# *FORMULATION AND UTILIZATION OF ISABGOL DIETETIC COOKIES FOR BOOSTING THE DIGESTIVE PROCESS*

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## ABSTRACT

**Aim:** The present research was carried out to characterize and utilize Isabgol for preparation of dietetic cookies. The production of cookies enriched with Isabgol can be considered as an alternative way to include this health promoter fiber in human nutrition.
**Place and Duration of Study:** Isabgol (Psyllium husk) was procured from the local market were collected from the local area of Bareilly region, India. The plant material was identified and authenticated by the Department of Pharmacognosy of Ram Murti Smarak College of Engineering & Technology (Pharmacy), Bareilly, India.
**Methodology:** Six different formulations of cookies were prepared using varying concentrations of Isabgol. All the preparations were according to the guidelines of AACC (2000). Physical and chemical traits diameter, thickness, moisture content, crude protein, of prepared cookies were evaluated.
**Result:** Straight grade flour was replaced with Isabgol in different combinations such as 5, 10, 15, 20 and 25%. Regarding the characterization of Isabgol, mean values obtained for moisture, crude protein, crude fat, the crude fiber in husk were 6.43±0.05, 2.08±0.06, 0.09±0.01, and respectively. Moreover, total dietary fiber was found to be 76.63±1.32. Physical characteristics of dietetic cookies i.e. diameter and spread ratio were diminished with the addition of Isabgol while thickness was increased. Results regarding the storage of the cookies showed an increase in diameter and spread ratio whilst thickness depicted a decreasing trend. The chemical assay revealed higher crude protein content in control cookies.
**Conclusion:** Softer cookies with low gross energy were obtained with the addition of Isabgol. Isabgol based cookies showed gradual enhancement in dietary fiber content as the amount of husk was increased in the formulation. The resultant cookies may have the potential to manage the digestion and bowel function in human subjects.

**Keywords**: Isabgol, dietary fiber, dietetic cookies, physicochemical properties.

## 1. INTRODUCTION

Cookies are widely consumed as snacks throughout the world. In fact, they represent the largest category of past time foods in most parts of the world. The consumption of cereal containing snacks like cookies requires the development of an adequate substitute for wheat. The substitute should be like that is readily present, cost-effective and can replace wheat flour in terms of functionality [1].

Isabgol husk is botanically obtained from dried ripe seeds of *Plantago* ovata *Forkal*, family *Plantaginaceae*. It consists of the seeds of *Plantago psyllium* and *Plantago arenaria*. Ispaghula and Psyllium are invariably named as psyllium. The US National Formulary Ispaghula (also called as Isabgol) husk regulates the bowel function and is most widely used as over the counter drugs to treat constipation [2].

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
- Superdisintegrant
- Microparticles

Psyllium mucilage has a long history as a nutritional supplement due to its considerable amount of soluble and insoluble fiber being reported as a medicinally active gel forming natural polysaccharide, successfully used for the treatment of high cholesterol, diabetes, obesity in children, remediation of constipation, diarrhoea, inflammation bowel diseases and ulcerative colitis [3].

Different studies have shown that Isabgol has the paradoxical properties of both improving constipation by increasing the stool weight and ameliorating chronic diarrhea [4].

The seed and husk both of Isabgol are widely used in the pharmaceutical industry as a demulcent, emollient, laxative, as an adjunct to dietary and drug therapy on lipid and glucose levels and in some above-mentioned diseases. The seed and husk of Isabgol contain mucilage which is present in the epidermis of the seed. It is official in IP (Indian Pharmacopoeia), BP (British Pharmacopoeia), and USP (United State Pharmacopoeia). [5].

It contains 6.83% moisture, 0.94% protein, 4.07% ash and 84.98% of total carbohydrates (Guo et al., 2008; Yu et al., 2009). Osborne fractionation (based on solubility) yielded albumin 35.8%, globulin 23.9%, and prolamin 11.7%. The oil from plantago seeds had a high percentage of linoleic acid (40.6%) and oleic acid (39.1%) and a minor proportion of linolenic acid (6.9%) [6].

