WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 11, Issue 9, 443-450. Review Article ISSN 2277– 7105

HERBAL ACTIVES - POTENT SUNSCREENING AGENT

Nikita Mahalle* and Monica Borikar

P.G Department of Cosmetic Technology, Nikalas Mahila Mahavidhyalaya, Khamla, Nagpur, Maharashtra, India.

Article Received on
09 May 2022,

Revised on 30 May 2022,
Accepted on 20 June 2022

DOI: 10.20959/wjpr20229-24657

***Corresponding Author**
Nikita Mahalle
P.G Department of Cosmetic Technology, Nikalas Mahila Mahavidhyalaya, Khamla, Nagpur, Maharashtra, India.

ABSTRACT

Sunscreening agents protect the skin from UV rays by absorption, scattering, and blocking. Ultraviolet rays are divided into three wavelengths UV-A, UV-B, and UV-C in which UV-B causes sunburn by affecting the epidermis layer. Hence to overcome all these adverse effects sunscreens & UV protecting products are used on large scale. According to consumers need for a product containing natural sunscreenig agents, natural sunscreen came into existence. Natural products are achieving remarkable worldwide prominence by responding to the growing need for skin protection and better SPF. Effective natural sunscreening agents, bioactive, emollients, improve its property to provide better protection to the skin. The increasing damaging effects caused by ultraviolet radiation have increased the use of natural sun screening agents, which shows effects in reducing the symptoms and reoccurrence of these problems. As of now, everyone is focusing on products containing herbal active for better results and safety. Focusing on natural sunscreening agents obtained from different parts of plants is the aim of this article.

KEYWORDS: Sunscreening agents, UV protection, Ultraviolet rays, UV filter.

1) INTRODUCTION

Due to increased pollution, there is continuous depletion of the ozone layer, increasing the risk of damage to the skin from harmful UV rays. Hence to overcome this damage, sunscreen is applied to the skin to protect it from the harmful effects of the sun and prevent sunburn. Sunscreen is also known as a topical product that absorbs or reflects some of the sun's ultraviolet (UV) radiation and thus helps protect against sunburn. UVA and UVB radiation are biologically active components of ultraviolet (UV) radiation. UVA rays are the main

concomitant cause of skin photosensitization and phototoxicity. The sun protection factor refers to the ability to block UVB, the rays that cause sunburns. Some of the newer sunblocks protect against UVA as well. Synthetic sunscreen contains organic and inorganic filters both. The efficiency of the sunscreen depends upon the type of UV filter used in sunscreen which may be an organic or an inorganic UV filter.[1][2]

1.1) Inorganic (Physical Blockers):- They act as a protective to indent ultraviolet light rays. The two primary inorganic UV filters are Zinc oxide (ZnO) and titanium dioxide (TiO_2) white particles which are used in the cosmetic and pharmaceutical industries. The current agents are ZnO, TiO_2, calamine, ichthammol, talc, and red veterinary petrolatum. These filters block UVB/UVA sunlight through scattering and reflection. Major characteristics determining the ability of minerals to act as physical filters are scattering/absorption property and cosmetic acceptability. Inorganic filters protect the skin by reflecting and diffusing UV radiations.[1][2]

1.2) Organic (Chemical Absorbers):- Organic UV filters like benzophenones, absorb UV radiation with excitation to a higher energy. These aromatic compounds are linked with a carbonyl group.

They are broadly classified into three categories based on the range of protection

1] UVB (290–320 nm) penetrates the ozone layer and acts on skin molecules causing sunburn, cataracts, and skin cancer. It is responsible for the most severe damage like a direct impact on cell DNA and proteins leading to acute damage like sunburn & long-term damage like carcinogenicity.

2] UVA (320–400 nm) which also penetrates the ozone layer, acting on the elasticity of the skin causing skin aging and temporary sunburn. It is not directly absorbed by biological targets, it Penetrates deeper than UVB.

