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Formulation And Evaluation of Herbal Chocolate Containing *Trigonella Foenum-Graceum* for Diabetic Patients

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Abstract

Chocolate is one of the most popular food types and flavours in the world whereas the medicine is hating substance. The objective of this study is to design and fabricate chocolate. It is also called as chocolate drug delivery. *Trigonella foenum-graecum* is an herbal drug which having several medicinal properties like Anti diabetic, anti-inflammatory effect, hypocholesterolmic, antioxidant activity, antioxidant activity, lactation aid, anticancer effect, immunomodulatory activity, advantages of fenugreek on digestion, antibacterial & antifungal effect, immunological activity. Thus, we must formulate the chocolate with powder of fenugreek seeds powder that gives the desired pharmacological effect. Further, prepared medicated chocolate is evaluated for general appearance, dimension, hardness, blooming test.

Keywords: Herbal Chocolate, Fenugreek seeds, Diabetes, Pharmacological activity, *Trigonella foenum-graecum*

INTRODUCTION

One of the finest delivery methods for patient compliance is oral. Chocolate is a highly developed and adaptable food that may be combined to produce totally distinct tastes and textures. The anhydrous nature of chocolate makes it resistant to the growth of microorganisms as well as the hydrolysis of active ingredients that are water-sensitive. In many ways, using chocolate as a delivery system for active compounds makes sense. Children and individuals of all ages find chocolate to be one of the tastiest, most acceptable, and favourite foods. For instance, chocolate's organoleptic properties are commendable for hiding disagreeable flavours connected to some active agents and providing compositions of active agents that would otherwise be unattractively grainy a smooth and creamy texture. A variety of confectionary items called chocolate are made from cocoa (cacao), fat (cocoa butter), and finely powdered sugar. A chocolate base is used to make medicated chocolate, and the medicine is added to the base after it has been made. It is referred to as a chocolate drug delivery system since the medicine is incorporated into the chocolate and released from the chocolate.[1-2]

Trigonella foenum graecum (fenugreek) belongs to the family *Fabaceae*. It is a medicinal herb used to treat various diseases, such as diabetes, inflammation, cancer, hypercholesteremia, reproductive dysfunction, and neurodegenerative disorders. For centuries, fenugreek seeds have been used as carminative, demulcent, expectorant, laxative, and stomachic agents. It originated in Eastern Europe but is now grown all over the world. It has a variety of phytochemicals, such as flavonoids, alkaloids, coumarins, vitamins, carbohydrates (Galactomannan), saponins, trigonelline, diosgenin, and soluble fibers, which are responsible for the pharmacological effects. Numerous clinical and pre-clinical studies have revealed its anti-diabetic, anti-sterility, and anti-fertility effects. The bioactive components of fenugreek, like galactomannan, saponins, trigonella, diosgenin, and 4-hydroxyisoleucine, have been reported to exert positive effects on diabetes. Several components have been isolated, and various studies have revealed their action on blood sugar. Fenugreek controls diabetes *via* multi-physiological pathways, such as restoring pancreatic β-cell function and inhibiting sucrase as well as alpha-amylase activities. 4-Hydroxyisoleucine directly induces insulin secretion from pancreatic β-cells.[3]

2. MATERIALS AND METHODS

2.1 Materials

Dried seeds of *trigonella foenum-graecum* were purchased from local market of Chandrapur. The collected seeds where grinded into coarse powder material & stored in sunlight container till future. Dark compound and saccharin are also purchased from local market of Chandrapur.

Table 1: List of ingredients

SN.	Ingredients	Use
1	Dark compound	Antidiabetic
2	Fenugreek Seed Powder	Antidiabetic
3	Saccharin	Sweeting Agent

2.2 Methods:

Method of preparation of chocolate by using Fenugreek seed powder

The temperature of the water in the bath was set to become heated, at around 50°C. After that, the chocolate base was melted in a porcelain dish until it was flowing freely. Add the necessary amount of saccharin to the melted chocolate base. Following the aforementioned process, the correct amount of fenugreek seeds, namely 1.35g, 1.5g, 1.65g, 1.8g, and 1.95g, were added and continuously mixed. The entire amount of chocolate base was then poured into a silicon chocolate mould and chilled for a period of time roughly 3-6 hours until it solidified.[12]

Table 2: Composition of Fenugreek seed chocolate

Content	F1	F2	F3	F4	F5
Fenugreek seed powder	1.35g	1.5g	1.65g	1.8g	1.95g
Dark compound	9g	10.5g	9g	9g	10.5g
Saccharin	6g	3g	6g	6g	9g

Figure 1: Mixing of Ingredients

3. EVALUATION OF HERBAL CHOCOLATE

3.1 Organoleptic properties

These are Sensory properties. Those that can be detected by the sense organs. For foods, it is used particularly of the combination of taste, texture, and astringency and aroma (perceived in the nose).

