

RESEARCH ON FORMULATION AND DEVELOPMENT OF HERBAL INHALER SOLUTION

Prasad S. Dighe^{*1}, Pramod S. Godge^{*2}, Avdhut V. Gunjal^{*3}, Om S. Satpute^{*4},
Mahesh R. Khemnar^{*5}

^{*1,2,3,4,5}Student Of Ashvin College Of Pharmacy, Manchi Hill, India.

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ABSTRACT

Excessive mucous secretion in the respiratory tract is a common pathological feature in various respiratory disorders, including asthma, chronic obstructive pulmonary disease (COPD), and cystic fibrosis. The aimed of this project is to developing formulation to decrease mucous secretion in the respiratory tract, thereby alleviating symptoms and improving the quality of life for affected individuals. Utilizing the knowledge, the project will explore potential therapeutic targets and interventions to modulate mucous secretion. Strategies may include pharmacological approaches targeting specific receptors or enzymes involved in mucin synthesis and secretion, as well as novel drug delivery systems to directly target mucin-producing cells within the respiratory tract.

Furthermore This project proposes to formulate the formulation by using chemical constituent of Ajwain (*Trachyspermum ammi*) and ginger (*Zingiber officinale*) extracts in reducing mucous secretion in the respiratory tract. Both Ajwain and ginger have been traditionally used in various cultures for their medicinal properties, including their purported ability to alleviate respiratory symptoms. Ajwain and ginger contain active compounds such as thymol and gingerol, which have antiinflammatory and expectorant properties.

Thymol in ajwain acts as a bronchodilator, helping to widen the airways and reduce congestion. Gingerol in ginger works as an expectorant, promoting the expulsion of mucus from the respiratory tract. Additionally, both herbs have antimicrobial properties that may help fight respiratory infections, further aiding in reducing mucous secretion. The outline of this formulation is to proposed methodology, which is assess the impact of Ajwain and ginger extracts on mucous production and secretion.

This project seeks to provide valuable insights into the potential use of Ajwain and ginger extracts as natural therapeutics for managing respiratory conditions characterized by excessive mucous secretion. Overall, this project aims to contribute to the development of effective therapeutic strategies for reducing mucous secretion in the respiratory tract, thereby improving respiratory health and quality of life for individuals with respiratory disorders.

Keyword: Respiratory Relief, Reduce A Mucus Secretion.

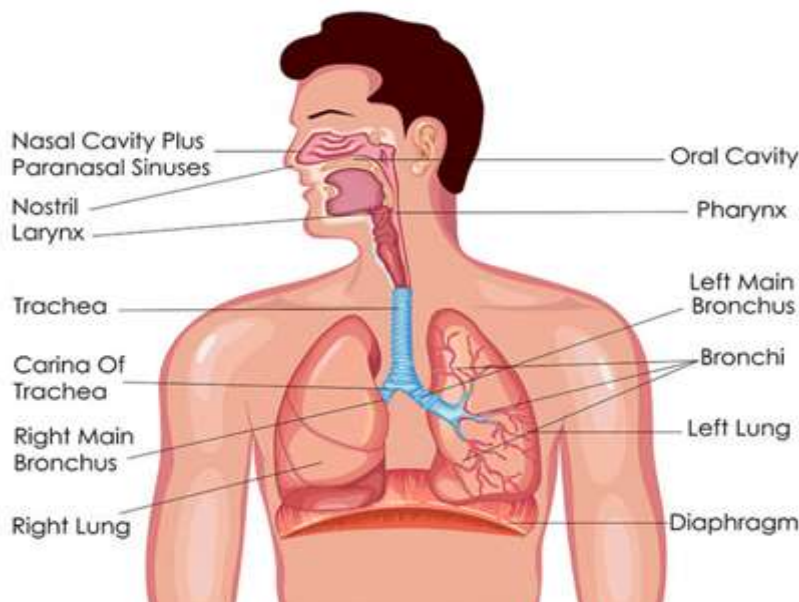
I. INTRODUCTION

Respiratory System

The respiratory system is a vital part of the human body responsible for the exchange of gases between the air we breathe and our bloodstream. It ensures that our cells receive oxygen for energy production while removing carbon dioxide, a waste product of metabolism. Comprising the nose, nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles, and lungs, the respiratory system facilitates the intake of air, its purification, humidification, and transport into the lungs where gas exchange occurs.

The primary functions of the respiratory system include breathing (the mechanical process of inhaling and exhaling), gas exchange (the transfer of oxygen from inhaled air into the bloodstream and the removal of carbon dioxide from the bloodstream into exhaled air), and maintaining acid-base balance in the body. Overall, the respiratory system ensures that our bodies receive the oxygen necessary for survival and removes waste gases, playing a critical role in maintaining homeostasis.

