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HERBAL SUNSCREENS AND ANTIOXIDANT THERAPY: THE EMERGING ROLE OF BOSWELLIA SERRATA IN SKIN HEALTH

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ABSTRACT :

The skin acts as the largest organ of the body and acts as a primary obstacle against environmental hazards such as ultraviolet (UV) rays, pollution and oxidative stress. Excessive exposure to UV radiation can cause premature aging, dark spots, photodermatitis and even skin cancer. Increasing anxiety over the negative effects of synthetic sunscreen, which can cause allergic reactions and potential systemic toxicity, is interested in herbal options that are safe, natural and rich in antioxidants. Among the candidates of the notable plant, Boswellia Senta (Indian frankincense) has emerged as a versatile natural agent that provides adequate skin-protection benefits. Boswellia serrata is a famous medicinal herb used to treat inflammatory conditions and more in Ayurveda and Unani medicine. Its oleo-gum resin is rich in Boswellia acids, terpenoids and phenolic compounds, which displays strong antioxidants, anti-inflammatory and anti-evolutionary effects. These phytochemicals effectively combat free radicals, reduce reactive oxygen species (ROS), and protect cellular components from oxidative damage caused by UV exposure. In addition, Boswellia acids affect inflammatory routes, obstructing matrix Metallo proteins (MMP), and collagen prevents decline, thus helping to prevent wrinkles and skin aging. The recent progress in phytopharmaceuticals has highlighted the integration of Boswellia serrata extracts in modern topical yoga such as cream, hydrogel, emulsion and nano carers. These state -of -the -art systems not only enhance photoprotection, but also improve the delivery and stability of active ingredients. Additionally, a synergistic mix ...

Introduction:

BOSWELLIA SERRATA:

Natural resins have been important since ancient times, it is seen as primary sources from plants for food, taste and scents. He is considered an important material due to his significant contribution to production. Frankincense is a major Oleo-Gum resin used in a variety of areas, including pharmaceuticals, cooking, aroma, seasoning, liquor, drinks and beauty industries. Throughout history, people have given importance to franchise for their formal and holy importance, dating back before the Bible time, and it is one of the most used essential oils today. In aromatherapy, it is used to treat respiratory problems, breathe and benefit people with asthma. Additionally, it helps to relieve symptoms of colds, asthma, bronchitis and laryngitis, and is applied to address various bacterial and fungal infections. Research has shown its effectiveness in treating some deadly conditions.

SKIN:

The skin is the largest organ of the body and serves as the primary obstacle against environmental hazards such as ultraviolet (UV) rays, pollutants and infections. Between these dangers, extended contact for UV light is the most important external factor that leads to skin damage, resulting in early aging, malaise, inflammation and sometimes skin cancer. Synthetic UV filter -containing traditional sunscreen has been used to protect the skin; However, their safety, potential skin irritation, stability on exposure to light, and their environmental effects promoted increasing interest in safe, biocompatible and environmentally friendly options. In this regard, herbal sunscreen rich in natural antioxidants attract significant attention.

A notable herbal option is Boswellia Sereta (Indian Frankincense), a widely recognized medicinal plant with a long history in Ayurveda and its anti-inflammatory, pain relief and other medicinal practices for wound-wound-rich benefits. The resin of this plant is abundant in various phytochemicals, especially Boswellia acids and terpenoids, which are responsible for the therapeutic effects of its broad range. Recent studies have brought to light the antioxidants and UV-protective capabilities of Boswellia Serata, which are valuable in reducing oxidative stress caused by UV exposure and increasing overall skin health.

Herbal antioxidants obtained from Boswellia not only combat free radicals, but also promote the underlying skin's underlying defence systems against photographing. In addition, unlike chemical sunscreen, these natural extracts often provide several benefits, including anti-inflammatory, antimicrobial and collagen-conservation properties, which make them particularly favourable for skincare yoga. Consumer preferences Shift towards natural skincare products, the integration of Boswellia serrata extracts into sunscreens and cosmetic products presents a safer and more sustainable option.

