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Development of Cookies using Fenugreek Leaves (*Trigonella foenum-graecum*) as a Functional Ingredient

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Abstract:- Fenugreek leaf extract and fenugreek leaf powder (FLP) were used as a value-added food component in cookies made with fine wheat flour. The purpose of this study was to assess the nutritional and sensory properties of cookies containing fenugreek leaves powder. Fenugreek leaves powder was incorporated into the cookies at varied concentrations. The length of time cookies was baked has a direct impact on their taste and texture. Cookies were tested via sensory evaluation, using the 9-point hedonic scale (1-extreme dislike, 9-extreme like), by a semi-trained panel of 4 judges evaluating for color, flavor appearance, taste, texture, and overall acceptability as per the standards. The cookies incorporated with a lower concentration of fenugreek leaves powder had shown much better organoleptic features, according to the Study. The impact of baking temperature on the various response variables varied, but in the end, 180°C was acceptable. Cookies incorporated with 0.34 % powdered fenugreek leaves, 34 % flour, 20.40 % sugar, and 4.7 % baking soda and baked at 180° C had the best acceptable sensory qualities, according to the study.

Keywords:- *cookies, fenugreek, baking temperature, sensory evaluation.*

I. INTRODUCTION

Fenugreek (Trigonella foenum-graecum) Fenugreek (Fenugreek- graecum), also known as "methi" is an annual hub of the leguminous family that is primarily planted in Western Asia and Southeast Asia. (Naidu MM et all; 2011) India is the world's greatest fenugreek grower, yet it does not have a significant proportion of the worldwide fenugreek trade due to high internal consumption. (Basu,2006; Basu et al,2014; Basu and Agoramoorthy;2014) or millennia, the herb has been employed in Indian ayurvedic treatment, as well as Tibetan and Chinese traditional medicines. (Acharya S et all; 2006) The Fenugreek plant has huge international demand in the associated pharmaceutical, nutraceutical, and functional food industries. Fenugreek's harsh taste and strong aroma make it a popular ingredient in the food industry. (Mehrafarin A et al; 2010) However, adding Fenugreek leaves powder to wheat flour boosted the amount of lysine, mineral, protein, and dietary fiber in the flour to the point of substitution! Also, baked biscuits, bread, and macron made from wheat-fenugreek mixes at 10%, 15%, and 20% levels were shown to be organoleptically acceptable! Fenugreek has been utilized in bakery goods like biscuits and extruded products in the past. (Hooda and S. Jood, 2005; Shrirani and Ganesharanee, 2009)

Cookies were chosen as a better carrier of Fenugreek because of their comparatively pleasant taste, widespread consumption, long shelf life, and acceptable eating quality when compared to other similar items. (Tsen CC et al; 1973) Cookies could be a handy way to convey the health-promoting chemicals found in Fenugreek to customers. The purpose of this study is to investigate the use of Fenugreek leaves in the construction of cookies with a variety of health advantages, as well as the effects of Fenugreek on cookies in terms of physical and sensory properties. When compared to other similar things, cookies were chosen as a better carrier of Fenugreek because of their fairly pleasant taste, widespread consumption, long shelf life, and the acceptable eating quality. (Merriam-Webster's Collegiate Dictionary, 1999)

The majority of cookies are cooked until crisp or just long enough to retain their softness, while others are not baked at all. Sugars, chocolate, butter, resin, almonds, and dried fruits are among the ingredients used to make cookies in a variety of styles. The softness of the cookie may be affected by the amount of time it is baked. Cookies can provide a convenient vehicle for the delivery of health-promoting compounds possessed in fenugreek to consumers. The aim of the present research work involves the use of fenugreek leaves for the development of cookies with several health benefits and the study of the effects of fenugreek on cookies in terms of physical and sensory characteristics. (Arafat Hossain *et al*, 2021)

II. MATERIALS AND METHODOLOGY

A. Collection of raw materials

The fenugreek leaves were inspected and cleaned manually to remove any foreign materials dirt, stones, grits weeds, etc. dried in sunlight for about three to four days, then stored in an airtight container. All-purpose flour, sugar, butter, milk, and chocolates were purchased from a local market. Flour was sieved to get rid of bran and other matter. Sugar was powdered. flour and sugar both were sieved.

B. Cookies ingredients

Flour (34.00 %), sugar (powdered) 20.40%, butter 14.06%, baking soda 4.7%, fenugreek leaves (powered) 0.34%, chocolates 15.30%, flavor 0.95% (3 to 4 drops), sodium chloride 0.05% and sufficient milk to make required consistency of cookies dough (Table 1 and 2)

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C. Standardization of different combinations

To make fenugreek Chocolate cookies, several amounts of ingredients were explored. Standardization was done at two concentrations which are shown below in table 2. fenugreek leaves powder; 0.68% and 0.34%, sugar; 23.80% and 20.40%, and baking soda; 3.00% and 4.7%, These concentrations were chosen to test the cookie's taste, aroma, softness, and texture at different temperature and time.

