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ANTIOXIDANT ACTIVITY OF VARIOUS PARTS OF *MARSILEA MINUTA* (L)

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ABSTRACT

The methanolic crude extracts of various parts of *Marsilea minuta*, L. were screened for their free radical scavenging properties using ascorbic acid as standard antioxidant. Free radical scavenging activity was evaluated using 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical. The overall antioxidant activity of frond was the strongest, followed in descending order by rhizome and petiole. All the methanolic extracts exhibited antioxidant activity significantly. Free radical scavenging activity with the DPPH method showed its maximum in frond followed by petiole and rhizome. Phytochemicals may play key roles in the potent antioxidant activity of wetland medicinal plants. The potential of these easily accessible sources of natural antioxidants should be explored by the pharmaceutical, medical, and health food industries. The study reveals that the consumption of this plant would exert several beneficial effects by virtue of their antioxidant activity.

KEYWORDS: *Marsilea minuta*, frond, petiole, rhizome, antioxidant, DPPH, free radical scavenging activity.

INTRODUCTION

Epidemiological studies and a substantial body of evidence have linked the production of free radicals with the occurrence of cardiovascular diseases, carcinogenesis, rheumatoid arthritis and degenerative processes associated with aging. Antioxidants aid in the prevention by scavenging the excess free radicals, hence preventing the formation of reactive oxygen species in the body (1). The use of synthetic antioxidants such as butylated hydroxytoluene, butylated hydroxyanisole, tert butylhydroquinone and propyl gallate has been negatively perceived by consumers due to safety and health effects (2). Hence, there is an increasing interest in the search of natural antioxidants from plant sources. It is well known that many botanicals possess natural antioxidants with high antioxidant activity (3) and investigations on these were initiated based on their uses in traditional folkloric medicines. The majority of the antioxidant activity is due to the flavones, isoflavones, flavonoids, anthocyanin, coumarin lignans, catechins and isocatechins (4). Antioxidant-based drug formulations are used for the prevention and treatment of complex diseases like atherosclerosis, stroke, diabetes, Alzheimer's disease and cancer (5, 6, 7).

Ferns belong to a group of non-flowering plants known as *Pteridophytes.* Despite the large number of ferns, knowledge on the antioxidant properties of some botanicals is still scarce. With this background an attempt was made to evaluate the antioxidant activity of various parts of *Marsilea minuta.*

MATERIALS AND METHODS

Plant material collection

Healthy and disease free entire plants of *Marsilea minuta*, L. were collected from the rice fields of Trichy, district.

Preparation of extract

The fresh materials were washed in tap water for 5 min and then frond, petioles and rhizome were separated out from the entire plant and dried at shade for two weeks. The separated parts (about 1 g) were pulverized in liquid nitrogen and extracted with 50 ml of methanol continuously for an hour at room temperature in a rotary orbital shaker. The extract was filtered under reduced pressure and stored at 20 °C to be used within one week.

Antioxidant activity (DPPH free radical scavenging activity) of methanolic extract

The antioxidant activity of the different extracts and the standard was assessed on the basis of the radical scavenging effect of the stable 1, 1-diphenyl-2-picrylhydrazyl (DPPH)-free radical activity by modified method(8). The diluted working solutions of the test extracts were prepared in methanol. Ascorbic acid was used as standard in 1-100 μg /ml solution. 0.002% of DPPH was prepared in methanol

and 1 ml of this solution was mixed with 1 ml of sample solution and standard solution separately. These solution mixtures were kept in dark for 30 min and optical density was measured at 517 nm using Cecil-Elect Spectrophotometer. Methanol (1 ml) with DPPH solution (0.002%, 1 ml) was used as blank. The optical density was recorded and % inhibition was calculated using the formula given below (9):

$$\text{Percent (\%) inhibition of DPPH activity} = \frac{A - B}{A} \times 100$$

Where A = optical density of the blank and B = optical density of the sample.

