting in a variety of major disorders (**Mellen et al., 2008**). Dietary fiber is well known for its function in the prevention of a variety of disorders, including cardiovascular disease. (**Lairon et al., 2005; Homayouni et al., 2014**). It is therefore important to enrich several types of foods with a variety of dietary fibers such as psyllium. **Sudha et al., 2007**. As a result, it's critical to include a variety of dietary fibers, such as psyllium, in a variety of foods. Dietary fiber consumption is linked to a lower risk of cardiovascular disease. **Graham and colleagues (2007), Grundy et al, 2004 , Anderson (2009)** Dietary fiber consumption is linked to a lower risk of cardiovascular disease. **Graham et al., 2007, Grundy, 2004, and Anderson, 2009**. It can reduce the content of low-density lipoprotein cholesterol (LDL-C) in hypercholesterolaemic and diabetic patients by 5–10%. Brown and colleagues **Brown et al., 1999.**

In human secondary CVD risk trials as well as in obese animals **(Solà et al., 2007, Galisteo et al .,**

2009), it can lower triglyceridemia. Psyllium was observed to lower fasting plasma cholesterol in people who had obesity, hypercholesterolemia, or diabetes **(Frati-Munari et al.,1983, Bell et al.,1989).** In general, psyllium husk consumption can lower total cholesterol by 5% and low density lipoprotein (LDL cholesterol) by 7-8% **(Anderson et al.,2000a, Anderson et al.,2000).** Increased bile acid production is most likely to blame for the decrease in plasma total cholesterol and triacylglycerol levels that occur following psyllium husk ingestion increased transcript levels of genes implicated in cholesterol synthesis, as well as subsequent rises in lipogenic gene transcript levels, could hint at a regulatory mechanism targeted at restoring the lowered plasma cholesterol and triacylglycerol levels during the feeding phase. **Chan, &Heng (2008).**

Anti-diabetic activity

Diabetes mellitus can develop as a result of a decrease in insulin synthesis or the ability to utilize insulin. Psyllium reduces hyperglycemia by inhibiting glucose absorption in the intestine and increasing motility. It was once used to help diabetics improve their glucose tolerance. This effect is caused by a delay in gastric emptying, an increase in intestinal transit, or a change in digestive enzyme secretion and function. **Yadav, et al 2009, Babu et al , 2008, Hannan et al , 2006 ,. Brennan et al., 2012.** Investigate the effect of fiber-enriched ready-to-eat snacks on non-diabetic patients' postprandial glycemic response. At a 15 percent flour replacement concentration, oat and psyllium were mixed into a ready-to-eat snack. Participants' blood glucose levels were shown to be significantly lower after the trial. Insoluble fiber can impair hepatic insulin sensitivity. **Weickert et al., 2005, Thorburn et al., 1993.**Psyllium is a medicinally important gel that forms a glucose-lowering dietary fiber, and a drug delivery method developed through its functionalization has the potential to cure diabetes twice. **Singh, B., &Chauhan, N. 2010.**

Psyllium was associated with normal carbohydrate absorption in both healthy and diabetic subjects **(Jarjis et al1984 , Uribe et al 1985).** The improvement in glucose tolerance that occurs as a result of consuming viscous fiber is attributable to delayed carbohydrate absorption rather than mal-absorption. Intimate mixing, which allows food and fiber to interact physically, appears to be key in converting the carbohydrate to a slow-release form. **Pastors et al., 1991; Rendel, 2000**.

The body must maintain a very narrow range of blood glucose levels. Insulin and Glucagon are the two hormones responsible for this. The pancreas's production of insulin and glucagon ultimately determines whether a patient has diabetes, hypoglycemia, or another sugar-related problem. Psyllium has been proposed as a possible treatment for high blood sugar levels in diabetics. Human studies found that a single dose of psyllium reduced blood sugar levels moderately, but the long-term effects were unclear **Jenkins et al., 2000.**

Anti-obesity property

Psyllium is important for fat reduction and weight control because it increases satiety, lowers caloric intake, slows digestion, and reduces fat absorption. (**Cummings et al., 2004**). Psyllium has traditionally been used as a medicine with pharmacological properties such as anti-obesity, hypoglycemic, and hypocholesterolemic properties. (**Anderson et al., 2000; Moreyra et al., 2005; Ziai et al., 2005; Pal et al., 2011, Clark et al. 2006 Singh ,2008**) In obese Zucker rats, consuming a P. ovata husk-supplemented diet protects endothelial damage, hypertension, and obesity, as well as improving dyslipidemia and aberrant plasma concentrations of adiponectin and tumer necrosis factor (TNF) **Galisteo, et al 2005**. Diabetes, dyslipidemia, arteriosclerosis, hypertension, and other metabolic disorders are all directly linked to obesity. Psyllium dietary fibers are thought to promote weight loss and fat loss by acting as a bulking agent, increasing satiety and lowering caloric intake, ingestion rate, and nutrient absorption. **DeFronzo, Ferrannini ,1991 Vergara-Jimenez et al 1999**.

Psyllium is an important component of medical and human health management. Because of its low acute toxicity, it has been utilized as a safe and effective laxative and can be taken internally as a dietary supplement. It has been discovered to be beneficial in the maintenance of digestive system health, as well as in the prevention of cardiovascular disease, cancer, diabetes, and other illnesses. Fiber-rich dietary sources have been proven to help manage blood glucose levels, serum cholesterol levels, and the insulin levels needed to stimulate glucose uptake into body tissues **Cummings et al 2004.**

Conclusion

Psyllium seed is a type of functional food that contains antioxidants and dietary fiber, which are both beneficial to human health. It also helps to lower the risk of various ailments, including cancer and diabetes It is an anti-hypercholesterolemia and anti-hyperlipidemic meal that helps to reduce the severity of cardiovascular disorders. The impact of Psyllium seeds on obesity was found to be mixed. Most studies were conducted on animals and this limits the understanding of its impact on human health. Therefore, more research is required on humans to investigate their role in preventing diseases. The majority of studies were done on animals, which limits our understanding of how it affects human health. As a result, the further human study is needed to investigate its role in disease prevention. Psyllium

may play a key role in the food business if it can provide both health (cholesterol management, glycemic control, and satiety) and technological benefits, such as sensory acceptance and high fiber content of goods. Psyllium's capacity to bind with water is advantageous in the creation of gluten-free and low-fat meat products. It's worth noting that these products are eligible for health claims due to their ability to reduce fat absorption. More research is needed, however, to assess the characteristics of industrial manufacturing processes that can influence the benefits of psyllium industrial food products.

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