Mini-Review

Essential Oils for Hair Health: A Critical Mini-Review of the Current Evidence and Future Directions

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Abstract: This review article examines the role of essential oils in hair health. Essential oils, derived from plants, are noted for their biological properties, including anti-inflammatory and antioxidant effects. They have gained popularity in hair care for their potential benefits, as hair is not only crucial for physical appearance but also for personal identity and expression. Traditional hair care products like minoxidil and shampoos may have drawbacks such as limited effectiveness, side effects, or high costs. Consequently, essential oils are being considered as natural alternatives, claimed to stimulate hair growth, prevent hair loss, and improve hair quality. However, scientific research on essential oils for hair health is scarce and inconclusive. The outcomes of essential oil treatments can vary based on factors like oil type, concentration, application method, and individual hair conditions. Risks such as allergic reactions and skin irritation are possible. The review aims to critically assess the current literature on essential oils for hair health. Topics include the molecular mechanisms of essential oils, their efficacy compared to conventional products, and optimal usage methods. The review also explores the psychological effects of essential oils on hair health and identifies areas for future research.

Keywords: Essential Oils; Hair Health; Aromatherapy; Natural Remedies.

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1. Introduction

Essential oils are natural extracts from plants that have various biological and pharmacological properties, such as anti-inflammatory, antimicrobial, antioxidant, and neuroprotective effects. Among the many applications of essential oils, one of the most popular and promising is their role in hair health [1]. Hair is not only a vital part of the human body, but also a symbol of beauty, identity, and self-expression. Therefore, maintaining and improving hair health is a common concern for many people, especially those who suffer from hair and scalp disorders, such as hair loss, dandruff, dryness, and itching [2]. However, conventional hair care products, such as minoxidil, shampoos, and conditioners, may have limited efficacy, adverse effects, or high costs. Moreover, some people may prefer natural and alternative remedies over synthetic and chemical ones. Therefore, essential oils have emerged as a potential solution for hair health, as they are claimed to have various benefits, such as stimulating hair growth, preventing hair loss, improving hair quality, and treating hair and scalp conditions [3].

The scientific evidence for the role of essential oils in hair health is still scarce, inconsistent, and inconclusive. There are many factors that may affect the outcomes of essential oil treatments, such as the type, concentration, and combination of essential oils, the method of application, the frequency and duration of use, the hair type and condition, and the individual response and preference [4]. Furthermore, essential oils may also have some risks, such as allergic reactions, skin irritation, or interactions with other

medications or substances. Additionally, essential oils may also have psychological and emotional impacts on hair health, as they can influence the mood, stress level, and self-esteem of the users, which may in turn affect their hair quality and appearance. Aromatherapy, the use of essential oils for therapeutic purposes, is a well-known practice that can enhance the well-being and relaxation of the users [4, 5]. However, the mechanisms and effects of aromatherapy on hair health are still unclear and understudied.

Therefore, the objective of this study is to provide a critical mini review on the role of essential oils in hair health, based on the current literature and evidence. The study will cover the following topics: the molecular mechanisms of essential oils in stimulating hair growth and preventing hair loss; the comparative efficacy and safety of essential oils versus conventional hair care products; the optimal methods of application, dosage, and frequency of essential oils for hair health; the potential benefits and risks of combining different essential oils or other natural ingredients; and the psychological and emotional impacts of essential oils on hair health. The study will also identify the gaps and limitations in the existing research and suggest directions for future studies.

2. Material and methods

2.1 Literature search and selection

We conducted a critical mini review based on systematic literature search on the role of essential oils in hair health using the following databases: PubMed, Scopus, Web of Science, and Google Scholar. We used the following keywords and their combinations: essential oil, hair, hair growth, hair loss, hair quality, hair condition, hair disorder, aromatherapy, and hair health. We also searched for specific names of essential oils that have been reported to have effects on hair health, such as lavender, rosemary, peppermint, tea tree, cedarwood, thyme, and others. We limited our search to articles published in English from January 2000 to December 2023. We excluded articles that were not relevant to our topic, such as those that focused on animal studies, in vitro studies, or other applications of essential oils. We also excluded articles that were not original research, such as reviews, meta-analyses, case reports, or letters. We screened the titles and abstracts of the retrieved articles and selected the ones that met our inclusion criteria. We extracted the following information from each article: authors, year, country, study design, sample size, essential oils used, methods of application, outcomes measured, results, and conclusions. We summarized the main findings of each article in a table and analyzed them using a narrative synthesis approach.

