

REVIEW: HERBAL POTENTIAL IN THE USE OF SPF 30 AND 50 SUNSCREENS

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ABSTRACT

Sunscreen is a substance that can reflect or absorb light, protecting the skin from damage caused by exposure to UV radiation. Soursop juice extract (*Annona muricata* L.), lime peel extract (*Citrus aurantifolia*), shallot skin extract (*Allium cepa* L.), celery leaf extract (*Apium graveolens* L.), and ethanol extract of kersen leaves (*Muntingia calabura*) are some plants that can be used as natural sunscreens. According to the SPF value and the protective power category, the soursop juice extract has an SPF value of 5.188, 12.242, and 17.247. Lime peel extract has SPF values of 28.6, 42.2, and 81.8 (max-ultra). Onion peel extract has SPF values of 11.4, 20.12, 31.8, and 34.83 (max-ultra). Celery leaf extract had SPF values of 1.7873, 4.5553, 7.3183, and 8.1573 (max-ultra). Kersen leaf ethanol extract had concentrations of 1.528, 3.890, 3.971, 4.585, and 5.252 (max-ultra). Phenolic components, polyphenols, flavonoids, tannins, and vitamin C are known as bioactive compounds in the five plant extracts that function as sunscreens. The polarity of the solvent influenced the SPF rating and protective power category. It is concluded that the SPF value and protective power of the plant extracts have SPF values and protective power categories with extracts in ultra categories. The bioactive compounds contained in the five plant extracts that act as sunscreens are phenolic compounds, polyphenols, flavonoids, tannins, and vitamin C. The cause of the SPF value and protective power category can increase because the solvent used during extraction has the same polarity (reaches equilibrium) with bioactive compounds, which causes the amount of active content extracted to increase in the UV-Vis spectrophotometric test.

Keywords: sunscreen, SPF, natural materials, extracts.

INTRODUCTION

Indonesia is a tropical country that receives abundant sunlight throughout the year. Sunlight is needed for the survival of living things, especially humans. However, extreme sun exposure also harms the skin from ultraviolet radiation (UVR), comprising about 95% UVA and 5% UVB. The epidermis partially absorbs UVA radiation, but 20%-30% can reach the deep dermis. In UVB radiation, 70% is absorbed by the stratum corneum, 20% is absorbed by the epidermal layer below the stratum corneum, and 10% reaches the upper dermis. This uptake causes adverse effects on the skin, such as erythema, immediate pigment darkening (IPD), photoaging, and photocarcinogenicity. Malignant melanoma, a skin cancer, is also associated with sun exposure (Baran et al., 2017).

One of the efforts to prevent adverse effects on the skin is to use sunscreen. Sunscreen is one of the skincare cosmetics that can protect the skin from sun exposure (Minerva, 2019). The ingredients in sunscreen are usually called UV filters, including organic UV filters (chemical) and inorganic UV filters (physical). Organic filters work by absorbing UV radiation and converting it into heat. Examples of organic UV filters are avobenzone and octyl

methoxycinnamate (Rähse, 2020). Inorganic UV filters work by reflecting and scattering UV light. Zinc oxide and titanium dioxide are inorganic UV filters (Draelos, 2016).

Organic UV filters, however, can be degraded by UV radiation, which reduces their effectiveness and produces photodegradation products that can cause skin irritation or photodermatitis (Nash, J. F., & Tanner, 2014). Sunscreens must contain an SPF (Sun Protection Factor) value that is sufficient to protect the skin from UV exposure, such as SPF 30 or 50. SPF (Sun Protection Factor) or Sun Protection Factor (FPM) is one of the common indices used in measuring the effectiveness of sunscreen protection (Baran et al., 2017). SPF measures the level of protection a sunscreen should provide against UV rays. The higher the SPF value, the greater the level of protection (Baki, G., & Alexander, 2015).

