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Formulation and Evaluation of Herbal Medicated Chocolate in Treatment of Intestinal Worms and Related Problems

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ABSTRACT:

Objective: The goal of this study is to develop and assess a polyherbal medicated chocolate for stomach deworming and other related issues that has higher bioavailability and compliance than standard treatment options. An effort was undertaken to create a chocolate with a chocolate base with the addition of herbal fruits and spices for an easier and faster commencement of the action.

Method: Polyherbal medicinal Chocolate formulations were developed utilizing a direct melting method over the water bath method with the addition of herbal components. Formulations were evaluated for Shape, size, taste, texture, dimensions, moisture content, bloom test, viscosity, weight variation, hardness, and stability.

Result: In terms of physical examination, weight variation, dimensions, texture, and hardness, every polyherbal formulation produced satisfactory results. Formulated chocolate passes the bloom test. And the formulated chocolate completes all the requirements of the oral drug delivery system with greater assessment for therapeutic effect.

Conclusion: Drug compliance, bioavailability and patient compliance are the major factors increased by inexpensive medicated Chocolate.

Keywords: Medicated chocolate, Deworming, Herbal, Modified dosage form, Stomach Problems, Herbal fruits and spices.

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INTRODUCTION:

One of the finest delivery methods for patient compliance is oral. It offers advantages of its own. However, it also has drawbacks of its own (1,2). As a result, there are circumstances where absorptive mucosa should be considered as the route of administration for medicines with first-pass metabolism. Tran's mucosal route as a route of administration is one illustration of absorptive mucosa. The mucosal route of a Tran includes the nasal, vaginal, rectal, and oral canals (3). Chocolate is an incredibly sophisticated and adaptable delicacy that can be mixed to produce unique tastes and textures. Chocolate is resistant to microbial growth and the hydrolysis of active ingredients that are water-sensitive because it is anhydrous. In many ways, using chocolate as a delivery system for active compounds makes sense. For instance, chocolate's general characteristics are great for hiding the disagreeable flavors of active ingredients as well as giving otherwise unappealingly granular active ingredient compositions a smooth and creamy texture (4,5).

Given its versatility, chocolate can be used to create a wide variety of flavours and textures. Polyphenols, saturated fat, methylxanthines and aliphatic alcohols are just a few of the substances that chocolate is rich in (6). Phenylethylamine, sometimes known as "the love drug," is a chemical that naturally arises in the brain and gives people a sensation of happiness and pleasure. Additionally, chocolate contains phenylethylamine, which increases blood pressure and blood sugar levels and gives one a feeling of well-being. (7). Five fundamental flavours make up human taste: sweet, sour, bitter, salty, and savoury. One of the most enjoyable tastes is sweet. (8)

To create medicated chocolate, a chocolate base is used, and after the base has been created, the medication is added. It is referred to as a chocolate medication delivery system since the drug is integrated into the chocolate and released from it. It is the best medicine delivery method available, especially for children and younger generations (9).

Two advantages of the chocolate drug delivery technology include the potential bypass of first-pass effects and the prevention of pre-systemic elimination within the GI tract. Due to its anhydrous nature, chocolate is also resistant to microbial development and the degradation of water-sensitive active ingredients. Chocolate is a great delivery system for active compounds in numerous ways (10,11).

Helminthiasis is the term for an infection of the human body with parasitic worms like roundworms, pinworms, etc. Although the intestinal system is typically affected, the worms can occasionally invade other organs (12). It is a major issue that affects not just humans but also livestock, particularly in tropical regions. Around the world, 3.5 billion individuals suffer from intestinal parasite infection, with low socioeconomic groups bearing the brunt of the disease (13). Helminths are worms made up of many cells. Nematodes—roundworms, cestodes—tapeworms, and trematodes—flatworms—are some of the most prevalent

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helminths found in the human intestine. Typically, helminths cannot reproduce inside the human body. (14).

According to the WHO, helminthiasis is controlled through pharmacological therapy, biological control, good hygiene, and health education. Herbs known as anthelmintics can be used therapeutically to treat helminthiasis because they have qualities that either kill parasitic helminths and protozoal parasite worms or stop their growth or replication. Hunteri aumbellata, Combretum mucronatum, raw garlic, Hillaria latifolia, citrus aromaticum, Citrus medica, Citrus aurantifolia etc. are some of the medicinal plants with anthelmintic activity (15)

The herbs and fruits used in this polyherbal medicated chocolate have a vast variety of pharmacological use with context to stomach worms and their related issue.

