

To Formulate and Evaluate Herbal Lozenges by Using Natural Herbal Ingredients for The Relief of Throat Irritation, Cough, and Related Oral Conditions.

Miss. Prerita S Waghmare¹, Miss. Sadhana G Vaidya², Mrs. Kadam R D³
^{1,2,3}*Prerna Institute of Pharmacy Parbhani*

Abstract—Lozenges are a solid dosage form that is intended to slowly dissolve in the mouth for therapeutic effect. A small usually sweetened and flavored medicated material that is designed to be held in the mouth. This study was carried out to prepare and evaluate herbal lozenges for the relief of flu and common cold symptoms. Flu and cold are very common illnesses that cause sore throat, cough, nasal congestion, and mild fever. Many medicines are available for treatment, but long-term use may cause side effects. Herbal medicines are considered safer and have been used traditionally to treat respiratory problems. In this study, herbal ingredients such as ginger (*Zingiber officinale*), tulsi (*Ocimum sanctum*), licorice (*Glycyrrhiza glabra*), and peppermint (*Mentha piperita*) were selected because they help reduce cough, throat irritation, and inflammation. The lozenges were prepared using sugar and other suitable ingredients to give proper shape, taste, and hardness. The prepared lozenges were tested for weight variation, hardness, thickness, friability, disintegration time, taste, and stability. The results showed that the herbal lozenges had good physical properties, a pleasant taste, and proper release of active ingredients. The study concludes that herbal lozenges can be a safe, effective, and convenient option for relieving flu and cold symptoms. Further studies can be done to confirm their effectiveness in patients.

Index Terms—Polyherbal lozenges, common cold, flu polyherbal, lozenges, formulations, cold & flu

I. INTRODUCTION

A. Definition:

Lozenges are a solid dosage form containing the flavoring and sweetening agents that are intended to dissolve or disintegrate slowly in the mouth or oral cavity." They are most often used for localized effects in the oral cavity and can also show systemic effects if they are well absorbed in the buccal lining and

pharynx. Lozenges are solid preparations that contain one or more medicaments, usually in a flavored, sweetened base, that are intended to dissolve or disintegrate slowly in the mouth. They can be prepared by molding (gelatin and/or fused sucrose and sorbitol base) or by compression of sugar-based tablets. Lozenges are the medicated tablets kept in the mouth until they get dissolved and release the medicament and produce the soothing effect on the throat. Varieties of lozenges are usually used to treat cough and sore throat. Lozenges are dissolved slowly. In the mouth to stop the cough and soothe irritation of the tissues in the throat.

B. Overview of flu and common cold:

Flu (influenza) and the common cold are among the most prevalent upper respiratory tract infections worldwide. Influenza is primarily caused by the influenza virus, while the common cold is most frequently associated with the rhinovirus, along with other respiratory viruses. These infections are characterized by symptoms such as sore throat, cough, nasal congestion, headache, fever, and general malaise. Although usually self-limiting, they cause significant discomfort and can lead to complications, especially in children, the elderly, and immunocompromised individuals.



Fig. no.: 01 cold or flu

Conventional treatments mainly focus on symptomatic relief using antihistamines, decongestants, antipyretics, and cough suppressants. However, increasing interest in natural remedies, reduced side effects, better patient compliance, and growing awareness of traditional medicine systems have led to the development of herbal-based dosage forms such as lozenges.

C. Concept of Herbal Lozenges:

Lozenges are solid, flavored medicated dosage forms intended to dissolve slowly in the mouth. They are designed to deliver active ingredients locally to the oral cavity and throat or systemically after absorption through the buccal mucosa. Herbal lozenges incorporate plant-based active ingredients with therapeutic properties suitable for relieving symptoms of flu and colds.

The slow dissolution of lozenges ensures prolonged contact of active constituents with the throat mucosa, enhancing therapeutic efficacy. This makes them particularly suitable for treating sore throat, cough irritation, and mild infections associated with upper respiratory tract illness.

