FORMULATION AND EVALUATION OF HARD HERBAL LICORICE LOZENGES USING LICORICE POWDER :A NATURAL APPROACH TO SOOTHING SORE THROAT INFECTION , HEARTBURN AND DIGESTION

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Abstract:

Herbal remedies have been integral to traditional medicine systems for centuries, revered for their multifaceted therapeutic efficacy, favourable safety profiles, and alignment with holistic health approaches. These natural formulations are increasingly gaining global recognition as complementary or alternative options to conventional pharmaceuticals. Among the diverse range of medicinal plants, *Glycyrrhiza glabra*, commonly known as liquorice, occupies a prominent position due to its extensive pharmacological profile. This plant-derived substance is well-documented in scientific and ethnopharmacological literature for its potent anti-inflammatory, antimicrobial, demulcent, and gastroprotective effects. Such properties make liquorice particularly valuable in the management of conditions involving mucosal irritation and inflammation, such as sore throat and gastrointestinal discomfort.

The current study focuses on the formulation and evaluation of hard herbal lozenges incorporating liquorice powder as the primary active ingredient. These lozenges are designed to offer a convenient, patient-friendly dosage form that enables slow dissolution and prolonged contact of the herbal actives with the mucosal surfaces, thereby enhancing therapeutic efficacy. The aim of the study is to develop a natural, safe, and palatable delivery system that addresses common ailments such as throat irritation, acid reflux, and mild digestive disturbances, while promoting the integration of traditional herbal medicine into modern pharmaceutical dosage forms.

Keywords:

Liquorice, Glycyrrhiza glabra, Herbal lozenges, Sore throat, Heartburn, Digestion, Natural remedies, Glycyrrhizin, Gastrointestinal relief, Phytopharmaceuticals

Introduction

In recent years, there has been a growing shift toward natural and plant-based remedies in the treatment and management of various ailments. This trend is largely propelled by concerns over the side effects of synthetic drugs and a growing interest in holistic wellness. Among these natural remedies, herbal lozenges have gained popularity as an effective and convenient dosage form, particularly for soothing throat infections, aiding digestion, and alleviating heartburn. Lozenges are solid, flavoured dosage forms that dissolve slowly in the mouth, allowing for prolonged contact of the active ingredients with the mucosal membranes of the oral cavity and throat. This method of administration not only enhances local effects but also

offers systemic benefits for gastrointestinal discomfort when the ingredients are absorbed through the saliva or swallowed.

Licorice (Glycyrrhiza glabra) is a widely recognized medicinal plant known for its broad spectrum of therapeutic properties. Traditionally used in Ayurvedic and Chinese medicine, licorice root contains glycyrrhizin, flavonoids, and saponins, which contribute to its anti-inflammatory, demulcent, antacid, and antimicrobial effects. These properties make licorice particularly suitable for addressing conditions such as sore throat, cough, indigestion, acid reflux, and mild infections of the upper respiratory tract. Moreover, licorice has been found to help soothe irritated mucous membranes, making it a valuable component in throat-soothing preparations.

The formulation of hard herbal lozenges incorporating licorice powder presents a promising natural alternative to conventional treatments. Unlike syrups or capsules, hard lozenges provide a more palatable and portable option, especially appealing to children and the elderly. The slow dissolution of the lozenge ensures a sustained release of active compounds, enhancing the therapeutic action over time. Additionally, the formulation process can be adapted to include other natural excipients and flavouring agents to improve taste, stability, and effectiveness.

Licorice powder, obtained from the dried roots of Glycyrrhiza glabra, is a well-known herb in traditional medicine systems. It possesses a distinctive sweet flavor and offers multiple therapeutic benefits, including anti-inflammatory, antimicrobial, and demulcent properties. It is commonly used to relieve sore throat, respiratory ailments, digestive discomfort, and symptoms of acid reflux.

Combining jaggery with licorice powder in the formulation of herbal lozenges presents a natural and effective approach to managing throat infections, indigestion, and heartburn, while also providing a palatable and health-enhancing delivery system.