Because Ferula foetida, also known as "Hing," contains a variety of beneficial phytoconstituents, including terpenoids, sulfide derivatives, volatile oil, phenols, and minerals, it has shown promise as a potential therapeutic agent. Studies have been done on a variety of pharmacological properties, including antioxidant, antibacterial, antifungal, anticancer, and antidiabetic effects (16).

Assafoetidnol A and Assafoetidnol B are two sesquiterpene coumarins discovered in asafetida that have been discovered to have antimicrobial properties. Galbanic acid is another sesquiterpene that is frequently found in the drug's resin component. Galbanic acid, a key chemical component present in Ferula species, is known to have strong antibacterial and antibiotic properties (17). Another class of plant compounds known as sequi-terpenoids has been shown to have anti-helminthic effects (18). This plant contains several terpenoids, flavonoids, and essential oils. This plant contains poly-phenolic chemicals that serve as the primary source of helminthics (19).

In Ayurveda, S. chirata is used to treat fevers and conditions such as analeptic, anthelmintic, cathartic, leucorrhea, antipyretic, and inflammatory mitigation. Additionally, it is used as a laxative, a carminative, a purifier for breast milk, and to treat ulcers, skin conditions, coughs, neurological problems, and urinogenital tract issues. It is made clear that the Unani school of medicine also employs it as a tonic for the treatment of many types of fever (20,21)

S. has an anthelmintic effect. The entire plant exhibits chirata against Haemonchus contortus, a parasite that results in anaemia and edema in sheep and goats. The dose of 3 g/kg of powder medication, crude aqueous extract, and the methanolic extract is reportedly administered to sheep infected with GIT nematodes. This herbal medicine's extract is used to treat helminthic disease. Due to the action of flavonoids and secoiridoids, a methanolic extract of S. chirata exhibits antioxidant activity. For the medication, antioxidant substrate and scavengers known as free radicals remove the harmful impact (22)

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The Major objective of any medicine in treatment against worms is deworming, preventing constipation and detoxing the body. This unique herbal formulation covers all the parameters of and standard medicinal product.

To deliver herbal anthelmintics drugs, the current study's goal is to create a polyherbal chocolate formulation. It also aims to assess the prepared formulations' physiochemical parameters so that they can be further standardized and applied in the commercial sector.

MATERIAL AND METHODS:

MATERIAL

All the fruits and herbs are Banana Peel, Apple peel, S. chirata, Ferula asafetida, Star aniseed, Chocolate Base (Amul), and Honey. In addition to this equipment is taken as of analytical grade.

METHOD

Extraction of Fruits Used in Formulation

Apple and banana fruits were purchased from a nearby fruit market. Manually separating the peels, allowing them to dry in the shade, and preserving a sample allowed for future research. The dried peels were mechanically ground into powder. The powdered plant material is extracted repeatedly using various solvents, including water, methanol, and chloroform. Maceration was used for extraction using methanol and chloroform.

Soxhlet apparatus is used to produce an aqueous extract. The process that was used was as follows: For six days, chloroform is macerated with the powder. Then vacuum filtration is used to filter the contents. The same solvent is used to treat the marc once more for three days. Filtered, blended, and concentrated materials are used. Following methanol extraction, the solid material was suitably dried before being subjected to an eight-hour soxhlet extraction with water. It was a concentrated extract. A desiccator was used to store each extract.

Extraction of *S.chirata*

Using a soxhlet apparatus, dried and powdered plant materials were first defatted with petroleum ether before being successively extracted with methanol and water. As a solvent, 70% ethanol was used to create the hydroalcoholic extract. The extracts were filtered, cooled to room temperature, and then evaporated until completely dry.

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Extraction of *Ferula asafoetida*

Ferula asafoetida's phytochemical makeup comprises 45–65 per cent resins, 20 per cent gum, 4–15 per cent volatile oil, and roughly 10 per cent ash. The presence of some Sulphur compounds, such as isobutyl propenyl disulphide, is what gives it an alliaceous smell. It is employed medicinally as a laxative, expectorant, carminative, and antispasmodic.

We carefully dried 2g of F. asafetida that had been taken. These were then ground into a coarse powder and placed in 2-litre jars before being prepared for extraction in 90% alcohol. The containers were left to stand for several days, periodically shuddering. It was strained off of the liquid. To release the blocked solution, the pressure was applied to the marc. Filtration was used to combine and make the strained and occluded solutions clear. The solution was concentrated and distilled. All the extracts are shown below in figure 1

