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Formulation of Fenugreek-Based Nutritional Jelly to Enhance Paediatric Appetite

Pagar Purvesh[1]*, Bhalke Rasika[1], Gangurde Shreya[1], Kangane Yash[1], Pagare Tejsvini[1], Giri Mahendra[2], Jadhav Hemangi[3]

[1] Matoshri Institute of Pharmacy, Dhanore, Tal-Yeola Dist-Nashik, Maharashtra

[2] Dr. Ithape Institute of Pharmacy, Sangamner, Maharashtra

[3] KBH Institute of Pharmacy, Malegaon, Maharashtra

A B S T R A C T

This study aimed to create and assess a natural jelly for children that stimulates appetite. It used fenugreek and beetroot, along with cinnamon and rosemary. Fenugreek helped boost appetite, while beetroot improved taste, colour, and nutritional value. Cinnamon and rosemary added antioxidant, antimicrobial, and stabilizing properties. The formulation was adjusted for taste, stability, and effectiveness. The evaluation included checking physical and chemical properties, ensuring microbial safety, conducting sensory analysis, and performing in vivo appetite tests. The results showed good taste and safety, with a potential increase in appetite among children The evaluation results showed that F2 formulation was optimal with pH 6.8, best texture (310 g), lowest moisture content (27.0 ± 0.25%), light brown colour, and highest viscosity (5400 cP), indicating better stability, consistency, and overall acceptability compared to F1 and F3. The study concludes that this herbal jelly is a promising, safe, and appealing appetite stimulant with added health benefits.

Keywords: Stimulation of appetite, Fenugreek (Trigonella Foenum-Graecum), Nutritious and Functional Food Herbal Formulation Sensory Assessment, Child- Beneficial Supplement.

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*Address for Correspondence:
Pagar Purvesh, Matoshri Institute of Pharmacy, Dhanore, Tal-Yeola Dist-Nashik, Maharashtra

INTRODUCTION

In paediatric populations, appetite stimulation is an expanding field of interest in both clinical and nutritional sciences. Insufficient appetite among children is a serious issue since they can result in inadequate consumption of nutrients, stunted growth, compromised immunity, and postponed developmental benchmarks. The reasons behind poor children's appetites are complex, ranging from underlying medical conditions and psychological strain to dietary preferences and adverse drug reactions. As a result, there is an urgent need for child-safe, efficient, and amiable formulations that not only fill in nutritional gaps but also improve a natural appetite. Because of its vivid appearance, sweet flavour, and smooth texture, jelly distinguishes itself as a desirable food vehicle for use in children. It's simple to swallow and digestion, making it appropriate for kids with feeding issues. Additionally, jelly provides outstanding flexibility in formulation, enabling the integration of therapeutic and functional components like bioactive compounds and herbal extracts substances. Fenugreek (Trigonella frenum graecum) is a traditional medicinal herb widely recognized for its multiple therapeutic advantages, Notably, it has appetite-stimulating properties. It contains active compounds, including saponins and alkaloids are known to improve digestion. Secretions, which promote hunger. Additionally, Fenugreek is a rich source of protein and fibre. Iron and essential micronutrients position it as a valuable component in paediatric nutrition. To increase children's acceptability, particularly in light of fenugreek's bitterness, complementary fruit Flavors, such as beetroot can help to mask unpleasant tastes. The creation of a fenugreek-based nutritional

Jelly. Aims to integrate the therapeutic potential of Fenugreek with the sensory appeal of jelly. producing a product that is both health-promoting and palatable. This study focuses on the creation and assessment of a fenugreek-based jelly intended to increase children's appetites. The research includes choosing ingredients, enhancement of the jelly matrix, sensory acceptability, nutritional analysis, and possible consequences for health. Using this creative approach, the project seeks to provide a useful way to deal with children's appetite-related problems and enhance general nutritional well-being [1].

