

**FORMULATION & EVALUATION OF IN VITRO SUN PROTECTION FACTOR (SPF)
OF LAGERSTROEMIA SPECIOSA LEAVES EXTRACT**

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ABSTRACT

SPF stands for Sun Protection Factor and is the system used around the world to determine the degree of protection of a sunscreen, applied to the skin at a thickness of 2 mg / cm². *Lagerstroemia speciosa* is a species *Lagerstroemia* in the family Lythraceae. This plant is also known as the pride of India or as a species of Queen pancake plant. The pharmacological properties or uses of this plant include antidiabetic activity, antiviral activity, cytotoxic activity, anti-inflammatory activity, antioxidant activity, antibacterial activity. un protection is an unpredictable theme, which includes different classes of mixes. The photoprotective viability of a sunscreen includes numerous natural exercises, for example, bright (UV) radiation channel properties and cancer prevention agent, calming, and antimutagenic impacts

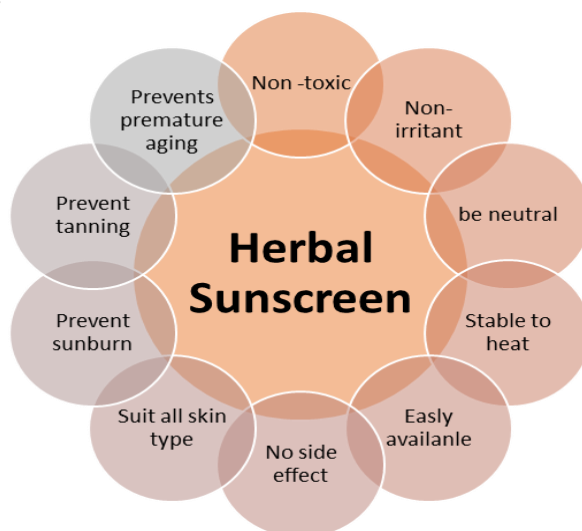
KEYWORD: SPF, Speciosa, Antibacterial, UV, Sunscreen.

INTRODUCTION

Herbal sunscreen (also known as Herbal sunblock, Herbal suntan ointment) is a cream, shower gel or other topical product that protects the skin from the sun's UV (UV) rays and reduces sunburn and other skin lesions, along with the goal of reducing the risk of skin diseases with the help of herbs.^[1] In the United States, however, the term sunscreen ointment largely implies something opposite of sunscreen, and instead refers to a cream that is intended to saturate and increase the introduction of UV rays and tans rather than the square type.^[2] They are often referred to as indoor tanning moisturizers when

used with tanning beds or sunscreen only when used outdoors and may have SPF guarantees. Sun protection is an unpredictable theme, which includes different classes of mixes. The photoprotective viability of a sunscreen includes numerous natural exercises, for example, bright (UV) radiation channel properties and cancer prevention agent, calming, and antimutagenic impacts.^[3] Definition system is likewise a key factor. A few examinations have analyzed the job of regular particles as photoprotective mixes, and a significant number of financially accessible sunscreens contain home grown concentrates however not as sun filters.^[4]

Benefits of Herbal Sunscreen.^[5,6,7]



SPF^[7]

SPF stands for Sun Protection Factor and is the system used around the world to determine the degree of protection of a sunscreen, applied to the skin at a thickness of 2 mg / cm². The test determines the level of UV radiation (mostly UVB) causing barely detectable sunburn in a given person with and without sunscreen. For example, if you need 10 minutes to burn without sunscreen and 100 minutes to burn with sunscreen, the SPF of that sunscreen is 10 (100/10).

In-vitro SPF Estimation By Mansur Equation^[7]

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

Abs(λ)

CF – Correction factor.

EE (λ) – Erythrogenic effect of radiation.

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



Fig. 1: Lagerstroemia speciosa Tree.

Plant Profile

Lagerstroemia speciosa is a species *Lagerstroemia* in the family Lythraceae. This plant is also known as the pride of India or as a species of Queen pancake plant. The common name is Jarul. It is a small or medium sized plant (20-30 m), the size of leaves is 8-14 cm long or 37 cm wide, flower size 20 to 30 cm and petal size 23 cm. Basically, this plant grows in India, the southeast. It is an ornamental plant^[8] The seeds of this plant have addictive properties. Different parts of the plant may have different activities because the leaves have a hypoglycaemic effect and the fruit is used to treat mouth ulcers. Corolla acid, amyl alcohol, ellagic acid, hydroxybenzoic acid, methionine and alanine, these chemical components are present in the plant. The pharmacological properties or uses of this plant include antidiabetic activity, antiviral activity, cytotoxic activity, anti-inflammatory activity, antioxidant activity, antibacterial activity.^[9]



Fig. 2: Lagerstroemia speciosa Leaves.