II. TYPES OF LOZENGES

A. Medicated lozenges:

Medicated lozenges are solid, flavored, and sweetened dosage forms designed to be held in the mouth or pharynx to dissolve slowly, releasing the active ingredients for local and systemic effects.



Fig. no.: 03 Medicated Lozenges

B. non-medicated lozenges:

Non-medicated lozenges are solid oral dosage forms designed to dissolve slowly in the mouth, containing flavorings, sweeteners, and occasionally natural soothing agents like glycerin and pectin rather than active pharmaceutical ingredients.



Fig. no.: 04 non-medicated lozenges

III. CLASSIFICATION OF LOZENGES

Category	Type	Examples
According to Site of Action	Local Effect	Antiseptics, Decongestant
	Systemic Effect	Vitamins, Nicotine
According to Texture & Composition	Chewable	Vitamins
	Hard	Lollipops
	Soft	Bentasil
	Compressed	Troches

Reasons for Herbal Lozenges used in Flu and Cold:

Herbal medicines have been used for centuries in various traditional systems such as Ayurveda, Traditional Chinese Medicine, and Unani. Several medicinal plants possess antiviral, anti-inflammatory, antimicrobial, demulcent, and immunomodulatory properties that are beneficial in managing flu and cold symptoms.

IV. TYPES OF HERBAL LOZENGES

A. Hard lozenges:

Hard candy lozenges are mixture of sugar and other carbohydrates in an amorphous or glassy Condition. Usually, they have a moisture content of 0.5 to 1.5%. Hard lozenges should provide a slow, Uniform dissolution or erosion over 5 to 10 Minutes, not disintegrate, have a smooth surface Texture and pleasant flavor masking the drug taste. Hard candy lozenges generally weigh Between 1.5 to 4.5 gm. The incorporation of corn Syrup solids at a greater than 50% concentration Decreases the graining tendencies which increase Product stickiness and interactions of medicaments. Using greater than 70% sucrose solids tends to Increase graining tendencies and the rapidity of Crystallization. Regular hard candy has a pH of

About 5.0 to 6.0 but with the addition of acidulants, It may be as low as 2.5 to 3.0. Calcium carbonate, sodium bicarbonate, and magnesium trisilicate can be added to increase the lozenge pH to as high as 7.5 to 8.5.

B. Soft Lozenges:

Soft lozenges have become popular because of the ease of extemporaneous preparation and application to a wide variety of drugs. The bases usually consist of a mixture of various polyethylene glycols, acacia materials. They are similar to a historical form of medicaments that is making a comeback: the confection is defined as heavily saccharinated, soft masses containing medical agents. Polyethylene glycol-based lozenges may soften if exposed to high temperature. Storage in a cool, dry place should be recommended.

C. Chewable lozenges:

Soft, chewable candies have been on the Market for a number of years. They are very highly Flavored and many often contain a slightly acidic Taste. The most difficult part involves the Preparation of the gelatin base which is described Below. These are especially used for pediatric Patients and are a very effective means of Administering medicaments for gastrointestinal Absorption and systemic use.

V. AIM AND OBJECTIVE

Aim:

To formulate and evaluate herbal lozenges by using natural herbal ingredients for the relief of throat irritation, cough, and related oral conditions.

Objective:

- To formulate and evaluate herbal lozenges containing natural ingredients for the relief of cold and flu symptoms such as sore throat, cough, and throat irritation.
- To select suitable herbal ingredients with antimicrobial, anti-inflammatory, and soothing properties for cold and flu relief.
- To develop herbal lozenges using appropriate excipients and manufacturing methods.
- To evaluate the physical properties of the formulated lozenges such as hardness, weight variation, thickness, and friability.

- To assess organoleptic properties, including taste, color, and mouthfeel.
- To evaluate the dissolution and disintegration behavior of the herbal lozenges.
- To study the stability of the formulated lozenges under different storage conditions. To determine the antimicrobial activity of the herbal formulation against common throat pathogens.

