

Uses of Neem in Cosmetics and Skincare

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Abstract: *This review article examines the versatile applications of neem (Azadirachta indica) in skincare and cosmetics, blending ancient knowledge with contemporary beauty practices. Neem, a time-honored botanical treasure, has long been revered in traditional medicine for its medicinal properties. In recent years, its incorporation into skincare and cosmetic formulations has surged, driven by a growing appreciation for natural, sustainable ingredients. The article explores the bioactive compounds within neem, such as nimbidin, nimbin, and azadirachtin, elucidating their roles in conferring antibacterial, antifungal, and anti-inflammatory attributes. We delve into the scientific foundation supporting neem's efficacy in addressing various skin concerns, including acne, eczema, and overall skin health. Furthermore, this review sheds light on the cultural heritage that has propelled neem into the forefront of the beauty industry. It navigates through the intersections of dermatology, beauty rituals, and sustainable practices, offering a comprehensive understanding of neem's multifaceted contributions to modern skincare and cosmetics.*

Keywords: Skincare, Cosmetics, Antimicrobial, Anti-inflammatory, Acne, Eczema, Psoriasis, Antioxidant, Anti-aging, Natural skincare, Neem oil, Neem extract, Herbal remedies, Traditional medicine

OBJECTIVE:

- 1: Identification of neem plant.
- 2: Morphology of neem plant.
- 3: medicinal information of neem in cosmetics and skincare.

I. INTRODUCTION

The review article explores the multifaceted applications of neem (*Azadirachta indica*), a versatile tree native to the Indian subcontinent. Renowned for its rich medicinal, agricultural, and cosmetic properties, neem has been a subject of extensive research and traditional use. This comprehensive review delves into the diverse uses of neem, ranging from its historical significance in traditional medicine to its modern applications in agriculture, skincare, and beyond. By examining the scientific evidence and cultural practices associated with neem, this article aims to provide a nuanced understanding of its potential benefits and challenges across various domains. Through this exploration, readers will gain insights into the holistic impact of neem on human health, environmental sustainability, and the broader socio-economic landscape.

The use of neem in skincare and cosmetics represents a convergence of ancient wisdom and modern wellness. *Azadirachta indica*, commonly known as neem, has been a staple in traditional medicine for centuries, celebrated for its diverse therapeutic properties. In recent years, the beauty industry has embraced neem for its natural and sustainable attributes, making it a prominent ingredient in skincare and cosmetic formulations.

Neem is a rich source of bioactive compounds such as nimbidin, nimbin, and azadirachtin, which contribute to its antibacterial, antifungal, and anti-inflammatory properties. These qualities make neem a compelling choice for addressing various skin concerns, from acne and eczema to promoting overall skin health.

II. BOTANICAL DESCRIPTION OF NEEM

Neem (*Azadirachta indica*) is a tropical evergreen tree known for its various medicinal and practical uses. The tree typically reaches a height of 15-20 meters and has a spreading crown. The leaves are compound, alternate, and pinnate, with 20-31 serrated leaflets. Neem produces small, white, fragrant flowers arranged in clusters, and its fruit is a drupe

containing a seed. The tree is valued for its natural insecticidal properties and has been used in traditional medicine for its antibacterial and antifungal qualities.



III. PHARMACOLOGY AND INFORMATION

Neem tree extract has been widely used to maintain health since ancient times and has many health benefits. Early studies have shown that dried fruit leaf extracts have significant hypoglycemic and hypolipidemic activities, as well as hepatoprotective and hypertensive activities. [4 6] The difference between the tree and the extracted oil is known to inhibit tumors by weakening and activating many cell signaling pathways. Ethanolic neem leaf extract (NLE) has been shown to increase the expression of pro-apoptotic genes, including caspase 3 and caspase 8, and inhibit Bcl 2 expression in 7,12 dimethylbenzo(a) anthracene (DMBA)-induced cancer. and p53

PLANT DESCRIPTION AND CLASSIFICATION :

Neem tree is found in abundance in tropical and semi-tropical regions and is a fast-growing tree that can reach a height of up to 15–20 m with small bright green leaves. Its blossom timing is in spring with numerous white flowers. It is a member of the Meliaceae family and its botanical classification is described [Table 1]. The neem tree and its different parts are shown in Figure 1.

TAXONOMIC OF NEEM :

Neem, scientifically known as *Azadirachta indica*, belongs to the mahogany family (Meliaceae). It is a fast-growing evergreen tree native to the Indian subcontinent. Neem is renowned for its various medicinal and agricultural uses, with its extracts commonly used in traditional medicine and pest control.

