

A RESEARCH ON: DEVELOPMENT AND EVALUATION OF AROMATHERAPY BASED HERBAL INHALER FOR SLEEP ENHANCEMENT

Snehal Gangaram Nichit*¹, Kajal Bhaskar Walunj²

¹Student of Samartha Institute of Pharmacy, Belhe, Pune, Maharashtra, India.

²Assistant professor Of Samartha Institute of Pharmacy, Belhe Pune, Maharashtra, India.

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*Corresponding Author: Snehal Gangaram Nichit

Student of Samartha Institute of Pharmacy, Belhe, Pune, Maharashtra, India.

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ABSTRACT

Sleep disorders and insomnia are increasingly prevalent due to modern lifestyle stress, irregular sleep schedules, and psychological factors. Natural therapeutic approaches such as aromatherapy have gained significant attention as complementary treatments for improving sleep quality. Aromatherapy involves the inhalation or topical application of essential oils extracted from plants that possess relaxing and calming properties. This research paper focuses on the formulation and conceptual evaluation of a sleep-enhancing aromatherapy inhaler composed of lavender, chamomile, vetiver, and sandalwood essential oils dissolved in ethanol and delivered through a portable inhaler device. The objective of the research is to design a convenient inhalation system capable of delivering volatile aromatic compounds that influence the central nervous system through the olfactory pathway. These essential oils were selected based on literature evidence supporting their sedative, anxiolytic, and relaxation-inducing effects. The study discusses formulation development, preparation method, mechanism of action, advantages, and potential applications of aromatherapy inhalers for sleep improvement. The findings from literature suggest that inhalation of essential oils such as lavender and chamomile can reduce anxiety, improve relaxation, and enhance overall sleep quality. The proposed inhaler formulation provides a non-invasive, portable, and natural method for supporting sleep without the side effects commonly associated with pharmaceutical sleep medications.

KEYWORDS: Aromatherapy, Essential Oils, Sleep Enhancement, Lavender Oil, Chamomile Oil, Vetiver Oil, Sandalwood Oil, Aromatherapy Inhaler, Insomnia, Natural Therapy.

INTRODUCTION

Sleep is an essential biological process required for maintaining physical health, mental well-being, and cognitive function. Adequate sleep is necessary for memory consolidation, hormonal balance, immune system regulation, and emotional stability. However, in recent decades the prevalence of sleep disorders such as insomnia has increased significantly worldwide. Insomnia is characterized by difficulty in falling asleep, maintaining sleep, or experiencing non-restorative sleep. Common causes include stress, anxiety, irregular working hours, excessive screen exposure, and lifestyle changes. According to global health reports, millions of individuals experience chronic sleep disturbances that affect their productivity and quality of life.

Conventional pharmacological treatments for insomnia typically involve sedative-hypnotic medications. While these medications may provide short-term relief, long-term use can lead to adverse effects such as dependency, tolerance, daytime drowsiness, and cognitive impairment. As a result, there is increasing interest in alternative therapies that are safer and more sustainable. Aromatherapy is one such complementary therapy that utilizes natural plant-derived essential oils to promote physical and psychological well-being. The inhalation of aromatic compounds stimulates olfactory receptors in the nasal cavity, which transmit signals to the limbic system of the brain. The limbic system plays a crucial role in regulating emotions, stress responses, and sleep patterns. Several essential oils have been traditionally used for relaxation and sleep promotion. Lavender oil is widely recognized for its calming properties and ability to reduce anxiety. Chamomile oil is known for its mild sedative effects. Vetiver oil has grounding properties that support deep relaxation, while sandalwood oil promotes mental tranquility. This research focuses on the conceptual development of a sleep-enhancing aromatherapy inhaler that combines these essential oils in a portable device. The inhaler allows controlled inhalation of aromatic compounds before bedtime, offering a convenient and natural method for improving sleep quality.

