



Ghee-based balm: A novel and innovative herbal therapy for patients with common cold, nasal congestion, and allergic rhinitis

Sourav Pattanayak¹, Sagar Sheel², Vikash Kumar³ and Vinutha Bhat⁴

¹ M. Pharm, MBA (NMIMS), Business Development at BIBO Health (Hilt Brands India Pvt Ltd), Bengaluru, Karnataka, India

² B. Pharmacy (PESCP), B2B Sales at BIBO Health (Hilt Brands India Pvt Ltd), Bengaluru, Karnataka, India

³ MBA (IIT), CEO and Co-Founder at BIBO Health (Hilt Brands India Pvt Ltd), Bengaluru, Karnataka, India

⁴ Assistant Professor, Faculty of Pharmaceutical Sciences, PES University, EC campus, Bengaluru, Karnataka, India

DOI: <https://doi.org/10.33545/26647222.2021.v3.i2a.69>

Abstract

Systemic and topical nasal decongestants are often used in otorhinolaryngology and general practice to treat acute rhinosinusitis and as an adjuvant in some types of chronic rhinosinusitis. These treatments can occasionally be purchased over-the-counter and can be the target of misuse, which is challenging to prevent. These medicines are particularly effective at quickly reducing nasal congestion. Herbal extract and isolated plant components play a significant role in preparing a traditional Ayurvedic balm to treat nasal congestion and allergic rhinitis. We focus on the modern science of ayurvedic treatment to respiratory therapy. The innovation was Cow Ghee base balm with herbal phytochemicals to prevent respiratory conditions as mentioned earlier. The herbal products are safe for children's use. The medicinal plant plays an important role in the treatment of the common cold, nasal congestion, and chronic conditions like allergic rhinitis. The essential oils are used for the preparation of herbal product-based Ayurvedic balm an invention to replace the petroleum jelly-based treatment.

Keywords: Ghee-based balm, herbal balm, nasal congestion, allergic rhinitis, respiratory therapy, Aromatherapy, phytoconstituent therapy, Coconut oil, Beeswax

1. Introduction

These days, upper respiratory tract infections (URTIs) are common. The most prevalent URTIs include the common cold and cough. Ointments and inhalers are used to treat cold symptoms, particularly nasal congestion, and blocked nose [1]. Now a days petroleum jelly-based creams are well known for treating chest and nasal congestion. For treating chest and nasal congestion, certain petroleum jelly-based ointments are well-known. The usage of petroleum jelly-based ointments, cream, or balm is linked to a large number of occurrences of lipoidal pneumonia [2, 3]. A case of exogenous lipoidal pneumonia caused by persistent, extra nasal use of petroleum-based jelly (in this case, Vicks VapoRub) for nasal decongestion was described by Kilaru *et al.* in a young woman who was 21 years old. According to a case study by Ojeda *et al.*, an 85-year-old woman developed exogenous lipoidal pneumonia as a result of using petroleum jelly-containing ointments like Vicks VapoRub continuously to treat the symptoms of chronic rhinitis [4]. The right lower lobe of the lung was shown to have pulmonary consolidation on the CT scan, which also showed regions of low density and focal ground-glass opacities. Intranasal corticosteroids were provided for the patient's rhinitis along with advice to stop using petroleum-based products. The lipid consolidation had shrunk by around 10% in size, according to follow-up data obtained after two years. Nasal application of petrolatum ointment - A silent cause of exogenous lipoid pneumonia: Successfully treated with prednisolone by Kilaru *et al.* said in this case, a young woman who had been using Vicks

VapoRub for nasal decongestion for a prolonged period of time had exogenous lipoid pneumonia, which manifested as cough, dyspnoea, and fever [5]. There is an alternative solution using plant extracts that demonstrate antibacterial activity due to rising antibiotic resistance and multidrug-resistant microorganisms.



The antibacterial benefits of essential oils derived from many plant species are demonstrated by several investigations. A variety of volatile molecules found in essential oils may have a variety of pharmacological characteristics [6]. Some plant extracts and essential oils are appropriate for inhalation and aid in the relief of upper and lower respiratory tract problems. The lower respiratory system is made up of the trachea, bronchi, bronchioles, and lungs, whereas the upper respiratory tract is made up of the nose, nasal cavity, mouth, sinuses, pharynx, and larynx. The antibacterial, anti-inflammatory, and analgesic properties of essential oils have been reported. Balm based therapy has been a widely used kind of therapy for hundreds

of years. It is used as a standalone therapy for several medical disorders and consequences ^[7].

