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Rosemary essential oil *(Salvia rosmarinus)* for hair growth combined with high frequency and epicranial massage.

Rosemary essential oil (Salvia Rosmarinus) in hair growth associated with high frequency and epicranial massage

Essential oil of rosemary (Salvia rosmarinus) in hair growth that combines high frequency and epicranial massage

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Abstract

Androgenetic alopecia is a common condition that can significantly impact the self-esteem and quality of life of affected individuals. In the search for complementary approaches to manage this condition, this study aimed to review the scientific literature on the potential of rosemary essential oil *(Salvia rosmarinus),* associated with epicranial massage and high frequency, in stimulating hair growth. This is a descriptive literature review, conducted through the analysis of scientific articles, books, dissertations, and other publications related to the topic. The results showed that rosemary essential oil has the potential to stimulate hair growth, with clinical results similar to those observed with the use of 2% minoxidil in individuals with androgenetic alopecia. Furthermore, studies suggest that its antioxidant and anti-inflammatory properties may contribute to maintaining follicular health. Regarding
epicranial massage and high frequency, the literature indicates possible benefits related to the stimulation of local circulation, scalp balance, and enhanced permeation of active ingredients, although scientific evidence on their association is still limited. It is concluded that rosemary essential oil shows potential as a complementary resource in aesthetic protocols aimed at hair growth.

However, the scarcity of clinical trials, the lack of standardization of protocols, and the methodological limitations of the available studies highlight the need for more robust research to evaluate, both individually and in combination, the effects of rosemary essential oil, epicranial massage, and high frequency.

Keywords: Androgenetic alopecia; Rosemary essential oil *(Salvia rosmarinus);*
Hair growth; High frequency; Epicranial massage.

Abstract:

Androgenetic alopecia is a common condition that can significantly impact the self-esteem and quality of life of affected individuals. Given the growing interest in complementary approaches to managing this condition, this study aimed to review the scientific literature on the potential of rosemary essential oil (Salvia rosmarinus), when used in epicranial massage and high-frequency therapy, to stimulate hair growth. This is a descriptive bibliographic review based on

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an analysis of scientific articles, books, dissertations, and other publications on the topic. The results showed that rosemary essential oil has the potential to stimulate hair growth, with clinical outcomes similar to those observed with 2% minoxidil in individuals with androgenetic alopecia. Furthermore, studies suggest that its antioxidant and anti-inflammatory properties may help maintain follicular health. Regarding epicranial massage and high-frequency therapy, the literature indicates potential benefits, including stimulation of local blood circulation, scalp balance, and enhanced penetration of active compounds. However, scientific evidence regarding their combined use remains limited. It is concluded that rosemary essential oil presents potential as a complementary resource in aesthetic protocols aimed at promoting hair growth. However, the scarcity of clinical trials, the lack of standardized protocols, and the methodological limitations of the available studies highlight the need for more robust research to evaluate, both individually and in combination, the effects of rosemary essential oil, epicranial massage, and high-frequency therapy.

Keywords: Androgenetic alopecia; Rosemary essential oil *(Salvia Rosmarinus);* Aromatherapy; Hair growth; High-frequency therapy; epicranial massage.

1. Introduction

Human hair is one of the main elements of identity, self-esteem, and expression.
Cultural, having been valued since ancient times in different societies. Changes
Conditions related to your health, such as hair loss, thinning, or sparse hair, can have an impact.
significant negative impact on the individual's self-image and psychosocial well-being (SANTANA)
et al., 2017). Among the most frequent clinical conditions, androgenetic alopecia stands out.
(AAG), also known as male or female pattern baldness, one of the main
Causes of progressive hair loss. This condition is multifactorial, involving predisposition.
Genetics, hormonal influence, and environmental factors influence its development, and it can manifest in both sexes.
with an estimated prevalence of more than 30% in women and up to 50% in men with more
50 years old (RAMOS et al., 2023).

The most commonly used conventional treatments for combating alopecia include minoxidil and
finasteride, whose mechanisms of action involve, respectively, the stimulation of
Peripheral vascularization and inhibition of the 5-ÿ-reductase enzyme. Despite its effectiveness
Although proven, such drugs may have some disadvantages, including adverse effects.
skin problems, hormonal changes (in the case of finasteride) and poor therapeutic adherence (BRENNER)
et al., 2011; Nestor et al., 2021). Given this scenario, the search for natural alternatives is growing.
and safe, that can assist or replace traditional pharmacological therapies.

Androgenetic alopecia presents important pathophysiological characteristics, such as
follicular miniaturization induced by dihydrotestosterone (DHT), the reduction of the anagen phase,

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the presence of chronic perifollicular inflammation (microinflammation), vascular impairment of the hair follicle and increased local oxidative stress. These processes may be related to the properties of rosemary essential oil, given its effects Antioxidants, anti-inflammatories, and microcirculation stimulants act on mechanisms involved in the pathophysiology of androgenetic alopecia, and may contribute to the improvement of follicular environment.

Among the resources studied, essential oils stand out for their wide range of properties. pharmacological properties, including antimicrobial, anti-inflammatory, and antioxidant action. Stimulates cutaneous microcirculation (ABELAN et al., 2022). These substances are mixtures. complexes of volatile compounds extracted from aromatic plants, widely used in traditional medicine and the cosmetics industry.

These properties work together to maintain the health of the leather. scalp, promoting an environment conducive to hair growth and preservation. integrity of the hair follicle.

Among the essential oils most important for hair health, the essential oil of Rosemary *(Salvia* rosmarinus) stands out for its potential to stimulate hair growth. and modulate biological processes associated with alopecia. Its therapeutic use dates back to In antiquity, it was used in medicinal rituals, purification practices, and as... natural stimulant (MORAIS, 2019). Currently, scientific studies are investigating its pharmacological properties and their applicability in different health and aesthetic contexts. with promising results.

