



UV ABSORPTION PROPERTY OF *AMARANTHUS SPINOSUS* L. LEAVES: EFFECT OF EXTRACTION SOLVENTS

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ABSTRACT

Since time immemorial *Amaranthus spinosus* linn. (*A. spinosus* L.) is being used for medical treatment. Modern researchers found that this plant has a wide range of pharmacological activities like anti diabetic, anti gastric ulcer, anti cancer, anti inflammatory, anti oxidant, anti microbial, gastro protective, hepato protective etc. Aim of the present study was to examine effect of extraction solvents on UV absorbing property of the plant. Leaves of *A. spinosus* L. were collected and identified by the taxonomist. Solvent extractions of the leaves were made separately by using methanol, acetone, benzene, ethanol, chloroform and ethyl acetate. In a spectrophotometer using UV region the extractions were separately exposed for absorption of UV ray. Result showed that all extracts of *A. spinosus* L. leaves had UV absorption property but ethanol extract had maximum activity. Ethanol extract of *A. spinosus* L. leaves, therefore, may be further studied for isolation of the active compound responsible for UV absorbing property for its use in preparation of sun screen lotions.

KEYWORDS: *Amaranthus spinosus* linn. leaves; Solvent extractions; UV absorbing property.

1. INTRODUCTION

A. spinosus L. (family, Amaranthaceae), a medicinal plant of India, is believed to originate from South and Central America and then introduced into various regions of Africa. The plant is now widely distributed in roadsides, fields and waste places of Maldives, Japan, Sri Lanka, Myanmar, Bangladesh, Indonesia, Australia, Ghana, Cambodia, Philippines and India.^[1]

A. spinosus L. is known by different names e.g. 'Prickly amaranthus' in English, 'dhuti ghans' in Nepali, kantanotyia in Bengali, kanta chaulai in Hindi, kantaneutia in Oriya, kantalo in Gujarati, dhimdo in Tamil, mullukkeerai, in Telegu, mullatotakura in Marathi and chengkruk in Manipuri. The plant grows annually as an erect perennial herb with many branches. Leaves are alternate, have characteristic odour with bitter taste. Stems are hard having greenish to purple in colour. Flowers appear throughout the year. Fruit is ovoid shaped. Seed is shiny, black or brownish-black in colour.^[2]

Phytochemical investigations showed that *A. spinosus* L. is a rich source of amino acids, rutin, catechuic acid, saponin, betalain, phenolic acids, steroids, alkaloids, linoleic acid, terpenoids, lipids, tannins, flavonoids, glycosides, b-sitosterol, stigmaterol, and carotenoids.

The plant also contains amaranthine and isomaranthine, quercetin and kemferol glycoside, 7-p-coumaroyl apigenin 4-o-beta-D-glucopyranoside, xylofuranosil, uracil, beta-sitosterol glucoside, beta - D-ribofuranosyl adenine, betaxanthin, betacyanin, betanin, stigmaterol, hydroxycinnamates etc.^[3]

Due to presence of high amount of nutrients *A. spinosus* L. is used as green vegetables.^[4] As traditional medicine parts of the plant are used to treat diarrhea, toothaches, gastroenteritis, gall bladder, boils, earache, burns, wounds, abscesses, arthritis and as an antidote to snake poison.^[5]

Studies have shown that *A. spinosus* L. has a wide range of pharmacological activities like immuno-modulatory properties, antimicrobial, anti-hyperlipidemic, antibacterial, anti-peptic ulcer, antidiabetic, antitumor, anti-inflammatory, analgesic, bronchodilator and spasmolytic, hepato-protective, antifertility, anti-nociceptive, antidiarrhoeal, gastrointestinal activity, anti-helminthic, antigenic and allergenic activity, haematological activity, antimalarial, antipyretic, diuretic, antioxidant etc.^[6] Aim of the present study was to see UV absorption property of *A. spinosus* L., if any.

2. MATERIALS AND METHODS

2.1 Collection of plant material

A. spinosus L. leaves were purchased from the local market. Leaves were authenticated by the taxonomist 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

A. spinosus L. leaves were washed thoroughly, then shade dried and powdered. 50g of this powder was extracted separately with 500 ml of acetone, chloroform, methanol, ethanol, benzene and ethyl acetate in a soxhlet apparatus at 37⁰ C for 10 minutes,. Extracted materials were then filtered. By using lyophilizer filtrate was made to dry. Brown- yellow mass obtained. To 10 mg of this mass distilled water (100 ml) was added. The solution after filtration was processed in a spectrophotometer for UV ray absorption at the range of 200-400 nm.

