Development of Sunscreen Emulgel Containing Cinnamomum Burmannii Stem Bark Extract

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Abstract: Ultraviolet B (UVB) rays are the major cause of sunburns. Sunscreens are used to protect the skin against harmful UV radiation. The objective of this research is to determine the sunscreen activity of Cinnamomum burmannii stem bark extract and finally to develop and characterize the sunscreen emulgel formulation. Cinnamon stem bark was extracted using ethanol by maceration process. Ethanol extract was formulated to topical emulgel preparation and submit to physical and sunscreen activity test. Determination of SPF values of the extract and emulgel were conducted in vitro using spectrophotometer. The result showed that both of the extract and formulated emulgel have potency to protect against UV-B radiation. The emulgel formulated was stabilize base on physical stability test.

Keywords: cinnamon bark, extract, emulgel, sunscreen, spectrophotometer

1. Introduction

Ultraviolet radiation (UVR) is defined as that electromagnetic radiation with wavelengths between x rays and visible light (100 and 400 nm) and is divided into UVA (320-400 nm), UVB (290-320 nm), and UVC (100-290 nm). UVB is largely responsible for erythema of sunburn and suntan of the skin [1]. Excessive exposure to UV carries profound health risks, including atrophy, pigmented changes, wrinkling and malignancy [2]. UVR induced reactive oxygen species (ROS) production and generating photobiological reactions on the skin [3].

Topical application of sunscreens, containing ultraviolet-filters (UV-filters), is preferred protection against adverse effects of ultraviolet radiation (4). The main goals of sunscreens are to protect against UVB radiation and long wavelength UVA radiation, scavenge ROS, activate cellular repair systems, including DNA repair. Antioxidants are commonly added in commercial sunscreen preparations in order to reduce the photo-oxidative damage that results from UV-induced ROS production. [5] [6]

Cinnamomum burmannii Nees ex. Bl. is a shrub or a small tree commonly known as Indonesian cassia, Batavia cassia, and Padang Cassia that distributed in Southeast Asia and is cultivated in parts of Indonesia and Philippines [7]. Cinnamomum burmannii stem bark (cinnamon bark) is one of the plant that known have antioxidant and UV absorption property [8]. Our previous study was evaluated antioxidant activity of cinnamomun bark extract. The study show that the extract have very high antioxidant activity, with the IC₅₀ value is 10.398 μg/mL ± 0.075. The major compound of Cinnamomum burmannii oil is cinnamaldehyde that known have antibacterial [9] and antioxidant activity [10]. Besides cinnamaldehyde , cinnamon bark also containing of cinnamic acid, that known to have sunscreen activity [11][12]. The natural sunscreen activity of the cinnamon bark need further investigated. Combination of sunscreen and antioxidant activity of cinnamon bark, give an advantage in sunscreen formulation.

Most common types of sunscreens presently in use are the topical preparations. Emulgel is one such topical drug delivery system that incorporates properties of both gel and emulsion [13]. Emulgels show good spreadability and ease of compliance [14]. Emulgel having physical stability better than cream and ointments [15].

There are some in vitro assays methods to determine sun protecting factor (SPF) of the samples, one of them is with measurement of the absorption characteristics of the sunscreens product on the basis of spectrophotometric analysis of dilute solutions. UV spectrophotometric method for SPF determination is easy, rapid, cost effective, and can be used for in vitro determination of SPF value in many cosmetic formulations [16].

The objective of this research is to determine the sunscreen activities of cinnamon bark extract and the formulated emulgel. The ultimate goal of this research is to develop an effective herbal sunscreen emulgel.

2. Methodology

2.1 Plant Material

Stem barks of Cinnamomum burmannii Nees ex. Bl. were collected from manoko, West Java, Indonesia, and determined at herbarium Bandung Institute of Technology (ITB), Indonesia. The stem bark after collection were dried and powdered to get a coarse powder.

2.2 Extraction Process

The dried powder of cinnamon bark was extracted by maceration with ethanol (EtOH) for 24 hours at room temperature for three times, and evaporated using a vacuum rotary evaporator.

2.3 Phytochemical screening

Preliminary screening of secondary metabolites such as alkaloids, flavonoids, saponins, quinones, polyphenol, tannin, terpenoids and steroid were carried out according to the common phytochemical methods [17].

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