General Information^[10]

- **Common Name:** Crepe Myrtle, In English- Pride of India , In Hindi- Jarul
- **Botanical Name:** *Lagerstroemia speciosa* (Lythraceae)^[11]
- **Family:** *Lythraceae*
- **Order :** *Myrtales*^[12]
- **Genus:** *Lagerstroemia*
- **Species:** *L. speciosa*
- **Size of Tree:** 20 m. (66ft)
- **Flower colour :** Pink & Lavender pink^[13]

MATERIALS AND METHODS**Plant Samples**

The fresh leaves of the plants *Lagerstroemia speciosa* were collected from local area Dehradun in month of March. The medicinal plant species was identified and authenticated from Botanical Survey of India, (BSI), Dehradun.

Preparation of Plant Extract

Leaves of *Lagerstroemia speciosa* were used for extraction by using aqueous and ethanol solvent by using maceration method.^[14]

The leaves of plant was macerated with 400 ml of ethanol at room temp. for 7 days with frequent agitation and then filtered through filter paper. The filtrate was collected, evaporated and concentrated.

Preparation of the extract solution

1.0gm of extract were weighed and transfer to 100ml volumetric flask. Volume diluted with ethanol, then filtered through cotton, rejection the first 10 ml, 25.0 ml aliquot transfer to 50 ml volumetric flask and diluted to volume with ethanol. Then 25.0 ml aliquot was transferred to a 50 ml volumetric flask and the volume complete with ethanol.^[15]

Spectrophotometric measurement & SPF determination of extract.^[15]

- The absorption spectra of solution were obtained in the range of 290 to 325 nm, at every 5 nm.

- Three determination were made at each point using ethanol as a blank.
- Then the SPF value were determined using Mansur equation.

Equation

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

Formulation of Cream

Oil in water (O/W) emulsion-based cream (semisolid formulation) formulated. The emulsifier (stearic acid) and other oil soluble components (Oil Phase Part A) dissolved and heated. in the oil phase (Part A) and heated to 75° C. The preservatives and other water soluble components of plant extract dissolved in the aqueous phase (Part B) and heated to 75° C. After heating, the aqueous phase added in portions to the oil phase with continuous stirring until cooling of emulsifier took place.^[16]

Preparation of the Cream solution

1.0 gm of extract were weighed and transfer to 100ml volumetric flask. Dilute volume with ethanol, then filtered through cotton, rejection the first 10 ml, 25.0 ml aliquot transfer to 50 ml volumetric flask and diluted to volume with ethanol. Then 25.0 ml aliquot was transferred to a 50 ml volumetric flask and the volume complete with ethanol.^[17]

Spectrophotometric measurement & SPF determination of cream^[15]

- The absorption spectra of solution were obtained in the range of 290 to 325 nm, at every 5 nm.
- Three determination were made at each point using ethanol as a blank.

RESULTS AND DISCUSSION

Preparation of Plant Extract



Fig. 3: (Ethanol Solvent Extraction).



Fig. 4: (Ethanol Extract).

- Then the SPF value were determined using Mansur equation.

Formulation of Lotion

Stearic acid and triethanolamine were selected as independent variables while spreadability, pH and viscosity were dependent factors. Lotion is prepared by adding the non-polar phase to the polar phase and stirring rapidly to avoid separation of water and phase. The non-polar phase is first melted together and the is added slowly to the preheated polar phase composite mixture. Triethanolamine and stearic acid, when mixed, undergo an acid free radical reaction to give an ionic compound. Cetosteryl alcohol combines with other ingredients in the formulation such as triethanolamine and stearic acid to form an emulsion.^[18]

Preparation of the Lotion solution

1.0gm of extract were weighed and transfer. Dilute volume with ethanol, then filtered through cotton. rejection the first 10 ml, 25.0 ml aliquot transfer to 50 ml volumetric flask and diluted to volume with ethanol to produce. Then 25.0 ml aliquot was transferred to a 50 ml volumetric flask and the volume complete with ethanol.^[15]

Spectrophotometric measurement & SPF determination of lotion.^[15]

- The absorption spectra of solution were obtained in the range of 290 to 325 nm, at every 5 nm.
- Three determination were made at each point using ethanol as a blank.
- Then the SPF value were determined using Mansur equation.

Table 1: SPF value of *Lagerstroemia speciosa* (leaves) ethanol extract.

| S. No. | Wavelength(λ) | EE*I(normalized) | Abs | CF*EE*I*Abs | SPF= CF * Σ EE(λ)*I(λ) *Abs(λ) |
|--------|-------------------------|------------------|--------|-------------|---|
| 1. | 290 | 0.0150 | 0.273 | 0.2731 | 2.49 |
| 2. | 295 | 0.0817 | 0.2554 | 0.2554 | |
| 3. | 300 | 0.2874 | 0.2465 | 0.2465 | |
| 4. | 305 | 0.3278 | 0.2397 | 0.2390 | |
| 5. | 310 | 0.1864 | 0.2340 | 0.2340 | |
| 6. | 315 | 0.0839 | 0.231 | 0.231 | |
| 7. | 320 | 0.018 | 0.2346 | 0.2348 | |

Formulation of Cream

The sunscreen formulation of *Lagerstroemia speciosa* (leaves) ethanol extract was successfully prepared and the SPF value of the formulation was calculated through

UV Spectrophotometric method which was found to be 0.70 & amp; the following observations were observed (**Table No: 3**)