The present research was carried out to characterize and utilize Isabgol for formulation and evaluation of Dietic cookies.

## 2. MATERIAL METHOD

### 2.1 Materials and Methods

#### 2.1.1 Procurement of raw materials

Dried Isabgol (Psyllium husk) was purchased from local market Bareilly. All ingredients like sweeteners, straight grade flour, and cow Ghee were procured from the local market. Non-

nutritive sweeteners such as aspartame and sorbitol were used for the preparation of cookies [13].

### 2.1.2 Product development

The rationale was to obtain an acceptable quality product for that preliminary trials were carried out for the development of dietetic cookies consisting of Isabgol. After deciding the ingredients, different formulations of cookies were made and evaluated for various quality traits.

### 2.1.3 Preparation of dietetic cookies

Six different formulations of cookies were prepared using varying concentrations of Isabgol husk (Raymundo et al. 2014) (Table 2). Control cookies were prepared by selected ingredients: 500g commercial straight grade flour, 250mL sorbitol, 2g dried sugar powder, 0.84g aspartame, and 220g cow ghee and 7g baking powder. All the preparations were as per the guidelines of AACC (2000).

**Fig.1. Formulated Isabgol Dietetic Cookies**

**Table-1: Ingredients for Preparation of Standard Cookies**

| S.No. | Ingredients | Quantity |
|---|---|---|
| 1. | Isabgol | 5% |
| 2. | Straight grade flour | 500g |
| 3. | Aspartame | 0.84g |
| 4. | Sugar Powder | 2g |
| 5. | Cow Ghee | 220g |
| 6. | Baking powder | 7g |

**Table-2: Different formulations**

**(Including control) of Isabgol Dietic cookies**

| Formulation | Flour% | Isabgol % |
|---|---|---|
| F1 | 100 | - |
| F2 | 95 | 5 |
| F3 | 90 | 10 |
| F4 | 85 | 15 |
| F5 | 80 | 20 |
| F6 | 75 | 25 |

## 2.2 PHYSICAL ANALYSES OF COOKIES

### 2.2.1 Diameter & Thickness

Cookies were analyzed for physical traits like diameter (mm), thickness (mm) and spread factor as per the methods are given in AACC (2000). Diameter (D) of six cookies was measured. The method followed for measurements included that the cookies were kept horizontally to take a reading (Ayo et al, 2007). For duplicate reading cookies were rotated at an angle of 90° and repeated the procedure for average calculation.

Likewise, thickness (T) was calculated by measuring the height of six cookies with ruler kept on top of one another (Mcwatters et al, 2003). The procedure was repeated twice and the average value was presented in (mm). Spread factor (SF) was calculated by incorporating the values of D and T in subsequent formula (Giami et al, 2005).

$$SF = (D/T \times CF) \times 10$$

CF = Correction factor

### 2.2.2 Texture analysis

Cookies were also analyzed for its texture through texture analyzer (Model EZ Tester, Texture Shimadzu Texture Analyzer) in a compression mode with a sharp blade-cutting probe. For measurement, three cookies were selected randomly and placed to the base of analyzer and texture and resistance of cookies to fracture was observed accordingly.

## 2.3 CHEMICAL CHARACTERISTICS

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

**2.3.1 Moisture content**: By using air forced draft oven **(**Model: Universal Moisture Testing Machine, India**)** moisture content of Isabgol husk was evaluated. For measurement, cookies samples were weighed accurately in a moisture dish and were kept in a hot air oven for 2 hours at 105°C and then it was cooled in desiccators and weighed. Process of heating was repeated for 30 min. and again cooled and weighed (AACC, 2000; Method No. 44-15A). This procedure was done until the difference between two successive weighings became less than 0.001 gm.

