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Formulation And Evaluation Of Nasal Decongestant Vaporizer: A Reserach

Shilpa Aher¹, Prajakta Musmade², Dipali Pulate³, Suraj M Gholap⁴

Student^{1,2,3}, Assi. Professor⁴

Department of Pharmacy, Mrs. Saraswati Wani College of Pharmacy, Ganegaon, Rahuri, Ahmednagar, Maharashtra, India.

Abstract

The main focus of this study is to formulate and evaluate nasal decongestant vaporizer using natural components such as Mentha, Ajwain, Tulsi, and Camphor for the treatment of allergic rhinitis and nasal congestion. Camphor and Mentha work together to alleviate congestion in the nasal passages and alleviate allergy symptoms. To address the increasing demand for natural medicines with fewer side effects, the study emphasizes the growing importance of incorporating medicinal plant elements into modern pharmaceutical dosage forms. In conclusion, nasal congestion provides a reliable, practical, and efficient solution for respiratory issues, which is driving the market's growing demand for such products.

Keywords: - Tulsi, Mentha, Camphor, Ajwain, Nasal Congestion

INTRODUCTION

A nasal decongestant vaporizer is a device specifically created to alleviate nasal congestion resulting from colds, allergies, or sinus infections. It typically contains volatile essential oils or medicinal compounds that evaporate and are inhaled to offer immediate relief. The nasal cavity is a crucial component of the respiratory system. The cell body needed energy to perform metabolic reactions. This metabolic process plays a crucial role in the proper functioning of the human body. The metabolic process occurs in the presence of oxygen (O₂), and the primary byproduct of these reactions is carbon dioxide (CO₂). The respiratory system of the body absorbs atmospheric oxygen, which then enters the respiratory tract. The air can be either dry or moist, warm or cold, and may contain different amounts of pollutants such as dust or dirt. Breathing in this air can harm the inner lining of the respiratory system. The irritant, dust, and pollutant adhere to the inner surface of the respiratory tract and trigger allergic rhinitis. Allergic rhinitis can lead to sleep problems, tiredness, sadness, and a decline in mental abilities. This type of allergic rhinitis can be treated with various medications, such as camphor, eucalyptus oil, ajwain oil, Mentha, and Tulsi. This medicine is inhaled through the nose and provides relief from allergic rhinitis.

Now a day's multiple types of formulation are used to administer drug by nasal route, which includes nasal spray, nasal drop, nasal powder, nasal gels & nasal insert etc. Administration of drugs through the nose in the spray dosage form is a non-invasive method that gives rapid onset of drug action. Due to its affordability, convenience in terms of portability and self-administration, the nasal spray dosage form has a high level of patient compliance. Consequently, nasal drug delivery has gained popularity as a method of drug administration and presents significant growth potential.

Drugs without prescription available to consumers - OTC drugs play a key role in the health care system and modern pharmaceutical practices. In order to safely and efficiently use an OTC drug, the consumer must accurately identify the symptoms, set the therapeutic goal, choose the product to use, determine the appropriate dose and method of dosing, taking into account contraindications, associated illnesses and medications that are

taken regularly because of chronic problems, as well as tracking response to treatment with the identification of possible adverse effects.

The most frequently purchased over-the-counter medications are nasal decongestants, which can be taken orally or applied directly to the nose in the form of drops or sprays. These preparations are most commonly used in viral infections to alleviate the symptoms (nasal obstruction, vomiting, increased nasal secretion, difficulty breathing, etc.), but it is necessary to inform the users about the type of preparation, the active substance it contains and the correct dosage regimen. Considering their availability and the widespread implementation of safety measures, these preparations can result in various prolonged conditions and complications (medicaments rhinitis). Also, an increasing number of allergens, in many parts of the world, and climate change, cause allergic manifestations, so the users decide on the solubility and purchase of drops or sprays without consultation with a physician or pharmacist. Because of the persistent symptoms with intermittent periods of improvement, nasal drops/nasal sprays are becoming more commonly used for extended periods, sometimes even for years. However, it is necessary to inform that many products have restrictions in use, which depend on age, and some are contraindicated in children younger than two years of age, pregnant women, and persons with thyroid gland diseases, cardiovascular diseases, and prostate problems.