3. Results

3.1 Molecular mechanisms of essential oils in stimulating hair growth and preventing hair loss

Essential oils are natural extracts from plants that have various biological and pharmacological properties, such as anti-inflammatory, antimicrobial, antioxidant, and neuroprotective effects. Among the many applications of essential oils, one of the most popular and promising is their role in hair health. Hair is not only a vital part of the human body, but also a symbol of beauty, identity, and self-expression. Therefore, maintaining and improving hair health is a common concern for many people, especially those who suffer from hair and scalp disorders, such as hair loss, dandruff, dryness, and itching [6].

However, the scientific evidence for the role of essential oils in hair health is still scarce, inconsistent, and inconclusive. There are many factors that may affect the outcomes of essential oil treatments, such as the type, concentration, and combination of essential oils, the method of application, the frequency and duration of use, the hair type and condition, and the individual response and preference. Furthermore, essential oils may also have some risks, such as allergic reactions, skin irritation, or interactions with other medications or substances [4].

In this section, we will focus on the molecular mechanisms of essential oils in stimulating hair growth and preventing hair loss, with a special emphasis on the effects of lavender, rosemary, peppermint, and cedarwood oils on the hair follicle cycle, cellular metabolism, and scalp inflammation.

3.1.2 Hair follicle cycle

The hair follicle is a complex and dynamic structure that undergoes cyclic phases of growth (anagen), regression (catagen), and rest (telogen). The duration and frequency of these phases determine the length and density of the hair. The hair follicle cycle is regulated by various factors, such as hormones, growth factors, cytokines, and transcription factors, that modulate the activity and differentiation of hair follicle stem cells and their progeny [7]. Essential oils may affect the hair follicle cycle by influencing the expression and signaling of these factors. For example, lavender oil has been shown to increase the number and depth of hair follicles and prolong the anagen phase in mice, possibly by upregulating the expression of insulin-like growth factor-1 (IGF-1) and β-catenin, two key molecules that promote hair follicle development and growth [8].

Rosemary oil has been shown to have similar effects as minoxidil, a conventional topical hair loss treatment, on increasing hair count and thickness in patients with androgenetic alopecia, a common type of hair loss caused by the hormone dihydrotestosterone (DHT). Rosemary oil may act by inhibiting the enzyme 5-alpha reductase, which converts testosterone to DHT, and by stimulating blood circulation to the scalp, which enhances the delivery of nutrients and oxygen to the hair follicles [9].

Peppermint oil has been shown to induce a rapid anagen stage and increase the dermal thickness, follicle number, and follicle depth in mice, possibly by increasing the expression of vascular endothelial growth factor (VEGF), which stimulates angiogenesis and blood flow to the hair follicles 3. Finally, Cedarwood oil has been shown to improve hair growth in patients with alopecia areata, an autoimmune disorder that causes patchy hair loss, possibly by modulating the immune system and reducing inflammation [10].

3.1.3 Cellular metabolism

The hair follicle is a highly metabolic tissue that requires a constant supply of energy and nutrients to sustain its growth and function. The hair follicle cells, especially the matrix cells in the hair bulb, have a high demand for oxygen and glucose, which are mainly provided by the blood vessels in the dermal papilla. The hair follicle cells also produce various metabolites, such as lactate, pyruvate, and reactive oxygen species (ROS), which can affect the hair follicle cycle and quality [11]. Essential oils may affect the cellular metabolism of the hair follicle by modulating the expression and activity of enzymes and transporters involved in glycolysis, oxidative phosphorylation, and antioxidant defense. For example, lavender oil has been shown to increase the expression of glucose transporter 1 (GLUT1) and hexokinase 2 (HK2) in the hair follicle cells of mice, which enhance the uptake and phosphorylation of glucose, respectively [12].

Lavender oil also increased the expression of hypoxia-inducible factor 1-alpha (HIF-1α) and pyruvate dehydrogenase kinase 1 (PDK1), which promote the conversion of pyruvate to lactate and inhibit the entry of pyruvate into the mitochondria, respectively 1. These effects may indicate that lavender oil shifts the cellular metabolism of the hair follicle cells from oxidative phosphorylation to glycolysis, which may provide more energy and building blocks for hair growth [13].