2.3 Chemicals

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

2.4 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.^[7]

RESULTS

UV absorption spectra of ethanol, methanol, acetone, benzene, ethyl acetate and chloroform extracts of *A. spinosus* L. leaves are shown in Figures – 2, 3, 4, 5, 6 and 7 respectively. Ethanol extract absorbs maximum UV ray at 200 nm (1.7). UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm were 0.8, 0.6, 0.5 and 0.4 respectively. At 200 nm wave length methanol extract absorbs maximum UV rays (1.5). At 250 nm, 300 nm, 350 nm and 400 nm wave lengths methanol extract of *A. spinosus* L. leaves showed absorptions 0.65, 0.5, 0.4 and 0.3 respectively.

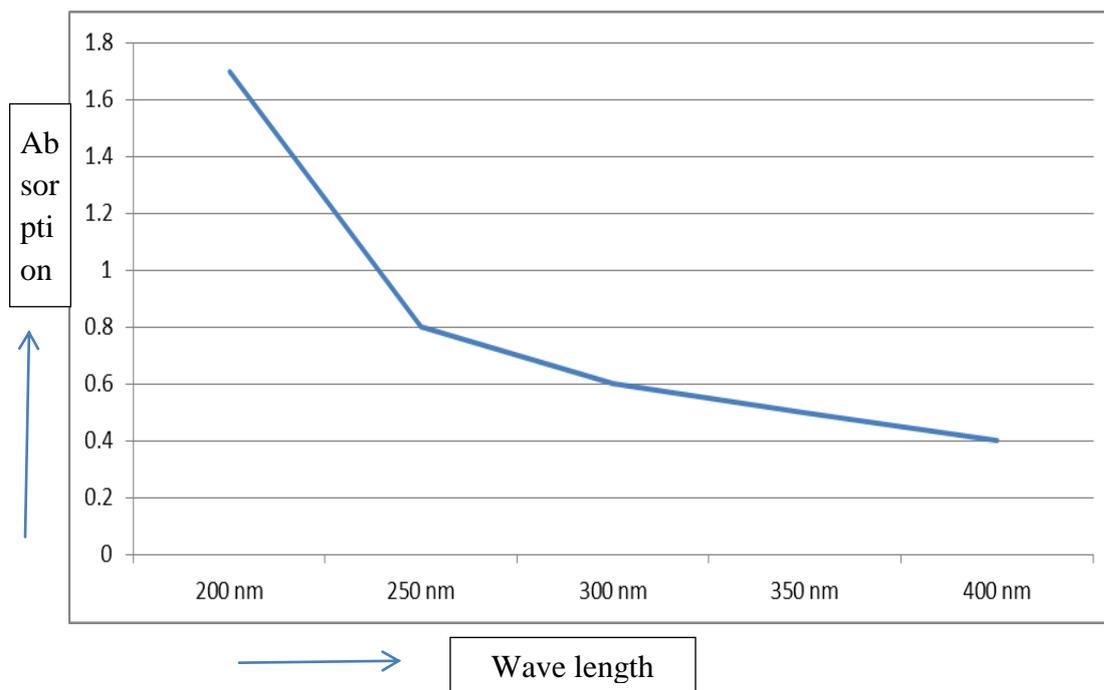


Figure – 2: UV radiation absorption by the ethanol extract of *A. spinosus* L. leaves.

