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Kity Maurya

Assistant Professor,
Chemistry, SBS Govt. P.G.
College Pipariya, Madhya
Pradesh, India

Dr. Aneeta Sen

Assistant Professor,
Economics, SBS Govt. P.G.
College Pipariya, Madhya
Pradesh, India

Different natural sunscreen agents and their properties: A review

Kity Maurya and Dr. Aneeta Sen

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Abstract

A sunscreen is a substance that has capacity to protect skin from sun's harmful rays. Basically, the skin of human's needs protection from U.V. radiations. Main function of sunscreen is to block these radiations so that the skin damage could be protected. Synthetic sunscreen has many side effects both on skin and other vital organs. To replace these, there is alternate of natural sunscreens. Various fruits, vegetables, natural oils etc. have properties to protect the skin from sun's damage. Such natural sunscreens have many advantages and cost effective. The phytoconstituents which are present in such plants play very important role in blocking the effects of U.V. rays. In this article various such natural sunscreens have been explained along with the major constituents which are responsible for protecting the skin. The efficacy of such natural sunscreens have also been discussed here.

Keywords: Sunscreen, U.V. rays, polyphenols, skin damage

Introduction

Prolonged exposure to sunlight is harmful to human as it affect the immune system, eyes and skin [1]. There has been a drastic increase in the cases of skin cancer as a result of outdoor activities [2]. The persons going on beach in only swimming costumes are recommended to use the sunscreen to avoid such harmful effects [1-2]. The sunscreen is defined as the substances that protects the skin from excessive exposure to the Ultraviolet radiations of the sun [7]. Main function of sunscreen is to block U.V. radiation induced sunburns. It prevents the sunburns and reduce the harmful effect of the sun such as premature skin aging and skin cancer [7]. The function of sunscreen is based on its ability to absorb, reflect or scatter the sun's rays [7-8]. The Sun Protection Factor (SPF) of a sunscreen is calculated by comparing the amount of time needed to produce sunburn on unprotected skin [10]. As recommended by WHO, it is essential to use sunscreen of broad spectrum (SPF 15+) in adequate amount after outdoor activities like playing, swimming or exercising [1-2]. The potential of sunscreens depends upon its ability to protect the sunburns induced by U.V. radiation.

[5, 10] Ultra violet radiations are divided into three types according to the wavelength. UV- A has highest wavelength (320-400 nm) and has less energy [5, 8]. Around 80-90% of the UV- A reaches Earth's atmosphere [5]. It can penetrate to deeper layer of dermis thus it can easily damage DNA by indirect photosensitizing reaction by production of reactive oxygen species [6]. UV- B has wavelength of 280-320 nm and has more energy than UV- B. Around only 10% of the rays reach to the earth's atmosphere [7, 11]. It reaches to the epidermis and it is absorbed by DNA which results in molecular rearrangements forming different photoproducts [7, 11]. UV - C has wavelength of 200-280 nm. It is absorbed by ozone layer of earth's stratosphere.

Ideal properties of Sunscreen products

- Sunscreen must protect the skin from broad range of UV spectrum.
- It must be non-volatile in nature so that it will not evaporate at high temperature.
- It must be stable in presence of light, air or moisture
- If it undergoes decomposition then should not produce any toxic material.
- It must be non-toxic and non-irritating.
- It should be easily absorbed by the skin.
- It must be neutral or nearly too neutral so that the effects of acids and bases is nullify.
- It should have good solubility in ointment base or vehicle.
- It should have low solubility in water so as to avoid its removal by perspiration.

Corresponding Author:

Kity Maurya

Assistant Professor,
Chemistry, SBS Govt. P.G.
College Pipariya, Madhya
Pradesh, India

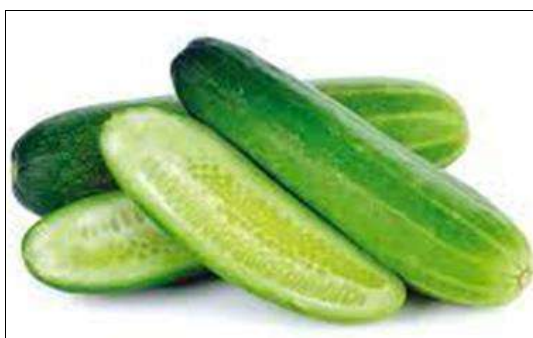
Some natural Sunscreens

Pomegranate: Its Botanical name is *Punic granum* [11-12]. Its fruit act as antioxidant. Masuri *et al.* explained that its major constituent is Ellagitannins and anthocyanin's ad applying sunscreen treatments to pomegranate fruit on degree of sunburn damage and the effect of maturity and sunburn on the internal antioxidant concentration of the juice. The fruit is found to be very effective in sunburn. It has been reported to provide chilling effect which is actually responsible for preventing the sunburn damage of the skin.