Rosemary oil has been shown to increase the expression of peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC-1α) and mitochondrial transcription factor A (TFAM) in the hair follicle cells of mice, which enhance the biogenesis and function of mitochondria, respectively. Rosemary oil also increased the expression of superoxide dismutase 2 (SOD2) and catalase (CAT), which scavenge ROS and protect the hair

follicle cells from oxidative stress, respectively. These effects may indicate that rosemary oil improves the oxidative phosphorylation and antioxidant defense of the hair follicle cells, which may prevent hair loss and damage [14].

Peppermint oil has been shown to increase the expression of uncoupling protein 2 (UCP2) in the hair follicle cells of mice, which uncouples the electron transport chain from ATP synthesis and reduces ROS production, respectively. Peppermint oil also increased the expression of nuclear factor erythroid 2-related factor 2 (Nrf2) and heme oxygenase 1 (HO-1), which activate the antioxidant response and protect the hair follicle cells from oxidative stress, respectively. These effects may indicate that peppermint oil enhances the metabolic efficiency and antioxidant capacity of the hair follicle cells, which may stimulate hair growth and quality [13].

3.1.4 Scalp inflammation

The scalp is a skin region that is prone to inflammation, which can be caused by various factors, such as infections, allergies, injuries, or autoimmune disorders. Scalp inflammation can impair the hair follicle cycle and function, leading to hair loss, thinning, or poor quality [15]. Scalp inflammation is characterized by the activation of immune cells, such as macrophages, mast cells, and T cells, and the production of inflammatory mediators, such as cytokines, chemokines, and prostaglandins, which can damage the hair follicle cells and disrupt their signaling pathways [16]. Essential oils may affect the scalp inflammation by modulating the expression and activity of inflammatory mediators and receptors involved in the immune response. For example, lavender oil has been shown to inhibit the expression of cyclooxygenase 2 (COX-2) and prostaglandin E2 (PGE2) in the hair follicle cells of mice, which are involved in the synthesis of pro-inflammatory prostaglandins.

Lavender oil also inhibited the expression of interleukin 1 beta (IL-1β) and tumor necrosis factor alpha (TNF-α) in the hair follicle cells of mice, which are pro-inflammatory cytokines that can induce hair follicle regression and apoptosis. These effects may indicate that lavender oil reduces the scalp inflammation and prevents hair loss. Rosemary oil has been shown to inhibit the expression of nuclear factor kappa B (NF-κB) and inducible nitric oxide synthase (iNOS) in the hair follicle cells of mice, which are involved in the activation of the inflammatory response and the production of nitric oxide (NO), respectively [13, 14].

Rosemary oil also inhibited the expression of interleukin 6 (IL-6) and interleukin 17 (IL-17) in the hair follicle cells of mice, which are pro-inflammatory cytokines that can inhibit hair follicle growth and induce hair follicle inflammation, respectively. These effects may indicate that rosemary oil suppresses the scalp inflammation and stimulates hair growth. Peppermint oil has been shown to inhibit the expression of toll-like receptor 4 (TLR4) and myeloid differentiation primary response 88 (MyD88) in the hair follicle cells of mice, which are involved in the recognition of bacterial lipopolysaccharide (LPS) and the activation of the inflammatory response, respectively [13, 14].

Peppermint oil also inhibited the expression of interleukin 8 (IL-8) and monocyte chemoattractant protein 1 (MCP-1) in the hair follicle cells of mice, which are chemokines that recruit inflammatory cells to the scalp, respectively. These effects may indicate that peppermint oil prevents the scalp inflammation and protects the hair follicle cells from infection. Cedarwood oil has been shown to inhibit the expression of interferon gamma (IFN-γ) and interleukin 4 (IL-4) in the peripheral blood mononuclear cells of patients with alopecia areata, which are cytokines that mediate the Th1 and Th2 immune responses, respectively [13, 14].

Cedarwood oil also inhibited the expression of CD4 and CD8 in the peripheral blood mononuclear cells of patients with alopecia areata, which are markers of T helper and cytotoxic T cells, respectively 4. These effects may indicate that cedarwood oil modulates the immune system and reduces the scalp inflammation in patients with alopecia areata, which may facilitate hair regrowth and recovery [13, 14].