Cow Ghee

Ghrita, which meaning clarified butter in Sanskrit, is where the name "ghee" first appeared. Ghee is a milk fat that is nearly anhydrous. Chemically speaking, it is a complex lipid that contains glycerides, free fatty acids, phospholipids, sterols, fat-soluble vitamins, sterol esters, carbonyls, hydrocarbons, carotenoids (only in ghee made from cow milk), trace quantities of burned casein, and other elements. There is less than 3% moisture in it. Desi cow ghee is an excellent source of vital fatty acids and the fat-soluble vitamins A, D, E, and K ^[8]. Ayurveda claims that Purna Ghrita, also known as old ghee (ghee that has been aged for five to ten years), can be used to treat a variety of ailments, including epilepsy, intoxication, fainting, malaria, illnesses of the head, eyes, and ears, and some conditions affecting the female reproductive system. Its nature makes it both antibacterial and antimicrobial. It is a powerful expectorant and can be used to treat conditions including cough, pneumonia, and excessive phlegm. Boils, carbuncles, and wounds are treated topically with it ^[9]. As a result, desi cow ghee is one of those foods that has a significant impact on our daily life. Not only is it a staple of our culture's food, but Ayurveda also highly recommends it because of all its health benefits. It is recognized as a superfood. Ghee made from the milk of desi cows is different from that made from the milk of crossbreed cows. Desi cow ghee, which is made from "Gir" cows, has several health benefits for us ^[10]. The majority of these cows live in forested areas, like those seen in several Gujarati districts. Compared to other breeds of cows, gir cows are known to produce more milk. This milk cow breed is indigenous to the Gir Hills and woods of Kathiawar in India, which are in the Gujarati districts of Junagadh, Bhavnagar, Rajkot, and Amreli. These cattle are renowned for their ability to withstand challenging circumstances and their resistance to several tropical illnesses. Commercially, a lot of balms are offered in stick form. Conventional stick balms often include a significant quantity of wax, such as quantities that exceed 20% of the composition by weight. For the mixture to have enough rigidity to keep a stick form throughout shipment and everyday usage, waxes are added. Microcrystalline petroleum-based waxes and other petroleum-derived waxes with strong stick properties, such as ozokerite and paraffin, are frequently utilised in manufacturing. petroleum-based waxes mostly cause lipoidal pneumonia in the lungs ^[11, 12].

Many consumers prefer to use "natural" products and see waxes made from petroleum as synthetic products. As a result, "natural" waxes like beeswax or waxes made from plants like candelilla or carnauba have occasionally been used in place of or in combination with cow ghee. India's climatic conditions like summer temperatures are more than 25 degrees Celsius. In these conditions, cow ghee is liquid in nature, so it is difficult to make the balm, so we mix the natural beeswax with cow ghee to increase the solidification consistency and increase the melting point of the balm. We also add coconut oil to help to increase the viscosity of the balm formulation. coconut oil helps in balm as an emollient property. This helps the formulation non-greasy ^[13].

Benefits of Ghee

1. Cow ghee is clarified butter; thus, it doesn't include any milk particles. Additionally, it has extremely little lactose and casein. It is, therefore, safe for lactose-intolerant people to eat¹⁴.

2. Cow ghee is used for the formulation of external application like balm which present other essential oil along with it to prevent the upper respiratory disease like common cold, sunnitis, rhinitis and other nasal allergic reaction.
3. Cow ghee is a better choice than butter and other oils when it comes to nutrients for those who are health conscious. Cow ghee contains healthful fat and needs to be included in your diet on a regular basis, but in moderation¹⁵.
4. Additionally, cow ghee is renowned for its ability to treat burns and other skin conditions. Cow ghee has long been suggested by our ancestors as a hair conditioner because it relieves dryness and flaky scalp ^[8].
5. Since grass-fed cows are the primary source of cow ghee, K2, butyric acid, and conjugated linoleic acid are all present in good amounts (CLA). Natural fatty acid CLA aids in digestion boosts the immune system, and aids in weight reduction. It also possesses anti-cancer and antioxidant characteristics ^[9].

