



INNOVATIVE FORMULATIONS AND PACKAGING OF MEDICATED AROMA INHALERS USING GARLIC OIL

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Abstract: This report explores aromatherapy and highlights the significant effects of essential oils on human health. Harmonizing the therapeutic qualities of essential oils obtained from plants to support mental, emotional, and physical balance is known as aromatherapy, a holistic approach to health and wellbeing. A wide variety of essential oils, each with distinct olfactory qualities and medicinal benefits, are investigated in this study. In-depth information about the chemical makeup, techniques of extraction, and possible medicinal uses of garlic essential oil are provided in this paper. Essential oil of garlic, obtained via steam distillation of *Allium sativum* bulbs, is well known for its unique warm and spicy scent and has a long history of use in traditional medicine. An extensive overview of aromatherapy is given in the report's opening section, together with information on its historical foundations and current applications in healthcare. The potential of essential oils as supplemental healthcare practices is highlighted as the significance. The study devotes a large amount of space to a comprehensive evaluation of several essential oils. The benefits of aromatherapy inhalation for human health conditions are also included in this work. approach entails a comprehensive examination of the chemical makeup, extraction techniques, and quality standards of essential oils obtained from various oil plant of essential oils in fostering relaxation, stress alleviation, and general mental wellness is examined. This study examines the therapeutic effects of various bioactive components of garlic essential oil as well as the impact of the oil on a range of illness conditions. This report involves the methods to evaluate the potency and purity of these oils and provide a solid basis for therapeutic use, the study employs state-of-the-art analytical chemical techniques.

Index Terms - Essential oil, Aromatherapy, Mechanism of action, Bioactivities, Classification of aromatherapy, Inhalation Aromatherapy

I. INTRODUCTION

INTRODUCTION

Essential oil are complex mixtures of volatile compounds produced by living organism and isolated by physical means only (pressing and distillation) from a whole plant or plant part of known taxonomic origin.

1.1. Essential oil: All plant possesses principally the ability to produce volatile compounds, quite often, however, only in traces “essential oil plants” in particular are those plant species delivering an essential oil of commercial interest.

1.2. Aromatherapy: Aromatherapy is the practice of using essential oils for therapeutic benefit. Aromatherapy has been used for centuries. When inhaled, the scent molecules in essential oils travel from the olfactory nerves directly to the brain and especially impact the amygdala, the emotional center of the brain.

1.2.1. Essential oils in aromatherapy: Aromatherapy is one of the complementary therapies which use essential oils as the major therapeutic agents to treat several diseases. Using a variety of techniques, the volatile or essential oils are collected from the fruits, stem, leaves, roots, flowers, and bark of the plant. The main techniques in aromatherapy that use these oils to permeate the skin

surface with noticeable auras include inhalation, local application, and baths. essential oils might be beneficial: Improve mood. Enhance work output by lowering stress and paying more attention. ^[1,2]

1.3. Mechanism of action of bioactive components of essential oils:

1.3.1. **Antibacterial action:** Essential oils exploit hydrophobicity to penetrate bacterial cell membranes, disrupting their structure and increasing permeability. This, in turn, leads to significant cell content loss, causing cell death.

1.3.2. **Antiviral activity:** Saltolinia essential oil inhibited the propagation of the virus from cell to cell in infected cells, demonstrating antiviral efficacy against HSV-1 and HSV-2. Viral particles were immediately inactivated by the oil, preventing virion from adhering to host. ^[3,4]

1.3.2. **Anticancer activity:** the diallyl sulfide and diallyldisulfide composites activated the enzymes that are crucial to the hepatic phase-1 detoxification process in the host cells (rats). and phase-2. It has been observed that geraniol reduces the cancer cells' (TC 118) resistance to the chemotherapeutic drug 5-fluorouracil.

1.4. **The mode of action of garlic:** Chemical study in the 1800s linked the action of garlic to its oil, which included sulphur. In the mid-1900s an American chemist named the strong-smelling liquid "allicin". When the bulb is ground or crushed, the sulphur component alliin (S-allyl-L-cysteine sulfoxide) is converted by the enzyme allinase into allicin (diallyl thiosulfinate). Allicin is the main active ingredient in fresh garlic extract, and it may quickly permeate phospholipid membranes to increase its biological activity. ^[5,6]

1.5. **Extraction procedure of garlic active constituents and methods:** Three distinct varieties of fresh garlic gloves (*Allium sativum*) and the plant material used for extraction. Every variety of garlic comes from vegetable crops. Ethanol and demineralized water were utilized in the extraction process of the garlic.