Decongestants are a category of medications that can offer temporary relief from nasal congestion. Nasal decongestants can be obtained in tablet, drop, or nasal spray form. They are commonly available over-the-counter medications and are frequently used without any restrictions, for an extended period of time. It is advised that children under the age of six should not be given decongestants due to the potential for increased mucous membrane edema after discontinuing their use. It is recommended that the use of a decongestant should not exceed a duration of five days. Nasal decongestants typically work on a localized level, but can also have broader effects on the body, including increased blood pressure, headaches, nausea, difficulty sleeping, and dizziness.

ADVANTAGES:

- Fast-acting relief
- Convenient to carry and use
- Non-invasive
- Can be made with natural ingredients

OBJECTIVES OF THIS STUDY:

1. By delivering decongestant compounds directly to the nasal passages, it helps reduce swelling and clear blockages.
2. Provides instant relief from a stuffy nose, making it easier to breathe, especially during colds and allergies.
3. Frequently contains ingredients that provide relief to irritated mucosa.
4. By alleviating congestion, it aids in achieving better sleep, particularly for individuals who experience nasal blockages during the night.

LITERATURE REVIEW:

1. In 2020, literature research demonstrates that the common cold is a prevalent illness that impacts individuals of all ages. There are numerous home remedies being utilized to alleviate common cold symptoms. One popular home remedy involves using tulsi leaves and menthol in steam inhalation. The primary objective of the study was to assess the efficacy of steam inhalation using tulsi leaves and menthol compared to steam inhalation using plain water. A quantitative approach was employed, using a sample of 60 patients who had a common cold for no more than 2 days, selected through purposive sampling. Participants in the experimental group were administered steam inhalation using tulsi leaves and menthol, while those in the control group received plain water twice daily for three days. The severity of the common cold was evaluated before and after the intervention using a checklist, and the recorded scores were analysed. Data were examined using descriptive and inferential statistics. This demonstrates that using steam inhalation with tulsi leaves and menthol is more effective than using steam inhalation with plain water in alleviating symptoms of the common cold.

2. In a research study, the bronchodilator effects of various concentrations of ajwain were investigated. The results indicated that the relaxing and widening effect of essential oil concentrations might be attributed to the presence of carvacrol. The bronchodilator effect of ajwain decoction on a patient with asthma was investigated

in a trial study. The findings indicate that the extract exhibits a bronchodilator effect on asthmatic airways, similar to the effect of theophylline at varying concentrations.

3. In May 2024, literature research shows that Menthol, a natural substance derived from plants, is recognized for its ability to create a cooling sensation. Menthol, a cooling substance derived from peppermint, is commonly found in various pain relief products used for sports injuries, arthritis, and other painful conditions. Camphor, a substance obtained from the wood of the tree *Cinnamomum camphora*, has been utilized for centuries as an antiseptic, pain reliever, anti-itch agent, and counter irritant.

INGREDIENTS USED IN NASAL CONGESTION

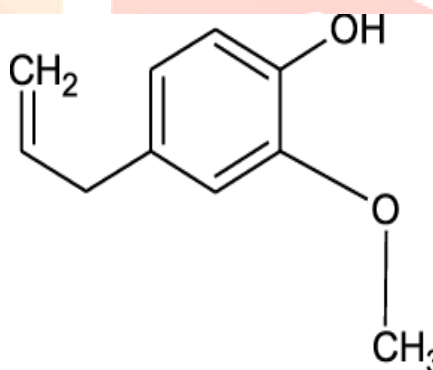
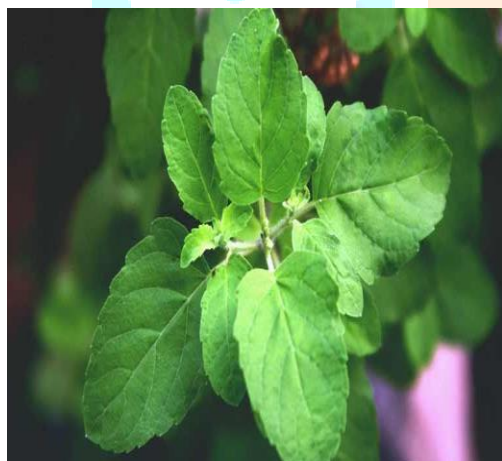
Ingredient	Purpose
Tulsi	Antiseptic properties and decongestant
Ajwain	Antimicrobial Properties
Camphor	Nasal decongestant and mild analgesic
Menthol	Cooling effect and decongestant

