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Preliminary study of Anti-solar activities of *Lantana camara* L. plants with yellow and red flowers

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ABSTRACT

Natural substances such as phenolic acids, flavonoids and high molecular weight polyphenols have been considered as sunscreen agents because of their ultraviolet ray absorption in the UV region. In the present study, the anti-solar activity of *Lantana camara* L. plants with red and yellow flowers which have flavonoids and phenolics as the most important chemicals, were evaluated using diffuse transmittance method in UV-Visible Spectrophotometry in the range of 200-400 nm. The extracts were prepared with a mixture of distilled water and methanol (3:5) by cold maceration process. Yellow sage extract showed absorbance of 0.9532 with λ_{max} at 330 nm and λ_{max} at 270 nm with absorbance of 0.7058. Red sage extract showed absorbance of 0.3389 with λ_{max} at 330 nm and λ_{max} at 270 nm with absorbance of 0.2527.

Key Words : Yellow sage, red sage, total phenolics, antisolar activity.

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INTRODUCTION

While some exposure of skin to sunlight is enjoyable, excessive will affect ones through both heat and ultraviolet radiation (UV) it generates. UV radiation which has a shorter wavelength than visible light, is responsible for harmful effects like blistering sunburn and long term problems like photocarcinogenesis, photoaging and photosensitivity. To avoid these harmful effects, there are products known as sunscreens.

Sunscreens are chemicals which absorb sun's ultraviolet (UV) radiation on the skin exposed to sunlight and prevent the UV radiation from reaching the skin [1]. There are sunscreens which absorb different types of UV radiation such as UV-A (320-400 nm), UV-B (290-320 nm), UV-C (100-290 nm) and Vacuo UV (10-100 nm) [2]. The use of many synthetic sunscreens as photoprotectives restricted their use at cellular level and this limited use is because of their potential toxicity in humans and ability to interfere only in selected pathways of the multistage process of carcinogenesis.

2-Phenylbenzimidazole absorbs UV rays from solar light, but it is photomutagenic [3]. Salicylic acid and Ethylhexyl Salicylate used as a UV absorber in cosmetics and lotions absorb into the skin with 10 % of these remaining in the skin causing damage and increases sun sensitivity [4]. Ethylhexyl p-methoxylcinnamate, Octyl p-dimenthylaminobenzoate and Oxybenzone which are used in sunscreens inhibit our cell's growth, impairs DNA synthesis and retard their cycle progression. This is caused by the systematic sunscreen absorption of our skin [5].

At the turn of the century, natural substances such as phenolic acids, flavonoids, anthraquinones and high molecular polyphenols have been considered as sunscreen agents because of their ultraviolet ray absorption in the UV region [6] and their antioxidant activity [7]. An antioxidant epigallocatechin-3-gallate, known as EGCG isolated from green tea reduced skin cancer risk from 50 % to 80 %, when applied topically to the skin, protecting the body from UV induced immune suppression [8]. Tamarind and Aloe barbadensis which contains Ogliosaccharides have an immune suppression protective effect, reducing the damage by 50 % and completely blocking other damage [9]. Studies show that pomegranate fruit extracts protect against both UV-A and UV-B induced skin damage in a dose dependent manner [10].

Lantana camara L. belonging to family Verbenaceae is a aromatic shrub, native of South America, now cultivated in all parts of the world, chiefly for its ornamental flowers. The leaves of this plant are used in folk medicine as antitumoral, antibacterial and antihypertensive agent. The roots are used for the treatment of tooth ache and the flowers for chest complaints in children. The presences of Lancamarone, a steroid and Lantamine, an alkaloid have been reported from the leaves of this plant [11].

The aim of this study was to carry out the preliminary evaluation of anti-solar activity of methanolic extracts of young yellow sage and old red sage flowers of *Lantana camara* L. which have flavonoids as the most important chemical using *in vitro* diffuse transmittance method.

