International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 2 Mar-Apr 2024, pp: 78-87 www.ijprajournal.com ISSN: 2249-7781

An overview of the use of herbal remedies in nebulizers for the treatment of cold, cough and respiratory issues.

Khairnar Neha Prakash, Kaloge Nikita Somnath, Khairnar Lalit Balu, Khardekar Atharva Vilas and Prof. Sonawane Bharti Mitesh.
Loknete Dr.J. D. Pawar College Of Pharmacy Manur, Kalwan-423501

Submitted: 11-03-2024 Accepted: 21-03-2024

ABSTRACT: Herbal nebulizers have emerged as a potential therapeutic intervention for addressing cold, cough, and respiratory problems. In this exploratory article, we studied the intricate role that herbal nebulizer plays in area of respiratory health. These nebulizers utilize botanical extracts with a history rooted in traditional medicine, aiming to harness the therapeutic properties of herbs to alleviate respiratory symptoms. The study begins by examining the key herbal ingredients commonly found in nebulizer formulations. These may include eucalyptus, peppermint, ginger, and other botanicals known for their respiratory benefits. We explore the historical context of these herbs, recognizing their traditional uses in mitigating respiratory ailments. Furthermore, the research investigates the mechanisms underlying the efficacy of herbal nebulizers. These devices transform liquid herbal preparations into a fine mist, facilitating direct delivery to the respiratory tract. By doing so, they aim to soothe irritation, reduce inflammation, and promote overall respiratory well-being. To substantiate the potential of herbal nebulizers, the study reviews clinical trials and emerging research in the field. Evidence supporting the effectiveness of herbal nebulizers in improving respiratory function is examined, shedding light on their promising role in complementary and alternative medicine. In conclusion, this exploration underscores the promising prospects of incorporating herbal nebulizers into mainstream respiratory care. The natural and holistic approach offered by these devices presents an appealing option for individuals seeking alternatives to conventional treatments for cold, cough, and respiratory issues. As we navigate the intersection of traditional wisdom and modern science, herbal nebulizers stand out as a noteworthy avenue for respiratory health enhancement.

KEYWORDS: Herbal drugs, Herbal nebulizer, Phytoconstituents, Pharmacological studies, Respiratory diseases.

I. INTRODUCTION

Liquids can be turned into aerosols small enough to be breathed into the lower respiratory tract using nebulizers. Atomization is the pneumatic process of dividing a bulk liquid into tiny droplets. [1]

Nebulizer drugs are a class of pharmaceuticals that include budesonide, a corticosteroid that reduces airway inflammation, and albuterol, a bronchodilator that helps open airways in disorders like asthma. Nebulizers can also be used to give saline solutions and medicines for respiratory conditions. Elodaterol, Tiotropium, Budesonide, Cromolyn sodium, Albuterolsulfate, Salbutamol, Formoterol fumarate, Tiotropium + Olodaterol, Ipratropium bromide + Buterol, Ipratropium bromide + Buterolsulfate, and Nicotine are among the nebulizer medications that are present in market.[2] Nowadays, marketed inhaled medications only cover a small number of mechanisms of action, with the majority of established treatments focusing on bronchodilatory and anti-inflammatory mechanisms. Treatments for asthma and Chronic Obstructive Pulmonary Disease(COPD) mostly consist of inhaled corticosteroids(ICS) like budesonide, long-acting β2-agonists (LABA) like salmeterol, and long-acting muscarinic antagonists (LAMA) like tiotropium.[3] Herbal plants are useful in the management and prevention of a wide range of illnesses and respiratory conditions. Research has shown that traditional medical systems can effectively treat respiratory illnesses, and that using plants to treat various respiratory conditions is also effective. Plants used for their medicinal properties have been used since ancient times. The majority of plants and certain other sources that contain phytoconstituents have been identified, and their efficacy in treating respiratory conditions has been evaluated.[4] There is a long history of using traditional medicine to treat patients worldwide. The use of medicinal plants to treat illnesses and preserve public health is