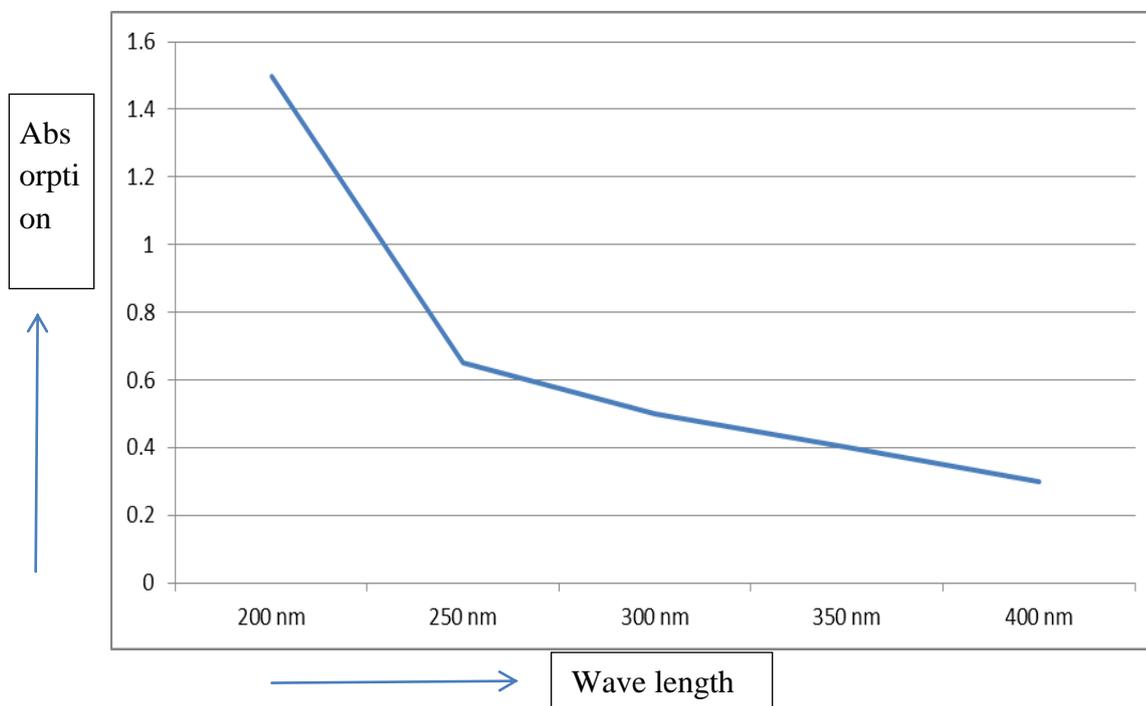


Figure – 3: UV radiation absorption by the methanol extract of *A. spinosus* L. leaves.

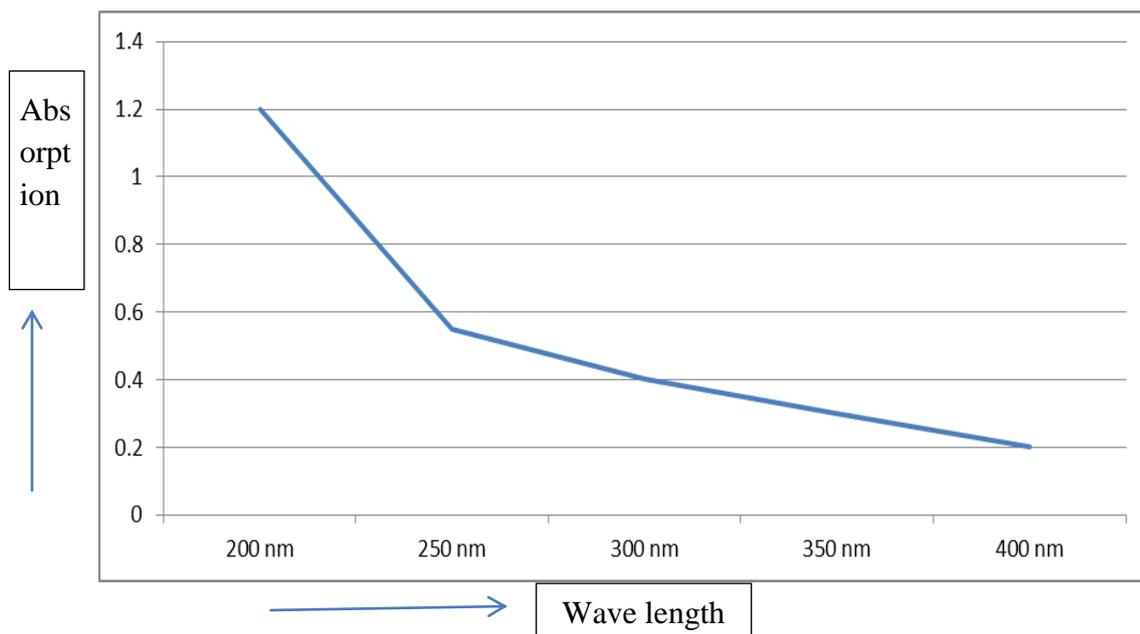


Figure – 4: UV radiation absorption by the acetone extract of *A. spinosus* L. leaves.