**Fig. 5: (*Lagerstroemia speciosa* Leaves Cream Formulation).****Table 2: Composition of cream formulation.**

| S. No. | Ingredients | Uses | Components(%w/w) |
|--------|---------------------|------------------------|------------------|
| 1. | Cetostearyl alcohol | Emulsifier | 5 |
| 2. | Stearic acid | Emollient,Coemulsifier | 2 |
| 3. | Carbopol | Gelling agent | 0.5 |
| 4. | Methyl paraben | Preservative | 0.3 |
| 5. | Triethanolamine | Surface active agent | 0.5 |
| 6. | Cetyl alcohol | Emollient,Coemulsifier | 1 |
| 7. | Extract | Active ingredient | 2 |
| 8. | Distilled water | Vehicle | q.s (upto 100ml) |

Table 3: SPF value of *Lagerstroemia speciosa* (leaves) Cream Formulation.

| S. No. | Wavelength(λ) | EE*I(normalized) | Abs | CF*EE*I*Abs | SPF= CF * Σ EE(λ)*I(λ) *Abs(λ) |
|--------|-------------------------|------------------|--------|-------------|---|
| 1. | 290 | 0.0150 | 0.0827 | 0.0124 | 0.70 |
| 2. | 295 | 0.0817 | 0.0807 | 0.0659 | |
| 3. | 300 | 0.2874 | 0.0737 | 0.2118 | |
| 4. | 305 | 0.3278 | 0.0695 | 0.2278 | |
| 5. | 310 | 0.1864 | 0.0670 | 0.1250 | |
| 6. | 315 | 0.0839 | 0.0646 | 0.0542 | |
| 7. | 320 | 0.018 | 0.0655 | 0.0117 | |

Table 4: Evaluation parameters of Cream.

| | |
|-----------------|----------------|
| pH | 6.2 |
| Color | Light yellow |
| Viscosity | 13680 cP |
| Spreadability | Good & Uniform |
| Texture | Good |
| Irritation Test | No |
| Appearance | Light |
| Odour | characteristic |

Formulation of Lotion

The sun lotion formulation of *Lagerstroemia speciosa* (leaves) ethanol extract was successfully prepared and the SPF value of the formulation was calculated through

UV Spectrophotometric method which was found to be 2.49 & amp; the following observations were observed (**Table No: 3**)

**Fig. 6: (Lagerstroemia speciosa Leaves Lotion Formulation).****Table 5: Composition of Lotion Formulation.**

| S. No. | Ingredients | Components(%w/w) |
|--------|---------------------|------------------|
| 1. | Cetostearyl alcohol | 4 |
| 2. | Stearic acid | 11 |
| 3. | Methyl paraben | 0.02 |
| 4. | Triethanolamine | 0.5 |
| 5. | Cetyl alcohol | 4 |
| 6. | Glycerol | 2 |
| 7. | Extract | 1 |
| 8. | Distilled water | q.s (upto 100ml) |

Table 6: SPF value of *Lagerstroemia speciosa* (leaves) Lotion Formulation.

| S. No. | Wavelength(λ) | EE*I(normalized) | Abs | CF*EE*I*Abs | SPF= CF * Σ EE(λ)*I(λ) *Abs(λ) |
|--------|-------------------------|------------------|--------|-------------|---|
| 1. | 290 | 0.0150 | 0.2731 | 0.0409 | 2.49 |
| 2. | 295 | 0.0817 | 0.2554 | 0.2087 | |
| 3. | 300 | 0.2874 | 0.2465 | 0.7084 | |
| 4. | 305 | 0.3278 | 0.2390 | 0.7836 | |
| 5. | 310 | 0.1864 | 0.2340 | 0.4362 | |
| 6. | 315 | 0.0839 | 0.2310 | 0.1938 | |
| 7. | 320 | 0.018 | 0.2348 | 0.0422 | |

Table 7: Evaluation parameters of Lotion.

| | |
|-----------------|----------------|
| pH | 6.4 |
| Viscosity | 12120cP |
| Spreadability | Good & Uniform |
| Texture | Good |
| Irritation Test | No |
| Appearance | Light |
| Odour | characteristic |

CONCLUSION

Solar protectors are used to help body's natural defense mechanisms protect against harmful UV rays of the sun. Its function is based on your ability to absorb, reflect or spread the sun's rays. The SPF number measurement is the best way to determine the effectiveness of the formulation of solar filters and has become a global standard for measuring the efficiency of solar products. This gives an idea of the duration of your time in the sun without burning the rays of the sun. The higher the SPF, the higher the protection of solar protection against UVLE. Although several synthetic solar protectors are available, they have limited applications in cosmetics because of their potential human toxicity and their ability to intervene only in selected cancer routes. Botanical and herbal agents are known to be safe and have been widely accepted by consumers. They also work in many ways, stimulating the immune response, inducing the suppression of genes, detoxifying carcinogens, blocking oxidative damage to DNA, starting selected routes or other mechanism. Thus, these plant-based agents play several roles in improving the carcinogenesis process. Therefore, these herbal formulations in optimal concentrations could produce various beneficial effects for the skin in addition to functioning as UV filters that are part of this search.

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