Therefore, investigating the potential of Boswellia serrata as a natural sunscreen and 56antioxidant treatment is an encouraging direction in dermatological research. This review seeks to emphasize its phytochemistry, antioxidant capabilities, formulation techniques, and the evidence supporting its growing significance in promoting skin health.

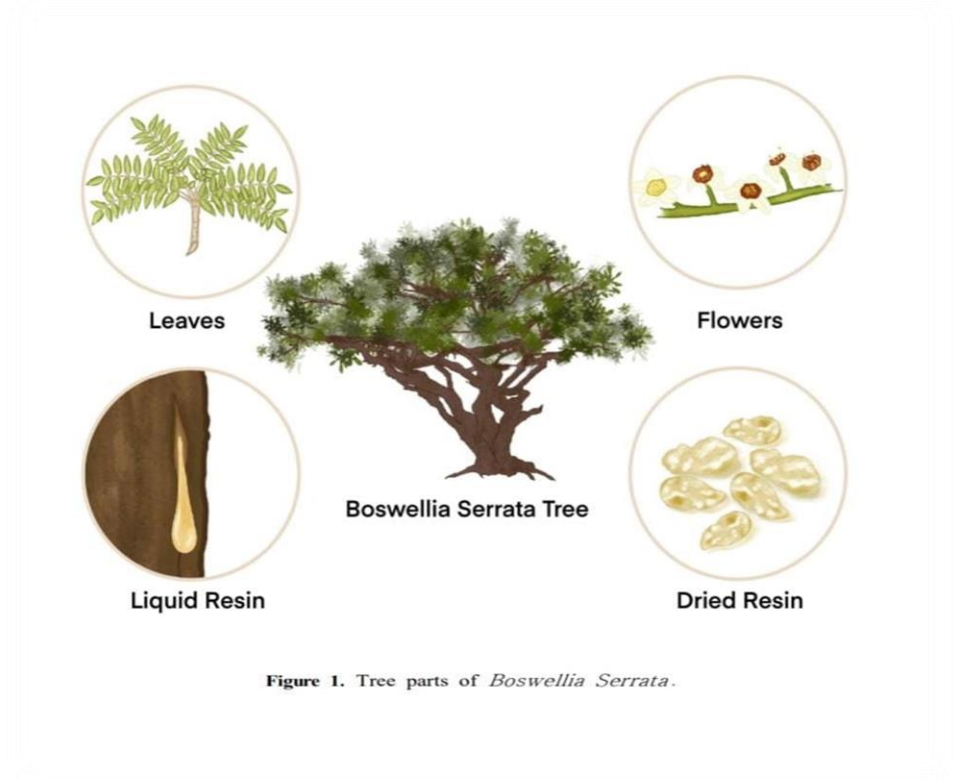

Figure 1. Tree parts of *Boswellia Serrata*.

Taxonomical Hierarchy of Boswellia serrata

Kingdom Plantae-Plants
Division: Angiospermae
Class: Dicotyledonae
Order: Geraniols
Family: Burseraceae
Genus: Boswellia
Species: Serrata

Fig no: 2

ANTI-OXIDANT:

It acts as a protective mechanism to protect the body's cells from injury. As we are of age, antioxidant protein cells protect cells from potential damage due to free radicals. The clear understanding of proteins and their roles in antioxidant functions is important to support healthy aging.

CAUSES OF SKIN DAMAGE:

Fig no: 3

Skin Damage by UV Radiations and Oxidative Stress

The skin is subjected to frequent sunlight from ultraviolet (UV) radiation, which plays an important role in premature aging and various skin disorders. UV radiation is generally divided into three categories: UVA (320–400 nm), UVB (290–320 nm), and UVC (100–290 nm). While UVC is primarily absorbed by the ozone layer, UVA and UVB reach the skin and cause considerable harm. UVB mainly impacts the epidermal layer, resulting in sunburn, DNA mutations, and the potential for cancer, whereas UVA penetrates deeper into the dermal layer, leading to long-term consequences like collagen degradation, photoaging, and changes in pigmentation.