Respiratory System



II. LITERATURE REVIEWS

SR. NO	TITLE	AUTHOR	SUMMARY
1	Chemical Composition of Trachyspermum ammi L. And Its Biological Properties	Kk Chahal, K Dhaiwal, A Kumar, D Kataria, N Singla	Trachyspermum ammi L. exhibits a wide array of pharmacological properties with potential therapeutic benefits for various health condition
2	Chemical constituents and biological activities of zingiber officinale	Dr. Abida Sultana Sathi	Ginger (<i>Zingiber officinale</i>) contains a variety of bioactive compounds that contribute to its pharmacological properties and health benefits. Some of the key chemical constituents found in ginger include: gingerol, shogaols, zingerone, paradols, terpenes etc. These bioactive compounds work synergistically to provide ginger with its diverse pharmacological properties and health benefits.
3	Chemical Composition and Biological Activities of Eucalyptus globulus Essential Oil	Cmiková. N. Galovičová, ˇ L. Schwarzová, M. Vukic M. D.vukovic, N.L.Kowalczewski, P.Ł. Bakay, L. Kluz, M.I. Puchalski, C. Kacániová M.	Eucalyptus essential oil, extracted from the leaves of the eucalyptus tree, contains a variety of bioactive compounds that contribute to its pharmacological properties and potential therapeutic benefits for various health conditions. Some of the key chemical constituents found in eucalyptus essential oil include: Eucalyptol (1,8-cineole), α -Pinene and β -pinene, α -Pinene and β -pinene etc.
4	An extraction and utilization of	Darshankumar bhingaradiya 1	It is primarily used to treat flatulence, atonic dyspepsia, diarrhoea, abdominal

	essential oil from ajwain (Trachyspermum ammi L.) Seed	, Subhajit Ray 2	tumours, stomach discomfort, piles, and bronchial difficulties. It is also used to treat amenorrhea, asthma and appetite deficiency. Ajwain possesses of significant antibacterial, antifungal, antimicrobial and antioxidant characteristics and activities. different extraction methods including conventional as e.g. steam distillation, hydrodistillation, solvent extration etc. and non-conventional e.g. Microwave assisted extraction (MAE), Supercritical Fluid Extraction (SCFE) and Pulsed Electric Field (PEF) etc. based upon latest research finding.
5	Extraction of Ginger Oil Using Different Methods And Effect of Solvents, Time, Temperature To Maximize Yield	Resham Kanadea, D. S. Bhatkhandeb	Ginger can be extracted using a variety of methods such as Soxhlet Extraction, Ultrasound assisted extraction, and autoclave agitator etc. Optimal extraction conditions: at temp 80oC, at a 60 min extraction time. This study applied that acetone is better solvent and soxhlet extraction is better method to determine optimum extraction conditions for fresh ginger to produce a high yield of ginger oil.
6	Extraction of Essential Oils:Eucalyptus Oil Extraction Techniques And Methods	Rahul Khandge, Sushank Sane, Nikhil Khatri, Nitin Satao.	Extraction of eucalyptus oil by Soxhlet method
7	Preparation and evaluation of herbal nasal spray	Virali J Parmar, Yashraj Sinh Y Jadeja and Aanju Bhandole.	To evaluate different methods to prepare herbal nasal spray.

III. PLANT PROFILE

1) AJWAIN

Synonyms: Bishop's weed, Ajwain, Ajma, Ajmo, Yavan.

Biological name: *Trachyspermum ammi L.*

Family: Apiaceae .



part of ajwain

Organoleptic characteristics:

1) Color : Ajwain seeds are typically brownish-green to olive-green in color.

- 2) Odor : Ajwain seeds have a strong, pungent aroma, often described as similar to thyme or cumin but with a more intense, peppery scent.
- 3) Taste: They have a sharp, slightly bitter taste with a hint of thyme-like flavor and a lingering heat.
- 4) Texture: The seeds are small and oval-shaped, with a ridged surface texture.

Uses of Ajwain:

- 1) Relief from congestion: Ajwain has expectorant properties that help in clearing congestion from the respiratory tract, making it easier to breathe.
- 2) Cough relief: Its antitussive properties make ajwain effective in relieving cough by soothing the throat and reducing irritation.
- 3) Antimicrobial effects: It possesses antimicrobial properties that can help fight respiratory infections caused by bacteria or viruses.
- 4) Bronchitis treatment: Ajwain is often used in traditional medicine to treat bronchitis due to its ability to reduce inflammation and promote expectoration.
- 5) Sinus relief: Inhaling steam infused with ajwain seeds can help relieve sinus congestion and pressure.

