DETERMINATION OF IN VITRO SUN PROTECTING FACTOR VALUE OF EUCHEMEA SPINOSUM EXTRACT CREAM

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ABSTRACT

The research was aimed to determine in vitro SPF value of seaweed (Eucheuma spinosum) extract used as protection level of sunscreen. Fresh Eucheuma spinosum sample was extracted by maceration method with methanol 80% and subsequently extracted by liquid-liquid extraction with n-hexan and 96% of ethanol. The extract was formulated as cream cosmetic at concentrations of 2%, 4%, 6%, 8% and 10% and determined its SPF value using spectrophotometry method. The research data revealed that cream containing 10% of extract was the most effective as sunscreen with SPF value of 14.74. It can be categorized as ultra protection level.

Key words : SPF, in vitro, Eucheuma spinosum Extract, Sunscreen
Determination of In Vitro Sun Protecting Factor Value of Euchema spinosum Extract Cream

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Abstract

The research aimed to determine in vitro SPF value of seaweed (Euchema spinosum) extract used as protection level of sunscreen. Each Euchema spinosum sample was extracted by immersion method with alcohol at 92% and subsequently extracted by liquid-liquid extraction with n-hexane and 96% ethanol. The extract was formulated at various concentrations of 0%, 4%, 8%, 12%, and 16% and determined its SPF value using spectrophotometry method. The research data revealed that cream containing 10% of extract was the most effective as sunscreen with SPF value of 14.34, it can be categorized as high protection level.

Keywords: SPF in vitro, Euchema spinosum extract, sunscreen.

Introduction

Many kind of seaweeds harvested from nature and man culture have been reported in abundance on the shore of eastern sea of Indonesia. Some of these seaweeds have been cited as possible sources for industrial use while others are valuable foods for daily life.

Euchema sp. Seaweed is one of the marine resources that used by many people for diet, herbs, and cosmetics. Euchema spinosum, one type of red algae (Rhodophyta), contains proteins, phycobilins, and phycobiliprotein compound which composed of a chromophore group. The materials of mycosporine, carotenoids, flavonoids, carboxylic, and phenolic compounds is synthesized from this type of algae and is used as a cosmetic component to defense excessive exposure of ultraviolet radiation.

(4,5)

Ultraviolet is a description of the band of sunrays that have length spectrum shorter than visible light but longer than X rays. The length of these rays are 2800-4000 Å and include UVA, UVB and UVC. During the past few decades it has become increasingly evident that exposure to ultraviolet radiation, UVB and UVA, is potentially harmful to humans. When these sunrays hit the skin, some are scattered, some reflected but much is absorbed and will give adverse effects such as erythema, pigmentation and premature aging.

The degree of skin damage depends upon a number of factors including the length and frequency of exposure on the skin, sunlight intensity and sensitivity of each person. Even though the body's natural protection system is able to withstand some radiation, with the alarming numbers of skin damages, it is increasingly evident that the skin need additional protection from ultraviolet radiation. One of effective methods to protect the skin against excessive and unavoidable UV radiation is by using sunscreen product that commonly absorbs or reflects some of the sun's ultraviolet (UV) radiation to the skin (11,12). Activity of a sunscreen product can be determined in vitro by determining the SPF (Sun Protecting Factor) and measuring the percentage of erythema and pigmentation transmission on the skin. The aim of this study are to determine the SPF level of sunscreen cream containing various concentration of Euchema spinosum extracts by UV spectrophotometric method in vitro.
Material and Methods:

Material

*Eucnema spinosum* were collected from cultivation in Bangka Tenggara, South Sulawesi. The materials used for extraction and formulation are distilled water, *n*-hexane, methanol 95%, methanol 80%, 96% ethanol, ethanol 95%, *n*-hexane, methyl alcohol, stearic alcohol, propyl paraben, alpha-tocopherol, methyl paraben, propylenglikol, span 60 (Merck®) and tween 60 (Merck®). All the other chemicals used for spectrophotometric analysis were of analytical grade.

Methods

Preparation of ethanolic extract. An air-dried sample of the seaweed was extracted by maceration method with 80% methanol solution. Then the methanolic extract was partitioned by solid-liquid extraction method with *n*-hexane and 96% ethanol solutions as the eluent and the ethanolic extract was collected and concentrated in vacuo.