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MATERIAL AND METHODS

Collection and Identification

Yellow sage and Red sage were collected in B.G. Nagara, Mandya District, State of Karnataka. These specimens were identified by Prof. Ramesiahia and are on deposit in the Herbarium of Department of Pharmacognosy, Sri Adichunchanagiri College of Pharmacy, B.G.Nagar. The flowers were dried under shade.

Extraction

The dried flower materials of the plant (50 g) were powdered and extracted with 400 ml of hydroalcohol (methanol: water, 5:3) by cold maceration process. Then it was concentrated under reduced pressure to get a gummy mass.

Phytochemical Examination

Preliminary tests were performed to comfirm the presence of flavonoids. The chemical tests that were conducted are Shinoda test, lead acetate test and sodium hydroxide test.

To both the methanolic extracts, added 5 ml of 95 % ethanol and few drops of conc.Hcl. To this solution 0.5g of magnesium turnings were added. Observation of pink coloration indicated the presence of flavonoids (Shinoda test). To the small quantity of methanolic extracts lead acetate solution was added where formation of yellow precipitate indicated the presence of flavonoids. On addition of an increasing amount of sodium hydroxide, the methanolic extracts showed yellow colouration which decolourized after addition of acid and confirmed presence of flavonoids.

Measurement of total phenolics

Total phenolics of the extracts were determined colorimetrically using Folin-Ciocalteau method [12]. The aliquots (400 µl) of each extract was mixed with 2 ml of Folin-Ciocalteau reagent and 1.6 ml of 4 % sodium carbonate. The mixture was allowed to stand for 2 h with intermittent shaking for reaction. The absorbance was measured at 750 nm using Shimadzu UV-160, a Spectrophotometer, Shimadzu Corporation, Japan. Using gallic acid monohydrate, standard curve was prepared and linearity was obtained in the range of 10-50 µg/ml. Total phenolics was calculated using the standard curve and the concentrations are expressed as milligrams of gallic acid equivalent (GAE) per mg of the extracts.

Measurement of total flavonoids contents

Aluminium chloride colorimetric technique [13] was used for flavonoids estimation. Flavonoids are capable of forming complexes with metal ions and act as antioxidants. A known volume (1.0 ml) of the extract was mixed with 3ml of methanol, 0.2 ml of 10 % aluminium

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chloride, 0.2 ml of 1 M potassium acetate and 5.6 ml of distilled water. After incubation at room temperature for 30 min, the absorbance of the reaction mixture was measured at 415 nm with the help of Shimadzu UV-160, a Spectrophotometer, Shimadzu Corporation, Japan. The total flavonoid content was expressed as milligrams of quercetin equivalent per mg of the extracts.

Evaluation of anti-solar activity

1 mg/10 ml of solution was prepared by dissolving 10 mg of extracts in 100 ml of distilled water in a volumetric flask and used for the study (10 mg/100ml)

The UV absorption spectrum of samples in solution were obtained in the range of 200-400 nm using 1cm quartz cell, Shimadzu UV-160, a Spectrophotometer and distilled water as a blank. Figures 1. and 2. indicates absorption spectra of both extracts in the given range.

