

Design, Formulation, and Evaluation of Polyherbal Antimicrobial Lollipops for Symptomatic Relief of Throat Infection

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ABSTRACT:

This study explores the development of an innovative polyherbal lollipop for adult or children patients. The formulation is based on readily available homelike ingredients such as Tulsi (*Ocimum Sanctum* Linn), Cardamom (*Elettaria cardamomum*), Black Pepper (*Piper nigrum*), Turmeric (*Curcuma longa*), Ginger (*Zingiber officinale*), Honey, and Sugar syrup. The lollipop is characterized as a medicinal dosage form with flavours that are meant to be sucked and kept in the mouth or throat. Due to whether change and throat infection occurs in adult or children commonly conventional. A complete protocol for formulation, testing, and antimicrobial evaluation is provided for stability. Different evaluation parameters were performed on the prepared herbal lollipop. A sugar-based medicated lollipop containing an effective antimicrobial agent designed to maintain contact with the Oropharyngeal Mucosa. The optimized formulation showed uniform drug distribution, good mechanical strength, pleasant taste, and prolonged antimicrobial action.

Keywords: Throat infection, Herbal Lollipop, Antimicrobial activity, Herbal extract, Sugar syrup.

1. INTRODUCTION:

In oral drug delivery, throat infections are among the most common conditions. The term "lollipops" or lozenges refers to flavored medicinal preparations designed to be slowly dissolved in the mouth or pharynx, containing multiple active ingredients.^[1] Doctors and patients often prefer solid dosage forms such as tablets, capsules, and lozenges because of their convenience, stability, and ease of administration.^[2] These formulations enhance patient compliance and provide controlled delivery of active ingredients.^[12] Medicated lollipops represent an innovative solid dosage form designed for local action in the oral cavity.^[2]

They consist of a sweetened and flavoured base that is incorporated. When placed in the mouth, the lollipop gradually dissolves, releasing the medication in a sustained manner, providing both local relief and improved patient acceptability.^[2]

Polyherbal lollipops are formulated using natural ingredients with known medicinal properties, such as Tulsi, Ginger, Turmeric, Black pepper, and Cardamom. These herbal components possess antimicrobial, anti-inflammatory, and soothing effects that help relieve throat infection. The formulation not only provides therapeutic benefits but also offers a pleasant taste, making it suitable for both adults and children.

A throat infection occurs when viruses or bacteria attack the tissues of the throat, causing irritation and inflammation. Most throat infections are viral, such as those caused by the common cold or flu viruses. Sometimes, bacteria like *Streptococcus* can also infect the throat, leading to strep throat. Other factors such as allergies, dry air, smoking, or excessive shouting can also irritate the throat and make it more prone to infection. When the body's immune system reacts to these germs or irritants, it causes pain, redness, and swelling in the throat, which are the common symptoms of a throat infection.^[3,9]

Plants play a vital role in producing medicines useful for maintaining human health. According to a WHO report on primary health care needs, more than 80% of the world's population relies on traditional medicine.^[15]

This polyherbal medicated lollipop is formulated using Tulsi powder, black pepper, Turmeric, Cardamom, and Ginger. All these ingredients are blended in an optimal ratio, then dried and powdered to form the lollipop. Tulsi is a key ingredient. Tulsi powder, also known as Holy Basil, is one of the most important medicinal plants in Ayurveda. Tulsi powder is made from dried Tulsi leaves and is widely used for its healing properties. It helps in treating cough, cold, sore throat, and other respiratory problems due

to its antibacterial and anti-inflammatory effects. Tulsi powder also strengthens the immune system, reduces stress, and supports digestion. Regular use of Tulsi is believed to purify the blood and promote overall health and well-being.

Honey enhance the medicinal effect of tulsi, improves taste ,and acts as a binder in the formulation. The combination of honey and tulasi soothes the throat, enhances immunity,and provide a natural healing effect to the body. ^[15] Cardamom is abundant in antioxidant that protect body from free radical damage and possesses strong anti -inflammatory properties, while pepper and function as natural bio-enhancers. Cardamom boosts the body's glutathione level , a key compound responsible for its strong antioxidant activity. Apart from its medicinal value, it is also used as a natural flavouring agent. In traditional medicine, cardamom and related herbs are widely used to manage respiratory disorders such as pneumonia, bronchitis, tuberculosis, and flu related or chest congestion. It's anti-inflammatory nature helps in loosening phlegm and alleviating respiratory discomfort, while also being highly effective in relieving infection. This herbal lollipop formulation is prepared using honey , which naturally stimulate insulin secretion ^[10] .Honey possesses a broad range of medicinal properties – it's effective in managing eye and stomach ailments, wound infection , oral health issues , cancer, asthma , and heart diseases. Used for more than 8,000 years , honey remains the only naturally derived sweetener of animal origin. It contains antioxidant, Vit. C, pinocembrin, pinobanksin, formic acid, all of which contributes to its healing and health -promoting qualities. ^[13]