**2.3.2 Crude protein**: Nitrogen percentage was quantified through Kjeltech Apparatus (Model: KT 200 Kjeltech Apparatus) for the determination of crude protein. Content of crude protein was calculated by multiplying percent nitrogen with conversion factor (AACC 2000; Method No. 46-10).

**2.3.3 Crude Fat:** Oven-dried crude fat sample was quantified by Soxtech System (Model: ST 243 Soxtech Apparatus). For the crude fat determination 5g of weighed crude drug sample was extracted with petroleum ether. After extraction, the residue was dried till constant weight was achieved. (AACC, 2000; Method No.30-10).

**2.3.4 Crude fiber:** Crude fiber of husk sample was estimated through Labconco Fibertech (Labconco Corporation Kansas, USA) for this fat-free 2g sample was digested firstly with 1.25% $H_2SO_4$ and finally with 1.25% NaOH.

## 3. RESULT

The second phase of the study was based on product development and quality check in which dietetic cookies were prepared with varying levels of Isabgol husk and tested for different parameters followed by two months storage condition.

### 3.1 Product development

The control and cookies contain Isabgol were analyzed for physical and chemical traits on a fortnightly basis during two months storage. Similarly, gross energy and texture were also estimated during the entire span on respective intervals.

### 3.2 Physical characteristics of dietetic cookies

It is important for the manufacturer as well as for consumers that product should be of acceptable quality in the first look. The control and Isabgol supplemented cookies were evaluated for physical characteristics like diameter and thickness.

**3.3 Diameter**: Means for the effect of formulations on the diameter of the cookies presented a decreasing trend presented in Table 3. The maximum diameter 44.92±0.08mm and minimum value 40.85±0.08mm was observed and recorded in F1 (Control) and F5 (containing 25% Isabgol) respectively. During two months of storage, means for diameter ranged from 40.92±0.06 to 41.10±0.4 mm while maximum value appraised at 60 days showing an increasing trend in diameter as a function of storage (Table 4).

This remarkable effect in formulations on the diameter of cookies may be due to the addition of fiber that alters dough rheology and allied characteristics in a baked product as well fiber addition leading to the deterioration due to the potential of fiber to absorb moisture from the surroundings.

**3.4 Thickness:** Increment in thickness in formulations had been observed with increasing level of Isabgol as 10.23±0.06 mm in control cookies whereas maximum value 11.01±0.08 mm in F5 shown in Table 3.

Results for the storage period displayed in Table-4 showed a reduction in thickness as determined means 10.83±0.02mm at zero to 10.01±0.02 mm at 60 days. On further present studies, replacement of sugar with other sweeteners no reduction in thickness was observed. In a similar way, variation in thickness within formulations may be due to the flour that was replaced with Isabgol decreased starch and protein contents resulting into gradual condensation of dough as a resulting increment in thickness was observed.

**Table-3: Formulation effects on Physical characteristics of Isabgol dietic cookies**

| Formulations | Diameter (mm) | Thickness (mm) | Spread factor |
|---|---|---|---|
| F1(Control) | 44.92±0.08 | 10.23±0.06 | 4.39±0.11 |
| F2 (5%) | 42.62±0.07 | 10.38±0.07 | 4.10±0.07 |
| F3 (10%) | 41.84±0.07 | 10.64±0.07 | 3.93±0.07 |
| F4 (15%) | 41.22±0.07 | 10.82±0.06 | 3.80±0.10 |
| F5 (20%) | 40.94±0.08 | 10.93±0.08 | 3.74±0.08 |
| F6 (25%) | 40.85±0.08 | 11.01±0.08 | 3.71±0.08 |

**Table-4: Storage condition effects on Physical characteristics of Isabgol dietic cookies**

| Storage Conditions (Days) | Diameter (mm) | Thickness (mm) |
|---|---|---|
| 0 | 41.95±0.06 | 10.83±0.02 |
| 15 | 41.99±0.05 | 10.81±0.02 |
| 30 | 42.07±0.06 | 10.23±0.02 |
| 45 | 42.13±0.06 | 10.09±0.02 |
| 60 | 42.20±0.06 | 10.01±0.02 |