The chemical composition of rosemary essential oil includes monoterpenes and sesquiterpenes, the main constituents being 1,8-cineole, camphor, borneol, and alpha-Pinene and verbenone. These substances are associated with vasodilatory effects. Antioxidants and enzyme modulators, which promote blood flow to the scalp. and reduce inflammatory processes that compromise the hair follicle (VICENTE et al., 2024). Furthermore, some studies suggest that rosemary essential oil may exert effects. beneficial in cases of androgenetic alopecia; however, there is no clinical evidence. robust studies that demonstrate its direct action as an inhibitor of the 5-ÿ-reductase enzyme (NESTOR et al.) al., 2021).

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These compounds are responsible for the main biological activities of the oil.
essential, acting synergistically in vasodilation, antioxidant protection, and stimulation.
of cellular metabolism in the hair follicle.

A randomized clinical trial compared the effectiveness of rosemary essential oil to...
minoxidil 2%, showing that both promoted a significant increase in density.
capillary regrowth after six months of use, with minimal difference between the groups (NESTOR et al., 2021).
This scientific evidence suggests that rosemary essential oil has therapeutic potential.
Or it can be a complement to conventional treatments, also offering the advantage of...
lower risk of adverse effects. This study is considered a landmark in the scientific literature and
This constitutes one of the main clinical evidences supporting the use of essential oil of
Rosemary in the treatment of androgenetic alopecia.

Another relevant aspect is that rosemary essential oil can be easily absorbed.
incorporated into aesthetic protocols, such as hair massages, aromatherapy techniques and
Applications associated with electrotherapy (such as high frequency and photobiomodulation).
These resources promote skin permeability, optimizing the action of bioactive compounds in
scalp (FRANÇA et al., 2025).

Considering the increased demand for natural, sustainable products with lower [cost/quality/etc.]
Environmental impact, the study on rosemary essential oil for hair growth makes-
if relevant not only in the scientific field, but also in the economic and social spheres, given
The hair cosmetics market generates billions annually and is showing growth.
Interest in plant-based assets.

Therefore, the main objective of this literature review article is to analyze
critically examine the available evidence on the use of rosemary essential oil in stimulating...
hair growth, associated with high frequency and epicranial massage, addressing its
chemical composition, mechanisms of action, clinical efficacy, safety of use and future prospects
future. As specific objectives, the intention was to:

1. To identify, from the scientific literature, the main studies that address the use of
Salvia rosmarinus essential oil to stimulate hair growth.
2. Describe the mechanisms of action of rosemary essential oil on the scalp.
considering its effects on blood circulation, antioxidant activity and stimulation
follicular.

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3. To analyze the theoretical foundations of epicranial massage as an aesthetic resource for the Increased microcirculation and promotion of hair follicle health.
4. To investigate, based on bibliographic references, the effects of high-frequency capillary treatment. on the scalp, highlighting its bactericidal, oxygenating and metabolism-stimulating action.

cell phone.

5. Discuss the possible synergistic effects of the combination between rosemary essential oil *(Salvia rosmarinus),* epicranial massage and high frequency in stimulating hair growth, based on scientific evidence.

This work is justified by the growing search for integrative therapies and less Invasive procedures are used in the treatment of hair disorders, especially androgenetic alopecia. Furthermore, the need to gather and critically analyze scientific evidence is highlighted. available information on the association between different therapeutic approaches, such as the use of oils. Essential techniques include epicranial massage and high frequency, given that, although there are studies on While these resources are considered in isolation, there are still limitations in the literature regarding the understanding of their... combined effects. Thus, the present study sought to contribute to the systematization of Knowledge in the field and for professional practice in aesthetics and hair health.

2. Theoretical Framework

2.1 Hair structure and hair follicle cycle

The hair strand (Figure 1) is a keratinized structure produced by the hair follicles. Located in the dermis of the scalp, the hair follicle constitutes a structural unit. complex, composed of the hair shaft and the dermal papilla, and may be associated with accessory structures, such as sebaceous glands and arrector pili muscle, which contribute to the Lubrication, protection, and support of the hair strand. The dermal papilla is responsible for supplying nutrients. and growth stimuli to the cells of the hair matrix (PRUDENCIATTI, 2023).

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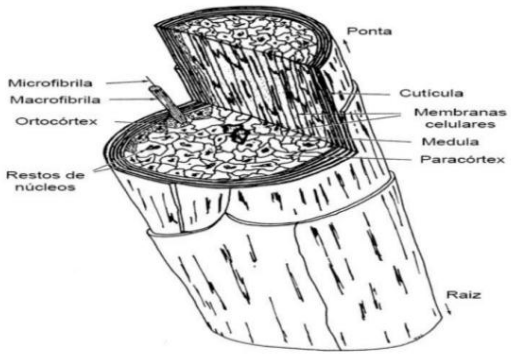
Figure 1 - Structure of the capillary shaft



Source: GOMES, 2019.

The scalp consists of three main layers: the epidermis, dermis, and hypodermis. In addition to accessory structures, such as sebaceous glands, responsible for sebum production, which lubricates and protects the hair shaft. The integrity of the scalp, the lipid composition Proper nutrition and the presence of a balanced microbiota are fundamental for healthy hair. and for the prevention of changes, such as hair loss (CLAVAUD et al., 2021). The cycle of Hair growth is divided into three main phases (Figure 2):

- Anagen phase (growth phase): can last from two to seven years and is characterized by Intense mitotic activity in the cells of the hair follicle matrix. At this stage, the hairs... They have greater thickness and more pigmentation.
- Catagen phase (transition): lasts, on average, two to three weeks. Regression occurs. follicular, with cessation of cell division and beginning of involution of the follicular structure.
- Telogen phase (resting phase): a period of three to four months in which the follicle... it remains inactive until the hair is replaced by a new one in the anagen phase (BOLOGNIA, 2015).

Changes in this cycle, such as shortening of the anagen phase or lengthening of the anagen phase. Telogen changes can result in hair loss. These changes are associated with hormonal factors. genetic, nutritional, psychological and environmental factors (RAMOS et al., 2023).

