Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
https://www.phytojournal.com
JPP 2024; 13(2): 162-164
Received: 13-01-2024
Accepted: 16-02-2024

Dr. Abhinay Kumar Dwivedi
Department of Pharmacognosy, Vardhaman College of Pharmacy, Washim, Maharashtra, India

Corresponding Author:
Dr. Abhinay Kumar Dwivedi
Department of Pharmacognosy, Vardhaman College of Pharmacy, Washim, Maharashtra, India

Spectroscopic evaluation of sun screen potential of *Hibiscus rosa sinensis*

Dr. Abhinay Kumar Dwivedi

DOI: https://doi.org/10.22271/phyto.2024.v13.i2b.14896

Abstract
Hibiscus rosa sinensis has been gifted with numerous chemical constituents which could be used to treat variety of human condition, the flower and leaves of the plant have long history of uses to cure and treat various ailments. The leaves of plant are emerald in color and serve as natural trove of important therapeutic compounds. UV-radiation observed as major cause that defile the intrinsic nature of skin. UV-radiation could adversely affect the normal function and appearance of human skin. Sunscreen or UV-protectives are the compounds from natural, semisynthetic or synthetic origin that could help to attenuate the deleterious effect of UV radiation by absorbing and countering to major extent.

Keywords: Sun screen, *Hibiscus rosa sinensis*, sun protection, UV rays, SPF

Introduction
Hibiscus rosa sinensis profoundly known as red hibiscus or China rose is a medium to large shrub, belonging to mallow family Malvaceae. The plant is native to southeast Asia. The plant has been cultivated since long before for their gorgeous decorative flowers and medicinally useful properties. Hibiscus leaves and flowers has been used in variety of human condition like menorrhagia, emmenagogue, abortion, antifertility, contraceptive. The leaves are oval with alternate arrangements. The leaves are dark or intense green in color with serrate or toothed margins. The cherry flowered species would be preferred over species for medicinal application the vital component of leaves are flavonoids, steroids, alkaloids, tannins, saponins, phenolic compounds and proanthocyanidin. Previous researches portended that leaf extract could offer protection against skin disorders, oxidative stress and deleterious UV radiation. Due to presence of screening metabolites, sunscreen activity has been chosen for the study. Sun screen agent are compounds which primarily protect the skin from damaging UV radiations and oxidative stress [1, 2].

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

MED minimal erythemal dose is the minimum time interval or dosage of ultraviolet irradiation prompted perceivable erythema on protected or unprotected skin. [3, 4] Higher SPF value would be indicator of higher protection against UV radiation. SPF is determined by spectrophotometer. The sample absorbance was recorded at 5 nm interval in the range of 290-320 nm. The SPF value was calculated by using the formula [5].

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

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

Materials and Methods
Analytical grade chemical and glassware of ASGI mark had been used to perform study. The analysis of sample was done in UV-VIS Spectrophotometer model UV-1700 Pharmaspec Shimadzu.

Collection and Processing of Plant material

The leaves of *Hibiscus rosa sinensis* have been collected in the month of January from the medicinal herbal garden VCOP, Washim, India. The plant leaves primarily washed with tap water then shade dried till crumpled. The dried leaves were used to made coarse powder. The powder is then shifted to get powder of uniform size, The powdered was then subjected to extraction with suitable solvents.

Extraction of Plant Material

The hydro alcoholic extract has been prepared by soaking the plant drug in the solvent for seven days with occasional stirring. 200g of powdered plant material was accurately weighed, each 50 g was extracted with 60%,70%,80% and 90% of alcohol respectively, the extract is then filtered thrice through whatman filter, the filtrate was collected, evaporated and dried to get powdered extract. The residual dregs of solvent were removed in desiccator. The yield of individual extract was calculated.

Sample Preparation

10 mg of plant extract mixed with 100 mL of hydroalcoholic solution to get 100 µg/mL. The mixture is then screened through Whatman filter paper, three dilution 40 µg/mL, 50 µg/mL and 60 µg/mL were made with stock solution, each sample had been scanned thrice for selected wavelength at 5nm intervals through UV spectrophotometer. The base line correction was made with similar solvent used for extraction. The absorption of selected concentration of *Hibiscus rosa sinensis* extract was recorded [7].

