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HARNESSING ROSEMARY FOR BEAUTY: PHYTOCHEMISTRY AND COSMECEUTICAL APPLICATIONS

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ABSTRACT

A Review of Literature In this present literature review, the significance of rosemary extract (Salvia rosmarinus) in herbal cosmeceuticals has been discussed, especially with reference to the phytochemistry of rosemary extract, its isolation, pharmacology, application, and regulation. Rosemary extract contains various bioactive molecules. The bioactive components of rosemary extract consist of phenols, rosmarinic acid, carnosic acid, and carnosol, volatile oil, 1,8-cineole (eucalyptol), α-pinene, camphene, borneol, and limonene, flavones, luteolin, and apigenin, and triterpenes, ursolic acid, oleanolic acid, and betulinic acid. The mentioned phytochemicals play an essential role in its therapeutic efficacy. Various extraction methods like steam distillation, solvent extraction, and supercritical fluid extraction are used in the separation and stabilization of these phytochemicals. These phytochemicals' extraction process determines their yield and biological properties. Rosemary extract's therapeutic activity is determined by its potent anti-inflammatory, antimicrobial, and antioxidant activity. Moreover, it prevents the impact of ultraviolet radiation on skin health and is significantly important in anti-ageing as well, as lower wrinkles on the skin increase its elasticity. Extraction of rosemary is extensively employed in the cosmetics industry due to it wide range of applications.The rosemary extract is applied in creams and sunscreens for skin care, it is included in shampoos, conditioners, and hair oil for hair care, and toothpaste, gel, and mouthwash for oral care. According to FDA in the United States, the rosemary extract is declared to be safe. According to EU, rosemary extract is used as an additive in foods (E392).

According to FSSAI in India, rosemary extract is allowed to use in cosmetics as an antioxidant. In general, through this literature review, various uses of rosemary extract in cosmetics are discussed. More research on its phytochemical components could make it more useful and effective in advanced cosmeceutical products.

2. INTRODUCTION

Rosemary is the primary common name worldwide in various regions like "rosmarino" (Italian), "romero" (Spanish), and "sagargandha" in Hindi. Rosemary's biological source is the evergreen shrub Salvia rosmarinus which belongs to the Lamiaceae (mint) family.[1] It consist of phytochemical constituent for the cosmaceutical purposes such as phenolic compound i.e rosemarinic acid, carnosic acid an carnosol which is beneficial for skin care product.[2] 'essential oil such as the 1,8-cineole , camphor, alpha-pinene and borneol which shows antimicrobial,' anti inflammatory, soothing and antioxidant activity.[3] flavonoid consist oof luteolin and apigenin exhibit anti inflammatory anti cancerous property[4] along with sterol are also present.There are extraction techniques is steam distillation, solvent extraction, supercritical fluid extraction by which there is the rosemary constituent is extracted.

It is used in herbal moisturizer formulation, sunscreen formulation, herbal shampoo, herbal conditioner,hair oil, herbal toothpaste, mouthwash and gel etc using rosemary extract.

Aspect of safety and regulation their are the uses of rosemary extract a higher dose that causes the allergic reaction and adv vereffect[5] with USA regulation FDA has approved it is safe with europe regulation accepted as a food additives under E392 and india also allow FSSAI under food items.[6-8]

Phytochemistry of Rosemary Extract

3.1 Major bioactive compounds

3.1.1 Phenolic compound

There are numerous compounds found in the extract of rosemary; nevertheless, the phenolic compounds such as rosemarinic acid, carnosic acid, and carnosol have been the focus of many studies. These three are the most popular in skin care and beauty products because they help keep skin healthy and fight signs of aging.[2] Soothing cream, anti-aging serum, and other products use rosmarinic acid, which is an antioxidant that fights inflammation. Carnosic acid is a powerful antioxidant and photoprotective agent that is used in gels to protect against

sun damage and wrinkles. Carnosol is used in hair care, preservatives, and other things because it can get rid of free radicals. Carnosic acid is a phenolic compound that makes up 97% of phenolic extract.[9]

3.1.2 Essential oil

Rosemary extract is made up of essential oil, which contains 1,8-cineole (eucalyptol), camphor, α-pinene, camphene, borneol, and limonene. 1,8-Cineole (eucalyptol) has 15–55%, camphor has 5–21%, α-pinene has 9–26%, and borneol has 1.5–5% of essential oil that has antimicrobial, anti-inflammatory, soothing, and antioxidant effects.[3]

3.1.3 Flavonoid phytoconstituent

These are some of the flavonoids that are in the rosemary extract. Primarily flavones, such as luteolin and apigenin, exhibit anti-inflammatory, antioxidant, and anticancer properties.[10] Some examples are luteolin-7-O-glucoside, kaempferol, and hesperidin.[4]

3.1.4 Another compound

Rosemary has a lot of pentacyclic triterpenes, like ursolic acid, oleanolic acid, betulinic acid, and other similar compounds. These are thought to be responsible for its antioxidant, anti-inflammatory, and cytotoxic effects.[11] Sterols found in rosemary Sterol (phytosterols) are present at 0.9-1%, usually in smaller but significant quantities, indicating membrane stability and a cholesterol-modulating effect.[12]

3.2 Extraction Techniques and Their Effects on Phytochemical Composition

3.2.1 The steam distillation method for getting essential oils

3.2.1 Rosemary essential oil extraction using the steam distillation method

Among various methods of extracting essential oils from rosemary plants, the steam

The distillation method is one of the most common ones. Among other factors that make the essential oil from rosemary advantageous, this process ensures increased production rate and efficiency of retaining the terpenes in rosemary (e.g., 1,8-cineole, α-pinene, and camphor) in an optimal way when conducted under normal pressure at temperatures ranging between 90-100 °C. Research shows that under optimal conditions, rosemary oil can be extracted in less than 10-30 minutes.[13] Standard process parameters are fresh or dried rosemary leaves that are usually cut into pieces that are 1–2 cm long. The steam flow raises the temperature to 94–100°C, and the rosemary leaves cut the water-to-particle ratio to about 1:3 by weight.[15] Extraction usually takes 60 to 180 minutes, depending on how big the batch is and how much

you want to get out of it. In the first hour, most of the oil is taken out.[1] Steam distillation technique explain in Fig No.1.

