FORMULATION AND EVALUATION OF LOZENGES CONTAINING EXTRACTS OF CAPPARIS DECIDUA TO TREAT TOOTHACHE.

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ABSRACT

Objective: this research focused on the formulation and evaluation of lozenges containing extracts of *capparis decidua* to treat toothache.

Methods: the present investigation aims to,prepare and evaluate the medicated hard lozenges of capparis decidua extract for paediatric, geriatric patients. The lozenges were prepared by molding method with, powerderd sugar,capparis decidua extract,corn syrup,mint extract, artificial flavours and colours and other essential excipients. The prepared medicated lozenges were characterized for drug content uniformity, hardness, thickness, weight variation, friability, moisture content, in vitro dissolution by pharmaceutical standard methods.

Keywords: capparis decidua, extracts, herbal lozenges , toothache.

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INTRODUCTION

A lozenge is a solid medication that includes a drug and a flavoring agent. It's designed to dissolve slowly in the mouth, providing either local or systemic effects.(4)The term "lozenge" originates from the French word for a four-sided diamond shape. They can be made using molding or compression techniques, with molded pastilles being one type and troches being compacted lozenges.(5) These have been produced in pharmacies since the twentieth century and are still commercially available.

A lozenge is a potent and solid substance taken orally that dissolves in the mouth or throat. It contains one or more active ingredients and is formulated in a sweet, sugary base.(9) Lozenges are used to treat oral irritation or throat conditions and can also aid in the absorption of drugs into the body. They have both local effects on the throat, such as soothing and cooling, and systemic effects if the medication is absorbed through the buccal linings or ingested.(10)

Lozenges are designed to be placed in the mouth, and buccal lozenges are commonly used due to their size and shape, as they can be positioned between the gums and the cheek. The duration of the lozenge's effect can vary, depending on the individual, but it can last up to 30 minutes. By controlling the rate of dissolution and absorption, patients can regulate the amount of medication delivered each time they use a lozenge. Sucking on the lozenge and increased saliva production can lead to dilution and swallowing of the medication.(11)

These oral preparations are particularly helpful for patients who have difficulty swallowing solid forms of medication or for drugs that require slow release to maintain a continuous dose in the mouth or throat.(12) Lozenges can contain a variety of drugs, including analgesics, sedatives, antihistamines, aromatics, astringents, corticosteroids, anesthetics, antimicrobials, antiseptics, antitussives, decongestants, and demulcents, among others, depending on the specific needs of the patient.(13)

Advantages

1. Easy Administration: Lozenges are simple to administer, making them suitable for both pediatric and geriatric patients who might have difficulty swallowing pills or tablets.

2. Pleasant Taste and Extended Local Activity: Lozenges are formulated with pleasant flavors and sweeteners, making them more palatable for patients. The slow dissolution in the mouth extends the time the drug remains in the oral cavity, allowing for prolonged local activity, which is beneficial for treating throat irritations or localized issues.

3. Buccal Cavity Absorption: Some drugs can be absorbed systemically through the buccal cavity (lining of the cheek), providing an alternative route for drug delivery and avoiding first-pass metabolism in the liver.

4. Minimal Equipment Required: The preparation of lozenges does not require complex equipment, making them relatively easy and cost-effective to produce.

5. Masking Unpleasant Taste: The sweeteners and flavors used in lozenge formulations can effectively mask the unpleasant taste of certain medications, improving patient compliance and acceptance.

6. Versatile Formulation Options: Lozenges can be formulated with a variety of drugs, allowing for a wide range of medications to be delivered using this dosage form, based on the specific needs of the patient.

Overall, lozenges offer several advantages, making them a valuable choice for delivering medications to patients who need local or systemic effects while providing ease of administration and a pleasant experience.

Disadvantages

1.Risk of Mistaken Use as Candy: Lozenges can resemble candies, especially those designed to be appealing with sweet flavors. This could lead to accidental ingestion by children who might mistake them for candy.

2.Caution for Parents: Parents need to be cautious not to associate lozenges with candy and should store them out of the reach of children to prevent accidental ingestion.

3.Incompatibility with Certain Candy Bases: Some drugs may not be suitable for formulation with certain candy bases, such as aldehyde candy bases, as it could affect the drug's stability or effectiveness. For example, benzocaine might not be suitable for lozenges due to potential interactions with the candy base.

4.Heat Stability Requirement: Certain drugs may require heat stability, and the manufacturing process of lozenges involves heating, which may limit the use of heat-sensitive drugs in this dosage form.