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Figure 2- Life Cycle of the Hair Rod



SOURCE: AI (Artificial Intelligence) Copilot 2026

2.2 Disorders associated with hair pathologies

Several factors can compromise hair health, leading to hair loss and...
Imbalance in the hair growth cycle. Among the main conditions are:

• Androgenetic alopecia (Figure 3): the most common form of hair loss, characterized due to the progressive miniaturization of hair follicles under hormonal influence, especially dihydrotestosterone (DHT). This hormone acts by shortening the anagen phase of the hair cycle. and promoting follicular atrophy, resulting in reduced hair density (BLOCH; ESCUDEIRO, 2020). However, more recent scientific evidence indicates that the The pathophysiology of androgenetic alopecia is multifactorial, involving not only factors... hormonal and genetic factors, but also chronic perifollicular inflammatory processes, stress Oxidative changes and alterations in the microcirculation of the scalp contribute to the progressive... degeneration of the hair follicle (ABELAN et al., 2022).

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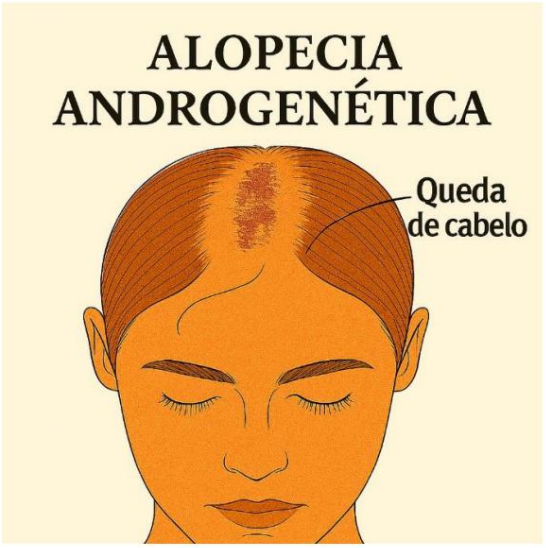
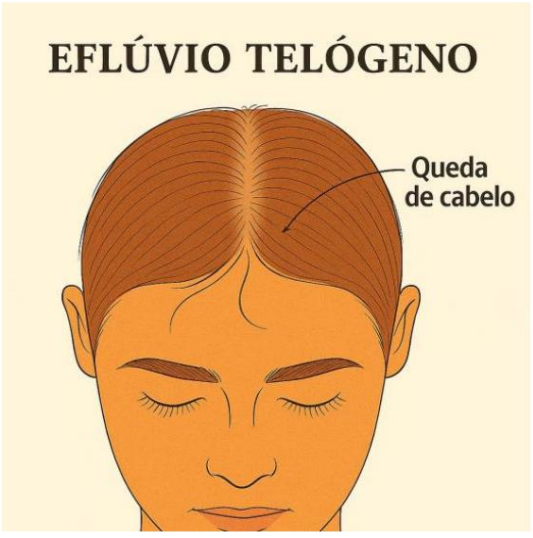
Figure 3 - Representative image of androgenetic alopecia



Source: AI (Artificial Intelligence) 2026

• Telogen effluvium (Figure 4): occurs when there is an abrupt increase in the number of hairs. in the telogen phase, usually triggered by physical or emotional stress, changes hormonal, nutritional deficiencies or the use of medications (ARIANO et al., 2020).

Figure 4 - Representative image of Telogen Effluvium



Source: AI (artificial intelligence) Copilot 2026

• Seborrheic dermatitis (Figure 5): chronic inflammation of the scalp, associated with Proliferation of fungi of the genus Malassezia, which causes scaling, itching, and inflammation.

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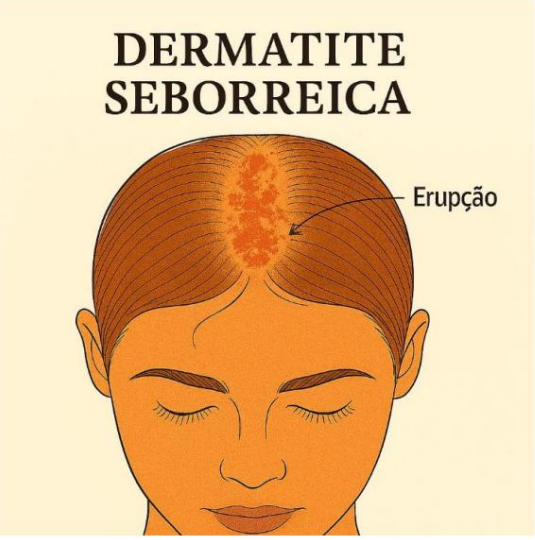
When left untreated, it can compromise the integrity of the hair follicle and lead to hair loss. hair (SANTIN et al., 2020).

Figure 5 - Representative image of seborrheic dermatitis

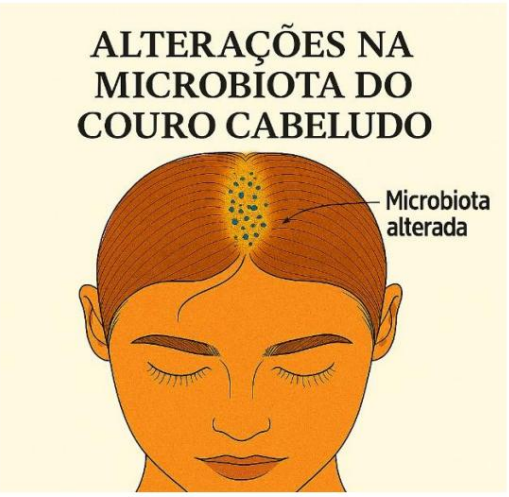


Source: AI (Artificial Intelligence) Copilot 2026

• Changes in the scalp microbiota (Figure 6): microbiota imbalance

Residential conditions can trigger inflammatory processes that negatively affect the health of hair follicle. Recent studies show that a diverse and balanced microbiota is essential for maintaining capillary homeostasis (CLAVAUD et al., 2021).

