

# Phytochemical screening of *Basella alba* leaves extracts and evaluate its efficacy on sun burn (Sun Protection Factor)

Hema Arya<sup>1</sup>, Chandra Mohan<sup>2</sup>, Savita Pandey<sup>3</sup>, Meenakshi Verama<sup>4</sup>, \*Vinod Kumar<sup>5</sup>

<sup>1</sup>Asst. Prof. Sharada University, Knowledge Park III, Greater Noida, Uttar Pradesh 201310, India.

<sup>2</sup>Asst. Prof., SBAS, K. R. Mangalam University, Gurugram 122103, Haryana, India

<sup>3,4</sup>Asst. Prof., K. R. Mangalam University, Gurugram 122103, Haryana, India.

<sup>5</sup>Asst. Prof., SMAS, K. R. Mangalam University, Gurugram 122103, Haryana, India

\*vinod.kumar@krmangalam.edu.in, +91-8447702535

**Abstract:** *Plant based preparation have been used to treat illness and beautifying the skin from ancient time. Basella alba is one of the important leafy vegetable species belongs to Basellaceae family have been used in traditional medicine system to treat several disorders in India. Apart from therapeutic use, it is the rich sources of many nutrients and antioxidant compounds which can be used to protect the skin from UV rays. The current work involves the evaluation of sun protection factor (SPF) of various extracts viz alcoholic, ethyl acetate and methanolic of Basella alba plant. All extracts were prepared via hot extraction using soxhlet and the total phenolic content and total flavonoid contents and sun protection factor (SPF) were calculated. Among all methanolic leaf extract showed the highest value i.e.,  $533.28 \pm 0.16$ ,  $446.02 \pm 0.1$  and  $12.04 \pm 0.011$  value of total phenolic content, total flavonoid contents and SPF value respectively.*

**Key words:** *Basella alba, Sun protection factor, total phenolic content, total flavonoid contents, Sun burn*

\*Corresponding author

E-Mail: vinod.kumar@krmangalam.edu.in (Mr. Vinod Kumar)

## 1. Introduction

Plants based preparation have been used to treat various disorders in humans and animals from ancient time, apart from the various therapeutic use medicinal plants also have the capacity to enhance the skin appearance and may provide protection against various skin disorders. As per World Health Organization, sun rays not only provides nutrients to the human body, which is important for growth of bones by boosting the body's vitamin D but the excessive exposure or amount can leads to various skin disorders such as sunburns, wrinkles, lower down the immunity against infections, causes premature aging, and cancer. Ultraviolet (UV) region can divide in to three regions: UV-A having wavelength 320-400 nm, causing premature aging, UV-B (320-400 nm) does not harm ozone layer and may causes sun burn) & UV-C fall between 200-290 nm, filtered by the earth atmosphere. Ultraviolet (UV) radiation may generate free radical species that causes oxidation and leads to various skin changes "[1]". Herbs having high antioxidant potential provide permanent protection against ultraviolet (UV) rays. Sunscreens are one of the pharmaceutical cosmetic formulation like tablet, capsules, moisturizers, nail polish, lotions, skin preparations etc that avoid sun burn and other dermatological disorders "[2]". The ability to block harmful UV-B radiation of any molecule is expressed by the sun protection factor (SPF), which is the energy required to produce minimal erythema dose (MED) divided by the UV energy required to produce MED on unprotected skin. Minimal Erythema Dose is defined as the lowest time interval or dosage of UV light irradiation sufficient for producing a minimal, perceptible erythema on unprotected skin. However medicinal formulation of plant origin are more safe as compare to those containing synthetic ingredients because of various toxicities and side effects associated with them. Medicinal plants which are rich in antioxidant, phenols, glycosides etc. are having natural capacity to stop the penetration of ultraviolet ray and protect the skin from others dermatological disorders. Therefore antioxidant rich medicinal plants can playing an important role for the research and can be open new window for new biological active compounds.