Method 1: Preparation of water garlic method: Fresh (90 g) Extract were mixed with in demineralised water (200 g) and grinded in a blender for 15 min. The solid parts of the garlic were removed by filtration sterile gauze follow by centrifugation at 4500 rpm for 30 min at 20°C. The supernants was filtrated though filter paper a using vacuum pump. The sample extract was collected stored in refrigerator the 4°C.

Method 2: Ethanol garlic extract: A traditional remedy involving chopping 300g of fresh garlic, mixing it with 96% ethanol, filtering, and centrifuging yielded a commercially available product. Further processing involved vacuum extraction and lyophilization for water garlic extraction.

Method 3: Aqueous garlic extraction: Fresh garlic was purchased from local market the aqueous garlic extraction was prepared according to lawlokun BA method the cloves were separated peeled obtained edible portion fifty gram of an edible portion was chopped homogenate was filtration though 25 um pore size.

1.6. Bioactivities of garlic essential oil:

1.6.1. **Insecticidal activity:** Studies have demonstrated that allyl disulfide, found in garlic essential oil, not only inhibits pests but also stops insect eggs from developing, hence preventing infestations. ^[7]

1.6.2. **Antitumor activity:** Globally, cancer claims millions of lives annually. Research focuses on natural alternatives. Lan et al. used flow cytometry and electron microscopy to study pancreatic cancer cells, revealing garlic essential oil induces apoptosis for anticancer effects. ^[8]

1.6.3. **Anti-inflammatory activity:** Its antioxidant action also contributes to the beneficial anti-inflammatory properties of garlic essential oil. It functions primarily by blocking the enzymes that produce thromboxanes and pro-inflammatory prostaglandins. ^[9]

1.6.4. **Anti-diabetic and anti-hyperlipidemic activity:** The hypoglycemic effects of various organic solvent extracts and aqueous extracts of garlic were investigated by Jain et al. in the 1970s in both normal and alloxan-induced diabetic rabbits. the study found that S-allylcysteine sulfoxide, the precursor of DADS in garlic essential oil, also has hypoglycemic effect, and the mode of action is similar to that of glibenclamide, a traditional hypoglycemic drug. ^[10]

1.7. **Benefits of garlic essential oil:** Zinc, copper, zinc oxide, selenium, and allicin are among the components in garlic that help improve the health and appearance of skin. Zinc, in particular, has a remarkable ability to regulate sebum production, which is the primary cause of acne. Garlic essential oil is used to cure coughs and colds because it has antibacterial qualities. Garlic essential oil has long been utilized as a fever and illness remedy, particularly in India. Prevents Hair Loss Thanks to its sulfur content, vitamin

E, vitamin C, vitamin B6 and vitamin B1, garlic essential oil not only prevents hair loss and damage, but also helps strengthen hair roots and follicles hair, promote hair growth faster. ^[11,12]

1.8. Aromatherapy: Aromatherapy combines aroma (fragrance) and therapy (treatment). Essential oils, concentrated extracts from various sources, are central to this practice. Studied for mood, stress, and now gaining popularity for cancer and sleep disorders. ^[13]

1.8.1. Mechanism of action of aromatherapy: The mechanism of their action involves integration of essential oils into a biological signal of the receptor cells in the nose when inhaled. The signal is transmitted to limbic and hypothalamus parts of the brain via olfactory bulb. These signals cause brain to release neuro messengers like serotonin, endorphin *etc.*, to link our nervous and other body systems assuring a desired change and to provide a feeling of relief. ^[14]

1.8.2. Classification of aromatherapy:

1.8.3. Cosmetic aromatherapy: Essential oils enhance cosmetics for face, body, and hair, serving toning, drying, cleaning, and moisturizing purposes. Aromatic baths and oils offer revitalizing experiences.

1.8.4. Massage aromatherapy: The use of grape seed, almond, or jojoba oil in pure vegetable oil during massage has been shown to have wonderful effects. This is also known as healing touch of massage therapy. It has been demonstrated that using pure vegetable oil infused with grape seed, almond, or jojoba oil during massage produces amazing results. Another name for this is the "healing touch" of massage treatment. ^[15]

1.8.5. Medical aromatherapy: Rene-Maurice Gattefosse, the creator of contemporary aromatherapy, has utilized medical aromatherapy information about the benefits of essential oils for treating and encouraging clinically diagnosed medical conditions by massaging patients while they undergo surgery. ^[16]

1.8.6. Olfactory aromatherapy: Olfactory aromatherapy, which is based on the inhalation of essential oils, has been shown to promote mental well-being, tranquility, relaxation, and bodily renewal. Scent memories are unlocked and pleasant aromas combine to relieve tension. Essential oils are not meant to take the place of medical therapy; rather, they should be used in conjunction with it. ^[17]