Active Compounds of *Azadirachta indica* L. (Neem):

Neem contains various active compounds, including:

1. Azadirachtin:* A key insecticidal component with antifeedant and growth-regulating properties.
2. Nimbin and Nimbidin:* These are anti-inflammatory and antipyretic compounds.
3. Quercetin:* A flavonoid with antioxidant properties.
4. Beta-Sitosterol:* Known for its cholesterol-lowering and anti-inflammatory effects.
5. Azadirone:* Exhibits antifungal properties.
6. Gedunin:* Shows potential anti-malarial properties.

These compounds contribute to the diverse therapeutic and pesticidal qualities of neem.

IV. PHARMACOLOGICAL ACTIVITIES

Neem exhibits various pharmacological activities due to its rich bioactive compounds. Some notable pharmacological properties include:

1. *Antimicrobial:* Neem has strong antibacterial, antiviral, and antifungal properties, making it effective against a wide range of microorganisms.

2. ***Anti-inflammatory:*** Neem has anti-inflammatory effects, which can be beneficial for conditions involving inflammation.
3. ***Antioxidant:*** The tree contains antioxidants that help neutralize free radicals, contributing to its potential in combating oxidative stress.
4. ***Antidiabetic:*** Neem may have a role in managing diabetes by regulating blood sugar levels.
5. ***Immunomodulatory:*** Neem can modulate the immune system, enhancing the body's defense mechanisms.

ANTI-INFLAMMATORY EFFECT:

Neem possesses anti-inflammatory properties attributed to various bioactive compounds present in its leaves, seeds, and other parts. Some components that contribute to its anti-inflammatory activity include nimbin, nimodin, and quercetin. These compounds may inhibit inflammatory pathways and enzymes.

The anti-inflammatory effects of neem can be beneficial for conditions involving inflammation, such as arthritis or skin disorders. Neem may help reduce swelling, redness, and pain associated with inflammation.

It's worth noting that while neem's anti-inflammatory potential has been studied, more research is needed to fully understand the mechanisms and establish its efficacy in different inflammatory conditions. Always consult with a healthcare professional before using neem or any herbal remedy for inflammatory purposes.

ANTIMICROBIAL ACTIVITY :

Neem extract is rich in antibacterial properties; Some studies have clearly shown that neem extract can help control certain foodborne illnesses and other spoilage diseases. [38] They found that NLE showed a zone of inhibition confirming its antibacterial properties, and the extract showed a greater zone of inhibition than 3% sodium hypochlorite. [39] Another study evaluated the minimum inhibitory concentration (MIC) and minimum bactericidal concentration of leaf and seed extracts against various dermatophytes. The results showed that the MIC of the seed extract against all dermatophytes tested was 31 µg/mL. It is also said that the seed extract concentration of 15 µg/mL is sufficient to affect the growth pattern of the tested bacteria. [40] evaluated the effects of neem limonoids (i.e. azadirachtin, salannin, desethodunin, gedunin, 17hydroxyazadione and desethodunin) on *Anopheles stephensi* mosquitoes. While azadirachtin, salannin and desethodunin showed higher bioactivity at all doses, added azadirachtin and limonin showed lower activity. Additionally, azadirachtin was the most effective in all experiments, with almost 100% larval mortality at the 1 ppm concentration. The antiviral properties of neem bark extract showed that the bark extract broadly inhibited the entry of HSV 1 into cells at concentrations of 50100 µg/ml. [42] Antifungal activity of seed extract against *Candida* species. It was also analyzed and the findings concluded that neem seed extract is a promising anti-candida. [43]

ANTIDIURETIC EFFECT :

The antidiuretic activity of neem extract was also evaluated. Preliminary findings confirmed that diabetic rats treated with neem extract (250 mg/kg body weight) had significantly reduced blood sugar levels compared to controls. [34] Neem root bark extract has been shown to reduce blood sugar levels at doses of 200 and 400 mg/kg b. w. Higher doses of this drug (800 mg/kg b. w.) showed a significant decrease in blood sugar, which was reduced by 54% compared to the control group.

[35] Additionally, the effects of neem seed powder and glibenclamide alone or in combination have been used as anti-inflammatory drugs in experimental animals. The results are for both drugs. The anti-diuretic effect of neem refers to its ability to reduce the production of urine by the kidneys. This effect is attributed to the presence of certain compounds in neem, such as gedunin and nimbolide, which have been found to exhibit anti-diuretic properties.

By reducing urine production, neem can help in managing conditions such as excessive urination (polyuria) and urinary incontinence. It may also be beneficial for individuals with kidney disorders or certain types of diabetes that lead to increased urine production.