5.Age Restrictions: While lozenges are generally easy to administer, they may not be suitable for very young children who might not understand how to use them properly. Age restrictions may be necessary to ensure safe use.

6.Bitter Taste of Drugs: Some drugs have inherently bitter tastes, and masking this taste with sweeteners and flavors in a lozenge formulation might be challenging or not entirely effective.

It is essential to consider these disadvantages while using lozenges as a medication delivery form and take appropriate precautions to ensure their safe and effective use.

Materials and methods

Materials

Stems of the capparis decidua plant were collected directly from the local market of Pandharpur, Maharastra. Powderd sugar corn syrup, mint extract ,artificial flavours and colours were procured from local market . Honey was purchased from the local market. All ingredients were pure and analytical grade.

Extraction of capparis decidua

Plant material can be fresh (for example, a plant stem) or dried. It needs to be crushed, using a pestle and mortar, to provide a greater surface area. The plant material should be sufficient to fill the porous cellulose thimble. To build the extraction apparatus may give them a greater appreciation for the process of extraction. Building a rig using stands and clamps to support the extraction apparatus. Following this, the solvent (250 ml of methanol) is added to a round bottom flask, which is attached to a soxhlet extractor and condenser. The crushed plant materialis loaded into the thimble, which is placed inside the soxhlet extractor. The side arm is lagged with glass wool. The solvent is heated using the isomantle and will begin to evaporate, moving through the apparatus to the condenser. The condensate then drips into the reservoir containing the thimble. Once the level of solvent reaches the siphon it pours back into the flask and the cycle begins again. The process should run for a total of 6-7 hours.

Preparation of lozenges(7,8)

A sugar syrup was made by mixing sugar and water. Powdered sugar was dissolved in a small amount of water and heated to 110°C until it formed a clear viscous syrup. The temperature was then lowered to 90°C, and the drug and other ingredients were added. The mixture was poured into molds to create lozenges. To protect them from moisture, the lozenges were wrapped in aluminum foil and stored in desiccators.

Capparis decidua extract	1gm
Powdered sugar	42gm
Corn syrup	16gm
Water	24ml
Mint extract	1.2ml
Colour and flavour	Q.s

Composition of capparis decidua lozenge

Ingridents	F1	F2	F3	F4	F5	F6	F7	F8
Capparis decidua extract	1gm	1gm	1gm	1gm	1gm	1gm	1gm	1gm
Powdered sugar	39gm	40 gm	41 gm	42 gm	43 gm	44 gm	45 gm	46 gm
Corn syrup	13gm	14 gm	15 gm	16 gm	16.1 gm	16.2gm	16.3 gm	16.4gm
Water	21ml	22ml	23 ml	24 ml	25 ml	26 ml	27 ml	28 ml
Mint extract	0.9ml	1 ml	1.1 ml	1.2 ml	1.3 ml	1.4 ml	1.5 ml	1.5 ml
Colour	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s
Flavour	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s

Evaluation of lozenges

1.determination of organoleptic properties(1)

The determination of organoleptic properties involves a visual inspection of the lozenges to assess their appearance, color, and shape. This evaluation is done to ensure that the lozenges meet the desired visual characteristics and quality standards.The determination of organoleptic properties involves a visual inspection of the lozenges to assess their appearance, color, and shape. This evaluation is done to ensure that the lozenges meet the desired visual characteristics and quality standards.

2.weight variation(1)

Weight variation testing involves randomly selecting ten lozenges from a batch and individually weighing them. The average weight and standard deviation of these ten lozenges are calculated. To pass the weight variation test, no more than two individual lozenges' weights should deviate from the average weight. This test ensures that the lozenges in the batch are consistent in terms of weight, meeting quality and dosage standards.

3.thickness uniformity(2)

In the evaluation process, six lozenges were randomly selected from each batch, and their thickness was measured using vernier calipers.

4.hardness(1)

Hardness or crushing strength (Fo) of a lozenge is the force needed to break it in diametric compression using a Monsanto hardness tester. To determine the hardness for each formulation, six lozenges were tested. The lozenges were held between the two jaws of the tester along their oblong axis. Initially, the reading should be 0 kg/cm². Then, a constant force was applied by rotating the knob until the lozenges fractured. The value noted at this point represents the hardness of the lozenge and is measured in kg/cm². This test provides valuable information about the lozenges' mechanical strength and durability, ensuring their quality and integrity during handling and use.

5.diameter (1,2)

The diameter, size, and shape of lozenges depend on the molds selected. The lozenges of various sizes and shapes can be prepared, but generally, they are circular with either flat or biconvex faces.