2) GINGER

Synonyms:- Gingerin, Rhizoma zingiberis, Zingibere, Ginger Officinale

Biological name:-*zingiber officinale*

Family:-zingiberaceae

Chemical constituents:-Zingerone,shagols,paradol,gingerol,1-dehydro-10-gingerbione,terpenoids.



plant of ginger

Organoleptic Characteristics:

- 1) Appearance: Ginger root has a rough, tan-colored skin with light brown undertones. It is elongated and knobby in shape, with thin branching roots.
 - 2) Aroma: Ginger has a strong, spicy aroma that is warm, pungent, and slightly sweet.
 - 3) Flavor: The flavor of ginger is bold and zesty, with a spicy kick and a slightly sweet undertone.
- Texture: Fresh ginger has a firm and fibrous texture, while dried ginger is brittle and crunchy.

Uses:

- 1) Expectorant: Ginger helps in loosening mucus from the lungs and throat, making it easier to expel.
- 2) Anti-inflammatory: Ginger contains compounds with anti-inflammatory properties that may help reduce inflammation in the respiratory tract, easing symptoms of conditions like asthma and bronchitis.

3) EUCALYPTUS

Synonym :- Dinkum oil, lemon gum tree, Blue gum tree

Biological name:-*Eucalyptus globulus*

Family:- Myrtaceae

Organoleptic Characteristics:

- 1) Appearance: Eucalyptus plants are evergreen trees or shrubs with a distinctive appearance. They typically have smooth, peeling bark that reveals patches of green, gray, or brown underneath.
- 2) Aroma: The aroma of eucalyptus is strong, refreshing, and invigorating, with a distinctive medicinal scent
- 3) Flavor: Eucalyptus leaves have a bitter, astringent taste with a cooling sensation, similar to menthol
- 4) Texture: The texture of eucalyptus leaves is leathery and smooth, with a slightly waxy surface

Chemical Constituents :-

- 1) Cineole (eucalyptol, 70-85%)
- 2) Citronellal
- 3) Terpenes:- pinene, camphene, phellandrene
- 4) Polyphenolic acid :- caffeic acid, gallic acid
- 5) Flavanoids :- Eucalyptin, Rutin

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Plant Of Eucalyptus



Uses :-

- 1) Expectorant
- 2) Decongestant
- 3) Anti-inflammatory
- 4) Bronchodilator
- 5) Cough suppressant

4) CAMPHOR TREE

Synonyms: camphor tree, camphrier, baume anglais, kampferbaum, alcanfor, long nao (Vietnam); kapur (trade name).

Biological Name: *Cinnamomum camphora*

Family: Lauraceae

Chemical Constituent:

- 1) Camphor
- 2) Linalool
- 3) Cineole

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Plant of camphor tree

IV. METHOD OF PREPARATION

1. Preparation of Workspace:

Firstly we cleaned and sanitize the workspace, including all equipment and surfaces, to ensure a sterile environment.

2. Gather Equipment and Ingredients:

In this we collect all necessary equipment, including measuring instruments, mixing vessels, syringes or pipettes for filling container, and the specified ingredients: ginger oil, menthol, ajwain oil, eucalyptus oil, and liquid Bhimaseni Kapoor.

3. Weigh and Measure Ingredients:

We used Micropipette and weighing Balance for accurate volume and weight of ingredient, We measured the required quantities of each ingredient as follows:

- Ginger oil: 0.33 ml
- Menthol: 4.2 ml
- Ajwain oil: 1.30 ml
- Eucalyptus oil: 3.17 ml
- Liquid Bhimaseni Kapoor: 1.00 ml

4. Mixing Process:

By using clean mixing vessel we combined the measured quantities of ginger oil, menthol, ajwain oil, eucalyptus oil, and liquid Bhimaseni Kapoor and Stir the mixture thoroughly using a sterile stirring rod or spoon for uniform distribution of all ingredients.

Adjust Consistency: In this we adjust the consistency of the mixture by adding small amounts of carrier oil or other suitable substances until the desired texture is achieved.

5. Filling Container:

With the help of sterile syringe or pipette we carefully filled each 2ml container with the prepared mixture. Take care for avoid spillage or contamination during this process.

6. Sealing Container: We Sealed each filled container. This involved using a flame to melt the container neck or applying a pre-made sealing material.

7. Labeling:Label

On the container we mentioned the product name, list of ingredients, dosage instructions, and warnings or precautions. After this we make sure that the labeling is clear and legible.

8. Packaging and Storage:

Place the sealed container is stored in a clean, sterile packaging container. Store the packaged Container in a cool, dry place away from direct sunlight to maintain product stability.