Figure 6 - Representative image of changes in the scalp microbiota.



Source: AI (Artificial Intelligence) Copilot 2026

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• Environmental factors and inadequate habits (Figure 7): excessive sun exposure, pollution, Frequent use of harsh chemicals, as well as practices such as excessive use of heat. Mechanical traction and stress can weaken the hair shaft, promoting breakage and hair loss. (FONTANA; OLIVEIRA, 2022)

Figure 7 - Representative image of environmental factors and inadequate habits.



Source: AI (Artificial Intelligence) Copilot 2026

Furthermore, genetic factors, autoimmune diseases, poor diet, and endocrine disorders also play a role. They are also among the main triggers of hair dysfunction (DIAS; REZENDE, 2020).

2.3 Androgenetic alopecia and psychosocial impact

Androgenetic alopecia (AGA) is considered the leading cause of hair loss. progressive, affecting men and women in different age groups. As mentioned earlier above, its mechanism is related to the action of dihydrotestosterone (DHT), derived from The conversion of testosterone by the enzyme 5-ÿ-reductase. This hormone promotes miniaturization. of the hair follicles, resulting in increasingly thinner and shorter hairs until they cease their function. growth (NESTOR et al., 2021). The progression of AAG is commonly classified according to Hamilton-Norwood Scale (Figure 8).

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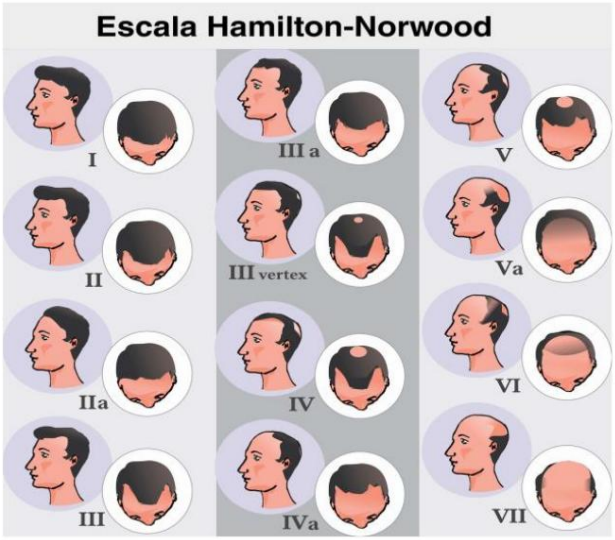
In addition to hormonal and genetic factors, studies indicate the influence of oxidative stress. on the scalp, which compromises cellular integrity and accelerates hair loss (ABELAN) et al., 2022).

In addition, the psychosocial impact of alopecia is significant. Individuals Those affected report low self-esteem, social isolation, anxiety, and even depressive symptoms. (SANTANA et al., 2017). Thus, the treatment of alopecia transcends the aesthetic aspect, also encompassing psychological and social well-being.

Figure 8 - Hamilton-Norwood scale for androgenetic alopecia



Source: ABD, 2024

2.4 Treatments and their limitations

The main medications approved for the treatment of androgenetic alopecia are:

- Minoxidil: a topical vasodilator that stimulates peripheral microcirculation, prolonging the anagen phase of the hair cycle.
- Finasteride: an inhibitor of the 5-ÿ-reductase enzyme, which reduces DHT levels in the skin. hairy.

Despite their effectiveness, both have disadvantages:

• Minoxidil may cause contact dermatitis, peeling, and unwanted hypertrichosis in adjacent areas.

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• Finasteride, when administered orally, can cause sexual dysfunction and Gynecomastia, and is contraindicated in women of childbearing age (BRENNER et al., 2011).

In addition to drug treatments, other therapeutic options are currently available. clinically practiced and scientifically discussed. In short, it is possible to analyze them. in Table 1 and also below:

- Exosomes work by stimulating hair follicles, promoting regeneration. cellular and helping to improve the scalp environment, as well as stimulating activity. It stimulates the follicular phase and prolongs the anagen phase, which is related to hair growth. It is applied with... microneedling assistance.
- Microneedling (dermaroller): A technique that uses small needles to stimulate the skin. Controlled microlesions in the scalp, stimulating angiogenesis, the release of factors. of growth and follicular regeneration. Clinical studies demonstrate positive results in Reduction of hair loss, increased hair density, and improved topical absorption. of therapeutic substances, such as minoxidil (DIAS; REZENDE, 2020).
- Hair transplant: A surgical procedure in which follicular units are removed. from donor areas and implanted in bald regions. Although it is considered an effective method, This is an invasive, high-cost procedure that requires post-operative care. rigorous and presents a risk of surgical complications (ARIANO et al., 2020).
- PRP (Platelet-Rich Plasma): An autologous technique that consists of collecting and centrifugation of the patient's own blood to obtain a platelet-rich concentrate in growth factors. These factors act in stimulating cell proliferation, angiogenesis and tissue regeneration, promoting hair growth and improving density of the threads. PRP has been widely used as a complementary therapy in Treatment of androgenetic alopecia, with good clinical results and a low incidence of side effects. adverse effects (ALVES; GRASSI, 2021).
- PRF (Platelet-Rich Fibrin): Considered an evolution of PRP, the PRF technique It uses a slower centrifugation protocol, resulting in a fibrin matrix rich in platelets, leukocytes, and growth factors with gradual release. This characteristic It promotes a more prolonged action on the tissue, stimulating follicular regeneration. vascularization and maintenance of the capillary cycle. PRF offers advantages such as greater vascularization and maintenance of the capillary cycle. biocompatibility and absence of chemical additives, making it a promising alternative in treatment of alopecia (CHOUKROUN et al., 2020).

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- High frequency: helps improve tissue oxygenation and blood circulation. local, promoting the nutrition of hair follicles and contributing to a more healthy for hair growth. In addition, its bactericidal and fungicidal action helps with... Controls excessive oiliness, dandruff, and microorganisms present on the scalp.
- Microcurrents: in hair therapy, they work by promoting improved circulation. local blood flow, increased tissue oxygenation, and metabolic stimulation of the cells of hair follicle. These effects aid in nourishing the hair root, contributing to the Strengthening the hair strands and promoting healthy hair growth.

