Original Research Article

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

ABSTRACT

Background: Functional foods are emerging implementations as preventive and curative appliances against health infirmity. The production of cookies enriched with Isabgol can be considered as an alternative way to include this health promoter fiber in human nutrition.
Aim and Objectives: The present research was carried out to characterize and utilize Isabgol for preparation of dietetic cookies.
Result: Straight grade flour was replaced with Isabgol in different combinations such as 5, 10, 15, 20 and 25%. Regarding characterization of Isabgol, mean values obtained for moisture, ash, crude protein, crude fat, crude fiber and nitrogen free extract (NFE) in husk were 6.43±0.05, 3.85±0.04, 2.08±0.06, 0.09±0.01, and 3.83±0.02 and 83.72±0.08%, 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 increase in diameter and spread ratio whilst thickness depicted a decreasing trend. 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 potential to manage the digestion and bowel function in human subjects.

Keywords: Isabgol, dietary fiber, dietetic cookies, physico-chemical properties.

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].
Ispaghula 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 Ispaghula) husk regulates the bowel function and are most widely used as over the counter drugs to treat constipation [2].
Some of the available appreciated works that has reviewed and briefly described under the use of Isabgol as

- Hydrogels
- Sustained release agent/Release retardant
- Gastroretentive agent

- Superdisintegrant
- Microparticals

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 shown that Psyllium has the paradoxical properties of both improving the constipation by increasing the stool weight 13 and ameliorating chronic diarrhea [4].

The seed and husk both of Isabgol are widely used in pharmaceutical industry as 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 contains mucilage which is present in the epidermis of the seed. It is official in IP, BP, and USP [5].

It contains 6.83%, 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].

Comment [XR1]: This value it doesn´t say of what?

MATERIAL METHOD

Material

Materials and Methods

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.

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 with Isabgol. After deciding the ingredients, different formulations of cookies were made and evaluated for various quality traits.

Preparation of dietetic cookies

Six different formulations of cookies were prepared using varying concentrations of Isabgol husk (Table 2). Ingredients chosen for control cookies were: 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 according to the guidelines of AACC (2000).


Fig.1. Formulation Isabgol Dietetic Cookies

Table-1: Ingredients for Preparation of Standard Cookies

S.No.	Ingredients	Quantity
1.	Psyllium husk	5%
2.	Straight grade flour	500g
3.	Sorbitol	0.84g
4.	Sugar Powder	2g
4.	Cow Ghee	220g
5.	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

PHYSICAL ANALYSES OF COOKIES

Diameter & Thickness

Cookies were analyzed for physical traits like diameter (mm), thickness (mm) and spread factor as per the methods given in AACC (2000). Diameter (D) of six cookies was measured. Method followed for measurements included that he cookies were kept horizontally to take reading. 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. The procedure was repeated twice and average value was presented in (mm). Spread factor (SF) was calculated by incorporating the values of D and T in subsequent formula;

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

CF = Correction factor

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. The resistance of the cookies to fracture was measured. For this three cookies were selected randomly and placed to the base of analyzer and texture was observed accordingly.

CHEMICAL CHARACTERISTICS

Parameters such as moisture content , crude fat, crude fiber, crude protein, total ash and nitrogen free extract (NFE) was determined for evaluating the chemical composition of Psyllium husk.

Moisture content: By using air forced draft oven **(**Model: Universal Moisture Testing Machine, India**)** moisture content of Isabgol husk was evaluated. The sample was dried at 105±5℃ to constant weight and calculations were made (AACC, 2000; Method No. 44-15A).

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

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

Crude fiber: After fat estimation, husk sample was examined for crude fiber through Labconco Fibertech (Labconco Corporation Kansas, USA). Fat free 2g sample was digested firstly with 1.25% H_2SO_4 and finally with 1.25% NaOH.

RESULT

Second phase of 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.

Product development

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

Physical characteristics of dietetic cookies

It is the 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.

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

The significant effect of formulations on diameter of cookies may be due to addition of fiber that alters dough rheology and allied characteristics in baked products. During storage, fiber addition may also be a factor for deterioration having potential to absorb moisture from the surroundings.

Thickness: Thickness increased gradually due to formulation with increasing level of Isabgol as indicated in Table 3. Means for thickness were estimated as 10.23±0.06mm in control cookies whereas maximum value 11.01±0.08mm in F5.

Results for storage period explicated in Table-4 showed reduction in thickness as means determined at zero days was 10.83±0.02 that decreased to 10.01±0.02mm at 60 days. Regarding present study, in different formulations of cookies sugar was replaced with other sweeteners, hence no reduction in thickness was observed.

Another possible justification for variation in thickness within formulations is that flour was replaced with Isabgol thereby decreased starch and protein contents resulting gradual condensation of dough that consequently increased thickness.

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

Formulations	Diameter (mm)	Thickness (mm)
F1(Control)	44.92±0.08	10.23±0.06
F2 (5%)	42.62±0.07	10.38±0.07
F3 (10%)	41.84±0.07	10.64±0.07
F4 (15%)	41.22±0.07	10.82±0.06
F5 (20%)	40.94±0.08	10.93±0.08
F6 (25%)	40.85±0.08	11.01±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

CHEMICAL CHARACTERISTICS

Moisture: Means for moisture in different formulations from 3.07±0.07 to 3.35±0.07% showing 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 moisture of cookies was due to increased Isabgol level that has tendency to absorb water because of hydrophilic nature. Moreover, cookies were packed in bioriented polyvinylchloride (PVC) wraps and water absorption from the surrounding may also be a factor for increased moisture level during.

Crude protein: Decrease 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 declined to 6.27±0.06% in cookies containing 25% Isabgol. Similarly, decreasing trend in protein was observed during storage varying from 7.27±0.04% in fresh cookies to 7.01±0.03% after two months.
Wheat flour was the main source of protein in cookies and replacement of flour with Isabgol resulted decrease in protein content. Another reason for reduction in protein content may be owing to increased moisture content of the cookies that changed the overall chemistry of end product. Possible complex formation between husk and protein moiety may also be a factor for reduced estimation of protein.

Crude fat: Formulations showed slightly decreasing trend on fat percentage of cookies. The maximum mean value was recorded as 17.62±0.14% in control that declined up to 17.02±0.12%. Similar, diminishing trend 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 slight decline in fat percentage might be due to increased fiber and moisture contents.

Crude fiber: Minimum crude fiber was observed as 0.38±0.01 (F1, Control) nevertheless by adding up of Isabgol it increased to 1.03±0.01% in cookies containing 25% Isabgol. Storage exhibited non-momentous effect on this attribute regarding crude fiber in cookies; data exposed

an increasing trend possibly due to adding up of Isabgol as dietary fiber contributes in its inclination.

Discussion

In the production of Isabgol cookies for boosting digestive process, Isabgol husk, which contains a high level of dietary fiber, was found to be a valuable additive. Unsurprisingly, various levels of incorporated Isabgol have different effects on the quality of Cookies. In line with the results obtained, the highest overall acceptability in terms of crude fiber evaluation was achieved by the samples which contained 25% of Isabgol husk. 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.

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 bowl function. In this article, prepared dietic cookies were evaluated for its physical and chemical characteristics and different formulations including control was compared for different attributes. The changes which obtained were accepted for preparation of Isabgol dietic cookies for boosting bowling process.

Conflict of Interest

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

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