Nutritional value-added fortified cookies with Psyllium husk (Isabgol)

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***Abstract*: Psyllium husk is currently being investigated for usage in digestive cookies. For psyllium husk characterization, psyllium husk was substituted for moisture, crude protein, fat, ash, and fibre, with husk values of 10.43 percent, 3.8 percent, 1.7 percent, 6.63 percent, and 2.97 percent, respectively. According to a chemical investigation, Control Cookies have a high crude protein level. Psyllium husk-based cookies had higher moisture, ash, and crude fibre content. Digestible cookies were also shown to have a higher nutritional value. The use of psyllium husk in digestive cookies is currently being researched. In various combinations, psyllium husk was substituted for refined wheat flour at a rate of 25%. Control Cookies had a high crude protein level, according to a chemical analysis. Cookies made with psyllium husk showed greater moisture, ash, and crude fibre content. It was also shown that digestible cookies have a higher nutritional value.**

Keywords: Isabgol, cookies, proximate analysis, dietary fiber.

Introduction –

The annual herb Psyllium husk, also known as "Psyllium ", in English and "Isabgol" in Hindi, belongs to the Plantaginaceae family and has short stems of 10-45cm. Ashwagolam, aspaghol, bazarqutuna, and blond psyllium are some of its names.

Isabgol is a high-fiber plant that functions as a sponge to cleanse the intestines and is widely grown around the world. (D. S. Katke et al., 2020; W. H. Deshpande et al., 2020). Some of the useful functionalities available, which are briefly detailed under Isabgol – Uses. Microparticles, Hydrogel, Sustained Release Agent/Release Retardant, Gastroprotective Agent, Super Disintegrant Psyllium fibre in a different form. <https://www.healthline.com/health/digestive-health/whats-the-best-fiber-supplement> Plantago ovata husk seeds are used to make this sculpture. Ispaghula is another name for it. It's usually referred to as an aperient.

Some of the available appreciated works that have reviewed and briefly described under the use of Isabgol as

- Hydrogels
- Sustained release agent/Release retardant
- Gastroretentive agent
- Super disintegrant
- Microparticles

Psyllium, on the other hand, is advantageous to many organs of the human body, including the heart and pancreas, according to study. Psyllium is a prebiotic—a chemical required for the growth of healthy probiotic colonies in the gut (https://www.healthline.com/health/probiotics-and-digestive-health). Natural hydrocarbons can be found in psyllium husk. The plants from which it is derived are well-known for their health benefits, and the Food and Drug Administration (FDA) revealed in 2012 that psyllium husk soluble fibre can help reduce the risk of coronary heart disease.

Psyllium husk arabinoxylans are resistant to gastrointestinal breakdown and have prebiotic qualities, allowing for an increase in beneficial microbes and a decrease in pathogenic bacteria in the digestive system. Psyllium husk is also a low-cost, biodegradable, and environmentally friendly material. Because of its significant amount of soluble and insoluble fibre as a pharmacologically active gel forming natural polysaccharide, psyllium mucilage has a long history as a nutritional supplement. It has also been reported to be successfully used for the treatment of high cholesterol. (Tripathi Devika and colleagues (2019). The produced husk comprises 6.83 percent moisture, 0.94 percent protein, 4.07 percent ash, and 84.98 percent total carbohydrate, according to the chemical composition. Food, medicine, and the cosmetic sector all employ psyllium husk.

It's found in ice cream, juice, breakfast cereals, and bakery products including biscuits, cakes, breads, and muffins, all of which have different functional and nutritional benefits (Casrani. B. Tahira. et al., 2014). Its primary function was as a laxative and colon cleanser; however, it is now thought that the dietary fibre in psyllium husk can help with weight management and loss (Kaisrani. B. Tahira. et al., 2014).

Psyllium, like other herbs, has a long history of usage in medicine, and its popularity has grown as a result of its nutraceutical potential. Constipation, diarrhoea, inflammatory bowel disease, and ulcerative colitis are all treated with it. (Kaisrani. B. Tahira et al., 2014; Tripathi Devika et al., 2019). Biscuits are one of the most extensively consumed bakery items in the world, owing to their

ready-to-eat nature, low cost, high nutritional quality, availability in a variety of flavours, and prolonged shelf life. (Raymundo, Anabela, and colleagues, 2014).

Materials and Methods

Characterization of psyllium husk and product development was carried out in Babasaheb Bhimrao Ambedkar University (BBAU), A Central University, Lucknow.

Procurement of Raw Material

Psyllium husk (Plantago ovata forsk) was purchased from Shahid Nagar, Lucknow. To make diet cookies, non-nutritive condensed milk and sugar powder were used. Condensed Milk and Sugar Powder Direct grade flour and shortening was procured from the local market, Lucknow.

