



SEASONAL EFFECT ON UV ABSORPTION PROPERTY OF *AMARANTHUS SPINOSUS* L. LEAVES

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ABSTRACT

Amaranthus spinosus Linn. (*A. spinosus* L.) is known to possess a wide range of pharmacological properties. Recently we have noted UV absorption property of ethanol extract of this plant leaves. It is known that pharmacological properties of medicinal plants are due to plant's secondary metabolite. It is also known that amount of secondary metabolite in plant varies with season. The aim of the present work was, therefore, to ascertain seasonal effect on the UV absorption property of the plant leaves. Leaves of *A. spinosus* L. were collected in winter, autumn, summer and rainy seasons. Ethanol extracts of the leaves were prepared separately. Extracts were scanned in a spectrophotometer (wavelength range from 200 nm to 400 nm) at 10 nm intervals to get absorption spectra. Amount of polyphenol in the leaf extract was also checked to note correlation, if any, between poly phenol content and UV absorbing property of the plant leaves. Results showed that ethanol extract of *A. spinosus* L. leaves of autumn had maximum UV absorbing property. Polyphenol content of the leaves was also high during autumn. Ethanol extract of *A. spinosus* L. leaves of autumn, therefore, may be used for isolation of active compound responsible for UV absorption property as well as as anti solar agent in preparation of sun screen lotions.

KEYWORDS: *Amaranthus spinosus* Linn. leaves, UV absorbing property, seasonal effect, polyphenols, sun screen lotion.

1. INTRODUCTION

Secondary metabolites are chemicals produced by plants which have no direct role in growth but are responsible for different activities in order to defend themselves against exogenous biotic / abiotic constraints. There are mainly four classes of secondary metabolites in plants: phenolic compounds, alkaloids, terpenoids and sulphur containing compounds. These chemicals exert pharmacological effects like anti microbial, anti diabetic, anti oxidant, anti inflammatory, anti allergic, anti cancer, anti gastric ulcer etc.^[1]

Amount of secondary metabolites present in plant varies with season. Fluck and Pharm showed influence of climate on secondary metabolites in medicinal plants.^[2] Thereafter, series of experiments were conducted in this direction. Now a days it is known that accumulation of secondary metabolites in roots, stem and leaves of plants varies with season.^[3-7]

A. spinosus L. (family, Amaranthaceae), a medicinal plant, is being used for medical treatment since long. Modern researchers found presence of secondary

metabolites in different parts of this plant which are responsible for wide range of pharmacological activities like anti microbial, anti cancer, anti inflammatory, anti diabetic, anti oxidant, anti gastric ulcer, hepato protective, gastro protective etc.^[8] Recently we have observed UV absorption property of the plant leaves.

Aim of the present study was to see the seasonal effect on UV absorption property of *A. spinosus* L. leaves, if any. Effort was also made to estimate amount of phenolic compounds in the plant leaves in different seasons as there is a positive correlation between amount of phenolic compounds in plant's leaf and its UV absorption property.^[9]

2. METHODOLOGY

2.1 Plant material

A. spinosus L. leaves were purchased from the local market during summer (March – May), rainy season (June – August), Autumn (September – November) and Winter (December – February). Leaves were authenticated by the experts of the department of Botany of the University of North Bengal, Dist. Darjeeling, West

Bengal, India. A voucher specimen was kept in the department of Medical Biotechnology, Sikkim Manipal

Institute of Medical Sciences of the Sikkim Manipal University, Gangtok, Sikkim, India for future references.



Figure – 1: *A. spinosus* L. leaves.

2.2 Extraction of the plant leaves

Collected *A. spinosus* L. leaves were washed thoroughly. Leaves were then shade dried and powdered separately. 50 g of the powder was extracted with 500 ml of ethanol (we found earlier that ethanol extract had maximum UV absorption activity) in a soxhlet apparatus at 37⁰ C for 10 minutes. Mixture was then filtered. Filtrate was made to dry using lyophilizer. Brown-yellow mass obtained.

2.3 UV ray absorption study

Brown-yellow mass (10 mg) obtained from the extraction process was mixed with 100 ml of distilled water. Solution was filtered. Filtrate was scanned in a spectrophotometer for UV ray absorption at the range of 200-400 nm. Each experiment was done five times and mean value calculated.

2.4 Total phenols content

10 mg of the brown-yellow mass obtained in extraction process was mixed with 100 ml of distilled water. Solution was then filtered. Total phenols content of the filtrate was determined by the method of McDonald *et al.*^[10] Each experiment was done five times and mean value calculated.

