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TRADITIONAL AROMATHERAPY IN MODERN STRESS MANAGEMENT: MECHANISMS, EVIDENCE AND THERAPEUTIC PERSPECTIVES

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ABSTRACT
Stress is an important health issue that is linked to various psychological and physiological disorders, thereby necessitating complementary methods that are safe and efficacious for therapeutic purposes. Aromatherapy is one of the complementary approaches that uses essential oils obtained from plants as means for alleviating stress. This paper aims to critically summarize literature data on the efficacy, mechanisms of action, application, synergy, safety and limitations in researching aromatherapy as a method for stress relief. Clinical and preclinical evidence suggests that essential oils including lavender, bergamot, chamomile, rose and ylang-ylang may have anxiolytic, sedative and mood enhancing properties. Possible mechanisms underlying such properties include olfactory activation of the limbic system, modification of GABAergic, serotonergic and dopaminergic transmission, control of hypothalamic-pituitary-adrenal axis and autonomic nervous system as well as antioxidant and anti-inflammatory effects. Synergy can be achieved by combining different oils because several mechanisms can be targeted at once, although variations in terms of chemical composition of oils, their doses and administration can affect comparison of the results in various studies.

KEYWORDS: *Anxiety, Aromatherapy, Complementary therapy, Essential oils, HPA axis, Stress management*

INTRODUCTION

Stress is a multifaceted physical and mental phenomenon, which takes place when one's homeostatic balance becomes endangered by some perceived threat. In today's world, the cases of stress have increased significantly owing to such variables as urbanization, stressful workplaces, changes in one's lifestyle, and psychosocial stressors. Stress is associated with a number of pathological states, such as depression, anxiety disorders, cardiovascular disorders, metabolic syndromes, and immune deficiency. The increase in stress-related disorders calls for more effective treatment approaches [1,2].

Traditional drug therapy such as benzodiazepines and SSRIs can be used for managing stress and anxiety. Despite being common in practice, these drugs often present significant problems such as sedation, dependence, tolerance, cognitive impairment, and withdrawal effects. Such disadvantages led to the development of CAM practices as an alternative means of generating therapeutic benefits while minimizing side effects [3,4].

Another important therapy under the umbrella of complementary and alternative medicine (CAM) is aromatherapy that makes use of the healing properties of essential oils derived from aromatic plants to improve both the physical and emotional wellbeing of a person. Essential oils are complicated mixtures of volatiles that include terpenes, alcohols, esters, and phenols, and each of them has different biological properties. They can be delivered to the body either by means of inhalation, topical administration, or diffusion. Inhalation is especially important in reducing stress because it promotes quick contact between the nasal area and the olfactory receptors [5,6].

A number of scientific studies conducted on animal models have found that different essential oils possess anxiolytic and stress-relieving effects. These studies have made use of animal tests such as the elevated plus maze, open field test, and light-dark box test to assess their anxiolytic potential. The therapeutic mechanism of action is believed to involve neurotransmitter systems like gamma-aminobutyric acid (GABA), serotonin, and dopamine systems. In addition, these compounds possess antioxidant and anti-inflammatory effects, contributing to their anti-stress potential [7-9].

Researches have also shown that aromatherapy is useful in lowering stress levels among people. Many researchers have shown that the breathing of essential oils, such as lavender oil, bergamot oil, and chamomile oil, causes decreases in various measures of stress such as decreased levels of cortisone, decreased blood pressure, decreased heart rates, and anxiety scores among others. This means that aromatherapy can be used as an effective therapeutic method in stress relief by different people such as students, health care practitioners, and patients during medical treatments [10–12].

Although substantial data exists regarding aromatherapy practices, there are difficulties associated with the standardization of such treatments owing to variations in essential oil content, doses, modes of administration, and study designs. For this reason,

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an extensive review of the literature available would play an instrumental role in understanding the effectiveness of aromatherapy as well as its mechanism of action and possible adverse effects. The purpose of this review is to provide a critical analysis of the literature that focuses on the efficacy of aromatherapy in stress management.

Pathophysiology of Stress

Stress refers to a physiological reaction that has many causes and involves a complex interaction among different biological systems including the nervous, endocrine, and immune system. In response to a stressor in one's life, either psychological or environmental, the body launches a physiological reaction geared toward restoring internal equilibrium. There are two main biological systems involved in this stress reaction: the HPA axis and SAM system [1,2].

Definition of Stress Stress is a reaction within the body which has several factors and is characterized by the complex interplay between the various biological systems such as the neurological, hormonal and immunological systems. The body reacts physiologically towards any form of stimuli, either psychological or environmental, with an aim of restoring balance in the body. There are two major biological systems that react during stress response, the HPA axis and SAM system [1,2].SAM system responds similarly to the HPA axis; however, the SAM system responds instantly to stress through the mechanism of "fight or flight". During activation of this biological system, catecholamines including adrenaline and noradrenaline are secreted into the bloodstream from the adrenal medulla. Catecholamines enhance respiration rate, heartbeat, blood pressure and glucose release to prepare the body for any threats. Excessive stimulation of SAM system causes cardiovascular diseases such as hypertension and atherosclerosis [5,6].

In terms of the CNS, stress greatly impacts on the functioning of brain structures responsible for emotions regulation and cognitive processes – such as the amygdala, hippocampus, and prefrontal cortex. Amygdala, which is responsible for emotional responses and fear perception, experiences increased activity in case of stress exposure. Conversely, hippocampus, which performs memory formation and HPA axis feedback regulation, reacts very sensitively to increased cortisol concentration. Chronic stress is associated with decreased volume of this structure and poor cognitive performance. Prefrontal cortex, which takes part in performing executive functions and decision-making, demonstrates decreased activity under chronic stress and leads to poor cognition [7,8].

The neurotransmitter system is essential in the pathophysiology of stress. For instance, gamma-aminobutyric acid (GABA), which is the main inhibitory neurotransmitter of the brain, is important for lowering neuronal excitability and calming the individual. It is known that stress results from reduced function of GABA receptors, thus increasing anxiety levels and neuron activity. Serotonin and dopamine systems also have a great influence on stress since imbalances in these neurotransmitters lead to mood problems during stress episodes [9,10].

Apart from changes in neuroendocrine and neurotransmitters, oxidative stress and inflammation are associated strongly with the process of stress. Stress leads to an increased formation of ROS, which causes cell dysfunction and neuron damage. Moreover, through inflammatory pathway activation caused by stress, levels of pro-inflammatory cytokines like IL-6 and TNF-α increase. It should be noted that these inflammatory factors do not only act on peripheral tissues but also impact brain physiology, contributing to neuropsychiatric disorders [11,12].

