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Research Article

Spectrophotometric Evaluation Of Sun Screen Potential Of Azadirachta Indica

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ABSTRACT

Ultraviolet (UV) radiation has been found as a major cause of damage to the skin tissues that would lead to alteration of structure and functionality of human skin. Sunscreen are agents from natural and synthetic origin that would help to reduce the harmful effect of UV radiation by absorbing and neutralizing to certain extent. These products are commonly employed on the surface of skin. Majority of natural products have shown their potential as sunscreen agent to less or more extent various contemporary research revealed the potency of natural products such as plant extracts, fixed oil, plant products, volatile oil could be used for their sunscreen potential. Azadirachta indica or neem is regarded as most versatile, multifarious plant of tropical regions. Azadirachta indica is a renowned plant in Indian system of medicine used for variety of ailments.

INTRODUCTION

Azadirachta indica, family Meliaceae is an evergreen tree prevailing in Indian subcontinent. Azadirachta indica is well known and renowned medicinal plant in Indian system of medicine since thousands of years. The people in India have been inveterately using neem from centuries to clean their teeth, oral disorders, skin disorders, and insecticidal properties. Ultraviolet radiation has found as fundamental agent which deteriorate the skin function, appearance and vitality. The ultraviolet radiation emitted by the sun composed of defined range of wavelengths i.e. UVA

(320-400 nm). UVB (290-320 nm) and UVC (100-280 nm). Out of these UVC is the most harsh and damaging radiation, but it has been naturally filtered and absorbed by ozone layer. The remaining UVA and UVB radiation reaches at the earth surface, which is majorly responsible for all skin related issues. Various plant extracts, fixed oil, volatile oil, plant products and isolated compound have been used as sunscreen agent in cosmetics they would absorb, reflect, or scatter UV radiations. The ability of sunscreen potential could be evaluated by Sun Protection Factor (SPF) the efficiency of a sunscreen property is usually

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expressed by the sun protection factor (SPF), which could be calculated by in vitro approach by using formula [1-4].

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

The minimal erythematous dose (MED) would be defined as the minimum time interval or dosage of UV light irradiation eligible to yield perceptible erythema on protected or unprotected skin. The product had higher SPF, would provide better protection against UV radiation. The in vitro SPF could be determined according to the method described. The absorbance of sample has been recorded at 5 nm intervals (290-320 nm). The SPF of sample was calculated by using the formula depicted below [5-7].

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

where is CF denoting Correction factor (10), EE (λ) indicated Erythrogenic effect of radiation with wavelength (λ) Abs (λ) related to spectrophotometric absorbance values at wavelength (λ). The values of EE(λ) \times I(λ) are constant and represented in Table 1.

MATERIAL AND METHODS-

Analytical grade chemicals have been used for the purpose of study. The glass wares used in the study had borosilicate and ASGI mark. UV-VIS Spectrophotometer model UV-1700 Pharmaspec Shimadzu, Japan has been used for SPF determination.

Collection and Processing of Plant material

The leaves of *Azadirachta indica* has been procured from the medicinal herbal garden Vardhaman college of pharmacy, Washim, Maharashtra, India, in the month of march. The collected plant leaves washed with tap water and dried in shade for seven days. The dried plant material then powdered using mechanical grinder

the grounded plant material is then shifted through sieve to get fine powder, The fine powder has been used for extraction with appropriate solvents.

Extraction of Plant Material

The varying proportion of hydro alcoholic extract of plant material has been prepared by maceration method. 100g of powdered plant material has been taken extracted with 60%,70%,80% and 90% ethanol, the extract then filtered using whatman filter paper, the filtrate has been collected and dried under vacuum using rotary evaporator. The concentrated extracts were placed in the desiccator to remove residual solvent. The yield of each extract was calculated as percentage yield.

Sample Preparation

The stock solution is prepared by dissolving 10 mg of plant extract in 100 mL of hydroalcoholic solution to get 100 $\mu\text{g/mL}$ of concentration then filtered through Whatman filter paper to get clear solution, three dilution 40 $\mu\text{g/mL}$, 50 $\mu\text{g/mL}$ and 60 $\mu\text{g/mL}$ of each had been made using stock solution, further each of sample scanned thrice for specified wavelength intervals in 200 nm to 400 nm through UV spectrophotometer UV-1700 Pharmaspec Shimadzu. The base line correction has been made by similar solvent used for extraction, then sample absorption is taken in one cm quartz cell where hydroalcoholic solution were used as blank. The absorption of each strength of *Azadirachta indica* extract solution has been recorded [8].

In vitro SPF Determination

The UV screening efficiency of various herbal extracts have been determined with robust and reliable in vitro method. The 40 $\mu\text{g/mL}$, 50 $\mu\text{g/mL}$ and 60 $\mu\text{g/mL}$ concentration of each extract were made from preliminary stock solution furthermore each extract was scanned between wavelength 290 nm to 320 nm at the interval of 5 nm for in triplicate. The average value is taken as absorbance at particular concentration of each extract, the absorbance values were multiplied

with $EE(\lambda) \times I$. the constant shown in table number one, the summation of those multiplied with correction factor was constant 10[9,10].