RESULTS AND DISCUSSION

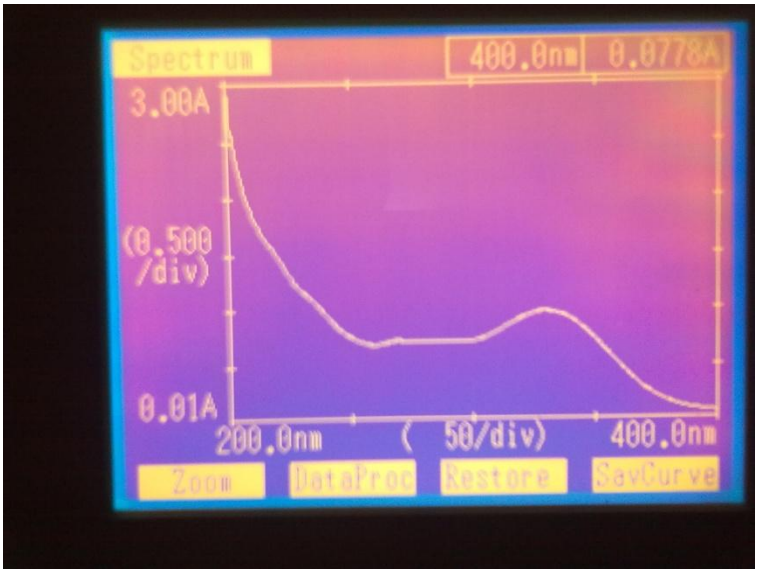

Figure.1. Scanning spectra of red sage extract on UV Spectrophotometer

Both the hydroalcoholic extracts were dark green in colour and gave positive test for phenolic compounds (Flavanoids). The total phenolics and flavonoids content of both the extracts were found to be 9.53 ± 0.892 % & 6.72 ± 0.79 % and 10.451 ±.08 % & 8.24 ± 0.52 % for Yellow sage and Red sage respectively.

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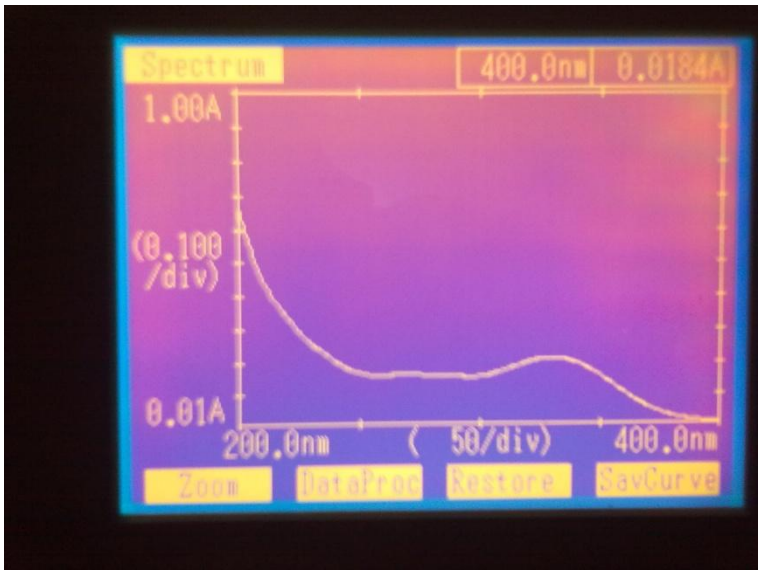

Figure.2. Scanning spectra of yellow sage extract on UV Spectrophotometer

UV scanning of yellow sage extract showed absorbance of 0.9532 with λ_{max} at 330 nm and λ_{max} at 270 nm with absorbance of 0.7058. Red sage extract showed absorbance of 0.3389 with λ_{max} at 330 nm and λ_{max} at 270 nm with absorbance of 0.2527. Both flower extracts also showed a plateau in the range of 250-305 nm with absorbance of 0.7174-0.7275 for yellow sage and absorbance of 0.2531-0.2610 for red sage respectively.

Table.1. Total flavonoid and phenol contents of the plant extracts of *Lantana camara* L.

Extract	Total phenol (mg GAE /100 mg)	Total flavonoid(mg QE/100 mg)
Yellow sage	9.53 ± 0.892	6.72 ± 0.79
Red sage	10.45 = 1.08	8.24 ± 0.52

Phytochemical screening by simple chemical tests showed presence of flavonoids. Table 1. shows the total flavonoids and phenol contents of both the extracts. Flowers of Yellow sage and Red sage are highly coloured which may be due to flavonoids and consist of large amount of chromophores responsible for the anti-solar activity. Absorption of UV radiation is a main characteristics for identification of flavonoids in flowers. The results indicated that the absorption ability is may be due to the presence of polyphenolic compounds of both the flowers. This preliminary study indicated that both the flowers of yellow sage and red sage can be used as an alternative to harmful synthetic formulations that are available nowadays.

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