VI. PLANT PROFILE

1. Glycyrrhiza glabra (Licorice):

- Synonym: licorice root, glycyrrhiza
- Biological name: Licorice consists of dried, peeled, and unpeeled roots and stolons of *Glycyrrhiza glabra* belonging to the family Leguminosae.
- Common name: Mulethi, sweet wood, licorice root
- Chemical constituents: Triterpenes, saponins, and flavonoids.



Licorice

It is derived from the root of *Glycyrrhiza glabra*, a plant in the Leguminosae family, and is known for its distinct flavor. The licorice plant is a perennial legume native to 3 regions. The sweet flavour extracted from the root of *Glycyrrhiza glabra* (Family: Leguminosae) is derived from the licorice plant, a herbaceous perennial legume native to southern Europe and parts of Asia, including India. In India, it is also referred to as "mulethi" and "jestamadhu" and is commonly utilized in the Ayurvedic system of medicine to address respiratory-related ailments. Known for its expectorant and demulcent properties, these benefits are attributed to the presence of glycyrrhethinic acid.

• Uses

- a) Digestive Health: Relieves heartburn, gastroesophageal reflux disease (GERD), and stomach ulcers by increasing mucus production to protect the stomach lining.

- b) Respiratory Relief: Acts as an expectorant and demulcent, thinning mucus and soothing throat irritation to alleviate coughs and asthma.
- c) Skin Care: Topical gels are used for eczema (atopic dermatitis) to reduce itching, redness.

2. Zingiber officinale (Ginger):

- Synonym: zingiber, Rhizoma zingiberis
- Biological source: Ginger consist of a dried or fresh rhizomes of the plant Zingiber officinale Roscoe, belonging to the family Zingiberaceae.
- Common name: Adrak, sunthi, ginger
- Family: Zingiberaceae



Zingiber officinale (Ginger)

Zinger a flowering plant with rhizomes used as a spice and folk medicine, grows as a herbaceous perennial with tall pseudostems. The product is made from the rhizomes of Zinzibe rofficinale (Family: Zingiberaceae), which are peeled to remove the outer skin and then dried under the sun. Ginger primarily contains oleo-resin, known for its aromatic, carminative, and expectorant properties. The active component of fresh ginger is gingerol, which is typically present as a yellow, pungent oil with a spicy-sweet fragrance.

- Uses
- a) Digestive Aid: Ginger stimulates digestive juices, reduces bloating, gas, and eases indigestion.
- b) Nausea Relief: Effectively treats morning sickness, motion sickness, and nausea following surgery or chemotherapy.
- c) Anti-inflammatory & Pain Relief: Contains compounds that reduce inflammation, easing joint pain associated with arthritis.
- d) Immune System Support: Known for its antioxidant properties, it can help protect against illness.

3. Clove:

- Synonym: Clove buds, clove flowers, lavang, laung
- Biological source: Clove consists of dried, unopened flower buds of Syzygium aromaticum Merr. belonging to the family Myrtaceae.
- Chemical Constituents: Eugenol



Clove

On the other hand, are aromatic flower buds from a tree in the Myrtaceae family, specifically Syzygium aromaticum, native to the Maluku Islands in Indonesia. Cloves originate from the Maluku Islands (or Moluccas) in Indonesia and are the fragrant flower buds of the tree Syzygium aromaticum (Eugenia caryophyllus). They are known for their analgesic and antiviral properties, which can be attributed to the presence of eugenol and other compounds found in the flower bud.

- Uses
- a) Dental Health & Oral Hygiene: Clove oil is an effective natural anesthetic for toothaches. It acts as an antibacterial to prevent gum infections, kill germs, and treat bad breath.
- b) Pain Relief: The high eugenol content acts as a powerful anti-inflammatory and antiseptic, providing relief from inflammation and muscle aches.
- c) Digestive Aid: Cloves help alleviate bloating, gas, indigestion, and indigestion by boosting digestive enzymes.
- d) Respiratory Care: Used to alleviate coughing, congestion, and sore throats.