Beeswax



Beeswax is a substance that develops spontaneously in the hives of honeybees (*Apis mellifera*). This wax is produced by glands under the bees' abdomen and is utilised to create the honey comb. The wax is produced by eight glands found in the female worker bees' abdomen segment. When honey is gathered and processed, the wax is recovered as a by product. Honey bees produce and exude beeswax, a natural material they utilise to build their honeycombs¹⁶. The main ingredients of beeswax include fatty acids, hydrocarbons, and esters. When cold, the wax is brittle and breakable; but, when heated or exposed to human body warmth, it becomes flexible and soft. Natural beeswax has a melting point between 62 and 65 °C and becomes brittle at low temperatures. Beeswax is very plastic and inert. It guards against abrasion, corrosion, and moisture loss ^[17]. One of the most beneficial commercially available waxes is beeswax. Commercial beeswax is employed in the production of candles, metal castings, textiles, varnishes, cosmetics, and food products. Yellow and white beeswax are used in manufacturing as thickeners, emulsifiers, and stiffeners in cosmetics. In soaps and perfumes, beeswax absolute is used as a scent. Additionally, beeswax absolute and white beeswax are used to polish tablets. Bees wax mixed with ghee to increase the solidification and increase the thickness of the formulation to get solid in nature and when it applies in our body it gets melt slowly and show the action in the application side and also shows aromatherapy activities in the respiratory treatment ^[18-20].



Coconut oil

Coconut oil is one of the most important and powerful phytoconstituents which is used in several Ayurvedic formulations. Mostly it is used in skin care preparation as well as preparing the balm of it. The oil extracted from the coconut fruit also retains the benefits of the fruit of the coconut ^[21]. In the current situation, this oil has been used for health benefits as well as respiratory care treatment along with other phytoconstituents. Coconut oil also helps in the trending diets process like ketogenic and paleo diets. This is the white clear liquid oil in warm conditions and in winter conditions it is semisolid in nature. It contains medium-chain fatty acids like capric acid, caprylic acid, and also lauric acid. Coconut oil presents 52 to 85% of saturated fats called medium-chain fatty acids which help in moisturizing effect when applied to the skin. Coconut oil melts at 78 degrees Fahrenheit ^[22]. 47% Lauric acid is present in coconut oil ^[23]. Lauric acid in balm is used as an antimicrobial property that also helps to prevent wound healing and bacterial infection. Now Bibo Health (Hilt Brands India Pvt Ltd) has a novel approach to the formulation with ghee based essential oil which helps to prevent common cold and nasal congestion. The balm also helps to keep moisturizing the skin for a long period of time. Recently many studies have also shown the benefits of coconut oil for skin and respiratory care treatment²⁴. There are Most cases of nasal congestion due to allergic conditions If you apply coconut oil directly or as a balm it will prevent allergic reactions in the nostrils and take a free breath. Coconut oil also helps as an anti-inflammatory property in upper respiratory symptoms. Coconut oil is mixed with natural ghee because of its increased viscosity and solidifying properties of the products in summer conditions ^[25, 26].



Eucalyptus oil

The family *Myrtaceae* includes *Eucalyptus globulus*. The terms "Eu," which means "truth," and "calyptus," which means "to cover," are its ancestors. Leaves of several *Eucalyptus* species²⁷. This oil has an aromatic odour and is colourless or light yellow in liquid form. Most often, *Eucalyptus* oil is used to treat upper respiratory tract illnesses including colds, coughs, bronchitis, and to relieve the symptoms of catarrh. The essential oil known as *Eucalyptus* oil is produced by distilling fresh leaves of *Eucalyptus globulus* and other species from the *Myrtaceae* family, including