2.5 Chemicals

Chemicals required for the study were purchased from Merck, Germany as well as Loba Chem. Lab and Himedia Lab, India.

2.6 Statistical Analysis

All experiments were repeated for five times. Data were analyzed statistically by SPSS 20. The statistical significance between UV absorption spectra of different extracts was evaluated with Duncan's multiple range test (DMRT). 5% were considered to be statistically significant.^[11]

3. RESULTS

UV absorption spectra of ethanol extract of *A. spinosus* L. leaves during autumn, summer, winter and of rainy season are shown in Figures – 2, 3, 4 and 5 respectively. Ethanol extract of the plant leaves of autumn absorbs maximum UV ray at 200 nm (1.5). UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm were 0.88, 0.62, 0.56 and 0.43 respectively. Maximum UV absorption of ethanol extract of *A. spinosus* L. leaves of summer was found at 200 nm (1.2). At 250 nm, 300 nm, 350 nm and 400 nm wave lengths UV absorption were, however, 0.75, 0.58, 0.49 and 0.38 respectively. UV absorption spectra of ethanol extract of *A. spinosus* L. leaves of winter was found maximum at 200 nm (1.0). UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm were 0.70, 0.52, 0.41 and 0.33 respectively. Maximum UV absorption of ethanol extract of *A. spinosus* L. leaves of rainy season was found at 200 nm (0.8). At 250 nm, 300 nm, 350 nm and 400 nm wave lengths UV absorption were 0.55, 0.48, 0.39 and 0.28 respectively. Overall effect of season on UV radiation absorption by the ethanol extract of *A. spinosus* L. leaves at different wave lengths is presented in Figure – 6.

Effect of season on amount of phenolic compounds in *A. spinosus* L. leaves is shown in Figure - 7. *A. spinosus* L. leaves collected during autumn had 71.0 mg phenolic compounds in 1 g dry wt of the leaves whereas *A. spinosus* L. leaves collected during summer, winter and rainy seasons had 42.0, 34.0, 20.0 mg of phenolic compounds per g dry wt of the leaves respectively.

4. DISCUSSION

UV radiation comes from sun. It also generates from some laboratory instruments like trans illuminators, biological safety cabinets, germicidal lamps, lasers and

cross linkers. So there are ample scopes for man to take excess UV radiation through sun or the laboratory instruments. It is known that excess intake of UV ray can cause many detrimental effects including skin cancer.^[12,13] Therefore, attempts are going on to search the sources which can absorb UV ray. One identified source is medicinal plant. Many medicinal plants are found effective in absorbing solar UV radiation. Few of them are *Azadirachta indica*, *Phyllostachys pubescens*, *Aloe vera*, *papaya* etc.^[14,15] Recently we have seen that *A. spinosus* L. leaves can absorb UV rays.

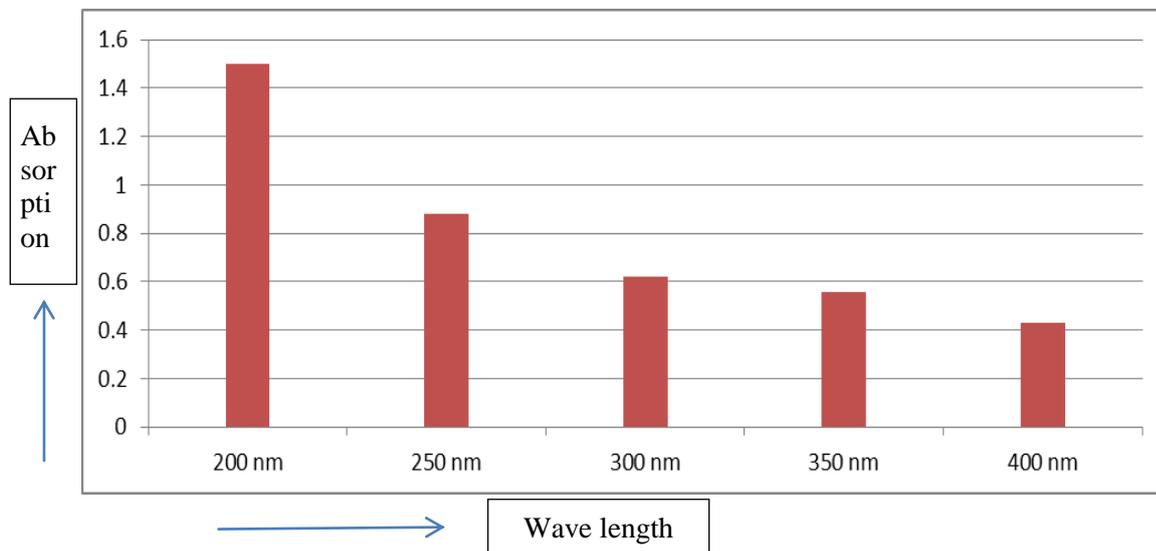


Figure – 2: UV radiation absorption by the ethanol extract of *A. spinosus* L. leaves during autumn.