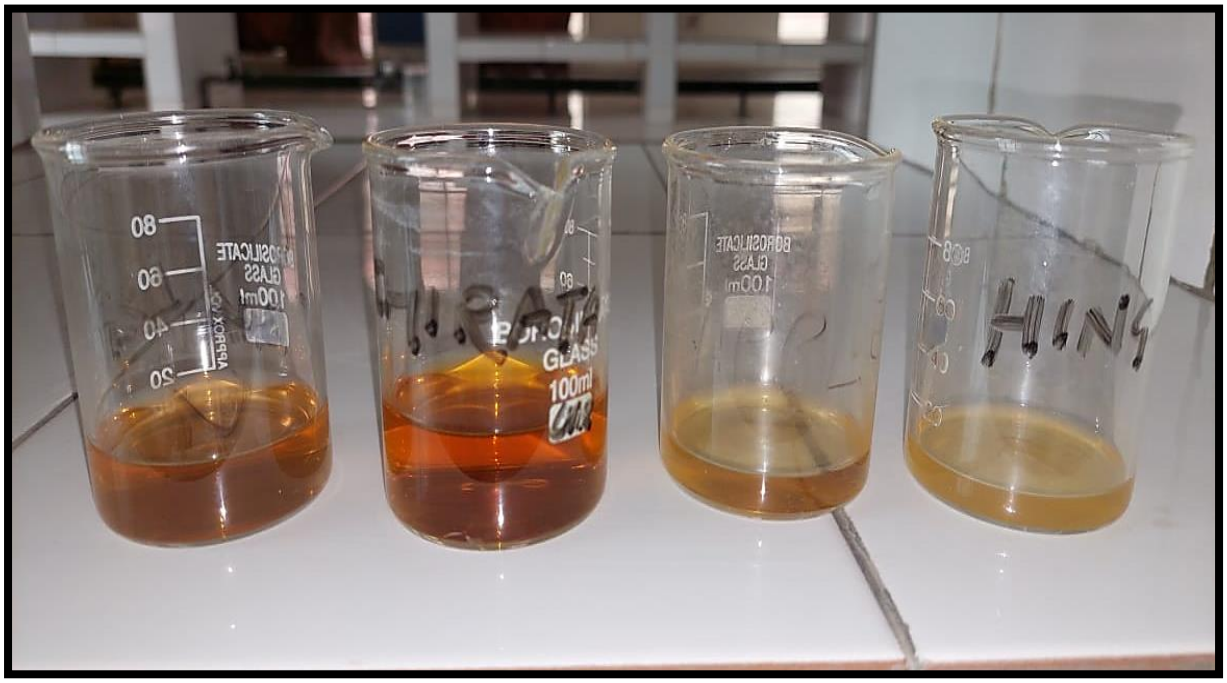

Figure 1: Extracts used in the formulation of medicated chocolate.

Formulation of Medicated Chocolate

The temperature of the water in the bath was set to become heated, reaching a temperature of roughly 50°C. The chocolate base was then heated in a porcelain dish until it was liquid as shown in figure 2. Then, add the necessary amount of honey to the melted chocolate base. Following the aforementioned phase, the proper quantity of medicine extract—namely, extracts of banana peel (0.05 ml), apple peel (0.04 ml), S. chirata extract (0.25 ml), Ferula asafetida extract (0.02 ml), and star anise oil for flavour—was added to the mixture and continually mixed. The entire batch of the chocolate base was then poured into a silicon chocolate mould and chilled for between three and six hours to solidify.

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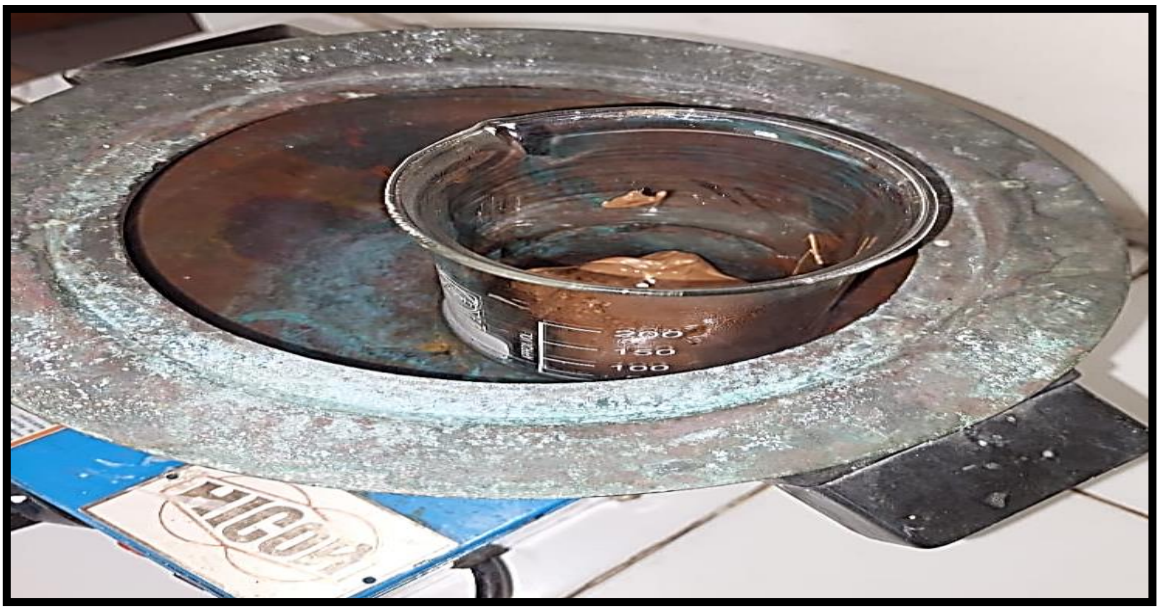

