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

Sajith Palakkal*[1], V. Ganesan [2]

1 Research Scholar, Department of Pharmaceutical Sciences, Vinayaka Missions Research Foundation, Salem, Tamilnadu, India.
2 Professor and HOD, Erode College of Pharmacy, Erode, Tamilnadu, India.

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***Corresponding author:**

Email : sajithpalakkal1976@gmail.com
Phone : +91-9497692630

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 have 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-picryl hydrazyl) radical was used for evaluation of free radical scavenging and the total phenolic content was determined by folin-Ciocalteau reagent. The IC_{50} values were calculated and the antioxidant activity of various extract were compared with ascorbic acid. The ethanol extracts of both leaves and barks produced a comparatively higher antioxidant activity than methanol and hexane extracts. The result indicates the antioxidant activity of the extracts and the correlation between the total phenolic content and antioxidant activity.

INTRODUCTION

The objective of the study is to evaluate the total phenolic content and antioxidant actions of various extracts of *Macaranga peltata* and to evaluate their potential use in management of disease conditions resulting from oxidative cell damages. Oxidative cell damages resulting from free radicals are the major contributing factors for many diseases in human beings. Natural antioxidants are of very importance for human to reduce the 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, flavanoids, terpenoids etc present in small amounts in higher plants.

Macaranga peltata is a seasonal tree commonly found in India, Thailand and Sri Lanka. Existence of about 300 species of the genus *Macaranga* have been reported, Plant species of genus *Macaranga* have been used as traditional medicines to treat fungal infections, stomachaches, reduce fever, coughs and tonsillitis[1]. 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 leaves and bark extract of *Macaranga peltata*.

MATERIALS AND METHODS

Plant materials

The plant materials were collected from 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-picrylhyorazyl (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). Corresponding blank sample were prepared and L-Ascorbic acid was used as reference standard. 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.

$$Percentageinhibition = \frac{Ac - As}{Ac} X\ 100$$

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

DPPH readical scavenging activity is one of the most widely used method 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 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 methanolic extract produced a moderate DPPH radical scavenging activity, where as the hexane extract produced a comparatively lower inhibitory activity.

Figures 1 and 2 shows the comparative data of DPPH radical scavenging activity as determined by the IC_{50} values of the different extracts. IC_{50} value is the concentration of the sample required to scavenge 50% of the free radicals present in the system. 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 exctract	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

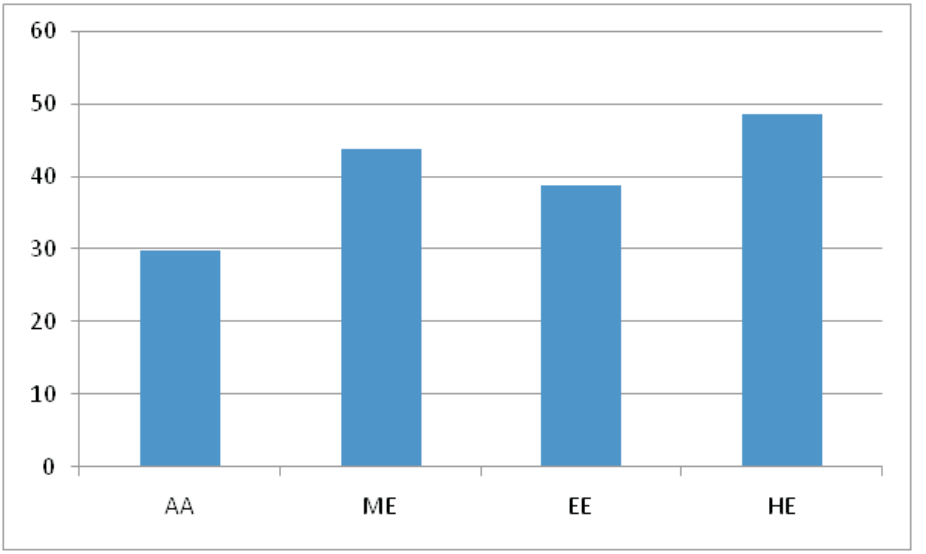

Fig. 1 : IC_{50} values of various leaf extracts of *Macaranga peltata*

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

Concentration µg/ml	Percentage inhibition			
	Ascorbic acid	Methanolic extract	Ethanolic exctract	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

