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Effect of Season on UV Absorption Property of *Murrya koenigii* (Linn) Spreng Wettst Leaves

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Abstract **Original Research Article**

Since time immemorial *Murrya koenigii* Linn. Spreng Wettst (*M. koenigii* L.) is being used to treat medical problems. The plant is also known to possess a wide range of pharmacological properties. Recently we have shown maximum UV absorption property of methanol extract of this plant leaves. As pharmacological properties of medicinal plants are due to its secondary metabolite and amount of secondary metabolite varies with season, it is thought worthwhile to study the seasonal effect on the UV absorption property of the *M. koenigii* L. leaves. Leaves of *M. koenigii* L. were collected in summer, winter, autumn and rainy seasons. Methanol extracts of the leaves of different seasons were prepared separately. Extracts were allowed to absorb UV rays (wavelength range from 200 nm to 400 nm at 10 nm intervals) in a spectrophotometer to get absorption spectra. It is known that polyphenols have relation with UV absorbing property. Amount of polyphenol in the leave extract was therefore estimated. Results showed that methanol extract of *M. koenigii* L. leaves of summer had maximum UV absorbing property. Polyphenol content of the leaves was also high during summer. It is concluded that methanol extract of *M. koenigii* L. leaves of summer may, therefore, be used as anti-solar agent in preparation of sun screen lotions.
Keywords: *Murrya koenigii* Linn. Spreng Wettst Linn. Leaves, UV absorbing property, seasonal effect, polyphenols, sun screen lotion.

INTRODUCTION

Secondary metabolites of plants are responsible to defend themselves against exogenous biotic / abiotic constraints. They have no direct role in growth. Secondary metabolites present in plants are of different type's viz. alkaloids, terpenoids, phenols and sulphur containing compounds. They are responsible for various pharmacological effects of plants like anti-allergic, anti-cancer, anti-microbial, anti-diabetic, anti-inflammatory, anti-oxidant, anti-gastric ulcer *et al*. [1].

It is known that 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, many investigators have shown that accumulation of secondary metabolites in stem, roots and leaves of plants varies with season [3-7].

M. koenigii L. (family, Rutaceae), commonly known as curry leaf, is a medicinal plant, and is being used for medical treatment since long. Modern researchers found presence of secondary metabolites in different parts of the plant which are responsible for anti-diabetic, anti-oxidant, anti-microbial, anti-gastric ulcer, anti aallergic, anti-cancer, anti-inflammatory, gastro protective and hepato protective activities [8]. Recently we have observed UV absorption property of *M. koenigii* L. leaves and maximum aborbtion is with methanol extract of the plant leaves. Results are under communication.

Therefore, aim of the present study was to see the seasonal effect, if any, on UV absorption property of *M. koenigii* L. leaves. As there is a positive correlation between amount of phenolic compounds in plant's leaf and its UV absorption property [9], effort was also made to estimate amount of phenolic compounds in the *M. koenigii* leaves of different seasons.

METHODOLOGY

Plant material

M. koenigii 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, and 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, and India for future references.

Fig-1: *M. koenigii* L. leaves

Extraction of the plant leaves

Collected *M. koenigii* L. leaves were washed thoroughly under tap followed by distilled water. Leaves of different seasons were then shade dried and powdered separately. 80 g of the powder was extracted with 400 ml of methanol in a soxhlet apparatus at 37^0 C for 10 minutes. Mixture was then filtered. Filtrate was made to dry using lyophilizer. Brownish mass obtained.

UV ray absorption study

Brownish mass (20 mg) obtained from the extraction process was mixed with 100 ml of Distilled water. Solution was filtered. Filtrate was processed in a spectrophotometer for UV ray absorption at the range of 200-400 nm. Each experiment was done for five times and mean value calculated.

Total phenols content

20 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 for five times and mean value calculated.

Chemicals

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

Statistical analysis

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].