Cucumber

Its botanical name is *Cucumis sativus* [12]. Its fruit is very effect in preventing the effect of UV rays of sun. Thus it is very effective in sunburn damage [3]. It prevent as well as helps in healing of such damage [12]. The main constituent of cucumber is ascorbic acid (Vitamin C) and coffee acid [12]. These ingredients as main in preventing the damage by the sun. It helps to remove the dead skin cells and tightens skin [11]. Cucumbers soothe skin irritations, prevent water retention and are rich in water, fibre and beneficial minerals. It helps to tighten the skin [13]. The two acids compounds prevent water retention that's why cucumber applied topically are helpful in swollen eyes, burns and dermatitis.



Green Tea

[19] It is obtained from the leaves of a plant whose Botanical name is *Camellia senensis*. The main part which is useful for sunscreen is leaves [18-19]. The major constituent of Green tea is terpinen-4-ol, 1, 8-cineole, alpha-terminal and gamma- terrine [19]. It is not only effective antiseptic but fungicide and germicide too. It is very popular component of many sunscreen formulations that relieve sunburn by increasing blood flow in capillaries, brining nutrients to damaging skin [7, 19]. Very little absorption by green tea in UV - B ABD UV A range is observed [5, 9]. It is effective when given systemically and protection against at least some of the biological effects of ultraviolet radiation occur when green tea is applied immediately after exposure [3].

Goswaami PK *et al.*, reported that topical and oral application of green tea has been shown to afford protection against chemical and UV- B induced carcinogenesis and inflammatory responses.



Aloe Vera

[6] The leaves of *Aloe Vera* and *A. barbadensis* are the major source of aloe Vera gel [7-6]. It contains various types of amino acids like Lucien, isoleucine, lysine, methionine, phenylalanine, threonine, Valin, tryptophan and many Anthraquinones like Chrysophanoic acid and Iodine. It also contains enzymes like catalase [9]. It has been reported to block UV - A and UV- B rays and maintain skin's moisture balance. Aloe Vera may acts as unique and effective moisturizer [9-10]. It works as a healing agent for the skin which is damage by sunburn [11]. The enzyme Brady kinase in aloes stops sunburn and stimulate immune system intervention [12]. Aloe Vera is broadly used in cosmetics and toiletries for moisturizing and revitalizing action.



Almonds

The Botanical name of almonds is *Prunes dulcis*. The fruits of almonds are used as sunscreen agent [5]. The major constituent of almond is Phenolic acid [1]. The seeds of almonds are rich in polyphenol compounds especially flavonoids and phenolic acids. 3The UV- B radiation analysis has been done using almonds. It has been reported that the Goswami *et al.* has reported when mice is exposed to UV B radiation; on topical application od formulated cream of almonds to mice after irradiation and 2 hour prior to irradiation showed decreased levels of lipid peroxidation and increased levels of glutathione. The results showed that the cream formed of the almonds have anti-oxidant and anti-photo aging properties.



Amla

Botanically, Amla is recognized as *Embolic officinal is*. The fruit extract is useful as sunscreen lotions for human skin. The main constituent of amla is 1-O-Galloyl- β -D- glucose (β -glucogallin), β -Glucogallin [5]. The fruit extract of amla has photo protection efficacy due to its inhibitory effect on ultra-violet radiation. B-glucogallin is considered to be an active principle which is responsible for photoreception efficacy [9]. It has strong anti- oxidant activities against the UV penetration and anti-aging properties which makes it suitable for sunscreen cosmetics. It has been used in different cosmetics as an agent to prevent skin damage by sunlight or sunburns.