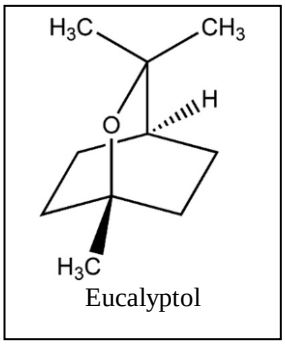
International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 2 Mar-Apr 2024, pp: 78-87 www.ijprajournal.com ISSN: 2249-7781

widespread throughout many cultures and countries. Natural products are crucial to the study and creation of novel medications.[5] However, the medications currently prescribed to treat respiratory conditions have significant adverse effects in addition to lacking full therapeutic efficacy. Therefore, there is a need to create new medications for the treatment of respiratory illnesses that are more effective and have fewer side effects.[6] Common medicinal plant which are used in this study are Eucalyptus, Basil, Peppermint, Chamomile, Turmeric, Thyme, Euphoribia hirta, Aloe vera , Ginger, Fennel etc.

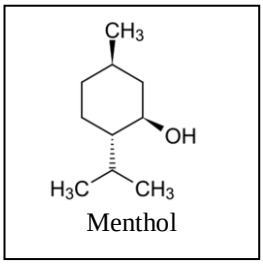
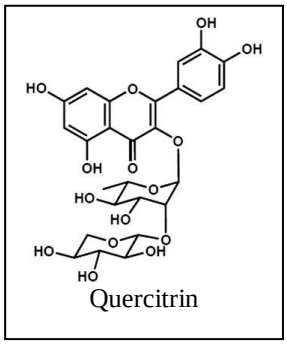
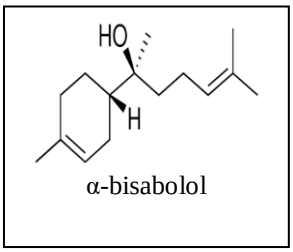
Common medicinal plants which may be use in nebulizers to treat cough, cold and other respiratory problems includes,

Vasaka	Green tea	Moringa
Amla	Rosemary	Garlic
Vasang	Datura metalmill	Mango
Giloy	Ephedra	Licorice
Pipli	Pineapple	Indian mulberry
Tejapatta	Boswellia	Flaxseed
Adulsa	Cinnamon	Mullein
Horehound	Lavender	Ashwagandha
Honey	Brahmi	Yarrow
Neem	Sunflower	Methi

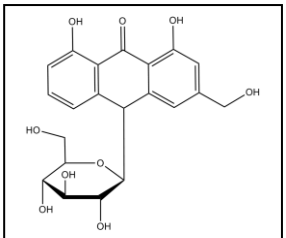
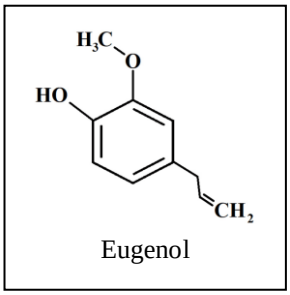
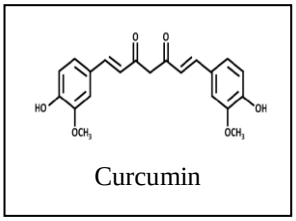
PHARMACOLOGICAL STUDY-

Sr.No	Drugs	Biological Source	Active Constituents	Pharmacological Study	Ref.
1	Eucalyptus	Eucalyptus globulus and other species of Eucalyptus. Family– Mirtaceae.	Cineol (also known as Eukalyptol - not less than 80 %). Camphene and Phellandrene  Eucalyptol	Depending on the dosage of eucalyptol, 30 male rats were split into experimental and control groups. The phagocytic activity of CD4, CD8, and AM in the bronchopulmonary lavage fluid was identified using flow cytometry. A sensible usage of essential oils containing eucalyptol can enhance the body's immunity and the respiratory tract's ability to fight off infections, but excessive dosages can be harmful.	[7] [8] [23]