Fig. 1 Polyherbal Throat infection Lollipop

2. Literature Review

2.1 Background and Rationale

Polyherbal medicated lollipops are solid oral dosage forms that gradually dissolve in the mouth, allowing the drug to be released slowly. This provides localized as well as systemic relief by enhancing the absorption of herbal actives. In recent years, researchers have focused on developing lollipops as patient-friendly formulations for treating throat infections and providing soothing effects.

2.2 Herbs and actives commonly used :

- Tulasi (*Ocimum tenuiflorum*):
- Turmeric (*Curcuma longa*) :
- Black pepper (*Piper nigrum*) :
- Cardamom (*Elettaria cardamom*) :
- Honey (*Apis mellifera*):

2.3 Typical Formulation Approaches :

The heating-and-congealing technique involves warming sucrose or corn syrup to the candy stage, then blending in the herbal extract. The mixture is poured into molds containing sticks and left to harden. This method is commonly applied in preparing

medicated lollipops. In some traditional or diabetic-friendly formulations, honey or sugar syrup may be used in place of regular sugar.

2.4 Standard Evaluation Tests :

- Appearance (Colour, Odour, Taste)
- Weight variation, Size uniformity
- PH, Dissolution Time

3. Materials and Methods :

Tulasi powder, Turmeric powder, Black pepper, Ginger powder, and Honey all those Ingredients are collected from market from Ayurvedic Store.



Fig. 2 Herbs used in this formulation

4. Formulation Table :

INGREIDIENTS	QUANTITY	USES
Tulasi powder	9.1g	Antimicrobial ,soothes throat
Turmeric powder	2.6g	Anti- inflammatory
Black pepper powder	2.6g	Bio-enhancer; relives cough
Ginger powder	2.6g	Anti- Inflammatory ,Anti- Cough
Cardamom powder	2.6g	Flavouring, Anti -oxidant
Honey	Q.S	Sweetener + Soothes throat

5. Formulation Table :

Polyherbal Lollipop formulated by Heating and Congealing Method.

Step 1 : All ingredients were precisely weighed and thoroughly combined.

Step 2 : In earthenware vessel , the measured sugar was dissolved in water and heated until it reached the hard crack stage , forming a sugar syrup with continuous stirring.

Step 3: The prepared herbal ingredients were then added to the hot sugar syrup and mixed uniformly.

Step 4: The required quantity of honey was incorporated into this mixture.

Step 5: The final formulation was poured into calibrated moulds to set into lollipop form.

Step 6: Once formed, the lollipops were dusted with a blend of fine powdered sugar and cornstarch in a 3:1 ratio to prevent stickiness and protect them from moisture.

6. Storage :

The Air in an tight prepared lollipops were wrapped in butter paper and stored container.

Ensuring a shelf life of up to 90 days.

7 . Evaluation parameter :

1. Appearance : The polyherbal lollipop exhibited a smooth , glossy surface with a uniform brownish-amber colour and no visible cracks or defects.

2. Weight Variation : Five lollipop measured individually to determine the weight deviation and average weight of lollipop were calculated.

$$\% \text{ Variation} = \frac{\text{Individual weight} - \text{Average weight}}{\text{Average weight}} \times 100$$

3. PH :

One lollipop dissolved in 10 ml distilled water and tested with PH paper strip or PH meter.

4. Dissolution Time :

Dissolution time means required to dissolve lollipop in mouth . It is tasted with dissolving lollipop in warm water at 37 degree Celsius temperature.

8. RESULT:

Parameter	Observation
Average weight	7.912
PH	5 to 7
Dissolution time	16-17 min
Moisture content	3.07 %

9. Conclusion:

It was observed that polyherbal lollipops prepared for both children and adults are effective for managing cough and other respiratory infections. Their physicochemical characteristics—including taste, pH, smell, and colour—were thoroughly assessed and found satisfactory. The formulation also demonstrated strong stability and compatibility. Therefore, these convenient, patient-friendly polyherbal lollipops can enhance the effectiveness and reliability of therapy.

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