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 different plant extract s used in the study was found as Azadirachta indica 5.5%,5.8%,6.0%,6.3% The result indicated 90%

hydroalcoholic solvent has maximum extractable content out of four compositions selected for the study. The in vitro SPF screening method could be useful in sunscreen cosmeceutical development and would have better prospect to vivo SPF. In present study various plant extract had been evaluated by UV spectrophotometry. The SPF has been calculated by using Mansur equation.The observation and result revealed that hydro alcoholic extracts of Azadirachta indica have sun screen potential and can be used as sunscreen agent in cosmetics development. The extract made with 90% hydroalcoholic solvent had the higher sun protective effect compared to other plant extract while the extract made with 60% hydroalcoholic solvent has shown lowest photo protective effect.

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

Sr. No	Wave length in nm	EE(λ) X I (normalized)	AI 60% (absorbance) 40µg/mL	AI 70% (absorbance) 40µg/mL	AI 80% (absorbance) 40µg/mL	AI 90% (absorbance) 40µg/mL
1	290	0.015	0.9022±0.019	2.7793±0.023	3.8277±0.011	4.7526±0.013
2	295	0.0817	0.8664±0.022	2.6897±0.015	3.1893±0.008	4.3667±0.021
3	300	0.2874	0.8381±0.021	2.5237±0.025	2.9223±0.005	4.0381±0.014
4	305	0.3278	0.7121±0.025	2.1737±0.016	2.6857±0.009	3.9947±0.015
5	310	0.1864	0.6977±0.018	1.9147±0.018	2.1527±0.012	3.7643±0.009
6	315	0.0837	0.5955±0.019	1.7937±0.024	1.9653±0.013	3.1317±0.018
7	320	0.018	0.5123±0.015	1.6357±0.021	1.8869±0.017	2.8251±0.014

Value=Mean±SD

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

Sr. No	Wave length in nm	EE(λ)XI (normalized)	AI 60% (absorbance) 50µg/mL	AI 70% (absorbance) 50µg/mL	AI 80% (absorbance) 50µg/mL	AI 90% (absorbance) 50µg/mL
1	290	0.015	2.3212±0.019	3.5723±0.019	4.5276±0.021	6.1521±0.024
2	295	0.0817	2.1032±0.028	3.2894±0.021	4.1563±0.008	5.9667±0.021
3	300	0.2874	1.9824±0.018	2.9937±0.025	3.9152±0.018	5.5381±0.028
4	305	0.3278	1.5236±0.005	2.7737±0.004	3.5957±0.024	5.0947±0.015
5	310	0.1864	1.0896±0.018	2.1214±0.011	2.9525±0.013	4.8642±0.013
6	315	0.0837	0.9554±0.026	1.7931±0.012	2.5653±0.014	4.6352±0.019
7	320	0.018	0.7123±0.017	1.2354±0.011	2.0169±0.015	3.9353±0.012

Value=Mean±SD



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

Sr. No	Wave length in nm	EE(λ)XI (normalized)	AI 60% (absorbance) 60µg/mL	AI 70% (absorbance) 60µg/mL	AI 80% (absorbance) 60µg/mL	AI 90% (absorbance) 60µg/mL
1	290	0.015	3.7112±0.019	4.8223±0.016	5.8275±0.035	7.5214±0.013
2	295	0.0817	3.3032±0.027	4.3895±0.019	5.4563±0.021	7.1967±0.014
3	300	0.2874	2.9874±0.018	4.0129±0.012	5.0152±0.024	6.7385±0.027
4	305	0.3278	2.5216±0.015	3.8937±0.011	4.8957±0.029	6.3945±0.011
5	310	0.1864	2.2894±0.021	3.3212±0.023	4.5256±0.019	5.8642±0.022
6	315	0.0837	1.9454±0.019	2.9931±0.021	4.0653±0.026	5.5352±0.016
7	320	0.018	1.2123±0.016	2.1354±0.028	3.5324±0.031	4.9353±0.019

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

Sr.No.	Extract	SPF 40µg/mL	SPF 50µg/mL	SPF 60µg/mL
1	AI 60%	1.068	2.245	3.745
2	AI 70%	3.193	3.799	5.383
3	AI 80%	3.768	5.018	6.895
4	AI 90%	5.589	7.438	9.112