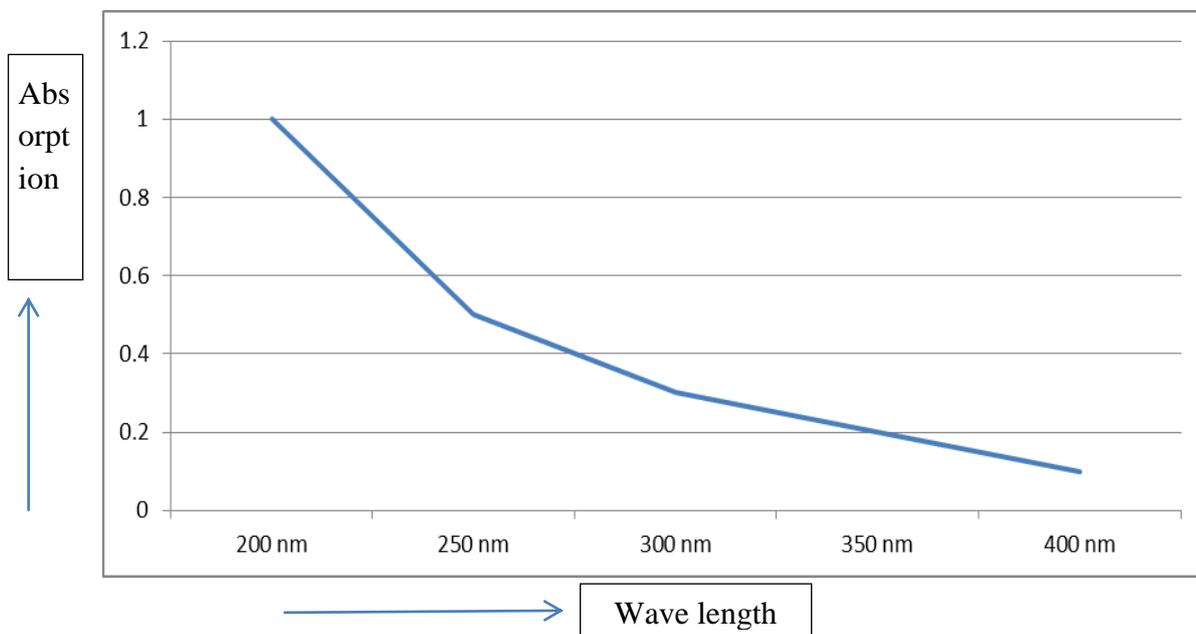


Figure – 5: UV radiation absorption by the benzene extract of *A. spinosus* L. leaves.

