



RESEARCH ARTICLE

**Determination of Sun Protecting Factor of Methanolic Extract of *Butea
Monosperma* Flower**

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ABSTRACT

Determination of SPF (sun protecting factor) of methanolic extract of flower of given herbal drug *Butea monosperma* which is previously used for various pharmacological activities like antimicrobial, wound healing, etc. Here determination of SPF is step to prove its excellency in sun burn disease. SPF is a laboratory measure of effectiveness of sunscreen factor. Higher the SPF value more protection against ultraviolet radiation which causes sun burn disease. SPF determination is the in vitro testing of sunscreen activity with the help of UV spectrophotometer (290-320nm). Here different dilutions of extract of given herb is taken in the consideration for the measurement of SPF which is compared with each other to get the view for higher photo protective value.

KEYWORDS

Butea Monosperma, Flower and Sun Protecting Factor

INTRODUCTION

Ultra Violet Radiations (UVR) exposure to skin causes skin disorders such as squamous cell carcinoma, basal cell carcinoma,¹ accelerated skin ageing, immune depression of skin and photodermatoses.^{2,3} The UV radiations are categories in three categories as such UV-C (200-280nm), UV-B (280-320nm) UV-A (320-400nm). From above three categories of UV radiations, UV-C radiation can cause severe biological damage to skin as compared to UV-B and UV-A radiation. But UV-C radiations are filtered by the ozone layer, so UV-B and UV-A radiation are currently the reason for causing skin cancer.⁴ So as to avoid this radiation to cause damages to the skin some additives are used in the formulations which is having higher photo protective value or we can say that higher sunscreen activity.

There are so many Sunscreen agent formulations are available in market today obtained either for synthetic or natural source. The example for synthetic agents are Octabenzol, Ocetyl methoxycinnan-ate, Benzophenone-3, Provatene, 2-Ethoxy ethyl p-methoxycinnamate, Sulisobenzone, Mexenone, Avobenzene, Dioxybenzone, 4-dimethyl amino benzoic acid, etc. and the example to natural agents are Antioxidant (alpha carotene, Ascorbic acid, Flavonone and Flavones), Vitamins and Enzymes (Superoxidedismutase, Peroxidase and Proteolytic).¹

Sunscreen agents are to be considered effective when they have good sun protecting factor (SPF). SPF is a ratio of UV spectrometric energy required to produce a minimal erythema dose ($MED_{\text{protected skin}}$) in protected skin to ($MED_{\text{unprotected skin}}$) unprotected skin. The in vitro model for determination of SPF is to take the absorbance of prepared solution of herbal extract between 290-320 nm at every 5 nm intervals.

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SPF can be calculated by applying the following formula known as Mansur equation.^{5,6}

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

Where,

CF = Correction factor (10)

EE (λ) = Erythmogenic effect of radiation with wavelength λ

Abs (λ) = Spectrophotometric absorbance values at wavelength λ .

The values of $EE(\lambda) \times I(\lambda)$ are constants and given in table. 1

Table 1

Wavelengths (nm)	Value of $EE(\lambda) \times I(\lambda)$
290	0.0150
295	0.0817
300	0.2874
305	0.3278
310	0.1864
315	0.0837
320	0.0180

Butea monosperma is erect medium sized deciduous tree, it grows up to 15m in height, the leaves are pinnate with an petiole of 8-16cm and three leaflets are large and stipulate, each leaflet is of 10-20cm long, the flowers are 2.5cm long and are bright orange red and produced in racemes upto 15cm long, fruit is a pod of 15cm long and 4.5cm broad.⁷ The chemical constituents of the methanolic extract of flower is Butrin, Chalcones and Aurones.⁸ The various pharmacological activity proven earlier from the flower extracts are, Wound healing activity was found in methanolic extract of flower.⁹ Antimicrobial activity was found in hydro alcoholic (Methanol + Water) extract of flower.¹⁰ Acid Base indicator activity from dye obtained

(aqueous extract) from flower.¹¹ Extract of *butea monosperma* having negligible skin irritancy on rabbits and human skin in cream and gel formulation thus it can be potentially safe for topical cosmetics.¹²

MATERIAL AND METHODS

Collection of Plant Material

The herbs used for determination of SPF were collected in the month of February 2014 from the Rajkot region, Gujarat and it is authenticated by Botanical survey of India (No. BSI/Tech./2014/CP01). The flower extract is used for determination of SPF.