E. polybractea, *E. viminalis*, and *E. smithii*. A long time ago, intermittent fever was treated with *Eucalyptus globulus*. In cases of dyspepsia, stomach catarrh, typhoid fever, asthma, whooping cough, etc., the leaves and preparations from them have been employed successfully as tonics, stimulants, stomachic, etc. The use of it as a diuretic in the treatment of dropsy has been advocated more recently. Both gas chromatography (GC) and gas chromatography/mass spectrometry (GC/MS) were used to determine the chemical makeup. 1,8-cineole (63.1%), p-cimene (7.7%), α-pinene (7.3%), and α-limonene (7.3%) made up the majority of EGEO (6.9 percent). There were up to 99.2 percent of monoterpenes. 1,8-cineole, commonly known as eucalyptol, makes up 70 to 85 percent of the volatile oil in *Eucalyptus* oil. Aldehydes, ketones, alcohols, ledol, minor amounts of sesquiterpenes like aromadendrene, and p-cymene and -pinene are also found. Additionally, it contains flavonoids such eucalyptin, hyperoside, and rutin as well as polyphenolic acids including ferulic acid, caffeic acid, and gallic acid ^[27, 28].



The oil has several medicinal uses, including those of a stimulant, antiseptic, flavouring agent, aromatic, deodorant, expectorant, antibacterial, febrifuge, diuretic, and antispasmodic. Additionally, it is used to treat bronchitis, sore throats, colds, as a vapour bath for asthma, and other respiratory conditions. According to Juergens *et al.*, eucalyptol has a potent inhibitory effect on inflammatory mediators such cytokines ^[29]. This may point to the long-term use of eucalyptol to treat the inflammation of the airways in conditions like asthma, bronchitis, and other steroid-sensitive illnesses. Another double-blind, placebo-controlled trial showed that eucalyptol has anti-inflammatory properties, is effective in treating people with severe asthma, and may be used as a mucolytic drug to treat conditions of the upper and lower respiratory tracts ^[30-32].

Camphor

Cinnamomum camphora (L.) Nees et Eber, a member of the *Lauraceae* family, produces a volatile oil known as camphor, which is a solid ketone³³. Turpentine is used to make synthetic camphor, which is optically inactive and would have likely replaced the natural substance entirely. Originally from Eastern Asia, the plant is a large tree that is also extensively distributed in the Mediterranean area, Sri Lanka, Egypt, South Africa, Java, Sumatra, Brazil, Jamaica, Florida, Formosa, Japan, South China, India, and California. The tree is grown in gardens up to 1,300 metres high in the North-West Himalayas in India. At Dehradun, Saharanpur, Calcutta, Nilgiris, and Mysore, it is effectively grown. Camphor, cineole, pinene, camphene, phellandrene, limonene, and diterpenes are all present in camphor oil. Camphor is a monoterpenes ketone only. It has a fundamental carbon structure with bofneol³⁴. Camphor is used orally as a stimulant, carminative, and antibacterial as well as topically as a rubefacient and counterirritant. It is a topical antipruritic and anti-infective that is

used in skin medications and cosmetics at concentrations of 1-3 percent. Other uses for it include the production of certain plastics, celluloid, lacquers, varnishes, explosives, pyrotechnics, mothballs, and embalming solutions. There are medical uses for camphor. It exhibits qualities that are analgesic, anti-inflammatory, anti-infective, antiseptic, antispasmodic, expectorant, and nasal decongestant^{35,36}. These qualities make it perfect for usage in situations like colds and fevers as well as for reducing inflammation in conditions like infectious disorders, bronchitis, sinusitis, and asthma. Camphor can be used topically as an antiseptic and counterirritant. Camphor comes in a variety of chemical forms, each with a unique essential oil content. Camphor is the primary constituent of *Cinnamomum camphora*. Cineol, linalool, eugenol, limonene, camphene, and a few more substances are also parts of camphor^[37, 38]