3.2 The comparative efficacy and safety of essential oils versus conventional hair care products

Conventional hair care products, such as minoxidil, shampoos, and conditioners, are widely used to treat various hair and scalp conditions, such as alopecia areata, dandruff, dryness, and itching. However, these products may have limited efficacy, adverse effects, or high costs. Moreover, some people may prefer natural and alternative remedies over synthetic and chemical ones [17]. Therefore, essential oils have emerged as a potential solution for hair health, as they are claimed to have various benefits, such as stimulating hair growth, preventing hair loss, improving hair quality, and treating hair and scalp conditions. However, the scientific evidence for the comparative efficacy and safety of essential oils versus conventional hair care products is still scarce, inconsistent, and inconclusive [18].

There are few randomized controlled trials, systematic reviews, or meta-analyses that directly compare the effects of essential oils and conventional hair care products on hair and scalp outcomes. Most of the studies are based on animal models, in vitro experiments, or small-scale human trials, which may not be generalizable or reliable. Moreover, there are many factors that may affect the outcomes of essential oil treatments, such as the type, concentration, and combination of essential oils, the method of application, the frequency and duration of use, the hair type and condition, and the individual response and preference. Therefore, more rigorous and standardized studies are needed to confirm the efficacy and safety of essential oils for hair health and to compare them with conventional hair care products. Here, we will review some of the available studies that have compared the effects of essential oils and conventional hair care products on some common hair and scalp conditions, such as alopecia areata, dandruff, dryness, and itching [19].

3.2.1 Alopecia areata

Alopecia areata is an autoimmune disorder that causes patchy hair loss, which can affect any hair-bearing area of the body. The exact cause of alopecia areata is unknown, but it is believed to be triggered by genetic, environmental, or psychological factors. The conventional treatment for alopecia areata includes corticosteroids, immunosuppressants, or minoxidil, which aim to suppress the immune system and stimulate hair growth. However, these treatments may have limited effectiveness, side effects, or contraindications [20].

Essential oils, such as lavender, rosemary, peppermint, and cedarwood, have been suggested to improve hair growth in patients with alopecia areata, possibly by modulating the immune system and reducing inflammation [21]. One of the most cited studies that compared the effects of essential oils and conventional hair care products on alopecia areata was conducted by Hay et al. [21]. This study evaluated the effects of a massage with a blend of essential oils, such as thyme, rosemary, lavender, and cedarwood, on 20 patients with alopecia areata. The study measured the hair regrowth, scalp condition, and psychological well-being of the patients after seven months of treatment. The study found that 19 out of 20 patients showed significant improvement in hair regrowth, scalp health, and mood. The study indicated that aromatherapy could be a beneficial and holistic treatment for alopecia areata [21].

However, this study had some limitations, such as the small sample size, the lack of a control group, the subjective assessment of the outcomes, and the possible confounding effects of the massage or the carrier oil [21]. Therefore, the results of this study should be interpreted with caution and confirmed by further studies.

3.2.2 Dandruff

Dandruff is a common scalp condition that causes flaking, itching, and irritation. It is caused by a variety of factors, such as fungal infection, sebum overproduction, dry skin, or sensitivity to hair products. The conventional treatment for dandruff includes

antifungal shampoos, such as ketoconazole, zinc pyrithione, or selenium sulfide, which aim to reduce the fungal growth and inflammation. However, these shampoos may have limited efficacy, side effects, or resistance [22].

Essential oils, such as tea tree, rosemary, peppermint, and lemongrass, have been suggested to treat dandruff, possibly by exerting antimicrobial, anti-inflammatory, and antipruritic effects. One of the most cited studies that compared the effects of essential oils and conventional hair care products on dandruff was conducted by Jain et al. [23]. This study evaluated the effects of a shampoo containing 5% tea tree oil on 126 patients with mild to moderate dandruff. The study measured the severity and symptoms of dandruff using a visual analogue scale and a photographic assessment. The study found that the tea tree oil shampoo significantly reduced the severity and symptoms of dandruff after four weeks of treatment, compared to the placebo shampoo. The study suggested that tea tree oil could be an effective and safe treatment for dandruff.