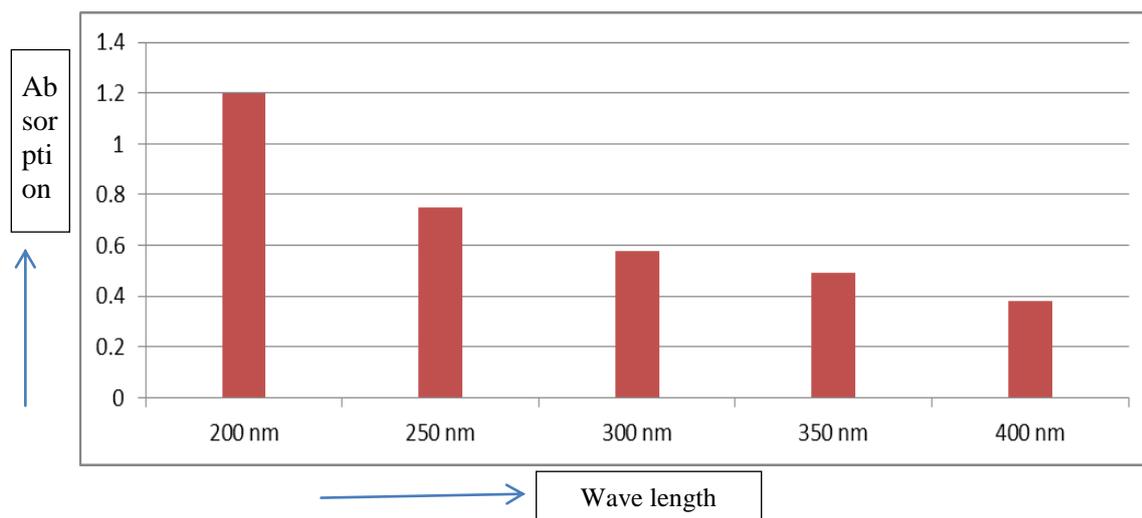


Figure – 3: UV radiation absorption by the ethanol extract of *A. spinosus* L. leaves during summer.

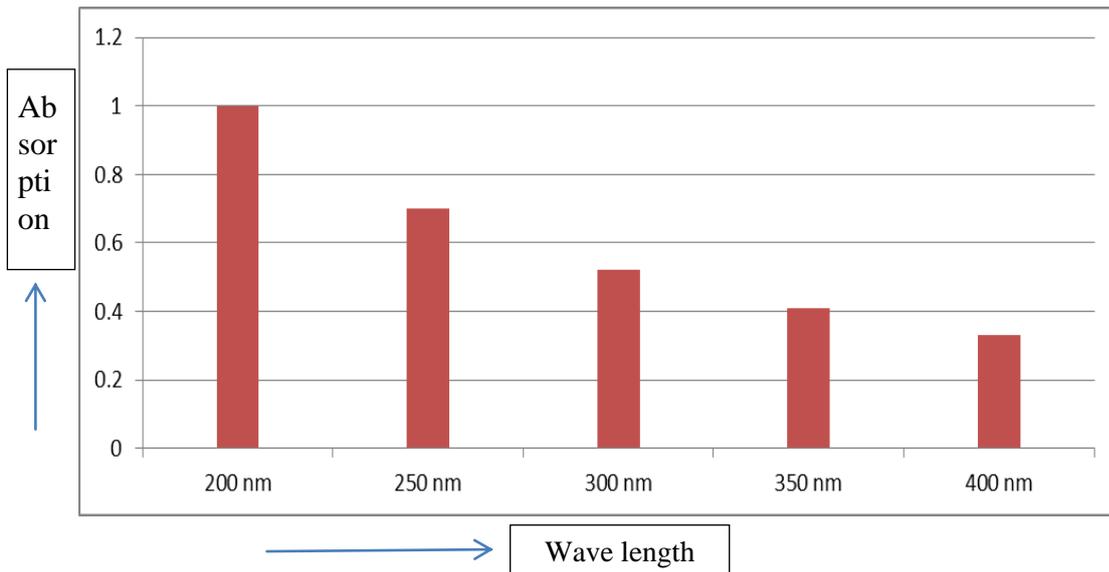


Figure – 4: UV radiation absorption by the ethanol extract of *A. spinosus* L. leaves during winter.