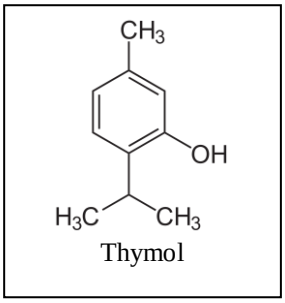
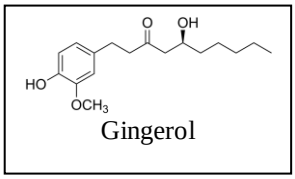
International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 2 Mar-Apr 2024, pp: 78-87 www.ijprajournal.com ISSN: 2249-7781

2	Peppermint	Mentha piperita L. Family– Lamiaceae.	Volatile oils in that principle component is menthol, then other monoterpenes are menthone (10-40%) and menthyl acetate(1-10%)  Menthol	Research demonstrates that menthol produces reflex respiratory inhibition in dogs and guinea pigs. The respiratory tract's cold receptors are stimulated by evaporated menthol.	[10] [24]
3	Euphorbia Hirta	Euphorbia hirta Linn. Family- Euphorbiaceae	Flavonoids - quercitrin (3- rhamnosyl quercitrin) a bioflavonoid, myricitrin.  Quercitrin	In animal studies, the aerial portions of Euphorbia hirta demonstrated immunosuppressive and antihistaminic effects. It prevented the degranulation of rat peritoneal mast cells caused by compound 48/80. In a (mild) asthma model, it avoided and decreased the amount of protein in bronchoalveolar lavage fluid.	[11] [25]
4	Chamomile	Matricaria chamomilla L. Family- Asteraceae.	1-2% volatile oils including α-bisabolol, α-bisabolol oxides A and B and matricin (usually converted to chamazulene)  α-bisabolol	Twenty rats were split up into five similar groups. Before receiving a single intratracheal Bleomycin injection, the rats received daily injections of 100 mg of anthocyanoside (0.5 CC) and 50 mg/kg of chamomile (0.5 CC) for seven days. Lipid peroxidation is inhibited by chamomile and anthocynoside, which reduces fibrosis and causes inflammation.	[12] [13] [26] [27]

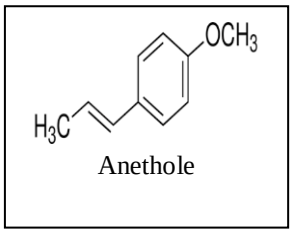
International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 2 Mar-Apr 2024, pp: 78-87 www.ijprajournal.com ISSN: 2249-7781

5	Aloe-vera	Aloe-vera is a succulent plant species belonging to the genus Aloe. Family- Liliaceae.	Aloein including nataloins like picric and oxalic acids, a-barbaloins. Lupeol and salicylic acid.  Aloein	Fifty adult male rats were utilized. The first was used as a control group; the second was administered bleomycin (BLM); and the third was given an oral dose of aloe vera (AV) every day for a period of 14 days. When compared to the BLM group, the aloe group's accumulation of collagen fibers was significantly reduced ($P \leq 0.05$), however the expression of caspase-3 was significantly lowered.	[15] [28]
6	Basil	Ocimum sanctum Family- Lamiaceae	Eugenol, Rosmarinic acids, essential oils.  Eugenol	This investigation is carried out on both healthy participants and individuals with asthma by inducing bronchoconstriction. Thus, the goal of this study is to assess Ocimum sanctum Linn.'santiasthmatic activity and compare it to salbutamol, the industry standard bronchodilator medication, in individuals with mild to moderate asthma.	[16] [29]
7	Turmeric	Curcuma longa Family- Zingiberaceae	Curcumin (1-7% in roots)  Curcumin	Six groups of 42 BALB/c mice were created: I, II, III, IV, V, and the control group. During the challenge phase, Group I was given nebulized saline. Curcumin was given to the mice in groups II, III, IV, and V during the last five days of the challenge period. The animals	[17] [18]