The damaging effects of UV radiation are primarily driven by the production of reactive oxygen species (ROS). These ROS include superoxide anions, hydroxyl radicals, and singlet oxygen, which disturb the equilibrium between the skin's pro-oxidant and antioxidant defence systems. An overproduction of ROS induces oxidative stress, resulting in lipid peroxidation of cellular membrane, protein oxidation, damage to mitochondria, and breakdown in DNA strands. Since these processes accumulate over time, they obstruct normal cellular activities, accelerate skin aging, and increase the risk of skin cancer - induced skin cancer.

Due to structural disadvantage, oxidative stress begins inflammatory signalling routes such as NF-κB and AP-1, which in turn provoke cytokines, matrix metalloproteinase (MMPS), and release of other intermediaries. These elements contribute to frequent inflammatory conditions such as collagen erosion, wrinkles formation, decreased skin elasticity, and dermatitis.

While the skin contains the underlying antioxidant mechanisms, including enzymes such as superoxide dismutase, catalase, and glutathione peroxidase, these defence may be out with long -term UV exposure. As a result, adding external antioxidants has become a beneficial way to reduce oxidative stress caused by UV rays. Plant-based sources, especially Boswellia secta, offer natural compounds that can compete with reactive oxygen species and mould the skin from damage caused by sunlight**.**

Phytochemistry and Pharmacological Profile of Boswellia serrata

The Boswellia serrata, often known as an Indian frankincense, is a medium -sized deciduous tree that belongs to the Burcars family. Oleo-gum-region extracted from its bark has been used extensively in Ayurveda, Greek and traditional medicine to treat various inflammatory conditions, arthritis, asthma, wounds and various skin diseases. The medicinal characteristics of Boswellia serrate stem primarily from its specific phytochemical makeup, especially a category of pantylid triterpenoids known as Boswellia acid.

The resin consists of four major Boswellia acids: OS-Boswellia Acid, acetyl-β-boswellic acid, 11-keto-β-boswellic acid (KBA), and acetyl-11-Keto-Boswellic Acid (AKBA). AKBA is considered to be the most medicinally powerful compound, which performs vital anti -inflammatory and anticancer properties. In addition to acids, the resin includes essential oils in monoterpenes (α-pinne, limone, myrcene) and diterpenes, which contribute to its antimicrobial and antioxidant effects .In addition, the presence of flavonoids and polycerids in gum fraction is important for immune modulation and skin regeneration.

From a medicinal perspective, Boswellia displays a wide range of secret activities. Its anti-inflammatory properties are easily convenient by the prohibition of 5-lipochexinus (5-LOX), leading to a decrease in Leukotriene production. In this method of action, it is effective for chronic inflammatory diseases and skin issues which are characterized by redness and irritation. Antioxidant activity of Boswellia are associated with ability to neutralize free radicals, reduce lipid peroxidation and increase the efficacy of natural antioxidant enzymes. In addition, various studies indicate its antimicrobial effects, providing protection to the skin against bacteria and fungal infections.

In the field of dermatology, Boswellia serrata has demonstrated encouraging outcomes in slowing down photoaging, enhancing wound healing, alleviating hyperpigmentation, and safeguarding against UV-induced oxidative damage. Its favourable safety profile, combined with its multifunctional pharmacological properties, positions it as an appealing option for incorporation into herbal sunscreens and skin treatments focused on antioxidants.

Antioxidant and Photoprotective Potential of Boswellia serrata

Oxidative stress is an important factor of skin damage caused by ultraviolet (UV) radiation. An overproduction of reactive oxygen species (ROS), including superoxide ions, hydroxyl radicals, and singlet oxygen, is the result in lipid peroxidation, protein fall and DNA damage, which all have hurry to increase the risk of photo and skin disorders. Consequently, antioxidants are considered as important agents in combating ROS, preserving redox balance and preserving the skin from prolonged UV-related damage.

