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Sunscreen Activity of Soursop Seeds Extract

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ABSTRACT

Indonesia is a tropical climate country that is rich in sunlight. Sunlight overexposure leads to skin damage such as sunburn, black spots, wrinkles, and aging skin which is caused by oxidative stress. Soursop is a fruit rich in flavonoids that has the antioxidant activity to prevent oxidative stress and is known for its sunscreen effect. This study was aimed to determine the sunscreen activity of soursop seed extract by Sun Protective Factor (SPF) parameter. Soursop extract divided to 0.15 and 0.25% concentration and the SPF value was measured quantitatively using Spectrophotometer UV-Vis. SPF measurement result showed that soursop seeds extract 0.15 and 0.25% concentration gives 4.35 and 7.38 respectively SPF value. Soursop seeds extract showed sunscreen activity with low protection category.

Keywords: Sunscreen, Soursop, Extract

INTRODUCTION

Indonesia is a tropical country rich in sunlight during daylight all year. This overexposure to sunlight not only give a positive impact but also give negative impact on human skin health. Direct sunlight (Ultraviolet/UV) will be absorbed by the skin (Wondrak *et al*., 2006). This cause skin damage such as sunburn, erythema, black spot, and skin darkening. Skin aging, wrinkle, and skin cancer were other problems caused by sunlight radiation (Amaro-Ortiz *et al*., 2014).

Normally skin has a self-defense mechanism by producing antioxidant superoxide dismutase (SOD) to prevent oxidative stress of Reactive Oxygen Species (ROS) condition caused by overexposure to direct sunlight which leads to skin tissue damage (Budiawan, 2019). Direct sunlight overexposure makes ROS production overwhelming fibroblast production which protects skin tissue. Synthetic-based sunscreen products could be used to protect skin from direct sunlight overexposure but this can be replaced by natural resources such as soursop fruit. Soursop fruit contains antioxidant flavonoids and acetogenin. Soursop fruit also rich of alkaloid, saponin, and caroten (Anaya Esparza and Montalvo-González, 2020). Flavonoid was already known for its activity of antioxidant and sunscreen effect (Choquenet *et al*., 2008).

Sunscreen activity can be shown by Sun Protective Factor (SPF) number. Sun Protective Factor is the amount of UV energy that could be reached minimal erythema dose (MED) of sunscreen protected skin (Nobre and Fonseca, 2016). A higher SPF number means better protection for the skin from the UV radiation effect. The flavonoid content of soursop fruit is distributed on every part of it. This background leads to the aim of this research which is to determine the sunscreen activity of soursop seed extract by measuring its SPF number.

METHODS

A. Tools and Material

Spectrophotometer UV Vis was used to determine the SPF number. Other tools being used in this research were rotary evaporator, oven, analytic balance, micropipette, beaker glass, and erlenmeyer glass. Materials being used in this research were pro analysis and technical grade ethanol 96%, *aqua destilata*, and soursop fruit from Madiun City, East Java area.

B. Extract Preparation

Soursop seeds are separated from other parts of the fruit and cleaned with clean water. The seeds dried in the oven and ground. Ground seeds were sieved until the powder was obtained. The 100 g powder of soursop seeds was macerated with 500 ml ethanol 96% for 5 days. The filtrate from the maceration process is being macerated for another 5 days. The first and the second macerate were mixed and evaporated with a rotary evaporator at 40°C until thick extract was obtained.

C. SPF Measurements

Sunscreen activity was obtained by measuring SPF number in vitro using spectrophotometer UV Vis. Ethanolic extract of soursop seed dissolved into ethanol 96% p.a. until 1000 ppm concentration and then diluted until concentration 75, 125, and 250 ppm. Extract solution concentration series being measured its absorbance on 290-320 nm wavelength with 5 nm interval (Nobre and Fonseca, 2016). Sun Protective Factor was obtained using the formula:

$$SPF = CF \times \sum_{290}^{320} EE \times I \times Abs$$

Where:
CF: correction factor (10), EE: erythema effect spectrum, I: light intensity spectrum, Abs: sample absorbance

D. Data Analysis

Sunscreen activity data were statistically analyzed using the independent T-test analysis method with $\alpha = 5\%$.

