



Gambir (*Uncaria gambir* Roxb) as Natural Cosmeceutical Agent

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ABSTRACT

Uncaria gambir contains varying amounts of polyphenols, mainly catechins. Catechin has a photo-protection activity which can be applied as sunscreen. The future goal of this cosmeceutical product is to prevent skin photo-damaging by UV-radiation.

Keywords: Catechin, cosmeceutical, gambir, photo-protection, sunscreen

ABSTRAK

Uncaria gambir mengandung banyak komponen polifenol, terutama *catechin*. *Catechin*, sebagai senyawa utama tanaman gambir, memiliki aktivitas perlindungan terhadap cahaya matahari sehingga dapat diaplikasikan dalam sediaan tabir surya. Tujuan dengan adanya produk *cosmeceutical* ini adalah untuk mencegah kerusakan kulit akibat radiasi sinar ultraviolet. **Hanny Setyowati. Gambir (*Uncaria gambir* Roxb) sebagai Agen Cosmeceutical Alami**

Kata kunci: *Catechin*, *cosmeceutical*, gambir, proteksi cahaya, tabir surya

INTRODUCTION

Excessive exposure to ultraviolet (UV) radiation can induce oxidation (free radical substances) causing a wide range of adverse effects such as sunburn, photo-aging, photo-immunosuppression, and photo-carcinogenesis. Use of sunscreen is important to protect against excessive UV exposure and to reduce UV damages.¹

Cosmeceutical products are considered to be the hybrid of cosmetics and topical medications that influence the biological and physiological function of the skin.² Cosmetics are developed to reduce wrinkles, fight acne, and to control oil secretion. Formulations like skin protective, sunscreen, antiacne, antiwrinkle, and antiaging are designed using varieties of materials, either natural or synthetic. Natural substances extracted from herbs, like gambir extract, can act as a potential photo-protective resources owing to their UV absorbing property. The use of botanicals is an approach to reduce the UV generated ROS-mediated photo-damage, immune-suppression and skin cancer in patients. These herbal products were claimed to have no side effects commonly seen in synthetic

products.³ Due to both their skin-altering and skin-healing function, natural cosmeceutical products should be considered.

In Indonesia, *Uncaria gambir* Roxb. (Gambir) oftenly used for medications, such as for burns, headaches, diarrhea, dysentery, gargles, cancer sores, sore skin, and to aid digestion.⁴ Gambir was extracted from the leaves and young twigs of *Uncaria gambir* Roxb plant, which is a member of the Rubiaceae family. It contains several officially recognized pharmacological compounds:⁵ catechin, catechu acid, red catechu, quercetin, fat, and wax. This substance has antioxidant activity with total phenolic and flavonoid contents 18.37±2.79 mg gallic acid equivalents (GAE)/g dry weight and 5.82±2.23 mg rutin equivalents (RE)/g dry weight, respectively.⁶ Catechin is a bioactive compound used as a raw material in various industries, especially in cosmetic and pharmaceutical industries.⁷ Catechin content in gambir is used as one of the quality parameters in Indonesia gambir trading standard, SNI 01 - 3391-2000.⁸

The following section deals with the source of UV radiation, its types, adverse effects

on the skin and its protection by botanical sunscreen.⁹

LITERATURE REVIEW

Cosmeceutical

Cosmeceuticals usually contain active ingredients such as vitamins, phytochemicals, enzymes, antioxidants, and essential oils and can be applied to products such as creams, lotions, and ointments. Therefore, cosmeceuticals have recently attracted increased attention because of their beneficial effects on human health.¹⁰ Several ingredients that have been used for cosmeceuticals were salicylic acid, glycolic acid (AHA), arbutin, ceramide, ascorbid acid, vitamin E, and active components from plants that have a role for antiinflammation, skin regeneration, moisturizers, sunscreen, and antihiperpigmentation.¹¹

Application of Cosmeceutical

Skin aging is a biological complex process due to various intrinsic and extrinsic factors including genetic, hormonal, metabolic changes, and exposure to environmental stresses particularly Ultraviolet (UV) rays from sunlight (Figure 1).¹²