Boswellia serrata has as a promising natural antioxidant with important photoprotective activity. Boswellia acid and essential oil compounds found in the resin display quite free radical scavenging properties. These substances directly neutralize ROS, thus reduce oxidative stress in skin tissues. In addition, Boswellia extracts have demonstrated the ability to promote the functioning of endogenous antioxidant enzymes such as superoxide Dismuke (SOD), Catas (CAT), and Glutathione peroxide (GPX), which strengthens the skin vested defence system.

In addition to its antioxidant properties, Boswellia Serrata shows remarkable photoprotective benefits. Research has depicted its effectiveness in reducing UVB-inspired erythema, preventing collagen fall and interrupting matrix metalloproteinase (MMP), which is mainly responsible for the growth of wrinkles and reducing the elasticity of the skin. Its opponents facilitated inflammatory properties, prohibiting 5-lipoxinase and downgrade of pro-inflammatory cytokines, which helps protect the skin from UV-inspired irritation and redness.

When included in topical products such as creams, gels and nanomoles, Boswellia extract has demonstrated significant improvements in the skin. Hydration, elasticity and barrier functionality. When combined with other herbal antioxidants, such as green tea polyphenols or vitamin E, it shows synergistic effects in reduced markers of photoaging. In particular, unlike several synthetic sunscreen, Boswellia serrata is tolerated, non-toxic and well tolerated, making it a hypnotic option for long-term use in dermatology.

In summary, joint antioxidants and photoprotective characteristics of Boswellia serrata underline their ability as a multicoloured herbal ingredient in sunscreen products and antioxidant-based skin treatments.

Formulation Approaches in Herbal Sunscreens

Remarkable attention has been paid to include herbal extracts in sunscreen products as consumers seek natural, safe and multicribute options rather than rapidly synthetic UV filters. Boswellia serrata, known for its antioxidants, anti -inflammatory and photoprotective properties, serves as a valuable component in the manufacture of herbal sunscreen. However, to fully exploit its therapeutic capacity, careful formulation strategies are considered.

Traditional timely dosage forms such as creams, lotions and gels are usually used to give herbal extracts on the skin. These yoga works as a physical carrier, which creates proper skin coverage and uses ease of use. Gels, especially, are preferred due to their non-spacing nature, quick absorption and inflammation or soothing effects on irritated skin. By integrating Boswellia resin extract into emulsions or gels, its stability can be enhanced by providing antioxidant benefits in addition to UV protection.

Recent developments in nanotechnology have further broadened the possibilities for creating more effective herbal sunscreens. Techniques such as nanocores , liposomes, solid lipid nanoparticle (SLN), and nanostructure lipid carriers (NLC) are becoming more common to improve the solubility, stability and skin absorption of phytoconstituents. For Boswellia Serrata, nano-based formulation can increase the bioavailability of Boswellia acid, protect them from decline, and ensure a continuous release in the target region. These systems not only promote sun protection factor (SPF), but also provide additional benefits for anti-aging and skin repair.

Another method includes polyherbal formulations that combine Boswellia with other UV-Move list vegetation such as aloe vera, curcuma longa and

green tea polyphenols. These combinations provide synergistic antioxidant effects, increase photostability, and expand protection against both UVA and UVB radiation.

Beyond the effectiveness, the development of yoga should deal with the standardization of extracts, their compatibility with exercises, and their stability related issues over time. It is also important to ensure that sensory properties such as ease of application, non-tidiness, and aesthetic appeal are given priority for consumer acceptance. In summary, inclusion of Boswellia Serrata in advanced delivery systems and combination yogas provides a promising approach to make the next generation herbal sunscreen that provides better efficacy, safety and many skin benefits.

BOSWELLIA SERRATA RESIN EXTRACT PRODUCTS:

Fig no: 4

Boswellia serrata in cosmetology

Plants have been used in cosmetics since the ancient era, and the current scientific investigation continues to investigate the region. Now we can create more complex images to progress our understanding of plants and skin growth over time. Plants are living organisms that respond to their environment by producing various metabolites. The application of Phyto molecules on the skin influences its health and appearance by interacting with skin cells.