ANTICANCER ACTIVITY :

Neem has been investigated for its potential anticancer properties, and several studies suggest that certain compounds found in neem may exhibit anti-cancer activity. The primary components thought to contribute to these effects include nimbidin, nimbolide, and quercetin.

The proposed mechanisms of neem's anticancer activity include:

1. ***Induction of Apoptosis:*** Neem extracts have demonstrated the ability to induce apoptosis, a process that leads to programmed cell death in cancer cells.
2. ***Inhibition of Cell Proliferation:*** Neem compounds may interfere with the proliferation of cancer cells by affecting their growth and division.
3. ***Anti-Angiogenic Effects:*** Some studies suggest that neem may inhibit the formation of blood vessels that supply nutrients to tumors, which is crucial for their growth.
4. ***Antioxidant Properties:*** Neem's antioxidant compounds may help counteract oxidative stress, which is linked to the development of cancer.

While these findings are promising, it's important to note that research on neem's anticancer properties is still in the early stages, and more clinical studies are needed to validate its efficacy and safety for specific types of cancer. Always consult with healthcare professionals for advice tailored to your individual health circumstances.

V. THE PHARMACOLOGICAL PROPERTIES OF NEEM

pharmacological properties of neem are attributed to its various bioactive compounds, including nimbin, nimbidin, nimbinin, quercetin, and fatty acids such as oleic acid, linoleic acid, and stearic acid. These compounds have been studied for their anti-inflammatory, antimicrobial, antifungal, and antioxidant properties.

Neem oil and extracts are obtained from the seeds and leaves of the neem tree through processes such as cold-pressing or solvent extraction. These extracts are then incorporated into skincare and cosmetic products for their beneficial effects on the skin.

In traditional medicine, neem has been used topically to promote wound healing and reduce inflammation. Its anti-inflammatory properties make it useful for soothing irritated or inflamed skin. Additionally, neem's antimicrobial and antifungal properties make it effective in treating acne, eczema, and other skin conditions.

The antioxidant properties of neem help protect the skin from environmental damage and premature aging. This makes it a popular ingredient in moisturizers, lotions, and creams, as it can help nourish and protect the skin.

Overall, the methodology of neem in skincare and cosmetic products involves extracting its bioactive compounds and incorporating them into formulations that can be applied topically to provide various benefits for the skin.

Neem can be classified as a botanical ingredient, specifically as a plant extract. Its bioactive compounds and properties make it suitable for use in skincare and cosmetic products.

Neem can be extracted in various forms including neem oil, neem leaf extract, and neem seed extract. The extraction process typically involves crushing or pressing the neem seeds to extract the oil, or boiling the neem leaves to create an extract. The oil or extract is then filtered to remove any impurities and is ready to be used in skincare and cosmetic products. Some extraction methods may also involve using solvents or other chemical processes to obtain specific compounds from neem for use in different types of skincare and cosmetic formulations. It is important to note that the extraction process should be done carefully to ensure the purity and quality of the neem extract for use in skincare and cosmetics.

Neem, also known as *Azadirachta indica*, is a tree native to the Indian subcontinent and has been used for centuries in traditional Ayurvedic medicine for its various health and skincare benefits. In recent years, neem has gained popularity in the skincare and cosmetics industry due to its natural and effective properties. Here are some of the uses of neem in skincare and cosmetics:

1. **Acne treatment:** Neem contains antibacterial and anti-inflammatory properties that make it an effective treatment for acne. It helps in reducing the bacteria that cause acne and also soothes inflammation, making it a popular ingredient in acne-fighting skincare products.
2. **Skin healing:** Neem is known for its ability to promote wound healing and reduce scarring. It has been used traditionally to treat cuts, wounds, and minor skin infections. Neem oil and neem leaf extracts are commonly used in skincare products to aid in the healing of damaged skin.

3. Anti-aging properties: Neem is rich in antioxidants that help protect the skin from environmental damage and signs of aging. It helps in reducing the appearance of fine lines and wrinkles, making it a valuable ingredient in anti-aging skincare products.
4. Moisturizing: Neem oil is a natural emollient that helps in moisturizing and nourishing the skin. It is often used in lotions, creams, and balms to provide hydration to dry and flaky skin.
5. Hair care: Neem oil is also beneficial for hair care as it helps in promoting a healthy scalp, reducing dandruff, and strengthening hair follicles. It is often used in shampoos, conditioners, and hair oils to improve the overall health of the hair and scalp.
6. Anti-inflammatory properties: Neem has anti-inflammatory properties that can help soothe irritated and sensitive skin conditions such as eczema, psoriasis, and rashes. It can provide relief from itching, redness, and discomfort associated with these skin conditions.