*Basella alba* or Ceylon spinach belongs to order Caryophyllales having fleshy, ovate to heart-shaped leaves with length 5 to 11 cms, Spikes are solitary and axillary, it having fleshy fruit which are ovoid or spherical in shape. It has been used to treat fungal, anemia, seizures, etc disorders. Apart from this it provide positive effect on total-body vitamin A, rural people of Orissa, India used root paste with rice water to cure irregular periods from ancient times. The leaves of *Basella alba* used to treat hypertension by Nigerians, refreshing sleep as per

ayurveda system of medicine, malariain Cameroonian and providing soothing and cooling on burns“[3]”. Apart from this it is also used to treat hemorrhages, constipation in children, various skin disorder, sexual disorder etc. Literature showed that *Basella alba* acting as good source of Vitamines, minerals, flavonoid and phenolic compounds etc which make this plant very useful for humans. *B. alba* showed strong antioxidant activity due to presence of numerous flavonoid and phenols“[4,5]”. Traditionally *B. alba* plants paste is used to protect skin against the sun harmful radiation but due to lack of valid scientific data in ancient literature promote us to carry the present study and determine the SPF value of alcoholic, ethyl acetate and methanolic leaf extracts of *B. alba* through transmittance method.

## 2. Materials and Methods

Dried leaves of *B. alba* were collected, washed with distilled water, dried under dark for 3 to 5 days, and make fine powder form using mechanical blender. Alcoholic, ethyl acetate and methanolic leaf extracts were prepared using hot extraction technique and concentrated under reduced pressure.

**2.1 Chemicals and Materials:** All the chemicals used for evaluation was obtained from Hi media (Delhi).

**2.2 Apparatus:** UV Shimadzu UV-2600 spectrophotometer.

### 2.3 Sample preparation

1 gram of samples of each extracts were weighed and diluted up to 100 ml with ethanol in 100 ml conical flask, sonicate the mixture for 07 minutes and then withdrawn 05 ml from it and diluted up to 50 ml with ethanol in conical flask. Repeated the same procedure for 05 ml aliquot and diluted up to 25 ml in 25 ml conical flask using ethanol as solvent. Measure the absorbance in the range of 290 to 480 nm using ethanol as blank. Sun protection factor (SPF) values of each extracts were calculated by Mansur equation“[6]”:

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

Where CF = Correction factor (10)

EE ( $\lambda$ ) = Erythmogenic effect of radiation with wavelength  $\lambda$

Abs ( $\lambda$ ) = Spectrophotometric absorbance values at wavelength  $\lambda$

Table 1: Erythmogenic effect value of radiation with wavelength  $\lambda$  and spectrophotometric absorbance values at wavelength (I)

| $\lambda$ (nm) | EE×I (normalized) |
|----------------|-------------------|
| 290            | 0.0150            |

|              |               |
|--------------|---------------|
| <b>295</b>   | <b>0.0817</b> |
| <b>300</b>   | <b>0.2874</b> |
| <b>305</b>   | <b>0.3278</b> |
| <b>310</b>   | <b>0.1864</b> |
| <b>315</b>   | <b>0.0839</b> |
| <b>320</b>   | <b>0.0180</b> |
| <b>Total</b> | <b>1</b>      |

#### **2.4 Preliminary phytochemical analysis**

Preliminary phytochemical analysis of *B. alba* leaves extracts were carried out by using previously described method. “[7]”.

#### **2.5 Total phenolic content (TPC)**

TPC was analyzed using by the Folin-ciocalteu reagent method “[7, 8]”; 02 ml aliquot of leaves extracts were mixed with 1 ml FolinCiocalteu reagent, incubated it for after 5 minutes and added 5 ml, 10 % Na<sub>2</sub>CO<sub>3</sub>, allow standing for 30 minutes at room temperature and measured the absorbance at 725 nm taking Gallic acid as standard and results were expressed as mg Gallic acid equivalent (GAE) per gram of extract.

#### **2.6 Total flavonoid content (TFC)**

TFC was determined by absorbance method “[9]” using Quercetin as the standard. 0.8 ml of all extracts were placed in test tube containing 10% Aluminium trichloride (0.1 ml), 0.4 ml of 1 M potassium acetate and 5 ml of distilled water. Incubate the reaction mixture at room temperature for 25 minutes and measure the absorbance at 415 nm using Quercetin as the standard. The concentration of flavonoid was expressed as mg Quercetin equivalent (QE) per gram of extract.