RESULTS AND DISCUSSION

Ripe soursop fruit was collected from the Madiun City area and the seeds were separated from other parts to dried in the oven at 60°C for 24 hours. The dried seed was ground and sieved with mesh 40 to obtain the fine powder. The 100 grams fine powder of soursop seed was mixed with 500 ml ethanol 96% (1:5 ratio). The extraction process was used the maceration method. This method was based on the difference concentration between the inner and extracellular of simplicia. The secondary metabolites of soursop seed will diffuse from inner cell tissue to solvent until balance concentration is achieved. The solution from the maceration process was evaporated using a vacuum rotary evaporator at 50°C until 2/3 parts remained. The evaporating process was continued in the oven at 50°C until thick extract was obtained. The evaporating process was performed at a controlled temperature to maintain thermolabile secondary metabolites of soursop seed. From 100 grams powder, 2.73 grams of thick extract were obtained and the extraction yield result from the extraction process was 2.73% w/v.

The extract was made into two concentrations such as 0.15 and 0.25%. The two concentrations were made by weighing thick extract 0.15 and 0.25 grams. Two weighted thick extracts were diluted in *aqua destilata* until 100 ml to SPF measurement. Sun Protective Factor is the amount of UV energy that could be reached minimal erythema dose (MED) of sunscreen protected skin (Nobre and Fonseca, 2016). Every natural source with sunscreen activity has SPF value. Spectrophotometer UV-Vis Jasco 3000 was used to determine the SPF value of soursop seed extract. The extract solution that had been prepared was scanned at 290-320 nm for every 5 nm wavelength. Every absorbance result was recorded and the SPF value was counted using Mansur *et al* (1986) equation (Mishra *et al*., 2012). SPF is a product of multiplication among the correction factor, the amount of EE x I, and the absorbance. The EE x I are constant numbers determined by Sayre *et al* (1979) that cited in Zarkogianni *et al* (2016)(Table 1).

Table 1. Normalized product function used in SPF calculation

λ (nm)	**EE x I**
290	0.015
295	0,0817
300	0,2874
305	0,03278
310	0,1864
315	0,0839
320	0,018
Σ	1

Sun Protective Factor measurement result is described in Table 2. The measurement result showed that 0.15 and 0.25% concentrations of soursop seed extract give SPF values 4.35 and 7.38 respectively. The SPF value was compared with the sunscreen protection category (Table 3). Two concentrations of soursop seed extract were in the low protection category. Statistical test result of 0.15% concentration of soursop extract showed significantly different (p<0.05) SPF value with 0.25% concentration.

Table 2. SPF measurement result

Concentration (%)	Replication	SPF
0.15	1	4.28
	2	4.30
	3	4.45
Average		**4.35**
0.25	1	7.35
	2	7.24
	3	7.54
Average		**7.38**

Table 3. Sunscreen activity category

Protection category	SPF means
Low	≥ 4 < 15
Medium	≥ 15 < 30
High	≥ 30 < 60
Very high	≥ 60

The SPF value that has been shown by the soursop extract is caused by its flavonoids contain. Anaya Esparza *et al* (2020) research showed that soursop fruit contains flavonoids, alkaloids, terpenoids, tannins, glycosides, and essential oils. Nguyen *et al* (2020) research result showed that soursop seed ethanolic extract has flavonoid content which correlated with antioxidant properties. Flavonoids give photoprotection activity by three effects such as antioxidant properties, ultraviolet (UV) absorption, and modulating signal pathway (Saewan and Jimtaisong, 2013). SPF value of soursop seed extract was in the low protection category which was caused by its low concentration. It's proven with increasing SPF value in higher concentration. There is a possibility that the SPF value will show a higher protection category in higher concentration.

CONCLUSION

SPF measurement result showed that soursop seeds extract 0.15 and 0.25% concentration gives 4.35 and 7.38 respectively SPF value. Soursop seeds extract showed sunscreen activity with low protection category.

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