Based on research conducted by Hari (Hari, 2013), they have explained that sunscreens are divided into two groups, namely chemical and physical sunscreens. Chemical sunscreens protect the skin by absorbing sunlight and converting it into heat energy. The skin absorbs this sunscreen, which can potentially cause skin irritation and cannot be used by infants as young as six months. At the same time, physical sunscreens work to protect the skin by reflecting sunlight. This sunscreen is known as sunblock or inorganic sunscreen. This sunscreen has a broad spectrum that can protect from UV A and UV B rays, is stable, has low allergy potential, and is not absorbed by the skin, so it can be used on children. If you want to optimize the ability of sunscreens, a combination of physical and chemical sunscreens is often done by some cosmetic manufacturers.

Searching for active compounds of natural origin that can be useful as natural sunscreen ingredients is essential. Recently, the development of sunscreens has led to the use of natural ingredients because the public more easily accepts them. This literature study aims to find natural ingredients, including other bioactive compounds, that can increase the SPF value in sunscreens and sunscreen dosage forms that can be formulated. Based on this background, the author is interested in conducting a review article by comparing the SPF value and protection category contained in the active ingredients soursop fruit juice extract (*Annona muricata L.*), lime fruit peel extract (*Citrus aurantifolia*), red onion peel extract, celery leaf extract (*Apium graveolens L.*), and kersen leaf ethanol extract (*Muntingia calabura*), which are thought to provide protective effects from UV rays as natural sunscreens.

RESEARCH METHOD

The method used is a literature review or literature review on research journal databases and internet searches, where the databases used are Google Scholar and PubMed. The keywords used in finding article references from several relevant studies are "sunscreen" and "natural materials." The references obtained were from 30 articles. Furthermore, it was reviewed into five plant articles containing sunscreen. Inclusion criteria include journal research articles discussing herbs' potential for using SPF 30 and 50 sunscreens. Maximum publications in the last ten years, from 2013-2023. Of the 50 articles, 15 were excluded because they did not discuss the potential of herbs in the use of SPF 30 and 50 sunscreens, resulting in a total of 15 articles used regarding the potential of herbs in the use of SPF 30 and 50 sunscreens, as shown in **Figure 1**.

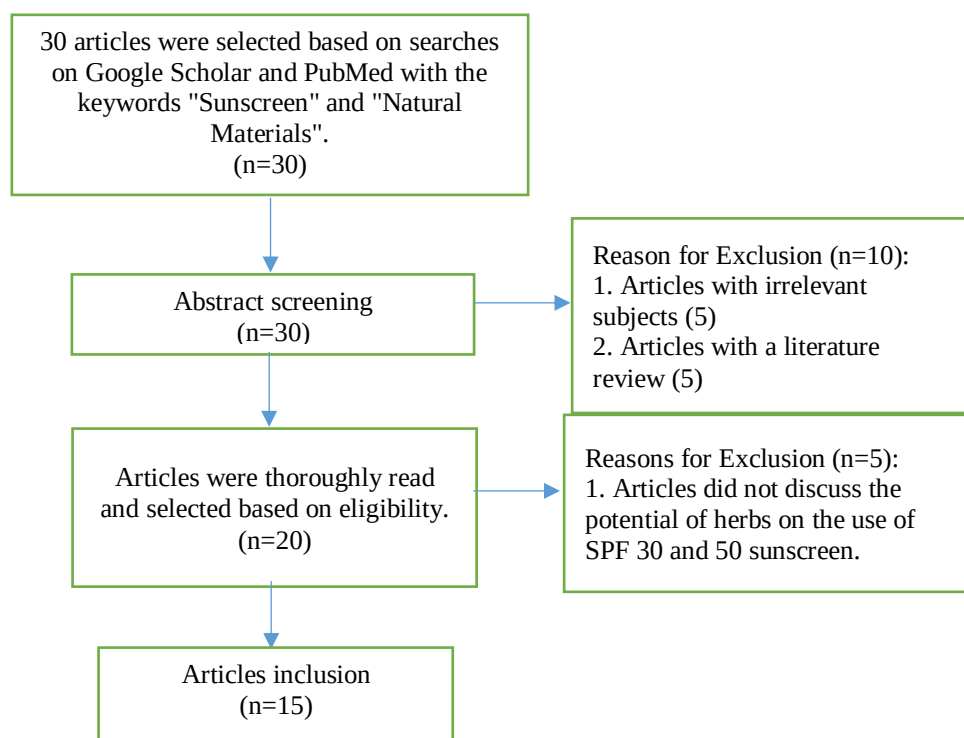


Figure 1. Flow of Research Methods

RESULTS AND DISCUSSION

Table I. Results of herbal potency in the use of SPF 30 and 50 sunscreens with various concentrations