RESULTS AND DISCUSSION

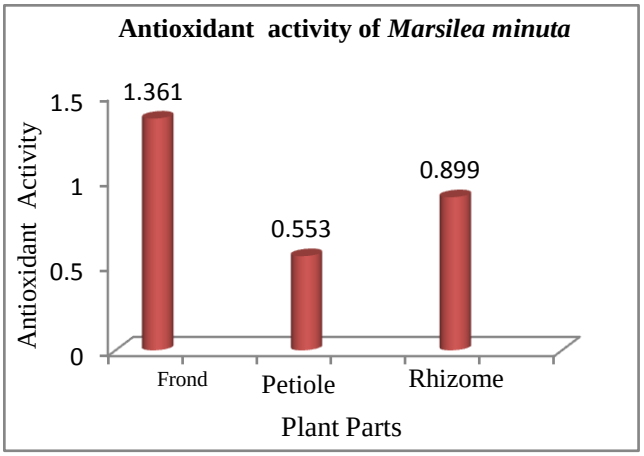
Antioxidant activity

The antioxidant content was measured for all the selected parts of *M. minuta* under present investigation (Table-1). The antioxidant content of the frond was 1.361mg/g which was a significant quantity when compared with the petiole and the rhizome. The antioxidant content of the rhizome was 0.899mg/g remarkably much lower than the leaves. The antioxidant content was substantially low in the petiole (0.553mg/g) of *M. minuta*. An antioxidant is a molecule that slows or prevents the oxidation of molecules. Oxidation refers to transfer of electrons from a substance towards oxidizing agents. Antioxidants (thiols, ascorbic acids and poly phenols) are often considered as reducing agents. Antioxidant terminates these chain reactions by removing free radical intermediates and inhibits the other oxidative reaction by being oxidized themselves (10).

Table 1. Antioxidant activity of various parts of *M. minuta*

Activity	Samples	mg/g
Antioxidant	Frond	1.361 ± 0.063
	Petiole	0.553 ± 0.042
	Rhizome	0.899 ± 0.037

Figure 1. Antioxidant activity of Marsilea minuta



Free radical scavenging activity (DPPH Activity)

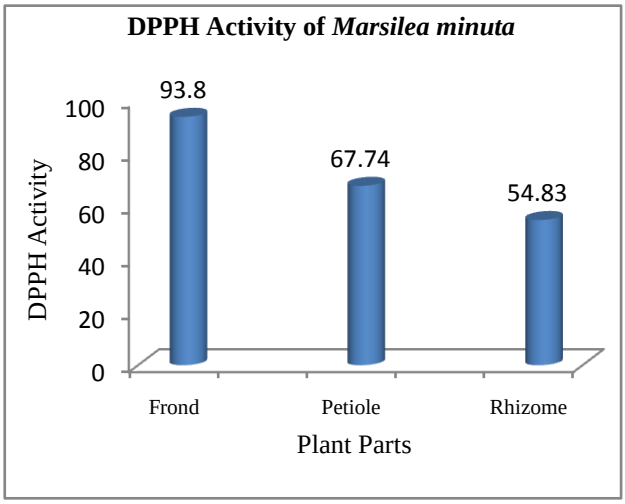
Free radical scavenging (DPPH) activities of frond, petiole and rhizome are given in table-2. The highest activity of 93.8% was registered for the frond of *M. minuta*. The activity of the leaves was nearly two and half fold greater than the petiole (67.74%). Regarding the free radical scavenging activity of the rhizome (54.83%), the percentage was three fold less than the

leaves. Thus production of free radical or reactive oxygen species during metabolism are produced by oxidative reactions. This protective efficiency mechanism helps in the balance between free radical and availability of antioxidants in the microenvironment of a cell (11). Antioxidant potential in our investigation is in accordance with results on the same fern *M. minuta* by (12). Their research report revealed that the methanol extract possess significantly higher antioxidant activity among three other organic solvent extracts.

Table 2. DPPH Activity of various parts of M.minuta

Activity	Samples	mg/g
DPPH activity	Frond	93.8 % ± 2.7
	Petiole	67.74% ± 1.6
	Rhizome	54.83% ± 0.92

Figure 2. DPPH Activity of various parts of M.minuta



CONCLUSION

In the present investigation on the various parts of *M. minuta*, the frond showed the highest amount of antioxidant with significant percentage of free radical scavenging activity indicating that this plant contains substantial level of antioxidant. This medicinal plant by its results appears as interesting, promising and may be effective as potential sources of novel antioxidant drugs.

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