4. Long Pepper:

- Synonym: long Pepper, pippli
- Common name: pippal, pipeline, Lindi pipal
- Family: Piperaceae
- Chemical Constituents: Piperine, piperlongumine



Long pepper

It consists of the dried unripe or nearly ripe fruits of perennial climbing vines (Family: Piperaceae). It is also called long native pepper and pipili in Hindi. In Ayurveda, long pepper is widely used for various formulations because of its wide range of therapeutic applications. It has a taste same to, but hotter than other closely related species of pepper. Pepper is mainly indicated in respiratory disorders in cold, as decongestant, helps in expelling out mucus accumulated in the respiratory Tract, bronchodilator in asthma patients, also in fever.

- Uses
- a) Respiratory Relief: Helps remove phlegm deposits, clears mucus, and relieves congestion digestive.
- b) Health: Improves appetite, eases stomach aches, treats flatulence, and aids in detoxification.
- c) Respiratory Ailments: Frequently used in Ayurveda for managing chronic bronchitis, asthma, and cough.
- d) Pain & Inflammation: Acts as a natural analgesic and anti-inflammatory to reduce arthritis pain, migraines, and muscle soreness.
- e) Metabolic and Liver Support: Helps manage weight by boosting metabolism and protects the liver.

5. Honey:

- Synonym: Madhu, madh, purified honey
- Common name: honey, purified honey
- Family: Apis mellifera
- Chemical Constituents: Fructose, Glucose, protein.



Honey

It is a saccharine fluid (From the nectar of flower). Deposited in the honey comb by the hive bee, Apismellifera, Apisdorsata and other species of Apis (Fam: Apidae). Honey is well known home remedy for dry cough as well as wet cough because of its consistence. It is having soothing effect helps in relieving irritation in the throat.

- Uses
 - a) Cough and Throat Relief: Honey acts as a demulcent, coating the throat and suppressing coughs.
 - b) Wound and Burn Healing: When applied topically, honey promotes healing by acting as an antiseptic, reducing odor, infection, and pain.
 - c) Nutritional Boost: It serves as a natural, more nutritious alternative to processed sugar, containing antioxidants (flavonoids), enzymes, and trace elements.
 - d) Digestive Health: It acts as a prebiotic, nourishing good bacteria in the gut, which helps with constipation and indigestion.
 - e) Skin Care: Used in skincare to nourish, moisturize, and soothe skin due to its anti-inflammatory properties.
 - f) Antioxidants: Contains flavonoids and phenolic acids that protect against oxidative damage.
- Energy Source: Provides a quick source of carbohydrates for energy.

6. Guduchi:

- Synonym: Giloy, vatsadani
- Common name: Giloy, heart leaved moonseed
- Family: Menispermaceae
- Chemical Constituents; Steroids, Glycosides, Alkaloids.



Guduchi

Guduchi consists of dried, matured pieces of stem of *Tinospora cordifolia* (Family- Menispermaceae). It is also known as Giloy which very popular herb in Ayurveda is extensively used in fever and respiratory problems, diabetes, anemia, cardiac disorders etc.

• Uses:

- a) Immunity Booster: Known as an "amrita" (divine nectar), it strengthens the immune system, helping the body fight infections and boosting metabolic health.
- b) Fever Management: Guduchi is highly effective as a febrifuge, frequently used to manage chronic, recurrent fevers, malaria, and dengue.
- c) Anti-inflammatory & Arthritis Management: It acts as a strong anti-inflammatory, easing joint pain, muscle stiffness, and conditions like gout.
- d) Diabetes Control: Known as "Madhunashini" (destroyer of sugar), it helps regulate blood sugar level.

7. Turmeric:

- Synonyms: haldi, Indian saffron, curcuma, rhizoma curcuma.
- Common name: haldi, curcuma
- Family: zingiberaceae
- Chemical Constituents: Curcumine, Curcuminoids.



Turmeric

They are dried rhizomes of *Curcuma longa* (Zingiberaceae). Turmeric is one of the spice widely used in Indian Dishes because of its yellow colour. It possesses antiseptic property hence used for respiratory conditions Like common cold, bronchitis, cough and other upper respiratory problems. It is also protective to skin and hence used in cosmetic products. It contains curcuminoids and curcumin is chief constituents which has many therapeutic applications.