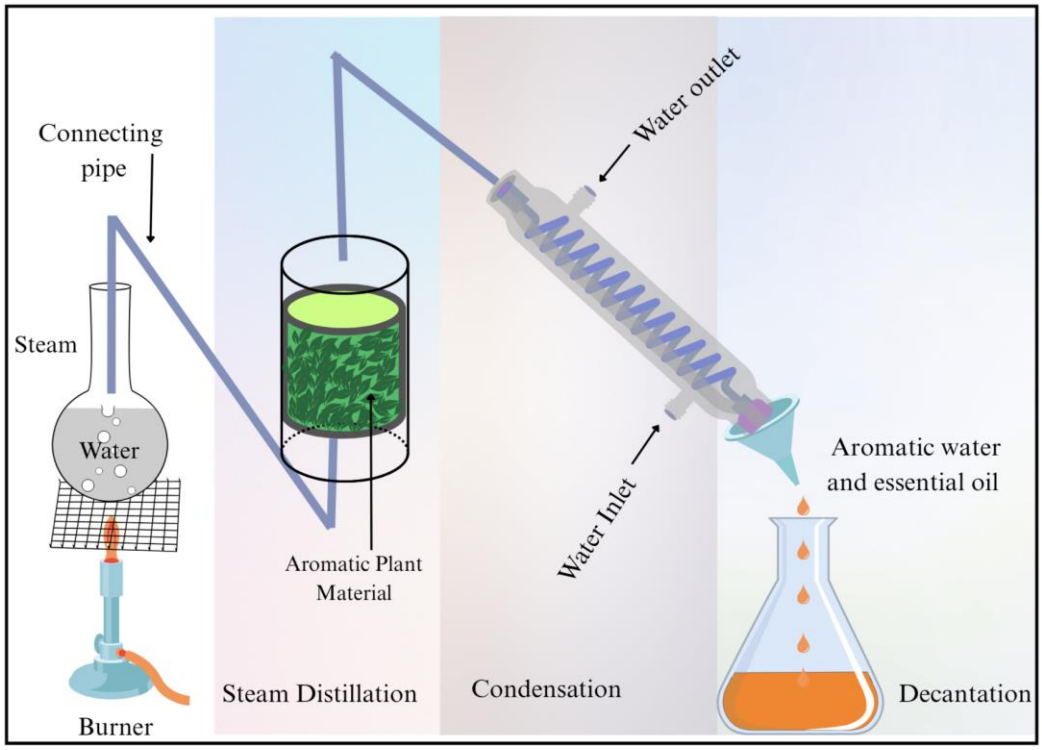

Fig. No.1:- Essential oil by steam distillation process.

3.2.2 Extraction with a solvent

To extract rosemary extract using an alcohol-based (ethanol-based) solvent, the basic steps are to mix ground dried rosemary leaves with ethanol (or ethanol-water mixtures), then get rid of the solvent to get a concentrated or powdered extract. Common choices of solvents some common solvents It works well in Soxhlet or reflux extraction and gives a good yield of lipophilic antioxidants like carnosic acid and carnosol.[17]

Aqueous ethanol (30–70% ethanol in water)

Studies show that a concentration of about 30–50% ethanol in water works best for getting the most antioxidant activity and phenolic yield from rosemary, especially for rosmarinic acid.[18] simple way to extract (on a small scale).

1] Prepare the raw material

Use fresh or dried rosemary leaves that have been dried at room temperature or mild heat (40–50°C) and then grind into a fine powder (0.5–1 mm).[17]

2] Choice of alcohol solution

Alcohol solution (50%) - v/v or w/w for maximum content of total phenolics and antioxidant activity. In case of lipophilic antioxidants, such as carnosis acid extract, the proportion of alcohol in the solution should be between 70-90%.[17]

3] The extraction technique

A) Simple maceration

Use the proportion of plant matter to solvent of 1:10 to 1:15 (w/v). Stir and mix for 2-6 hours at room temperature and then strain. Repeat if required.[19]

B) Continuous Soxhlet extraction

Use dry plant powder in Soxhlet thimble filled with absolute ethanol or 95% ethanol and extract for 4-8 hours at reflux condition.

C) Ultrasonicated extraction (UAE)

Same solvent used for maceration (e.g., 50–70 %EtOH), but ultrasonication applied for 20-60 min. This method greatly increases the extraction efficiency.[21]

4] Separation and concentration of the extract

Possible filtering techniques using gauze or filter paper. Use a rotary evaporator under vacuum at 40-60 C for removal of ethanol. [62] Or concentrate extract to dry powder by vacuum or freeze drying techniques. Store the extracts in brown bottles in nitrogen atmosphere and at 4°C.[17] Solvent Separation process explain in Fig No.2

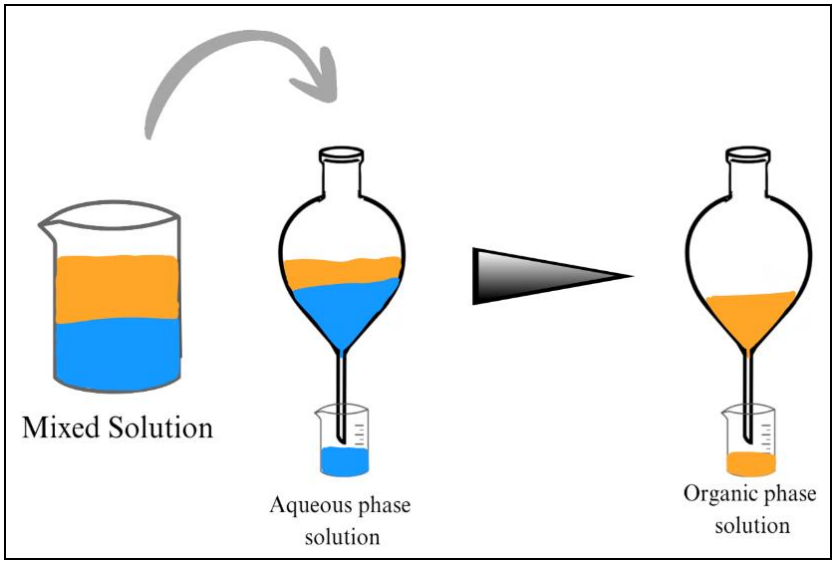

Fig No.2:- Solvent separation process.