Conclusion

In general, the pathology of stress is quite complicated, as it includes hormonal, neurochemical, and immunological factors. The malfunctioning of these factors due to chronic stress contributes to various physiological and psychological problems. Studying these factors scientifically allows for investigating therapeutic measures such as aromatherapy as a means of alleviating stress.

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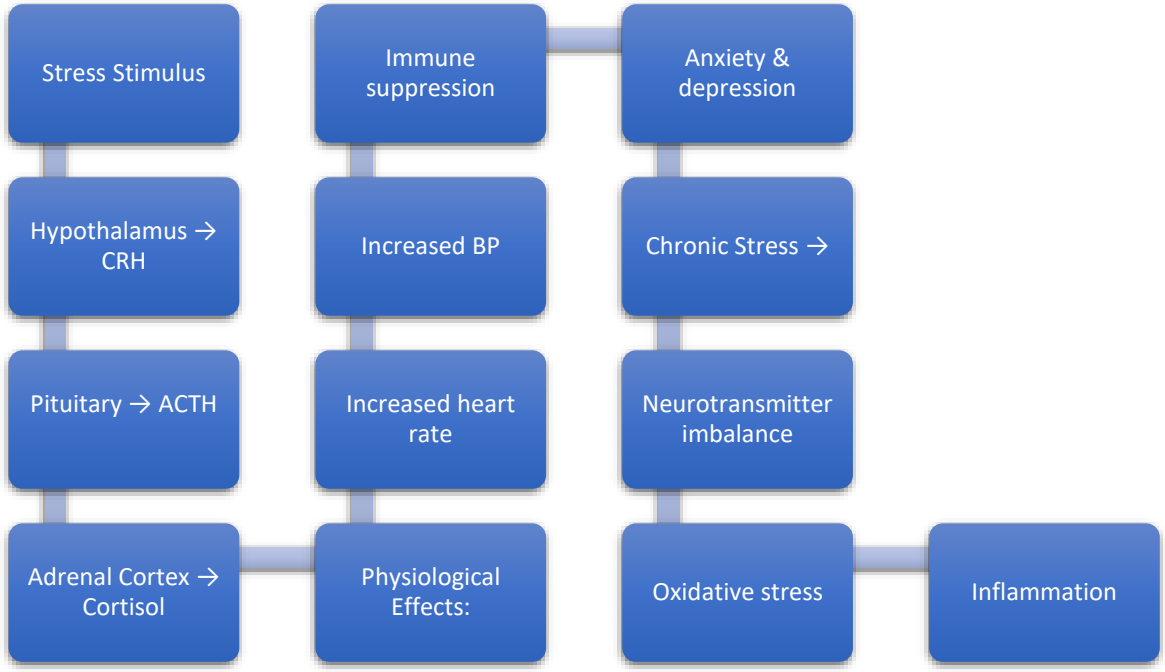

Figure 2: Pathophysiology of Stress

Overview of Aromatherapy

Aromatherapy can be described as one of the disciplines of CAM that entails the application of essential oils derived from plants as a means of improving the health of an individual physically, psychologically, and emotionally. Aromatherapy is an ancient practice which traces its origins back to ancient civilizations such as Egypt, China, and India where extracts from aromatic plants were applied for both medicinal and spiritual purposes. Modern day aromatherapy has attracted a lot of attention for its effectiveness in dealing with anxiety and other related disorders [13,14].

Essential oils are highly volatile extracts of a plant obtained from different parts of that plant, such as leaves, bark, flower, root, fruit, etc. Essential oils have an intricate composition of bioactive elements, including terpenes, esters, aldehydes, ketones, phenols, and alcohol. The chemical composition of essential oils varies with the variety of plant from which it is extracted, its geographical source, and storage conditions [15,16].

The use of aromatherapy can occur in various ways; however, inhalation and topically are some of the most widely practiced methods of application. During inhalation, there is the dispersion of essential oil particles into the atmosphere where they are inhaled into the body via the olfactory pathway. When inhaled, the volatile components of the particles excite the olfactory receptors in the nasal passage, sending their signals to the limbic system in the brain. The limbic system consists of structures such as the amygdala and hippocampus, which are responsible for managing stress and emotion [17,18].

Topical use of oils is another popular approach in aromatherapy, which involves dilution of essential oils in carrier oils followed by application on the skin via massage. The topical administration of oils involves their penetration into the skin and entry into systemic circulation, producing local as well as systemic effects. Aromatherapy massage therapy is especially useful in stress relief owing to its unique combination of touch therapy and pharmacotherapy [19,20].

There is evidence for the effectiveness of aromatherapy in managing stress, considering that it is possible to regulate a number of biological and psychological functions via aromatherapy. In particular, essential oils can affect the activity of the autonomic nervous system, contributing to such effects as reduced heart rate, blood pressure, and cortisol level. Moreover, some types of essential oils can exert effects on neurotransmitter systems (GABA, serotonin, dopamine), resulting in anxiety relief and improved mood [21,22].

Recently, there have been many applications of aromatherapy in healthcare practice. These include hospitals, hospice centers, and other settings. Its application involves using it as a complementary approach for increasing comfort, reducing anxiety prior to medical procedures, and improving quality of life. However, the validation of aromatherapy through science continues to be a topic of discussion and research aimed at making the practice more effective [23,24].

Conclusively, aromatherapy is defined as a form of holistic therapy based on the medicinal and sensory components of essential oils used in altering both physiological and emotional states. The simplicity and non-invasiveness of this treatment technique, coupled with a low risk of adverse effects, make it a favorable choice for stress management. Nevertheless, there is need for further investigation into the processes involved in its working mechanisms.