• Uses:

- a) Chronic Inflammation & Pain: Curcumin effectively reduces swelling and is used to treat arthritis (osteoarthritis/rheumatoid arthritis), sometimes providing pain relief comparable to ibuprofen.
- b) Digestive Health: It treats various digestive issues including bloating, gas, indigestion, and Crohn's disease, and aids in liver/gallbladder function.
- c) Cardiovascular Health: It helps manage cholesterol levels (lower LDL) and improves endothelial function (blood vessel health), reducing heart disease risks.
- d) Skin Care: Used topically (mixed with milk or oil), it helps combat acne, dandruff, and skin irritation due to its antibacterial and antiseptic properties.

8. Vasaka:

- Synonym: Adulsa, Arusha, vasa
- Common name: Adulsa, adhatoda
- Botanical name: *Justicia adhatoda*
- Family: Acanthaceae
- Chemical Constituents: Alkaloids, vasicine



Vasaka

It consists of the fresh and dried leaves of *Adhatoda Vasica* (Family: Acanthaceae). Vasaka is an important Ayurvedic medicinal herb. The entire parts of the plant

from roots to leaves are used to treat many diseases. Leaves of the plant have great importance in the treatment of asthma, bronchitis, tuberculosis and other it is very good mucolytic. Vasaka contains vasicine which has mucolytic property used in various herbal expectorant formulations.

• Uses:

- Respiratory Care:** Used in treating chronic bronchitis, asthma, and whooping cough by aiding in mucus removal and relaxing bronchial muscles.
- Cough & Cold Relief:** Acts as a bronchodilator and expectorant, reducing throat irritation and managing congestion.
- Antimicrobial and Anti-inflammatory:** Contains compounds like vasicine and vasicinone that exhibit anti-inflammatory effects and help combat infections.
- Ayurvedic Applications:** Utilized to treat jaundice, skin conditions (due to antibacterial properties), and to reduce bleeding (styptic properties).

VII. MATERIAL AND METHOD OF PREPARATION

7.1 Ingredients for formulation

A. Active Ingredients:

- 1) *Justicia adhatoda* (Vasaka) leaf powder
- 2) *Zingiber officinale* (Ginger) powder
- 3) *Curcuma longa* (Turmeric) powder
- 4) *Piper longum* (Long pepper) powder
- 5) *Syzygium aromaticum* (Clove) powder
- 6) *Tinospora cordifolia* (Guduchi) stem powder

B. Base / Binding Agent:

- 1) Pure Honey

C. Equipments:

- 1) Mortar and pestle or grinder
- 2) Stainless steel bowl
- 3) Spatula
- 4) Measuring balance
- 5) Sieve (80 mesh)
- 6) Molds or hand-rolling surface
- 7) Butter paper

SR. NO	INGREDIENTS	QUANTITY
1.	Vasaka leaf powder	5 gm
2.	Ginger powder	5 gm
3.	Turmeric powder	3 gm

4.	Long pepper powder	2 gm
5.	Clove powder	1 gm
6.	Guduchi stem powder	4 gm
7.	Binding agent (honey)	10 gm
8.	Jaggary	20 gm

7.2 Methods of Preparation

Step I:

Firstly, jaggery and sugar were dissolved in little water till a sufficient consistency was obtained.



Addition Of Jaggery

Step II:

In another container little water was added and all the herbs were added and mixed thoroughly and finally filtered.



Weighing of all herbs

Step III:

Sugar and jaggery Syrup was poured in the beaker containing the filtered Herbal juice. Honey was added. The mixture was heated with constant stirring until it reached a temperature of 150°C.



Mixing of all herbs

Step IV:

The preparation was then removed from heat And was poured on a lozenge mold to get lozenges of Ideal size. The mold was allowed to cool and harden at Room temperature. After cooling the hard lozenges were Tossed over powdered sugar to avoid getting sticky in Humidity.



