

ACTIVITY OF SOLAR SCREEN FROM AVOCODO SKIN EXTRACT (PERSEA AMERICANA MILL.) IN VITRO

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ABSTRACT

Sunscreen is a preparation that is used on the surface of the skin that works to absorb, scatter or reflect ultraviolet light. Therefore, it is necessary to use the ingredients to become active ingredients in sunscreen. The research objectives are to (a) To determine the total flavonoid content and total polyphenol content of avocado peel extract (*Persea americana* Mill.). (b) Knowing the sunscreen activity of avocado skin extract (*Persea americana* Mill.). This type of exploratory experimental research is based on a quantitative approach. The results showed that avocado skin extract (*Persea americana* Mill.) has a total flavonoid content of 10.855 mgQE/g extract and a total polyphenol content of 221.593 mgGAE/g extract. It is known that avocado peel extract (*Persea americana* Mill.) has sunscreen activity with an SPF value of 3.887 at a concentration of 500 ppm including minimal protection category. The results of the activity test showed that avocado skin sunscreen potential had phenolic comp

Keyword: Sunscreen, avocado peel, in vitro

INTRODUCTION

Indonesia is a tropical country full of sunshine throughout the year. Sunlight itself is a source of energy that is beneficial to human life. The sun can emit ultraviolet light which is beneficial for humans, including for synthesizing Vitamin D and also functions to kill bacteria. However, apart from the benefits mentioned above, ultra violet rays can be detrimental to humans if exposed to human skin for too long (Isfardiyana, 2014). Excessive exposure to sunlight can cause the skin's epidermal tissue to not be able to adequately fight the negative effects of sunlight, causing various skin disorders ranging from redness (erythema), pigmentation, premature aging, wrinkles, to even causing skin cancer. Thus, various efforts have been made to protect themselves against exposure to UV rays by using artificial protection such as sunscreen (Zulkarnain, 2013).

Sunscreen is a compound that can be used to protect the skin from sunburn, especially ultra violet (UV). Based on the type of active ingredient in sunscreen, it is divided into two, namely as a physical blocker and a chemical absorber. Physical blockers can reflect UV rays directly, for example TiO₂, ZnO, while chemical absorbers can absorb UV rays so they don't attack skin cells, for example Octyl p-methoxycinnamate, 2-ethyl hexyl p-methoxycinnamate (suryanto, 2013). However, concerns about the side effects of synthetic sunscreens make natural sunscreens the preferred alternative.

Avocado is a plant that has been used by the community for generations as a traditional medicine. Avocado (*Persea americana* Mill) is a plant that contains many antioxidant

compounds. Flavonoids and tannins are several compounds that have antioxidant activity that have potential as sunscreens (Suryanto, 2012). At this time, waste is being intensively used in various studies. One of the most common wastes found in Indonesia is avocado skin, so researchers want to try to find out the content of avocado peel to determine the potential and activity of sunscreen compounds.

Ultraviolet (UV) rays are external factors that most play a role in causing the skin aging process. Chronic UV exposure produces free radicals which can cause various damage to the structure and layers of the skin (Suryanto, 2013).

Ultraviolet (UV) light is divided into three regions, namely the UV A region (320-400 nm), the UV B region (290-320 nm), and the UV C region (200-290 nm). Exposure to UV A can cause skin browning, exposure to UV B can cause erythema and premature aging of the skin, while exposure to UV C can cause skin cancer. Naturally the skin has the power to protect against exposure to UV rays, namely by the formation of melanin and thickening of the stratum corneum. The contact between UV rays and the skin for too long causes the skin's natural protection power to not be able to provide maximum protection (Probowati, 2015).

Sunscreen (sunblock) is a substance or material that can protect the skin against UV radiation. Sunscreen cosmetic preparations come in various forms, for example lotions to be applied to the skin, creams, ointments, gels or sprays to be applied to the skin. Cosmetic preparations containing sunscreen are usually stated on the label with a certain SPF (Sun Protecting Factor) strength. The SPF value lies between the range of 2-60, this number indicates how long the product is able to protect or block UV rays that cause sunburn. A user can determine the duration of a product's effectiveness simply by multiplying the SPF number by the length of time it takes to burn his skin if he does not use sunscreen (Isfardiyana, 2014). Sunscreen preparations can be categorized as sunblocks, namely preparations that can absorb almost all UV-B rays and UV-A rays if they have %Te <1% and %Tp 3-40%, if %Te is 6-18% and %Tp 45- 86% is categorized as Suntan or it can be said that a material absorbs most of the UV-B rays and absorbs a small amount of UV-A rays (Cumpelik, 1972).