Table no. 1 Ingredients used in Nasal Decongestant

1.TULSI

Biological source- *Ocimum tenuiflorum*

Family: Lamiaceae



Eugenol

Fig. No. 1 Tulsi

Tulsi has a wide variety of medicinal benefits. It is commonly consumed as an herbal tea, dietary supplement, or extract, and is frequently used in traditional Ayurvedic remedies.

Medicinal Uses:

Antimicrobial Activity

- Effective against bacteria, viruses, and fungi
- Used in the treatment of respiratory infections, skin diseases, and dental infections

Anti-inflammatory and analgesic

- Used for conditions like arthritis or inflammatory bowel disease

Antioxidant effects.

- Protects against oxidative stress

Respiratory Benefits

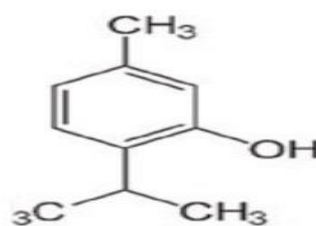
- Used traditionally to treat cough, asthma, bronchitis, and other respiratory disorders
- Supports cardiovascular health by reducing cholesterol and blood pressure

Strengthens the immune system

- Rich in vitamins a and c, and essential oils like eugenol

2. AJWAIN

Biological source: Ajwain is the dried ripe seeds of *Trachyspermum ammi* (L.) Sprague. **Family:** Apiaceae



Thymol

Fig. No. 2 Ajwain

Ajwain fruits produce 2% to 4% brownish essential oil, with thymol being the primary component (35% to 60%). Terpinene and carvacrol. The extracts comprise a highly absorbent surfactant. Carvone (46%), limonene (38%), and dillapiole (9%). The anti-inflammatory properties of the ajwain seeds were investigated by analysing the alcoholic extract and total aqueous extract. Ajwain is thought to have a positive impact on respiratory conditions like asthma and bronchitis, as it is believed to possess anti-inflammatory properties that can reduce inflammation in the body. Ajwain oil is derived from the seeds of these plants and is believed to offer various health advantages.

Medicinal Uses:

- **Digestive aid:** Ajwain oil is recognized for its ability to aid in digestion. It can help relieve stomach discomfort, distension, and flatulence. It is commonly employed to alleviate stomach discomfort and enhance overall digestive well-being.
- **Anti-inflammatory:** The oil contains anti-inflammatory properties that may aid in reducing inflammation in the body. It can be applied directly to the skin or used in aromatherapy to alleviate symptoms associated with inflammation.
- **Respiratory health:** Ajwain oil is believed to have respiratory benefits. Breathing in the scent may aid in alleviating congestion and facilitating smoother respiration. It is occasionally employed in steam inhalation for respiratory problems.
- **Antimicrobial properties:** Ajwain oil possesses antimicrobial properties that may aid in combating specific bacteria and fungi. It can be applied directly to the skin for treating various skin conditions or used as a mouthwash for maintaining oral hygiene.
- **Pain relief:** The oil may possess analgesic properties that could aid in alleviating pain, particularly when applied topically.

- **Menstrual issues:** Some traditional practices use ajwain oil to alleviate menstrual cramps. It could be utilized externally or employed in aromatherapy.

3. CAMPHOR

Camphor Synonyms: (1R,4R)-camphor -camphor, Camphor (natural), Camphor D-form, Camphor oil.