No	Name	Concentration (%)	SPF Value	Protection Category
1.	Soursop fruit juice extract (<i>Annona muricata</i> L.) (Rahmawati <i>et al.</i> , 2018)	1	5,188	Medium
		2	12,242	Maximum
		3	17,247	Ultra
2.	Fruit peel extract lime (<i>Citrus Aurantifolia</i>) (Andy Suryadi <i>et al.</i> , 2021)	0,02	5,9	Medium
		0,04	24	Ultra
		0,06	42,5	Ultra
3.	Red onion peel extract (<i>Allium cepa</i> L.), (Wiraningtyas <i>et al.</i> , 2019)	0,0004	11,44	Maximum
		0,0008	20,12	Ultra
		0,0012	31,80	Ultra
		0,0016	34,83	Ultra
4.	Celery leaf extract (<i>Apium graveolens</i> L.) (Meilina <i>et al.</i> , 2023)	2	4,5553	Medium
		4	7,3183	Extra
		6	8,1573	Maximum

5. Kersen leaves extract (<i>Muntingia calabura</i>) (Mulangsri & Puspitasari, 2013)	0,01	1,528	Minimum
	0,02	3,890	Minimum
	0,03	3,971	Minimum
	0,04	4,585	Medium
	0,05	5,252	Medium

Based on the results, it showed that the five articles discussed contain that bioactive compounds in extracts that have properties as natural sunscreens from plants such as soursop juice extract (*Annona muricata L.*), lime peel extract (*Citrus aurantifolia*), shallot skin extract (*Allium cepa L.*), celery leaf extract (*Apium graveolens L.*), and ethanol extract of Kersen leaves (*Muntingia calabura*). The above are natural antioxidants such as phenolic compounds, flavonoids, vitamin C, polyphenols, and tannins. *Sunscreen* is a protective cosmetic that can filter and resist sunlight on the skin. Based on in-vitro research, some of the herbal plants mentioned above can be used as sunscreens.

The five articles show that the greater the solvent concentration, the higher the SPF value. Each solvent has a different character when taking bioactive compounds from a sample with different polarities. The effectiveness of the extraction of a compound by a solvent is highly dependent on the solubility of the compound in the solvent. By the principle of like dissolve like, namely, a compound will dissolve in a solvent with the same properties (Verdiana et al., 2018). This is related to the content of compounds that can absorb UV light because, as the concentration increases, the absorbance will also increase (Prasiddha et al., 2016). This is in line with the operating principle of the spectrophotometer, which states that the value emitted by the transmitted light is expressed in absorbance because it has a relationship with the sample concentration. The working of a spectrophotometer is based on Lambert Beer's law, which states that the absorbance of light is directly proportional to the concentration (Mantele, W., & Deniz, 2016).

In conclusion, extracts from the above plants can be an alternative to natural sunscreen, as they contain excellent components for photoprotector products. The extract content in these plants can slow down UV-induced ROS injury associated with preventive functions, correlated with UV-A and UV-B filtering properties, and other practical actions due to their good antioxidant activity.

CONCLUSION

Based on the review of articles that have been conducted, it can be concluded that the SPF value and protective power of the plant extracts above are plant extracts that have SPF values and protective power categories with extract categories up to ultra: are soursop juice extract (*Annona muricata L.*), lime peel extract (*Citrus aurantifolia*), shallot skin extract (*Allium cepa L.*), celery leaf extract (*Apium graveolens L.*), and ethanol extract of kersen leaves (*Muntingia calabura*). The bioactive compounds contained in the five plant extracts that act as sunscreens are phenolic compounds, polyphenols, flavonoids, tannins, and vitamin C. The cause of the SPF value and the category of protective power can increase because the solvent used during extraction has the same polarity (reaches equilibrium) with bioactive compounds, which causes the amount of active content extracted to increase in the UV-Vis spectrophotometric test.