Figure 2: Formulation of medicated chocolate.

Table 1: Ingredients of Formulated Medicated chocolate

S.no.	Ingredients name	Intended use	Quantity (gm)or (ml)
1.	Banana Peel Extract	Anti-parasitic, preventing constipation, anthelminthic	0.05ml
2.	Apple peel extract	Deworming activity	0.04 ml
3.	S. chirata extract	Deworming Activity	0.25 ml
4.	Ferula asafoetida extract	Anti-helminthic	0.02 ml
5.	Star aniseed oil	Flavour and anti-oxidant activity	q.s
6.	Chocolate Base	Principle ingredient	3.64 gm
7.	Honey	Sweetening agent	q.s

EVALUATION AND CHARACTERIZATION:

1. General appearance:

The visual identity and overall elegance of a chocolate formulation are what determine its overall appearance, which is important for consumer acceptability and trouble-free manufacture (24).

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2. Dimensions:

The dimension of the chocolate was evaluated while using Vernier's callipers (25)

3. Moisture content determination:

A desiccator was used to determine the moisture content. This test was performed to determine the level of moisture in the chocolate when it was dry. The resulting chocolate mixture was precisely weighed and stored in a desiccator with anhydrous silica gel. After 24 hours, the formulations were removed, weighed, and the percentage of moisture absorption was determined using the formula (26).

$$\%\ Moisture = \frac{Intial\ Weight - Final\ Weight}{Final\ Weight}$$

4. Viscosity determination of chocolate base

Brookfield To determine the viscosity of the prepared chocolate foundation, a rotating digital viscometer is utilized. Before taking measurements, samples of the chocolate foundation are heated to 50°C while the spindle rotates at 20 rpm (26).

5. Weight Variation :

Six chocolate recipes were weighed separately and collectively. The weight of all the chocolate was used to calculate the average weight. The average weight was contrasted with the individual weights. The weight variation's percentage difference must stay within the allowed bounds. The following formula was used to determine the per cent deviation (10)

$$\%\ Deviation\ \frac{: Individual\ Weight - Average\ \ Weight}{Average\ Weight} \times 100$$

6. Hardness test

To shatter a chocolate bar across its circumference, a certain amount of hardness is needed. The strength of chocolate can be determined by how hard it is. Using a Monsanto Hardness tester, the hardness was determined. Kg/cm2 was used to express the values (27,28).

7. Bloom Test

Flat Bloom Test :

On the chocolate, the fat bloom shows as patches of a light colour. As implied by the name, cocoa butter, a naturally occurring fat derived from the cacao bean, makes up the bloom. A bland-looking covering of soft white will then form.

- The sample was heated to 40 degrees for eight hours and then cooled to 20 degrees.

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- After being at 20°C for 8 hours, a test sample was checked to see if bloom had occurred or not (29).

8. Stability

Medicinal products are defined as being stable if they can maintain their physical, chemical, microbial, therapeutic, and toxicological specifications in a specific formulation in a specific container. (30). To put it another way, the stability of a drug is its capacity to withstand degradation. The lowest permissible potency level is typically accepted to be 90% of the labelled potency. Due to changes in its physical, chemical, and microbiological properties, drug degradation can happen in a variety of ways. The modifications could reduce the preparation's medicinal efficacy or raise its toxicity (31)(32).