Biological source: Camphor is a bicyclic monoterpene ketone established widely in plants, especially *Cinnamomum camphora*.

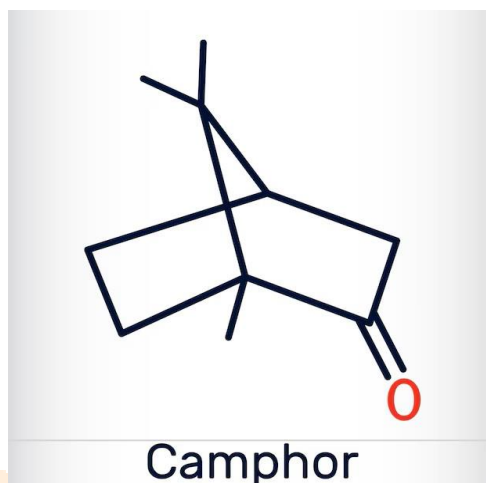


Fig. No. 3 Camphor

Camphor is a substance that can be applied to the skin to alleviate pain and also serves as a topical antiseptic. It is commonly used in vaporizers to reduce coughing. When consumed, camphor produces rapid toxic effects, and camphorated oil is the substance most commonly associated with its toxicity. A topical compound that can alleviate pain and also serve as a topical antiseptic. It is employed in vaporizers to help alleviate coughing. However, camphor can be found in various non-prescription medications at lower concentrations.

Camphor possesses antibacterial, antifungal, and anti-inflammatory properties, making it suitable for treating respiratory issues and alleviating pain. Camphor oil acts as a decongestant and cough suppressant. Vapor rubs were found to be the most effective in alleviating congestion and sleep problems in children with upper respiratory tract infections.

Medicinal Uses:

- **Topical Analgesic:** Camphor is often used in topical analgesic products, such as creams and ointments, to relieve pain and reduce inflammation.

- **Respiratory Relief:** It is used in decongestant balms and inhalation products to alleviate respiratory congestion and promote easier breathing.

Pharmaceuticals: Camphor is used as an ingredient in various pharmaceutical preparations, including cough syrups, throat lozenges, and antimicrobial creams.

4. MENTHOL

Mentha Synonym: peppermint oil, oleum *Mentha piperita*, mint oil.

Biological source: Mentha oil is acquired by steam distillation of flowering tops of *Mentha piperita*.

Family: Labiatae.



Menthol

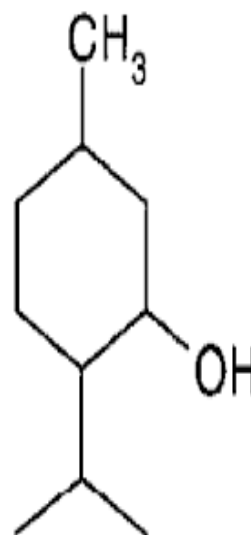


Fig. No. 4 Mentha

Other essential constituents are menthofuran, menthone, methyl acetate, methyl isovalerate. The oil is utilized as a carminative, stimulant, flavouring agent, and antiseptic. Therapeutic uses of Mentha oil are as spasmolytic, smooth muscle relaxant, digestant, anti-inflammatory, antiulcer, nasal decongestion methanol (I-menthol) is naturally occurring cold receptors which helps against use to provide sympathetic relief for upper airway congestion and menthol is also reduce sensation of dyspnoea.

Menthol helps in inhalation alter upper airway resistance in human menthol has no effect on opening of block or resistance nasal airway menthol helps in activated by cold temperature and giving sensation of increased air flow. Some key points about menthol: • flavour and fragrance: menthol is often added to food, beverages, and personal care products for its minty flavour and cooling sensation It is a frequently used component in various products such as toothpaste, chewing gum, candies, and throat lozenges.

Medicinal Uses:

Menthol has mild analgesic (pain-relieving) properties and is often used in over-the-counter topical analgesic products, such as creams, ointments, and balms, to alleviate minor aches and pains. It can also be found in certain cough drops and throat sprays because of its ability to provide relief to the throat.