### **3. Results & Discussion**

#### **3.1 Preliminary phytochemical analysis**

The preliminary qualitative analysis is one of the useful methods which detect various bioactive compounds which is responsible for several pharmacological activities like antioxidant value depends upon the presence of flavonoid and phenolics compounds, further contributed to cure cancer and boost immunity etc. and phytochemical screening of *B.*

*alba* revealed the presence of alkaloids, flavonoids, glycosides, tannins, carbohydrates etc as showed in Table-2.

### 3.2 Determination of total phenolic and flavonoid contents

Phenolic and flavonoid compound can prevent the aging, inflammatory, and cell proliferation, however apart from them also help in the diabetes complications and CVS disorders and complication associated with them like neuropathy, nephropathy and retinopathy etc “[10]”. The total phenolic content of the all leaf extracts of *B. alba*, were calculated from the calibration curve and was  $470.13 \pm 1.1$ ,  $331.17 \pm 0.2$  and  $533.28 \pm 0.16$  and the total flavonoid content was  $333.5 \pm 0.12$ ,  $223 \pm 0.5$  and  $446.02 \pm 0.1$  for alcoholic, ethyl acetate and methanolic extract gallic acid and rutin equivalents/g respectively (Table 3). Phenolic and hydroxyl group containing compounds have redox properties, which allow them to act as good antioxidants.

Table 2: Preliminary phytochemical screening of various leaf extracts of *B. alba*

| S. No. | Phytochemicals constituents | Type of extract |               |            |
|--------|-----------------------------|-----------------|---------------|------------|
|        |                             | alcoholic       | Ethyl acetate | Methanolic |
| 1      | Alkaloids                   | +++             | +++           | +++        |
| 2      | Glycosides                  | ++              | ++            | ++         |
| 3      | Tannins                     | +++             | +++           | +++        |
| 4      | Carbohydrates               | ++              | ++            | ++         |
| 5      | Flavanoids                  | ++++            | ++++          | ++++       |
| 6      | Poly phenols                | ++++            | ++++          | ++++       |
| 7      | Saponins                    | +               | +             | +          |
| 8      | Minerals                    | ++              | +             | ++         |
| 9      | Vitamins                    | ++              | ++            | ++         |

+++ : High    ++ : Moderate    + : Present    - : Absent

### 3.3 Determination of the in vitro sun protection factor

The SPF value of hydroalcoholic, ethylacetate and methanolic leaf extract of *B. alba* was found out be  $6.86 \pm 0.001$ ,  $3.03 \pm 0.021$  and  $12.04 \pm 0.011$  respectively. The methanolic extract offered high SPF value and ethyl acetate showed lowest SPF value among all. The highest value value of SPF indicated that the methanolic extract of *B. alba* can be used as potent sunscreen agent “[11]”.

Table 3: Total flavonoid and phenolic contents with SPF value of all leaf extracts of *B. alba*

| S. No. | Type of extract | Total phenolic content | Total flavonoid content | Sun protection factor (SPF) |
|--------|-----------------|------------------------|-------------------------|-----------------------------|
| 1      | Alcoholic       | 470.13 ± 1.1           | 333.5 ± 0.12            | 6.86 ± 0.001                |
| 2      | Ethyl acetate   | 331.17 ± 0.2           | 223 ± 0.5               | 3.03 ± 0.021                |
| 3      | Methanolic      | 533.28 ± 0.16          | 446.02 ± 0.1            | 12.04 ± 0.011               |

#### 4. Conclusions

The result obtained were showed that ability of extracts to absorb UV radiation and hence proved UV protection ability. It is essential for collection of similar data for different part of plant such as flowers, as well as other parts. This proved activity of plant showed its importance and prophylactic utility in anti-solar formulation. This will be a better, cheaper and safe alternative to harmful chemical sunscreens that used now a day in the industry. Besides its antisolar activity and effects, making it a useful sun care as well as skin care product.

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#### 6. Conflict Of Interest:

The authors have no conflict of interest.

#### 7. Acknowledgments

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