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Research Article

Seasonal Effect on UV Absorbing Property of *Ageratum conyzoides* Linn Leaves

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Abstract

Ageratum conyzoides Linn (*A. conyzoides* L.), a medicinal plant, is known to possess a wide range of pharmacological activities. Recently we have noticed UV absorbing property of *A. conyzoides* L. leaves. Since pharmacological activity of a plant depends on season, in the present study we have examined effect of season on UV absorbing property of *A. conyzoides* L. leaves.. Leaves of *A. conyzoides* L. were collected in autumn, winter, summer and rainy season. Ethanol extracts of the leaves of different seasons were prepared separately. Extracts were used to get absorption spectra by scanning in the wavelength range from 200 nm to 400 nm at 10 nm intervals. Amounts of polyphenols in the leave extracts were also checked to note correlation, if any, between poly phenol content and UV absorbing property of *A. conyzoides* L. leaves. Results showed that ethanol extract of *A. conyzoides* L. leaves of summer had maximum UV absorbing property. Polyphenol content of the leaves was also maximum during summer. Ethanol extract of *A. conyzoides* L. leaves of summer may be used as anti solar agent in preparation of sun screen lotions.

Keywords: *Ageratum conyzoides* Linn. Leaves; UV Absorbing Property; Seasonal Effect; Polyphenols; Sun Screen Lotion

Introduction

Secondary metabolites also known as active metabolites/active principles produced by plants are chemicals which have no direct role in growth of plants but are responsible to defend plants against exogenous biotic/abiotic constraints. Alkaloids, phenolic compounds, terpenoids and sulphur containing compounds are mainly four classes of secondary metabolites in plants. These metabolites exert pharmacological activities like anti gastric ulcer, anti microbial, anti inflammatory, anti diabetic, anti oxidant, anti allergic, anti cancer etc. [1]

Amount of secondary metabolite present in plant varies with season. As early as 1955 Fluck and Pharm showed the influence of climate on the active principles in medicinal plants [2]. Thereafter, series of experiments were conducted in this direction. That the amount of oak leaf tannins and nutrients changes with season was noticed by Feeny in 1970 [3]. Gupta in 1977 observed that during summer amount of active principle constituents of *Eclipta prostrata* L.. was maximum [4]. In 1982 Schultz., *et al.* showed that leaf quality of two northern hardwoods tree species varies with season [5]. Vasicine content of *Adhatoda vasica* was found maximum in autumn by Arambewela., *et al.* in 1988 [6]. In 1989 Mauffette and Oechel noted that leaf chemistry of the coast live oak *Quercus agrifolia* changes with season [7]. Drossopoulos., *et al*. in 1996 observed that mineral nutrients and carbohydrates in walnut tree leaves were maximum in rainy season [8]. In 1997 Coli., *et al.* showed that vertical variation in activity of pear thrips (Thysanoptera: Thripidae) within stands of sugar maple was maximum in autumn [9]. Fernnandez De Sim., *et al.* found in 1999 that amount of phenolic compounds of Spanish oak was more in rainy season [10]. In 2000 Ganjewala and his co-workers noted that accumulation of bacoside A in *Bacopa monniera* was maximum in summer [11].

Recently we observed that *A. conyzoides* L. leaves have UV absorbing property. Paper is under communication. Aim of the present study was to know effect of season on UV absorbing property of *A. conyzoides* L. Efforts were also made to estimate amount of phenolic compounds in *A. conyzoides* L. leaves in different seasons for a positive correlation, if any, between amount of phenolic compounds in plant's leaf and its UV absorption property [12].

Methodology

Plant material

A. conyzoides L. leaves were collected from the medicinal plants garden of the University of North Bengal, Siliguri (26041'30.9984" N, 88027'4.5756" E, elevation, 410 ft), Dist. Darjeeling, West Bengal, India during Autumn (September - November), Winter (December - February), Summer (March - May) and rainy season (June - August) of 2018-2019 at about 9 am. Leaves were authenticated by the experts of the department of Botany of the said university. A voucher specimen (No. SM-MB-08) 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 a

Extraction of the plant leaves

Collected leaves of *A. conyzoides* L. of different seasons were washed thoroughly. Leaves were then shade dried and separately powdered. The powder (50g) was extracted with 500 ml of ethanol in a soxhlet apparatus at 37^0C for 15 minutes. Ethanol as solvent. temperature (37^0C) and time (15 min) were maintained as per our earlier experiment as these precondition were needed to get maximum UV absorption property of *A. conyzoides* L. leaves. Mixture was then filtered. Filtrate was made to dryness by using lyophilizer. Brown mass obtained.

UV ray absorption study

Brown mass (10 mg) obtained from the extraction process was dissolved in 100 ml distilled water. The solution was processed in a spectrophotometer for UV ray absorption at the range of 200 - 400 nm at 10 nm intervals. Each experiment was done for three times and mean value calculated.

Total phenol content

10 mg of the brown mass obtained in extraction process was dissolved in 100 ml distilled water and total phenol content of the solution was determined by the method of McDonald., *et al.* [13]. Experiments were done three times and mean value calculated.

Chemicals

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

Statistical analysis

Data were analysed statistically by SPSS 20. The statistical significance between UV absorption spectra of different extracts was evaluated with Duncan's multiple range test (DMRT). 5% was considered to be statistically significant [14].