## 3.5 CHEMICAL CHARACTERISTICS

**3.5.1 Moisture**: Means for moisture in different formulations from 3.07±0.07 to 3.35±0.07% showing a progressive increase in moisture level with the addition of Isabgol in cookies. The data explicated that in fresh cookies moisture content was 3.03±0.07% that increased to 3.34±0.01% at 60 days indicating uplift in this trait with the passage of time. Increase in the moisture of cookies was due to increased Isabgol level that has a tendency to absorb water because of the hydrophilic nature of Isabgol that increased moisture percentage in cookies during the manufacturing process. For prevention from moisture absorption, cookies were then packed in bioriented polyvinylchloride (PVC) wraps.

**3.5.2 Crude protein:** Decreasing pattern in protein content was observed by the addition of Isabgol among different formulations of cookies. Highest mean value 8.04±0.07 was reported in control that reduced to 6.27±0.06 in cookies containing 25% Isabgol after two months of storage. The reason for this was the Wheat flour included as the main source of protein and the replacement

of flour with Isabgol resulted from a decrease in protein content. Another reason for the reduction in protein content may be owing to an increased moisture content of the cookies that changed the overall chemistry of the end product. Possible complex formation between husk and protein moiety may also be a factor for reduced estimation of protein.

**3.5.3 Crude fat**: Formulations showed a slightly decreasing pattern on the fat percentage of cookies. The maximum mean value was recorded as 17.62±0.14% in control that reduced up to 17.02±0.12%. Similarly, diminishing pattern in fat level was observed during two months storage. The mean for crude fat at zero days were 17.82±0.01% that gradually decreased to 16.21±0.02% at 60 days. Formulations exerted a slight reduction in fat percentage might be due to increased fiber and moisture contents.

**3.5.4 Crude fiber**: Minimum crude fiber was observed as 0.38±0.01 (F1, Control) by adding of Isabgol it increased to 1.03±0.01% in cookies F6. Storage exhibited a non-momentous effect on this attribute regarding crude fiber in cookies.

## 4. Discussion

The present investigation was undertaken to evaluate the quality as well as the acceptability of dietic cookies prepared by incorporation of Isabgol. The physical and chemical analysis of Isabgol cookies had been carried out. The physical analysis results showed the decreasing trend in diameter with increment in Isabgol content in cookies i.e. 44.92±0.08mm to 40.85±0.08mm. Similarly, increment in thickness in formulations has also observed with increasing level of Isabgol as 10.23±0.06 mm in control cookies whereas maximum value 11.01±0.08 mm in whereas storage conditions showed a reduction in thickness as 10.83±0.02mm at zero to 10.01±0.02 mm at 60 days. In chemical analysis, formulated cookies were evaluated for moisture content, crude fiber, crude fat, and crude protein. In line with the results obtained, the moisture content was found to be increased with the increment in the Isabgol content as 3.03±0.07% to 3.34±0.01% after 60 days of storage. For protein estimation opposite pattern was found by the addition of Isabgol among different formulations of cookies. Highest mean value 8.04±0.07 was reported in control that reduced to 6.27±0.06 in cookies containing 25% Isabgol after two months of storage. Similarly, crude fat content was also found to be decreased on increasing Isabgol percentage in cookies i.e. 17.62±0.14% in control to 17.02±0.12% in F6. Whereas minimum crude fiber was observed as 0.38±0.01 (F1, Control) by adding of Isabgol and it increased to 1.03±0.01% in cookies F6. Storage exhibited a non-momentous effect on this attribute regarding crude fiber in cookies. Unsurprisingly, various levels of incorporated Isabgol have different effects on the quality of Cookies. Softer cookies with low gross energy were obtained with the addition of Isabgol. Isabgol cookies showed gradual enhancement in dietary fiber content as the amount of husk was increased in the recipe.