UV rays initiates photo-oxidative reactions to activate protein kinase C enzyme and reactive oxygen species which further reacts with protein lipids and DNA to form cyclobutane pyridine dimers. This leads to erythema, edema, skin sunburn, and cell apoptosis. UV irradiation activates cell surface growth factor and cytokine receptors on keratinocytes and fibroblasts in human skin, critical in the regulation of cell proliferation and survival. UV-driven formation of H₂O₂ regulates the tyrosine kinase activity of the epidermal growth factor receptor (EGF-R) and emerging evidence suggests the inhibition of protein tyrosine phosphatases as a consequence of UV-induced ROS formation (Figure 2).¹³ UVA protection is recommended as UVA radiation is associated with ageing such as wrinkles; thus sunscreen is a vital component of antiageing formulation.¹⁴

Sunscreens

Sunscreens are cosmetic products to protect skin from damage by sunlight radiation. UV filters can be grouped into two broad categories based on their mechanism of action: chemical and physical UV blockers. Chemical sunscreens are generally (not inclusive) aromatic compounds conjugated with carbonyl group. This general structure allows the molecule to absorb high-energy ultraviolet rays and release the energy as lower energy rays and also, exposure of chemicals to UV light does not allow it to undergo significant structural change. This property makes the chemical substances to retain the UV absorbing potency without significant photo-degradation, thereby preventing the skin from damaging effects of ultraviolet radiation.¹⁵ Topical sunscreen which either absorbs or reflects radiations unable to give complete protection to organs like eyes and lips.^{13,14}

Antioxidant as Sun-protection

Another protective strategy is the use of antioxidants to neutralize free radicals that plays a major role in photo-aging. A large number of antioxidants have been found to exhibit protective effects against the different ROS involved in photo-aging. The detrimental effects of sun exposure can be decreased by the application of antioxidants.¹⁶

Catechin including (-) epicatechin (EC), (-) epicatechin-3-gallate (ECG), (-)

epigallocatechin (EGC), (-) epigallocatechin-3-gallate (EGCG), (+) catechin, and (+) gallic acid (GA) reduces DNA damage and erythema formation due to protection of DNA repair enzymes from inactivation by ROS and due to UVB absorption ability.^{17,18} The use of active photoprotectives from natural origin is

very beneficial in combating the deleterious effects of UV rays. The important group of compounds acts as the UV blockers include phenolic acids, flavonoids, and high molecular weight polyphenols. Naturally occurring phenolic acids include hydroxycinnamic acid and hydroxyl benzoic acid. High molecular