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 2 Mar-Apr 2024, pp: 78-87 www.ijprajournal.com ISSN: 2249-7781

				were killed 24 hours after the last medication was administered, and light microscopy was used to assess the histology of the airway samples. When comparing Group III to Group I, all characteristics were shown to be significantly superior, with the exception of epithelial thicknesses.	
8	Thyme	Thymus vulgaris Family-Lamiaceae	Thymol and Carvacrol.  Thymol	An experimental model of OVA-induced BA was established using adult male New Zealand rabbits, which reduces inflammatory immune responses in the airways. Thus, by modifying the inflammatory and apoptotic signaling pathways of chronic inflammatory illnesses, thyme oil can lessen their severity.	[19] [30]
9	Ginger	Zingiber officinale Family-Zingiberaceae	Phenolic and terpene compounds. The phenolic compounds in ginger are mainly gingerols, shogaols, and paradols.  Gingerol	By augmenting the Th1 response and mitigating ovalbumin-induced Th2 responses, as well as by lowering levels of eotaxin, IL4, IL5, and immunoglobulin E (IgE), ginger can lessen airway inflammation in mice.10. Because calcium channel function is regulated, it can help alleviate asthma symptoms by relaxing the smooth	[20] [31]

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 2 Mar-Apr 2024, pp: 78-87 www.ijprajournal.com ISSN: 2249-7781

				muscle of the airways.	
10	Fennel	Foeniculum vulgare Family-Umbelliferae	Anethole and fenchon  Anethole	On guinea pigs with constricted tracheal chains, ethanol extract and essential oil from F. vulgare demonstrated bronchodilatory action. The calming impact of fennel on guinea pig tracheal chains could potentially be attributed to its potassium channel opening action. Additionally, anethole resembles the catecholamines dopamine, norepinephrine, and adrenaline quite a little. The bronchodilatory effect and other sympathomimetic actions of F. vulgare appear to be caused by this structural similarity.	[21] [22]

II. MATERIALS AND METHODS

Numerous medicinal plants were found to alleviate symptoms comparable to those treated by allopathy after research into respiratory issues.[9] Ayurveda is helpful for treatment, depending on the conditions and symptoms of the patient.[32] Then, after studying articles, we draw the conclusion that, although over 100 plants can help with respiratory conditions, only few of them are effective enough to replace steroids when used. Nebulizers are the most traditional modern inhalation approach for administering medication to the lungs.[14][33] Easy-to-find plants with active ingredients that counteract the effects of steroids and bronchodilators in respiratory issues include aloevera, peppermint, euphorbia hirta, eucalyptus, fennel, basil, ginger, turmeric, chamomile, thyme, etc.

III. FUTURE SCOPE

It involves further research into optimized herbal formulations, effectiveness comparisons with conventional treatments, potential integration into mainstream healthcare, and exploring its adaptability for various respiratory conditions. This could lead to innovative solutions, increased natural treatment options, and possibly even a shift towards more holistic healthcare approaches in the future. The scope of future work may include investigating potential synergies between herbal extracts and conventional treatments, as well as delving deeper into the precise mechanisms and best formulations for nebulized herbal remedies. Stay up to date on research and advancements occurring in the area of herbal treatment for respiratory ailments.

In future for herbal plants used in nebulizers to treat respiratory problems and cold cough involves several potential avenues:

- Research and standardization

- Integration with conventional medicine
- Personalized medicines
- Innovations in delivery systems
- Clinical trials and evidence- based practice
- Global acceptance and regulations

By addressing these aspects, the future scope seeks to improve the efficacy, safety, and legitimacy of nebulized herbal medicines for respiratory health, providing supplementary and alternative options within the therapeutic paradigm. Keep an eye out for new findings and advancements in these fields.