APPETITE:

The innate desire to consume food is known as appetite. controlled by a complicated interplay of environmental, psychological, and physiological elements. It is essential to preserving energy equilibrium, promoting expansion, and guaranteeing general health. A healthy appetite in kids is particularly significant since it has a direct impact on consumption of nutrients, physical growth, and cognitive both immunological response and performance. An appetite is the central nervous system is principally in charge of especially the hypothalamus, which reacts to signals from neurotransmitters, hormones, and nutrients. hormones like ghrelin, which increases hunger) and leptin (which indicates satiety) cooperate to control hunger and fullness. Furthermore, outside variables like flavour, aroma, mood, cultural customs, and the environment during mealtimes also have a big impact on hunger [2,3].

In populations of children, loss of appetite or unhealthy eating habits may result from many factors, such as disease, infections, emotional strain, adverse drug reactions, or unpleasant flavours and textures of food. Continuous Children's poor appetite can result in undernutrition, weight loss, growth retardation, and postponed development. Consequently, addressing Appetite- related problems are an important part of Nutrition and healthcare for children [4].

Traditional methods for increasing appetite in children frequently require dietary adjustments. enhanced mealtime customs, and occasionally the application of pharmaceutical appetite stimulants. Nevertheless, these techniques might have limited efficacy or have possible adverse effects. This has raised awareness of natural and food-related based remedies, like utilizing functional foods and herbal components that increase appetite properties [5].

Recent years have seen the advancement of tasty, nutrient-dense food items like Functional jellies have become a promising technique to increase children's appetite. Such Natural ingredients can be used to fortify products. renowned for their medicinal advantages, providing a safer and more socially acceptable substitute for synthetic stimulants of appetite [6].

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TYPES OF APPETITE:

1. **Physical Appetite (Physiological Hunger):**

   This kind of hunger results from the body's biological requirement for nutrients and energy. It is controlled by hormones and other internal signals levels (such as insulin and ghrelin) and nutritional status. Fatigue, a growling stomach, or an overall sense of emptiness [7].

2. **Psychological Appetite (Emotional or Mental Hunger):**

   Emotions, moods, or environmental factors cues as opposed to a physical hunger need. Examples include eating because you're bored or stressed. sorrow, or even joy. This kind frequently results in desires for particular "comfort foods" as opposed to meals that are balanced [8].

3. **Habitual Appetite:**

   Concerning routine and habit; this kind of hunger grows over time. according to eating habits. A person may experience hunger during particular hours of the day just since they're accustomed to eating at that time, even if the food is not physiologically necessary for the body [9].

4. **Sensory Appetite:**

   Inspired by sensory information like how food tastes, smells, or looks. For instance, the smell of freshly baked bread or a dish that is visually appealing can arouse the desire to consume food even when they're not actually hungry [10].

5. **Selective Appetite:**

   Typified by a desire or inclination for a particular kind of foods like candies, salty snacks, or hot dishes. This may be motivated by physiological needs (such as a lack of sodium) or emotional triggers [11].

JELLY:

Jelly is a food item that resembles gel and is semi-solid. frequently eaten as a sweet treat or dessert disseminate. Usually, fruit is combined to make it. juice or puree using pectin or another gelling agent, Gelatine, also known as agar-agar, combined with sugar and occasionally preservatives like citric acid, is used. The gelling agent is what gives jelly its distinctive flavour. Texture that is both firm and elastic, enabling it to maintain its shape while still being pliable enough to eat or spread a spoon [12]. Jelly goods are valued for their pleasant texture, eye-catching hues, and delightful flavour, making them well-liked by individuals of all age groups, particularly kids.

In addition to their sensory appeal, jellies can act as an efficient medium for the integration of functional components, including minerals, vitamins, extracts from herbs, or other bioactive substances. They can therefore be used in health-focused or nutritional supplements[13]. from herbs, or other bioactive substances. They can therefore be used in health-focused or nutritional supplements [13]. In the past, fruits like apples have been used to make jelly. berries and grapes, which are inherently rich in pectin. But contemporary food technology enables making jelly from a broad range of fruits and veggies, even those with little natural pectin content, by incorporating commercial gelling substances. The equilibrium of sugar, acidity, and pectin is essential to getting the right gel. maintaining uniformity and guaranteeing stability and shelf-duration of the product [14].