RESULTS

UV absorption spectra of methanol extract of *M. koenigii* L. leaves during summer, rainy season, autumn and winter are shown in Figures – 2, 3, 4 and 5 respectively. Methanol extract of the plant leaves of summer absorbs maximum UV ray at 200 nm (1.6). UV ray absorptions by the same extract at 250 nm, 300 nm, 350 nm and 400 nm were 0.85, 0.67, 0.51 and 0.43 respectively. Maximum UV absorption of methanol extract of *M. koenigii* L. leaves of rainy season was found at 200 nm (1.25). At 250 nm, 300 nm, 350 nm and 400 nm wave lengths UV absorption were, however, 0.71, 0.52, 0.45 and 0.39 respectively. UV absorption spectra of methanol extract of *M. koenigii* L. leaves of autumn 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 0.62, 0.48, 0.38 and 0.30 respectively. Maximum UV absorption of methanol extract of *M. koenigii* L. leaves of winter was found at 200 nm (0.7). At 250 nm, 300 nm, 350 nm and 400 nm wave lengths UV absorption were 0.56, 0.40, 0.29 and 0.18 respectively. Overall seasonal effect on UV radiation absorption by the methanol extract of *M. koenigii* L. leaves at different wave lengths (200 – 400 nm) is presented in Figure – 6.

Effect of season on amount of phenolic compounds in *M. koenigii* L. leaves is shown in Figure - 7. *M. koenigii* L. leaves collected during summer had 78.4 mg phenolic compounds in 1 g dry wt of the leaves whereas *M. koenigii* L. leaves collected during rainy season, autumn and winter had 45.6 mg, 34.5 mg, 22.0 mg of phenolic compounds per g dry wt of the leaves respectively.

DISCUSSION

Ultraviolet (UV) radiation comes mainly from sun. It also generates from laboratory instruments like

biological safety cabinets, Trans illuminators, germicidal lamps, lasers and cross linkers. So there are ample scopes for a 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 *Oscimum sanctum, Mentha piperita , Azadirachta indica, Lycopersicon esculantum, Phyllostachys pubescens*, Calotropis gigantean, *Aloe vera, carica papaya* etc.[14,15]. Recently we have seen that *M. koenigii* L. leaves can absorb UV rays.

Biological activity of a plant, mediated through secondary metabolite, varies with season. Drossopoulos *et al.* noted that mineral nutrients and carbohydrates in walnut tree leaves were Maximum in rainy season [16]. Coli *et al.* investigated seasonal variation in activity of pearthrips (*Thysanoptera: Thripidae*) within stands of sugar maple and noted maximum activity in autumn [17]. 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 [18].

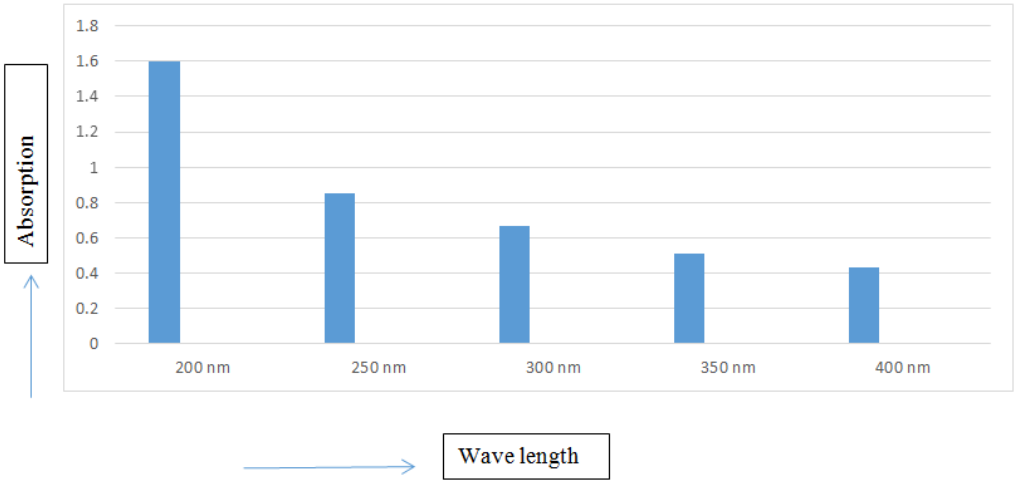

Fig-2: UV radiation absorption by the methanol extract of *M. koenigii* L. leaves during summer