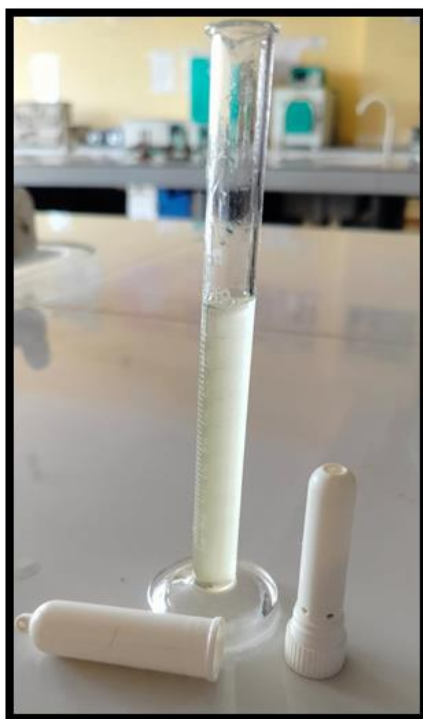


Fig 01: Experimental setup showing prepared mucoadhesive oral gel and its packaging container.



Fig 02: Developed oral gel formulation with applicator used for administration.

Literature Review

Numerous scientific studies have explored the effects of aromatherapy on sleep quality and relaxation. Lavender essential oil has received the most extensive research attention among essential oils used for sleep improvement.

A study conducted by Lillehei and Halcon (2015) investigated the effects of lavender aromatherapy on sleep quality among university students with self-reported sleep problems.

The results indicated that inhalation of lavender essential oil significantly improved sleep quality compared to the control group.

Another clinical study evaluated the effects of lavender aromatherapy on hospitalized patients recovering from cardiac surgery. The results showed that patients who inhaled lavender aroma before sleep experienced improved sleep quality and reduced anxiety levels.

Chamomile essential oil has also been widely studied for its calming and mild sedative properties. Chamomile contains bioactive compounds such as apigenin that interact with neurotransmitter receptors associated with relaxation and sleep regulation.

Vetiver oil is commonly used in traditional aromatherapy practices for its grounding and stabilizing effects on the nervous system. The earthy aroma of vetiver oil promotes emotional balance and deep relaxation.

Sandalwood oil has been used for centuries in traditional medicine and meditation practices. Studies suggest that sandalwood aroma can reduce mental agitation and promote relaxation, which indirectly supports sleep induction.

These studies collectively indicate that essential oils can influence psychological and physiological responses associated with sleep. Combining multiple oils with complementary properties may enhance the overall therapeutic effect.

AIM

To develop and evaluate an aromatherapy-based herbal inhaler for the enhancement of sleep quality using selected essential oils with potential sedative and calming effects.

OBJECTIVES

1. To select suitable herbal essential oils (e.g., lavender, chamomile, vetiver) based on their known sleep-enhancing and anxiolytic properties.
2. To formulate an aromatherapy-based herbal inhaler using appropriate excipients and carrier materials for effective delivery of volatile constituents.
3. To standardize and optimize the formulation for parameters such as concentration of essential oils, uniformity, and stability.
4. To evaluate physicochemical properties of the formulated inhaler, including appearance, odor, pH (if applicable), and leakage or compatibility.
5. To assess the release and diffusion of volatile components from the inhaler under simulated conditions.
6. To perform stability studies of the formulation under different environmental conditions.
7. To evaluate the effectiveness of the inhaler in sleep enhancement, using suitable parameters such as relaxation response or sleep quality assessment (e.g., questionnaires or scales).
8. To ensure safety and non-irritancy of the formulation for nasal inhalation.

Need of study

Sleep disorders such as insomnia and stress-related sleep disturbances are increasingly common due to modern lifestyle, work pressure, and excessive use of electronic devices. Many people rely on synthetic drugs for sleep enhancement, which may cause side effects like dependency, dizziness, and long-term health issues.

Herbal remedies and aromatherapy have gained attention as safer and natural alternatives for improving sleep quality. Essential oils like lavender, chamomile, and sandalwood are known for their calming and relaxing effects on the nervous system.

However, there is a lack of convenient, portable, and easy-to-use dosage forms for delivering these herbal actives effectively. Therefore, the development of an aromatherapy-based herbal inhaler can provide a simple, fast-acting, and non-invasive solution for sleep enhancement.

MATERIALS AND METHODS**Materials**

The following materials were used for the formulation of the aromatherapy inhaler:

Lavender essential oil

Chamomile essential oil

Vetiver essential oil

Sandalwood essential oil

Ethanol (95 percent) as solvent

Cotton wick

Plastic inhaler tube

Glass mixing container

Formulation

A prototype formulation was developed to create a balanced aromatic profile with relaxing properties. The formulation for a 10 ml solution was:

Lavender oil – 6 drops

Chamomile oil – 4 drops

Vetiver oil – 2 drops

Sandalwood oil – 2 drops

Ethanol – 10 ml

Preparation Method

The essential oils were added to a clean glass container and mixed thoroughly. Ethanol was added as a solvent to facilitate even distribution of the essential oils and improve vaporization. The mixture was gently shaken to ensure uniform mixing. The cotton wick inside the inhaler tube was soaked with the prepared aromatic solution. The inhaler was then sealed to prevent evaporation and stored in a cool environment.