Pouring into moulds

Step V:

The sugar powder tossed lozenges are stored in a wide mouthed air tight container in a cool place.



Formulated Lozenges

Step VI:

Honey was used for both the formulation to produce soothing effect on throat.



VIII. EVALUATION TEST

1. Organoleptic test:

Colour	Brownish yellow
Odour	Slightly aromatic
Taste	Organoleptic
Diameter	18-24mm
Texture	non-greasy

2. Hardness test

The Hardness testing was done by using Monsanto type tablet hardness tester for sampled lozenges and average hardness was determined and the results were indicated as 20 kg/sq. cm.

3. Monsanto hardness tester

Batch	Hardness (kg/cm ²)
F1	8.5
F2	9.2
F3	7.8

3. Friability

The friability of the prepared Lozenges was determined with a Friability Test Apparatus of Veego. Twenty Lozenges were collected at random and weighed on a precision balance (Metler Toledo, USA). Lozenges were placed into drums of the Apparatus which is then set for 100 revolutions. After the test the lozenges were deducted a Weighed again. The % friability was calculated



Friability test apparatus

The Roche Fabricator is utilized to assess the friability of formulated pastilles. It operates by rotating at a speed of 25 RMP for a duration of approximately 4 minutes. Initially, 20 lozenges are weighed. After the 4-minute rotation, the lozenges are removed, dusted, and weighed again. The obtained value is expected to be below 1%. The % brittleness is then calculated based on a predetermined plan. The analysis revealed that the percentage of lozenge friability ranged from $1.79 \pm 0.015\%$ to $2.14 \pm 0.003\%$.

4. Disintegration time-

Disintegration test of the prepared lozenges was performed according to monographic procedure given in USP34, using A disintegration tester in phosphate buffer (pH 6.2) maintained at $37 \pm 0.5^\circ\text{C}$ as disintegration medium. Six lozenges were placed in the cylindrical glass and the time required for Complete disappearance of a lozenge or its Particles from the tester net was recorded as Disintegration time.

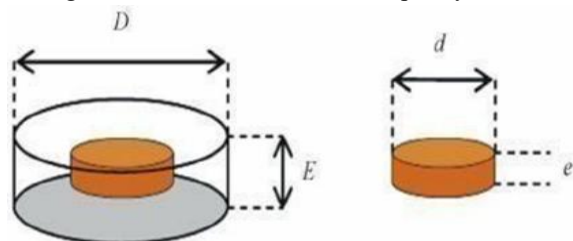


Disintegration test apparatus

Batch	Disintegration Time (min)
F1	12
F2	15
F3	10

5. Diameter and thickness

Diameter of the lollipop is significant for uniformity of lozenges size. It is often measured using vernier Callipers. The extent to which the diameter of the lozenges deviated from $\pm 5\%$ of the quality value.



Diameter and thickness

Diameter: $\sim 5.0\text{-}6.0\text{ cm}$

Thickness: $\sim 1.5\text{-}2.0\text{ cm}$

IX. RESULT AND DISCUSSION

The herbal ingredients selected (e.g., ginger extract, turmeric, licorice, clove, long pepper, liquorice, vasaka, and honey powder) showed good compatibility with excipients such as sucrose, glucose syrup, and binding agents. No significant color change, odor alteration, or precipitation was observed during compatibility testing, indicating absence of interaction.

Moisture content of herbal powders was within acceptable limits (generally $<5\%$), ensuring stability and preventing microbial growth. Flow properties (angle of repose, bulk density, tapped density) indicated fair to good flow, suitable for compression or molding methods.

A. Formulation of Lozenges:

Several batches (F1–F3) were prepared by varying concentrations of: Herbal actives

Sweetening agents

Binding agents

1. Organoleptic characters:

Formulated herbal lozenges are brownish in colour, slightly aromatic odour having organoleptic taste, 18-24 cm diameter and having non-greasy texture.

