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EXPLORATION OF TOTAL ANTIOXIDANT CAPACITY OF AQUEOUS EXTRACT OF *SWIETENIA MACROPHYLLA* LEAVES

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ABSTRACT: ***Swietenia macrophylla*** is a medicinal treecommonly known as Mahogany hasmagnificent medicinal properties. In the present study, aqueous extracts of ***Swietenia macrophylla*** leaves were prepared by simple maceration and decoction methods.The total antioxidant capacity was analyzed by Cupric Ions Reducing assay (CUPRAC method) and Phosphomolybdenum reduction assay. Both extracts have exhibited significant total antioxidant capacity.The total antioxidant capacity performed by CUPRAC method ranged from 112.93 - 284.79 mmolTE/g and 98.20 -152.21 mmolTE/g for aqueous leaves extract of Mahogony and standard ascorbic acid respectively. The total antioxidant capacity screened by Phosphomolybdenum reduction assay increases with increase in concentration of both aqueous extracts of leaves of Mahogany and standard ascorbic acid .The IC 50 of maceration , decoction extracts of ***Swietenia macrophylla*** leaves for CUPRAC and PM reduction assays were 36.506 µg/ml,155.162 µg/ml and 36.162 µg/ml,134.607 µg/ml respectively and showed significant results when compared with the standard ascorbic acid. The statistical analysis showed siginificant antioxidant capacity ($p<0.05$).The present study revealed that the aqueous extracts of ***Swietenia macrophylla*** leaves firmly possess strong antioxidant effects and can be a potential natural antioxidant source.

KEYWORDS: *Swietenia macrophylla*, Antioxidant activity, CUPRAC method, Phosphomolybdenum Assay,Mahogany aqueousextract.

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1. INTRODUCTION

Mahogany is a kind of wood the straight grained, reddish brown timber of three tropical hard wood species of the genus *Sweitenia*, indigenous to the Americas and part of the pantropical chinaberry family,*Meliaceae*.***Swietenia macrophylla***, commonly known as Mahogany, Honduranmahogany, Hondurasmahogany, big-leaf mahogany, or West Indian mahogany. It is one of the three species that yields genuine mahogany timber, the other being *Swietenia mahogany* and *Swieteniahumilis* [1-3].

Phytomedicines derived from herbal plants are widely used in many parts of the world due to the presence of diverse bioactive compounds. According to World Health Organization (WHO) estimated, nearly 75-80% of the world population utilizes medicinal plants for their primary health care needs. Different phytoconstituents and herbal products which are safer than synthetic medicines are beneficial in the treatment of disease caused by free radicals. It also protects the body by preventing the free radicals to cause tissue injury. Phytoconstituents are conferring less side effect and compatible to body physiology. Therefore, it is demand of the modern era to use such phytoconstituent or phytomedicines. Photochemical are secondary metabolites produced by plants. Their presence in plant gives its medicinal value and produce physiological action in human body. Natural photochemical formulate antioxidant based drugs[4,5]. Antioxidant inhibits the oxidation of other molecules and protects the body against free radicals that may cause pathological conditions. Free radicals are atoms or molecules with singlet i.e. unpaired electron which makes them highly reactive. Antioxidant capacity assays may be broadly classified as single electron transfer (SET) and hydrogen atom transfer (HAT) based assays. Majorities of HAT assays are kinetics based and involve a competitive reaction scheme in which antioxidant and substrate compete for free radicals thermally generated through the decomposition of azo compounds[6,7]. SET assays measure the capacity of an antioxidant in the reduction of an oxidant which changes colour when reduced. SET assays are easier than HAT assays. SET assays likeCupric Ions Reducing assay (CUPRAC method) and Phosphomolybdenum reduction assay were selected to analyze the reduction capacity. These methods are involved in the mechanism of single electron transfer system. In this system, electron from oxidized antioxidant transferred to the substrate by inhibiting oxidation of oxidant [8].

2. MATERIALS AND METHODS

2.1 Collection of the plant material

Fresh ***Swietenia macrophylla*** leaves were collected in the Herbal Garden of Prime College of Pharmacy, Palakkad, Kerala and identified with the help of regional floras and authentified.