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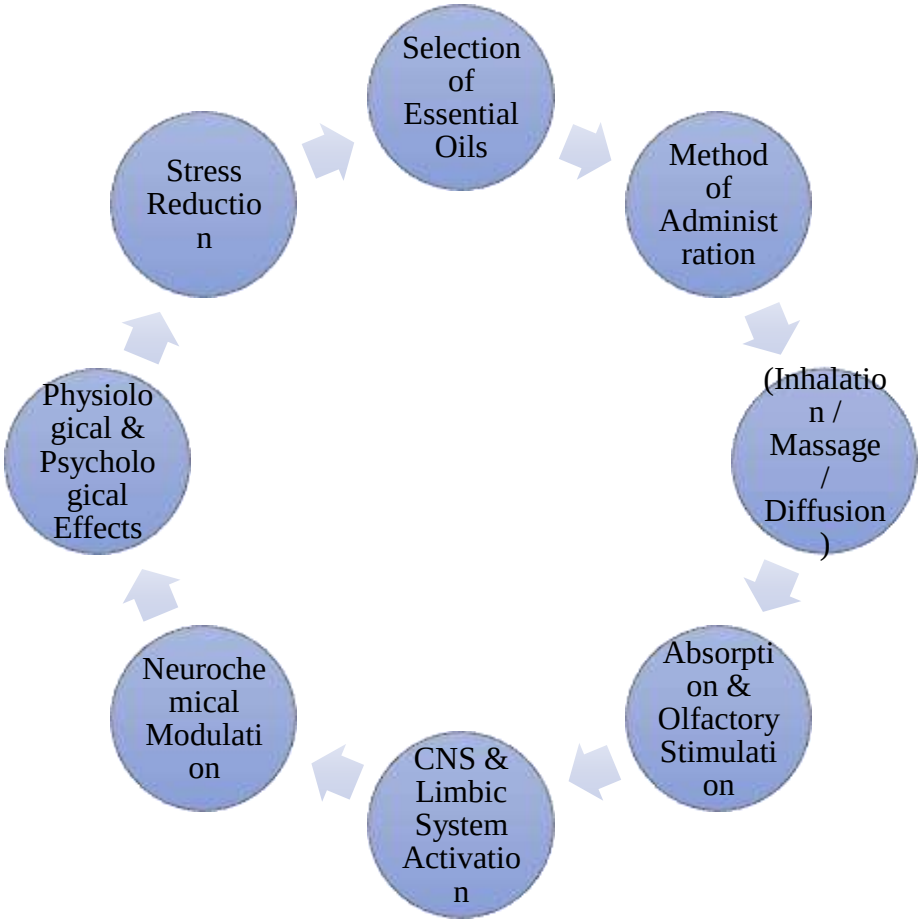

Flowchart 1: Aromatherapy Intervention in Stress Management

Mechanism of Action of Essential Oils in Stress Management

The pharmacological properties of aromatherapy used in managing stress work through several pathways of the neurobiology, endocrinology, and biochemistry. The essential oils have multiple biological constituents that affect the CNS and the physiological functions in the body peripherally. These effects mainly occur through olfactory stimulation, neurotransmitter activity regulation, HPA axis regulation, and antioxidant and anti-inflammatory functions [6,3].

Among other ways of affecting humans is the olfactory pathway where there is a direct connection from inhaled essential oils to the brain through the olfactory receptors. The olfactory receptor neurons get activated by the binding of these components to receptors. Signals from these neurons are then conducted to the olfactory bulb, which sends impulses directly to the limbic region of the brain. The limbic region comprises of two sections, the amygdala and the hippocampus, both known for their roles in controlling emotions and stress response [25,26].

Essential oils also regulate important neurotransmitter systems that play a role in stress and anxiety. One such neurotransmitter system involves the inhibition of neuronal firing by gamma-aminobutyric acid (GABA), which is considered to be the main inhibitory neurotransmitter in the brain. Some components of essential oils, including linalool and linalyl acetate in lavender oil, have proven effective in enhancing GABAergic neurotransmission, resulting in decreased neuronal activity and, consequently, anti-anxiety action. Moreover, essential oils affect the serotonin and dopamine pathways, which are vital for maintaining proper mood balance [5,27-28].

One more key mechanism is HPA axis modulation, whose dysfunction usually takes place during chronic stress situations. Essential oils are known to normalize the activity of the HPA axis by inhibiting excessive stress hormone production. The reduction in the amount of cortisol produced has been linked to enhanced mood, less anxiety, and physiological homeostasis. It has been proven that inhalation of certain essential oils results in the significant decrease in the level of salivary cortisol [4,8].

Aromatherapy affects the autonomic nervous system as well. The use of essential oils leads to a shift from sympathetic dominance (associated with stress) to parasympathetic dominance. It causes slowing down of heart rate, lower blood pressure, and promotes relaxation. This effect is typical of decreased levels of stress and positive emotions [9].

Apart from affecting the neurons of the body, the essential oils have been found to possess powerful antioxidant and anti-inflammatory actions that contribute positively in dealing with stress. Increased oxidative stress and production of pro-inflammatory

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cytokines have been reported in conditions characterized by stress. Essential oils have been reported to contain a high concentration of phenols and terpenes that help to prevent cellular damage in the neurons [10,11].

Additionally, the oils can bind to ion channels and receptors, such as NMDA (N-methyl-D-aspartate) receptors and TRP (transient receptor potential) channels, aiding their role in neuromodulation. This binding plays a key role in regulating synaptic transmission and neuronal excitability, hence the anxiolytic and calming effect of the oils [29].

The modes of actions of essential oils on stress management are various and include direct impact on the brain via the olfactory system, impact on hormones, neurotransmitters, and other substances, as well as antioxidant and anti-inflammatory actions. It is the interconnection of all these mechanisms that explains the efficiency of aromatherapy for stress management.

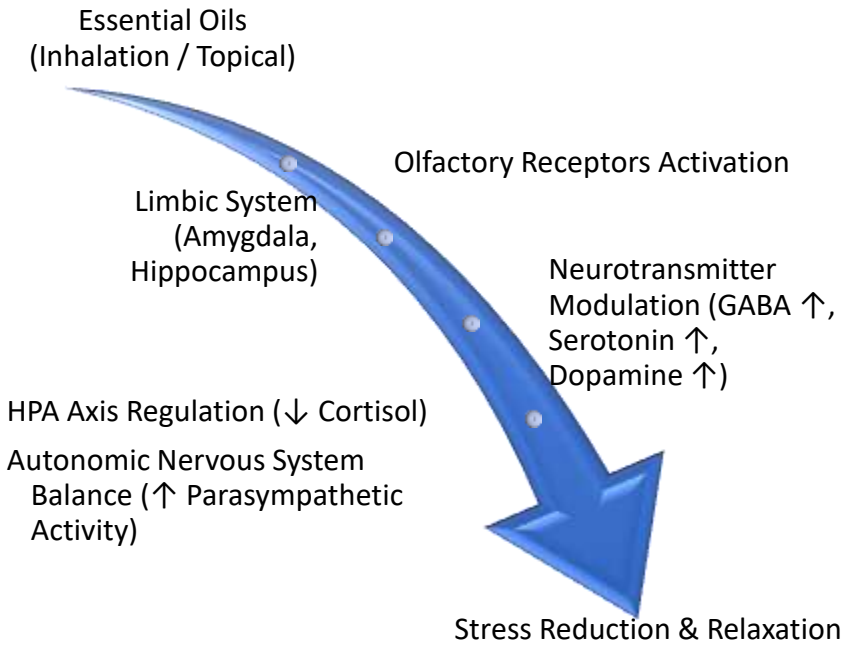

Figure.1 Mechanism of Action of Aromatherapy in Stress Management

Common Essential Oils Used for Stress Relief

Different types of essential oils are known for their stress relief abilities because of either conventional or scientific understanding. Although essential oils vary in terms of chemical make-up, they all contain various substances like terpenes, esters, and alcohols that help induce calmness and improve moods. It can be said that the use of essential oils in treating stress is based upon their pharmacology and safety, among other factors [34,35].