METHOD

This research method starts with taking and collecting samples of avocado skin (*Persea americana* Mill.) obtained from the Samarinda area. The samples obtained were made simplicia and continued to the extraction stage using the maceration method with 96% ethanol solvent. The sunscreen activity test included calculating the values of %Te, %Tp and SPF using the spectrophotometer method using a UV-Vis spectrophotometer. This research is included in exploratory experimental research with a quantitative approach, namely by obtaining the value of sunscreen activity from the peel of avocado (*Persea americana* Mill.).

The research began by collecting the main research material, namely the part of the avocado plant (*Persea americana* Mill.) that was used was the peel of the fruit. Avocado plant samples (*Persea americana* Mill.) were taken from the Samarinda area. The samples that have been collected are then sorted wet and then washed with clean running water. Weigh the wet sample as much as x gram which has been cut into pieces, then dried in an oven at 45oC until 100 grams of dried avocado skin (*Persea americana* Mill.) is obtained. Then the peel of the avocado (*Persea americana* Mill.) is ready for the extraction process.

Parameters of sunscreen activity of avocado peel extract (*Persea americana* Mill) observed were %Te and %Tp compared to ethanol. After the absorption value (A) is obtained, the transmission value (T) can be calculated using the formula $T = 10 - A$.

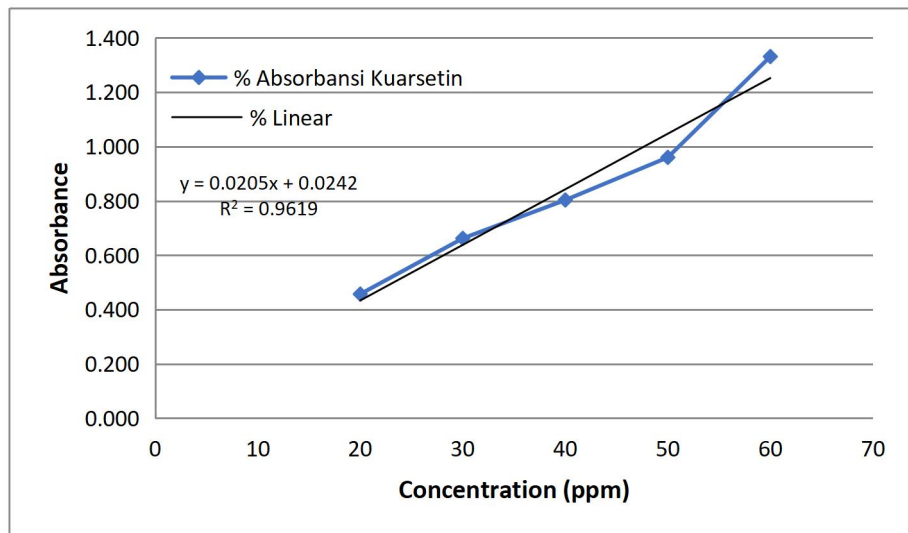
RESULT AND DISCUSSION

The total flavonoid content in the extract was measured at a concentration of 1000 ppm using a UV-Vis spectrophotometer at the maximum wavelength of the quarcetin standard. The purpose of measuring the total levels of flavonoids is to control the total levels or the number of flavonoid compounds contained in 1000 ppm of avocado peel extract.