Research in physio-chemical and ethnobotanical studies has revealed many plants that can enhance modern cosmetic formulations. Many elements can damage the outer layer of the skin, including acute UV exposure, poor nutrition and both physical and mental stress. The effects of UV radiation on the skin are associated with the early signs of aging through oxidative stress, clearly free radicals, and research displaying a direct relationship between the production of reactive oxygen species.`.

BENEFITS OF BOSWELLIA SERRATA

- **Reduce inflammation and irritation**
- **Anti-aging**
- **Heals and regenerate skin**
- **Protects from oxidative stress**
- **Improve skin tone and brightness**
- **ANTI-acne**
- **SUV protection and photoaging prevention**
- **Soothing**

APPILICATION OF BOSWELLIA SERRATA:

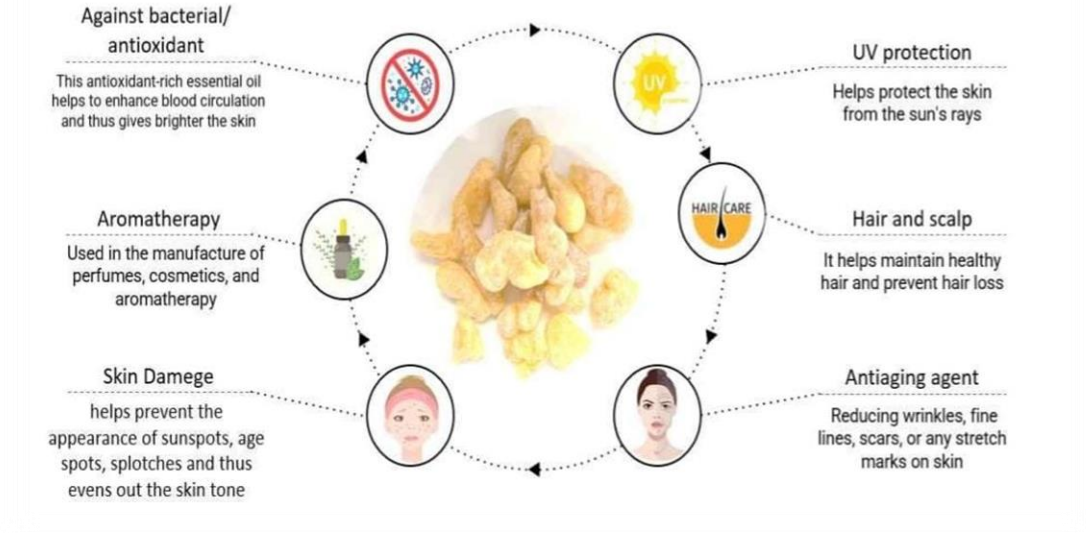

Fig no: 5

CONCLUSION:

Increasing preference for natural, safe and multi-coloured skincare products highlights the importance of herbal yogas in skin care. Boswellia serrate is recognized for its powerful anti -inflammatory, antioxidant and photoprotective properties, herbal has emerged as a major option to develop sunscreen and antioxidant solutions. Bioactive compounds, especially Boswellia acids, protect the skin from oxidative damage not only due to UV exposure, but also contribute to reduce the signs of photo aging, pigmentation issues and inflammatory skin conditions. When included in topical yogas such as sunblock, Boswellia serrate provides both sun protection and skin rejuvenation. Integrating Boswellia serrate in herbal skincare presents a holistic approach to enhance skin health, insert traditional knowledge with modern scientific research and pave the way for innovative, natural and safe skin solutions.