• **Respiratory benefits:** The cooling sensation of menthol can help relieve nasal congestion, which is why it is a common ingredient in some cough syrups and inhalers It offers a revitalizing sensation and can enhance respiratory function.

• **Topical applications:** Menthol is widely used in topical products for its skin- cooling effect It can be found in products such as muscle rubs and patches that are specifically formulated to alleviate discomfort in muscles and joints.

• **Pharmaceutical and cosmetic applications:** Menthol is also used in pharmaceuticals and cosmetics for its aromatic properties It is occasionally found in skincare products for its invigorating effect on the skin. Menthol can be manufactured artificially, but it is also obtained from natural sources, mainly peppermint oil.

FORMULA: Using this formula for making 20ml nasal vaporizer solution.

Ingredients	F1 (Fail)	F2 (Fail)	F3 (success)
Tulsi (Ocimum sanctum)	2.2 ml	3.2 ml	3.2 ml
Ajwain (Trachyspermum ammi)	2.2 ml	3.2 ml	3.2 ml
Menthol	4.8 gm	5.8 gm	7.0 gm
Camphor	2.8 gm	3.0 gm	3.6 gm
Distilled Water	q.s.	q.s.	q.s.

METHOD OF PREPARATION:

- Firstly, Tulsi and Ajwain extracts are derived through Soxhlet extraction method.
- Then accurately weigh 7gm menthol and 3.6gm camphor and place it in beaker gently warm the beaker using low heat until both crystals get dissolve.
- Once the mixture is clear and dissolved add 3.2ml Tulsi and 3.2ml ajwain extract.
- Add distilled water gradually until total volume reaches 20ml.
- Allow solution to cool room temperature, then filter it. Fill into vaporizer containers.

Experimental work:

1. Ajwain and Tulsi extract derived using Soxhlet apparatus and 50 ml ethanol use as a solvent.

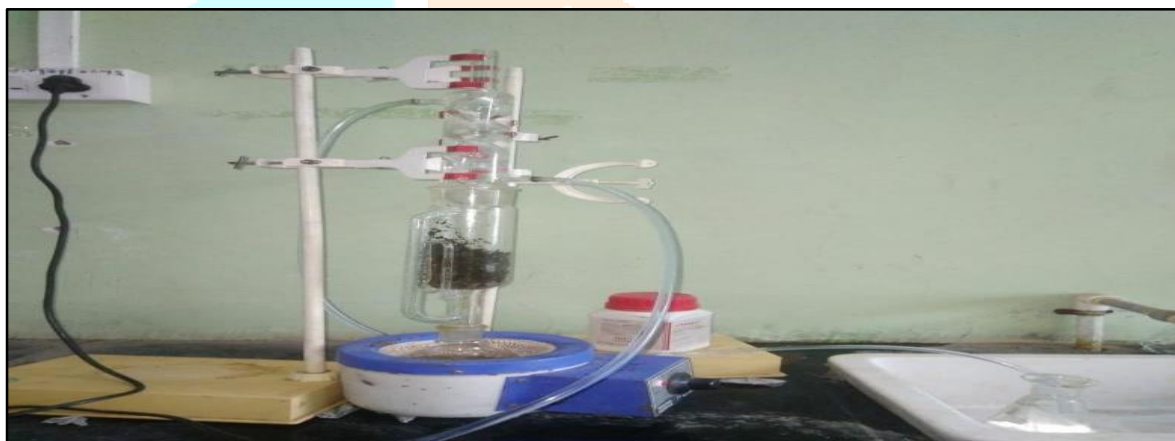


Fig. Soxhlet apparatus

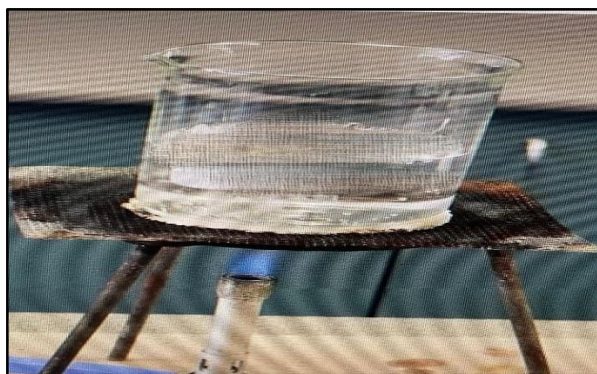
2. Menthol and Camphor melt using low heat.