***In vitro* SPF Determination**

The UV absorption efficiency of *Hibiscus rosa sinensis* extracts were determined by spectrophotometric method. The 40 µg/mL, 50 µg/mL and 60 µg/mL dilutions of distinct extract were made from initial stock solution, the prepared dilutions were scanned through 290 nm to 320 nm at 5 nm interval in triplicate. The mean of absorbance was taken for each distinct concentration, the absorbance values had been multiplied with the constant shown. 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

Results and Discussion

The percentage yield of plant extract with different solvents was found as *Hibiscus rosa sinensis* 6.5%, 6.4%, 6.9%, 7.2% The result supported that 90% hydroalcoholic solvent had more extractable efficiency in terms of maximum solid output compared to four other extraction solvent used in the study. The spectrophotometric SPF screening method could be useful in development of sunscreen preparation furthermore it would be the better alternative for preliminary evaluation to *vivo* SPF. In this study plant extracts were evaluated by UV spectrophotometry. The SPF was calculated by Mansur equation. The observation and result revealed that hydro alcoholic extracts of *Hibiscus rosa sinensis* had good potential of sun screen and could be used as sunscreen ingredients in cosmetics development. 90% hydroalcoholic extract had shown greater SPF effect compared to other ratio in the study, although extract of 60% hydroalcoholic had shown lowest UV screening potential.

Table 2: *In vitro* SPF value at concentration 40 µg/mL

Sr. No	Wave length in nm	EE(λ) X I (normalized)	HRS 60% (absorbance) 40 µg/ml	HRS 70% (absorbance) 40 µg/ml	HRS 80% (absorbance) 40 µg/ml	HRS 90% (absorbance) 40 µg/ml
1	290	0.015	2.4583±0.015	3.9524±0.016	4.6421±0.018	5.8547±0.019
2	295	0.0817	2.3256±0.013	3.7245±0.021	4.4231±0.012	5.6781±0.021
3	300	0.2874	2.1254±0.015	3.5124±0.014	4.2542±0.014	5.4652±0.017
4	305	0.3278	2.0012±0.021	3.2369±0.013	3.9125±0.019	5.2154±0.019
5	310	0.1864	1.9823±0.017	2.9254±0.019	3.7541±0.022	4.9851±0.016
6	315	0.0837	1.7532±0.019	2.7254±0.017	3.5247±0.014	4.7425±0.014
7	320	0.018	1.5236±0.018	2.3215±0.016	3.2785±0.021	4.3423±0.011

Value=Mean± SD, HRS- *Hibiscus rosa sinensis*

Table 3: *In vitro* SPF value at concentration 50 µg/mL

Sr. No	Wave length in nm	EE(λ)XI (normalized)	HRS 60% (absorbance) 50 µg/ml	HRS 70% (absorbance) 50 µg/ml	HRS 80% (absorbance) 50 µg/ml	HRS 90% (absorbance) 50 µg/ml
1	290	0.015	3.2154±0.019	4.5487±0.016	5.6542±0.018	6.5421±0.013
2	295	0.0817	2.9245±0.013	4.1254±0.014	5.3548±0.017	6.3254±0.018
3	300	0.2874	2.7541±0.018	3.9874±0.017	5.0365±0.012	6.0514±0.017
4	305	0.3278	2.1254±0.019	3.5421±0.012	4.8542±0.011	5.8564±0.019
5	310	0.1864	1.8541±0.017	3.1254±0.021	4.5894±0.021	5.5421±0.022
6	315	0.0837	1.7542±0.014	2.9875±0.014	4.2785±0.014	5.1248±0.018
7	320	0.018	1.5984±0.017	2.7654±0.021	3.9854±0.018	4.8625±0.019