Table 1 – Treatment, Mechanism of Action, Benefits and Application

Treatment	Mechanism of action	Key Benefits	Application
Stimulates microcirculation, antioxidant, anti-inflammatory action of Rosemary *(Salvia Rosmarinus)* .	the	Stimulates hair growth, improves density, and reduces hair loss.	to the Topical use diluted in carrier oil.
Epicranial massage	Mechanical stimulus that follicular and local blood circulation, and promotes tissue relaxation, oxygenation, and enhanced absorption of active ingredients.	Improved nutrition increases	and from the Manual technique with rhythmic movements on the scalp.
High frequency	It produces ozone with bactericidal action and promotes vasodilation.	Improved oxygenation, for oil control and specific of the scalp cellular system.	Application with electrodes in metabolic stimulation
Microneedling	Induction of microlesions that stimulate growth factors and angiogenesis.	Increase in density and microneedles improves the absorption of controlled active ingredients.	Procedure with capillary
PRP (plasma rich in application) for hair growth and	Release of factors injectable products that stimulate thickness.	Stimulus autologous cellular regeneration	to the (Platelet and improve hair

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PRF (Fibrin Rich in Platelets) growth factors	Gradual release of in a fibrin matrix	Prolonged stimulation of follicular injectable regeneration	Autologous application
Microcurrents	Low-intensity electrical stimulation that increases cellular activity.	Improved circulation and cellular metabolism.	Application with of specific electrodes
Hair Aromatherapy: Use of essential oils	with therapeutic action, anti-inflammatory action on the scalp, and relaxation.	Balance of the microbiota and	Application topical associated with massages

2.4.1 Mechanism of action of minoxidil

Minoxidil is considered one of the leading topical treatments for alopecia. androgenetic alopecia is widely used due to its proven effectiveness. Its mechanism of action is... The action is primarily associated with peripheral vasodilation, which increases blood flow. minoxidil works on the scalp and improves the nutrition of hair follicles. In addition, minoxidil acts on... Opening of ATP-dependent potassium channels, which stimulates cellular activity in the papilla. Dermal and prolongs the anagen phase of the hair cycle. This effect directly contributes to the increased density and thickness of the threads (ROSSI et al., 2012; RANGANATHAN; (MUKHOPADHYAY, 2010).

In addition to vasodilation, studies show that minoxidil plays an important role. in angiogenesis through increased expression of Vascular Endothelial Growth Factor (VEGF), promoting the formation of new blood vessels around the hair follicle and expanding the local nutritional supply (LACHGAR et al., 1998). The drug also participates in modulation of prostaglandins, especially through increased synthesis of prostaglandin E2, related to stimulating hair growth and maintaining the hair growth phase. anagen (KWACK et al., 2011).

Additionally, minoxidil acts on dermal fibroblasts and on components of the extracellular matrix, stimulating cell proliferation and contributing to remodeling tissue of the follicular microenvironment. Studies also point to antifibrotic effects, reducing perifollicular fibrosis processes frequently associated with the progression of alopecia

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androgenetic (ROSSI et al., 2012). At the metabolic level, minoxidil promotes direct stimulation. to the follicular cells, increasing the cellular activity of the dermal papilla and promoting the local energy metabolism, essential factors for growth and thickening of the threads (BADRI; JAIN; BARRON, 2021).

Despite its therapeutic benefits, the use of minoxidil may be associated with side effects. adverse reactions that directly compromise adherence to treatment. The most frequent reactions Symptoms include scalp irritation, itching, burning, erythema, and scaling. frequently related to the irritant action of the alcoholic vehicle and propylene glycol present in some topical formulations (ROSSI et al., 2012). In addition, some patients They may develop irritant or allergic contact dermatitis, especially with treatments. prolonged (FRIEDMAN et al., 2002). Another important characteristic refers to A phenomenon known as *shedding,* characterized by a temporary increase in hair loss. in the first few weeks of use. This process occurs due to the accelerated transition of the hair strands. from the telogen phase to the anagen phase, being considered a transient effect of the mechanism. pharmacological effects of minoxidil (BADRI; JAIN; BARRON, 2021). In some cases, it can also Hypertrichosis can occur in extrafollicular regions, such as the face and arms, especially in women and in patients more sensitive to systemic absorption of the drug (ROSSI et al., 2012).

Although less frequent, systemic effects can occur when there is increased absorption. of the drug, including headache, tachycardia, hypotension, and peripheral edema, mainly in high concentrations or improper use (BADRI; JAIN; BARRON, 2021). Therefore, Despite the clinical efficacy of minoxidil in the treatment of androgenetic alopecia, its effects Local and systemic adverse effects can compromise therapeutic continuity and adherence. patients.

2.5 Essential Oils

Aromatherapy involves the use of essential oils extracted from plants, with Therapeutic properties capable of promoting physical, mental, and emotional health. In the context In the field of hair care, the topical application of essential oils to stimulate hair growth and improve scalp health stands out (SIMÕES, 2024).

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Despite its therapeutic benefits, the use of rosemary essential oil in hair treatment... Caution is required, as it is a highly concentrated and biologically active substance. Its topical application should always be done in a diluted carrier vegetable oil. Concentrations are generally between 1% and 3% in order to avoid skin irritation and adverse reactions. (TISSERAND; YOUNG, 2014).

Among the main contraindications, individuals with hypersensitivity stand out. cutaneous, active dermatitis, scalp lesions, or a history of allergic reactions to oils. essential. Under these conditions, application may cause irritation, erythema, itching, and a sensation. burning sensation, compromising the integrity of the skin barrier (PRICE; PRICE, 2012).