REFERENCES:

1. Leapers J., Lagunez J., Ceballos G. Topical boswellic acids for treatment of photoaged skin. Planta Medica. 2010.
2. Togni S., Maramaldi G., Di Pierro F., Biondi M., Giacomelli L. A cosmeceutical formulation based on boswellic acids for erythematous eczema and psoriasis. Clin Cosmet Investig Dermatol. 2014.
3. Liu Y., Wang T., Tang S., et al. AKBA protects human keratinocytes from UVA-induced damage via NRF2. J Cosmet Dermatol. 2017.
4. Pradhan A., Patra S., Rout S., et al. α-Boswellic acid alleviates atopic dermatitis in mice by modulating NLRP3/Th2. Biomed Pharmacother. 2022.
5. Shen J., Zhang L., Li H., et al. α-Boswellic acid reduces dermatitis via NF-κB/NLRP3/Th2 pathways. Biochem Biophys Res Commun. 2022.
6. Dong F., Zheng L., Zhang X. Alpha-boswellic acid accelerates acute wound healing via NF-κB signaling. PLOS ONE. 2024.
7. Rana R., Zhang H., Chen L., et al. β-Boswellic acid facilitates diabetic wound healing by targeting STAT3/ferroptosis. Front Pharmacol. 2025.
8. Maru N., Verma R., Agarwal R., et al. Comparison of irritation potentials of B. serrata gum resin and AKBA in human skin cells. Toxicol In Vitro. 2008.
9. Poeckel D., Werz O. Boswellic acids: biological actions and molecular targets. Curr Med Chem. 2006.
10. Ammon H.P.T. Modulation of the immune system by Boswellia serrata extracts and boswellic acids. Phytomedicine. 2010.
11. Resende D.I.S.P., Jesus A., Sousa Lobo J.M., et al. Up-to-date overview of natural ingredients in sunscreens. Pharmaceuticals. 2022.
12. Li X., Sun Y., Zhang Z., et al. Natural products and plant extracts as natural UV filters. Photochem Photobiol Sci. 2022.
13. Thiele J.J., Ekanayake-Mudiyanselage S. Vitamin E in human skin: organ-specific physiology & clinical implications. Mol Aspects Med. 2007.
14. Thiele J.J., Hsieh S.N., Ekanayake-Mudiyanselage S. Vitamin E: critical review of cosmetic/clinical use. Dermatol Surg. 2005.
15. Al-Niaimi F., Chiang N.Y.Z. Topical vitamin C: mechanisms and clinical applications. J Clin Aesthet Dermatol. 2017.
16. Nichols J.A., Katiyar S.K. Skin photoprotection by natural polyphenols. Arch Dermatol Res. 2010.

17. Darr D., Dunston S., Faust H., Pinnell S. The role of antioxidants in photoprotection: a critical review. J Cosmet Dermatol. 2012.

18. Stahl W., Sies H. Photoprotection by dietary carotenoids. Mol Nutr Food Res. 2011.

19. Krutmann J., Bouloc A., Sore G., Bernard B.A., Passeron T. β-Carotene & other carotenoids in protection from sunlight. J Am Acad Dermatol. 2012.

20. Elmets C.A., Singh D., Tubesing K., et al. Cutaneous photoprotection from UV injury by green tea polyphenols. J Am Acad Dermatol. 2001.

21. Heinrich U., Moore C.E., De Spirt S., et al. Green tea polyphenols provide photoprotection & modulate skin properties (RCT). J Nutr. 2011.

22. Gandini A., Sguizzato M., Cortesi R., et al. New herbal biomedicines for topical treatment of skin disorders. Biomedicines. 2020.

23. Zhou Z., Zhang Y., Li C., et al. Diterpenoids & triterpenoids from frankincense as anti-psoriatic agents (in-silico + literature). Front Chem. 2020.

24. Zhao F., Tang H., Ji R., et al. β-Elemonic acid from frankincense: anti-inflammatory activities. Molecules. 2019.

25. Radice M., Buso P., Manfredini S., Vertuani S. Herbal extracts, lichens & biomolecules as natural photoprotection alternatives (systematic review). J Cosmet Dermatol Sci Appl. 2016.