BENEFITS FOR SKIN OF NEEM

Neem offers several benefits for the skin due to its antibacterial, anti-inflammatory, and antioxidant properties. Some potential advantages include:

1. ***Acne Treatment:*** Neem helps combat acne by addressing bacteria on the skin, reducing inflammation, and controlling excess oil production.
2. ***Skin Infections:*** Its antimicrobial properties make neem effective against various skin infections, such as fungal infections and dermatitis.
3. ***Eczema and Psoriasis Relief:*** Neem's anti-inflammatory effects may provide relief for conditions like eczema and psoriasis by soothing irritated skin.
4. ***Wound Healing:*** Neem promotes wound healing with its antibacterial properties, potentially preventing infections and supporting the skin's recovery process.
5. ***Anti-Aging:*** The antioxidants in neem may help protect the skin from oxidative stress, potentially reducing the signs of aging, such as wrinkles and fine lines.
6. ***Skin Tone and Clarity:*** Neem may contribute to an even skin tone by reducing pigmentation and improving the clarity of the skin.
7. ***Moisturizing:*** Neem oil can act as a natural moisturizer, helping to hydrate the skin and alleviate dryness.

It's essential to note that while neem offers these potential benefits, individual responses can vary. Patch testing and consulting with a dermatologist or skincare professional are advisable before incorporating neem into a skincare routine, especially for those with sensitive skin or existing skin conditions.

FIGHTING INFECTIONS :

Neem has been traditionally used in Ayurvedic medicine for its antimicrobial properties, making it effective in treating various skin infections. Its antibacterial, antifungal, and antiviral properties can help combat skin infections such as acne, eczema, psoriasis, and fungal infections.

Neem oil or neem leaf extract can be applied topically to the affected area to help reduce inflammation, soothe irritation, and promote healing. Its ability to inhibit the growth of bacteria and fungi can help clear up infections and prevent them from recurring. Additionally, neem's immunomodulatory effects can help support the immune system's response to skin infections, potentially speeding up the healing process. It is important to note that while neem can be beneficial for skin infections, it is essential to use it cautiously and consult with a healthcare professional, especially if you have sensitive skin or are allergic to neem. To use neem for skin infections, you can make a neem leaf paste by grinding fresh neem leaves with water to form a smooth paste. Apply this paste to the affected area and leave it on for about 20 minutes before rinsing it off with water. This can help reduce inflammation and promote healing. Alternatively, you can dilute neem oil with a carrier oil such as coconut oil or olive oil and apply it directly to the affected area. Be sure to do a patch test first to check for any adverse reactions. It's important to note that neem oil has a strong, pungent odor, so some people may find it unpleasant. If you find the smell too strong, you can add a few drops of essential oils such as lavender or tea tree oil to mask the scent.

ANTI BACTERIALS:

Neem exhibits potent antibacterial properties attributed to its rich composition of bioactive compounds such as azadirachtin, nimbin, and nimbidin. These constituents disrupt the growth and development of bacteria by affecting their cell membranes, inhibiting enzyme systems, and interfering with essential metabolic processes.

Azadirachtin, a prominent component, has been found to disrupt the molting process of bacteria, hindering their life cycle. Nimbin and nimbidin contribute to neem's antibacterial effects by exerting inhibitory actions on bacterial cell division.

Neem's antibacterial spectrum extends to a variety of bacteria, including both Gram-positive and Gram-negative strains. It has shown effectiveness against pathogens such as *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Bacillus subtilis*.

Furthermore, neem's antibacterial activity has been explored in various applications, from traditional medicine to agricultural practices. In healthcare, neem-based formulations are utilized for their antimicrobial potential, while in agriculture, neem oil is employed as a biopesticide to combat bacterial plant diseases.

It's important to note that while neem offers promising antibacterial properties, further research is ongoing to fully understand its mechanisms and potential applications in different fields.

ANTIVIRAL AGENTS:

Neem is well-known for its strong antibacterial properties, attributed to various bioactive compounds present in its leaves, seeds, and oil. Here's how neem exhibits antibacterial effects:

1. ***Azadirachtin Content:*** Azadirachtin, a key component in neem, is believed to disrupt the growth and development of bacteria, inhibiting their ability to multiply.
2. ***Nimbin and Nimbidin:*** These compounds in neem have been found to have antibacterial activity and contribute to its effectiveness against a range of bacteria.
3. ***Quercetin:*** Neem contains quercetin, a flavonoid known for its antimicrobial properties, including antibacterial effects.
4. ***Disruption of Cell Membranes:*** Neem may disrupt bacterial cell membranes, leading to structural damage and compromising the integrity of the bacteria.

