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Evaluation of Antioxidant Property of Extracts of *Macaranga peltata* by DPPH Free Radical Scavenging Activity

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GANESAN V[1], SAJITH PALAKKAL*[2]

[1]*Professor and HOD, Erode College of Pharmacy, Erode*

[2]*Research Scholar, Department of Pharmaceutical Sciences, Vinayaka Missions Research Foundation, Salem*

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ABSTRACT

The objective of the present investigation was to conduct phytochemical screening of phenolic content and antioxidant activity of various leaf and bark extracts of *Macaranga peltata*. Antioxidants are the substances which inhibit oxidation, which has the ability to remove the potentially damaging oxidizing agents in a living organism. Many phytochemicals present in the plants are able to reduce or prevent the oxidative damage to the human cells which can cause even cancer in humans. DPPH (1,1-diphenyl-2-picrylhydrazyl) radical was used for evaluation of free radical scavenging and the total phenolic content was determined by the folin-Ciocalteau reagent. The IC_{50} values were calculated and the antioxidant activity of the various extract was compared with ascorbic acid. The ethanol extracts of both leaves and barks produced a comparatively higher antioxidant activity than methanol and hexane extracts.

INTRODUCTION

Oxidative cell damages resulting from free radicals are the major contributing factors for many diseases in human beings. Natural antioxidants are of very important for the human to reduce oxidative stress due to free radical formation. Several biochemical reactions in our body generate reactive oxygen species and are capable of damaging critical biomolecules. Antioxidants are substances which inhibit oxidation and phytochemicals have beneficial effects in preventing oxidative reactions. They are beneficial in diseases like cancer, stroke, metabolic syndrome, etc. due to their antioxidant properties. Phytochemicals are natural bioactive compounds present in plants. These phytochemicals are often secondary metabolites like alkaloid, steroids, flavonoids, terpenoids, etc present in small amounts in higher plants.

Macaranga peltata is a plant found in India, Thailand, and Sri Lanka. Plant species of genus Macaranga have been used as traditional medicines to treat fungal infections, stomachaches, reduce fever, coughs, and tonsillitis. From the source of literature documentation and relevant traditional approaches on plant drugs, the present investigation was carried out to investigate the antioxidant activity of various leaf and bark extract of *Macaranga peltata* (1).

MATERIALS AND METHODS

Plant materials

The plant materials were collected from the Calicut district of Kerala. The plant specimens were authenticated by Dr.Minoo Divakar, Professor, Department of Botany, Providence Women's College, Calicut. The leaves and bark were washed, dried and powdered. The powdered plant material was weighed and extracted with solvents like Methanol, and Ethanol and Hexane using soxhlet apparatus for 48 hours. The solvent was then removed under reduced pressure by using rotary evaporator.

DPPH radical scavenging assay

The antioxidant activity of the extracts was measured on the basis of the scavenging activity of the stable 1, 1-diphenyl 2-picrylhydrazyl (DPPH) free radical (2). 1ml of 0.1mM DPPH solution in methanol was mixed with 1ml plant extract solution of varying concentrations (50,100,150,200 and 250 µg/ml). The corresponding blank sample was prepared and L-

Ascorbic acid was used as a reference standard. The mixture of 1ml methanol and 1ml DPPH solution was used as control. The reaction was carried out in triplicate and the decrease in absorbance was measured at 517nm after 30 minutes in dark using UV-Vis spectrophotometer. Percentage inhibition was calculated using the following formula.

$$Percentage\ inhibition = \frac{Ac - As}{Ac}\ X\ 100$$

Where Ac is the absorbance of the control As is the absorbance of the sample.

Determination of total phenol content:

The total Phenol content was determined by folin-Ciocalteau reagent in alkaline medium and was expressed in terms of catechol used as standard in µg/ml (3).

RESULTS AND DISCUSSION

DPPH radical scavenging activity is one of the most widely used methods for screening the antioxidant activity of plant (4). Tables 1 and 2 shows the antioxidant activities of the ethanol, methanol and hexane extracts of leaves and barks determined by DPPH scavenging. 50-250µg/ml of ethanolic extracts produced the highest DPPH scavenging activity in both the leaf and bark extracts. The highest DPPH scavenging activity was observed in ethanolic leaf extract of Macaranga peltata. Similarly, the methanolic extract produced a moderate DPPH radical scavenging activity, whereas the hexane extract produced a comparatively lower inhibitory activity.

Figures 1 and 2 show the comparative data of DPPH radical scavenging activity as determined by the IC_{50} values of the different extracts. An IC_{50} value is the concentration of the sample required to scavenge 50% of the free radicals present in the system. The IC_{50} value is inversely related to the antioxidant activity of crude extracts. Lowest IC_{50} value and hence the highest antioxidant activity was found in ethanolic extracts of both leaf and bark. IC_{50} values determined for the ethanolic extracts of leaves and barks were 39.8µg/ml and 40.7µg/ml respectively. IC_{50} for ascorbic acid was 29.97 µg/ml giving a better correlation for the antioxidant activity of the ethanolic extracts.