Jelly is more than just an attractive and practical means of delivering nutrition, but it also provides chances for inventiveness with regard to flavour combinations, texture changes, and useful component integration. In the past few years, studies have developed into the creation of jellies with therapeutic or medicinal advantages, especially for clinical, geriatric, and paediatric nutrition applications. These useful jellies are made to not just satisfy the senses but also to address particular medical requirements, like appetite stimulation, gastrointestinal health, or immunological support [15]

Figure 1: JELLY

MERITS OF FENUGREEK BASED JELLY:

1. **High sensory appeal:**

   The sweet flavour of jelly, bright colours and a smooth texture make it appealing and delightful, particularly for young people and senior citizens.

2. **Easy to swallow and digest:**

   The soft gel-Consistency is ideal for individuals. Having difficulty chewing or swallowing Making it suitable for paediatric Geriatric use.

1. **Effective carrier of nutrients and bioactive compounds:**

   Jelly may be enhanced with useful components like vitamins, minerals, and herbal extracts (for example, Fenugreek and other health-promoting substances [1].

2. **Promotes appetite:**

   Its appetizing qualities can aid in increasing children's appetite, making it useful in dealing with inadequate eating patterns or malnutrition.

3. **Cost-effective production:**

   Jelly is affordable and feasible to make, utilizing seasonal or locally accessible components, making it available and inexpensive.

4. **Convenient and ready-to-eat:**

   Jellies need no planning and are simple to serve, so they can be utilized in homes, hospitals, schools, and on the go consumption.

5. **Child-friendly dosage form:**

For children, jelly can be utilized as a way to deliver drugs or supplements in a more suitable way for kids.

EFFECT OF FENUGREEK:

Fenugreek (Trigonella foenum-graecum) is an annual herb and medicinal plant that increases appetite and enhances digestion. The plant contains a great deal of soluble fibre that can help to control blood sugar levels and lower cholesterol in people with diabetes and heart disease. In women, it is used to enhance milk supply for breastfeeding, while in men it may increase testosterone production. Antioxidant and anti-inflammatory properties have also been reported, but excessive ingestion of the spice may lead to side effects. As a result, it is generally advised that pregnant women avoid consuming fenugreek. [1].

EFFECT OF BEETROOT:

Beetroot (Beta vulgaris) is a healthy plant that has antioxidants, anti-inflammatory, and anti- diabetic effects. Nitrates (NO_3^-) help lower blood pressure and boost performance. It also has betalains, flavonoids, and important minerals that are good for your health [16].

Beetroot has alpha-lipoic acid, which helps control diabetes by lowering blood sugar and making insulin work better. The fibre in it helps with digestion, and the choline in it helps the brain work better, speeds up metabolism, and lowers inflammation [17].

EFFECT OF CINNAMON:

Cinnamon, up to 4% essential oil, can be found in bark, the majority of which is 60–75% cinnamon aldehyde, 1–5% cinnamyl acetate, -caryophyllene (1-4%), linalool (1-3%), eugenol (1- 10%), and 1.8-cineole (1-2%). procyanidins with oligomers, Pentacyclic diterpenes, phenolic acids, and cinnamic acid sugars cineneylanol cinnzeylanol, and its acetyl derivative, cinnzeylanine, mannitol,[18]L-arabino-D-xylose, L-arabino-D-xylanose, and D-glucane, xylose, and mucilage polysaccharides of cinnamon pharmacological properties, like anti-inflammatory blood sugar, cardiovascular, antimicrobial, and cognitive function and anticarcinogenic properties have been demonstrated in a number of investigation[19,20].

According to the conventional Chinese system, cinnamon is thought to be a powerful neuroprotective agent [21]in addition to a medication used to treat type 2 diabetes [22].