Thymol

Garden thyme, also known as *Thymus vulgaris*, is a member of the *Lamiaceae* family. Thyme is a Greek word that meaning "to fumigate." *Thymus vulgaris* or other species of *Thymus*' fresh blooming aerial parts are used to make thyme oil³⁹. Steam distillation is used to extract it. Phenols, particularly thymol and carvacrol, and terpenoids are the principal phytochemicals found in thyme oil. It has a distinctive scent and is a transparent, golden or dark reddish-brown liquid. Thyme's many pharmacological characteristics have been put to use for ages. Along with a few other crucial functions, it demonstrates antioxidant, anti-inflammatory, analgesic, expectorant, free radical scavenging, antibacterial, antiviral, antifungal, antiseptic, anticancer, antispasmodic, and carminative characteristics^[40]. Terpenoids, flavonoids, phenolic acids, and glycosides are the main phytochemicals found here^[41]. Thymol is used to treat respiratory disorders such whooping cough, bronchitis, asthma, sinusitis, and catarrh because of its anti-inflammatory qualities^[42]. It is advised for fungal and bacterial infections. Thyme was used as an antidote in ancient Rome, and it was drunk both before and after meals (Treatment for poisoning). The antidote properties of this plant are attributed, according to several research, to the presence of phytochemicals such thymol and carvacrol. Carvacrol and -terpinene, which exhibit anti-inflammatory and antiviral activities, are found, according to several phytochemical analysis studies. Because of these qualities, it is a key herb for treating respiratory tract infections, bronchitis, whooping cough, colds, sore throats, and other ailments^[41, 43]

Menthol

One of the most fragrant plant species is *Mentha piperita*, also known as peppermint or mint, and it is a member of the *Lamiaceae* family^[44]. Phytochemicals from the mint family exhibit anticancer effects against several human malignancies, including cervix, lung, breast, and more. Caffeic acid and its derivatives, such as

caftaric acid, cinnamic acid, ferulic acid, and oleanolic acid, are present in *Mentha* species, which are also high in polyphenols. These plants include flavonoids such luteolin and its derivatives apigenin, acacetin, thymonin, diosmin, and salvigenin. The essential oils of these species have a significant influence in the phytochemicals present. Menthol has been proven in several studies to provide a cooling effect that can help with dyspnoea⁴⁵. Additionally, it lessens breathing pain, fear, anxiety, and physical and mental strain during inspiratory resistive laden breathing. Gram-positive bacteria like *Staphylococcus aureus* and *Bacillus subtilis* are more strongly inhibited by *M. piperita* L. leaf extracts than Gram-negative bacteria. *Escherichia coli*. In addition, *M. piperita* exhibits additional vital pharmacological properties as antifungal, antiviral, anticancer, anti-inflammatory, and anti-allergic properties. Colds, mouth, and respiratory tract inflammation can all be treated with peppermint leaves^[46]. Numerous *in vitro* experiments demonstrate peppermint oil's ability to calm smooth muscles also helps to treat allergic rhinitis condition. These species have high concentrations of carotenoids, phenolic compounds, and ascorbic acid among other antioxidants. The phenolic compounds have abilities to scavenge free radicals^[32, 47].



Conclusion

The natural ghee-based balm mention in this article is clinically proven to treat common cold, cough and chronic condition like rhinitis. The balm has also anti-bacterial and anti-microbial property for the respiratory care treatment. It is prepared in natural cow ghee as a base so, it is freeform petroleum base and other chemical constituent. This dose not cause any lipoidal pneumonia. Using the essential oil in this formulation to improve the upper respiratory therapy process. Using ghee and essential oil are shows the synergistic effect for the treatment of upper respiratory conditions. Bibo Health (Hilt Brands India Pvt Ltd) has a novel and innovative product based in cow ghee and essential oil base balm for the treatment of common cold and allergic condition in respiratory problem. This Balm are non-sticky in nature and formulated in pure natural product and its also use by kids. The balm is cost-effective, convenience to use and safe for all age group of people.

References

1. Kursa O, Tomczyk G, Sawicka-Durkalec A, Giza A, Słomiany-Szwarc M. Bacterial communities of the upper respiratory tract of turkeys. Scientific Reports; c2021. p. 11.
2. Hadda V, Khilnani GC, Bhalla AS, Mathur S. Lipoid pneumonia presenting as non-resolving community-acquired pneumonia: a case report. Cases Journal. 2009;2:9332.
3. Onyenekwu CP, Sheinin Y. Exogenous Lipoid Pneumonia