Its use is also not recommended for pregnant women, breastfeeding women, and children, due to the absence of... conclusive studies on safety in these populations and the potential stimulant effect systemic absorption of volatile compounds present in the essential oil. Furthermore, individuals with Those with uncontrolled high blood pressure, epilepsy, or a history of seizures should avoid use or proceed with caution, due to its stimulating potential (TISSERAND; YOUNG, 2014).

In the context of hair treatment, it is recommended to perform a test beforehand. Sensitivity *(patch test),* applying a small amount of the diluted solution to an area. A small amount of skin should be removed to check for possible adverse reactions. Furthermore, its use should be guided. by a qualified professional, ensuring correct dilution, frequency of application and the Safe combination with other therapies, such as epicranial massage and electrotherapy. (BUCKLE, 2015).

Therefore, although rosemary essential oil represents a promising alternative and Effective for stimulating hair growth, its use must follow technical criteria. rigorous, ensuring therapeutic efficacy and minimizing risks to the patient (PANAHI et al., 2015).

Among the essential oils most studied for this purpose, rosemary oil (Salvia) stands out. rosmarinus) (Figure 9).

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Figure 9 - Rosemary essential oil (Salvia Rosmarinus)



Source: Safra Vida website, 2026

Rosemary is an aromatic plant from the Lamiaceae family, widely used in medicine. Traditionally used in herbal medicine and aromatherapy due to its therapeutic properties. During For many years, its scientific name was described as *Rosmarinus officinalis* L. However, after taxonomic revisions based on phylogenetic analyses, the species came to be... to be classified as *Salvia rosmarinus Spenn.,* which is currently the botanical nomenclature. scientifically accepted (DREW et al., 2017).

The plant originates from the Mediterranean region and has a composition rich in compounds. bioactive compounds, including cineole, camphor, borneol, ÿ-pinene, substances responsible for their biological and pharmacological properties. Its essential oil is widely used in therapeutic and cosmetic protocols, especially in hair treatments, due to growing scientific interest in its applications for scalp and hair health (TISSERAND; YOUNG, 2014). In addition to these, other information regarding *Salvia Rosmarinus* and its therapeutic potential can be seen in Table 2.

In addition to its use in the cosmetics field, rosemary essential oil is also used in... pharmaceutical, food and cosmetic industries, being valued for its characteristics Aromatic plants and their therapeutic potential. Therefore, there is interest in the use of *Salvia rosmarinus.* The use of integrative treatments has increased significantly in recent years. driving studies on its effectiveness and safety of use.

Table 2 - Characteristics of rosemary essential oil.

Aspects	Description

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Scientific name	*Salvia Rosmarinus*
Part used	Leaves and flowers
Extraction method	Steam distillation
approximate pH	4.5 to 6.0 *(slightly acidic)* — however, as it is an essential oil (a nonpolar substance), the pH may vary when diluted in aqueous or cosmetic solutions.
Main chemical components	Cineole (1,8-cineole), camphor, alpha-pinene, borneol, verbenone
Aspects	Description
Therapeutic properties	Circulatory stimulant, hair tonic, antioxidant, astringent, anti-inflammatory, mild analgesic, mental stimulant.
Cosmetic properties	It stimulates hair growth, tones the skin, and helps fight acne and cellulite.
Aesthetic indications	Hair treatments (hair growth and strengthening), skin revitalization, lymphatic drainage, and energizing massages.
Therapeutic indications	Mental and physical fatigue, muscle aches, poor circulation, mild headache, lack of concentration.
Contraindications	Pregnant women, breastfeeding women, children under 6 years of age, people with hypertension, epilepsy, or a history of seizures.

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Toxicity	It can cause skin irritation if used undiluted; it should always be diluted in a carrier vegetable oil (usually in...). (concentration of 1 to 3%). Ingestion is toxic. Excessive use may cause agitation, insomnia, and increased blood pressure.
Precautions for use	Avoid sun exposure after application (risk of mild photosensitivity in some varieties); perform a sensitivity test before use; store in a cool, dark place.
Common synergies	Rosemary combines well with peppermint, lavender, cedar, lemon, and eucalyptus for stimulating and purifying effects.

2.6 Mechanisms of action and physiological effects of rosemary essential oil on the hair growth.

According to Carneiro, Santos and De Liz (2023), derivatives of Salvia rosmarinus present multifactorial action on hair growth, involving related biological mechanisms to microcirculation, inflammatory modulation, and cellular stimulation of the hair follicle. Studies Clinical studies with essential oil (PANAHI et al., 2015) and experimental studies with rosemary extract. (MURATA et al., 2013) demonstrate promising results in stimulating hair growth.

Regarding inflammation, rosemary essential oil has anti-inflammatory properties. anti-inflammatory and antioxidant properties that help reduce oxidative stress in the scalp. process associated with the degeneration of follicular cells and the progression of alopecia (BOZIN et al., 2007). Furthermore, direct stimulation of cellular activity in hair follicles is observed, the which promotes cell proliferation and prolongs the anagen phase (MURATA et al., 2013). Similarly, although due to different components, rosemary essential oil It features an integrated mechanism of action, working simultaneously to improve vascularization, in controlling inflammation and in stimulating hair growth, the which justifies its therapeutic potential in the treatment of hair loss.

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2.7 Mechanisms of action and physiological effects of rosemary essential oil in alopecia androgenetic

Rosemary essential oil *(Salvia rosmarinus)* has biological properties.
relevant for the treatment of androgenetic alopecia, acting primarily by
mechanisms related to improved local microcirculation, antioxidant action, and modulation
of the inflammatory response and the maintenance of scalp homeostasis.

One of the main mechanisms attributed to rosemary essential oil is its action.
vasodilator, which increases blood microcirculation in the scalp. This effect
It promotes the supply of oxygen, nutrients, and growth factors to the hair follicles.
contributing to the maintenance of the anagen phase and stimulating hair growth.
Compounds present in the oil, especially volatile monoterpenes, show potential.
to stimulate peripheral circulation and improve follicular nutrition (BOZIN et al., 2007).