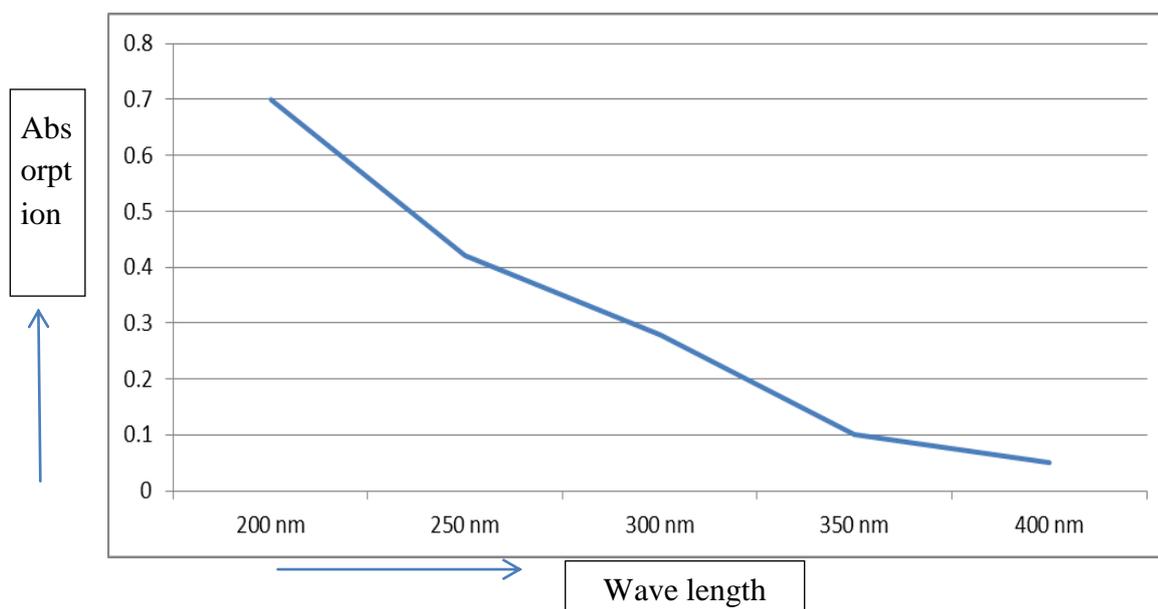


Figure – 6: UV radiation absorption by the ethyl acetate extract of *A. spinosus* L. leaves.

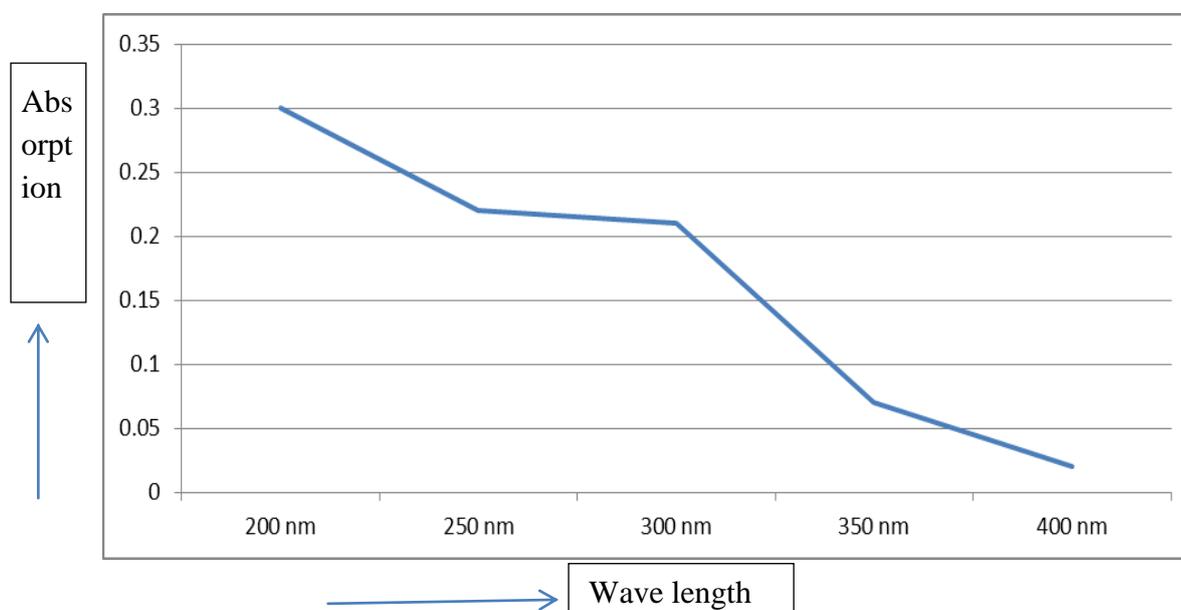


Figure – 7: UV radiation absorption by the chloroform extract of *A. spinosus* L. leaves.

Acetone extract showed maximum UV absorption at 200 nm (1.2). UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm were 0.55, 0.4, 0.3 and 0.2 respectively. At 200 nm benzene extract absorbs maximum UV rays (1.0). At 250 nm, 300 nm, 350 nm and 400 nm wave lengths benzene extract of *A. spinosus* L. leaves however showed 0.5, 0.3, 0.2 and 0.1 absorptions respectively. Ethyl acetate extract showed maximum UV absorption at 200 nm (0.7). UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm were 0.42, 0.28, 0.1 and 0.05 respectively. Chloroform extract showed maximum UV absorption at 200 nm (0.3). UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm were 0.29, 0.21, 0.07 and 0.02 respectively.