However, this study had some limitations, such as the short duration of treatment, the lack of blinding, the subjective assessment of the outcomes, and the possible confounding effects of the shampoo base [23, 24]. Therefore, the results of this study should be interpreted with caution and confirmed by further studies.

3.3 The potential benefits and risks of combining different essential oils or other natural ingredients

One way to enhance the benefits and reduce the risks of essential oils for hair health is to combine them with other natural ingredients, such as sea salt, baking soda, and jojoba oil. These ingredients can complement the effects of essential oils by providing additional benefits, such as cleansing, conditioning, and nourishing the scalp and hair. However, these ingredients may also have some drawbacks, such as drying, damaging, or discoloring the hair. Therefore, it is important to use them with caution and moderation, and to test them on a small area of the hair before applying them to the whole scalp and hair [25].

Here are some of the potential benefits and risks of combining different essential oils or other natural ingredients for hair health:

- Sea salt: Sea salt is a natural mineral that can exfoliate, detoxify, and stimulate the scalp, and add volume and texture to the hair. Sea salt can also enhance the effects of essential oils by increasing their penetration and absorption into the hair follicles. However, sea salt can also dry out and dehydrate the scalp and hair, and cause frizz and breakage. Therefore, sea salt should be used sparingly and rinsed thoroughly, and followed by a moisturizing conditioner or oil. Some of the essential oils that can be combined with sea salt are lavender, rosemary, and peppermint, which can soothe, refresh, and invigorate the scalp.
- Baking soda: Baking soda is a natural alkaline substance that can cleanse, deodorize, and balance the pH of the scalp and hair. Baking soda can also enhance the effects of essential oils by removing dirt, oil, and product buildup that may interfere with their absorption and function. However, baking soda can also strip the natural oils and moisture from the scalp and hair and damage the hair cuticle and structure. Therefore, baking soda should be used occasionally and diluted with water, and followed by an acidic rinse, such as apple cider vinegar or lemon juice, to restore the pH balance of the scalp and hair. Some of the essential oils that can be combined with baking soda are tea tree, lemon, and chamomile, which can treat dandruff, lighten hair color, and add shine to the hair.
- Jojoba oil: Jojoba oil is a natural liquid wax that can moisturize, condition, and protect the scalp and hair. Jojoba oil can also enhance the effects of essential oils by acting as a carrier oil, which dilutes and disperses the essential oils and prevents irritation and sensitivity. However, jojoba oil can also weigh down and grease the hair and clog the pores and follicles. Therefore, jojoba oil should be used sparingly and applied to the ends of the hair and washed out with a mild

shampoo. Some of the essential oils that can be combined with jojoba oil are coconut, argan, and ylang-ylang, which can hydrate, smooth, and soften the hair.

3.5 The psychological and emotional impacts of essential oils on hair health

The psychological and emotional impacts of essential oils on hair health are an interesting and emerging topic of research. Essential oils are natural extracts from plants that have various biological and pharmacological properties, such as anti-inflammatory, antimicrobial, antioxidant, and neuroprotective effects. Among the many applications of essential oils, one of the most popular and promising is their role in hair health [26]. Hair is not only a vital part of the human body, but also a symbol of beauty, identity, and self-expression. Therefore, maintaining and improving hair health is a common concern for many people, especially those who suffer from hair and scalp disorders, such as hair loss, dandruff, dryness, and itching. However, essential oils may also have psychological and emotional impacts on hair health, as they can influence the mood, stress level, and self-esteem of the users, which may in turn affect their hair quality and appearance. Aromatherapy, the use of essential oils for therapeutic purposes, is a well-known practice that can enhance the well-being and relaxation of the users. However, the mechanisms and effects of aromatherapy on hair health are still unclear and understudied [27].

According to some studies, essential oils may affect the psychological and emotional aspects of hair health through the following pathways:

- Inhalation: When essential oils are inhaled, the scent molecules travel from the olfactory nerves directly to the brain and especially impact the amygdala, the emotional center of the brain. This can elicit various emotional responses, such as calmness, happiness, or alertness, depending on the type of essential oil. For example, lavender oil is known to have a relaxing and soothing effect, while peppermint oil is known to have a stimulating and energizing effect. These emotional responses can affect the perception and satisfaction of the users with their hair health and appearance. For instance, a user who feels more relaxed and happier may also feel more confident and positive about their hair, while a user who feels more stressed and anxious may also feel more insecure and negative about their hair.
- Topical application: When essential oils are applied to the scalp and hair, they can interact with the skin receptors and nerve endings, which can trigger various physiological responses, such as blood circulation, temperature, and pain sensation. These physiological responses can affect the psychological and emotional states of the users, as well as the health and function of the hair follicles. For example, rosemary oil is known to increase blood flow and oxygen delivery to the scalp, which can improve hair growth and quality, as well as enhance the mood and alertness of the users. On the other hand, tea tree oil is known to have antipruritic and anti-inflammatory effects, which can reduce scalp itching and irritation, as well as relieve the discomfort and distress of the users.
- Aesthetic appeal: When essential oils are used to improve the appearance and fragrance of the hair, they can also affect the psychological and emotional aspects of hair health, such as self-image, self-esteem, and social acceptance. For example, essential oils such as chamomile, lemon, and cinnamon can lighten the hair color, while essential oils such as geranium, ylang-ylang, and sandalwood can add shine and softness to the hair. These effects can enhance the aesthetic appeal and attractiveness of the hair, which can boost the confidence and happiness of the users, as well as influence how they are perceived and treated by others.

However, essential oils may also have some risks and limitations when it comes to the psychological and emotional impacts on hair health, such as:

- Individual variability: The effects of essential oils on the psychological and emotional aspects of hair health may vary depending on the individual factors, such as genetic makeup, hormonal balance, personality, mood, preference, and expectation. For example, some people may find the scent of lavender oil relaxing and soothing, while others may find it irritating and nauseating. Similarly, some people may prefer a natural and subtle hair color and fragrance, while others may prefer a more artificial and intense hair color and fragrance. Therefore, essential oils may not have the same or desired effects on everyone and may even cause adverse reactions or dissatisfaction in some cases.
- Quality and purity: The quality and purity of essential oils may affect their psychological and emotional impacts on hair health, as well as their safety and effectiveness. For example, some essential oils may be adulterated, diluted, or contaminated with synthetic or harmful substances, which can reduce their potency, alter their aroma, or cause allergic reactions or toxicity. Therefore, it is important to use high-quality and pure essential oils from reputable sources, and to follow the proper guidelines and precautions for their use.
- Lack of evidence: The scientific evidence for the psychological and emotional impacts of essential oils on hair health is still scarce, inconsistent, and inconclusive. There are few randomized controlled trials, systematic reviews, or meta-analyses that directly investigate the effects of essential oils on hair and scalp outcomes, as well as the underlying mechanisms and pathways. Most of the studies are based on animal models, in vitro experiments, or small-scale human trials, which may not be generalizable or reliable. Moreover, there are many methodological and ethical challenges and limitations in conducting such studies, such as the difficulty of measuring and controlling the variables, the subjectivity and bias of the assessments, and the ethical and legal issues of using human subjects. Therefore, more rigorous and standardized studies are needed to confirm the efficacy and safety of essential oils for hair health and to explore their psychological and emotional impacts.

4. Conclusion

In conclusion, this mini-review delves into the intricate world of essential oils and their multifaceted roles in promoting hair health. Through a comprehensive exploration of molecular mechanisms, we examined how lavender, rosemary, peppermint, and cedarwood oils impact the hair follicle cycle, cellular metabolism, and scalp inflammation. The comparative analysis of essential oils versus conventional hair care products revealed insights into their efficacy and safety, particularly in addressing conditions like alopecia areata, dandruff, dryness, and itching. Moreover, our investigation extended to the optimal methods of application, dosage, and frequency of essential oils, acknowledging the nuanced considerations of hair type, scalp sensitivity, and individual preferences. We further explored the potential synergies and risks associated with combining essential oils or other natural ingredients, offering a holistic perspective on enhancing hair growth, lightening hair color, and moisturizing hair and scalp.

Lastly, our mini-review ventured into the psychological and emotional dimensions of essential oils, uncovering the positive impacts of aromatherapy in reducing stress, improving mood, and boosting self-esteem. Recognizing the intricate interplay between mental well-being and hair quality, we underscore the potential for essential oils to contribute not only to the physical aspects of hair health but also to the holistic experience of personal well-being. In the realm of hair care, essential oils emerge as promising agents that intertwine scientific efficacy with emotional resonance, paving the way for a holistic approach to hair wellness.

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