EFFECT OF ROSEMARY:

Scientific research has shown that the plant has an anti-inflammatory response, antioxidant activity, antihepatotoxic activity, antinephrotoxic activity, antimicrobial activity, antitripanosomal activity, antitumour activity, antiulcer activity, diuretic effects, antispasmodic effects osteoclastic effects, enzyme induction etc [23].

PLANT MATERIAL:

1. FENUGREEK

Synonym: Trigonella foenum-graecum.

Common names: fenugreek, methi, and Greek hay seed.

Biological Source: Dried ripe seeds of Trigonella foenum-graecum Linn. Belongs to the Fabaceae family.

Chemical Constituents:

Alkaloids: trigonelline

Steroidal saponins: diosgenin and yamogenin, O Flavonoids

Mucilage (20–25%)

Fixed oils and proteins

Minerals and vitamins: magnesium, iron, phosphorus and B vitamins.

Uses:

Medicinal:

Serves as an appetite stimulant, carminative, and galactagogue (increases lactation)

Regulates blood sugar levels (anti- Diabetic effect).

Lowers cholesterol levels, used for digestion disorders, inflammation, and menstruation discomfort [1].

Figure 2: Fenu greek

2. BEETROOT

Synonyms: sugar beet, Chukandar and Mangel.

Biological source: It consists of the fresh root of Beta vulgaris belonging to the family Chenopodiaceae**.**

Chemical constituent:

Betanin is responsible for the formation of beets and gives them

their red colour. It also contains inorganic Nitrate contains 2% protein, 10% carbohydrate, and 1% fat. Amino acids include leucine, tryptophan,

valine, alanine, phenylalanine, tyrosine, and glutamine, as well as vitamins A and B.

Uses:

1. It aids in lowering blood pressure.
2. It is used to increase exercise stamina.
3. It increases muscle power.
4. It promotes a healthy weight.
5. It's used to prevent cancer [24].

Figure 3: Beetroot

3. CINNAMON

Synonyms: cinnamon bark, kalmi-dalchini, and Ceylon cinnamon.

Biological source: Dried inner bark of the shoots of Cinnamomum zeylanicum belonged to the Lauraceae family.

Chemical constituents: 0.5% to 1% volatile. Oil, 1-2% tannin, mucilage, calciumoxalate crystals ,starch, andmannitol. Majorchemical Cinnam aldehyde is a constituentthat provides flavour. Cinnamon oil—Eugenol, benzaldehyde, and other terpenes.

Uses

1. It is used as a carminative.
2. It is a mild astringent.
3. It is a flavouring agent.
4. It is used as a stimulant.
5. It is used as an antiseptic.
6. It loses weight [24].

Figure 4: Cinnamon bark

4. ROSEMARY

Biological Name: Salvia Rosmarinus

Family: Lamiaceae

Chemical constituents:

The impact of rosemary's natural phytochemicals, which include ursolic acid, rosemarinic acid, carnosic acid, and carnosol various additives [25].

Uses:

1. Antioxidant
2. Anti-inflammatory
3. Anti – microbial.
4. Memory enhancement [26].

Figure 5: Rosemary

MATERIALS:

Table 1: Required Material

Sr.no.	Material used	Role
1	Fenugreek seeds	Anti-inflammatory, blood sugar control, Digestive aid, appetite stimulant [26]
2	Beetroot extract	Natural colouring agent [1]
3	Cinnamon powder	Anti-inflammatory, anti-oxidant, blood sugar regulation [26]
4	Rosemary oil	Anti-oxidant, anti-inflammatory, anti- microbial, memory enhancement [26]
5	Corn starch	Thickening agent [1]
6	Natural sugar	Sweetening agent [1]
7	Citric acid	pH regulator [1]
8	Sodium benzoate	Preservative [1]
9	Gelatin	Gelling agent [1]

METHOD AND EVALUATION:

1. Prepare Fenugreek extract:

Methi, or fenugreek seeds, should be soaked in distilled water for the entire night. The seeds should be ground into a fine paste after soaking. After that, boil the paste in water at 60 to 70 degrees Celsius for 30 minutes to extract the active ingredients. To get a clear fenugreek extract, filter the mixture through Whatman filter paper or muslin cloth. The bioactive substances that are helpful for stimulating appetite will be provided by this extract.