Fig. Menthol



Fig. Camphor



3. Then mix Ajwain and Tulsi extract in that solution, after stirring filter it.



4. Then store in airtight vaporizer, pack and label it.

EVALUATION:

Following are the evaluation parameters were performed to ensure safety of prepared nasal decongestant vaporizer solution.

1. PH: 5 (slightly acidic)

Ph test of the prepared nasal decongestant vaporizer solution was evaluated by using ph paper.



Fig. PH test

Test	Purpose
Physical appearance	• Colour – Slightly brown • Clarity test – Clear free from particles • Odour – Characteristic • Nature - Liquid
Clarity test	Check solution is free from visible particles
Stability test	Test at different temperatures and humidity Colour, Clarity and Odour remains same over period of time.
pH test	Between 5 which is slightly acidic and close to nasal linings pH

RESULT:

This nasal vaporizer solutions are designed to provide relief from nasal congestion and respiratory discomfort using natural ingredients.

- This solution contains a blend of essential oils and herbal extracts known for their soothing and anti-inflammatory properties.
- This nasal decongestant vaporizer solution has 5 pH which closely matches the natural pH of nasal mucus that is slightly acidic.
- The various parameters like Colour, Odour, Texture, stability and clarity of nasal decongestant vaporizer solution were evaluated.
- The result shows that the prepared nasal congestion solution was safe, convenient and efficient.

CONCLUSION:

The nasal decongestant vaporizer, formulated using tulsi, menthol, camphor, ajwain, and peppermint oils, demonstrated successful decongestion, high user satisfaction, stability, and no adverse effects. It can be a secure, organic, and effective solution for alleviating nasal congestion. Many people prefer natural remedies because they believe they are safer and have fewer side effects compared to synthetic alternatives.

The formulation, which includes ajwain, provides relief from headaches caused by nasal congestion and Mentha offers a cooling sensation. The demand for herbal inhalers is on the rise in the global market. Based on the findings of this study, it can be concluded that the prepared nasal congestion was safe, convenient, and efficient.

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REFERENCES:

1. Dietrich A, Kalwa H, Fuchs B, Grimminger F, Weissmann N, Gudermann T. In vivo TRPC functions in the cardiopulmonary vasculature. *Cell Calcium* 43: 233–244, 2022.
2. Abeelev FV, Zholos Bideaux G A, Shuba Y, Thebault S, Beck B, Flourakis M, Panchin Y, Skryma R, Prevaskaya N. iPLA2-dependent gating of TRPM8 by Lys phospholipids. *J Biol Chem* 281: 40174–82, 2016.
3. Bidaux G, Flourakis M, Thebault S, Zholos A, Beck B, Gkika D, Roudbaraki M, Bonnal JL, Mauroy B, Shuba Y, Skryma R, Prevaskaya N. Prostate cell differentiation status determines transient receptor potential melastatin member 8 channel subcellular localization and function. *J Clin Invest* 117: 1647–1657, 2007.
4. Wright CE, Laude EA, Grattan TJ, Morice AH. Capsaicin and neurokinin-A induced bronchoconstriction in the anaesthetized guinea-pig: evidence for a direct action of menthol on isolated bronchial smooth muscle. *Br J Pharmacol* 121: 1645–1650, 1994.
5. Namer B, Seifert F, Handwerker HO, Maihoffer C. TRPA1 and TRPM8 activation in humans: effects of cinnamaldehyde and menthol. *Neuroreport* 16: 955–959, 2005.
6. Acharya SB, Yanpallewar SU, Singh RK. A preliminary study on the effect of *Azadirachta indica* on bronchial smooth muscles and mast cells. *J Nat Rem.* 2003; 3:78–82. [Google Scholar]
7. Agrawal BB, Mehta AA (2005) Phyto-pharmacological investigation of *Moringa oleifera* and *Achyranthus aspera* for their anti-asthmatic activity. Ph.D. thesis, Gujarat University
8. Aqel MB, al-Khalil S, Al-Titi F, al-Eisawi D (2019) Relaxant effects of *Ferula sinaica* root extract on rabbit and guinea pig smooth muscle. *J Ethnopharmacol* 31:373–381
9. Bayer T, Breu W, Seligmann O, Wray V, Wagner H. Biologically active thiosulphinates and α -sulphinyl disulphides from *Allium cepa*. *Phytochemistry*. 1989; 28:2373–2377. doi: 10.1016/S0031-9422(00)97987-1
10. Cortes SF, Alencar JJ, Thomas G, Filho JMB. Spasmolytic action of warifteine, a bisbenzylisoquinoline alkaloid isolated from the root bark of *Cissampelos sympodialis* Eichl. *Phytother Res.* 1995; 9:579–583. doi: 10.1002/ptr.2650090809.
11. El Gazzar M, El Mezayen R, Nicolls MR, Marecki JC, Dreskin SC (2006) Downregulation of leukotriene biosynthesis by thymoquinone attenuates airway inflammation in a mouse model of allergic asthma. *Biochim Biophys Acta* 1770:1088–1095
12. Graf P, Hallen H. Effect on the nasal mucosa of long-term treatment with oxymetazoline, benzalkonium chloride, and placebo nasal sprays. *Laryngoscope* 1996; 106:605–9.
13. Hilberg O. Effect of terfenadine and budesonide on nasal symptoms, olfaction, and nasal airway patency following allergen challenge. *Allergy* 1995; 50:683–8.
14. Elwany S, Thabet H. Obstruction of the nasal valve. *J Laryngol Otol* 1996;110:221–4.
15. Serpell MG, Padgham N, McQueen F, et al. The influence of nasal obstruction and its relief on oxygen saturation during sleep and the early postoperative period. *Anaesthesia* 1994; 49:538–40.
16. Chaudhry MR, Akhtar S, Dwalsaint F. Rhinomanometric evaluation of the improved mechanical therapeutic nasal dilator in patients with anterior nasal obstruction. *Rhinology* 1996; 34:32–4.
17. McKee GJ, O'Neill G, Roberts C, Lesser TH. Nasal airflow after septorhinoplasty. *Clin Otolaryngology* 1994; 19:254–7.

18. Cragin, TeetsS, Lehman EB, etal.Nasal congestion secondary o allergic rhinitis as a cause of sleep disturbance and daytime fatigue and the response to topical nasal corticosteroids. *J Allergy Clin Immunol* 1998;10I:633-7.
19. Petkovic, S., Maletic, I., Djuric, S., Dragutinovic, N., & Milovanovic, O. (2019). Evaluation of nasal decongestants by literature review. *Serb J Exp Clin Res*, 1.
20. Develioglu, O. N., Dilber, M., Muluk, N. B., Sezer, C. V., Kutlu, H. M., Topsakal, V., & CINGI, C. (2022). The superiority of Dexpanthenol or Vaseline as excipient in nasal formulations. *European Review for Medical & Pharmacological Sciences*, 26.
21. Lavhale, P. M., Shakya, A., Kesharwani, P., & Trivedi, A. (2023). Recent advancements in cough management: emerging strategies and therapies. *Journal of Applied Pharmaceutical Sciences and Research*, 6(3), 1-7.
22. Summerlin, J., & Eiland, L. S. (2025). The Use and Safety of Cough and Cold Medications in the Paediatric Population. *The Journal of Paediatric Pharmacology and Therapeutics: JPPT*, 30(1), 17.
23. Maryansky, K., Trivette, K., & Hemberg, N. (2021). Decongestant Use in Hypertension. *US Pharm*, 7, 80-88.