One of the most researched essential oils is lavender oil (Lavandula angustifolia), which is considered a gold standard for relaxation and relieving stress in aromatherapy. This oil contains linalool and linalyl acetate compounds that are said to help in managing stress due to their calming and anti-anxiety effects by altering GABA receptors. Various research findings show that lavender oil alleviates anxiety levels, promotes better sleep, and decreases physiological symptoms of stress, including heart rate and cortisol levels. The effectiveness of this oil has been proven in several animal tests and clinical studies [7-9].

The Bergamot essential oil (Citrus bergamia) is yet another essential oil that possesses considerable anxiolytic actions. Containing high amounts of such chemical components as limonene and linalyl acetate, Bergamot oil has been proved to help relieve stress and enhance relaxation. According to several clinical trials, exposure to Bergamot essential oil decreases cortisol concentrations and improves mood conditions in healthy subjects and in patients suffering from psychological stress [30,32].

Oil of chamomile **(Matricaria chamomilla or Chamaemelum nobile)** is well known for its gentle sedative and soothing properties. This oil comprises active compounds like apigenin that can bind to the benzodiazepine receptors in the brain, resulting in anti-anxiety properties. Historically, chamomile has been used for treating insomnia, anxiety, and nervous tension. Both experimental studies and clinical trials confirm its effectiveness as a natural agent in decreasing stress and increasing relaxation [36,37].

Essential oils of **ylang-ylang (Cananga odorata)** are used in aromatherapy for their mood-lifting effects. This essential oil has been proven effective in reducing high blood pressure, heart rates, and stress response by acting on the autonomic nervous

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system. The inhalation of ylang-ylang essential oil stimulates the parasympathetic activity that results in relaxation and good emotions [38].

Peppermint oil (Mentha piperita), although predominantly used for its stimulative and refreshing effect, also helps manage stress. It is useful in relieving mental exhaustion, enhancing concentration, and alleviating headache caused by stress. The active compound in peppermint oil, menthol, possesses mild analgesic properties, contributing to its therapeutic value [25].

Other oils, like **rose oil (Rosa damascena)**, have been found to possess significant anxiolytic and antidepressant properties. Rose oil has several active constituents like citronellol and geraniol that affect the brain. It has been clinically proven that inhalation of rose oil can help lower anxiety, especially when faced with anxiety-provoking situations like medical procedures and childbirth [26].

Other oils such as sandalwood **(*Santalum album*),** frankincense ***(Boswellia carterii),*** and clary sage (Salvia sclarea) are also known to exhibit stress-reducing abilities as a result of their grounding and calming properties. They are used singly or in combination to create synergy that boosts the effectiveness of their application [34,35].

In conclusion, essential oils like lavender, bergamot, chamomile, ylang-ylang, peppermint, and rose can be considered among the important ingredients of aromatherapy with respect to stress relief. The various modes of actions of these oils, together with sufficient empirical studies conducted on them, justify the effectiveness of their use.

Essential Oil	Major Constituents	Mechanism of Action	Reported Effects
Lavender (*Lavandula angustifolia*)	Linalool, Linalyl acetate	GABA modulation, CNS depression	Anxiolytic, sedative, improves sleep
Bergamot (*Citrus bergamia*)	Limonene, Linalyl acetate	Cortisol reduction, ANS modulation	Mood enhancement, stress reduction
Chamomile (*Matricaria chamomilla*)	Apigenin, Bisabolol	Benzodiazepine receptor interaction	Mild sedation, anxiolytic
Ylang-ylang (*Cananga odorata*)	Germacrene, Linalool	Parasympathetic activation	Reduces BP, relaxation
Peppermint (*Mentha piperita*)	Menthol	CNS stimulation, analgesic effect	Reduces fatigue, improves focus
Rose (*Rosa damascena*)	Citronellol, Geraniol	CNS modulation, emotional regulation	Anti-anxiety, calming effect

Preclinical Studies (Animal Models)

Animal Model Studies (Preclinical)

Preclinical animal model studies have been instrumental in explaining the anti-anxiety and stress-relief properties of essential oils. Animal model studies are used in the understanding of the underlying mechanisms of action of aromatherapy. Established behavioral paradigms are adopted in animal studies to investigate stress and anxiety levels in animals such as EPM (elevated plus maze), OFT (open field test), light-dark box test, and FST (forced swim test). The models are accepted and reliable means of evaluating the anxiolytic and antidepressant potentials of drug compounds [3,4].

Among these tests, one of the most frequently utilized tests for evaluating anxiety-related behavior is the elevated plus maze test. The elevated plus maze test is an animal model that is founded on the innate avoidance tendency of rodents toward areas that are elevated and open. Generally, anxiolytic drugs cause an increase in the time spent in the open arms as well as the frequency of the animal's entry into the open arms, which denotes lower anxiety. There have been many essential oils reported to show considerable anxiolytic activity when administered to animals using the EPM test. Lavender oil (Lavandula angustifolia) is a notable example of this phenomenon [10–12].

Another common technique used to study exploratory behavior and locomotion activity is the open field test. With this technique, stressed and anxious animals usually display low locomotor activity and aversion to the center part of the arena. Bergamot (Citrus bergamia) and chamomile (Matricaria chamomilla) oils have both shown an ability to promote higher locomotor activity and spending more time in the central zone of the open field, meaning lower levels of anxiety and increased exploratory behavior[30,31].

Anxiogenic behavior is measured using the light-dark box test that takes into account the innate tendency of mice to prefer the darker enclosed areas. The use of anxiolytic drugs leads to more time being spent in the brightly lit chamber and more transitions from one chamber to the other. Various studies conducted showed that mice exposed to essential oils exhibit increased exploration in the bright chamber, hence, acting as anxiolytics [2].

In addition to being applied in determining behaviors similar to those associated with depression, the forced swim test has also been used to study the influence of essential oils on stress-related disorders. The reduction in immobility time is taken to indicate an antidepressant response. Essential oils like lavender oil and rosemary oil have been found to reduce immobility time, hence

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demonstrating the possibility of using essential oils to treat stress-induced depression through their ability to alter monoamine neurotransmission systems [33,40].

Besides the behavioral assessment, there have been some investigations into biochemical and molecular processes involved in the administration of essential oils to animals. This includes low serum concentration of the hormone cortisol, decreased oxidation, and the regulation of cytokines involved in inflammation. Some researchers have found that essential oils have the ability to increase the activity of antioxidants enzymes such as superoxide dismutase and catalase, as well as reduce lipid peroxidation [1,38].