Licorice powder is particularly effective in soothing sore throats, relieving coughs, and treating gastrointestinal disorders like indigestion and acid reflux. Its naturally sweet taste also makes it an ideal herbal ingredient for oral dosage forms such as lozenges. In the formulation of hard herbal licorice lozenges, licorice powder serves a dual role—therapeutic for its health benefits and organoleptic for its pleasant flavour—making it a valuable component in the development of natural remedies for throat and digestive health.

Jaggery is a traditional, unrefined sugar derived primarily from sugarcane or date palm sap. Unlike refined white sugar, jaggery retains essential minerals like iron, magnesium, and potassium, making it a healthier alternative. It is widely used in Ayurvedic formulations due to its natural sweetening properties and its ability to aid digestion, detoxify the liver, and boost immunity.

Licorice powder is particularly effective in soothing sore throats, relieving coughs, and treating gastrointestinal disorders like indigestion and acid reflux. Its naturally sweet taste also makes it an ideal herbal ingredient for oral dosage forms such as lozenges. In the formulation of hard herbal licorice lozenges, licorice powder serves a dual role—therapeutic for its health benefits and organoleptic for its pleasant flavour—making it a valuable component in the development of natural remedies for throat and digestive health.

PLAN OF WORK:

1) LITERATURE SURVEY:

2) SELECTION AND PROCURMENT OF DRUG WITH SUTIABLE EXPICIENT:

- LIQUORICE POWDER

3) SELECTION AND PROCURMENT OF SUTIABLE EXPIENT

4) CHARACTERIZATION OF DRUG:

- Morphological Characteristics
- Microscopical Characteristics
- Macroscopical Characteristics
- Chemical Characteristics

5) FORMULATION OF LOZENGES CONTANING LICORICE POWDER

6) OPTIMIZATION OF PREPARED FORMULATION

1. Hardness Test
2. Friability Test
3. Thickness Test
4. Stability Testing
5. Weight Variation
6. Disintegration Test
7. Dissolution Test

- STORAGE

MATERIAL AND METHOD:

PREFORMULATION STUDY:

MATERIAL:

SR.NO	MATERIAL	USES

01)	Licorice Powder	For Throat Infection, Digestion
02)	Jaggery	Sweetening Agent
03)	Water	As A Solvent

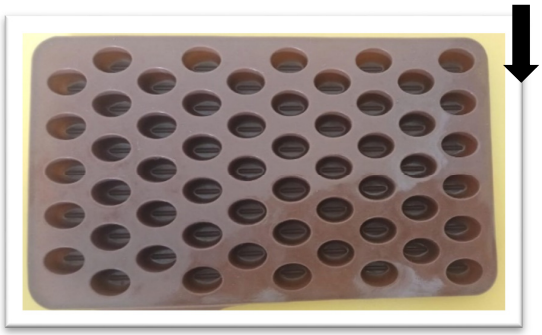
Table No: 01 Raw Material

MATERIAL AND METHOD:

Melting Jagerry



Cooking



Incorporation Of Herbal Ingredients

Moulding

Packaging

Fig No: Formulation of Lozenges

Fig No: Lozenges Mould

EVALUATION PARAMETERS

ORGANOLEPTIC TEST:

The organoleptic properties of the prepared licorice hard candy lozenges were evaluated manually

PARAMETERS	RESULTS
Shape	Oval
Colour	Brown
Texture	Smooth
Test	sweet



Fig. 1: Monsanto Hardness Tester

Table No :03 Organoleptic Test

HARDNESS:

The hardness of ten hard lozenges was measured using a Monsanto Hardness tester. The average hardness and the variation (standard deviation) were calculated and reported in units of kg/cm². The results, including the average hardness, standard deviation, and individual readings, are shown in the table below.

EVALUATION PARAMETERS	(F1)	(F2)	(F3)
Hardness	$18\pm1kg/cm^2$	$14\pm1kg/cm^2$	$12\pm1kg/cm^2$

Table No:04 Hardness Test of Lozenges

Fig No: 10 Monsanto Hardness Test

DIAMETER AND THICKNESS:

The diameter and thickness were measured using a Vernier caliper. These dimensions of the hard candy lozenges are crucial in their production. Three lozenges were randomly selected from the batch, and their thickness and diameter were then measured.