3.2 Dimensions

It was measured by Vernier's calipers

The dimensions are width, length, height.

3.3 Hardness Test

Hardness of chocolate was measured by Monsanto Hardness Tester.

3.4 Blooming Test

This is rough and irregular layer on top of chocolate formulation. This is caused by condensation (when chocolate is taken out of the refrigerator). This Moisture will dissolve the sugar in the chocolate. When the Water evaporates, sugar recrystallizes into rough, irregular Crystals on surface. This results into unpleasant look. Test sample of chocolate was subjected to treatment Cycles contains. 30 ℃ for 11 hours Shifting of temperature for 1 hour 18 ℃ for 11 hours Shifting of temperature for 1 hour Observed the test sample of chocolate whether blooming Has taken place.[12-13]

3.5 Test for Carbohydrate (Molisch's Test)

Take 2ml of Sample in dry test tube. Take 2ml of distilled water in another test tube as control. Add 2-3 drops of Molisch's reagent to the solution. Gently pipette 1ml conc. H_2SO_4 alongside of the test tube so that two distinct layers are formed. Observe colour change at the junction of two layers Appearance of purple colour indicates the presence of Carbohydrate.

3.6 Test for Protein (General Test)

Take the given sample to be tested in cleaned test tube. Add 2ml of sodium hydroxide solution to it. To that add 5 to 6 drops of copper sulphate solution to it. If there is appearance of bluish violet colour indicate the presence of protein.

4. RESULT AND DISCUSSION

4.1 Organoleptic Properties and Dimensions:

Table 3: Organoleptic Properties and Dimensions of Herbal chocolate

Sr. No.	Parameters	Observations
1	Colour	Dark Brown
2	Oduor	Chocolate with no brunt, no smoky smell
3	Taste	Sweet
4	Texture	Smooth and even
5	Width	0.8cm
6	Length	2.5cm
7	Height	1.2cm

4.2 Hardness Test:

Table 4: Hardness Parameter of Herbal chocolate

Sr No.	Sample	Results
1	Sample 1	0.6 kg/cm^2
2	Sample 2	2.1 kg/cm^2
3	Sample 3	1.8 kg/cm^2

4.3 Blooming Test:

Table 5: Blooming test parameter for Herbal chocolate

Sr. No.	Test	Observations
1	Fat Bloom	No blooming observed
2	Sugar Bloom	No blooming observed

Figure 2: Blooming Test Observation

4.4 Test for Carbohydrate (Molisch's Test):

Appearance of purple colour indicates the presence of Carbohydrate.

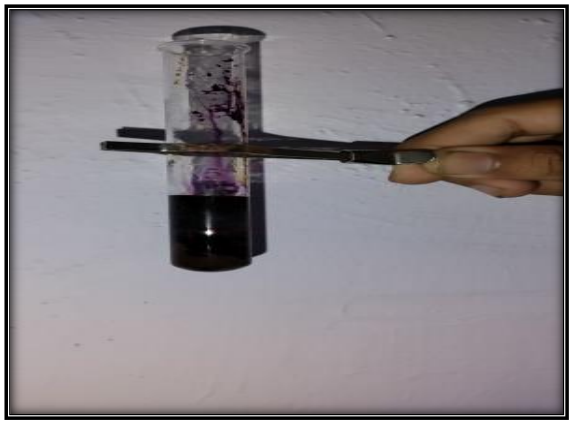

Figure 3: Carbohydrate Test

4.5 Test for Protein (General Test):

Appearance of bluish violet colour indicate the presence of protein.

Figure 4: Protein Estimation Test

5. CONCLUSION

The improvement of natural chocolate through the use of fenugreek powder was carried out in the current research work. Homegrown chocolates were prepared using fenugreek powder and evaluated for appearance, aspect, hardness, blossoming test, Molisch's test and the test for protein.

Given the aforementioned considerations, it was assumed that the chocolates provided a smooth and velvety surface to the detailing, were ideal for masking the unpleasant taste of the drugs, and were safe to take without risking any negative side effects.

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