3] UVC(200 nm - 290 nm), which is filtered by the ozone layer is germicidal. Broad-spectrum sunscreens (UVA+UVB) cover the entire spectrum (290–400 nm). Organic filters like PABA, PABA derivatives, and benzophenones show considerable negative effects like eczematous dermatitis and burning sensation.[1][2][3][6]

The organic filters can be classified into

a) Photostable filters: These are the molecules that dissipate the absorbed energy to the surroundings in the form of heat.

b) Photounstable filters: These are the molecules that undergo degradation or change in their chemical structure on the absorption of UV radiation. Hence, these cannot absorb UV energy on subsequent exposure.

c) Photoreactive filters: These molecules jump to their excited state with UV. In excited state, they interact with other molecules in their surroundings including the ingredients of sunscreen, skin lipids, and proteins. The results in the production of reactive species, results in biological effects.[2]

1.3) Natural (Chemical Absorbers)

Natural chemicals like polyphenols, flavonoids, tannins, carotenoids, anthocyanidins, few vitamins, triglyceride oils, volatile oils from vegetables, fruits, medicinal plant parts like leaves, flowers, fruits, berries, also algae, and lichens are more effective than synthetic chemicals which are due to their long term beneficial effects especially against free radical generated skin damages along with UV-rays blocking.[1] Natural products are produced by living organisms as a secondary metabolite that is found in nature. Living organisms that are exposed to UV radiation have numerous photo-adaptive mechanisms which will include antioxidant and UV-absorbing properties.[4]

Now natural sunscreen is more used over synthetic sunscreen because synthetic sunscreen affects the human skin by inducing reactive oxygen Species, natural antioxidants like alpha-carotene, ascorbic acid, flavones have the capability of donating electrons and cease free radical chain. Natural sunscreen protects the skin from early maturing and keeps the skin smooth and energetic. Natural sunscreen is cheaper than synthetic sunscreen and they are easily available and are compatible with all types of skin.[4] The phenolic and flavonoids present in plants produce antioxidant properties. These bioactive components can absorb UV radiation. Moreover, it also neutralizes the free radicals produced in the skin due to UV radiation.[5]

Sun Protection Factor (SPF) and the number beside it indicate how well the sunscreen protects skin against sunburn. Sunscreen with higher SPF protection and broad-spectrum coverage offers protection against sunburn, UVA damage, and DNA damage than comparable products with lower SPF values.[1]

The sunscreens products are applied for the prevention of adverse effects that occur due to UV rays. Meanwhile, natural herbal products are in demand for use to control skin problems.

Natural herbs showing sun screening properties are safer to use as they don't have any side effects. Correspondently, the present study features flowers, fruits, grass, roots, and seeds that act as sun screening agents in cosmetics which will alleviate sunburn and improves UV protection.

1.3.1) FRUIT -Watermelon (*Citrullus Lanatus)*

Watermelon is a good source of lycopene, a red carotenoid that protects the skin against sunburn and skin cancer. It is an effective antioxidant as beta carotene to block UV light. Lycopene helps to fight against wrinkles as it protects the skin cells from the UV rays. Watermelon provides compounds useful in blocking UVA and UVB light which damages the skin, so the simple and inexpensive system can be used as a screening system to predict relative sun blocking.[7] It decreases sensitivity towards UV-induced erythema.[8]

1.3.2) FLOWER - Marigold (*Calendula Offcinalis*)

Marigold is a good source of apigenin. Apigenin is effective in the prevention of UVA/UVB-induced skin carcinogenesis.[9] Marigold extract (*Calendula Officinalis* extract) protect against ultraviolet (UVB) irradiation-induced skin damage.[10] The marigold should absorb the majority of UV radiation (290 to 320nm) to be effective in preventing skin cancer, wrinkle formation, photoaging, and sunburn.[11]

1.3.3) FRUITPEEL - Rambutan (*Nephelium Lappaceum Linn*)

It is a natural additive for enhancing the final product sun protection factor (SPF) The addition of rambutan extract in the formulation shows the potential to reduce the use of synthetic photo protectors by about 64% of the total synthetic organic filters used to achieve the SPF value of 26.3 in their research. Sunscreen formulation containing 1.00% rambutan extract shows the potential to minimize the risk of synthetic agent toxicity and provide sunscreen protection. The ethanolic extract of rambutan rind showed both UV filter activity and antioxidant activity. Its activities are possibly related to its bioactive components.[13]

1.3.4) LEAVES – Banana (*Musa Sapientum Linn*)

Banana leaves and stems has high fiber content nitrogen free extract content and water soluble carbohydrate contents, with certain nutritive value. Tannins are present in banana leaf stems. There are lactic acid bacteria in the banana leaves and stems. Banana fiber is a lingo-cellulosic fiber, which is obtained from the leaf and pseudo-stem of banana plant. Lignin is natural active as a sun screening agent. Various sources of lignin including green coffee, soy,

and papaya as well as banana leaves act as sunscreen. Banana leaves are selected as a source of lignin because they are reported to contain high level of lignin.[14]

