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Research Article

Potential Ethanol Extract Kapuk Randu Leaves (*Ceiba petandra* (L.) Gaertn) As Sunscreen

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ABSTRACT

The sun is a natural light source that plays a very important role in life for the photosynthesis of plants as well as a source of vitamin D for the body. But it also has a bad impact on skin health when exposed to excessive amounts. One alternative that can be used to prevent the impact of excessive sunlight radiation is sunscreen. So research was conducted to find out the activity and value of SPF (Sun Protection Factor) extract of ethanol leaves kapuk randu (Ceiba petandra (L.) Gaertn) at concentrations of 100, 200, 300, 400, and 500 ppm. This study was conducted in vitro using UV-Vis spectrophotometers at wavelengths of 290-320 nm. The test results showed that ethanol extract of kapuk randu leaves has protection activity with successive SPF values at concentrations of 100, 200, 300, 400, and 500 ppm i.e. 3 (minimal protection); 6.9 (extra protection); 10.4 (maximum protection); 13.9 (maximum protection) and 17.4 (ultra protection). Based on the SPF value, ethanol extract of kapuk randu leaves can to be used as the active ingredient of sunscreen with the content of active compounds tannins and flavonoids.

Keywords: *Ceiba petandra (L.) Gaertn*, Sunscreen, SPF

1. Introduction

Indonesia is a tropical country with high sun exposure [1]. High sun exposure can cause the skin to burn or reddish if not protected [2]. Naturally, the epidermis tissue on the skin can counteract the negative effects caused by UV rays such as sweating, melanin formation, and thickening of the stratum corneum, but the epidermis tissue is not able to ward off the UV rays that enter the skin continuously and if left alone without protection, UV rays that enter the skin will penetrate further into the hypodermis, causing elastosis (lack of structural support and elasticity of the skin) and other skin damage that could potentially lead to skin cancer [3][4]. Therefore, the skin needs protection such as the use of sunscreen to minimize the adverse effects of UV rays [5]. The effectiveness of sunscreen is seen from the value of SPF (Sun Protection Factor). The greater the SPF value, the greater its ability to protect the skin from the negative effects of UV rays [6]. Sunscreen can be produced from the synthesis of a compound as well as the extraction of natural ingredients. In the field of cosmetics, the manufacture of products from natural ingredients is more profitable because it has a good tolerance for the skin because does not cause severe irritation to sensitive skin [2]. Farmazah [7] has conducted research from Black Glutinous Rice Emulgel Extract (*Oryza sativa* var. glutinosa) using ethanol extract of 96% containing polyphenols and flavonoids to provide sunscreen activity with SPF 16.07 (ultra protection). Secondary metabolite compounds such as flavonoids and polyphenols have good potential as sunscreen agents. This is because these secondary metabolite compounds have aromatic groups conjugated with carbonyl groups where these compounds can stabilize electron displacement because they can absorb or reduce the intensity of UV radiation [8][9]. One of the natural ingredients that can be used as sunscreen is kapuk randu leaf (Ceiba petandra (L.) Gaertn) because it contains polyphenols and flavonoid compounds[10].

2. Materials and Methods

2.1. Materials

Kapuk randu (*Ceiba petandra* (L.) Gaertn) leaves taken from Ogan Komering Ilir Regency, South Sumatra, Indonesia. The sample is then washed thoroughly and dried by means of wind, and then after drying, the sample is smoothed until it becomes a powder (simplistic). Some of the chemicals used are derived from Nitrakimia and PT. Nissichem Indospecialty such as ethanol 96%, iron (III) chloride, hydrochloric acid, magnesium powder, sulfuric acid, Dragendorff reagent, and Liebermann Buchard reagent.

2.2. Sample Extraction

Simplistic kapuk randu leaves are each weighed and put into a maceration container, then added ethanol 96% until fully submerged. Once mixed with ethanol solvent, the solution is stirred with a mixing rod until homogeneous. Furthermore, the solution is soaked for 3 x 24 hours and filtered every 24 hours to get the desired extract. The extract obtained is then evaporated with a rotary evaporator until it becomes a viscous extract. Furthermore, viscous extract of ethanol kapuk randu leaves is calculated and conducted by phytochemical tests.

2.3. Phytochemical Evaluation

Phytochemical screening is one of the efforts made to determine phytochemicals or active ingredients of secondary metabolite compounds in plants. Phytochemical screening is performed using group detection reagents on drip plates or test tubes [11].

2.3.1. Alkaloid Test

Prepared extract of ethanol leaves kapuk randu (Ceiba petandra (L.) Gaertn) and take a few drops then put in a test tube. To the sample were added 2 drops of Dragendorff reagents and changes were observed after 30 minutes. The test results were declared positive when a reagent Dragendorff formed an orange color and there was a yellow precipitate [11].