3.2.3 Supercritical Fluid Extraction

Supercritical Fluid Extraction (SFE) technology relies on using CO2 for obtaining high quality rosemary extract through the extraction of antioxidants like carnosic acid without resorting to aggressive solvents. It is environmentally less harmful than traditional technologies like hydrodistillation.[22]

Process Overview: Supercritical fluid extraction (SFE) is the procedure that uses supercritical CO2 for treating dried rosemary leaves under conditions of 40-100°C temperature and 10-35 MPa pressure. The polarity can be changed by introducing 10-20% of ethanol. Sequential steps first use supercritical CO2 to get rid of solvents, then antioxidants, and finally essential oils. This method can make rosemary antioxidants 95.9% pure. From dried leaves, you can get up to 7.5% oleoresin, and the recovery of carnosic acid is high (35.7 mg/g).[23]

Benefits of Purity: SFE makes extracts that don't need to be cleaned up before being analyzed by HPLC. It does better than solvent sonication, with a relative standard deviation of 4.4%. It separates antioxidants (carnosic acid, carnosol) from pigments and volatiles in a way that meets food-grade standards, such as a ratio of antioxidants to volatiles of at least 15%. SFE increases antioxidant activity by up to 14 times compared to steam distillation.[24]

3.2.4 Effect on Phytochemical Profile

Changes in the phytochemical profile of rosemary extract are closely related to changes in its yield, stability, and activity. These changes depend on how the plant is grown, how it is extracted, and how it is stored.[25]

1. How changes in yield affect the phytochemical profile

- More total phenolics, flavonoids, and diterpenes (carnosic acid, carnosol) are usually found in higher extraction yields, such as those with ethanol–water mixtures that are 50–80% ethanol. But the proportion of compounds can be modified.[26]
- Seasonal or geographical factors that enhance biomass production (for example, wet season compared to dry season, different agro-ecological zones) usually modify the balance between phenolic compounds and volatiles, hence high productivity does not necessarily result in optimal phytochemicals.[27]

2. Different stability of phytochemicals

- Important antioxidants such as carnosic acid and rosmarinic acid break down in methanolic solutions, but their stability is greatly increased when extracted using natural deep-eutectic solvents (NADES), resulting in reduced antioxidant activity loss.[28]
- Phenols and radical scavenging activities decrease rapidly in light-exposed extracts and those with poor formulation, while extracts stored in darkness and under oxygen-free conditions remain more stable.[27]

3. Leading to changes in activity

- Antioxidant and antibacterial properties of rosemary extract are highly dependent on the levels of phenols and flavonoids; any change within these groups (such as high TPC in certain fractions of ethanol) would affect. DPPH, ABTS, FRAP, and the size of antibacterial zones.[29]
- Extraction techniques could lead to increased concentrations of particular compounds (such as those rich in carnosic acid compared to others rich in rosmarinic acid) which might result in "peaks" in activity (e.g., better FRAP than DPPH scavenging power).[30]

4. Pharmacological Activities Pertinent to Cosmeceuticals

4.1 Antioxidant Qualities

The antioxidant activity of rosemary extract is very high due to its capability to eliminate free radicals and prevent oxidative stress. Managing free radicals the rosemary extract successfully deactivates free radicals, especially DPPH and superoxide, by donating protons/electrons through its 'phenolic components, carnosic acid, carnosol, and rosmarinic acid.'[31] These compounds inhibit the propagation of free radicals within lipids and cells by working as radical terminators and metal chelators.[32] Preventing oxidative stress reduces MDA and NO concentrations and maintains elevated GSH concentration in neural tissues. This leads to reduced oxidative stress. It increases antioxidant enzyme activity and inhibits lipid peroxidation in stress-induced or diseased conditions, thereby reducing oxidative stress by preventing damage caused by ROS. Rosemary also prevents oxidation and photolytic oxidation in foods, making it more stable than TBHQ.

4.2 Anti-inflammatory properties

The anti-inflammatory properties of rosemary extracts are well-known, thus making it an often used component in skin care products.The key constituents of this extract, such as carnosic acid and carnosol, prevent the release of inflammatory mediators by inhibiting the

release of pro-inflammatory cytokines (TNF-α and IL-1) and enzymes (COX-2). This action is analogous to non-steroidal anti-inflammatory drugs; however, unlike NSAIDs, its side effects when applied topically are minimal. Ursolic and oleanolic acids also inhibit the NF-κB pathway.[33]

Cosmeceutical Uses: It is effective in soothing and protecting the skin from conditions such as acne, eczema, or rosacea. This compound works even more effectively when used together with antioxidants because it helps protect the skin from any inflammation brought about by the sun.[34]

4.3 Antimicrobial Activity

Rosemary extract has significant antimicrobial activities that can be helpful in cosmetics in protecting the skin from bacteria and fungi infections. Key Mechanisms active compounds such as carnosic acid, rosmarinic acid, and essential oils disrupt microbial cell membranes, inhibit biofilm formation, and interfere with bacterial enzymes. They are effective against Gram-positive bacteria (e.g., Staphylococcus aureus, MIC ~2 mg/mL) and have moderate effects on Gram-negative bacteria like E. coli. It works well with antibiotics, making pathogens like E. coli less resistant and making lower doses work better.[35] Antimicrobial Activities It inhibits the growth of S. aureus and C. albicans, hence making it effective in the prevention of acne, excessively oily skin, and skin infections. Its presence in the hair care formulations will prevent the growth of microbes in the oil based cosmetics and also help in soothing irritant skin.[33] Rosemary Extract is an ideal cosmeceutical for promoting hair growth especially when it comes to cosmeceutical hair care products used to counteract thinning hair and alopecia.