4. DISCUSSION

Ultraviolet radiation, the non-ionizing radiation falls under 180 – 400 nm wavelength region of the electromagnetic spectrum, is divided into three regions: UVC known as germicidal (wave length, 180-280 nm), UVB known as erythema (wave length, 281-314 nm) and UVA known as black light (wave length, 315-400 nm). Common source of UV radiation is sunlight. UV radiation also generates in the laboratory through germicidal lamps, trans illuminators, biological safety cabinets, lasers and cross linkers.

Solar UV-radiation is required for the cutaneous synthesis of vitamin D and this covers almost 90% of the vitamin D-requirements of the human body but this radiation has adverse effects too. UV-radiation of sun is the most important environmental risk factor for

development of non-melanoma skin cancer. Other detrimental effect of UV exposure is photosensitivity reactions to ingested drugs.

to invent sources through which solar / artificial UV rays can be absorbed. In this context research has been extended even in the field of medicinal plants.^[10]

There are ample scopes to get exposure of ultraviolet radiation by the human body either from sun or from the laboratory instruments. These may cause severe injury including skin cancer. Protection from UV radiation is therefore important for human body.^[8,9] Efforts are taken

Several medicinal plants like *Aloe vera*, *Lycopersicon esculantum*, *Calotropis gigantea L.*, *Oscimum sanctum*, *Mentha piperita*, *Azadirachta indica*, *Phyllostachys pubescens*, *Carica papaya* etc. have shown anti solar activity.^[11,12]

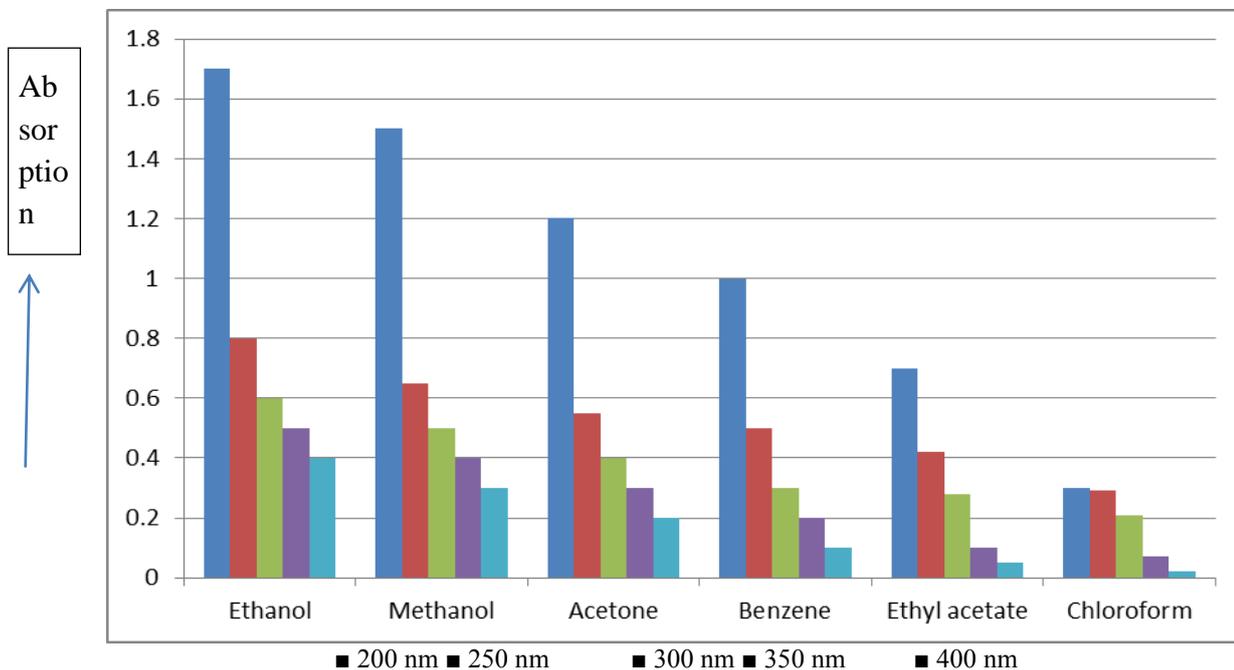


Figure – 8: UV radiation absorption at different wave lengths by the ethanol, methanol, acetone, benzene, ethyl acetate and chloroform extracts of *A. spinosus L.* leaves.