Method of Use

The inhaler is designed for use before bedtime. The user inhales the aroma gently through one nostril while closing the other nostril. Two to three slow inhalations are recommended to allow the aromatic compounds to stimulate the olfactory receptors.

Formulation of Aromatherapy Inhaler

Sr. No.	Ingredient	F1 (ml)	F2(ml)	F3(ml)	Role
1	Lavender oil	2.4ml	3.5ml	4ml	Sleep Inducing agent
2	Chamomile oil	2.4ml	2.5ml	2 ml	Relaxant
3	Vetiver oil	2.4ml	2 ml	2 ml	Sedative effect
4	Sandalwood oil	2.4ml	1.5ml	1,5ml	Calming agent
5	Ethanol	0.4ml	0.5ml	0.5ml	Solvent

Evaluation Parameters of Aromatherapy Inhaler

Evaluation parameter	F1	F2	F3
Colour	Pale yellow	Pale yellow	Pale yellow
Odour	Pleasant aromatic	Pleasant aromatic	Pleasant aromatic
Homogeneity	Good	Good	Good
Stability	Stable	Stable	Stable
Irritation test	No irritation	No irritation	No irritation

Mechanism of Action

The therapeutic effects of aromatherapy are primarily mediated through the olfactory system. When aromatic molecules from essential oils are inhaled, they bind to olfactory receptors located in the nasal cavity. These receptors transmit signals to the olfactory bulb, which then communicates with the limbic system of the brain.

The limbic system includes structures such as the amygdala and hippocampus, which are involved in emotional regulation, memory processing, and stress responses. Activation of these pathways can influence neurotransmitter release and autonomic nervous system activity.

Lavender oil contains linalool and linalyl acetate, compounds known for their anxiolytic and sedative properties. These compounds may reduce sympathetic nervous system activity and promote relaxation.

Chamomile oil contains apigenin, which interacts with gamma-aminobutyric acid (GABA) receptors in the brain. GABA is a neurotransmitter associated with calming effects and sleep induction.

Vetiver and sandalwood oils contribute additional calming and grounding effects that enhance the overall relaxation response.

ADVANTAGES

Portable and convenient device

Non-invasive method of aromatherapy delivery

Natural alternative to pharmaceutical sleep aids, Rapid action through inhalation

Minimal risk of systemic side effects

RESULTS AND DISCUSSION

Based on the literature evidence and formulation design, the aromatherapy inhaler is expected to produce calming effects that support sleep initiation and relaxation. The combination of essential oils creates a balanced aromatic profile that targets both psychological stress and physiological relaxation.

Lavender and chamomile primarily contribute sedative and anxiolytic effects. Vetiver enhances grounding and emotional stability, while sandalwood promotes mental calmness.

The inhaler delivery system offers several advantages compared to other aromatherapy methods such as diffusers or topical applications. The device is portable, easy to use, and allows controlled inhalation of aromatic vapors.

Additionally, inhalation provides rapid onset of action because aromatic molecules quickly reach the olfactory receptors and influence neural pathways associated with mood and relaxation.

Although the formulation is promising, further clinical evaluation involving human participants would be necessary to measure improvements in sleep quality using standardized assessment tools such as sleep questionnaires or actigraphy monitoring.

CONCLUSION

The development of a sleep-enhancing aromatherapy inhaler using lavender, chamomile, vetiver, and sandalwood essential oils represents a promising natural approach for promoting relaxation and improving sleep quality.

The inhaler design allows convenient delivery of aromatic compounds that interact with the olfactory system and influence neurological pathways associated with emotional regulation and sleep. Based on existing literature, essential oils such as lavender and chamomile demonstrate significant potential for reducing anxiety and supporting restful sleep. Future research should focus on controlled clinical trials to evaluate the effectiveness of the inhaler formulation in diverse populations. Additional optimization of essential oil concentrations and delivery mechanisms may further enhance the therapeutic potential of this aromatherapy device.

Compliance with ethical standards**ACKNOWLEDGMENTS**

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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