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SPECTROPHOTOMETRIC DETERMINATION OF SUN SCREEN POTENTIAL OF *OCIMUM SANCTUM*

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ABSTRACT

UV-Ultraviolet radiation is one of the major factors which debase the skin inherent characteristics that would turn out to malfunction and integrity of skin structure. Sunscreen or sun protectives are the class of compounds from natural, semisynthetic or synthetic origin that could help to extenuate the harmful effect of UV radiation by absorbing and countering to certain extent. These formulations are generally applied to skin surface. Majority of natural products have been proven significant for their therapeutic and cosmetic potential. Numerous natural compounds in the plant have been shown their potential to be used as sunscreen agent. Natural products such as plant extracts, fixed oil, resins, volatile oil and isolated compounds from plant parts would have sunscreen potential. *Ocimum sanctum* or Tulsi is regarded as most revered, holy and versatile plant in Bharat. *Ocimum sanctum* has been regarded as elixir for life in Indian system of medicine used to treat variety of ailments.

KEYWORDS: Tulsi, *Ocimum sanctum*, sun protection, UV rays, SPF.

INTRODUCTION

Ocimum sanctum, family Lamiaceae is pious, highly revered and worshiped herb in Bharat. Tulsi is favorably grown and prevailed in india throughout the country**.** *Ocimum sanctum* is popular and renowned medicinal plant in ayurvedic and other indigenous system of medicine since thousands of years. Commonly people in India have been used Tulsi for religious purpose from centuries. The plant is purported multifaced medicinal properties as antioxidant, cough and cold, immunomodulator, skin disorders, antibacterial and antiviral. Ultraviolet radiation has been proved as deleterious agent which would affect normal skin function, vitality and appearance. The radiation emitted by the sun composed of range of wavelengths categorized as UVA with wavelength of 320‑400 nm, UVB is with 290-320 nm and UVC with wavelength 100‑280 nm. Among all of these UVC is the most devastating, but it is being filtered and absorbed by ozone layer. The Ultraviolet A and Ultraviolet B reaches to the earth surface, which is fundamental cause of skin related issues. Various plant extracts, fixed oil, volatile oil, plant products and isolated compound have been used as sunscreen agent in cosmetics which could absorb, reflect, or scatter UV radiations. The potency of sunscreen agent could be measured by sun protection factor (SPF). The sunscreen property is usually expressed by the sun protection factor (SPF), which could be calculated by applying formula mentioned bellow.[1,2]

$$SPF = \frac{\text{Minimal erythemal dose in sunscreen protected skin}}{\text{Minimal erythemal dose in non-sunscreen protected skin}}$$

The minimal erythemal dose (MED) defined as the minimum time interval or dosage of ultraviolet irradiation eligible to give perceptible erythema on protected or unprotected skin.[3,4] The product had higher SPF, would be more efficient against UV radiation.

The *in vitro* SPF is determined according to the method described. The absorbance of the sample has been recorded at 5 nm intervals (290-320 nm). The SPF values were calculated by using the formula.[5]

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

where is CF indicated Correction factor (10), EE (λ) denoting Erythmogenic effect of radiation with wavelength (λ) Abs (λ) related to spectrophotometric absorbance values at specific wavelength (λ). The values of EE(λ)×I(λ) are constant and shown in Table 1.[6]

MATERIAL AND METHODS

All the chemical and glassware used in the study of analytical grade and borosil ASGI mark respectively. The analysis of sample for SPF has been done by UV-VIS Spectrophotometer model UV-1700 Pharmaspec Shimadzu, Japan.

Collection and Processing of Plant material

The leaves of *Ocimum sanctum* have been procured from the medicinal herbal garden VCOP, Washim, Maharastra, India, in bright sunny day in the month of December. The plant leaves had been washed with tap water then dried in shade till crumpled. The dried leaves then grounded to get coarse powder of drug. The powder is then sieved to get uniform size, The coarsely powdered leaves has been used for extraction with selected solvents.

Extraction of Plant Material

The hydro alcoholic extract of the leaves of plant material has been prepared by maceration method. 400g of powdered plant material was taken each 100 gm was extracted with 60%,70%,80% and 90% of alcohol solution, the extract is then filtered twice through whatman filter, the filtrate has been collected, the filtrate was evaporated and dried under vacuum. The dried extracts are again kept in the desiccator to remove dregs of solvent. The yield of individual extract has been calculated and recorded.