In addition to improving circulation, rosemary essential oil exhibits important activity.
antioxidant, mainly associated with the presence of compounds such as 1,8-cineole, ÿ-pinene and
borneol. These substances act in the neutralization of reactive oxygen species (ROS).
reducing oxidative stress associated with follicular aging and the progression of alopecia
androgenetic acuity (BOZIN et al., 2007; CELIKTAS et al., 2007).

According to Satoh et al. (2011), compounds derived from rosemary have demonstrated the ability to
To protect cells against oxidative and inflammatory damage, preserving their structural integrity.
of the tissues. Similarly, Nieto, Ros and Castillo (2018) highlight that the activity
Antioxidant properties constitute one of the main therapeutic mechanisms attributed to rosemary in
Dermatological and hair applications.

Another relevant aspect involves the anti-inflammatory action of rosemary essential oil.
Studies show that its bioactive compounds can modulate inflammatory mediators.
and help reduce perifollicular microinflammation, a condition frequently associated with
Miniaturization of hair follicles in androgenetic alopecia (ABELAN et al., 2022).

Additionally, some experimental studies suggest a possible interference from
rosemary extract in pathways related to androgenic activity, including effects on the
Cell proliferation and hair growth. However, there is no robust clinical evidence that...
confirm the direct action of rosemary essential oil on the 5ÿ-reductase enzyme or the reduction
of dihydrotestosterone (DHT) in humans (NESTOR et al., 2021). Thus, the effects

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The most well-established therapeutic uses of essential oils are primarily related to
Improvement of the follicular microenvironment through circulatory, antioxidant and other mechanisms.
anti-inflammatory drugs.

Therefore, rosemary essential oil should be understood as a therapeutic agent.
complementary, capable of promoting the improvement of the physiological conditions of the scalp and
to aid in maintaining follicular health, indirectly contributing to growth.
For capillary action and to control the progression of androgenetic alopecia.

2.8 Epicranial massage

Epicranial massage (Figure 10) is a manual technique applied to the scalp.
and the face, using movements that promote mechanical stimulation, muscle relaxation and
Improved local blood circulation.

The application is performed with the fingertips, using friction techniques.
Sliding, percussion, and gentle pressure, lasting an average of 30 to 40 minutes. Among its...
The main effects include:

- Increased tissue oxygenation
- Stimulating the nutrition of hair follicles
- Reducing stress and muscle tension
- Release of endorphins, promoting a feeling of well-being (NESSI, 2013)

In addition to neurosensory benefits, epicranial massage exerts a direct action on the
It stimulates hair growth, as it facilitates the penetration of essential oils and enhances the effects of...
Aromatherapy. When combined with the application of essential oils diluted in vegetable oils, the
This technique activates nerve endings and improves the absorption of active ingredients in the hair follicle.
promoting hair growth effectively (BARROS; MOREIRA, 2023).

This technique is especially suitable for integrative aesthetic protocols, as it is natural.
Safe, non-invasive, and easily incorporated into treatments at clinics and spas.

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Figure 10 - Illustration of epicranial massage and self-massage



Source: AI (Artificial Intelligence) Copilot 2026

2.9.1 High Frequency

High frequency (Figure 11) is a therapeutic modality widely used in aesthetics. based on the emission of electromagnetic waves that promote tissue heating, stimulating blood circulation and oxygenation (BAROLLI; REGO, 2020).

In the context of hair care, the application of high frequency to the scalp induces... Vasodilation, promoting follicular nutrition, is essential for the hair growth cycle. (FERREIRA; REIS, 2025). In addition, it has antimicrobial properties, helping in control of scalp dermatoses, such as seborrheic dermatitis, which can compromise hair health and growth (FERNANDES, 2025).

Combining high frequency therapy with aromatherapy enhances the therapeutic effects. While essential oils act on the biochemical stimulation of the hair follicle, the high Frequency improves the permeation of active ingredients and increases local vascularization (BARROS; MOREIRA, 2023).

This is a safe, non-invasive, and well-tolerated technique with minimal risk of side effects. adverse effects when performed by trained professionals. Its use integrated with protocols of Hair therapy has proven to be an effective approach to promote hair growth and strengthening of the hair strands (FERREIRA; REIS, 2025).

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Figure 11 - Illustration of the application of high frequency.



Source: AI (Artificial Intelligence) Chatgpt

3. Materials and methods

This work is a narrative literature review, whose objective is to gather, organize and Critically analyze the main scientific evidence regarding the use of essential oil of Rosemary (Rosmarinus officinalis) was chosen to stimulate hair growth. of study due to the possibility of integrating different theoretical approaches and results. experimental, in order to offer a broad and up-to-date view on the subject.

3.1 Type of study

Narrative review is characterized by methodological flexibility, allowing for the selection of different types of scientific work — such as original articles, literature reviews, dissertations and final course papers — provided they are relevant to the subject of study. Unlike a systematic review, which follows rigorous search protocols and In quantitative analysis, narrative review allows for greater freedom in the choice of sources. prioritizing qualitative and critical analysis of the findings (ROTHER, 2007)

3.2 Search strategies

The search for studies was conducted in electronic databases of scientific relevance. including *Scientific Electronic Library Online* (SciELO), PubMed/MEDLINE, Google Scholar

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(Google Scholar), Virtual Health Library (VHL), institutional repositories of Brazilian universities.

In addition to databases, undergraduate theses were consulted and Articles published in national journals specializing in health, aesthetics, and cosmetology.

The descriptors used in the search were combined in Portuguese and English as oil. Rosemary essential oil; *Salvia rosmarinus;* hair growth; androgenetic alopecia, *hair growth, essential oil rosemary; Rosemary oil hair loss*

Boolean operators (AND, OR) were applied to broaden the scope of results.

3.3 Inclusion and exclusion criteria

Studies published between 2010 and 2025 were included; articles in Portuguese and in English; research that specifically investigated rosemary essential oil in the context of Hair growth, in in vitro models, in vivo (animals) or in clinical trials in humans; Literature reviews and academic papers that directly addressed the topic.