RESULT AND DISCUSSION:

A. Organoleptic Properties

Sno.	Characteristics	Result
1.	Colour	Brown
2.	Odour	Pleasant with no burnt smell
3.	Taste	Sweet
4.	Surface	Smooth and even

B. Dimensions

It was measured by Vernier's callipers

Avg. width of 5 chocolate formulations:

$$\frac{1.85 + 1.90 + 1.84 + 1.85 + 1.86}{5}$$

The average width of 5 chocolate is observed to be = 1.86

C. Moisture Content Determination

Weight of Formulated chocolate = 4.25 gm

Weight of empty Crucible = 45.32 gm

Weight of formulated chocolate + weight of empty crucible = 49.27 gm

Weight after moisture loss = 49.18 gm

Therefore, the final weight obtained = 0.09gm

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Weight of one formulated chocolate = Final weight obtained

4.25gm = 0.09gm

100gm = X

X = $\frac{0.09\times100}{4.25}$

So, the **percentage of moisture content = 2.1%**

D. Bloom Test

Fat Bloom Test

The sample was heated to 40 degrees for eight hours in a hot air oven. After the 20c stage, a test sample was examined for 8 hours.

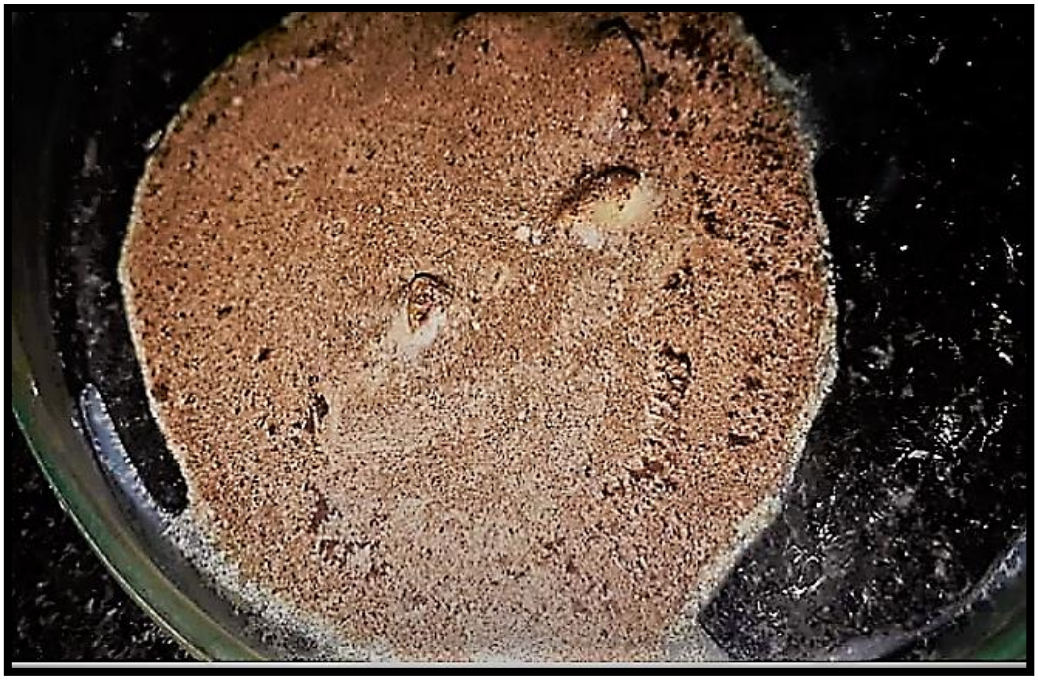

Figure 3: Observation from bloom test of Chocolate

E. Viscosity determination

It is determined by Brookfield viscometer and observed to be 560cp viscosity = **0.56kg/ms**

F. Weight variation determination

Average Weight of 5 formulations: $\frac{W1+W2+W3+W4+W5}{5}$

Average weight calculated to be $\frac{\mathbf{4.25+4.05+3.94+4.30+4.25}}{\mathbf{5}}$

= **4.15**

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G. Hardness Testing

Initial reading on hardness tester = 3.5 kg/cm

After breakage of chocolate = 8.5kg/cm

Therefore, hardness present in the chocolate formulation = 8.5 kg/cm-3.5kg/cm

i.e. **5kg/cm**

H. Stability testing

After being kept at room temperature for 24 hours in the foil container with shiny butter paper on the outside.

Figure 4: Final chocolate formulation

CONCLUSION:

In conclusion, based on the above-mentioned study, we can say that medical chocolate with ingredients like banana extract, apple peel extract, s. chirata, and Ferula asafoetida, which have a bland flavour, are smooth in texture, pleasant to the taste, and have patient compliance and safety for stomach deworming. The shape, size, taste, texture, dimensions, moisture content, bloom test, viscosity, weight variation, hardness, and stability of the formed chocolate were all analyzed. We concluded from the study that medicated chocolate gives the formulation a smooth and creamy texture and is effective at disguising unpleasant tastes while achieving a greater therapeutic effect.

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Conflict of Interest

None

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