Moreover, receptor antagonism experiments involving pharmacological investigations have shown the contribution of some neurotransmitters to the action of essential oils. In particular, the anxiolytic effect of certain oils was suppressed by the use of GABA receptor antagonists, showing the participation of the GABAergic system. The same was also reported regarding the interactions with the serotonin system, thereby confirming the multineurotransmitter theory of the action of these essential oils [3,13].

In general, preclinical research conducted on animal models provides considerable proof about the anxiolytic and stress-relieving effects of essential oils. Such research contributes to the establishment of a scientific background for aromatherapy application in stress management and sets a platform for future clinical trials.

Model Used	Essential Oil	Key Findings
Elevated Plus Maze (EPM)	Lavender	Increased open arm entries (anxiolytic effect)
Open Field Test (OFT)	Bergamot	Increased locomotion and exploration
Light–Dark Box	Chamomile	Increased time in light compartment
Forced Swim Test (FST)	Lavender, Rosemary	Reduced immobility (antidepressant effect)

Clinical Evidence (Human Studies)

There is considerable scientific proof through clinical trials regarding the effectiveness of aromatherapy in treating stress and anxiety in people. As opposed to preclinical trials, clinical research focuses on testing the practicality of essential oils in various settings for use by healthy persons, surgery patients, and people suffering from psychological problems. Results of these tests are based on subjective and objective factors, such as anxiety scales, mood changes, cortisol, heart rate, and blood pressure [3,27].

The essential oil that has received much scientific research attention in various clinical studies **is lavender oil (*Lavandula angustifolia*)**. Many randomized controlled studies have confirmed the considerable anti-anxiety properties of the oil. Inhaling lavender fragrance reduces the level of anxiety among patients about to undergo dental treatment, as well as enhancing their mood and relaxation. This is usually associated with physiological changes like reduced heartbeat and lowered blood pressure, reflecting lower levels of autonomic arousal. The oil is also known to enhance the quality of sleep, linked closely with stress relief [8,25,26].

Bergamot oil (*Citrus bergamia*) is another plant extract that has proven to be effective through clinical trials. It was found that inhalation of the essential oil of bergamot could result in a reduction of salivary cortisol secretion and improvement in positive emotional states. Trials performed on healthy participants as well as those exposed to stressful conditions confirmed its effectiveness in relaxation and reducing psychological stress [30,32].

The medical studies prove that **rose oil *(Rosa damascena*)** is also beneficial in treating anxiety and stress. Rose oil inhalation and topical application have proven to be helpful in decreasing the activity of the sympathetic nervous system, which helps lower heart rate, blood pressure, and breathing rate. Medical research proves that rose oil has helped in alleviating anxiety during labor and other clinical conditions [39].

The anxiolytic and mild sedative action of **chamomile *(Matricaria chamomilla)*** has been investigated in several clinical studies. Extracts of chamomile have been found to be effective in reducing symptoms of generalized anxiety disorder. The safety and efficacy of chamomile, along with low incidence of adverse effects, make it an ideal candidate for chronic use [7].

In addition to essential oils used independently, aromatherapy massage has also been extensively researched as a holistic treatment. This treatment technique involves combining the medicinal properties of essential oils with those of massages. Research on aromatherapy massages has established their significant contribution to lowering stress, anxiety, and depression levels for different patient groups, ranging from people with cancer to the elderly and healthcare workers [9].

Moreover, the effectiveness of aromatherapy has been documented for reducing anxiety and enhancing patient comfort in the clinical setting. Diffusion of essential oils in waiting areas and rooms in which treatments take place have helped to enhance the mood and minimize stress of the patients. This approach to treating conditions is especially helpful owing to its easy application and low risk of adverse effects [4,40].

While these findings may be optimistic, there are some limitations when it comes to conducting clinical studies for aromatherapy. The lack of uniformity in terms of design, variability in essential oils used, small samples, and non-standardized procedures might be factors that contribute to the inconsistency of findings. On top of that, placebo effects and personal variations in sense of smell must be considered as potential influences on the studies' results.

Overall, there is substantial empirical evidence indicating the effectiveness of aromatherapy as a complementary therapy for managing stress. Lavender, bergamot, rose, and chamomile oils have shown considerable success in alleviating stress in terms of both mental and physical symptoms. This further strengthens the therapeutic value of aromatherapy in healthcare.

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Study Type	Essential Oil	Population	Outcome
RCT	Lavender	Dental patients	Reduced anxiety and heart rate
Clinical trial	Bergamot	Healthy volunteers	Decreased cortisol levels
RCT	Chamomile	Anxiety patients	Reduced GAD symptoms
Clinical study	Rose	Labor patients	Reduced stress and BP
Aromatherapy massage	Mixed oils	Cancer patients	Reduced anxiety and improved well-being

Synergistic Effects of Essential Oils

Synergy is an important factor in aromatherapy because the combination of several essential oils generates an effect that is better than the separate effects generated by each of them. This process is known as synergistic interactions. Synergistic interactions are very helpful when dealing with stress, which is multi-dimensional, including various physiological mechanisms and psychological mechanisms. Combining different essential oils results in having a wider range of action by targeting all these dimensions at the same time [3,4].

The synergy occurs because of the presence of various bioactive ingredients in different essential oils. Every essential oil comprises its own set of bioactive compounds, which include but not limited to monoterpenes, sesquiterpenes, alcohols, esters, and phenolic compounds. These bioactive components can interact in pharmacodynamic and pharmacokinetic interactions, which would result in increased efficiency of treatment. This can be achieved because the first compound will help absorb the second one, while others will affect other receptors[25,41].

Under stress management, the use of blends of essential oils has been known to create combined functions such as anti-anxiety, sedative, anti-depressive, and mood stabilizers. This is seen in the case of lavender oil (Lavandula angustifolia) and bergamot oil (Citrus bergamia) whose functions overlap but differ. The function of lavender oil is mainly GABAergic neurotransmission, while that of bergamot is serotonin and autonomic nervous systems functions.

Collectively, their impact leads to a more significant decrease in anxiety and physiological stress indicators than when each one is taken separately [27,42].

The use of **chamomile** ***(Matricaria chamomilla)*** together with **ylang-ylang (*Cananga odorata*)** may improve the ability to relax by utilizing their sedative properties in addition to regulating the autonomic nervous system. In particular, the action of chamomile is based on receptor activity at the benzodiazepine site while ylang-ylang acts on the cardiovascular system [7,8].