1.3.5) RHIZOME - Curcumin (*Curcuma Longa Linn*)

Protective effect of curcumin against ultraviolet A irradiation‐induced photoaging in human dermal fibroblasts is evident.[15] Curcumin protects against skin injury caused by UV radiations. Curcumin suppress ultraviolet (UV) induced skin carcinogenesis and activate the nuclear factor erythroid 2-related factor 2 pathway.[16] The protective effects of curcumin against acute photo-damage is also reported.[17]

1.3.6) BARK - African Tulip Tree *(Spathodea Campanulata)*

The extract has ability to absorb UV radiation hence has UV protection ability. This plant makes it a better and safe alternative to harmful chemical sunscreens[9] Absorption of UV radiation is the main characteristic for the identification of flavonoids in natural sources. The result shows strong to moderate absorption of UV radiation along with the whole range and this ability is due to the presence of flavonoids in them.[18][19][20]

1.3.7) RESIN - Propolis (*Apis Melifera Linn*)

Propolis act as a potential cosmeceutical sunscreen agent for its combined photoprotective and antioxidant properties. It shows effectiveness in broad-spectrum UVB and UVA photoprotective sunscreens, as result by measurements of sun protection factor (SPF), the universal indicator related primarily to UVB radiations, and of the two parameters indicating the UVA absorbance properties like UVA, UVB ratio and critical wavelength.[21]

1.3.8) SEED - Sesame Oil (*Sesamum Indicum Linn*)

Sesame oil has been used as healing oil for thousands of years. Sesame oil has inhibited the growth of malignant melanoma prostaglandin and leukotrines. It has potent antioxidant activity In the tissues beneath the skin, this oil neutralizes free oxygen radicals. It contains palmitic acid, palmitoleic acid, stearic acid, oleic acid, linoleic acid, eicosenoic acid. Sesame oil is a rich source of vitamins especially vit E. Sesamol and sesamin restore moisture in the skin and keeping it soft and supple. Sesame oil resists 30% of UV rays.[22]

2) CONCLUSION

The exposure to ultraviolet rays damages the skin function in which UV-B affects the upper layer of skin causing Sunburn. To treat these skin diseases, sunscreen agents are used.

Everyone needs protection from harmful UV radiations. Since long, the use of chemicals in sunscreens as a photoprotective agent in the formulation is a common practice. Owing to the harmful effects, they are becoming less popular nowadays. The use of natural sunscreen has been gaining significant attention from researchers due to its safety, multiple biological actions on the skin, and cost-effectiveness. Sunscreen made up of natural products is better than the formulation made up of synthetic products. Synthetic actives present in formulations are effective but they are having side effects like endometriosis, cytotoxicity, and genotoxicity. To overcome this problem natural actives are used as sunscreen agents which has minimal side effects and it is efficacious. The additive properties exerted by the phytoconstituents of plants make them the most suitable ingredient for sunscreen formulations. The herbal actives are preferred over the chemical sunscreens due to the broad spectrum of UV absorption, and protection effect against oxidative stress and inflammation.

3) REFERENCES

1. Sahu Shradha, Maury Shashikant, Yadav Piyush, Yadav Kumar Manoj, Sahu Shreya; Review literature on sunscreen; Journal of emerging technologies and innovative research, June, 2021; 8(6): b858.
2. Shanbhag Shreya, Nayak Akshatha, Narayan Reema, Nayak Yogendra Usha; Anti-aging & sunscreen: A paradigm shift in cosmetics; Advance Pharmaceutical Bulletin, 2019; 9(3): 348-359.
3. Kaimal Sowmya, Abraham Anil; Sunscreens; Indian Journal of Dermatology, Venereology, and Leprology, March-April, 2011; 77(2): 238-243.
4. Bhattacharjee Devanjali, S Preeti, Patil B Amit, Jain Vikas; A comparison of Natural and Synthetic Sunscreen Agents: A Review; International Journal of Pharmaceutical Research, Jan-Mar, 2021; 13(1): 3494,3497.
5. Roy Amit, Sahu Kumar Ram; Formulation and Development of Herbal Sunscreen Cream; Research Journal of Topical and Cosmetic Science, Jan-June, 2014; 5(1): 12-14.
6. N Alawi, A Banna Al, N Jaiswal, Henari F; Formulation of Sunscreen Using Natural Substances; Research gate, Oct, 2017; 4(1): 1.
7. Perkins Penelope, Davis Angela; Watermelon-based Sunscreen Blocks UVA and UVB Light; Research gate, July, 2014; 5(2): 1.
8. Shivhare Yogesh, Jain Pratyush; Potentials of Botanicals as Sunscreen Agents: A Review; Research Journal of Pharmacognosy and Phytochem, 2018; 10(1): 68-72.