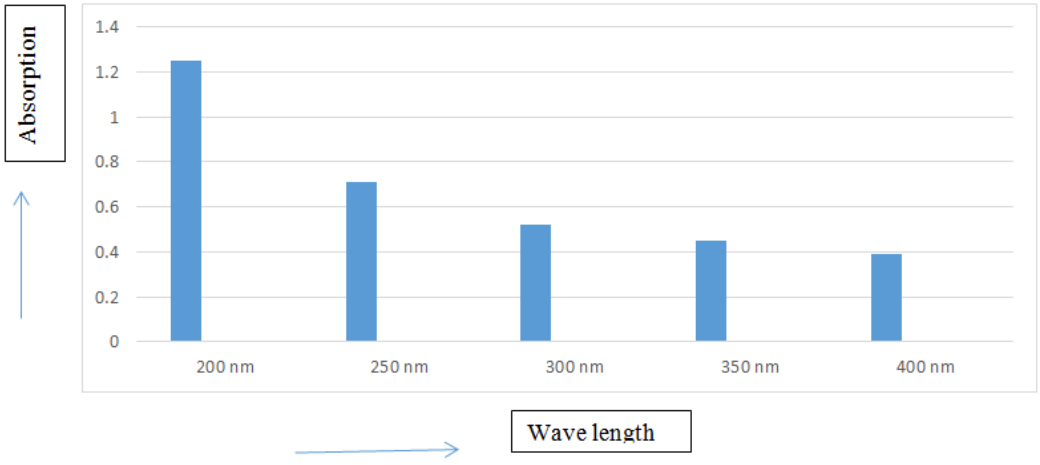

Fig-3: UV radiation absorption by the methanol extract of *M. koenigii* L. leaves during rainy season

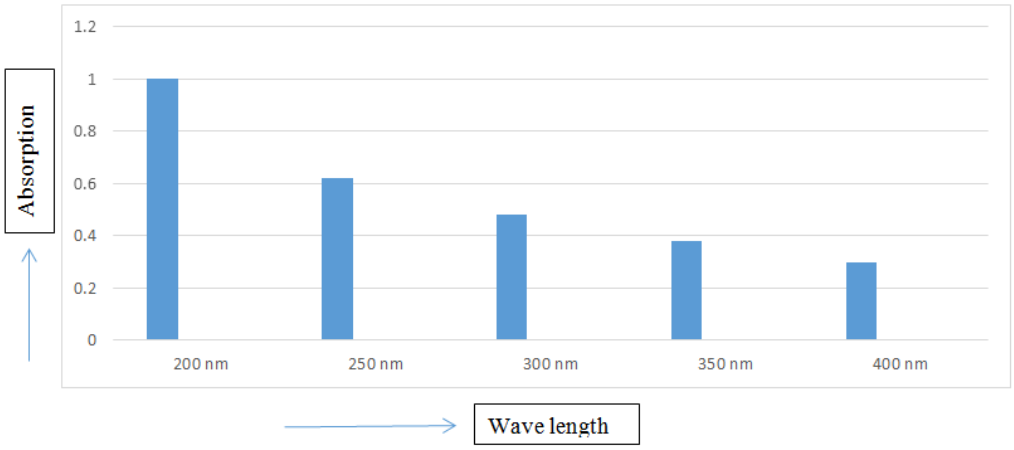

Fig-4: UV radiation absorption by the methanol extract of *M. koenigii* L. leaves during autumn