IV. CONCLUSION

The review highlights the diverse range of herbal plants with potential respiratory benefits, showcasing their traditional uses and emerging roles in nebulized therapies. As we navigate the intersection of traditional and modern medicine, the future scope suggests exciting prospects. Ongoing research, standardization efforts, and integration with conventional treatments could pave the way for personalized herbal solutions. Innovations in nebulizer technology and a commitment to evidence-based practice may usher in a new era of respiratory care, embracing the therapeutic potential of herbal remedies. However, it is crucial to approach these interventions with a cautious and informed perspective, acknowledging the need for rigorous clinical validation and regulatory frameworks. This project underscores the dynamic landscape of herbal medicine in respiratory health, urging continued exploration and collaboration between traditional wisdom and contemporary scientific inquiry.

REFERENCES

[1]. Faarc DR. Nebulizers: principles and performance. Respiratory care. 2000 Jun;45(6):609.

[2]. Hou S, Wu J, Li X, Shu H. Practical, regulatory and clinical considerations for development of inhalation drug products. Asian journal of pharmaceutical sciences. 2015 Dec 1;10(6):490-500.

[3]. Pasqua E, Hamblin N, Edwards C, Baker-Glenn C, Hurley C. Developing inhaled drugs for respiratory diseases: a medicinal chemistry perspective. Drug Discovery Today. 2022 Jan 1;27(1):134-50.

[4]. Smruti P. A review on natural remedies used for the treatment of respiratory disorders. Int. J. Pharm. 2021;8:104-11.

[5]. Asadbeigi M, Mohammadi T, Rafieian-Kopaei M, Saki K, Bahmani M, Delfan M. Traditional effects of medicinal plants in the treatment of respiratory diseases and disorders: an ethnobotanical study in the Urmia. Asian Pacific journal of tropical medicine. 2014 Sep 1;7:S364-8.

[6]. Aminian AR, Mohebbati R, Boskabady MH. The effect of Ocimumbasilicum L. and its main ingredients on respiratory disorders: An experimental, preclinical, and clinical review. Frontiers in Pharmacology. 2022 Jan 3;12:805391.

[7]. Kokate CK, Purohit AP, Gokhale DS. Pharmacognosy. Niraliprakashan; 2008.

[8]. Cermelli C, Fabio A, Fabio G, Quaglio P. Effect of eucalyptus essential oil on respiratory bacteria and viruses. Current microbiology. 2008 Jan;56:89-92.

[9]. Bielory L, Lupoli K. Herbal interventions in asthma and allergy. Journal of Asthma. 1999 Jan 1;36(1):1-65.

[10]. Shah PP, Mello PM. A review of medicinal uses and pharmacological effects of Mentha piperita.

[11]. Ekpo OE, Pretorius E. Asthma, Euphorbia hirta and its anti-inflammatory properties: News & views. South African Journal of Science. 2007 May 1;103(5):201-3.

[12]. Srivastava JK, Shankar E, Gupta S. Chamomile: A herbal medicine of the past with a bright future. Molecular medicine reports. 2010 Nov 1;3(6):895-901.

[13]. Srivastava JK, Gupta S. Chamomile: A herbal agent for treatment of diseases of the elderly. InFoods and dietary supplements in the prevention and treatment of disease in older adults 2015 Jan 1 (pp. 171-183). Academic Press.

[14]. Respaud R, Vecellio L, Diot P, Heuzé-Vourc'h N. Nebulization as a delivery method for mAbs in respiratory diseases. Expert opinion on drug delivery. 2015 Jun 3;12(6):1027-39.

[15]. Dailah HG. The ethnomedicinal evidences pertaining to traditional medicinal herbs used in the treatment of respiratory illnesses and disorders in Saudi Arabia: A review. Saudi Journal of Biological Sciences. 2022 Jul 22:103386

[16]. Vinaya M, Kamdod MA, Swamy M, Swamy M. Bronchodilator activity of Ocimum sanctum Linn.(tulsi) in mild and moderate asthmatic patients in comparison

with salbutamol: a single-blind cross-over study. Int J Basic Clin Pharmacol. 2017 Mar;6(3):511.