- Presenting as an Enlarging Lung Nodule in a Patient with a Long-standing Usage of Petroleum Jelly. *American Journal of Clinical Pathology*. 2020;154:S39-S39.
4. Cherrez Ojeda I, *et al.* Exogenous lipid pneumonia related to long-term use of Vicks VapoRub® by an adult patient: A case report. *BMC Ear, Nose, and Throat Disorders*; c2016. p. 16.
 5. Kilaru H, *et al.* Nasal application of petrolatum ointment - A silent cause of exogenous lipid pneumonia: Successfully treated with prednisolone. *Respiratory Medicine Case Reports*. 2017;22:98-100.
 6. Horváth G, Ács K. Essential oils in the treatment of respiratory tract diseases highlighting their role in bacterial infections and their anti-inflammatory action: a review. *Flavour and Fragrance Journal*. 2015;30:331-341.
 7. Ali B, *et al.* Essential oils used in aromatherapy: A systematic review. *Asian Pacific Journal of Tropical Biomedicine*. 2015;5:601-611.
 8. Anilakumar K, Khanum F, Murthy Na, Bawa A, Annapoorani A. Studies on the physicochemical characteristics of heated honey, honey mixed with ghee and their food consumption pattern by rats. *Ayu*. 2010;31:141.
 9. Sarkar G. Beneficial ghee? *Nature*. 1991;352:673.
 10. Wawre MB, Khobragade D, Mundhada D. An Emerging Approach for Optimization of Cow Ghee as an Ointment Base in Combination With Selected Conventional Bases. *Cureus*; cc2023. p. 15.
 11. Md Asif AH, *et al.* Fatty acid and amino acid profiles of cheese, butter, and ghee made from buffalo milk. *Journal of Advanced Veterinary and Animal Research*. 2022;9:144-154.
 12. Karandikar YS, Bansude AS, Angadi EA. Comparison between the Effect of Cow Ghee and Butter on Memory and Lipid Profile of Wistar Rats. *Journal of Clinical and Diagnostic Research*. 2016;10:FF11-FF15.
 13. Mor S, Sharma V, Arora S, Minz PS. Physico-chemical and color parameters to distinguish cow ghee from buffalo ghee. *Journal of Food Science and Technology*. 2022;59:3231-3236.
 14. Singh RB, *et al.* Association of trans fatty acids (vegetable ghee) and clarified butter (Indian ghee) intake with higher risk of coronary artery disease in rural and urban populations with low fat consumption. *International Journal of Cardiology*. 1996;56:289-298.
 15. Kossoff E. Ghee whiz! The growing evidence for the benefits of the modified atkins diet. *Epilepsy Currents*. 2013;13:211-212.
 16. Kurek-Górecka A, Górecki M, Rzepecka-Stojko A, Balwierz R, Stojko J. Bee products in dermatology and skin care. *Molecules*; c2020. p. 25.
 17. Bee Products: Beeswax, Bee Pollen, Propolis - PubMed. Available from: <https://pubmed.ncbi.nlm.nih.gov/35593876/>.
 18. Nong Y, *et al.* A review of the use of beeswax in skincare. *Journal of Cosmetic Dermatology*; c2023. p. 22.
 19. Danby SG, *et al.* Different types of emollient cream exhibit diverse physiological effects on the skin barrier in adults with atopic dermatitis. *Clinical and Experimental Dermatology*. 2022;47:1154-1164.
 20. Fratini F, Cilia G, Turchi B, Felicioli A. Beeswax: A minireview of its antimicrobial activity and its application in medicine. *Asian Pacific Journal of Tropical Medicine*. 2016;9:839-843.
 21. Pupala SS, Rao S, Strunk T, Patole S. Topical application of coconut oil to the skin of preterm infants: a systematic review. *European Journal of Pediatrics*. 2019;178:1317-1324.
 22. Deen A, *et al.* Chemical composition and health benefits of coconut oil: An overview. *Journal of Science Food and Agriculture*. 2021;101:2182-2193.
 23. Coconut oil and palm oil's role in nutrition, health and national development: A review - PubMed. Available from: <https://pubmed.ncbi.nlm.nih.gov/27752194/>.
 24. BORG K. Physiopathological effects of rapeseed oil: a review. *Acta Medica Scandinavica Supplementum*. 1975;585:5-13.
 25. Elson CE. Tropical oils: Nutritional and scientific issues. *Critical Reviews in Food Science and Nutrition*. 1992;31:79-102.
 26. Wallace TC. Health Effects of Coconut Oil-A Narrative Review of Current Evidence. *Journal of the American College of Nutrition*. 2019;38:97-107.
 27. de Castro MA, *et al.* Phytochemical standardization of *Eucalyptus tereticornis* Smith (Myrtaceae) used in Green Pharmacy from Northeastern Brazil. *Journal of Herbal Medicine*; c2022. p. 36.
 28. Juergens UR, *et al.* Inhibitory activity of 1,8-cineol (eucalyptol) on cytokine production in cultured human lymphocytes and monocytes. *Pulmonary Pharmacology & Therapeutics*. 2004;17:281-287.
 29. Qabaha K, Ras SA, Abbadi J, Al-Rimawi F. Anti-inflammatory activity of *Eucalyptus* spp. and *Pistascia lentiscus* leaf extracts. *African Journal of Traditional, Complementary and Alternative Medicines*. 2016;13:1-6.
 30. Silva J, *et al.* Analgesic and anti-inflammatory effects of essential oils of *Eucalyptus*. *Journal of Ethnopharmacology*. 2003;89:277-283.
 31. Bachir RG, Benali M. Antibacterial activity of the essential oils from the leaves of *Eucalyptus globulus* against *Escherichia coli* and *Staphylococcus aureus*. *Asian Pacific Journal of Tropical Biomedicine*. 2012;2:739-742.
 32. Taw MB, Nguyen CT, Wang MB. Integrative Approach to Rhinosinusitis: An Update. *Otolaryngologic Clinics of North America*. 2022;55:947-963.
 33. Hamidpour R, Hamidpour S, Hamidpour M, Shahlari M. Camphor (*Cinnamomum camphora*), a traditional remedy with the history of treating several diseases. *International Journal of Case Reports and Images (IJCRI)*. 2013;4:86-89.
 34. Lee SH, Kim DS, Park SH, Park H. Phytochemistry and Applications of *Cinnamomum camphora* Essential Oils. *Molecules*; c2022.p. 27.
 35. Lee SH, Kim DS, Park SH, Park H. Phytochemistry and Applications of *Cinnamomum camphora* Essential Oils. *Molecules*. 2022;27.
 36. Fashner J, Ericson K, Werner S. Treatment of the common cold in children and adults. *American Family Physician*. 2012;86:153-159.
 37. Newnham M, *et al.* CAMPHOR score: Patient-reported outcomes are improved by pulmonary endarterectomy in chronic thromboembolic pulmonary hypertension. *European Respiratory Journal*; c2020. p. 56.
 38. Salehi B, *et al.* Thymol, thyme, and other plant sources: Health and potential uses. *Phytotherapy Research*. 2018;32:1688-1706.
 39. Nagoor Meeran MF, Javed H, Tae HA, Azimullah S, Ojha SK. Pharmacological Properties and Molecular Mechanisms of Thymol: Prospects for Its Therapeutic Potential and Pharmaceutical Development. *Frontiers in Pharmacology*. 2017;8.