Duplicate studies across databases were excluded; as were studies that addressed only... Rosemary in other contexts (culinary, cardiovascular, anxiolytic use, etc.). Publications without A clear methodology, or one that has no direct relation to the topic of hair growth.

3.4 Analysis procedures

After the initial selection, the titles and abstracts were read, followed by a reading of the texts. complete list of eligible texts. For each study, the following data were extracted: author information and year. publication type; study type (experimental, clinical, review); population or model. experimental; methods of using rosemary essential oil (topical, oral, associated with techniques) aesthetics); results obtained; main limitations identified.

The data analysis was conducted qualitatively, grouping the results into... thematic categories: hair physiology, chemical composition of essential oil, mechanisms of Action, experimental and clinical evidence, and application perspectives.

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3.5 Methodological limitations

Because this is a narrative review, this study did not follow standard review protocols.
It did not systematically (like PRISMA), nor did it establish quantitative flowcharts or meta-analyses.
Thus, there is greater subjectivity in the selection and interpretation of the articles. However, an effort was made to...
to minimize this bias through the selection of recognized scientific sources, as well as
Critical analysis of the available findings.

4. Results and discussion

The literature review investigated the potential of rosemary essential oil *(Salvia).*
rosmarinus) in stimulating hair growth, especially in individuals with alopecia
androgenetic anagenesis; however, only one study in humans has been identified. Panahi et al.
(2015) developed a randomized, single-blind, six-month clinical trial,
performed on men aged 18 to 49 years, with a classification of grade II or IV, according to
Hamilton's scale. In this study, the authors structured two comparative groups: one
group (n=50) was treated with standardized rosemary essential oil (Salvia rosmarinus) with
~3.7 mg of 1,8-cineole per mL; in the other group (n=50), the proposed treatment was minoxidil.
2%. The application protocol was 1 ml of solution (rosemary essential oil or minoxidil at
2%), twice a day, with intervals of approximately 12 hours, totaling 2 ml per day. The regions of
The application techniques were applied to the frontoparietal and vertex areas, directly to the scalp, followed by massage.
smooth.

The data collection was carried out through duly documented photographs.
Standardized over 3- and 6-month periods. The photographs were evaluated by dermatologists.
with blinding, and, in the first three months, no significant change was observed in
Average hair count in neither group; however, at 6 months, both groups
They showed a significant increase in thread count, being: rosemary 129 ± 51.2 threads and
minoxidil 140.7 ± 38.5 strands. Therefore, the conclusion of the study is that both groups
They showed improvement, although none of them stood out.

In addition, Panahi et al. (2015) also report that changes such as dry hair,
Oily hair and dandruff, identified in some volunteers at the beginning of the study, did not
They showed improvement. A relevant finding of the study was the significant increase in

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Frequency of scalp itching throughout treatment, both at days 3 and 6.
months. However, individuals who used 2% minoxidil showed a higher incidence.
of this symptom in relation to those treated with rosemary oil, suggesting better tolerability of
Rosemary oil is used for scalp irritation.

Although statistical analyses have shown similar results between the groups,
Subjective assessment of patients at 6 months indicated moderate improvement (82%) in the group.
with rosemary essential oil, while in the group with 2% minoxidil, the classification is higher.
Significant was slight (92%).

It is worth highlighting that, despite the clinical results obtained, the proposed mechanisms for
These effects are not yet fully understood, and in the case of essential oils, there is no...
sufficient evidence to attribute these results exclusively to improved perfusion.
blood flow in the hair follicle.

It is speculated that the improvement may also be due to other mechanisms of action, such as
the antioxidant action of rosemary essential oil, which plays an important role in protection.
of the hair follicle against cellular damage. In this review, it was possible to verify that both the
Extracts and essential oil of Salvia rosmarinus exhibit antioxidant activity.
although through distinct bioactive compounds. In this sense, Abelan et al. (2022) highlight
that reducing oxidative stress contributes to the preservation of cellular integrity and
maintenance of the hair cycle.

Anti-inflammatory activity is also inferred, since microinflammation
Perifollicular development is directly related to the miniaturization of hair follicles. Studies
Studies indicate that rosemary essential oil *(Salvia rosmarinus)* may reduce mediators.
local inflammatory processes, contributing to the improvement of the follicular environment and promoting the
hair growth.

With regard to enzyme modulation, some experimental studies suggest that
Certain bioactive compounds present in rosemary extracts may be involved.
in pathways related to the conversion of testosterone to dihydrotestosterone (DHT). However,
These findings are limited and cannot be extrapolated to rosemary essential oil, a
since its chemical composition is distinct and mainly composed of monoterpenes.
volatile compounds, without consistent evidence of inhibitory action on the 5-ÿ-reductase enzyme. No
However, as described by Nestor et al. (2021), there is still no robust clinical evidence.

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that confirm its direct action as an inhibitor of the 5-ÿ-reductase enzyme in humans, this being A mechanism considered to have potential for investigation.

Furthermore, based on a review of the mechanisms of action of epicranial massage and high Frequent interaction suggests that the association between them may demonstrate synergistic potential. Massage mechanically stimulates blood circulation, while high frequency promotes vasodilation and antimicrobial action, favoring the permeation of active ingredients and contributing to balancing the scalp's microflora and, ultimately, enhancing the therapeutic effects.

Despite the promising results, the literature presents important limitations, such as... limited number of clinical trials, especially in humans, small sample sizes and The lack of standardization in the concentrations and application methods of essential oils. These Limitations make it difficult to generalize the results and highlight the need for further studies. more robust and standardized.

Therefore, although there is evidence to support the use of rosemary essential oil To stimulate hair growth, its use should be understood as complementary. especially in the context of integrative aesthetic protocols.

FINAL CONSIDERATIONS

Therefore, it is recommended that future research be conducted using methodologies... more rigorous standards, including controlled clinical trials, greater temporal continuity, and definition. standardized concentrations and application methods.

It can be concluded, therefore, that the association between rosemary essential oil and massage... Epicranial neuropathy and high frequency require study both individually and in combination.

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