Table 1: DPPH scavenging activities of leaf extracts of *Macaranga peltata*

Concentration µg/ml	Percentage inhibition			
	Ascorbic acid	Methanolic extract	Ethanolic extract	Hexanic extract
50	83.4	56.9	64.5	51.3
100	85.9	57.2	68.9	52.5
150	89.3	60.1	69.2	56.3
200	92.1	62.3	73.2	59.2
250	94.26	65	76.5	60.3

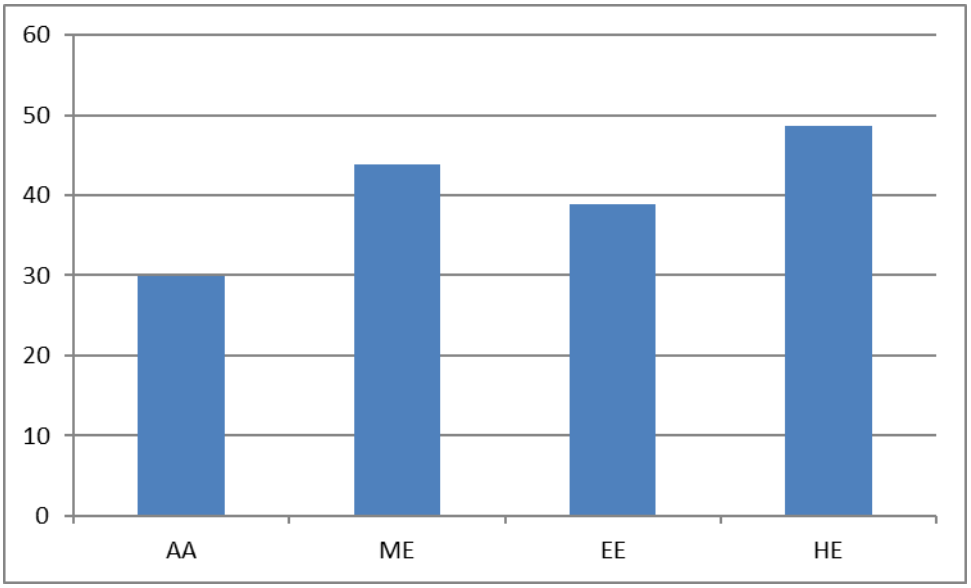

Figure 1: IC_{50} values of various leaf extracts of *Macaranga peltata*

Table 2: DPPH scavenging activities of bark extracts of *Macaranga peltata*

Concentration µg/ml	Percentage inhibition			
	Ascorbic acid	Methanolic extract	Ethanolic extract	Hexanic extract
50	83.4	58.3	61.3	55.2
100	85.9	59.4	62.5	57.2
150	89.3	60.5	65.4	61.3
200	92.1	62.1	66.9	64.0
250	94.26	64.3	70.2	65.2

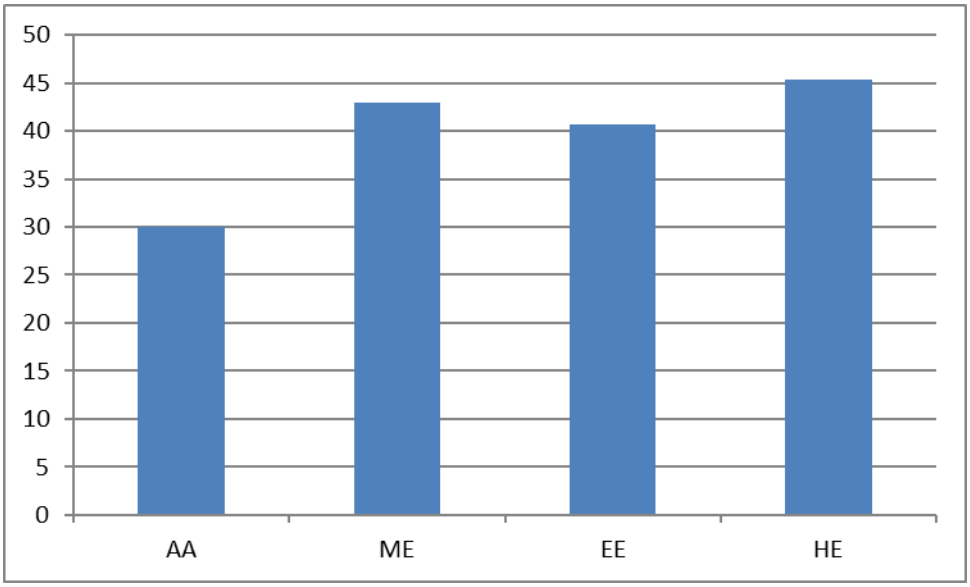

Figure 2: IC_{50} values of various bark extracts of *Macaranga peltata*

The total phenolic content obtained for the various extracts is as represented in table 3. Since polyphenols are responsible for the antioxidant activity, the obtained amount of total polyphenols in the extract indicated the extract to possess a high antioxidant activity (5).

Table 3: Phenol content of various plant extracts

Plant part	Extract	Phenol content
Leaf	Methanol Ethanol Hexane	165 205.17 131.32
Bark	Methanol Ethanol Hexane	154 198.15 121.45

CONCLUSION

Antioxidants owing to its radical scavenging ability may provide protection against oxidative damage induced to the biomolecules, proteins, and lipids. A significant correlation was observed between phenolic content and the scavenging of DPPH radical.

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