40. Micucci M, *et al.* *Thymus vulgaris* L. Essential Oil Solid Formulation: Chemical Profile and Spasmolytic and Antimicrobial Effects. *Biomolecules*; c2020. p. 10.
41. Hazzit M, Baaliouamer A, Faleiro ML, Miguel MG. Composition of the essential oils of *Thymus* and *Origanum* species from Algeria and their antioxidant and antimicrobial activities. *Journal of Agricultural and Food Chemistry*. 2006;54:6314-6321.
42. Patil SM, Ramu R, Shirahatti PS, Shivamallu C, Amachawadi RG. A systematic review on ethnopharmacology, phytochemistry and pharmacological aspects of *Thymus vulgaris* Linn. *Heliyon*. 2021;7.
43. Sevindik M. Pharmacological Properties of Mentha Species. *Journal of Traditional Medicine & Clinical Naturopathy*. 2018;7.
44. Prieur G, *et al.* Short-term effects of menthol on walking dyspnoea in patients with COPD: A randomised, single blinded, cross-over study. *ERJ Open Research*. 2021;7.
45. Tafrihi M, *et al.* The Wonderful Activities of the Genus Mentha: Not Only Antioxidant Properties. *Molecules*. 2021;26.
46. Singh R, Shushni MAM, Belkheir A. Antibacterial and antioxidant activities of *Mentha piperita* L. *Arabian Journal of Chemistry*. 2015;8:322-328.