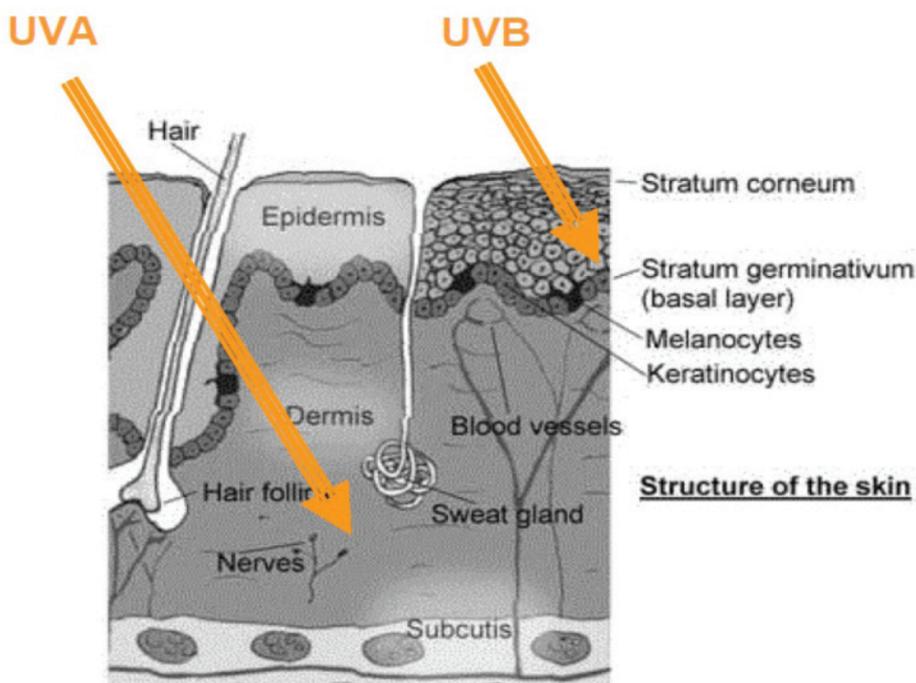


Figure 1. How UV rays affected skin

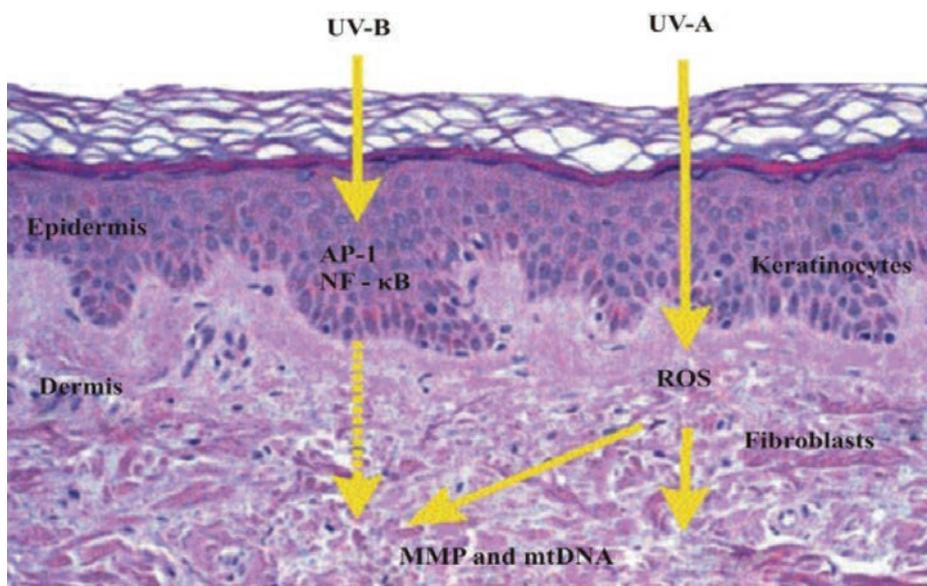


Figure 2. Ultraviolet light interacts with different skin cells at different depths. More specifically, energy from UVB rays is mostly absorbed by the epidermis and affects epidermal cells such as the keratinocytes. Energy from UVA rays affects both epidermal keratinocytes and the deeper dermal fibroblasts.

Note:

AP -1: activator protein- 1, NF - κ B: nuclear factor κ B, MMP: matrix metalloproteinase, mtDNA: mitochondrial DNA, ROS: reactive oxygen species



weight polyphenols include condensed polymers of catechins or epicatechins and hydrolysable polymers of gallic or ellagic acids. Many flavonoids such as quercetin, luteolin, and catechins are found to be better antioxidants as well as good UV blocker.^{9,18}

Catechin

Catechin is a group that occupies an intermediary position in the tannin hierarchy as a family of catechin tannins,¹⁹ successfully isolated from *Uncaria gambir* by pre-purification method with yield of 96,17%. This active compound could be determined by FT-NIR spectroscopy along with chemometric tools.²⁰ Gambir extracts is not only have antioxidant effects but also antibacterial, antiseptics, and wound healing activity due to

their catechin contents.²¹



Figure 3. *Uncaria gambir* Roxb.

The sun-protection activity was done by in vitro analysis. The result of SPF (sunburn protecting factor) value increases according to additional gambir extract.²² Mixed gambir extract with ethyl p-methoxycinnamate possessed protection against UV-A and UV-B.²³ The best results indicated by high value of

SPF and low value of erythral transmission and pigmentation transmission.²⁴

CONCLUSIONS

The use of botanicals substances as photo-protective has been gaining significant attention of researchers due to their safety, multiple biological actions on the skin and cost effectiveness. Catechin, an active compound from Gambir, has photo-protection activity towards UV-A and UV-B. This active compound is preferred over the chemical sunscreens due to the broad spectrum of UV absorption, protective effect against oxidative stress, inflammation and cancer. The suitable formula into cosmeceutical product can increase the effectivity into skin application, especially to be use as sunscreen.

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