Preparation of Standard Solutions

The dried powder of flower of *Butea monosperma* (100gm) is extracted with methanol for 36hrs. After completion of extraction the filtered extract is concentrated and kept in desiccators to get dry and percentage yield was found to be 12.6w/w.⁹

10 mg of extract was dissolved in 100 ml methanol solvent to produce 100ppm (part per million) solution. From prepared 100ppm solution 0.2ml, 0.4ml & 0.6ml solution is pipette out and diluted up to 10ml to produce 2ppm, 4ppm & 6ppm. And this solution is subjected to further process for determination of SPF.¹³

Determination of SPF Value

The absorbance of working standards were taken in the fixed wavelength mode and wavelengths are 390nm, 295nm, 300nm, 305nm, 310nm, 315nm and 320nm with the help of UV spectrophotometer (JASCO SPECTROPHOTOMETER152761148) and obtained absorbance were multiplied with EE values and their summation was multiplied with correlation factor 10.

RESULTS

The SPF of different concentrations of *Butea Monosperma* flower extract was determined by using UV spectrometric analysis is shown in table 2. (JASCO SPECTROPHOTOMETER152761148) and the spectrometric analysis is recorded in Image 1.

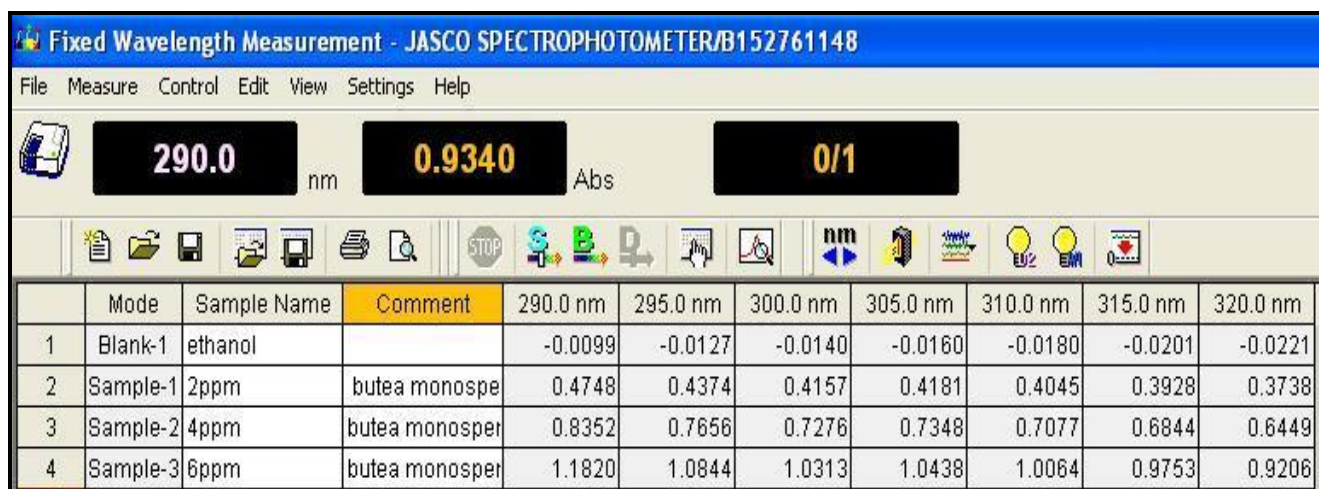


Figure 1

Table 2

Wavelength (nm)	EE _(λ) employed	Absorbance of Concentration 1. (2ppm)	Absorbance of Concentration 2.(4ppm)	Absorbance of Concentration 3.(6ppm)
290	0.0150	0.4748	0.8352	1.1820
295	0.0817	0.4374	0.7656	1.0844
300	0.2874	0.4157	0.7276	1.3013
305	0.3278	0.4181	0.7348	1.0438
310	0.1864	0.4045	0.7077	1.0064
315	0.0837	0.3928	0.6844	0.9753
320	0.0180	0.3738	0.6449	0.9206

The SPF values of different concentrations of *Butea Monosperma* flower extract are 2ppm, 4ppm, & 6ppm having respectively and shown in table 3.

Table 3

Concentrations	SPF value
2ppm	7.1001
4ppm	7.2576
6ppm	8.6160

Which proves that higher the concentration of extract having higher the SPF value.

CONCLUSION

Here determination of sun protecting factor of *Butea Monosperma* provides way towards considering this type of drugs which are having higher photo protective activity along with absence of adverse effect and topical safety. This type of drug can be used in formulation of sunscreen preparation to minimize the use of synthetic additives which are having side effects after longer use. So we can say that use of herbs in the formulation of sun protecting cosmetics is way towards healthy cosmetics.

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