Characterization of psyllium husk

The husk was characterized for various aspects like proximate analysis, and dietary fiber.

Chemical characteristics

The chemical composition of husk was estimated through Parameters such as moisture content, crude fat, crude fiber, and crude protein were observed for determining the chemical composition of Isabgol.

Moisture content

Psyllium husk was analyzed for moisture content by using air forced draft oven (Model: DO-1-30/02, PCSIR, Pakistan). The sample was dried at 105±5˚C to constant weight and calculations were made (AACC, 2000; Method No. 44-15A).

Crude protein

For determination of crude protein, nitrogen percentage was estimated through Kjeltech Apparatus (Model: D-40599, Behr Labor Technik, GmbH-Germany). The protein was calculated by multiplying percent nitrogen with conversion factor (AACC 2000; Method No. 46-10).

Crude Fat

Crude fat in oven dried sample was estimated by Soxtec System (Model: H-2 1045 Extraction Unit, Hoganas, Sweden). Sample weighing 5g was used for extraction of crude fat with petroleum ether. After extraction, residue was dried till constant weight (AACC, 2000; Method No. 30- 10).

Crude fiber

After fat extraction, husk sample was examined for crude fiber through Labconco Fibertech (Labconco Corporation Kansas, USA). Fat free 2g sample was digested firstly with 1.25% H2SO4 and finally with 1.25% NaOH. The residue was dried at 130˚C for 2 hours and weighed followed by ignition at 550±15˚C and cooled for further calculations (AACC, 2000; Method No. 32-10).

Total ash

For determination of ash content, sample was taken in pre-weighed crucible and charred on burner till no fumes before incineration in the Muffle Furnace (MF-1/02, PCSIR, Pakistan) to obtain white grayish residue with no other taints obtained (AACC, 2000; Method No. 08-01).

Characterization of psyllium husk

Because the addition of husk in cookies may play a mandatory function in the modification of physical and chemical features, the compositional estimation of the supplement (husk) is vital. Chemical analysis is also necessary for determining the supplement's efficacy. As a result, the physiologically active component of husk, moisture, ash, protein, crude fat, and crude fibre, was investigated for its contents.

Table 1: Compositional analysis of psyllium husk

Constituent	Quantity
Moisture	9.43%
Ash	6.63%
Fat	1.7%
Protein	3.8%
Crude fiber	2.97%

Product Development –

The development of isabgol-containing dietary cookies was justified by the need for a high-quality product for those early trials. Following the determination of the ingredients, various cookie formulations were made and assessed for various quality aspects.

Preparation of cookies -

Using varied concentrations of isabgol husk, three distinct cookie recipes were created (table 3). Control cookies were made with the following ingredients: 100 g wheat flour, 25 g sugar powder, 30 ml condensed milk, 1 tbsp cocoa powder, ½ tbsp baking powder, 5-10 drops vanilla essence, ½ tbsp salt.

Table 2. Ingredients for preparation of standard cookies

Ingredients	Quantity
Wheat flour	100 gm
Isabgol	5%
Sugar powder	25 gm
Condensed milk	30 ml
Cocoa powder	1 tbsp
Baking powder	½ tbsp
Vanilla essence	5-10 drops
Salt	½ tbsp

Table no. 03 Different formulations (Including control) of isabgol dietic cookies