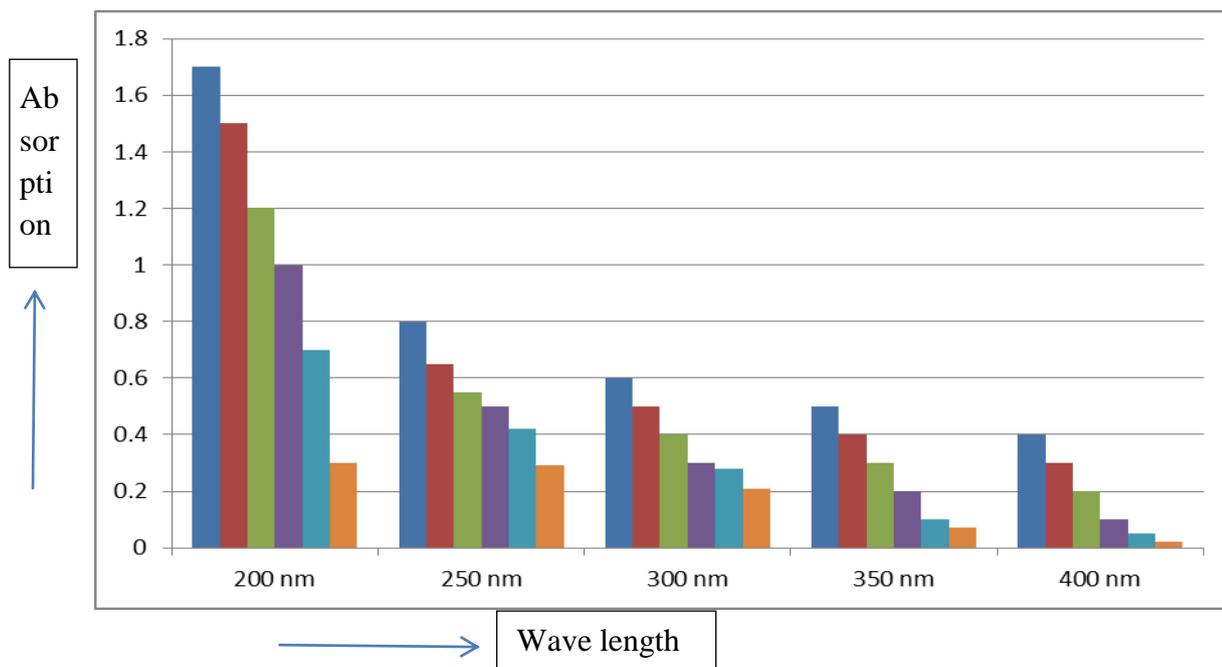


Figure – 9: UV radiation absorption by the ethanol, methanol, acetone, benzene, ethyl acetate and chloroform extracts of *A. spinosus L.* leaves.

In the present study we have shown UV radiation absorption property of *A. spinosus* L. leaves. Ethanol, methanol, acetone, benzene, ethyl acetate and chloroform extracts of the plant leaves showed UV radiation absorption property in all wave lengths of UV region but maximum absorption was found for UVC i.e. wave length 180-280 nm (Figure – 8). Further, ethanol extract of *A. spinosus* L. leaves showed maximum UV radiation absorption in all UV regions (Figure – 9).

Secondary metabolites of plants like polyphenols, flavonoids, coumarin derivatives and many others are usually responsible for their biological activities.^[13] In our earlier communication we also reported that *Syzygium cumini* L. Leaves contain high amount of polyphenols which was responsible for its UV absorption property.^[14]

It is known that season has effect on synthesis of secondary metabolite in plants thereby affecting their biologic activity.^[15-17] It is, therefore, worth to investigate the seasonal effect on UV absorption property of *A. spinosus* L. leaves. Work in this direction is now in progress.

5. CONCLUSION

Present study showed that ethanol extract of *A. spinosus* L. leaves had maximum UV absorbing property. Ethanol extract of *A. spinosus* L. leaves may, therefore, be further studied for isolation of the active compound responsible for UV absorbing property.

Recommendation

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

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Conflict of interest

Nil.

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