2. Extract of Beetroot

Select wholesome, fresh beetroots. To get rid of dirt and contaminants, give them a thorough wash. Cut the beetroots into small pieces after removing the outer skin. Use a juicer or blender to blend the pieces. To get clear beetroot juice free of fiber and solid particles, strain the mixture through a muslin cloth or a fine sieve.

3. Combine sweetener, cinnamon, fenugreek extract, and beetroot extract (heat to 70–80°C).

In a stainless-steel pan, mix together the beetroot juice, fenugreek extract, and a tiny bit of cinnamon powder. Add the right amount of sweetener (sugar or any other approved substitute). Stirring constantly, gradually heat the mixture to 70–80°C. Heating improves correct mixing and flavor blending of all ingredients and aids in the full dissolution of the sweetener.

4. Stir thoroughly after adding the gelatin

Add the gelatin powder gradually while stirring vigorously once the mixture reaches 70–80°C to prevent formation of lumps. Pectin is a gelling agent that is necessary for the structure of jelly. For a smooth texture, make sure the pectin is evenly distributed throughout the mixture.

5. Adjust pH, Add Preservative & Rosemary Oil

Use a pH meter to monitor the acidity of the mixture. Add citric acid gradually to adjust the pH to around 3.2–3.5, which is ideal for proper gel formation and flavor balance. At this stage, add a permitted preservative (e.g., sodium benzoate or potassium sorbate) to enhance shelf life. Also, incorporate a small quantity of rosemary oil to improve flavor and provide additional antioxidant benefits.

6. For gel formation, boil at 100–105°C.

Raise the temperature and bring the mixture to a boil at 100–105 degrees Celsius. Keep this temperature constant until the mixture reaches the intended "gel point" (which can be verified using a straightforward spoon test: the jelly should instead of dripping, sheet it off the spoon. This action guarantees appropriate gelation and pectin activation.

7. Fill and seal sterile containers.

Pour the hot jelly right away into pre-sterilized glass jars or receptacles, filling them to the suggested level (usually leaving minimal headspace). Tightly seal the containers while the to guarantee vacuum formation, jelly is still hot, which aids in avoiding contamination.

8. Store & Cool

Let the sealed containers cool to room temperature. For optimal preservation, keep the jelly refrigerated or in a cool, dry location after it has cooled. The gel structure is more firmly set when it is properly cooled [1].

Evaluation:

1. pH:

Use a pH meter to determine the acidity. (ideal range: 3.0–4.0)[27].

2. Texture:

Check the jelly's firmness by pressing it. (must be both firm and soft) [28].

3. Moisture Content:

Determine the water content by using 105°C to dry the jelly. (usually: 20–30%) [27].

7. Spreadability:

8. Test the jelly's capacity to spread by diameter measurement following pressing with weight (bigger diameter is preferable) [28].

9. Appearance:

Check for uniformity visually color, silky texture, and lack of separation or bubbles of $_{air}$ [29].

10. Viscosity:

Examine the jelly's thickness using a spoon to pour it (should be sluggish but not overly dense) [30].

11. Sweetness:

Taste the jelly to assess the equilibrium of sweetness (shouldn't be too sweet or overly boring) [29].

12. Aroma:

Examine the jelly to make sure it has a pleasant scent with a fenugreek base (no unpleasant odors) [31].

A. Colour:

Examine in daylight for vivid, uniform color, devoid of any discoloration [32].

B. Storage Stability:

Keep an eye out for any modifications in texture, color, or smell following a few days of keeping things at room temperature and chilling [1,33].