D. Preparation of cookies

Fine ground sugar, sieved, was creamed with butter and rubbed in flour before being combined with powdered fenugreek leaves, baking soda, and sieved and blended with the aforesaid combination. After that, milk was added to make the dough of the desired consistency for cookie preparation. Refrigerate the dough for 10 to 15 minutes. The dough was thinly rolled to a consistent thickness (3.5 mm) on a sheeting board and cut to a diameter of 50mm with a round cutter. In a microwave set at 180 degrees Celsius, bake the dough pieces in a greased dish for 8 to 10 minutes. The cookies were made and then allowed to cool for 30 minutes before being stored in airtight containers.

E. Sensory evaluation of the cookies

Using the 10-point hedonic scale, multiple comparison tests were used and the panellists were asked to indicate their observations and rate the parameters of the sample; color (dark brown, golden brown, creamish white), appearance (shape, size, colour), flavour (foreign flavour, pleasant), mouth feel (branny, no residue in mouth), and initial bite indicated a significant difference with changes in supplementation level.

Sr. No.	Ingredients	Quantity (%)
1	All-purpose flour	34.00%
2	Sugar(powdered)	20.40%
3	Butter	14.06%
4	Milk	10.20%
5	Baking soda	4.7%
6	Fenugreek leaves (powdered)	0.34%
7	Chocolates	15.30%
8	Vanilla extract(flavour)	0.95% (4-5 drops)
9	Salt	0.05%
10	All-purpose flour	34.00%

Table 1: Various combinations for Fenugreek Leaf Powder (FLP) cookies preparation

Formulation	Ingredient	Concentration	Temp.	Time	Observations				
					Colour	Texture	Appearance	Softness	Taste
1	Fenugreek leaves powder Sugar Baking Soda Chocolate Flavour	0.68% 23.80% 3.00% - 2-3 Drops	160 Degree Celsius	12-15 Minutes	Browm to very dark brown	Withstands substantial force on the initial bite	Slightly uneven surface	Flaky, on chewing a rough paste is formed	Giving a bitter taste of fenugreek
2	Fenugreek leaves powder Sugar Chocolate Baking soda Flavour	0.34% 20.40% 15.30% 4.7% 4-5 Drops	180 Degree Celsius	8-10 Minutes	Give patches of light & dark brown	Crispy & crumbly	No breakages, regular shape, without damage	A crunchy sound is heard	Pleasant taste characteristics of cookies

Table 2: Different concentrations of ingredients used

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III. RESULTS AND DISCUSSIONS

A. Sensory Evaluation of FLP Cookies

The cookies containing fenugreek leaves yielded the following results when tested. fenugreek leaves powder was added to the cookies in varying concentrations, out of which cookies containing 0.68% (Formulation 1, F1) and 0.34% (Formulation 2, F2) FLP was found to be optimum. The control sample was made entirely of all-purpose flour. The hedonic values were placed incrementally (1 corresponds to the hedonic term "disliked," and 10 corresponds to the term "liked a lot"), and the mean scores for each formulation about each of the sensory analyses demonstrated satisfactory acceptance of cookies for most of the parameters studied, considering that most of the mean scores are abbreviated (indifferent). (Bertagnolli et al, 2014). The flavour parameters showed substantial differences: the sample concentration of 0.34% fenugreek leaves powder in 34.0% flour mix had the best overall sensory acceptance.

The approximate composition result of the enriched fenugreek leaves in the cookies analyzed in the study is shown in the Table 5. As per the evaluation of formulation 1(F1) and formulation 2 (F2), F2 cookie appearance is more acceptable. Because fewer fenugreek leaves powder (FLP) was used as compared to F1, the taste of F2 is also palatable, while the overall sensory quality of F1 is not perfect as per the standards. Flavour of F2 is better than F1. F2 performs better in organoleptic tests than F1. At the end of all evaluations, Formulation 2 (F2) is accepted for manufacturing with minor modification of flavour value.

Parameters	Flavour	Appearance	Aroma	Taste	Texture
Tester 1	7	8	8	7	7
Tester 2	7	9	8	6	7
Tester 3	6	7	8	5	8
Tester 4	7	7	8	7	8

Table 3: Sensory Evaluation of Formulation1 (F1, FLP 0.68%) Cookies

Parameters	Flavour	Appearance	Aroma	Taste	Texture
Tester 1	8	8	8	9	8
Tester 2	8	8	8	8	8
Tester 3	8	8	9	9	8
Tester 4	8	7	8	8	7

Table 4: Sensory Evaluation of Formulation2 (F2, FLP 0.34%) Cookies

Parameters	Flavour	Appearance	Aroma	Taste	Texture
F1	7	7	8	7	8
F2	8	8	8	9	8

Table 5: Sensory Evaluation of F1 and F2 Cookies organoleptic features

Before After

Fig. 1: Cookies baked at 160° C

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Before After

Fig. 2: Cookies baked at 180° C

IV. CONCLUSION

The global biscuit market has a low cost of variety, such as glucose biscuits, but there is a high demand for specialty cookies. It is possible to make nutritious rich cookies by adding Fenugreek leaves powder. The use of fenugreek leaves powder in the making of cookies was investigated to see if it improved the nutritious value of cookies. Fenugreek leaves have a low-calorie content but a high soluble fiber content. The Fenugreek plant is in high demand worldwide in the pharmaceutical, nutraceutical, and functional food industries. The addition of supplements such as protein and vitamins to foods is gaining popularity as customers become more conscious of their nutritional needs.

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