

A PLANT BASED SUNSCREEN PRODUCT

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Introduction

The harmful effects of solar radiation are caused predominantly by ultra violet region of the electromagnetic spectrum. Sunburns, skin cancers, premature skin aging and suppression of the immune system are linked to exposure of skin to ultraviolet radiation. Solar ultra violet radiations are divided into three categories¹.

- UV - A : 320-400 nm
- UV - B : 280-320 m
- UV -C : 200-280 nm

UV-C is the most biologically damaging radiation, but it is filtered out by the ozone layer. UV-B is not completely filtered out and is responsible for the damage due to sun burn. UV-A radiation reaches the deeper layers of the epidermis and provokes premature aging. Ultra violet radiation has been implicated as a causative factor of skin cancer. Due to these facts sunscreen substances are now incorporated in creams, lotions, shampoos and other hair and skin preparations. Regular use of sunscreen products may help to reduce the chance of the harmful effects of ultraviolet radiations.^{1,2}

Sunscreen is a topical product that absorbs or reflects some of the solar ultraviolet radiation on the skin exposed to sun light and thus helps to protect against sun burn and other harmful effects of UV radiation. With the thinning of the ozone layer, protection from sun's rays has become more important. There are two kinds of sunscreen one works as a physical block, the other works as a chemical block³. The best known physical filters are zinc oxide and titanium oxide, naturally occurring minerals being more effective than some chemical sunscreens¹.

Chemical blocks that are synthesized and used in sunscreen products as active ingredients work by absorbing ultraviolet rays before they reach the skin's surface. It is believed that the rise in skin cancer is linked with increased

use of chemical filters⁴. Some of the chemical filters are genotoxic. The evaluating studies on sunscreen use and cancer has shown that chemical filters in sunscreen products cause more cancer deaths than they prevent.⁵ Some studies suggest that sunscreens interfere with the skin's ability to produce vitamin D and can cause hives and contact sensitivity². As adverse effects are observed in synthetic sunscreen products, there is a need for an alternative product which does not cause adverse reactions. The focus is now on natural plant based sunscreens. Since they are natural, they may not lead to such problems.

The effectiveness of Sunscreen is measured by a factor called Sun Protection Factor. The amount of light that induces redness in sun protected skin divided by the amount of light that induces redness in unprotected skin is known as the Sun Protection Factor. It is denoted as SPF and is mainly a measure of UVB protection. SPF ranges from 1 to 45. Generally evaluation of SPF has been assessed through in vivo methods which have been performed on human volunteers. In this study an in vitro method was employed to calculate the SPF of extracts and the final product.

The in vitro methods are of two types. Methods which involve the measurements of absorption or the transmission of UV radiation through sunscreen product films in quartz plates or bio membrane and methods in which absorption characteristics of the sun screen agents are determined based on spectrophotometric analysis of dilute solutions 6-10. Usually for extracts 0.02% solutions and for oils 0.1% solutions are used in this analysis¹⁰.

Mansur et al.(1986), developed a very simple mathematical equation utilizing UV spectrophotometry^[10]. The Equation is given below for the in vitro method.
$$SPF_{\text{spectrophotometric}} = CF \sum_{290}^{320} EE \times I \times Abs$$

Where : EE - erythermal effect spectrum; I - solar intensity spectrum; Abs - absorbance of sunscreen product; CF - correlation factor (=10)

The values of EE x I are constants. They were determined by Sayre et al.(1979) and shown in table .1

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Table 1 –Normalised product function used in the calculation of SPF (Sayre et al. (1979))

Wave length (nm)	EE x I (normalised)
290	0.0150
295	0.0817
300	0.2874
305	0.3278
310	0.1864
315	0.0839
320	0.0180

Plants which are commonly available in Sri Lanka were selected for the study. In addition to the plant extracts, essential oils were also incorporated to the sun protection gel.

The Sun Protection Factor and Anti-oxidant property of the plant based gel were evaluated in this study.

- Piper betle*
- Centella asiatica*
- Punica granatum*
- Alpinia galangal*
- Phyllanthus emblica*
- Alpinia calcarata*
- Aloe vera*