2.3.2. Flavonoid Test

Taking a number of samples and then adding magnesium powder and concentrated HCl, in the case of orange-red to red-purple indicates the presence of flavonoids. In the event of an orange-yellow color indicating the presence of flavon, calcon, and auron [12].

2.3.3. Tannin Test

One mL of ethanol extract was added with 3 drops of $FeCl_3$ 10%. Positive samples contain tannins when blackish green or blackish blue [12].

2.3.4. Terpenoid Test

Taken a few drops of samples and then added 2 drops of anhydrous acetic acid and 1 drop of concentrated sulfuric acid (Liebermann-Burchard reagent). The presence of a brownish-red color or a brownish-pink ring positively indicates a terpenoid compound [12].

2.3.5. Saponin Test

A number of samples were inserted into the test tube. Hot water is added to the sample. Changes that occur in the formation of foam are observed as a positive reaction if the foam is stable for 30 minutes and does not disappear at the addition of 1 drop of HCl 2 N [11].

2.4. Sunscreen Activity Test

Testing of sunscreen activity is performed by determining the SPF (Sun Protection Factor) value in vitro using UV-Vis spectrophotometry. Extance is diluted with concentrations of 100 ppm, 200 ppm, 300 ppm, 400 ppm, and 500 ppm. Then it measured its absorbance value at wavelengths of 290-320 nm at intervals of 5 nm. The data were analyzed with the Mansur equation as in equation (1) to get the SPF value [8].

$$\mathrm{SPF} = \mathrm{CF} \times \sum_{290}^{320} \mathrm{EE}(\lambda) \times \mathrm{I}(\lambda) \times \mathrm{Abs}(\lambda) \quad (1)$$

Based on equation (1) it can be stated that CF is a correction factor, EE is the spectrum of erythema effect, I is the spectrum of solar intensity, and Abs is the absorbance of the sample. Meanwhile, the value of EE x I is constant, where the value has been set by Sayre in Dutra [8] as shown in **Table 1** below.

Table 1. Value EE x I

Wavelength (λ)	Value EE x I
290	0,0150
295	0,0817
300	0,2874
305	0,3278
310	0,1864
315	0,0839
320	0,0180
Total	1

3. Results and Discussion

3.1. Extraction and Phytochemicals Screening

The extraction method used in this study was maceration. The maceration method was chosen because it is the safest method used for plant chemical compounds that are not heat resistant (thermostable) [13]. Maceration, this time using ethanol solvents because ethanol has semipolar properties so that active components with diverse polarities can be extracted more perfectly [14]. After maceration, the sample was compacted and evaporated using a rotary evaporator at a temperature of 40°C [15]. The use of high temperatures can damage secondary metabolite compounds in the sample, so a temperature of about 40-50 °C. A thick extract of kapuk randu leaves weighs 11.4 grams, so a yield of 3.8%. Phytochemical results are shown in **Table 2**.

Table 2. Phytochemical content of kapuk randu leaves

Group	Test Results	Color Change Standards
Alkaloid	Negative (Orange without sediment)	Orange yellow precipitate
Terpenoid	Negative (Yellow)	Red
Tannin	Positive (Blackish green)	Blackish green
Saponin	Positive (Yellow and froth.)	Frothy
Flavonoid	Positive (Yellow)	Yellow

3.2. Sunscreen Activity Test

UV rays absorbed when it hits organic compounds from ethanol extracts of kapuk randu leaves occur due to the stability of their electron transfer. This organic compound is an aromatic group that is conjugated with the para and ortho groups between the electron receiving group and the electron release group, thus allowing for the delocalization and transfer of electrons from the electron-releasing group to the electron receiving group. Mechanical quantum calculations show that the delocalization energy of this electron is related to the radiation energy in the UVA and UV B regions [8].

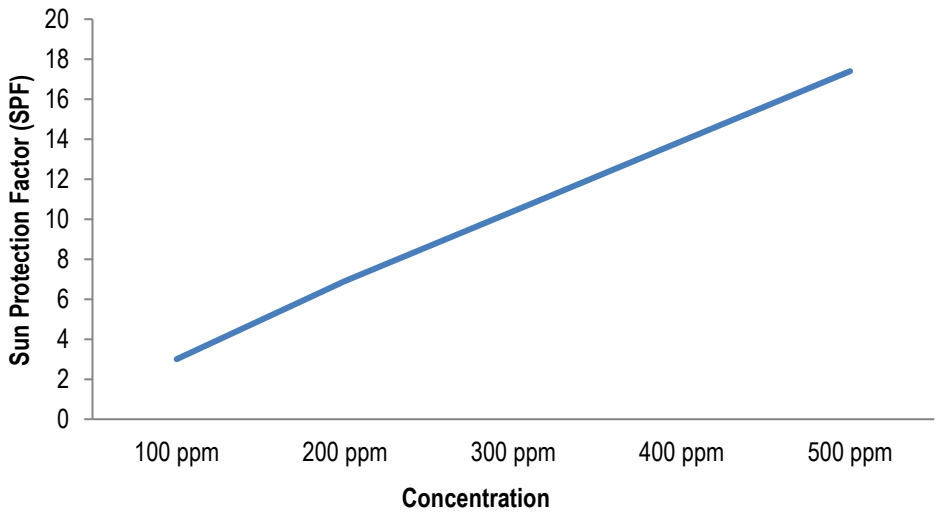

Figure 1. Sun protection factor chart

Description :