Table of Quarcetine Standard Curve Measurement Results

Concentration (ppm)	Absorbance			Avg. of Absorbance	Linear Regression
	1	2	3		
20	0,439	0,471	0,461	0,457	$y = 0,0205 x + 0,0242$
30	0,659	0,668	0,658	0,662	
40	0,625	0,878	0,907	0,803	
50	0,969	0,930	0,981	0,960	
60	1,304	1,275	1,413	1,331	

If presented in graphical form, the measurement results of the quarcetin standard standard curve are as follows:



Quarsetine Standard Curve Graphic Image

Table of Flavonoid Level Measurement Results

Concentration (ppm)	Absorbance	Flavonoid Levels in Extracts
1000 (R1)	0,652	10,855 mgQE/g Extracts
1000 (R2)	0,666	
1000 (R3)	0,663	
	$\bar{x} = 0,660$	

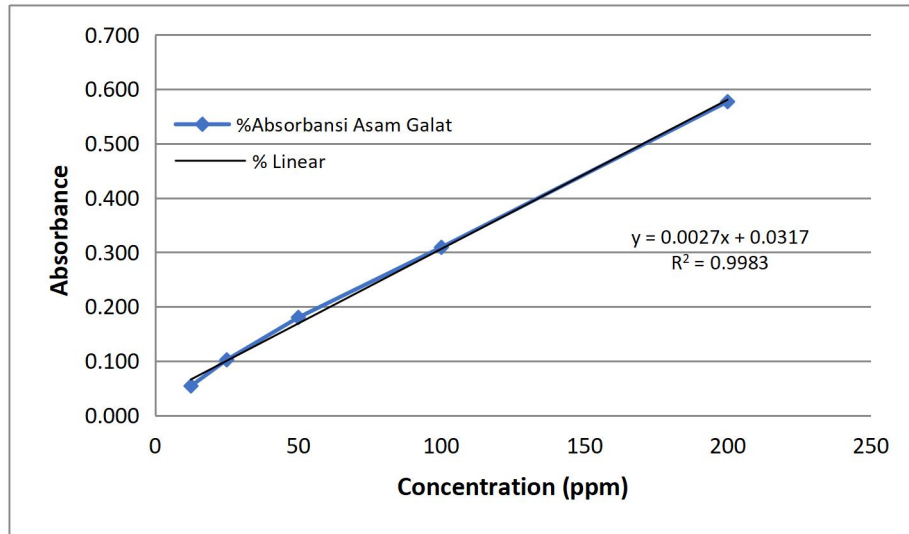
Total Polyphenol Levels

Phenolic compounds are compounds that have one or more hydroxyl groups attached to an aromatic ring. Polyphenols are compounds that have more than one phenol group. The problem studied was the level of total polyphenols in avocado peel extract. The total polyphenol content in the extract was measured at a concentration of 1000 ppm using a UV-Vis spectrophotometer at the maximum wavelength of standard gallic acid. The purpose of measuring the total levels of polyphenols is to determine the total levels or the amount of polyphenolic compounds contained in 1000 ppm of avocado peel extract.

Table of Standard Gallic Acid Standard Curve Measurement Results

Concentration (ppm)	Absorbance			Avg. Of Absorbance	Linear Regression
	1	2	3		
12,5	0,053	0,051	0,057	0,054	$y = 0,0027 x + 0,0317$
25	0,099	0,110	0,096	0,102	
50	0,210	0,152	0,117	0,180	
100	0,250	0,358	0,319	0,309	
200	0,695	0,485	0,578	0,557	

If presented in graphical form, the measurement results of the gallic acid standard standard curve are as follows:



Gallic Acid Standard Curve Graphic Image

Table of Polyphenol Level Measurement Results

Concentration (ppm)	Absorbance	Flavonoid Levels in Extracts
1000 (R1)	0,622	221,593 mgGAE/g Extracts
1000 (R2)	0,630	
1000 (R3)	0,639	
	$\bar{x} = 0,630$	

Activity of Sunscreen Ethanol Extract of Avocado Peel

The purpose of testing sunscreen activity is to determine the potential for sunscreen from avocado peels by looking at absorption at a wavelength of 292.5-372.5 nm and a wavelength of 290-320 nm to calculate the %Te, %Tp and SPF values. The results of testing the sunscreen activity of the ethanol extract of avocado peel at concentrations of 100 ppm, 150 ppm, 250 ppm, 400 ppm and 500 ppm are presented in d table below.