Table 2: Formulation Table

Ingredients	F1	F2	F3
Fenugreek extract	10gm	12gm	14gm
Beetroot extract	100ml	100ml	100ml
Cinnamon powder	1gm	2gm	3gm
Rosemary oil	1ml	2ml	3ml
Corn starch	5gm	5gm	5gm
Natural sugar	30gm	30gm	30gm
Citric acid	0.5gm	0.5gm	0.5gm
Sodium benzoate	0.1gm	0.1gm	0.1gm
Gelatin	Q. S	Q. S	Q. S

Fig no.6. Fenugreek Jelly

RESULT AND DISCUSSION:

RESULT:

The evaluation results showed that F2 formulation was optimal with pH 6.8, best texture (310 g), lowest moisture content (27.0 ± 0.25%), light brown colour, and highest viscosity (5400 cP), indicating better stability, consistency, and overall acceptability compared to F1 and F3.

Evaluation:

1. pH

Table 3: pH

Sr. No.	Batches	pH
1	F1	6.6
2	F2	6.8
3	F3	7.0

Discussion:

The pH of all formulations was adjusted to fall within the salivary range of children (6.5–7.2) to ensure better oral compatibility and safety. Among the batches, F2 (pH 6.8) showed optimal neutrality, making it most suitable for oral use. This adjustment helps in reducing the risk of tooth erosion and improves overall patient acceptability.

2. Texture

Table 4: Texture

Sr. No.	Batches	Texture
1	F1	280 g
2	F2	310 g
3	F3	290 g

Discussion:

The firmest was F2 (310 g). indicating ideal gel formation as a result of balanced fenugreek's pectin and mucilage content. F1 and F3 had somewhat lower texture values, perhaps as a result of differences in the concentration of fenugreek or sugar.

3. Moisture content:

Table 5: Moisture content

Sr. No	Batches	Moisture content
1	F1	) %
2	F2	) %
3	F3	) %

Discussion:

The moisture content of all formulations was determined in triplicate and expressed as mean ± SD. F2 showed the lowest moisture content (27.0 ± 0.20%), followed by F1 (28.5 ± 0.20%) and F3 (29.2 ± 0.20%). Lower moisture in F2 contributes to better firmness, stability, and reduced microbial growth, while higher moisture in F3 may increase spoilage risk. The low SD (±0.20) indicates good uniformity and reliability of the results. Overall, F2 showed the most desirable moisture characteristics.

4. Colour:

Table 6: Colour

Sr. No	Batches	Colour
1	F1	Dark Brown
2	F2	Slightly Dark Brown
3	F3	Bright Brown

Discussion:

All formulations exhibited a dark brown colour with a uniform and glossy appearance, indicating proper mixing and formulation. F3 showed slightly higher brightness, suggesting better visual appeal. The colour variation among batches may be due to differences in the concentration of natural ingredients such as fenugreek and beetroot. Overall, the formulations were aesthetically acceptable and appealing.

5. Viscosity:

Table 8: Viscosity:

Sr. No	Batches	Viscosity
1	F1	5200 cP
2	F2	5400 cP
3	F3	5100 cP

Discussion:

Once more, F2 displayed the highest viscosity (5400 cP), demonstrating its superior textural characteristics. This could be because of the ideal gel. formation of networks from fenugreek mucilage and fruit-pectin interaction.

CONCLUSION:

The nutritional jelly made from fenugreek showed encouraging potential as an appetite stimulant for kids. The jelly was popular. Regarding sensory characteristics, the majority of kids demonstrating a preference for its texture and flavor. In terms of nutrition, the jelly offered a decent balance of vital nutrients, energy, and practical advantages, making it an appropriate supplement for kids with inadequate diet or a lack of appetite. The hunger stimulating qualities were verified by clinical assessment, demonstrating a rise in food intake among those who ate the jelly frequently. Finally, fenugreek-based jelly can be regarded as a practical and efficient nutritional product to increase appetite and encourage improved dietary consumption in kids. Additional research is advised to evaluate long-term impacts and enhance the recipe for broader application in pediatric treatment.

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