Sample Preparation

The stock solution of extract was prepared, 10 mg of plant extract mixed with 100 mL of different hydroalcoholic solution to get 100 µg/mL. The mixture is then filtered twice through Whatman filter paper, three dilution 40µg/mL, 50µg/mL and 60µg/mL of each has been made using stock solution, each sample scanned thrice for selected wavelength at 5nm intervals from 200 nm to 320 nm through UV spectrophotometer. The base line correction was done by similar solvent used for extraction. The sample absorption was taken in one cm quartz cell. The absorption of selected concentration of *Ocimum sanctum* extract has been recorded.[7]

The UV absorption efficiency of *Ocimum sanctum* extracts have been determined by *in-vitro* method. The 40µg/mL, 50µg/mL and 60µg/mL dilutions of each extract were made from stock solution. All dilution were scanned between wavelength 290 nm to 320 nm at 5 nm interval in triplicate. The mean absorbance value was taken at particular concentration, the absorbance values were multiplied with the constant shown at specified wavelength in table number one, the summation of those multiplied with correction factor constant 10.[8]

Table 1: Product function used in calculation of SPF.

Sr. No	Wavelength in nm	EE(λ) X I (normalized)
1	290	0.015
2	295	0.0817
3	300	0.2874
4	305	0.3278
5	310	0.1864
6	315	0.0839
7	320	0.018
Total		1

RESULT AND DISCUSSION

The percentage yield of plant extract with different solvents was found as *Ocimum sanctum* 6.2%,6.8%,6.9%,7.1% The result indicated 90% hydroalcoholic solvent was more efficient in terms of maximum extractable content out of four solvents selected for the study. The *in vitro* SPF screening method might be useful in development of sunscreen cosmeceutical moreover it would be better prospect to *vivo* SPF. In the present study plant extracts had been evaluated by UV spectrophotometry. The SPF was calculated by using Mansur equation. The observation and result revealed that hydro alcoholic extracts of *Ocimum sanctum* had sun screen potential and could be used as sunscreen agent in cosmetics development. The extract of 90% hydroalcoholic solvent had shown greater sun protective effect compared to other plant extract in the study, while the extract of 60% hydroalcoholic solvent has shown lowest UV screening effect.

In vitro SPF Determination

Table no. 2: In vitro SPF value at concentration 40µg/mL.

Sr. No	Wave length in nm	EE(λ) X I (normalized)	OC 60% (absorbance) 40µg/ml	OC 70% (absorbance) 40µg/ml	OC 80% (absorbance) 40µg/ml	OC 90% (absorbance) 40µg/ml
1	290	0.015	2.9112±0.019	3.8521±0.018	4.9652±0.015	5.7254±0.012
2	295	0.0817	2.5032±0.015	3.3891±0.011	4.6245±0.014	5.3967±0.017
3	300	0.2874	2.2574±0.025	2.9012±0.017	4.3155±0.021	5.2385±0.013
4	305	0.3278	2.1235±0.011	2.6521±0.021	4.2017±0.016	5.0239±0.018
5	310	0.1864	1.5893±0.021	2.3212±0.023	3.9525±0.023	4.9853±0.025
6	315	0.0837	1.2544±0.012	2.1951±0.012	3..6653±0.019	4.8341±0.011
7	320	0.018	1.0123±0.017	1.9354±0.014	3.5224±0.015	4.5351±0.016

Value=Mean±SD, OC- *Ocimum sanctum*

Table no. 3: In vitro SPF value at concentration 50µg/mL.

Sr. No	Wave length in nm	EE(λ)XI (normalized)	OC 60% (absorbance) 50µg/ml	OC 70% (absorbance) 50µg/ml	OC 80% (absorbance) 50µg/ml	OC 90% (absorbance) 50µg/ml
1	290	0.015	3.9165±0.015	4.8351±0.011	5.9851±0.014	6.5965±0.015
2	295	0.0817	3.6032±0.023	4.5895±0.015	5.6245±0.012	6.3921±0.016
3	300	0.2874	3.2574±0.012	4.3901±0.019	5.3256±0.011	6.2652±0.011
4	305	0.3278	3.1254±0.017	4.1021±0.025	5.2125±0.013	6.0263±0.021
5	310	0.1864	2.8931±0.012	3.8215±0.013	4.9527±0.018	5.9521±0.011
6	315	0.0837	2.5453±0.016	3.6194±0.014	4..6524±0.021	5.8352±0.013
7	320	0.018	2.2123±0.002	3.3354±0.019	4.5835±0.011	5.5351±0.012

Value=Mean±SD, OC- *Ocimum sanctum*

Table no.4: In vitro SPF value at concentration 60µg/mL.