There are preclinical studies that also validate synergy between essential oils. Animal trials have shown that combination treatments of essential oils yield stronger anxiolytic actions, reflected in increased visits to the open arms of the elevated plus-maze test and lower immobility periods in the forced swim test. This implies that mixed formulations can deliver better results than monotherapy with essential oil [26,43].

Clinical evidence further endorses the effectiveness of essential oil mixtures in managing stress. Essential oils that are mixed together for massage therapies, diffused and inhaled usually comprise several oils specifically formulated to accomplish certain objectives. It is observed from the studies conducted that essential oil mixture can effectively lower down the level of anxiety in patients and improve their general well-being under stressful situations such as during hospitalization or treatment process [44,45].

From the mechanistic point of view, synergy can occur due to the interaction between many neurotransmitter systems, such as GABA, serotonin, and dopamine, along with HPA and autonomic nervous systems. Furthermore, the combination of antioxidative and anti-inflammatory activities of different oils is likely to contribute to better neuroprotection [25,41].

However, although there seems to be an immense possibility of using synergistic aromatherapy for the treatment of various conditions, some difficulties arise in establishing standard combinations and ratio proportions of essential oils used. It is due to the fact that there may be significant differences in the chemical composition of the oils used, individual reactions, as well as inconsistent protocols in clinical practice .

In summary, synergy in the use of essential oils is one important strength of aromatherapy in the treatment of stress. Through the combination of several oils, each of which operates on a similar mechanism, it becomes possible to attain better results from the use of aromatherapy.

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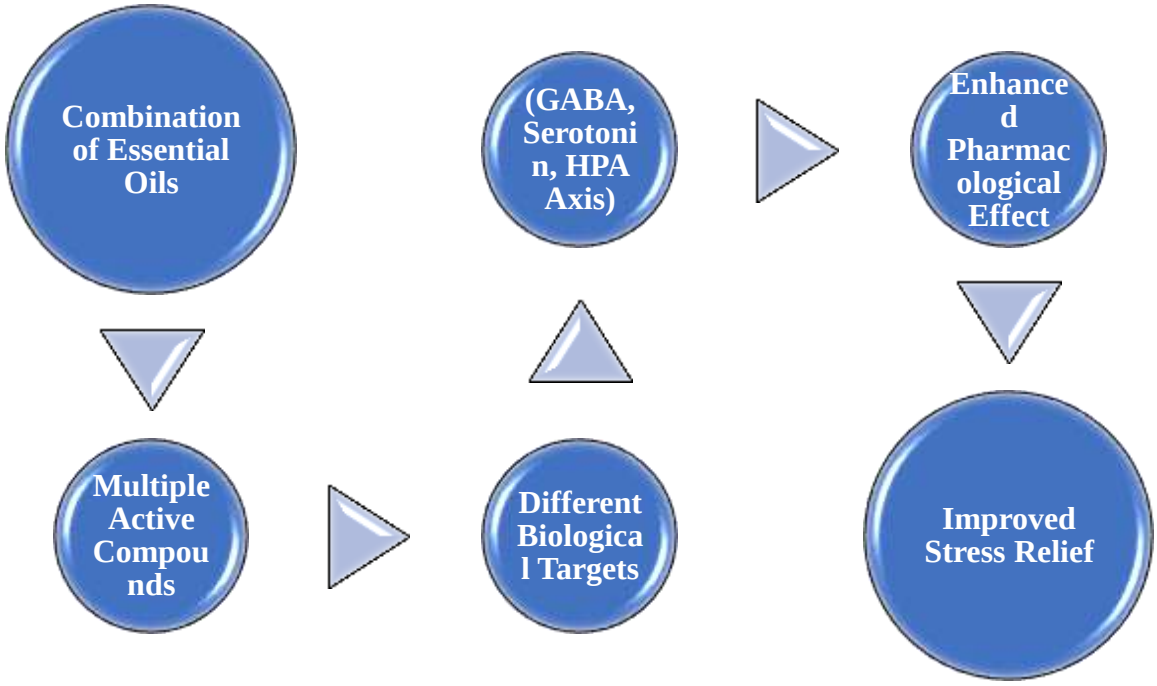

Flow chart. 2 Synergistic Action of Essential Oils.

Safety, Toxicity, and Limitations

While aromatherapy is considered to be a safe and non-invasive treatment modality, the application of essential oils is not risk-free. Various factors may affect the safety of essential oils, such as the chemical nature of oils, their concentration, mode of administration, time of exposure, and individual sensitivity. In this regard, knowledge about possible side effects and limitations of their use is needed to apply these products rationally and effectively [25,26].

One of the most frequently reported side effects of essential oils is skin irritation or allergy problems caused by improper application of these oils to the skin. As we know, essential oils are very potent compounds that can cause skin inflammation, redness, and other issues, especially if the oils are not properly diluted. Certain oils like cinnamon oil or clove oil, which contain lots of phenolic compounds, have especially high irritative effect [3,4].

Another crucial aspect to consider is toxicity from abuse or overdose. The inhalation of essential oils in excessive quantities may cause reactions such as headaches, dizziness, nausea, or even irritations in the respiratory tract. If essential oils are ingested accidentally, they may pose serious risks for the body due to neurotoxicity and hepatotoxicity, according to the type and concentration of the oil. Eucalyptus and camphor oils, among others, are known to pose a high risk of toxicity after ingestion [8,31].

Quality and purity of essential oils are important determinants in the effectiveness and safety of such compounds. Altering the chemical structure of essential oils through adulteration and contamination reduces their therapeutic benefits while increasing their adverse effects on health. In addition, factors such as inconsistency in the source plants and procedures used to manufacture the essential oils further increase inconsistencies in their quality [27].

One other disadvantage associated with aromatherapy is that there is no standardized method for determining dosing or course of treatment. Unlike mainstream medicines, essential oils do not provide a set dosage and frequency of use for achieving a specific purpose. Such variations make comparison and drawing definitive conclusions difficult. Individual differences in response due to age, gender, genetics, and smell sensitivity also play an important role in aromatherapy results [25,26].

Drug interactions may also be another source of possible worry when essential oils are combined with regular medicines. Essential oils can affect the cytochrome P450 system by inhibiting or activating it; hence, affecting the body's drug metabolizing ability and causing the drugs to become less effective or more toxic. Even though there is little research available in this regard, caution must be taken [5].

In addition, although there is increasing evidence from clinical research on aromatherapy, the results from most of the experiments are hampered by their small sample size, lack of blinding, and different methodologies used. Moreover, the placebo effect may also play a role when the subjective nature of some of the measurements such as anxiety and stress are considered [9,10].

These categories of people include pregnant women, newborns, elderly patients, and those suffering from any chronic ailments. Essential oils that are suitable for general use may not be safe for certain populations. For instance, there may be essential oils which possess hormonal or uterine stimulating properties and thus are harmful to pregnant women [6].