1.8.7. Psycho-aromatherapy: These oils can be used in psycho-aromatherapy to achieve certain mood and emotional states, bringing about feelings of calm, energization, or good memories. In this therapy, the patient inhales the oils directly from the infusion in their room. Psycho-aromatherapy's research on natural essential oils has been its only focus. ^[18]

1.8.8. Uses of garlic oil in aromatherapy: Acne, arthritis, bronchitis, bruises, cancer, circulatory problems, cystitis, diabetes, earache, fever, flu, gastritis, heart disease, high blood pressure, impotence, insomnia, intestinal disorders, liver problems, natural cholesterol reducer, parasites, rheumatism, scabies, sinusitis, skin blemishes, skin problems, sores, stomach problems, ulcers, yeast infections, wounds.

1.9. inhalation Aromatherapy via Brain-Targeted Nasal Delivery: Essential Oils on Mood Disorders: A class of mental diseases known as mood disorders, or affective disorders, significantly impair mood and its associated processes. Inhalation aromatherapy has shown unique advantages for treating mood disorders, especially depression, anxiety and mental disorders such as sleep disorder, which have been validated over the last decade through clinical and animal studies.

1.9.1. Introduction: Inhalation aromatherapy via brain-targeted nasal delivery is one of the most common methods of administration in trials of aromatherapy and has evolved from the inhalation of essential oils, in which simple inhalation benefits the emotional wellbeing, tranquility, relaxation, or renewal of the human body. ^[19] In clinical applications, transnasal inhalation of essential oils can be used nasal inhaler, vapor diffuser, spraying into the air, vapor balms, or direct inhalation by evaporation using tissue or cotton round. inhalation of essential oils or aromatic plant volatile oils can send signals directly to the olfactory system and trigger the brain to produce neurotransmitters e.g., serotonin [5-hydroxytryptamine (5-HT) and dopamine], influence the neuroendocrinological system, neurophysiological brain activity, sympathetic and parasympathetic nervous system, biomarkers changes, psychological and behaviour effects, and to modulate mental disorders further. ^[20]

1.9.2. Aromatherapy Inhalation for Sleep Disorders: Individuals dealing with mood disorders such as depression, anxiety, and others sometimes struggle to get a good night's sleep. Sleep issues may increase the likelihood of mental health

conditions ^[22]. Numerous antipsychotic medications can have an impact on sleep and sleep architecture. Lavender and peppermint oils are two of the many essential oils that have been utilized to treat sleep issues.

1.10. Phytochemicals of garlic: Promising candidates for cancer therapy: It's Weisberger and Pensky first reported in 1958 that diethyl thiosulfinate from garlic prevented the formation of sarcomas in mice carrying the S180 gene. Currently, collective epidemiological studies show that garlic intake is strongly associated with a reduced risk of cancers, particularly in the case of gastric or intestinal cancer. Overall, epidemiological research indicates that eating garlic is highly linked to a lower risk of cancer, especially stomach and intestinal cancer. Several global agencies, such as the World Health Organization (WHO), the American Institute of Cancer Research (AICR), and the National Cancer Institute (NCI), have shown a connection between a regular diet high in garlic and a lower chance of developing cancer.

1.10.1. Anticancer mechanisms of garlic: Garlic's anticancer effects involve mutagenesis suppression, free radical scavenging, enzyme regulation, and inhibition of protein folding. It also hinders cancer cell behaviors, preventing proliferation, resisting apoptosis, and evading immunosurveillance during initiation and promotion stages. ^[23,24]

1.11. Antiatherogenic neuroprotective effects of garlic: Garlic's medicinal value lies in its lipid-lowering and anti-atherogenic effects, countering atherosclerosis's inflammatory response. It reduces lipid content in arterial walls by inhibiting hepatic enzymes involved in lipogenesis and cholesterol synthesis. This addresses multiple cardiovascular risk factors, offering protective benefits.

1.12. Human clinical trials on antiatherogenic and related effects of garlic: The Agency for Healthcare Research and Quality [AHRQ] in their evidence report dated October, 2000. The Agency for Healthcare Research and Quality [AHRQ] in their evidence report dated October, 2000. summarized the effects of garlic on cardiovascular risk factors and disease, the association between garlic and cancer, and possible adverse effects of garlic. Out of 45 randomized controlled trials lasting at least four weeks, 37 trials (all in adults) revealed that various garlic preparations, compared with placebo, led to small but statistically significant reductions in total cholesterol at one month (1.2 to 17.3 mg/dL) and three months (12.4 to 25.4 mg/dL). ^[25,26]

NEED OF THE STUDY.