6.moisture content(1,2)

By the gravimetric method, 1 g sample was weighed and placed in an oven at 60–70°c for 12–16 h. Final weight was determined to utilize a delicate muslin fabric and its weight was rechecked. Percentage friability is given by the equation.

% f = (initial weight−final weight/initial weight) × 100.

7.drug content (1,2)

A 5 mg of lozenges were placed in 50 ml of phosphate buffer solution of ph 6.8 for 4 h on a rotary shaker. The filtered solution was measured using a uv–visible spectrophotometer

8 friability (3)

Determined by roche friabilator operated at 25rpm for 4min.

9.in vitro dissolution studies (1,2)

Usp apparatus ii (paddle type) was used for the study. Accurately weighed formulations of lozenges were placed in 900 ml phosphate buffer of ph 6.8. The temperature was kept up at 37°c and mixed at a speed of 50 rpm. At 5 min time interval, a 5 ml aliquot of the sample was withdrawn and the volume was replaced with an equal measure of plain buffer kept at 37°c. The obtained samples were filtered (#0.45 μm) and measured at 250 nm using uv–visible spectrophotometer .

10.stability studies (1,2)

The stability studies for lozenges were performed for optimized formulation (f7) at 40°c and 75% rh for 90 days as per ich guidelines. The lozenges were assessed for various parameters such as hardness, weight variation, drug content, moisture content, and drug release according to procedures mentioned previously by analyzing the samples after every 1 month

11.storage: [6] this preparation should be kept out of direct sunlight and out of reach of childrens. It should be kept away from moisture. Room temperature and refrigerator temperature are often advised based on the requirements of both the the drug and the base used in the lozenge formulation. Lozenges should be kept out of reach by the children as per the label instruction.

Packaging of lozenges :

Lozenges are usually hygroscopic in nature hence an involute and multiple packing system

should be used in order to maintain its stability during marketing.. The single unit of lozenge

is to be wrapped in a moisture impervious liner. These wrapped lozenges are then placed in a

tamper proof or water resistant glass, polyvinyl chloride or metal container. Finally, these are

over-wrapped using aluminum foil or by a cellophane sheet.

Application of Lozenges:

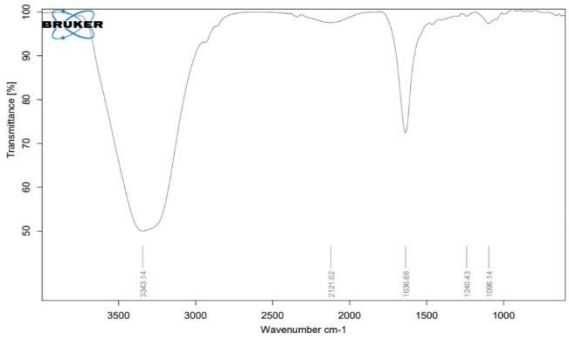
a) Local and systematic illness are commonly treated with lozenges.

b) Oral thrush, sore throat, cough, gingivitis, pharyngitis, decongestants, and other oral and

throat diseases can be treated and relieved by adding a range of medications to them.

c) Lozenges have also been used to distribute medication in a systematic manner forsmoking cessation and pain relief.

Result and discussion :

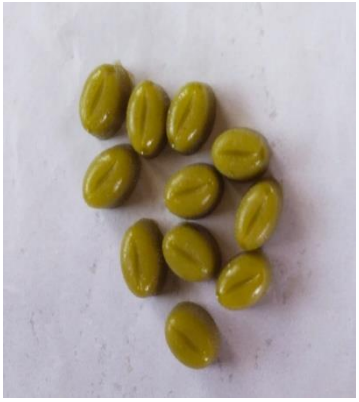


FT-IR results of capparis decidua

Sr.no	Bond	Functional group	Frequency
1	O-h strech	Alchol	3343
2	C≡ c strech	Alkyene	2121
3	C=n=s strech	Isothiocyanate	2121
4	C=c strech	Cyclic alkene	1636
5	C-o strech	Ether	1240
6	C-o strech	Primary alcohol	1096

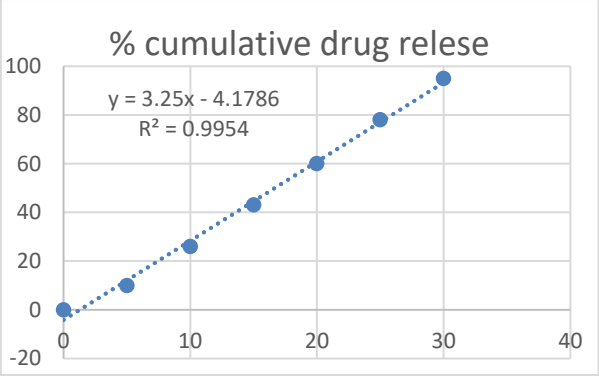
Evaluation of lozenges for post formulation parameters