To summarize, although aromatherapy is safe provided it is used correctly, there are certain risks associated with its application. Appropriate dilutions, dosage control, product quality, and awareness of potential allergies can help avoid any harm.

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The issues of standardization, scientific evidence of effectiveness, and safety evaluation should be considered carefully to allow aromatherapy to gain widespread recognition in modern medicine.

Future Perspectives and Research Gaps

In spite of the increasing number of studies confirming that aromatherapy can effectively help in dealing with stress, there are still a number of issues related to aromatherapy which need to be clarified by further research. The following discussion of potential gaps in research into aromatherapy and their possible solutions may be useful in further development of aromatherapy as an evidence-based practice.

One of the major gaps in aromatherapy research is connected with the problem of essential oils' standardization. Due to variation in plant species, location of the plants, harvesting, and extraction, each batch of essential oils may differ significantly in terms of its chemical composition. Further research should concentrate on finding ways for the standardization of essential oil extraction processes and applying quality control and analysis of essential oils, such as GC-MS analysis [25,26].

One other notable limitation includes a lack of proper dosage protocols and administration. This arises since current research employs different concentrations, duration times, and methods of administration, either by inhalation, application topically, or massaging. The determination of proper dosages through clinical trials will thus prove important if aromatherapy is to be applied clinically [3].

While there are numerous clinical studies that have reported promising results, many suffer from small sample size, inadequate duration, and methodological flaws, which include absence of blinding and placebos. Further research needs to focus on conducting large-scale studies using double-blind placebo-controlled designs in order to get high-quality results. Moreover, the use of biomarkers like cortisol, heart rate variability, and inflammatory markers can add scientific validity to research findings [4,31].

Mechanisms for essential oils need to be elucidated further. Even though there is evidence that neurotransmitter systems, the HPA system, and autonomic regulation play some roles, precise mechanisms have not yet been clarified sufficiently. Molecular biology and neuroimaging technologies, along with the use of pharmacological principles of systems biology, could provide more information on the mechanisms behind the actions of essential oils. Network pharmacology and in silico strategies could also be helpful for target pathway identification and synergistic effects prediction [8].

One other field where further research needs to be conducted is that of synergy between essential oils. Even though blending of essential oils is commonly used in aromatherapy, the scientific support in this area is not very substantial. Detailed studies on various blends of oils and their pharmacodynamics need to be carried out [27].

Also worthy of exploration is the importance of aromatherapy in the field of personalized medicine. The varying genetics, sense of smell, and personalities of patients could affect their reactions to essential oils. Further research needs to be done in order to create personalized aromatherapy programs[5].

Moreover, there is also a necessity to conduct research among different kinds of clinical populations. Although most of the studies are conducted among healthy people or particular patient populations, such as dental and preoperative patients, very few researches exist among patients suffering from chronic stress-induced disorders such as generalized anxiety disorder, depression, and post-traumatic stress disorder [4].

Regulatory and educational perspectives are also critical areas that can be explored. The lack of regulation regarding the application of essential oils and aromatherapy can result in errors and variations in the quality of essential oils. The creation of regulations as well as the introduction of education on aromatherapy in medical training can improve its proper application [26].

In summary, despite the significant potential of aromatherapy as an additional technique for dealing with stress, more research should be undertaken to cover current deficiencies. These improvements will not only benefit the scientific grounding of aromatherapy but also promote its incorporation in evidence-based medicine.

DISCUSSION

This review highlights how aromatherapy is an effective complementary approach to stress management. The research supports this by means of both the preclinical and clinical investigation of the use of lavender, bergamot, chamomile and rose essential oils for decreasing anxiety, enhancing mood, and reducing stress symptoms. Stress-related effects of these essential oils are primarily attributed to the modulation of the limbic system; modulation of the neurotransmitters, GABA, serotonin, and dopamine; and the regulation of the hypothalamic-pituitary-adrenal (HPA) axis. In addition, the synergistic incorporation of multiple essential oils has the potential to produce greater benefit to individuals by impacting more than one stress-related pathway. Limitations to the comparability of the Premise can be attributed to the variable composition, dosage, administration and design of the essential oils that were studied. Although the current evidence base for aromatherapy supports its use as a primary tool for stress management; there is a need for future, well-designed, sufficient-sized clinical study of aromatherapy with standardized formulations to establish the effectiveness, safety, and therapeutic potential of aromatherapy as it pertains to the management of stress.

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CONCLUSION

The application of aromatherapy constitutes an effective method in the treatment of stress as well. This technique is a valuable option that provides an alternative way to deal with stress without undergoing any medical procedure. This treatment method works on different levels since essential oils affect various processes linked with stress such as emotional responses, physiological changes, and neurochemical reactions.

The effects of essential oils like lavender, bergamot, chamomile, and rose on stress have been shown in both laboratory and clinical studies to have powerful abilities to alleviate stress. Moreover, the combination of different essential oils is effective as they work together in an additive fashion to produce the desired effect.

Despite its benefits, aromatherapy must be used properly, such as selecting the right type of oil, proper dilution, and personalizing according to the individual needs. Standardization and scientific proofing can be done to improve this technique.

Finally, aromatherapy has tremendous promise when it comes to managing stress. It is possible that with further studies, this complementary therapy will find its rightful place in health care as a means of dealing with stress.