Category SPF Value =	Minimal protection	(2 – 4)
	Medium protection	(4 – 6)
	Extra protection	(6 – 8)
	Maximum protection	(8 – 15)
	Ultra protection	(≥15)

Based on absorbance measurements in the wavelength range of 290-320 nm, where this is the wavelength of UV light B. The following SPF values of ethanol extract of kapuk randu leaves are presented in **Figure 1.**

Based on the results obtained from the test of sunscreen extract ethanol leaves kapuk randu, the concentration value and SPF value are directly proportional. The smaller the concentration, the lower the SPF value, and the greater the concentration, the higher the SPF value. This is because when high concentrations of secondary metabolites that have more chromophore groups cause the absorbance value to be high [16].

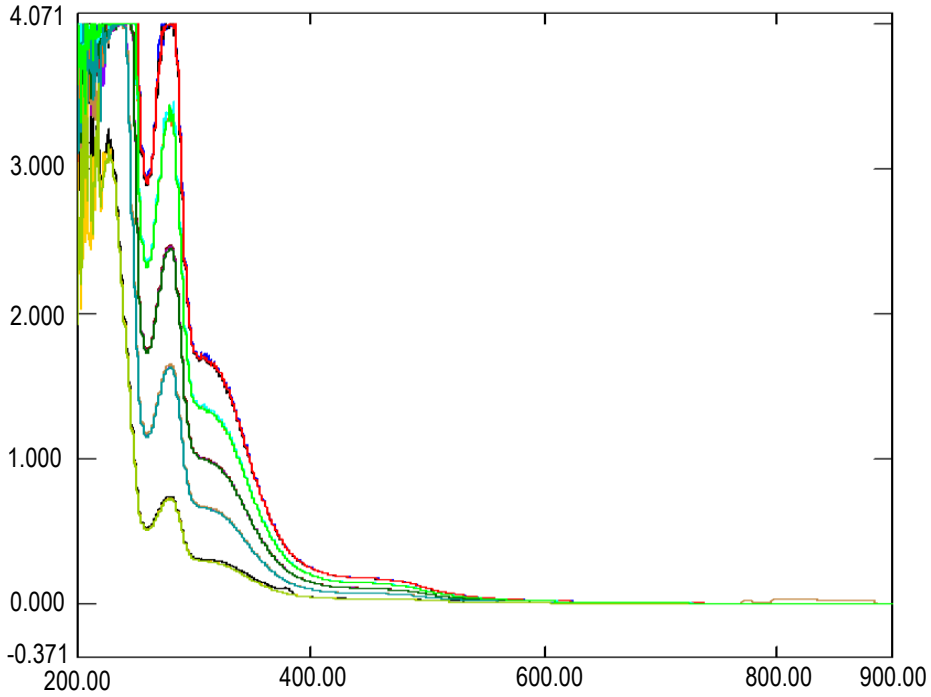

Figure 2. UV-Vis spectra result

Skin without the use of sunscreen will turn red and burn within 10 minutes in the sun. The selection of sunscreen based on the SPF value multiplied by 10 minutes indicates the length of resistance of sunscreen in protecting the skin, where sunscreen is considered good SPF is above 15 [17][18]. The sunscreen testing concentration of 100 ppm obtained an SPF value of 3 (minimal protection), which means it can protect the skin for 30 minutes. The concentration of 200 ppm with an SPF value of 6.9 (extra protection) insured the skin for 69 minutes, the concentration of 300 ppm with a value of SPF 10.4 (maximum protection) defended the skin for 104 minutes, the concentration of 400 ppm with a value of SPF 13.9 (maximum protection) defended the skin for 139 minutes and the concentration of 500 ppm with a value of SPF 17.4 (ultra protection) that can protect the skin for 174 minutes.

In this study, the highest SPF value of ethanol extract of kapuk randu leaves was at a concentration of 500 ppm, with an ultra protection category that is able to protect the skin for 2-3 hours.

4. Conclusion

Based on the results of the study, it can be concluded that ethanol extract of kapuk randu leaves has the potential as sunscreen at a concentration of 500 ppm with a 17.4 SPF value.

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