Value=Mean± SD, HRS- *Hibiscus rosa sinensis*

Table 4: *In vitro* SPF value at concentration 60 µg/mL

Sr. No	Wave length in nm	EE(λ)XI (normalized)	HRS 60% (absorbance) 60 µg/ml	HRS 70% (absorbance) 60 µg/ml	HRS 80% (absorbance) 60 µg/ml	HRS 90% (absorbance) 60 µg/ml
1	290	0.015	4.6211±0.017	5.2154±0.021	6.4284±0.016	7.1254±0.017
2	295	0.0817	4.3254±0.019	4.9254±0.018	6.1254±0.017	6.9542±0.014
3	300	0.2874	4.2512±0.024	4.7241±0.017	5.9214±0.023	6.6015±0.017
4	305	0.3278	3.8214±0.018	4.2541±0.012	5.7541±0.017	6.1254±0.012
5	310	0.1864	3.4258±0.012	3.8351±0.011	5.3214±0.018	5.9251±0.011
6	315	0.0837	3.1254±0.019	3.4587±0.017	4.9587±0.013	5.5985±0.024
7	320	0.018	2.8541±0.014	3.0785±0.015	4.5412±0.014	5.1244±0.019

Value=Mean± SD, HRS- *Hibiscus rosa sinensis*

Table 5: Spectrophotometric values of SPF at different concentration

Sr. No.	Extract	SPF 40 µg/ml	SPF 50 µg/ml	SPF 60 µg/ml
1	HRS 60%	2.910	3.280	5.498
2	HRS 70%	4.641	5.135	6.132
3	HRS 80%	5.699	6.923	8.105
4	HRS 90%	7.480	8.319	8.922

HRS - *Hibiscus rosa sinensis*

The work accolades the photo protective efficiency was accompanied by concentration, As the ratio of extract increased the SPF has been increased that might be due to more promising solute at higher concentration. The plant selected for the study already had many potential medicinal benefits, this additional property would broaden the regime of *Hibiscus rosa sinensis*.

Conclusion

Hibiscus rosa sinensis is a tropical plant found profusely in Indian subcontinent, The study unveiled sun protective potential of hydroalcoholic extract of leaves that makes plant more suitable to use for sun screen preparations. The inclination towards the nature spurred discovery of new metabolites from natural sources, natural therapy is always cozier and biocompatible than synthetic alternatives with smidgen of side effects. *Hibiscus rosa sinensis* is traditionally renowned for its medicinal properties. The present study reinforced the additional property as sun protective in concentration dependent manner that could improve the medicinal and cosmeceutical potential of *Hibiscus rosa sinensis.*

References

1. Dwivedi Abhinay Kumar, Jhade Deenanath. Cosmetic potential of selected medicinal plants: A review. J Pharmacogn Phytochem. 2021;10(4):381-386.
2. Dwivedi AK. “Spectrophotometric Determination of Sun Screen Potential of Selected Medicinal Plants” International Journal of Pharmaceutical Sciences Review and Research, Int. J. Pharm. Sci. Rev. Res. 2022;74(2):104-107. DOI: 10.47583/ijpsrr. 2022. v74i02.016
3. Dwivedi AK. Spectrophotometric Evaluation of Sun Screen Potential of *Azadirachta Indica*, Int. J. of Pharm. Sci., 2024;2(2):184-189. doi.org/10.5281/zenodo.10634571
4. Dwivedi AK, Nayak S. “Antioxidant, Antibacterial and Sun Protection activity of *Centella asiatica* Leaves Extract” International Journal of Advanced Multidisciplinary Research and Studies. 2022;2(6):295-298.
5. Li L, Chong L, Huang T, Ma Y, Li Y, Ding H. Natural products and extracts from plants as natural UV filters for sunscreens: A review. Animal Model Exp Med. 2023;6(3):183-195. doi: 10.1002/ame2.12295. Epub 2022 Dec 19. PMID: 36536536; PMCID: PMC10272908
6. Sutar MP, Chaudhari SR. Screening of *in vitro* sun protection factor of some medicinal plant extracts by ultraviolet spectroscopy method. 2020;8(6):48-534.
7. Mansur JS, Breder MNR, Mansur MCA, Azulay RD. Determinacao Do Fator De Protecao Solar Por Espectrofotometria. An Bras Dermatol Rio De Janeiro. 1986;61:121-4.
8. Poudel B, Gurung A, Subedi HR, *et al*. *In vitro* Sun Protection Factor Determination of Selected Medicinal Plants and Formulation of Sunscreen Cream. 2022, 13(10). DOI: 10.31858/0975-8453.13.10.664-671