Table Sunscreen Activity

Concentration (ppm)	%Te	Category	%Tp	Category	SPF	Category
100	83,064	-	81,271	Fast tanning	0,880	-
150	75,064	-	72,177	Fast tanning	1,330	-
250	66,811	-	62,985	Fast tanning	1,885	-
400	53,680	-	48,848	Fast tanning	2,974	Minimal
500	46,803	-	41,871	Sunblock	3,887	Minimal

Table of Categories of Sunscreen Activity Assessment

Category	% Transmission	
	Eritema	Pigmentation
Sunblock	<1%	3-40%
Extra Protection	1-6%	42-86%
Suntan Standard	6-12%	45-86%
Fast tanning	10-18%	45-86%

Table of SPF Value Category

SPF Value	Type of Protection
2-4	minimal
4-6	moderate
6-8	extra
8-15	maximal
>15	ultra

The results of the linear regression equation calculated the concentration of total flavonoids in the peel extract by means of the absorbance of the avocado peel extract. The linear regression equation was $0.660 = 0.0242 + 0.0205 x$ and the results showed that the avocado peel extract at a concentration of 1000 ppm contained flavonoid compounds. with a total content of 10.855 mgQE/g extract. While the total polyphenols linear regression equation obtained $0.630 = 0.0317 + 0.0027 x$ and the coefficient x states that every 1000 ppm of avocado peel extract contains a total polyphenol content of 221.593 mgGAE/g extract. Flavonoid and phenolic compounds are antioxidant compounds that can counteract free radicals in the body. Free radicals can cause damage to DNA and healthy cells, causing balance disturbances in the body, including heart disease, stroke, hypertension, cancer, and premature aging. Antioxidants work to ward off free radicals so they can prevent these diseases. Handayani (2018), one of the secondary metabolites that acts as an antioxidant is polyphenols. Because the avocado peel extract has previously been tested for its antioxidant activity and has positive antioxidant activity.

The %Te results obtained for all concentration series give high values, whereas according to Tahar (2019) sunscreen preparations can be said to have good effectiveness if these preparations have low %Te and %Tp values and have a high SPF value. So that it can be interpreted that of all the concentration series tested, none could provide skin protection from UV which could cause erythema.

The %Tp concentration (100 ppm = 81.271%; 150 ppm = 72.177%; 250 ppm = 62.985%; 400 ppm = 48.848%) is categorized as fast tanning because it is in the range (45-86% fast tanning). Fast tanning in the sense of sunscreen is the ability of a chemical molecule to absorb the least UV A and UV B rays. The fast tanning category means that it can absorb 85% of UV rays. Cumpelik (1972) fast tanning is able to transmit as much as 15% of UV B rays that cause erythema.

Whereas the SPF value at concentration (400 ppm = 2.974 and 500 ppm = 3.887) is categorized as minimal because it is in the protection range (SPF 2-4 minimum category), meaning it only provides a minimum level of protection or protection to the skin from erythema. The SPF value is the ratio of UV energy needed to produce minimal erythema on protected skin with the same erythema on unprotected skin in the same individual (Sharif, 2017). For example, an SPF 10 sunscreen will take ten times longer to develop erythema when exposed to UV-B radiation compared to when the individual has no sunscreen protection. According to Isfardiyana (2014) sunscreen (sunblock) is a substance or material that can protect the skin against UV radiation.

Sunlight that reaches the surface of the earth and has an impact on the skin are UV-A and UV-B rays. Sunscreen is a preparation that is used on the surface of the skin that works to absorb, scatter or reflect ultraviolet rays (Karina, 2015). So it needs ingredients to be active ingredients in sunscreen. From the results of the sunscreen activity test obtained, the potential for avocado peel sunscreen is estimated to have phenolic compounds that have antioxidant properties. Phenol is an aromatic compound that can provide absorption in the UV spectrum region due to the presence of conjugated single double bonds so that it can be efficacious as a sunscreen (Karina, 2015). Compounds containing phenol have antioxidant properties. That is, these compounds can control excess free radicals and help prevent damage to DNA.

CONCLUSION

Based on the results of the research and discussion it was concluded that avocado peel extract had a total flavonoid content of 10.855 mgQE/g extract and a total polyphenol content of 221.593 mgGAE/g extract. Avocado peel extract (*Persea americana* Mill.). Avocado peel extract (*Persea americana* Mill.) has sunscreen activity with an SPF value of 3.887 at a concentration of 500 ppm, including the minimal protection category.

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