Measurement of Ethanolic Extract Absorbance.

The extract was diluted with ethanol as the solvent to prepare concentration of 0 ppm, 20 ppm, 30 ppm, 40 ppm and 50 ppm extract solution. Absorbance was then measured with spectrophotometer UV at 290-400 nm wavelength.

Preparation of sunscreen cream

The ingredients and its amounts were shown in table 1. The water phase and oil phase were heated in the water bath to a temperature of 70°C respectively. The oil phase was poured slowly into the water phase and stirred constantly until it formed a smooth and uniform base-cream. When temperature of the cream was 45°C, ethanolic extract of *Eucnema spinosum* was added and homogenized.

Measurement of Sunscreen Cream Absorbance.

The cream was diluted with absolute ethanol with concentration of 0.4 g/L. Absorbance was then measured with spectrophotometer UV at 290-400 nm wavelength.

<table>
<thead>
<tr>
<th>Table 1: Design Formula of Sunscreen Cream</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol extract of <em>E. spinosum</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Stearic acid</td>
<td>4</td>
<td>4</td>
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<td>Tween 60</td>
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<tr>
<td>Span 60</td>
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<tr>
<td>Propylenglikol</td>
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<tr>
<td>Methyl Paraben</td>
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<tr>
<td>Fragol Paraben</td>
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<tr>
<td><em>α</em>-Tocopherol</td>
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<tr>
<td>Distilled water</td>
<td>78.75</td>
<td>78.25</td>
<td>72.75</td>
<td>70.75</td>
<td>70.75</td>
<td>68.75</td>
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</table>

Results and Discussion

The SPF is a quantitative measurement of the effectiveness of a sunscreen formulation. To be effective, product should have a wide range of absorbance between 290 and 400 nm. Evaluation of the efficiency of a sunscreen formulation has for a long time been assessed through in vivo test, which is performed with human volunteers. In vivo test is time-consuming, is normally subject to certain degree of variability, not mention the ethical problems of testing with human. The in vitro SPF is useful for screening test during product development, as a supplement of the in vivo SPF measure.

Research on the In Vitro determination of SPF (Sun Protecting Factor) of sunscreen cream
contains *Euchema spinosum* extract gave many results as follows:

1. Measurement of extract absorbance
   The absorbance curve of ethanolic extracts of 10 ppm, 20 ppm, 30 ppm, 40 ppm and 50 ppm in absolute ethanol were determined at wavelength of 290-400 A°.

2. Measurement of absorbance dosage
   The absorbance of each cream was measured at wavelength of 290-400 nm with a concentration of 0.4 g/L in absolute ethanol.

![Absorption curve of ethanolic extract of *Euchema spinosum* in absolute ethanol.](image)

Figure 1: Absorption curve of ethanolic extract of *Euchema spinosum* in absolute ethanol. The concentration of cream A = 10 ppm, cream B = 20 ppm, cream C = 30 ppm, cream D = 40 ppm and cream E = 50 ppm.

In this research, the *Euchema spinosum* extract were evaluated by UV spectrophotometry at wavelength of 318 nm and all of creams were evaluated at wavelength of 324 nm.

![Absorption curve of 0.4 g/L of the sunscreen cream in absolute ethanol.](image)

Figure 2: Absorption curve of 0.4 g/L of the sunscreen cream in absolute ethanol. Cream A - base cream (without extract), cream B - cream with 2% of extract, cream D - cream with 4% of extract, cream F - cream with 8% of extract, cream G - cream with 10% of extract.

The SPF values found for all creams are in close agreement with the proper SPF for sunscreen products to protect ultraviolet radiation whereas increasing concentration of the extract linearly increased the spectra. It can be observed that the cream containing 10% ethanolic extract of *Euchema spinosum* had the highest SPF value of 14.74 so that it can be used as protective cream against UV radiation.

**Conclusion:**

1. The ethanolic extract of *E. spinosum* can be used as a sunscreen due to its absorption at wavelength of 318 nm.
2. Cream containing 10% ethanolic extract of *E. spinosum* has the highest SPF value of 14.74.

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