REFERENCES

1. *Lehrner J, Eckersberger C, Walla P, Pötsch G, Deecke L. Ambient odor of orange in a dental office reduces anxiety and improves mood in female patients. Physiol Behav. 2000;71(1–2):83–86.*
2. *Conrad P, Adams C. The effects of clinical aromatherapy for anxiety and depression in the high risk postpartum woman – a pilot study. Complement Ther Clin Pract. 2012;18(3):164–168.*
3. *Perry N, Perry E. Aromatherapy in the management of psychiatric disorders: clinical and neuropharmacological perspectives. CNS Drugs. 2006;20(4):257–280.*
4. *Lee MS, Choi J, Posadzki P, Ernst E. Aromatherapy for health care: an overview of systematic reviews. Maturitas. 2012;71(3):257–260.*
5. *Herz RS. Aromatherapy facts and fictions: a scientific analysis of olfactory effects on mood, physiology and behavior. Int J Neurosci. 2009;119(2):263–290.*
6. *Buckle J. Clinical aromatherapy: essential oils in healthcare. 3rd ed. London: Churchill Livingstone; 2015.*
7. *Chioca LR, Ferro MM, Baretta IP, Oliveira SM, Silva CR, Ferreira J, et al. Anxiolytic-like effect of lavender essential oil inhalation in mice: participation of serotonergic but not GABAergic transmission. Phytomedicine. 2013;20(8–9):825–829.*
8. *López V, Nielsen B, Solas M, Ramírez MJ, Jäger AK. Exploring pharmacological mechanisms of lavender essential oil on central nervous system targets. Front Pharmacol. 2017;8:280.*
9. *Umezu T. Behavioral effects of plant-derived essential oils in the GABAergic system. J Pharmacol Sci. 2010;113(4):295–302.*
10. *Goes TC, Antunes FD, Alves PB, Teixeira-Silva F. Effect of sweet orange aroma on experimental anxiety in humans. J Altern Complement Med. 2012;18(8):798–804.*
11. *Kritsidima M, Newton T, Asimakopoulou K. The effects of lavender scent on dental patient anxiety levels: a cluster randomized-controlled trial. Community Dent Oral Epidemiol. 2010;38(1):83–87.*
12. *Lehrner J, Marwinski G, Lehr S, Johren P, Deecke L. Ambient odors of orange and lavender reduce anxiety and improve mood in a dental office. Physiol Behav. 2005;86(1–2):92–95.*
13. *McEwen BS. Protective and damaging effects of stress mediators. N Engl J Med. 1998;338(3):171–179.*
14. *Chrousos GP. Stress and disorders of the stress system. Nat Rev Endocrinol. 2009;5(7):374–381.*
15. *Smith SM, Vale WW. The role of the hypothalamic–pituitary–adrenal axis in neuroendocrine responses to stress. Dialogues Clin Neurosci. 2006;8(4):383–395.*
16. *Herman JP, Cullinan WE. Neurocircuitry of stress: central control of the hypothalamo–pituitary–adrenocortical axis. Trends Neurosci. 1997;20(2):78–84.*
17. *Goldstein DS. Adrenal responses to stress. Cell Mol Neurobiol. 2010;30(8):1433–1440.*
18. *Ulrich-Lai YM, Herman JP. Neural regulation of endocrine and autonomic stress responses. Nat Rev Neurosci. 2009;10(6):397–409.*
19. *Arnsten AF. Stress signalling pathways that impair prefrontal cortex structure and function. Nat Rev Neurosci. 2009;10(6):410–422.*
20. *Kim JJ, Diamond DM. The stressed hippocampus, synaptic plasticity and lost memories. Nat Rev Neurosci. 2002;3(6):453–462.*
21. *Möhler H. The GABA system in anxiety and depression and its therapeutic potential. Neuropharmacology. 2012;62(1):42–53.*
22. *Ressler KJ, Nemeroff CB. Role of serotonergic and noradrenergic systems in the pathophysiology of depression and anxiety disorders. Depress Anxiety. 2000;12(S1):2–19.*
23. *Liu YZ, Wang YX, Jiang CL. Inflammation: the common pathway of stress-related diseases. Front Hum Neurosci. 2017;11:316.*
24. *Salim S. Oxidative stress and psychological disorders. Curr Neuropharmacol. 2014;12(2):140–147.*
25. *Bakkali F, Averbeck S, Averbeck D, Idaomar M. Biological effects of essential oils – a review. Food Chem Toxicol. 2008;46(2):446–475.*
26. *Edris AE. Pharmaceutical and therapeutic potentials of essential oils and their individual volatile constituents: a review. Phytother Res. 2007;21(4):308–323.*
27. *Ali B, Al-Wabel NA, Shams S, Ahamad A, Khan SA, Anwar F. Essential oils used in aromatherapy: a systemic review. Asian Pac J Trop Biomed. 2015;5(8):601–611.*
28. *Gnatta JR, Kurebayashi LFS, Turrini RNT, Silva MJP. Aromatherapy and nursing: historical and theoretical conception. Rev Esc Enferm USP. 2016;50(1):130–136.*
29. *Silva GL, Luft C, Lunardelli A, Amaral RH, Melo DA, Donadio MVF, et al. Antioxidant, analgesic and anti-inflammatory effects of lavender essential oil. An Acad Bras Cienc. 2015;87(2):1397–1408.*

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30. *Han X, Gibson J, Eggett DL, Parker TL. Bergamot (Citrus bergamia) essential oil inhalation improves positive feelings. Phytother Res. 2017;31(5):812–816.*
31. *Watanabe E, Kuchta K, Kimura M, Rauwald HW, Kamei T, Imanishi J. Effects of bergamot essential oil aroma on salivary cortisol. Complement Ther Med. 2015;23(2):170–175.*
32. *McKay DL, Blumberg JB. A review of the bioactivity and potential health benefits of chamomile. Phytother Res. 2006;20(7):519–530.*
33. *Amsterdam JD, Li Y, Soeller I, Rockwell K, Mao JJ, Shults J. A randomized, double-blind, placebo-controlled trial of chamomile extract. J Clin Psychopharmacol. 2009;29(4):378–382.*
34. *Rodgers RJ, Dalvi A. Anxiety, defence and the elevated plus-maze. Neurosci Biobehav Rev. 1997;21(6):801–810.*
35. *Cryan JF, Holmes A. The ascent of mouse: advances in modelling human depression and anxiety. Nat Rev Drug Discov. 2005;4(9):775–790.*
36. *Bourin M, Hascoët M. The mouse light/dark box test. Eur J Pharmacol. 2003;463(1–3):55–65.*
37. *Porsolt RD, Bertin A, Jalfre M. Behavioral despair in mice. Arch Int Pharmacodyn Ther. 1977;229(2):327–336.*
38. *Moss M, Cook J, Wesnes K, Duckett P. Aromas of rosemary and lavender influence cognition and mood. Int J Neurosci. 2003;113(1):15–38.*
39. *Hongratanaworakit T. Relaxing effect of ylang-ylang oil on humans. Phytother Res. 2006;20(9):758–763.*
40. *Wilkinson SM, Love SB, Westcombe AM, Gambles MA, Burgess CC, Cargill A, et al. Aromatherapy massage in cancer patients. J Clin Oncol. 2007;25(5):532–539.*
41. *Tisserand R, Young R. Essential oil safety: a guide for health care professionals. 2nd ed. London: Churchill Livingstone; 2014.*
42. *Lis-Balchin M. Aromatherapy science: a guide for healthcare professionals. London: Pharmaceutical Press; 2006.*
43. *Zhou S, Koh HL, Gao Y, Gong ZY, Lee EJ. Herbal bioactivation: the good, the bad and the ugly. Life Sci. 2004;74(8):935–968.*
44. *Ernst E. The efficacy of aromatherapy: a systematic review. Perfumer Flavorist. 2000;25:46–50.*
45. *Cooke B, Ernst E. Aromatherapy: a systematic review. Br J Gen Pract. 2000;50(455):493–496.*