4.4 Hair Growth Promoting Activities

Major Factors Carnosic acid and 12-methoxycarnosic acid inhibit the production of DHT responsible for destruction of the hair follicle in androgenetic alopecia by up to 94.6 %. It encourages blood circulation within the scalp thus increasing the delivery of nutrients to the hair follicles, minimizing inflammations and protecting them from oxidative stresses to increase hair growth cycle[36] Cosmeceutical uses of topical products like serums, oils, and lotions use it at 3.7 mg/mL, which is the same as 2% minoxidil in trials with 100 patients over six months. It increases hair count and makes the scalp less itchy. New studies from 2024 to 2025 show that modern blends can increase growth rates by 47–58%, density by 32%, and hair loss by more than 40%. Rosemary extract (from Rosmarinus officinalis /

Salvia rosmarinus) has a number of skin-protective and anti-aging effects that are important to medicine. These effects are mostly due to its high levels of polyphenols (rosmarinic acid, carnosic acid, and other diterpenes) and strong antioxidant activity. Here is a short pharmacological description of how it works under your two headings.[33]

Protection from UV rays rosemary polyphenols and diterpenes are strong antioxidants that help protect against photo-damage by getting rid of reactive oxygen species (ROS) that are made when skin is exposed to This lessens oxidative stress in fibroblasts and keratinocytes.[34] Studies on cells in a lab and on human volunteers show that combinations that contain rosemary (usually with citrus bioflavonoids) raise the minimal erythema dose (MED), lower UV-induced erythema, and lower markers of lipid peroxidation (lipoperoxides). This suggests that taking them by mouth has a systemic photoprotective effect.[93] Rosemary extract may help protect against photo-damage and lower the risk of photoaging and some UV-related skin disorders by limiting UV-driven collagen breakdown, inflammatory cytokine release (like IL-6), and DNA damage.[37]

4.5 Effects That Fight Aging

4.5.1 Lessening of wrinkles: The extract prevents UV-induced degradation of collagen and elastin fibers in the dermis and delays the development of fine lines and wrinkles.[38] Clinical studies conducted in humans where rosemary is used with citrus or grapefruit extracts prove that the intake of the extract within a couple of weeks makes the skin smooth and wrinkle-free.[39]

4.5.2 Improvement in skin elasticity

Rosemary extract and its main ingredient, rosmarinic acid, boost the production of elastic fiber components (like tropoelastin and fibrillin) and speed up the formation of elastic fibers in dermal fibroblasts by increasing the signaling of transforming growth factor-β-1 and Camp response element-binding protein.[40] In clinical trials, formulations containing rosemary (topical or oral) have been correlated with enhanced skin elasticity and diminished roughness, consistent with the pharmacological function of rosemary in maintaining and reconstructing the dermal extracellular matrix.[41]

5. Application of Rosemary Extract

Rosemary extract can be used for healthy cosmaceutical purposes in addition to being a kitchen spice. Formulations for oral care, hair care, skincare, and other areas will benefit from it.[42]

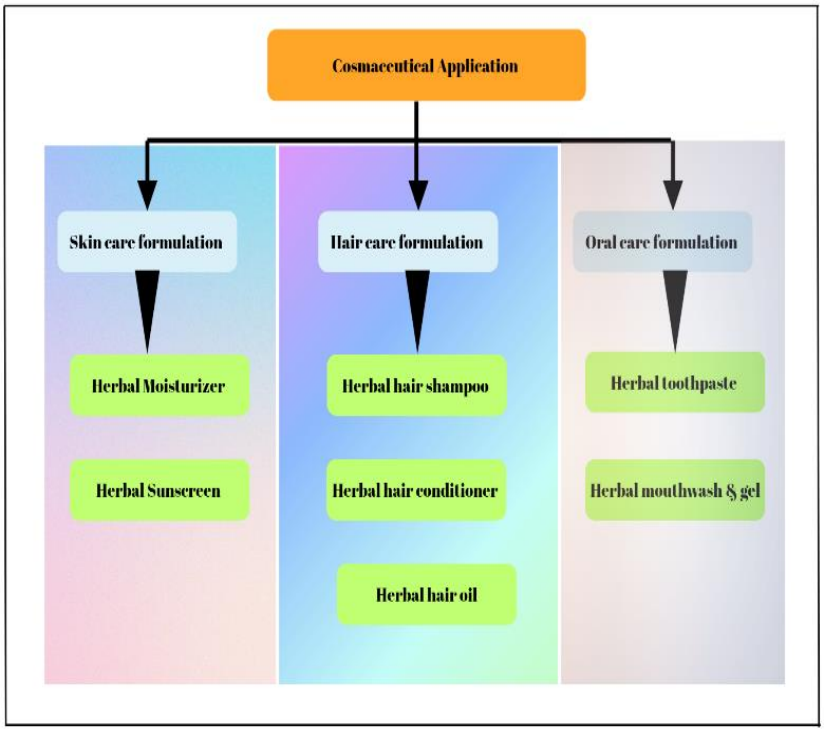

Fig. No.3:- Cosmaceutical application of rosemary extract.

5.1 Herbal Skin Care Product

Concentration of rosemary extract in herbal cream formulation using rosemary extract has antioxidant, antimicrobial, anti-inflammatory, and sebum-regulating properties that may help reduce acne, control excessive oil production, tighten pores, improve circulation, support collagen production, protect skin from environmental stress, provide a soothing effect, reducing signs of aging, etc.[43,44] Studies on herbal anti-wrinkle and protective creams have shown that using rosemary extract at concentrations of 0.5%, 1%, and up to 2% increases antioxidant activity.[45] Technical guidelines and cosmetic patents indicate that herbal cream formulations containing 0.1–10% rosemary extract are generally safe.[46] Three phases of herbal cream formulation are available: cool-down, water, and oil phases.