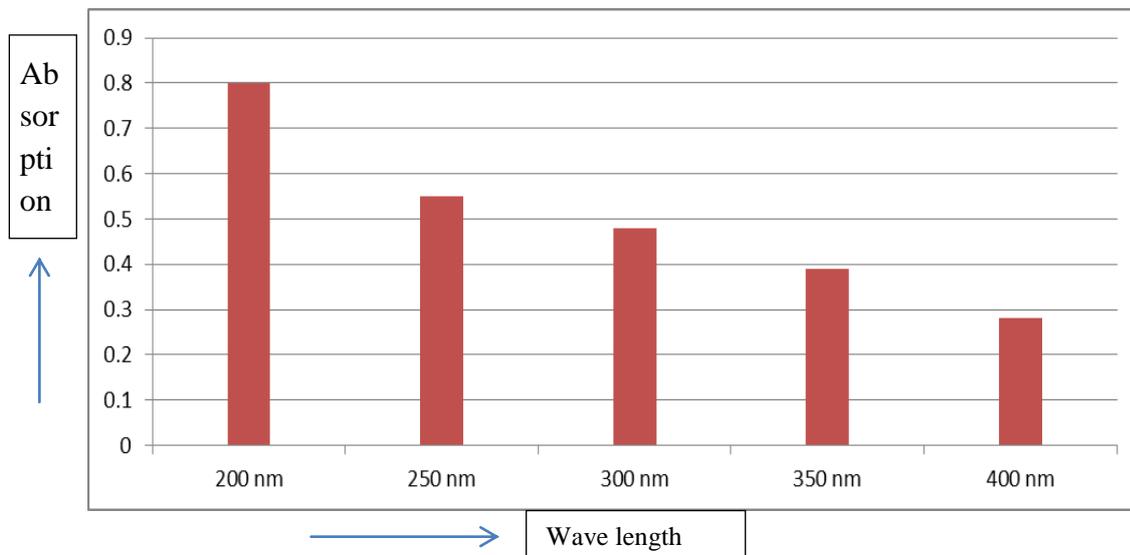


Figure – 5: UV radiation absorption by the ethanol extract of *A. spinosus* L. leaves during rainy season.

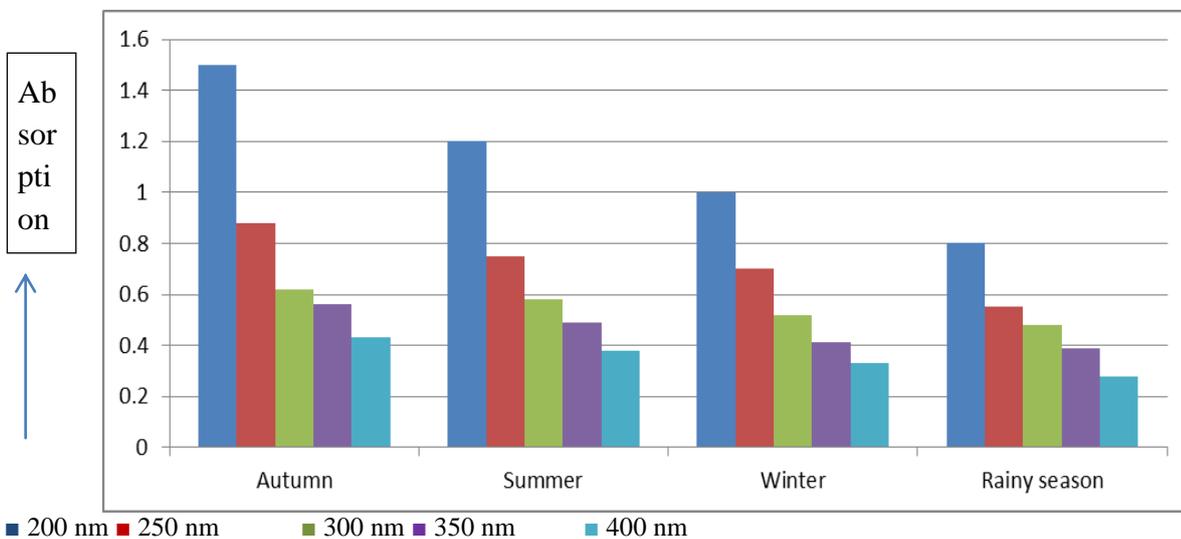


Figure – 6: UV radiation absorption at different wave lengths by the ethanol extract of *A. spinosus* L. leaves: Effect of season.