Sr. No	Wave length in nm	EE(λ)XI (normalized)	OC 60% (absorbance) 60µg/ml	OC 70% (absorbance) 60µg/ml	OC 80% (absorbance) 60µg/ml	OC 90% (absorbance) 60µg/ml
1	290	0.015	5.9112±0.015	6.8256±0.019	8.2354±0.017	9.7965±0.019
2	295	0.0817	5.8652±0.011	6.5256±0.014	8.0235±0.015	9.5961±0.018
3	300	0.2874	5.5324±0.019	6.3524±0.021	7.9312±0.011	9.4523±0.011
4	305	0.3278	5.2235±0.022	6.2112±0.011	7.6017±0.017	9.3235±0.005
5	310	0.1864	4.9326±0.012	5.9212±0.015	7.4521±0.012	9.1598±0.013
6	315	0.0837	4.6844±0.018	5.7951±0.018	7.3652±0.023	8.8345±0.015
7	320	0.018	4.2962±0.015	5.5342±0.013	6.9653±0.011	8.5321±0.018

Value=Mean±SD, OC- *Ocimum sanctum*

Table no.5- Spectrophotometric values of SPF at different concentration.

Sr.No.	Extract	SPF 40µg/ml	SPF 50µg/ml	SPF 60µg/ml
1	OC 60%	2.874	4.437	7.512
2	OC70%	3.841	5.898	8.836
3	OC 80%	5.966	7.401	10.973
4	OC 90%	7.278	8.706	13.291

OC- *Ocimum sanctum*

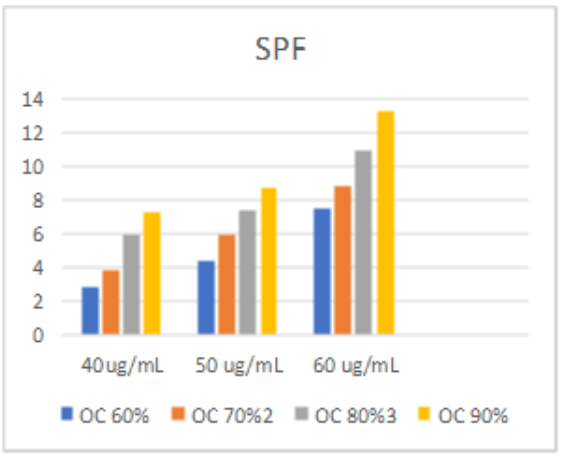

Figure 1: Graphical Presentation of SPF value.

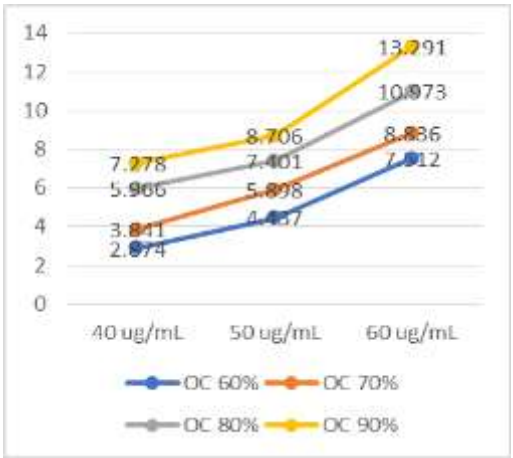

Figure 2: Line diagram for SPF value.

The study conferred that the photo protective potential raised with concentration of extract, As the amount of extract increased the sun protective effect also has been increased that could be due to availability of more promising solute at higher concentration. The plant selected for the study already had multifarious medicinal effect, this additional property might increase the regime of *Ocimum sanctum*.

CONCLUSION

Ocimum sanctum is revered plant in Indian subcontinent with multifaceted benefits, The study concluded that the alcoholic extract of leaves had extensive potential to be used for sun protective effects. The propensity towards the nature pique discovery of new substance, natural therapy is always cozier than synthetic alternatives. *Ocimum sanctum* is traditionally inherited and renowned

for its medicinal properties since ancient time. The present study fortresses the sun screen potential of leaves in concentration dependent manner that would improve the cosmeceutical potential of *Ocimum sanctum.*

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