9. Mansuri Rani, Diwan Anupama, Kumar Harshit, Dangwal Khashti, Yadav Dharmender; Potential of Natural Compounds as Sunscreen Agents; Pharmacognosy Reviews, Jan-June, 2021; 15(29): 49.
10. Fonseca Maria Yris, Catini Dias Carolina, Vicentini T M C Fabiana, Cardoso Cordeiro Juliana, Albuquerque Cavalcanti De Luiz Ricardo, Fonseca José Vieira Maria ; Efficacy of marigold extract-loaded formulations against UV-induced oxidative stress, June, 2011; 100(6): 2182-93.
11. Kushwaha Deepshikha, Katiyar Prashant, Verma Yashodhara; Presence of Sun Protection Factor (SPF) in the Tagetes Plants; SSR Inst. Int. J. Life Science, Oct, 2021; 07(06): 29.
12. Dantas Mota Milleno, Boa Morte Ariana Nascimentoda, Ribeiro Cerqueira Silva Lidércia Cavalcanti, Chinalia Fábio Alexandre; Sunscreen protection factor enhancement through supplementation with Rambutan (*Nephelium Lappaceum Linn*) ethanolic extract; Journal of Photochemistry and Photobiology, April, 2020; 205: 1118.
13. Wasule Dr. Deepak, Kawale Ankita, Pandey Deepti; Determination of Banana Leaf Extract for Sunscreen Property; International Journal for Research Trends and Innovation, Dec, 2018; 3(12): 75,76,80.
14. Liu Xiaoming, Zhang Ruizhi, Shi Haixia, Li Xiaobo, Li Yanhong, Taha Ahmad, Xu Chunxing; Protective effect of curcumin against ultraviolet A irradiation‐induced photoaging in human dermal fibroblasts; Molecular medicine reports, 2018; 17(5): 7227-7237.
15. Deng Huiyan, Wanb Miaojian, Lia Huaping, Chena Quan, Lia Runxiang, Lianga Bihua, and Zhua Huilan; Curcumin protection against ultraviolet-induced photodamage in Hacat cells by regulating nuclear factor erythroid 2-related factor 2; bioengineered, Dec, 2021; 12(2): 9993-10006.
16. Li Huaping, Gao Aili, Jiang Na, Liu Qing, Liang Bihua, Li Runxiang, Zhang Erting, Li Zhenjie, Zhu Huilan; Protective Effect of Curcumin Against Acute Ultraviolet B Irradiation-induced Photo-damage, 12 Aug, 2016; 92(6): 808-815.
17. Patil Vinayak, Patil S. B, Kondawar M. S., Naikwade N. S., Magdum C. S.; Study of methanolic extract of flower of *Spathodea Campanulata Linn* as an anti-solar; International Journal of Green Pharmacy, Jul-Sep, 2009; 248,249.
18. Niyonzima G, Scharpe S, Beeck LV, Vlietinck AJ, Laekeman GM,T. Mets Hypoglycaemic activity of *Spathodea Campanulata Linn* stem bark decoction in mice. Phytotherapy Research, Jan-Feb, 1993; 7(1): 64-67.

19. Makinde JM, Amusan O, Adesogan EK. Antimalarial activity of chromatographic fractions of *Spathodea Campanulate Linn* stem bark extracts against Plasmodium berghei berghei in mice. Phytotherapy Research, April, 1990; 4(2): 53-56.
20. Gregoris Elena, Fabris Sabrina, Bertelle Mariangela, Grassato Luigi, Stevanato Roberto; Propolis as potential cosmeceutical sunscreen agent for its combined photoprotective and antioxidant properties; E. International Journal of Pharmaceutics, 28feb, 2011; 405(1-2): 97-101.
21. Kulkarni Snehal. S, Bhalke Rasika. D, Pande Vishal. V, Kendre Prakash. N; Herbal plants in photo protection and sun screening action: an overview; Indo American Journal of Pharmaceutical Research, 2014; 4(02): 1104-1112.