5.1.1 Herbal Moisturizer Formulation

This formulation is beneficial for preventing skin aging and shielding the skin from environmental stress. It is made up of an antioxidant cream that can be applied every day to

oily, combination, or normal skin.[47] To increase antioxidant protection without overly irritating the skin, use a 0.5–2% concentration of standardized liquid or glyceric rosemary extract in the final moisturizer. The formulation includes rosemary extract, an oil phase (coconut oil), an aqueous phase (aloe vera gel), and preservatives/neutralizers (methyl paraben/NaOH).[48] mentioned in Fig No.3

5.1.2 Herbal sunscreen formulation

Rosemary extract is used in this herbal sunscreen, which helps shield skin from the sun. Rosemary extract offers a minor increase in UV protection (SPF) when mixed with materials like zinc oxide, carrot seed oil, or beeswax.[49] mentioned in Fig No.3

5.2 Herbal Hair Care Product

Because it increases scalp circulation, combats hair loss, and fortifies hair strands, rosemary extract is a popular herbal powerhouse in hair care. It can be found in shampoos, rinses, oils, and serums, all of which naturally promote healthier, fuller hair growth.

5.2.1 Preparing a herbal hair formulation

Basically, a sufficient amount of 100 milliliters of serum is made up of 10 milliliters of rosemary extract, 15 milliliters of flax seed gel, 10 milliliters of black seed oil, amla, coconut, and sesame oil.[50] Rosemary extract's antimicrobial qualities fight dandruff and scalp irritation while boosting blood flow to hair follicles to promote growth and lessen thinning. Rosemary's antioxidants strengthen strands and prevent premature greying. Its anti-inflammatory properties balance oil production and relieve itchy scalps.[51] mentioned in Fig No.3

5.2.2 Herbal Shampoo Formulation

This herbal shampoo contains rosemary extract, which encourages hair growth, lessens the thinning of hair follicles, increases shine, and prevents the development of dandruff. Additionally, it balances the pH of the scalp; a general study on formulations shows that it can improve hair strength by up to 29% and moisturize the scalp by 77%.[52,53] mentioned in Fig No.3

5.2.3 Herbal hair oil

Rosemary extract promotes hair growth, reduces hair loss and follicle thinning, and improves blood flow. like minoxidil, at the scalp to strengthen hair roots.[51] mentioned in Fig No.3

5.2.4 Herbal conditioner formulation

A rosemary extract-based herbal conditioner formulation nourishes the hair's roots and leaves the hair shiny and silky. A herbal conditioner for oily skin that helps remove oil dirt and minimize hair loss.[54] mentioned in Fig No.3

5.3 Herbal oral care formulation

Rosemary extract, which has anti-microbial and anti-inflammatory qualities, is frequently used in toothpastes, gels, mouthwashes, and other products to control plaque, manage gingivitis, and balance the oral microbiome.[55] Major oral pathogens like Lactobacillus rhamnosus, Streptococcus mutans, and Streptococcus oralis are inhibited by rosemary extract and its essential oil. Which contribute to the development of biofilms and caries.In clinical studies, its terpenoids and phenolic compounds improve gum health and lessen Bleeding upon probing by reducing oxidative stress and inflammation in gingival tissues.[56]

5.3.1 Herbal toothpaste

An alcoholic rosemary extract-based experimental dentifrice demonstrated antimicrobial activity against cariogenic and plaque- Forming bacteria that was on par with that of commercial herbal toothpastes. These pastes frequently include rosemary along with humectants (glycerin), flavoring agents, and abrasives (such as silica and calcium carbonate). mentioned in Fig No.3

5.3.2 Mouthwash and gels

To lessen plaque biofilm, gingivitis, and early- Stage periodontal disease, rosemary extract is occasionally 'combined with other herbs (such as neem, clove, sage, and chamomile) in mouthwashes and gels.'[57] mentioned in Fig No.3

6. Aspects of Safety and Regulation

6.1 Toxicity and adverse effects

Although rosemary extract is safe, some individuals may have Allergic reactions, sensitivity, or irritation. A very high oral intake may result in systemic toxicity in extreme circumstances.[58,59] Positive patch test results have confirmed rare reports of allergic contact dermatitis From cosmetics containing extract from rosemary leaves.[60] To avoid oral toxicity, a dose of 400 mg/kg body weight is usually selected to produce a Safe effect.[61] In individuals who are predisposed to epilepsy, high dosages or concentrated extracts may upset the digestive tract and, in rare instances, induce seizures.[62]

6.2 Regulatory status in various regions

With GRAS status in the USA and E392 approval in Europe, rosemary extract is widely recognized as a natural antioxidant in food, cosmetics, and supplements in major regions. Whereas quality control is based on active component content such as carnosic acid, regulation focuses on purity, the use of solvents, and standardization. Indian regulations ensure that it conforms to global standards by using it as a natural antioxidant in foods through FSSAI.