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REFERENCES

Andy Suryadi, A., Pakaya, M. S., Djuwarno, E. N., & Akuba, J. (2021). Determination of Sun Protection Factor (Spf) Value in Lime (*Citrus Aurantifolia*) Peel Extract Using Uv-Vis

- Spectrophotometry Method. *Jambura Journal of Health Sciences and Research*, 3(2), 169-180. <https://doi.org/10.35971/jjhsr.v3i2.10319>
- Baki, G., & Alexander, K. S. (2015). *Introduction to cosmetic formulation and technology*. John Wiley & Sons. Hoboken, New Jersey.
- Baran, R., & Maibach, H. I. (2017). *Textbook of Cosmetic Dermatology* (5th ed.). CRC Press. Boca Raton, FL, 5.
- Draelos, Z. D. (2016). *Cosmetic dermatology: products and procedures*. John Wiley & Sons. The UK.
- Hari, S. (2013). Photoprotection for Children Symposium Pearls Cosmetic Dermatology Update.
- Mantele, W., & Deniz, E. (2016). UV-VIS Absorption Spectroscopy: Lambert-Beer reloaded. *Spectrochimica Acta*.
- Meilina, R., Dewi, R., Dina, P., & Kulla, K. (2023). Sunscreen Preparation Formulation of Celery Leaf Extract (*Apium graveolens* L.) Sunscreen Preparation Formulation *Apium graveolens* L. Leaf Extract. 9(1), 536-545.
- Minerva, P. (2019). Use of Sunscreen for Skin Health. *Journal of Education. And Family.*, (1).(11.), 95-101.
- Mulangsri, D. A. K., & Puspitasari, A. D. (2013). Sunscreen Activity Test of Kersen (*Muntingia Calabura*) Leaf Ethanol Extract. *Scientific Journal of Cendekia Eksakta*, 2(2), 65-69. <https://publikasiilmiah.unwahas.ac.id/index.php/CE/article/view/2089/2108>
- Nash, J. F., & Tanner, P. R. (2014). Relevance of UV filter/sunscreen product photostability to human safety. *Photodermatology. Photoimmunology. Photomedicine*, 30, 88-95.
- Prasiddha, I. J., Laeliocattleya, R. A., & Estiasih, T. (2016). The Potency of Bioactive Compounds from Corn Silk (*Zea mays* L.) for the Use as a Natural Sunscreen: A Review. *Journal of Food and Agroindustry*, 4, 1, 40-45.
- Rahmawati, R., Muflihunna, A., & Amalia, M. (2018). Analysis of Uv-Ray Protection Activity of Soursop (*Annona Muricata* L.) Fruit Juice Based on Sun Protection Factor (Spf) Value by Uv-Vis Spectrophotometry. *Indonesian Phytopharmaca Journal*, 5(2), 284-288. <https://doi.org/10.33096/jffi.v5i2.412>
- Rahse, W. (2020). *Cosmetic Creams: Development, Manufacture, and Marketing of Effective Skin Care Products*. Wiley-VCH. Weinheim, Germany.
- Verdiana, M., Widarta, I. W. R., Gede, I. D., & Permana, M. (2018). (2018). Effect of Solvent Type on Extraction Using Ultrasonic Wave on Antioxidant Activity of Lemon Fruit Peel Extract (*Citrus limon* (Linn.) Burm F.). *Journal of Science and Technology* 7, 4.
- Wiraningtyas, A., Ruslan, R., Agustina, S., & Hasanah, U. (2019). Determination of Sun Protection Factor (SPF) Value of Red Onion Skin. *Redox Journal (Journal of Chemical Education and Chemical Sciences)*, 2(01), 34-43. <https://doi.org/10.33627/re.v2i01.140>.