Results and Discussion

Figure 1 shows UV absorption spectra of ethanol extract of *A. conyzoides* L. leaves of autumn. At 200 nm the extract absorbs maximum UV rays. It was 0.82. At 250 nm, 300 nm, 350 nm and 400 nm wave lengths ethanol extract of *A. conyzoides* L. leaves, however, showed absorption 0.62, 0.41, 0.27 and 0.19 respectively. UV absorption spectra of ethanol extract of *A. conyzoides* leaves of winter is shown in figure 2. At 200 nm wave length the extract absorbed maximum UV rays. Value was 1.29. At 250 nm, 300 nm, 350 nm and 400 nm wave lengths the same extract of *A. conyzoides* L. leaves showed absorption 0.77, 0.59, 0.37 and 0.25 respectively. Figure 3 shows UV absorption spectra of ethanol extract of A. conyzoides L. leaves of summer. The extract absorbed maximum UV ray at 200 nm wave length which was 1.63. UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm wave lengths were found 0.85, 0.67, 0.49 and 0.32 respectively. UV absorption spectra of ethanol extract of *A. conyzoides* L. leaves of rainy season is shown in figure 4. The extract showed maximum UV absorption at 200 nm.

Figure 1: UV radiation absorption by the ethanol extract of *A. conyzoides* L. leaves during autumn.

Figure 2: UV radiation absorption by the ethanol extract of *A. conyzoides* L. leaves during winter.

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

Figure 4: UV radiation absorption by the ethanol extract of *A. conyzoides* L. leaves during rainy season.

It was 1.32. UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm wave lengths were 0.71, 0.58, 0.31 and 0.23 respectively.

Effect of season on amount of phenolic compounds in *A. conyzoides* L. leaves is shown in figure 5. *A. conyzoides* L. leaves collected during summer had 65.8 mg phenolic compounds in 1 g dry wt of the leaves whereas *A. conyzoides* L. leaves collected during rainy season, winter and autumn had 52.3, 49.7, 32.2 mg of phenolic compounds per g dry wt of the leaves respectively.

Figure 5: Amount of phenolic compounds in *A. conyzoides* L leaves : Effect of season

A. conyzoides L. (family, Asteraceae) is a medicinal plant. The plant is distributed throughout India, lower and middle hill in Sikkim and Darjeeling up to 6000 ft. The plant is commonly found in any garden soil and in waste places as well as on ruined sites [15]. The plant is known by different names. 'Elame' in Nepali, 'Namyew' in Lepcha and 'Goat weed' in English. In traditional medicine different parts of *A. conyzoides* L. are used to treat boils, sore throat, skin disorders, sleeping sickness, malaria, stomach ailments, pneumonia, wounds, chronic ulcer, intra-uterine problems, frontal headache, rheumatism, colic etc. [16]. The plant contains several bioactive compounds such as 6-(1-methoxyethyl)-7-methoxy-2,2-dimethyl chromene, encecanescins, 6-(1-ethoxyethyl)-7-methoxy-2,2-dimethylchromene, 6-(1-hydroxy ethyl)-7-methoxy-2,2-dimethylchromene and p-hydroxybenzoic acid, p-coumaric acid, fumaric acid, gallic acid, coumalic acid, protocatechuic acid, resorcinol, hexadecanoic acid, sinapic acid, benzoic acid, cis-hexen-3-en-1-ol, phenyl ethyl acetate, methanazulene and tricycoundecane etc. [17] for which it exerts wide range of pharmacological activities like allelopathic, insecticidal, antidiabetic, hepatoprotective, anticonvulsant, antitumor, antidotal, antioxidant, antimicrobial, anthelmintic, antiulcerogenic, analgesic, cytotoxic, radioprotective, antiprotozoal, haematopoietic, wound healing, gastroprotective, anti-inflammatory, anti-cataleptic etc. [18]. Recently we observed that *A. conyzoides* L. leaves can absorb UV rays. Since biological activity of a plant depends on secondary metabolites and amount of secondary metabolite in plant varies with season [1-11], in the present work we have studied effect of season on UV absorption property of *A. conyzoides* L. leaves.

Results showed that *A. conyzoides* L. leaves of all seasons(autumn, winter, summer, rainy season) absorbed UV ray, maximum absorption was found at 200 nm followed by 250 nm, 300 nm, 350 nm and 400 nm (Figures, 1-4). Results also showed that UV absorption property of *A. conyzoides* L. leaves was maximum in summer sample in comparison to that of *A. conyzoides* samples of winter, autumn and rainy seasons (Figure 6). This result support other's work where it has been shown that biological activity of plant varies with season [19,20].

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

A positive correlation between amount of phenolic compounds in plant's leaf and its UV absorption property has been demonstrated by Ebrahimzadeh., *et al*. [12]. In the present study we have estimated amount of phenolic compounds in *A. conyzoides* L. leaves of different seasons. It revealed that *A. conyzoides* L. leaves of summer had maximum amount of phenolic compounds (Figure 5). This high amount of phenolic compounds may have correlation with maximum UV absorbing property of *A. conyzoides* L. leaves of summer.

Solar UV-radiation is one of the important environmental risk factors for development of non-melanoma skin cancer [21]. It can also cause pigmentary changes, atrophy, wrinkling, photosensitivity reactions to ingested drugs etc. [22]. Efforts are, therefore, going on to invent sources through which solar UV rays can be absorbed. Summer sample of *A. conyzoides* L. leaves may act as anti solar source in future.

UV absorption property of *A. conyzoides* L. leaves may be due to presence of some other compounds apart from phenolics. Mitra., *et al*. isolated anti solar compounds from *Murrya koenigii* and *Costus Speciosus* leaves [23,24]. Presently we are investigating in this direction to isolate the active ingredient(s) from *A. conyzoides* L. leaves responsible for UV absorption property.

Conclusion

Ethanol extract of *A. conyzoides* L. leaves of summer contains maximum amount of phenolic compounds and has maximum UV radiation absorbing property.

Recommendation

Ethanol extract of *A. conyzoides* L. leaves of summer may be used in preparation of sun screen lotion and other UV guard materials

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Conflict of Interest

Nil.

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