- USA Regulations: Rosemary extract is considered safe for consumption by the FDA.
- Europe Regulations: Permitted as a food additive under E392.
- India Regulations: Approved as an antioxidant in foods under the FSSAI.[63,64,65]

7. CONCLUSION

The current study provides comprehensive data on the importance and various applications of rosemary extract (Salvia rosmarinus). Rosemary extract is an extract which contains active ingredients such as antioxidants, anti-inflammatory agents, antimicrobial agents, and anti-aging agents. Active components in this extract are phenolic antioxidants (rosmarinic acid, carnosic acid, and carnosol), essential oils (1,8-cineole, camphor, α-pinene, and borneol), flavonoids (luteolin and apigenin), triterpenes, and phytosterols. Carnosic acid is one of the most important active components of rosemary as it contributes to antioxidants and photo protection in rosemary. The method used in the process of extraction is of great importance in yielding and stability of the extracted components. For instance, distillation method like steam distillation can be applied for the extraction of essential oils. Solvent and supercritical fluid extraction methods can be utilized for the extraction of phenolic antioxidants. Phytochemical composition depends greatly on factors including solvents, environment, storage conditions, and ultimately, influences its biological activity. Rosemary extract exerts a good scavenging activity against free radicals, preventing oxidative stress and inhibiting cytokines and COX-2 enzyme release, thus showing activities similar to NSAIDs, yet devoid of side effects. Its antimicrobial properties and biofilm inhibition abilities make this extract more useful in dermatological products as well as in oral formulations. In addition to that, rosemary extract can be effective in hair regrowth by inhibition of DHT synthesis, improved blood supply to the scalp, and increased anagen phase duration, which can be compared to common pharmaceutical drugs like minoxidil. In addition, the product is involved in protection against UV-rays and skin aging via minimizing collagen degradation, enhancing

the skin's elasticity and avoiding formation of wrinkles. Rosemary extract is widely used in various herbal preparations such as face creams, skin moisturizers, sun screens, shampoos, conditioners, hair oils, toothpastes, mouth washes, and gels. Recommended concentrations for the formulations usually range from 0.1% to 10%. These formulations might capitalize on multiple usages of rosemary extracts such as the ability of the rosemary extract to control sebum secretion, protect against microbial infections, and enhance skin barrier properties. Tests reveal the safety of the rosemary extract; however, individuals who are sensitive can experience allergic reactions to overusing this product. Legalization of rosemary extract for use as an antioxidant has been done by the FDA, E392 (European Agency) and FSSAI (India). In summation, this paper highlights the promising uses of rosemary extract as a natural and effective cosmetic ingredient.

8. REFERENCES

1. McCormick Science Institute. Rosemary [Internet]. [cited 2026 Apr 6]. Available from:
2. Sawarkar N. Rosemary extract in cosmetics and personal care products [Internet]. Knowledge. Available from:
3. Hcini K, Sotomayor J, Jordan M, Bouzid S. Chemical composition of the essential oil of rosemary (Rosmarinus officinalis L.) of Tunisian origin. Asian J Chem. 2012; 25(5): 2601–2603. doi:10.14233/ajchem.2013.13506
4. Bai N, He K, Roller M, Lai CS, Shao X, Pan MH, et al. Flavonoids and phenolic compounds from Rosmarinus officinalis. J. Agric. Food Chem., 2010; 58(9): 5363–5367. doi:10.1021/jf100332w
5. Cosmetic Ingredient Review Expert Panel. Safety assessment of Rosmarinus officinalis (rosemary)-derived ingredients as used in cosmetics (tentative report for public comment) [Internet]. 2013 Dec 17. Available from:
6. Knowde. Rosemary extract in food and nutrition [Internet]. Available from:
7. Wellgreen Technology Co., Ltd. From kitchen herb to clean label ingredient: The evolution of rosemary extract [Internet]. 2025. Available from: https://www.wellgreenxa.com/info/from-kitchen-herb-to-clean-label-ingredient-t-103174271.html
8. Pukalskas A. Isolation, identification and activity of natural antioxidants from sweet grass (Hierochloe odorata), costmary (Chrysanthemum balsamita) and horehound (Marrubium vulgare), cultivated in Lithuania [dissertation]. Wageningen University; 2008. doi:10.18174/122066

9. Ibrahim N, Abbas H, El-Sayed NS, Gad HA. Rosmarinus officinalis L. hexane extract: Phytochemical analysis, nanoencapsulation, and in silico, in vitro, and in vivo anti-photoaging potential evaluation. Sci. Rep., 2022; 12(1): 13102. doi:10.1038/s41598-022-16592-7
10. Mena P, Cirlini M, Tassotti M, Herrlinger KA, Dall'Asta C, Del Rio D. Phytochemical profiling of flavonoids, phenolic acids, terpenoids, and volatile fraction of a rosemary (Rosmarinus officinalis L.) extract. Molecules. 2016; 21(11): 1576. doi:10.3390/molecules21111576
11. Chan EWC, Wong SK, Chan HT. An overview of the chemistry and anticancer properties of rosemary extract and its diterpenes. J Herbmed. Pharmacol., 2022; 11(1): 10–19. doi:10.34172/jhp.2022.02
12. Kahkahi RE, Moustaine M, Zouhair R. Salvia rosmarinus: A comprehensive review of its phytochemical composition and pharmacological properties. Int. J. Pharm. Sci. Dev. Res., 2025; 11(1): 1–5. doi:10.17352/ijpsdr.000055
13. Boutekedjiret C, Bentahar F, Belabbes R, Bessière JM. Extraction of rosemary essential oil by steam distillation and hydrodistillation. Flavour. Fragr. J., 2003; 18(6): 481–484. doi:10.1002/ffj.1226
14. International Journal of Research and Analytical Reviews. [Title of the article]. Int. J. Res. Anal. Rev., 2020; 7(2). Available from:
15. Chen H, Gu Z, Yang L, Yang R, Ji Y, Zeng Q, et al. Optimization extraction of rosemary essential oils using hydrodistillation with extraction kinetics analysis. Food Sci. Nutr., 2021; 9(11): 6069–6077. doi:10.1002/fsn3.2549
16. Teshale F, Narendiran K, Beyan SM, et al. Extraction of essential oil from rosemary leaves using steam distillation: Process optimization and kinetic modeling. Appl. Food Res., 2022; 2: 100133. doi:10.1016/j.afres.2022.100133
17. Yeddes W, Majdi H, Gadhoumi H, Affes TG, Mohamed SN, Aidi Wannes W, et al. Optimizing ethanol extraction of rosemary leaves and their biological evaluations. J Explor. Res. Pharmacol., 2022; 7(2): 85–94. doi:10.14218/JERP.2022.00002
18. Psarrou I, Oreopoulou A, Tsimogiannis D, Oreopoulou V. Extraction kinetics of phenolic antioxidants from the hydrodistillation residues of rosemary and effect of pretreatment and extraction parameters. Molecules. 2020; 25(19): 4520. doi:10.3390/molecules25194520