[17]. Rathaur P, Raja W, Ramteke PW, John SA. Turmeric: The golden spice of life. International Journal of pharmaceutical sciences and research. 2012 Jul 1;3(7):1987

[18]. Karaman M, Firinci F, Cilaker S, Uysal P, Tugyan K, Yilmaz O, Uzuner N, Karaman O. Anti-inflammatory effects of curcumin in a murine model of chronic asthma. Allergologia et Immunopathologia. 2012 Jul 1;40(4):210-4.

[19]. Singletary K. Thyme: history, applications, and overview of potential health benefits. Nutrition Today. 2016 Jan 1;51(1):40-9.

[20]. Okiki Pius A, Oluwadunsin O, Benjamin O. Antibacterial activity of ginger (Zingiberofficinale) against isolated bacteria from the respiratory tract infections. Journal of Biology, Agriculture and Healthcare. 2015;5(19).

[21]. Rather MA, Dar BA, Sofi SN, Bhat BA, Qurishi MA. Foeniculum vulgare: A comprehensive review of its traditional use, phytochemistry, pharmacology, and safety. Arabian Journal of Chemistry. 2016 Nov 1;9:S1574-83.

[22]. Badgujar SB, Patel VV, Bandivdekar AH. Foeniculum vulgare Mill: a review of its botany, phytochemistry, pharmacology, contemporary application, and toxicology. BioMed research international. 2014 Oct;2014.

[23]. Shao J, Yin Z, Wang Y, Yang Y, Tang Q, Zhang M, Jiao J, Liu C, Yang M, Zhen L, Hassouna A. Effects of different doses of Eucalyptus oil from Eucalyptus globulus Labill on respiratory tract immunity and immune function in healthy Rats. Frontiers in Pharmacology. 2020 Aug 21;11:1287.

[24]. Sujana P, Sridhar TM, Josthna P, Naidu CV. Antibacterial activity and phytochemical analysis of Mentha piperitaL.(Peppermint)—An important multipurpose medicinal plant.

[25]. Al-Snafi AE. Pharmacology and therapeutic potential of Euphorbia hirta (Syn: Euphorbia pilulifera)-A review. IOSR Journal of Pharmacy. 2017 Mar;7(3):7-20.

[26]. Javadi I, Emami S. The antioxidative effect of chamomile, anthocyanoside and their combination on bleomycin-induced pulmonary fibrosis in rat. Medical Archives. 2015 Aug;69(4):229.

[27]. Singh O, Khanam Z, Misra N, Srivastava MK. Chamomile (Matricaria chamomilla L.): an overview. Pharmacognosy reviews. 2011 Jan;5(9):82.

[28]. Salem MY, El-Azab NE, Faruk EM. Modulatory effects of green tea and aloe vera extracts on experimentally-induced lung fibrosis in rats: histological and immunohistochemical study. Journal of Histology & Histopathology. 2014;1(1):6.

[29]. Cohen MM. Tulsi-Ocimum sanctum: A herb for all reasons. Journal of Ayurveda and integrative medicine. 2014 Oct;5(4):251.

[30]. Mousa AM, Almatroudi A, Alwashmi AS, Al Abdulmonem W, Aljohani AS, Alhumaydhi FA, Alsahli MA, Alrumaihi F, Allemailem KS, Abdellatif AA, Khan A. Thyme oil alleviates Ova-induced bronchial asthma through modulating Th2 cytokines, IgE, TSLP and ROS. Biomedicine & Pharmacotherapy. 2021 Aug 1;140:111726.

[31]. Aryaeian N, Tavakkoli H. Ginger and its effects on inflammatory diseases. Adv Food Technol Nutr Sci Open J. 2015;1(4):97-101.

[32]. Talwar S, Sood S, Kumar J, Chauhan R, Sharma M, Tuli HS. Ayurveda and allopathic therapeutic strategies in coronavirus pandemic treatment 2020. Current pharmacology reports. 2020 Dec;6:354-63.

[33]. Martin AR, Finlay WH. Nebulizers for drug delivery to the lungs. Expert opinion on drug delivery. 2015 Jun 3;12(6):889-900.