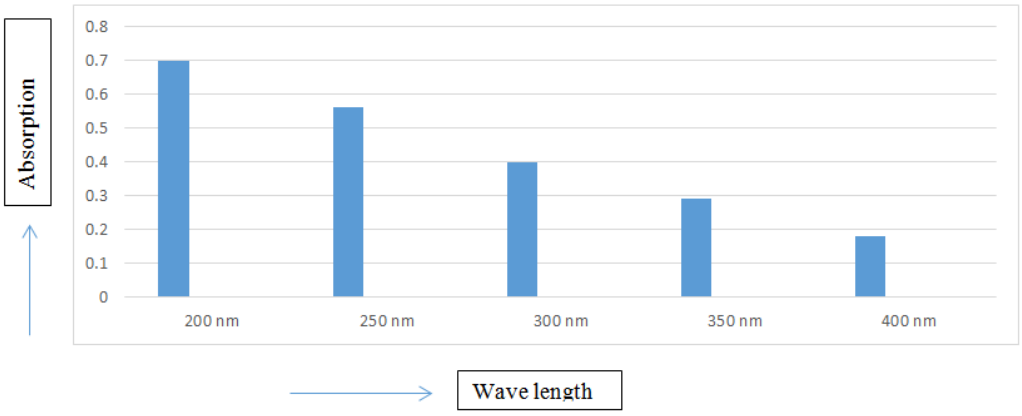

Fig-5: UV radiation absorption by the methanol extract of *M. koenigii* L. leaves during winter

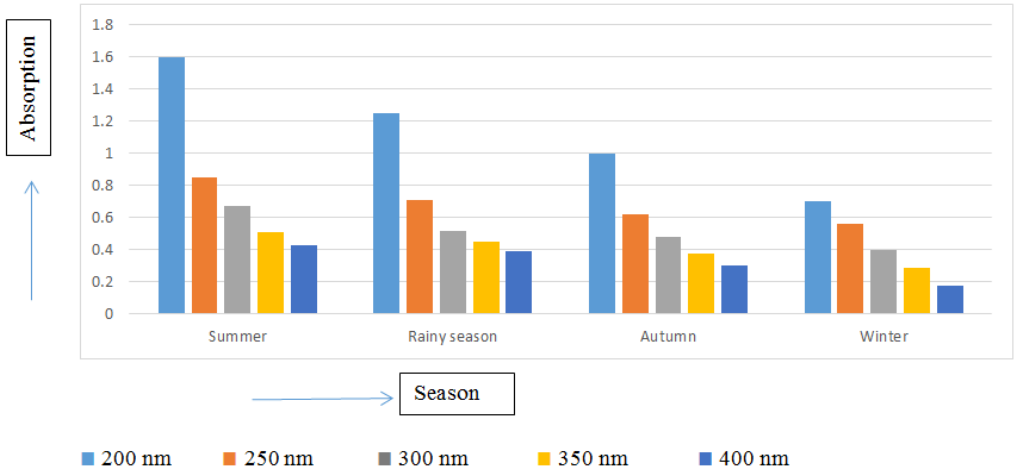

Fig-6: UV radiation absorption at different wave lengths by the methanol extract of *M. koenigii* L. leaves: Effect of season

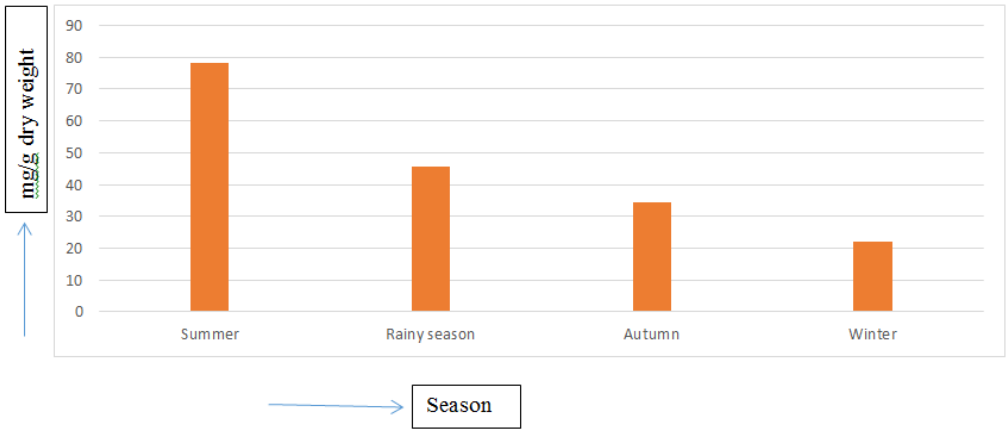

Fig-7: Amount of phenolic compounds in *M. koenigii* L. leaves: Effect of season

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 [19]. In the present work we found that UV absorption (200-400 nm) property of *M. koenigii* L. leaves was maximum in summer followed by rainy season, autumn and winter (Figure – 6).