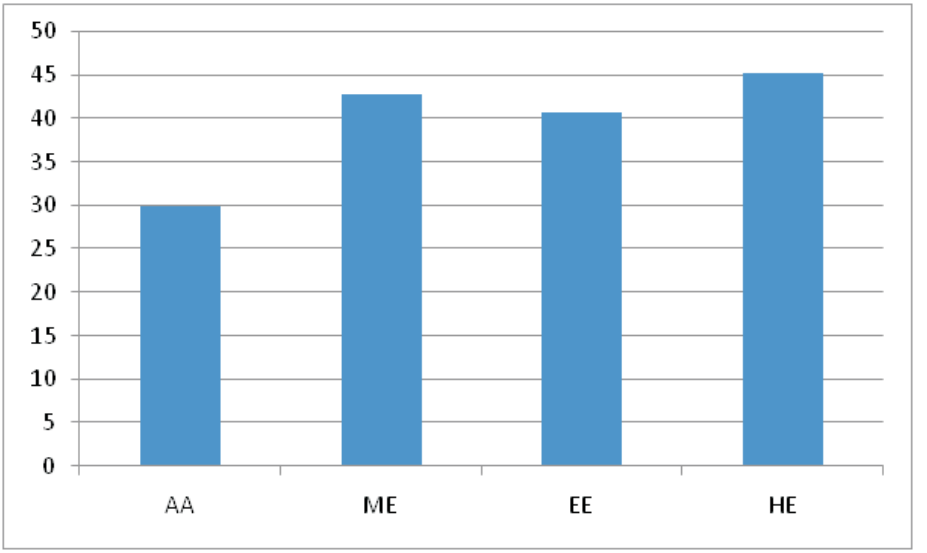

Fig. 2 : IC_{50} values of various bark extracts of *Macaranga peltata*

Table 3: Phenol content of various plant extracts

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

The total phenolic content obtained for the various extracts are 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].

DISCUSSION

Macaranga peltata belonging to the family Euphorbiaceae is a rich source of phytochemicals and the genus Macaranga have been reported to possess several traditional uses. The ethanolic extracts of both leaves and bark of *Macaranga peltata* was shown to exhibit antioxidant activity in the DPPH free radical scavenging assay. A strong positive correlation between dose of the extract and free radical scavenging activity ($R^2 = 0.9792$ for the ethanolic extract of the plant leaf).The leaf extract was found to possess slightly higher antioxidant action than the bark extract, due to a higher total phenolic contents of the leaf than the bark. The IC_{50} was comparably smaller than the standard ascorbic acid, which is a proven antioxidant. *Macaranga* species are naturally

found in secondary forest and often need more antioxidants to protect from the direct sun light which may be a suggested explanation for the high antioxidant contents present in the plant leaves[6]. The importance of the antioxidant constituents of plant material in the maintenance of health and protection from coronary heart disease and cancer is also raising interest among scientists, food manufacturers, and consumers. There is increasing evidence that consumption of a variety of phenolic compounds present in natural foods may lower the risk of serious health disorders because of the antioxidant activity of these compounds.

CONCLUSION

In conclusion the antioxidant activity of the leaves and bark extracts of *Macaranga peltata* were evaluated by DPPH assay. The extracts demonstrated promising antioxidant activities and the study also could prove the relation between phenolic content and the scavenging of DPPH radical. Antioxidants owing to its radical scavenging ability may provide protection against oxidative damage induced to the biomolecules, proteins and lipids.*Macaranga peltata* have significant antioxidant activity and has the potential to be used therapeutically in management of diseases due to oxidative stress like cancer, inflammation, etc. after a thorough evaluation of its potential adverse effects and other pharmacological actions.

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