2. Hardness:

Batch	Hardness (kg/cm ²)
F1	8.5
F2	9.20
F3	7.8

3. Weight Variation

Average weight was maintained at 50 ± 2 g, indicating acceptable uniformity for a nonconventional dosage form. Slight variation occurred due to manual pouring or compression of large units.

4. Disintegration test:

Batch	Disintegration Time (min)
F1	12
F2	15
F3	10

5. Dimensions (Diameter & Thickness):

- Diameter: $\sim 5.0 - 6.0$ cm
- Thickness: $\sim 1.5 - 2.0$ cm

6. Friability test:

The Roche Fabricator is utilized to assess the friability of formulated pastilles. It operates by rotating at a speed of 25 RMP for a duration of approximately 4 minutes. Initially, 20 lozenges are weighed. After the 4-minute rotation, the lozenges are removed, dusted, and weighed again. The obtained value is expected to be below 1%. The % brittleness is then calculated based on a predetermined plan. The analysis revealed that the percentage of lozenge friability ranged from $1.79 \pm 0.015\%$ to $2.14 \pm 0.003\%$.

X. SUMMARY & CONCLUSION

Lozenges are organoleptically accepted formulation by the pediatric patients and having dysphagia. Poly herbal lozenges have developed with 6 different herbs. The various measure taken for qualitative analysis and physical parameters of finished product are in compliance with the standard mentioned in GMP guidelines and requirements simultaneously supporting the impression of poly herbal lozenges which can compete with standard lozenges available in market. The study reveals that the lozenges are suitable dosage form for cold and flu for the symptomatic relief of cold and flu. The lozenges for cold and flu all the parameters and was found to be

more effective in the treatment of cold and flu. The standardization which provides a specific and rapid tool for setting the quality Standard identity and reproducibility in herbal lozenges for cold and flu.

REFERENCES

- [1] "Lozenges and Pastilles, Prolonged Medication from Palatable Preparations," Royal Pharmaceutical Society, Information Sheet 4.
- [2] D. Peters, "Medicated Lozenges," in *Pharmaceutical Dosage Forms: Tablets*, 2nd ed., H. A. Lieberman, L. Lachman, and J. B. Schwartz, Eds. New York, NY, USA: Marcel Dekker, Inc., 2005, pp. 419–577.
- [3] R. W. Mendes and H. Bhargava, "Lozenges," in *Encyclopedia of Pharmaceutical Technology*, 3rd ed., J. Swarbrick, Ed. North California, USA: Informa Healthcare Inc., 2006, pp. 2231–2235.
- [4] P. Batheja, R. Thakur, and B. Michniak, "Basic Biopharmaceutics of Buccal and Sublingual Absorption," in *Enhancement in Drug Delivery*, E. Touitou and B. W. Barry, Eds. London, U.K.: CRC Press, Taylor and Francis Group, 2006, p. 189.
- [5] A. Chauhan, V. Chauhan, and A. Nautiyal, "A Review: Health Benefits of Herbal Plants in Nutraceuticals," *Asian Journal of Pharmacy and Technology*, pp. 277–281, 2022, doi: 10.52711/2231-5713.2022.00045.
- [6] V. Sharma, S. Singh, A. Dixit, and A. Saxena, "Formulation and evaluation of herbal cough syrup from seeds extract of hedge mustard," *International Journal of Research in Pharmacy and Chemistry*, pp. 1–10, 2020, doi: 10.33289/IJRPC.10.1.2020.10(3).
- [7] N. Choudhary and B. S. Sekhon, "An overview of advances in the standardization of herbal drugs," *Journal of Pharmacy Education and Research*, pp. 55–70, 2011.
- [8] S. G. Valecha, C. C. Dongaonkar, and S. N. Dhole, "Formulation and Evaluation of Herbal Emulgel: A Review Article," *Asian Journal of Pharmacy and Technology*, pp. 297–303, 2023, doi: 10.52711/2231-5713.2023.00053.
- [9] M. Wink, "Modes of Action of Herbal Medicines and Plant Secondary Metabolites," *Medicines*, pp. 251–286, 2015, doi: 10.3390/medicines2030251.