Due to these antibacterial properties, neem is often used in traditional medicine and skincare products to address bacterial infections, acne, and other skin issues. Neem oil or neem-based creams are commonly applied topically for antibacterial purposes. However, it's important to consult with a healthcare professional for specific conditions and appropriate usage. **NEEM OIL** Neem oil contains compounds such as azadirachtin, nimbin, and nimbidin, which have been shown to have antibacterial and antifungal effects. These properties make neem oil effective in treating various skin infections such as acne, eczema, and fungal infections.

In addition to its antimicrobial properties, neem oil also has anti-inflammatory effects, which can help reduce redness, swelling, and irritation associated with skin infections.

When using neem oil for skin infections, it's important to dilute it with a carrier oil to avoid any potential skin irritation. It's also important to do a patch test before applying it to a larger area of the skin to check for any adverse reactions.

Overall, neem oil can be a beneficial natural remedy for treating skin infections due to its antimicrobial and anti-inflammatory properties. However, it's important to use it cautiously and consult with a healthcare professional, especially if you have sensitive skin or are allergic to neem.

EXTRACTION OF NEEM OIL

Neem oil is a natural oil extracted from the seeds of the neem tree (*Azadirachta indica*). Here's a brief overview:

1. ***Antimicrobial Properties:*** Neem oil is known for its strong antimicrobial properties, making it effective against bacteria, fungi, and viruses.
2. ***Skincare:*** It is commonly used in skincare products due to its ability to soothe and moisturize the skin. Neem oil may help with conditions like acne, eczema, and psoriasis.
3. ***Insecticidal Uses:*** Neem oil is a natural insecticide. It can be used to control pests on plants and is often included in organic gardening practices.

4. ***Anti-Inflammatory Effects:*** Neem oil has anti-inflammatory properties that may help alleviate redness and irritation, making it useful in treating skin conditions.
5. ***Wound Healing:*** The oil promotes wound healing and may prevent infections due to its antibacterial properties.
6. ***Hair Care:*** Neem oil is sometimes used in hair care products for its potential to nourish the scalp, reduce dandruff, and promote healthy hair.
7. ***Traditional Medicine:*** Neem has a long history of use in traditional medicine, and neem oil is employed for various therapeutic purposes.

ORAL ADMINISTRATION MAY LEAD TO:

- Vomiting
- Drowsiness
- Diarrhea
- Encephalopathy
- seizures and coma

SAFETY AND TOXICITY OF NEEM

Neem is generally considered safe when used appropriately, but there are some considerations regarding its safety and potential toxicity. The use of neem oil or extracts for various purposes, such as skincare, insect control, or medicinal applications, should adhere to recommended guidelines.

1. ***Dermal Application:*** Neem oil can cause skin irritation in some individuals. It's advisable to perform a patch test before widespread use. Additionally, prolonged or excessive skin contact may lead to dermatitis for certain individuals.
2. ***Ingestion:*** While neem has been traditionally used in some cultures for internal purposes, ingesting large quantities of neem oil or parts of the neem plant can be toxic. Neem oil should not be ingested without proper dilution and guidance from a healthcare professional.
3. ***Pregnancy and Lactation:*** Pregnant and lactating women should exercise caution with neem products, as there is limited research on their safety in these situations.
4. ***Children:*** Neem products should be used cautiously on children, and ingestion should be strictly avoided. Always follow age-appropriate guidelines.

VI. CONCLUSION

It has been noted that active ingredients are used against cancer in many tumors by regulating various cell types. Detailed animal studies are needed to understand the true effectiveness of disease control. Neem has many uses and benefits, making it useful. From its medicinal properties to its beneficial effects as a pesticide and fertilizer, neem offers sustainable solutions to a variety of agricultural, health and environmental problems. Its ability to promote overall health and stability makes it an important asset to the global community. As we continue to explore and exploit the potential of neem, it is important to prioritize its conservation and responsible use to ensure its continued existence. Using neem extract in medicine is a good way to develop new and effective treatments. Neem has proven antibacterial, anti-inflammatory and antioxidant properties that can treat many health problems. Its origins and minimal side effects also make it a good choice for pharmaceutical companies and doctors. While research on the medicinal properties of neem continues, it is important to ensure sustainable products and responsible use to achieve its worldwide health benefits. Overall, neem extract shows promise as a valuable addition to the pharmaceutical industry.

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