1) Acne Treatment Garlic oil can be used as a great remedy to treat acne. Zinc, copper, zinc oxide, selenium, and allicin are among the components in garlic that help improve the health and appearance of skin. Zinc, in particular, has a remarkable ability to regulate sebum production, which is the primary cause of acne.

2) Garlic essential oil is used to cure coughs and colds because it has antibacterial qualities. Garlic essential oil has long been utilized as a fever and illness remedy, particularly in India.

3) Organic Insect Repellent All you need is a cotton pad and a few drops of garlic essential oil to keep mosquitoes and other insects away.

4) alleviate tooth pain A toothache is a very painful sensation that prevents the sufferer from eating or simply from sitting still due to the excruciating pain that is unrelieved.**5) Prevents Hair Loss** Thanks to its sulfur content, vitamin E, vitamin C, vitamin B6 and vitamin B1, garlic essential oil not only prevents hair loss and damage, but also helps strengthen hair roots and follicles hair, promote hair growth faster. ^[11,12]

Mechanism of action of aromatherapy: The mechanism of their action involves integration of essential oils into a biological signal of the receptor cells in the nose when inhaled. The signal is transmitted to limbic and hypothalamus parts of the brain via olfactory bulb. These signals cause brain to release neuro messengers like serotonin, endorphin *etc.*, to link our nervous and other body systems assuring a desired change and to provide a feeling of relief. ^[14]

3. RESEARCH METHODOLOGY

3.1 MATERIAL AND METHODS:

Table1: Formulation of garlic oil.

Sr.No.	Ingredients	Quantity	Uses
1.	Pudina Crystal	2.0 gm	Irritation
2.	Camphor	2.0 gm	Cold Sores
3.	Methyl Salicylate	0.5 ml	Minor Aches
4.	Eucalyptus Oil	0.4 ml	Nasal Congestions
5.	Garlic Oil	1 ml	Pain killer

2.1. Procedure:

- Weigh each item by the formula.
- Place the garlic oil, camphor, and pudina in a beaker.
- Gradually warm the mixture and add Pudina Crystals and Bhimsun camphor, stir it.
- After letting it cool, slowly pour it onto a cotton roll.
- Cap the cotton in the container and let the solution slowly run down a cotton roll.
- To produce a particular effect, the vapor will saturate in a container intended for an inhaler.

2.3. Evaluations of essential oils (Methods):

2.3.1. **Refractive index:** The refractive index, indicating the velocity of light in a substance, is determined by the ratio of air to the substance's velocity. Measured using the Abbé refractometer at

20°C, it aids in purity assessments, crucial in pharmacopoeial determinations for volatile and fixed oils.

2.3.2. **Optical rotation:** The optical rotation of a liquid is the angle through which the plane of polarization of light is rotated when the polarized light is passed through a sample of the liquid; this rotation may be either clockwise or anticlockwise. Most volatile oils contain optically active components and the direction of the rotation, and its magnitude, is a useful criterion of purity. e. The specific rotation of the solid is given by

Angular rotation per dm of solution

Grams of optically active substance per ml of solution

$100 \alpha = 100 \alpha$

lc ldp

where α is the observed rotation in degrees, l is the length of the observed layer in dm, c is the number of grams of substance contained in 100 ml solution, d is the density and p is the number of grams of substance contained in 100 g of solution.

2.3.3. Chiral purity: Optical rotation as described above arises within molecules having at least one asymmetric carbon atom. Such molecules have two possible configurations (enantiomers), which are non-superimposable mirror images of one another and exhibit opposite light-rotational properties $[(-) \text{ and } (+)]$. The Pharmacopoeia uses chiral gas chromatography employing fused silica columns 30 m in length with a stationary phase of modified β -cyclodextrine.

2.3.4. Quantitative chemical tests: A number of quantitative chemical tests acid value, iodine value, saponification value, ester value, unsaponifiable matter, peroxide value, anisidine value, acetyl value, volatile acidity—are mainly applicable to fixed oils. Some of these tests are also useful in the evaluation of resins (acid value, sulphated ash), balsams (acid value, ester value, saponification value), volatile oils (acid value, acetyl value, peroxide value, ester value) and gums (methoxyl determination, volatile acidity).^[27,28].