- [10] K. R. Kritkar and B. D. Basu, *Indian Medicinal Plants*, vol. 1. India: Periodical Experts, 1935, p. 1186.
- [11] A. K. Nadkarni, *Indian Materia Medica*, vol. 1. Bombay, India: Popular Book Depot, 1989, p. 1186.
- [12] R. Rastogi and B. Mehrotra, *Compendium of Indian Medicinal Plants*, vol. 2. New Delhi, India, 1991, p. 1234.
- [13] S. S. Agarwal and M. Prabhadevi, *Herbal Drug Technology*, 1st ed. Universities Press, 2007, pp. 2–3.
- [14] C. Panati, *Panati's Extraordinary Origins of Everyday Things*. New York, NY, USA: Harper and Row, 1989, pp. 258–260.
- [15] Birader, "Formulation and evaluation of chewable tablets," *International Journal of Pharmacy and Pharmaceutics*.
- [16] D. Bhowmik, C. Pankaj, K. K. Tripathi, M. R. Chandira, and K. P. S. Kumar, "Zingiber officinale: The herbal and traditional medicine and its therapeutically importance," *Research Journal of Pharmacognosy and Phytochemistry*, vol. 2, no. 2, pp. 102–110, 2010.
- [17] R. Deepak and S. Sanjay, "Formulation and Evaluation of Antianthelmintic Chewable Tablet," *IntPharmaSciencia*, 2012.
- [18] T. Lieu, M. Kollarik, A. C. Myers, et al., "Neurotrophin and GDNF family ligand receptor expression in vagal sensory nerve subtypes innervating the adult guinea pig respiratory tract," *American Journal of Physiology-Lung Cellular and Molecular Physiology*, vol. 300, no. 5, pp. 790–798, 2011.
- [19] B. Singh and R. A. Sharma, "Pyrroloquinazoline alkaloid from the tissue cultures of *Adhatoda vasica* and their antioxidant activity," *AJPCT*, vol. 299, no. 3, 2014.
- [20] J. Rahul, "An ethnobotanical study of medicinal plants in Taindol village, district Jhansi, region of Bundelkhand, Uttar Pradesh, India," *Journal of Medicinal Plants Studies*, vol. 1, no. 5, 2013.
- [21] D. Rajanna, M. H. Rajkumar, and A. N. Sringeswara, "Ex-situ conservation of medicinal plants at University of Agricultural Sciences, Bangalore, Karnataka," *Recent Research in Science and Technology*, vol. 3, no. 4, 2011.
- [22] S. Hussain and D. K. Hore, "Collection and conservation of major medicinal plants of Darjeeling and Sikkim Himalayas," *Indian Journal of Traditional Knowledge*, vol. 6, no. 2, pp. 352–357, 2007.
- [23] J. N. Dhuley, "Antitussive effect of *Adhatoda vasica* extract on mechanical or chemical stimulation-induced coughing in animals," *Journal of Ethnopharmacology*, vol. 67, pp. 361–365, 1999.
- [24] M. E. Houssen, A. Ragab, A. Mesbah, et al., "Natural anti-inflammatory products and leukotriene inhibitors as complementary therapy for bronchial asthma," *Clinical Biochemistry*, vol. 43, pp. 887–890, 2010.
- [25] *Handbook of Pharmaceutical Excipients*. Pharmaceutical Press, 2009.
- [26] C. O. Esimone, F. B. C. Okoye, D. C. Odimegwu, C. S. Nworu, P. O. Oleghe, and P. W. Ejogha, "In vitro antimicrobial evaluation of lozenges containing extract of garlic and ginger," *International Journal of Health Research*, vol. 3, no. 2, pp. 105–110, 2010.
- [27] "Developing Treatments with Controlled Drugs. Part One: Cannabis, Coca, and Cocaine," *Museum of the Royal Pharmaceutical Society*, 2011.
- [28] T. Phaemachud and S. Tuntarawongsa, "Clotrimazole soft lozenges fabricated with melting and mold technique," *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, vol. 1, no. 4, pp. 579–586, 2010.