19. Jacotet-Navarro M, Laguerre M, Fabiano-Tixier AS, Tenon M, Feuillère N, Bily A, et al. What is the best ethanol–water ratio for the extraction of antioxidants from rosemary? Electrophoresis. 2018. doi:10.1002/elps.201700397
20. Shanghai Institute of Technology. A kind of rosemary extract and its preparation method and application (CN102697692B) [patent]. 2014. Available from:
21. Changsha Yaying Bio-Tech Co., Ltd. Preparation method of rosemary extracts (CN102599610A) [patent]. 2012. Available from:
22. Ibáñez E, Oca A, de Murga G, López-Sebastián S, Tabera J, Reglero G. Supercritical fluid extraction and fractionation of different preprocessed rosemary plants. J Agric. Food Chem., 1999;47(4):1400–1404. doi:10.1021/jf980982f
23. Ayyildiz SS, Pelvan E, Karadeniz B. Optimization of accelerated solvent extraction, ultrasound assisted and supercritical fluid extraction to obtain carnosol, carnosic acid and rosmarinic acid from rosemary. Sustain Chem. Pharm., 2024; 37: 101422. doi:10.1016/j.scp.2023.101422
24. Conde-Hernández LA, Espinosa-Victoria JR, Trejo A, Guerrero-Beltrán JÁ. CO_2-supercritical extraction, hydrodistillation and steam distillation of essential oil of rosemary (Rosmarinus officinalis). J. Food Eng., 2017; 200: 81–86. doi:10.1016/j.jfoodeng.2016.12.022
25. Kabubii ZN, Mbaria JM, Mathiu MP, Wanjohi JM, Nyaboga EN. Evaluation of seasonal variation, effect of extraction solvent on phytochemicals and antioxidant activity on Rosmarinus officinalis grown in different agro-ecological zones of Kiambu County, Kenya. CABI Agric, Biosci., 2023; 4(1): 1. doi:10.1186/s43170-023-00141-x
26. Al-Jaafreh AM. Evaluation of antioxidant activities of rosemary (Rosmarinus officinalis L.) essential oil and different types of solvent extractions. Biomed. Pharmacol. J., 2024; 17(1). Available from: https://bit.ly/43uFuNk
27. Andrade JM, Faustino C, Garcia C, Ladeiras D, Reis CP, Rijo P. Rosmarinus officinalis L.: An update review of its phytochemistry and biological activity. Future Sci OA. 2018;4 (4): FSO283. doi:10.4155/fsoa-2017-0124
28. Vieira C, Rebocho S, Craveiro R, Paiva A, Duarte ARC. Selective extraction and stabilization of bioactive compounds from rosemary leaves using a biphasic NADES. Front Chem., 2022; 10: 954835. doi:10.3389/fchem.2022.954835
29. Al-jaafreh AM. Evaluation of antioxidant activities of rosemary (Rosmarinus officinalis L.) essential oil and different types of solvent extractions. Biomed. Pharmacol. J., 2024; 17(1). Available from: https://pubs.acs.org/doi/10.1021/ac960506t

30. Aly SH, Mohamed AA, Ehab M, AbdElaziz AM, Ehab N, Salem E, et al. Phytochemical profiling of Rosmarinus officinalis aerial parts and exploring its in vitro wound healing activity and network pharmacology. Sci. Rep., 2026; 16: 623. doi:10.1038/s41598-025-31482-4
31. Al Jaafreh AM. Evaluation of antioxidant activities of rosemary (Rosmarinus officinalis L.) essential oil and different types of solvent extractions. Biomed. Pharmacol. J., 2024; 17(1): 323–339. doi:10.13005/bpj/2860
32. Nieto G, Ros G, Castillo J. Antioxidant and antimicrobial properties of rosemary (Rosmarinus officinalis L.): A review. Medicines. 2018; 5(3): 98. doi:10.3390/medicines5030098
33. Gonçalves C, Fernandes D, Silva I, Mateus V. Potential anti-inflammatory effect of Rosmarinus officinalis in preclinical in vivo models of inflammation. Molecules. 2022; 27(3): 609. doi:10.3390/molecules27030609
34. Xu J, Li T, Li F, Qiang H, Wei X, Zhan R, et al. The applications and mechanisms of Rosmarinus officinalis L. in the management of different wounds and UV-irradiated skin. Front Pharmacol., 2025; 15: 1461790. doi:10.3389/fphar.2024.1461790
35. Husein N, Abu Laban N, Owais DT. Exploring the antimicrobial potential of Rosmarinus officinalis against urinary tract infection isolates in Amman, Jordan. Iran J. Microbiol., 2025; 17(3): 460–469. doi:10.18502/ijm.v17i3.18829
36. Emrah Cinik Hair Transplant Clinic. Rosemary essential oil for hair growth: Clinical evidence & results [Internet]. 2025. Available from: https://emrahcinik.com/rosemary-essential-oil-for-hair-growth/
37. Pérez-Sánchez A, Barrajón-Catalán E, Caturla N, Castillo J, Benavente-García O, Alcaraz M, et al. Protective effects of citrus and rosemary extracts on UV-induced damage in skin cell model and human volunteers. J Photochem Photobiol B. 2014; 136: 12–18. doi:10.1016/j.jphotobiol.2014.04.007
38. Sahlabgi A, Lupuliasa D, Stanciu G, Lupșor S, Vlaia LL, Rotariu R, et al. The development and comparative evaluation of rosemary hydroalcoholic macerate-based dermatocosmetic preparations. Gels. 2025; 11(3): 149. doi:10.3390/gels11030149
39. Nobile V, Michelotti A, Cestone E, Caturla N, Castillo J, Benavente-García O, et al. Skin photoprotective and antiageing effects of a combination of rosemary and grapefruit polyphenols. Food Nutr. Res., 2016; 60: 31871. doi:10.3402/fnr.v60.31871