Walnut

Botanical name of walnut is *Juglans regia*. Fresh green shells of walnut has sunscreen properties. The main ingredient of walnut is juglone (5-hydroxy-1, 4-naphthoquinone), lawsone (2-hydroxy-1, 4-naphthoquinone). The phenolic compound identified in walnut husk are ferulic acid, vanillin acid, coumaric acid, syringic acid, myricetin and juglone. These are responsible for protection against sunburns and sun damage. Aqueous extract has been shown to be particularly effective as a self tanning sunscreen agent. Juglone has UV protection properties. Myricetin has antioxidant properties which has been reported to show the sunscreen properties. The extract is responsible for skin tightening and moisturizing.



Tomato

Botanical name of tomato is *Solanum lycopersicum*. Fruit extract is very useful for sun damage of skin. The main ingredient of tomato is lycopene which is useful for brighter and tight skin. It is a carotenoid which gives red colour to the tomatoes [3]. Lycopene scavenges lipid radicals and reduces peroxidation which helps in brightening of skin. It also prevents erythema caused by UV radiation on the skin. Lycopene may reduce the damaging effect which UV light can have on the skin and can provide protection against both the short term exposure which results in sunburn. It also prevents the skin from long term exposure which results in skin cancer [9]. It has been thus reported to have antioxidant and anti carcinogenic properties. Tomato has skill to neutralize free radicals especially those derived from oxygen, present under the lipid membrane and skin cover.



Indian Beech Tree

Botanical name of Indian Beech Tree is *Pongomiap pinnata*. The leaves extract has property of protecting skin from sun [13]. It has property to heal the damage caused by the sun. The absorption spectra of various solvent extracts of this plant were measured using UV visible spectrometer. The aqueous and methanol extracts is reported to be highly effective in UV – B region and moderately effective in UV A region [14]. Acetone extract was found to be highly effective in UV- A region [17]. The extracts of this region are reported to show good absorbance throughout the UV region including UV-A region. Hence the leaves extract can be used to formulate highly effective sunscreen preparations. Hence, *P.pinnata* extract can be used to formulate highly effective sunscreen preparations.



Red Grapes

Botanical name of red grapes is *Vitis viniferous*. Grape skins are used for protection from sun damage. The major constituent of Red Grape is polyphenols. It includes

Resveratrol stilbene (3, 5, 4'-trihydroxystilbene) [18]. It acts as antioxidant. Resveratrol has protective effects against Ultraviolet radiation mediated oxidative stress and cutaneous damages including skin cancer [17]. Topical application with resveratrol results in inhibition of UV- B induced tumour incidence and delay in the onset of skin tumorigenesis. Thus, it has an efficacy to reduce the chances of skin cancer.



Turmeric

Rhizome is the main part of turmeric plant which is useful for skin damage [8]. It has antiseptic properties. Turmeric has wide medicinal use; it is used in both respiratory and skin infections both. There are many other medicinal use. The major ingredient of turmeric which can be used against skin damage is curcuma (diferuloylmethane), polyphenols compounds and curcuminoids, demethoxycurcumin. Curcumin can prevent UV- irradiation induced apoptotic changes in human epidermis carcinoma A431 cells [14]. Curcumin possesses anti-inflammatory, anti-tumoral and antioxidant properties. Thus it is useful against the damage caused by sun to the skin and even the skin cancer.



African tulip tree

The botanical name of African tulip tree is *Spathodeacamp anulata* [5]. Bark of this tree is useful for sun protection. It has an antioxidant property. The ability of extract to absorb UV radiation due to which it is used against skin damage by sun [4]. This plant makes a better and safe alternative to harmful chemical sunscreens. The plant stem barks has anti-hyperglycaemic, antimalarial, anti-oxidant and wound healing properties. Patil V.V. *et al.*, evaluated methanolic extract of flowers has anti-solar activity properties. The extract is reported to show prominent absorbance at 200-240 nm while good absorbance at 240-325 nm. Thus the bark is used to protect the skin from sun.



Conclusion

The use of chemicals are quite popular from long back. But now, with the advancement in research it has been reported that such chemicals which are used as sunscreen has various harmful effects on various vital organs of the body. Due to which the popularity of natural sunscreen is increasing gradually. From this article it is clear that various natural sunscreen has potentials to protect the skin from sun damage. Such natural sunscreens have different natural ingredient which could protect the skin from UV- A and UV- B types of rays. The efficacy may differ but such natural sunscreens has no or very less side effects due to which their uses have increased. The use of natural sunscreen has been gaining significant attention of researchers due to their safety, multiple biological actions on skin and cost effectiveness. The additive phyto-constituents of plants make them as the most suitable ingredient for sunscreen formulations.