Polyphenol content of of *M. koenigii* L. leaves of different seasons was estimated. Results showed that amount of polyphenol in the plant leaves was maximum in summer followed by rainy season, autumn and winter (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].

Conclusion

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

Acknowledgements

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References

1. Guerriero G, Berni R, Muñoz-Sanchez J, Apone F, Abdel-Salam E, Qahtan A, Alatar A, Cantini C, Cai G, Hausman JF, Siddiqui K. Production of plant secondary metabolites: Examples, tips and suggestions for biotechnologists. Genes. 2018 Jun;9(6):309.
2. Flück H. The influence of climate on the active principles in medicinal plants. Journal of Pharmacy and Pharmacology. 1955 Aug 9;7(1):361-83.
3. Arambewela LSR and Ratnayake CK. Vasicine contents and their seasonal variation in *Adhatoda vvasica*. Fitoterapia. 1988;59(2):151-153.
4. Feeny P. Seasonal changes in oak leaf tannins and nutrients as a cause of spring feeding by winter moth caterpillars. Ecology. 1970 Jul 1;51(4):565-81.
5. Gupta PL. Variation in morphological characters and active principle constituents of Eclipta prostrata Linn. under different seasonal and soil conditions. JRIM. 1977;12(1):80-4.
6. Mauffette Y, Oechel WC. Seasonal variation in leaf chemistry of the coast live oak Quercus agrifolia and implications for the California oak moth Phryganidia californica. Oecologia. 1989 Jun 1;79(4):439-45.
7. Schultz JC, Nothnagle PJ, Baldwin IT. Seasonal and individual variation in leaf quality of two northern hardwoods tree species. American Journal of Botany. 1982 May;69(5):753-9.
8. Ahmed S, Hasan MM, Mahmood ZA. Antiurolithiatic plants: Multidimensional pharmacology. Journal of Pharmacognosy and Phytochemistry. 2016 Mar 1;5(2):4.
9. Ebrahimzadeh MA, Enayatifard R, Khalili M, Ghaffarloo M, Saeedi M, Charati JY. Correlation between sun protection factor and antioxidant activity, phenol and flavonoid contents of some medicinal plants. Iranian journal of pharmaceutical research: IJPR. 2014;13(3):1041.
10. McDonald S, Prenzler PD, Antolovich M, Robards K. Phenolic content and antioxidant activity of olive extracts. Food chemistry. 2001 Apr 1;73(1):73-84.
11. Balaam LN. Statistical Methods for Research in the Natural Sciences. 1968.
12. MacKie RM. Effects of ultraviolet radiation on human health. Radiation Protection Dosimetry. 2000 Sep 1;91(1-3):15-8.

13. Elwood JM, Jopson J. Melanoma and sun exposure: an overview of published studies. International Journal of Cancer. 1997 Oct 9;73(2):198-203.
14. Gupta D. UV absorbing properties of some plant derived extracts. Res. J. Chem. Environ. Sci. 2013 Jun;1:34-6.
15. Sun G. Thermodynamics, kinetics, and multifunctional finishing of textile materials with colorants extracted from natural renewable sources. ACS Sustainable Chemistry & Engineering. 2017 Jul 27;5(9):7451-66.
16. Coli WM, Hollingsworth CS, Hosmer TA. Seasonal and vertical variation in activity of pear thrips (Thysanoptera: Thripidae) within stands of sugar maple. Canadian journal of forest research. 1997 May 1;27(5):667-73.
17. Drossopoulos B, Kouchaji GG, Bouranis DL. Seasonal dynamics of mineral nutrients and carbohydrates by walnut tree leaves. Journal of Plant Nutrition. 1996 Mar 1;19(3-4):493-516.
18. Celiktas OY, Kocabas EH, Bedir E, Sukan FV, Ozek T, Baser KH. Antimicrobial activities of methanol extracts and essential oils of Rosmarinus officinalis, depending on location and seasonal variations. Food Chemistry. 2007 Jan 1;100(2):553-9.
19. Hussain AI, Anwar F, Sherazi ST, Przybylski R. Chemical composition, antioxidant and antimicrobial activities of basil (Ocimum basilicum) essential oils depends on seasonal variations. Food chemistry. 2008 Jun 1;108(3):986-95.