40. Kasamatsu S, Takano K, Aoki M, Takahashi Y, Suzuki T. Rosemary extract and rosmarinic acid accelerate elastic fiber formation. J Dermatol., 2024; 51(6): 816–826. doi:10.1111/1346-8138.17185
41. Draelos ZD, Gueniche A, Yatskayer M, Nelson DB. A randomized placebo-controlled trial evaluating rosemary extract on visible facial skin quality. J Clin Aesthet Dermatol. 2025; 18(3): 28–33. Available from: https://jcadonline.com/safety-effiacy-dietary-supplemet-aging-skin/
42. Doctor's Desk. Rosemary reimagined: How this culinary herb became a skincare hero [Internet]. 2025 Jul 23. Available from: https://www.clinikally.com/blogs/news/rosemary-reimagined-how-this-culinary-herb-became-a-skincare-hero
43. Li Pomi F, Papa V, Borgia F, Vaccaro M, Allegra A, Cicero N, et al. Rosmarinus officinalis and skin: Antioxidant activity and possible therapeutic role. Antioxidants. 2023; 12(3): 680. doi:10.3390/antiox12030680
44. Mohite PR, Mane VD, Bhoite AS, Mahadik YP, Dhumal PA, Kadam DV. Rosemary as a skin savior. Int. J. Innov. Res. Technol., 2024; 11(6): 468–474. Available from: https://ijirt.org/Article?manuscript=169082
45. Güzel MC, Toksoy MO. Design and characterization of the cream formulation containing rosemary and green tea extract against Propionibacterium acnes. J. Med. Dent. Investig. 2023; 4: e230345. doi:10.5577/jomdi.e230345
46. Marcus FK, Klingenberg A. Cosmetic containing extract of rosemary to protect skin, especially against UV radiation (DE4129331A1) [patent]. 1993. Available from: https://patents.google.com/patent/DE4129331A1/en
47. New Directions Aromatics. Rosemary botanical extract [Internet]. Available from: https://www.newdirectionsaromatics.com/cosmetic-ingredients/botanical-extracts/rosemary-botanical-extract
48. Chande KU, Ekhande NS, Padwal MH. Phytochemical and pharmacological activities of black turmeric: A review. Res J Pharmacol Pharmacodyn. 2023;15(4):327–330. Available from: http://dx.doi.org/10.52711/0975-4385.2023.00052
49. Doke R, Lokhande R, Chande K, et al. Recent advances in therapeutic strategies of Erdheim-Chester disease. Naunyn-Schmiedeberg's Arch Pharmacol. 2025; 398: 6407–6428. Available from: https://doi.org/10.1007/s00210-024-03769-2
50. Chande K, Nirmal R, Varpe N, et al. Alkaloid's undiscovered neuroprotective potential: a multi-target strategy to fight against neurodegenerative illnesses. 3 Biotech., 2025; 15: 409. Available from: https://doi.org/10.1007/s13205-025-04527-8

51. Chande KU, Ekhande NS, Deshpande PL, Aher SS. Haritaki: A review. World Journal of Pharmaceutical Research. 2020; 11(7): 302–317.
52. Magar A, Chande KU, Suryawanshi S. Herbal immune booster plant: A review. Int J Pharm. Pharm. Res., 2023; 27(2): 742–768.
53. Narkhede J, Chande KU, Kulkarni Y. Nutraceutical: functional food and dietary supplements. Int. J. Pharm. Pharm. Res., 2023; 26(2): 226–281.
54. Chande KU, Kamble SC, Ingale PL. Preparation and evaluation of polyherbal hair oil – an effective in cosmetic. J Emerg. Technol. Innov. Res., 2022; 9(12): 667–673.
55. Doke R, Chande K, Dingare S, et al. Demystifying the role of postbiotics in inflammation mediated metabolic disorders: an updated review. Food Sci. Biotechnol., 2026; 35: 463–484. Available from: https://doi.org/10.1007/s10068-025-01952-6
56. Chande KU, Pharande S, Karodi R. Digital twin technology in biopharmaceutical research: creating predictive models of human biology. Biopress J Comput Life Sci. 2025; 1(9). Available from: https://biopressjournals.com/index.php/BJCLS/article/view/115
57. Nandode T, Chande KU. Toxic diffuse goiter: a review. Int. J. Pharm. Sci., 2024; 2(6): 176–181.
58. More D, Chande KU, Jadhvar D. Obesity and its treatment with natural product. Int. J. Adv. Res. Sci. Commun. Technol., 2024; 4(1): 16–25.
59. Chande KU, Shaikh S, Gholap P. The development of a formulation of topical nanoemulgel of eberconazole nitrate. J Chem. Health Risks. 2024; 2023: 715–726.
60. Deshmukh S, Chande KU, Naik S. Benincasa hispida, an ailment bliss: a review. Int J Pharm. Pharm. Res., 2023; 27(1): 65–73.
61. Khan Y, Chande KU, Shah S, Akbari D, Mulange V. Sea buckthorn: review. Int. J. Sci. Res. Methodol., 2023; 25(2): 28–36.
62. Ekhande N, Chande KU. Psoriasis: nutritional management for patients with psoriasis. Indian J. Nat. Sci., 2023; 14(79): 58642–58648.
63. Chande KU, Ekhande NS, Jadhav SD. Food safety in the 21st century: a review. Int. J. Pharm. Pharm. Res., 2022; 25(4): 571–585.
64. Chande KU, Shinde A, Hase D, Pawar S. In-vitro hepatoprotective activity of Glycyrrhiza glabra root extract on HepG2 cell line. Int. J. Innov. Res. Technol., 2022; 9(5): 320–322.
65. Chande K, Dingare S. Coronavirus COVID-19: human coronavirus—a review of virus. Int. J. Anal. Exp. Modal. Anal., 2022; 4: 1751–1757.