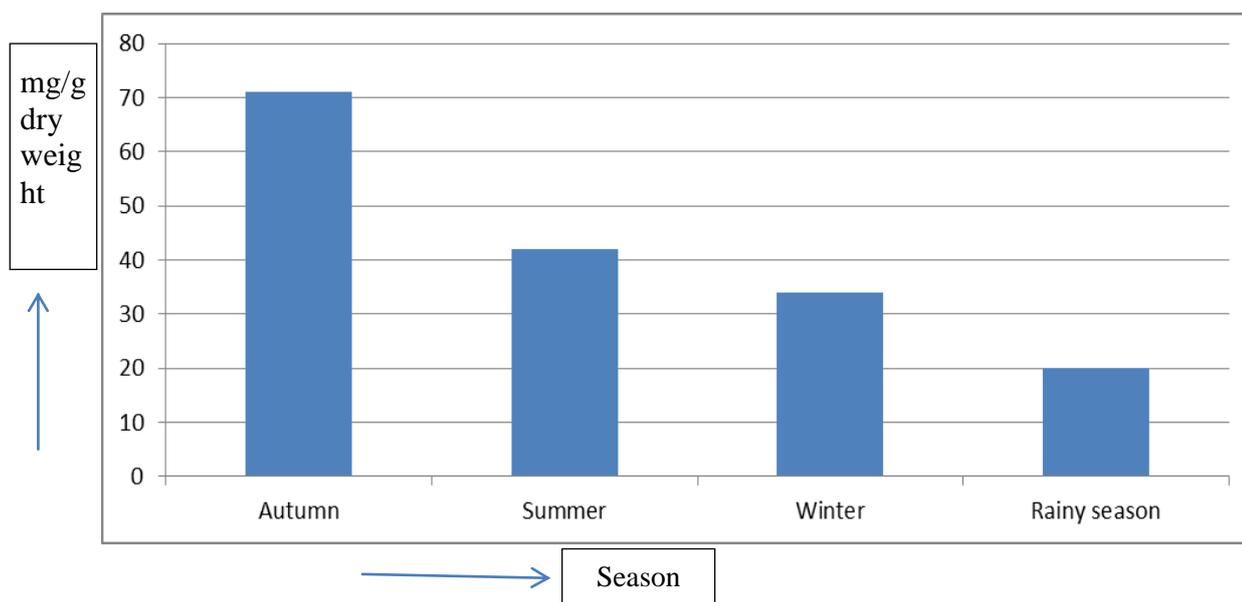


Figure – 7: Amount of phenolic compounds in *A. spinosus* L. leaves: Effect of season.

Biological activity of a plant, mediated through secondary metabolite, varies with season.

Celiktas *et al.* showed that antimicrobial activities of methanol extracts of *Rosmarinus officinalis* was maximum during winter due to presence of high amount of essential oils in the plant.^[16]

Hussain *et al.* investigated seasonal variations in chemical composition, antioxidant and antimicrobial activities of basil (*Ocimum basilicum*) essential oils. They noted that chemical composition of essential oil in basil varies with season resulting in variation of its antioxidant and antimicrobial activities.^[17] In the present work we found that UV absorption (200-400 nm) property of *A. spinosus* L. leaves was maximum in autumn followed by summer, winter and rainy season (Figure – 6).

Polyphenol content of *A. spinosus* L. leaves of different seasons were also examined. Results showed that amount of polyphenol in the plant leaves was maximum in autumn followed by summer, winter and rainy season (Figure – 7). The result is in agreement with the earlier finding that there is a positive correlation between amount of phenolic compounds in plant's leaf and its UV absorption property.^[9]

5. CONCLUSION

Present study showed that ethanol extract of *A. spinosus* L. leaves of autumn had maximum UV absorbing property. Therefore, the plant leaves of autumn may be utilized in further study for isolation of active compound responsible for UV absorbing property so that the compound can be used in preparation of sun screen lotions.

Recommendation

Ethanol extract of *A. spinosus* L. leaves of autumn may be used in sun screen lotion as UV absorbing material.

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Conflict of interest: Nil.

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