Formulation	Hardness (kg/cm^2)	Thickness (mm)	Weight (gm)	Diameter (mm)	Drug content %	Friability	Moisture content
F1	10	6.3	3	15.11	98.5	2.91	0.95
F2	10.4	7.5	2.9	15	99.2	2.89	0.91
F3	10.5	6.9	3	14.9	97	2.98	0.88
F4	10.2	6.8	3	15.2	95.88	2.95	0.95
F5	10.3	7.4	3	15.4	98.4	2.97	0.82
F6	11	7.2	2.9	15.6	97.8	2.87	0.93
F7	11	7	3	15.5	98.6	2.95	0.87
F8	10.1	6.4	3	15	96.9	2.87	0.81



Percentage cumulative drug release of formulations F1-F8

Time in min	F1	F2	F3	F4	F5	F6	F7	F8
0	0	0	0	0	0	0	0	0
5	4.68	4.51	6.73	12.68	6.45	7.71	5.36	10.66
10	6.76	7.25	12.07	20.69	9.05	10.99	10.86	17.6
15	17.84	18.43	21.65	37.1	24.97	25.64	23.04	34.7
20	36.94	33.06	38.37	57.38	32.64	44.49	43.14	51.83
25	58.78	65.8	65.29	76.54	71.03	61.7	59.99	71.6
30	98.78	93.8	94.83	99.47	92.41	91.1	92.31	97.76



Stability results of optimized formulation F4

Evaluation parameter	Optimized formulation F4			
	0 day	1 month	2 month	3 month
Hardness	10.9	10.3	10	9.8
Weight	3000.4	3000.3	3000.1	3000.1
% friability	2.50	2.52	2.52	2.52
Drug content	95.8	94.3	94.1	94.6
Moisture content	0.95	0.95	0.94	0.94

Comparative in vitro dissolution data of formulation F4

Time in minute	Cumulative % release of lozenges			
	Initial	1 month	2 month	3 month
5	12.68	11.66	10.8	12.48
10	22.69	20.37	19.74	20.03
15	37.1	36.92	36.21	36.68
30	99.47	98.9	98.87	98.8

Discussion-

The lozenges were prepared using the molding method with various ingredients, including powdered sugar, Capparis decidua extract, corn syrup, mint extract, artificial flavors, colors, and other excipients. The formulated lozenges underwent various characterization tests to ensure their quality and efficacy. These tests included drug content uniformity, hardness, thickness, weight variation, friability, moisture content, in vitro disintegration, and dissolution, all conducted following pharmaceutical standard methods.

An accelerated stability study was performed in compliance with ICH guidelines at elevated temperature and humidity conditions. The study confirmed that there were no significant interactions between the drugs, flavors, and colors, and the prepared formulations remained stable over a seven-week period.

The use of sweeteners and flavors effectively masked the taste of the drugs, making the herbal lozenges more palatable for users. These formulated herbal lozenges showed promising activity against toothache, and they were deemed safe to use with no reported side effects.

The product was found to be eco-friendly and cost-effective. All evaluation tests met the requirements specified in the pharmacopeia (IP - Indian Pharmacopoeia).

After evaluating eight batches, it was determined that Batch No. 4 performed best within the standard limits, making it the optimized batch for further production and distribution.

In conclusion, the formulation of these lozenges was successful, meeting pharmaceutical standards, proving stability, effectiveness against toothache, and ensuring ease of use. Batch No. 4 was selected as the optimized formulation for continued use and marketing.

Conclusion

The formulation of lozenges is a straightforward and efficient process, making it a preferred choice for medication, especially among pediatric patients who find them more organoleptically acceptable. Medicated lozenges are ideal dosage forms for children due to their ease of administration, patient compliance, convenience, and comfort during treatment. They offer additional advantages such as lower doses, immediate onset of action, reduced dosage frequency, and cost-effectiveness.

Lozenges represent an innovative dosage form that holds a significant place in the field of pharmacy. Their popularity is likely to continue in the future, given their positive attributes and benefits in terms of patient experience and treatment outcomes. Overall, lozenges provide a promising and effective solution for administering medications, particularly in pediatric populations.

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