## 5. Conclusion

The production of biscuits enriched with Isabgol can be considered as an alternative way to include this health promoter fiber in human nutrition. Dietary fibers from Isabgol have been used extensively both as pharmacological supplements and food ingredients and in processed food. After reviewing and summarizing the above-reported research studies, it can be concluded that the Isabgol possesses the dual potential in pharmaceuticals. Initially, its use was limited as a natural drug but due to its high fiber content, it was utilized as neutraceuticals food products as in

dietic cookies for improving and boosting digestive process as well as improving bowel function. Softer cookies with low gross energy were obtained with the addition of Isabgol. Isabgol based cookies showed gradual enhancement in dietary fiber content as the amount of husk was increased in the formulation. The resultant cookies may have the potential to manage the digestion and bowel function in human subjects.

**Conflict of Interest**

The authors of this manuscript declare that they have no conflict of interest.

**References**


1. Herminia SS, Angélica TLI, Favian BM, Bernarda RC. Nutritional Value and Sensory Properties of Cookies Prepared from Flour Mixes of Carrot (Daucus Carota), Lupine (Lupinus Perennis) and Barley (Hordeum Vulgare). Euro Sci J., 2017: 13(9):378.
2. Ravi Kumar MNV and Kumar N, Polymeric controlled drug delivery systems: Perspective issues and opportunities. Drug Dev. Ind. Pharm., 2001; 27:1–30.
3. Singh B, Psyllium as therapeutic and drug delivery agent, Int J Pharm., 2007; 334 (1):1-14.
4. Kumar A, Kumar N, Vij JC, Sarin SK, Anand BS. The optimum dosage of Ispaghula husk in patients with irritable bowel syndrome: correlation of symptom relief with whole gut transit time and stool weight. Gut 1987; 28: 150–55.
5. Ziai SA, Larijani B, Akhoondzadeh S, Fakhrzadeh H, Dastpak A, Bandarian F., Psyllium decreased serum glucose and glycosylated hemoglobin significantly in diabetic outpatients. J. Ethnopharmacol. 2005; 102(2):202–07.
6. Guo Q, Cui SW, Wang Q, and Young JC, Fractionation and physicochemical characterization of psyllium gum. Carbohyd. Polym, 2008; 73: 35-43.
7. L. Yu and J. Perret. Effects of solid-state enzyme treatments on the water-absorbing and gelling properties of psyllium, LWT-Food Science and Technology. 2003; 36(2): 203–208.
8. Wang Q and Cui SW. Understanding the Physical Properties of Food Polysaccharides, Taylor & Francis, Boca Raton, Fla, USA, 2005.
9. Peter Ikechukwu A, Okafor DC, Kabuo NO, Ibeabuchi JC, Odimegwu EN, Alagbaoso, SO, Njideka NE and Mbah, R. N., Production and Evaluation of Cookies from whole wheat and date palm fruit pulp as a Sugar substitute. International Journal of Advancement in Engineering Technology, Management and Applied Sciences, 2017; 4(4):1-31.
10. Ajibola FC, Oyerinde OV, and Adeniyan SO. Physicochemical and antioxidant properties of whole wheat biscuits incorporated with Moringa oleifera leaves and cocoa powder. Journal of scientific research and report, 2015; 7(3):195-206.
11. Fradinho P, Nunes MC, Raymundo A. Developing consumer acceptable biscuits enriched with Psyllium fiber, J Food Sci Technol, 2015;52(8):4830–4840.
12. Qaisrani TB, Butt MS, Qaisrani KM, Hypocholesterolemic perspectives of the psyllium husk based dietetic cookies, International Journal of Agriculture and Environmental Research, 2016;2(6):1721-1736.
13. Qaisrani TB, Butt MS, Hussain S, Ibrahim M. Characterization and utilization of psyllium husk for the preparation of dietetic cookies. Int. J. Mod. Agric. 2014;3(3):81-91.