9. Evaluation of herbal inhaler solution:

In this we performed different type of evaluation test for inhaler solution like Organoleptic test, pH test, Container Compatibility test etc.

V. EVALUATION TEST

1) Organoleptic Test :

Objective: The objective of the organoleptic test is to evaluate the sensory attributes of the herbal solution, including its appearance, color, odor, and overall acceptability, ensuring it meets consumer expectations and provides a pleasant user experience.



a) Appearance:

The herbal formulation presents a clear, pale yellow solution devoid of any visible particles, ensuring purity and quality

b) Color:

The solution displayed a normal pale yellow color, suggesting its herbal composition and natural origin.

c) Odor:

Herbal formulation emitted a refreshing aroma characterized by the invigorating scents and creating a harmonious blend of natural fragrances.

d) Taste:

The taste of the herbal formulation :

1. Cooling: Menthol and eucalyptus oil is imparted a cooling sensation.
2. Spicy: Ajwain oil and ginger oil is contributed for a spicy or pungent taste.

e) Texture:

The texture of the formulation is smooth and slightly viscous, providing a pleasant mouth feel upon consumption. Also it giving the cooling sensation from ingredients like menthol and eucalyptus oil enhanced the overall sensory experience.

2) pH Testing

Objective: Ensure the formulation has a pH that is compatible with nasal mucosa.

- The evaluation test of pH for the solution was performed by using the Digital pH meter.



3) Sterility Test :

Objective: The objective of the sterility test for the formulation is to verify that the product is free from viable microorganisms. This test is essential to ensure the safety and efficacy of the product.

- No microbial growth is observed after the specified incubation period, the herbal formulation is sterile. This indicates that the product is free from viable microorganisms and meets sterility requirements for safe use.

4) Viscosity Testing

Objective: Determine the flow characteristics of the liquid.

- Ostwald Viscometer is used for determination of viscosity of Inhaler solution.

VI. RESULT

The formulated solution is well-balanced blend of herbal extracts with beneficial respiratory benefits. Due to the extract of eucalyptus, ajwain, ginger, camphor, and menthol the solution is provided symptomatic relief for respiratory issues, such as congestion, cough, or asthma. The inhaler solution is having pleasant aroma, non-toxic, safe for inhalation and it is also effective for improving breathing and relief from symptoms of cold and cough. The formulated inhaler solution is pure, effective and absence of contaminants.

Sr.no	Parameters	Observations
1	Color	pale yellow color
2	Odor	Characteristic
3	Taste	Spicy and Cool
4	Texture	slightly viscous
5	Sterility Test	No microbial growth is observed
6	pH Testing	pH is 6.6
7	Viscosity Testing	1.1 mPa.s
8	Irritation test	No irritation is Caused
9	Compatibility Testing	Formulation is Compatible with container

VII. CONCLUSION

The formulation of a herbal nasal spray utilizing menthol, ajwain oil, ginger oil, eucalyptus oil, and Bhimseni Kapoor presents a promising approach for alleviating nasal congestion and reducing mucus in the respiratory tract. The combination of these natural ingredients offers potential benefits in terms of their decongestant, expectorant, and antimicrobial properties.

The inclusion of menthol provides a cooling sensation and helps to open up nasal passages, facilitating easier breathing. Ajwain oil, with its carminative and bronchodilator properties, may aid in relieving respiratory congestion. Ginger oil, known for its anti-inflammatory and immune-boosting properties, could help reduce inflammation in the respiratory tract. Eucalyptus oil, renowned for its decongestant and antimicrobial effects, may assist in clearing nasal passages and fighting respiratory infections. Finally, Bhimseni Kapoor (Camphor) possesses expectorant properties and can help soothe respiratory discomfort.

The method of preparation outlined ensures the proper integration of these ingredients to create a safe and effective herbal formulation. Diluting the essential oils with distilled water helps to prevent irritation and ensures gentle application to the nasal passages. The storage of the nasal spray in the refrigerator maintains its freshness and prolongs its shelf life.

While herbal remedies offer a natural alternative for respiratory congestion, it's essential to exercise caution and discontinue use if any adverse reactions occur. Further research and clinical studies are warranted to evaluate the efficacy and safety of this herbal nasal spray formulation in real-world settings.

Overall, the development of herbal remedies for respiratory health provides an important avenue for exploring complementary and alternative approaches to traditional pharmaceutical treatments. With further refinement and investigation, herbal nasal sprays may emerge as valuable tools in promoting respiratory wellness and enhancing quality of life for individuals experiencing nasal congestion and respiratory discomfort.

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