AI- Azadirachta indica

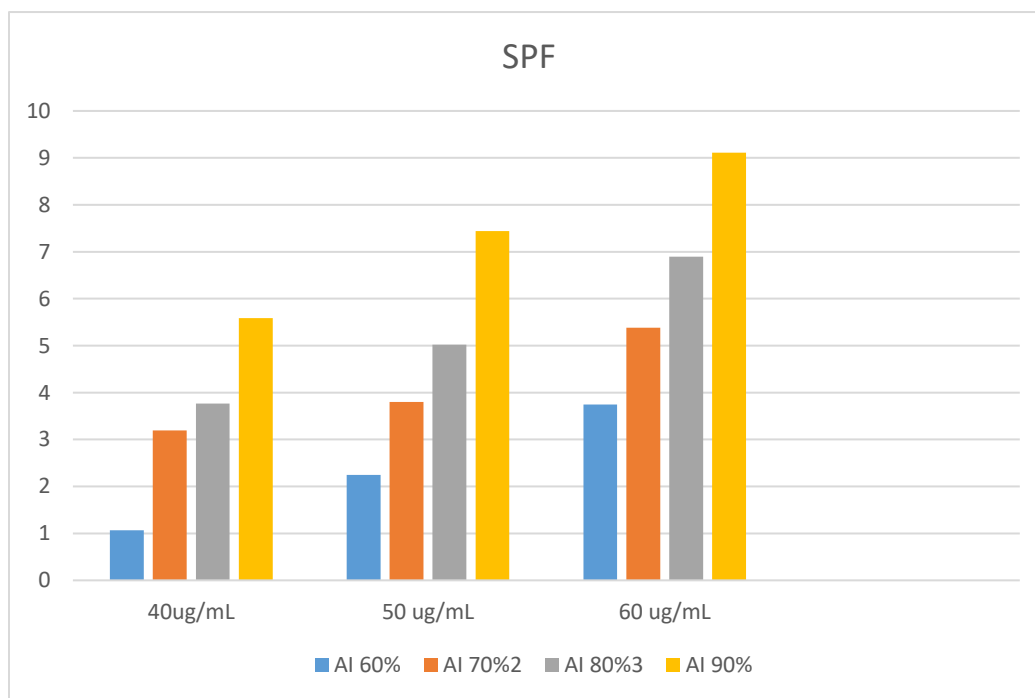


Figure1-Graphical Presentation of SPF value

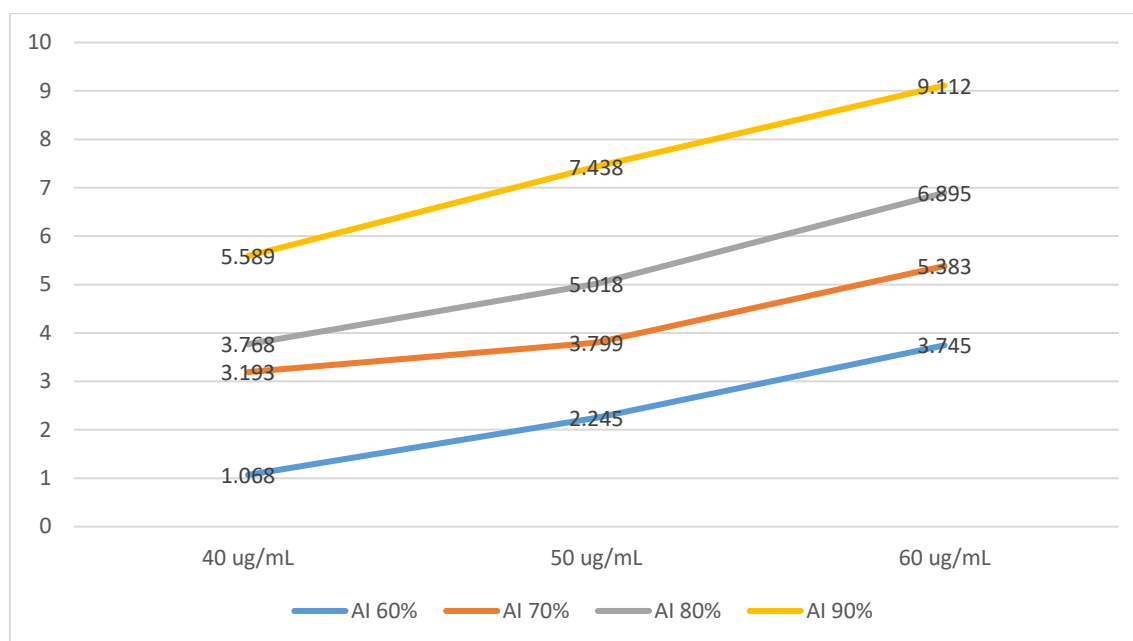


Figure 2 – Line diagram for SPF value

The inference of data unveiled that the concentration of extract accompanying the photo protective potential of extract, As the concentration of extracts increased the sun screen effect of all extracts has been increased that would be due to availability of more solute at higher concentration. The plant selected for the study bestowed with multifarious medicinal and cosmetic effect, this additional boon might increase the horizon of cosmeceutical effect of *Azadirachta indica*.

CONCLUSION

In addition to the multiple benefit of different part of *Azadirachta indica*, it has proven good potential to be used for sun protective effects. The necessities of human lead the discovery of new substance from natural trove, natural remedial therapy is always beneficial than synthetic alternatives because of their lower toxicity. *Azadirachta indica* is a revered, traditionally established and renowned for its medicinal properties since prehistoric times. The present study supported the sun screen potential of leaves in concentration dependent manner that would

magnify the cosmeceutical potential *Azadirachta indica*.

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