IV. RESULTS AND DISCUSSION

Inhalation aromatherapy via brain-targeted nasal delivery is one of the most common methods of administration in trials of aromatherapy and has evolved from the inhalation of essential oils, in which simple inhalation benefits the emotional wellbeing, tranquility, relaxation, or renewal of the human body. Inhaling essential oils stimulates the olfactory system, the part of the brain connected to smell, including the nose and the brain. Garlic essential oil is used to cure coughs and colds because it has antibacterial qualities. alleviate tooth pain A toothache is a very painful sensation that prevents the sufferer from eating or simply from sitting still due to the excruciating pain that is unrelieved. Garlic's medicinal value lies in its lipid-lowering and anti-atherogenic effects, countering atherosclerosis's inflammatory response. It reduces lipid content in arterial walls by inhibiting hepatic enzymes involved in lipogenesis and cholesterol synthesis. This addresses multiple cardiovascular risk factors, offering protective benefits.

4. CONCLUSION:

the realm of holistic healing and complementary medicine, aroma inhalation therapy stands as a venerable practice with roots tracing back centuries. Its efficacy has been acknowledged across cultures and epochs, persisting into the modern era as a promising avenue for alleviating various physical, mental, and emotional ailments. Throughout this exploration, we have delved into the principles, applications, and scientific underpinnings of aroma inhalation therapy, shedding light on its multifaceted benefits and potential limitations. At its core, aroma inhalation therapy harnesses the potent properties of essential oils to promote well-being and healing. Whether through direct inhalation, diffusion, or topical application, these concentrated plant extracts interact with the body in profound ways, eliciting physiological responses that extend far beyond mere olfactory pleasure. From relieving stress and anxiety to easing pain and enhancing cognitive function, the therapeutic potential of aroma inhalation therapy is vast and diverse. One of the most compelling aspects of aroma inhalation therapy lies in its ability to engage the limbic system, the emotional center of the brain, through the sense of smell. By triggering the release of neurotransmitters and modulating mood-regulating hormones, certain aromatic compounds can exert powerful effects on our mental and emotional state. This dynamic interplay between scent and psyche underscores the holistic nature of aroma inhalation therapy, addressing the interconnectedness of mind, body, and spirit. Moreover, the antimicrobial, anti-inflammatory, and antioxidant properties of many essential oils lend credence to their therapeutic utility in combating various physical ailments. Whether used topically to soothe sore muscles and joints or inhaled to clear congested airways and boost immune function, certain essential oils offer a natural and gentle approach to health and healing. However, it is essential

to recognize that while aroma inhalation therapy can complement conventional medical treatments, it should not serve as a replacement for professional medical care when necessary. In recent years, scientific research has increasingly validated the efficacy of aroma inhalation therapy, shedding light on its mechanisms of action and clinical applications. Studies have demonstrated the anxiolytic effects of lavender oil, the analgesic properties of peppermint oil, and the cognitive-enhancing effects of rosemary oil, among others. Such empirical evidence not only bolsters the credibility of aroma inhalation therapy but also paves the way for its integration into mainstream healthcare practices. Nevertheless, challenges remain in the realm of aroma inhalation therapy, including standardization of practices, regulation of products, and elucidation of safety profiles. Given the proliferation of essential oil products in the market, ensuring quality, purity, and authenticity poses a significant concern for consumers and practitioners alike. Additionally, certain individuals may experience adverse reactions or sensitivities to specific essential oils, necessitating careful consideration of individualized treatment approaches. In conclusion, aroma inhalation therapy represents a rich tapestry of ancient wisdom, modern science, and holistic healing. Its profound effects on the mind, body, and spirit underscore its enduring relevance in an era marked by increasing awareness of the interconnectedness of health and wellness. As we continue to unravel the mysteries of scent and its therapeutic potential, aroma inhalation therapy stands poised to occupy a central role in the quest for holistic well-being in the years to come. By embracing this ancient practice with open minds and receptive hearts, we honor the wisdom of the past while forging a path towards a healthier and more harmonious future.

Acknowledgment

I take this privilege and pleasure to acknowledge the contribution of many individuals who have been inspirational and supportive throughout my work and endowed me with great pleasure and a profound sense of gratitude, I express my most cordial and humble thanks to my eminent guide **Prof. Kshitij Varma**, Department of Medical Chemistry for his constructive guidance.

I would like to express my sincere to **Prof. Dr. R. S. Bhambar**, Principle, MGV's Pharmacy College, Panchavati, Nashik for providing the necessary facilities, I would like to extend my deep appreciation to all my group members without their support and coordination we would not have been able to complete this project.

I would like to make a very special reference to my parents and friends for supporting me in every step of my life.

I acknowledge with thanks, the valuable suggestions, criticism, and cooperation from colleagues.

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