Formulations	Flour%	Isabgol%
T0	100%	-
T1	80%	20%

T0 – control

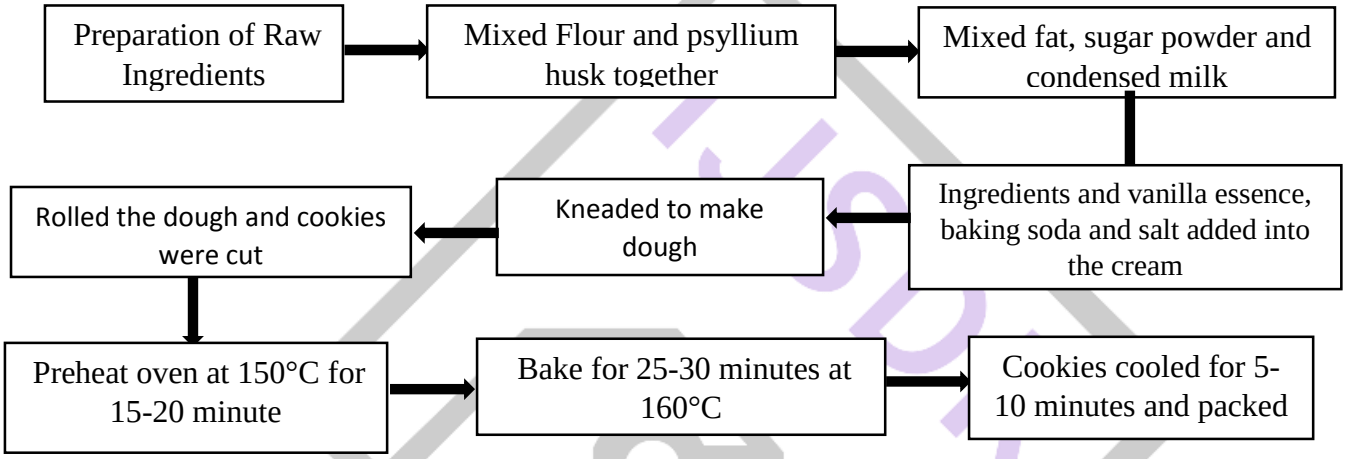

Fig. 01 (Preparation of cookies)

Result and discussion -

Proximate composition

Moisture: Moisture levels in different treatments ranged from 4.2 percent to 4.45 percent, indicating that adding psyllium husk to cookies resulted in a gradual increase in moisture levels. The increased moisture percentage in cookies was due to an increase in Isabgol level, which has a tendency to absorb water due to its hydrophilic nature, which increased the moisture percentage in cookies throughout the production process. The current findings corroborate those of Uysal et al. (2007), who found that adding fibre to oven-baked cookies had a substantial effect on moisture. They came to the conclusion that fibre improves the water retention ability of cookies when compared to wheat flour, resulting in a higher moisture content.

Table 4. Effect of treatments on proximate composition (%) of dietetic cookies

Treatments	Moisture	Ash	Crude Fat	Crude Protein	Crude Fibre
T0	**5.2%**	**4.78%**	**14.25%**	**6.45%**	**1.45%**
T1	**7.9%**	**5.34%**	**13,67%**	**5.25%**	**3.25%**

Ash: As shown in (Table 4), total ash increased steadily in the treatments from control (T0) to cookies containing 25% psyllium husk (T2). The mean ash percentage in T0 was 4.78 percent, compared to 5.34 percent in T2, demonstrating an increase in ash percentage with increasing psyllium husk content. Increased psyllium husk level gives appropriate amount of ash to the recipe as a compositional ingredient, resulting in a significant rise in ash in various treatments (Table 3). Pasha et al. (2011) also found an elevated mineral profile in baked goods, which they attributed to the composite flour's high ash level.

Crude fat: The fat percentage of cookies decreased marginally after treatment. In control, the maximum mean value was 14.25 percent, which dropped to 13.67 percent in T2 (Table 4). Increased fibre and moisture content in the treatments resulted in a modest decrease in fat percentage. As a result of the addition of wheat fibre, Uysal et al. (2007) reported a drop in the fat content of cookies.

Crude protein: The addition of psyllium husk to various cookie treatments resulted in a decrease in protein content (Table 4). T0 (control) had the highest mean value of 6.45 percent, which dropped to 5.25 percent in T2 (cookies containing 25 percent psyllium

husk). The main source of protein in cookies is white flour, and replacing it with psyllium husk resulted in a lower protein level. Another cause for the decrease in protein concentration could be due to the increased moisture level of the cookies, which altered the finished product's overall chemistry. Possible complex formation between the husk and the protein moiety could also be a cause in lower protein estimate, as shown by Bilgicli et al. (2007), who showed lower protein digestibility due to fibre concentration.

Crude Fiber: (Table 4) shows the crude fibre mean values for various treatments. T0 had the lowest crude fibre content of 1.45 percent, but when psyllium husk was added, it jumped to 3.25 percent in T4 (cookies containing 25 percent psyllium husk). Data revealed a rising trend in crude fibre in cookies, probably due to the use of psyllium husk as dietary fibre, which contributes to its inclination. Pasha et al. (2011) discovered that adding fiber-enriched mungbean flour to bread items boosted crude fibre content.

Conclusion -

Biscuits supplemented with Isabgol can be regarded an alternate method of incorporating this health-promoting fibre into human nutrition. Following a review and summary of the above-mentioned research papers, it can be stated that Isabgol has dual pharmaceutical potential. Its usage as a natural medication was restricted at first, but because of its high fibre content, it was used in nutraceuticals food products such as dietic cookies to improve and boost the digestive process as well as bowel function. The addition of Isabgol resulted in softer cookies with lower gross energy. As the amount of husk in the formulation was raised, the dietary fibre content of isabgol-based cookies gradually increased. The cookies that result may have the ability to manage the cookies that result could help human participants manage their digestion and intestinal function.

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