References

1. HariKishan MC Sai, CP Meher, SM Ahmed. "Sunscreen & Sunscreen Agents: A Review. Pharmacy Tutor, www. Pharmacy tutor. Org/articles/sunscreen-agents-review.
2. Gabros Sarah, Trevor A Nessel, Patrick M Zito. Sunscreens and photo protection; c2019.
3. Goswami Priyanka, Kantivan, Mayuri Samant, Rashmi Srivastava. Natural sunscreen agents: A review. Sch. Acad. J Pharm. 2013;2(6):458-463.
4. Sachdeva MK, Katy T. Abatement of detrimental effects of photo aging by *Prunusamygdalus* skin extract. International Journal of Current Pharmaceutical Research. 2011;3(1):57-59.
5. Patil VV, Patil SB, Kondawar MS, Naikwade NS, Magdum CS. Study of metabolic extract of flower of *Spathodea Campanulata* L. as an anti-solar. International Journal of Green Pharmacy. 2009;3(3):248-249.
6. Ashawant MS, Saraf S, Swarnlata S. Comparative sun protection factor determination of fresh Aloe Vera gel vs. marketed formulation. Indian Journal of Pharmaceutical Education and Research. 2008;42(4):319-322.
7. Mishra AK, Chattopadhyay P; Herbal Cosmeceuticals for Photo protection from Ultraviolet B Radiation: A Review. Tropical Journal of Pharmaceutical Research, 2011;10(3):351-360.
8. Wang Z, Agarwal R, Bickers D, Mukhtar H. Protection against ultraviolet B radiation induced photo carcinogenesis in hairless mice by green tea polyphenols. Carcinogenesis. 1991;12(8):1527-1530.
9. Katiyar SK, Elmets CA, Agarwal R, Mukhtar H. Protection against ultraviolet-B radiation induced local and systemic suppression of contact hypersensitivity and enema responses in C3H/HEN mice by green tea

- polyphenols. *Photochemistry and Photobiology*. 1995;62:855-861.
10. Bhattacharjee Devanjali, S Preethi, Amit B Patil VIKAS Jain. A comparison of natural and synthetic sunscreen agents: A review. *International Journal of Pharmaceutical Research*. 2021;13(01):3494-3505.
 11. Mansuri Rani, Anupama Diwan, Harshit Kumar, Khashti Dangwal, Dharmender Yadav. Potential of natural compounds as sunscreen agents. *Pharmacognosy Reviews*. 2021;15(29):47-56.
 12. Maheshwar G, Patil B, Dhumal P. Comparative sun protection factor determination of fresh fruits extract of Cucumber vs. marketed cosmetic formulation. *Research Journal of Pharmaceutical Biological and Chemical Sciences*. 2010;1(3):55-9.
 13. Gallay C, Dumont S, Kherad O. Effectiveness of sunscreen against melanoma. *Rev Med Suisse*. 2019;15(635):198-201.
 14. Patel NP, Highton A, Moy RL. Properties of topical sunscreen formulations: A review. *The Journal of dermatologic surgery and oncology*. 1992;18(4):316-20.
 15. Mills C, Cleary BV, Walsh JJ, Gilmer JF. Inhibition of acetyl cholinesterase by tea tree oil. *Journal of Pharmacy and Pharmacology*. 2004;56(3):375-9.
 16. Serpone N, Dondi D, Albini A. Inorganic and organic UV filters: Their role and efficacy in sunscreens and sun care products. *Inorganic Chemical Acta*. 2007;360(3):794-802.
 17. Donglikar MM, Deore SL. Sunscreens: A review. *Pharmacognosy Journals*. 2016, 8(3).
 18. Wijeratne SS, Abou-zaid MM, Shahidi F. Antioxidant polyphenols in almonds and its coproduces. *Journal of Agricultural and Food Chemistry*. 2006;54(2);312-318.
 19. Nabihah Y, Cynthia I, Katiyar S, Craig A. Photo protective effects of green tea polyphenols. *Photo dermatology, Photo immunology & Photo medicine*. 2007;23(1):48-56.