EVALUATION PARAMETRES	RESULT (F1) (mean ±SD) (n=3)	F2	F3
Diameter	10±0.00mm	10.25±0.00mm	12.20±0.00mm
Thickness	12.20±0.00mm	12..26±0.00mm	12.24±0.00mm

Table No:05 Diameter And Thickness Of Lozenges



Fig No: 11 Vernier caliper Test

FRIABILITY:

Friability was assessed using a Roche friabilator. Ten lozenges were weighed and then placed in the friabilator, with all parameters set accordingly. The machine was set to rotate at 25 rpm (100 rotations) for a duration of 4 minutes. After the rotations, the lozenges were removed and reweighed. The maximum allowable mean weight loss for the samples should not exceed 1.0%. The percentage of friability was calculated using the following formula:

$$\% F = \frac{W_0 - W}{W_0} \times 100$$

% F = Friability in percentage,
W_0 = Initial weight of lozenges
W = Final weight of lozenges after revolution



Fig No: 12 Friability apparatus

EVALUATION PARAMETERS	RESULTS (MEAN±SD) (F1)	RESULTS (MEAN±SD) (F2)	RESULTS (MEAN±SD) (F3)
Friability	0.10%	0.9%	0.8%

Table no :06 Friability Test Result Of Lozenges

WEIGHT VARIATION TEST:

A random sample of twenty lozenges from the batch was selected and weighed together. Each lozenge was then weighed individually. The batch is considered to pass the weight variation test if no more than two of the individual lozenges deviate from the average weight by more than the allowable percentage, as specified by the IP limits.

Average weight of tablet (mg)	F1	F2	F3
Less than 80	8% deviation	15% deviation	10% deviation
80-250	3.5% deviation	4.8% deviation	7.5% deviation
More than 250	6% deviation	8% deviation	5% deviation

Table No:07 Weight Variation

DISINTIGRATION TEST OR MOUTH DISSOLVING TIME

The dissolution time of the lozenges was measured using the USP disintegration apparatus. Each lozenge was placed in a separate tube, and the time taken for complete dissolution was recorded. The test was conducted using 900 ml of phosphate buffer at pH 6.8 and 37°C. This procedure

was repeated three times, and the average dissolution time, along with the standard deviation, was calculated and reported.

Evaluation parameters	Result (mean±sd) F1	Result (mean±sd) F2	Result (mean±sd) F3
Disintegration	10min	9 min	11 min

Table No :13 Disintegration Test Result Of Lozenges

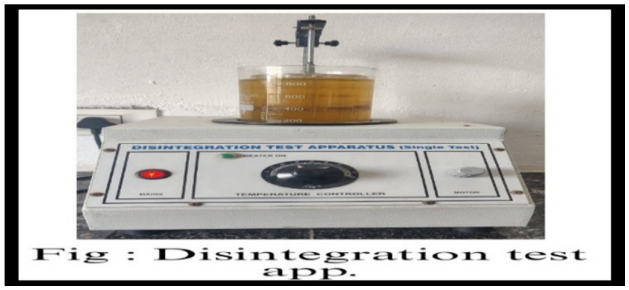


Fig No: Disintegration Test Apparatus

Conclusion:

This study demonstrates the therapeutic promise of hard herbal licorice candy lozenges as a natural remedy for throat infections, digestive discomfort, and heartburn. Licorice root (*Glycyrrhiza glabra*), known for its anti-inflammatory, antimicrobial, and gastroprotective effects, serves as the principal bioactive agent in the formulation. Developed into a convenient lozenge form, it offers targeted and sustained relief, making it a viable alternative to conventional treatments, particularly for those seeking herbal or complementary options.

The optimized lozenge formulation exhibited desirable physicochemical properties, such as uniform weight, appropriate hardness, low friability, and appealing organoleptic characteristics. In vitro dissolution testing confirmed a sustained release of active compounds, supporting prolonged therapeutic action on the oropharyngeal mucosa. The inclusion of excipients like citric acid and peppermint oil enhanced the lozenges' stability, taste, and overall patient acceptability, further contributing to their efficacy.

The study supports the use of licorice based lozenges in managing upper respiratory tract infections, heartburn, and mild gastrointestinal disorders, highlighting the herb's established safety profile and pharmacological benefits. This research exemplifies how herbal pharmacotherapy can be effectively incorporated into modern dosage forms, bridging traditional knowledge with contemporary pharmaceutical practices.

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