2.2. Preparation of plant extracts

2.2.1Preparation of aqueous extract by simple maceration [9]

The collected leaves of ***Swietenia macrophylla*** were washed using distilled water and air-dried. Dried leaves were powdered using a mechanical blender.50g of the powdered leaves were weighed and poured in to 500ml conical flask in which 200ml of distilled water was added. The mixture was

kept for 12 hours with constant agitation at 30minutes intervals. Then it was filtered using Whatman No. 1 filter paper, labelled and stored in a refrigerator for further studies[10].

2.2.2. Preparation of aqueous extract by decoction[11 ,12]:

1g of powdered ***Swietenia macrophylla*** leaf were boiled with 15 ml of double distilled water in a water bath100^0C for 5 minutes, filtered and labelled .The extract was stored in a refrigerator for further use .

2.3. Methods for Total Antioxidant Capacity

2.3.1. CUPRAC Assay

This method involves mixing the antioxidant solution with aqueous copper (II) chloride, alcoholic neocuproine, and ammonium acetate aqueous buffer at pH 7, and subsequently measuring the developed absorbance at 450 nm after 30 min. [13]

2.3.1.2 Procedure

1 ml 10 mM cupric chloride, 1 ml 7.5 mMneocuproine and 1 ml 1 M ammonium acetate buffer of pH 7 solutions were added to test tubes containing 2 ml of distilled water. Aqueous extract of ***Swietenia macrophylla*** leaves in different concentration ranging from 10µg/ml to 50µg/ml were added to each test tube separately. These mixtures were incubated for half an hour at room temperature and measured against blank at 450 nm. Ascorbic acid was used as positive reference standard[14].

2.3.2.Phosphomolybdenum Reduction Assay (PM)

The total antioxidant capacity of the aqueous extract of ***Swietenia macrophylla*** leaves was evaluated by the phosphomolybdenum reduction assay[15] .The assay is based on the reduction of Mo(VI) to Mo(V) and subsequent formation of green phosphate /Mo(V) complex at acid pH.

2.3.2.1 Procedure

Aqueous extract of ***Swietenia macrophylla*** leaves in different concentration ranging from10µg/ml to 50µg/ml were added to each test tube individually containing 3 ml of distilled water and 1 ml of Molybdate reagent solution. These tubes were kept incubated at 95°C for 90 min. After incubation, these tubes were normalized to room temperature for 20-30 minutes and the absorbance of the reaction mixture was measured at 695 nm. Mean values from two independent samples were calculated foreach extract. Ascorbic acid was used as positive referencestandard.

3. RESULTS AND DISCUSSION

The total antioxidant capacity was performed byCupric Ions Reducing assay (CUPRAC method) and Phosphomolybdenum reduction assay.

3.1. CUPRAC Assay

The Total antioxidant capacity (TAC) of aqueous extract of ***Swietenia macrophylla*** leaves were evaluated by CUPRAC methods. The concentration ranging from 10 – 50µg/ml of aqueous extract of ***Swietenia macrophylla*** leaves was compared with the standard ascorbic acid. The total

antioxidant capacity performed by CUPRAC method ranged from 112.93 - 284.79 mmolTE/g and 98.20 -152.21 mmolTE/g for aqueous extract of Mahogany leaf and ascorbic acid respectively as shown in Table.

Table 1: TAC of aqueous extract of *Swietenia macrophylla*leaves by CUPRAC

Sl.No.	Concentration (µg/ml)	TAC (mmol TE /g)		
		Leaf extract by Maceration	Leaf extract by Decoction	Ascorbic acid
1.	10	137.48	112.93	98.20
2.	20	157.12	137.48	117.84
3.	30	181.67	152.21	132.57
4.	40	250.41	162.02	137.48
5.	50	284.79	196.40	152.21

The IC50 value for CUPRAC assay was determined for maceration, decoction extracts of ***Swietenia macrophylla*** leaves were 36.506 µg/ml and155.162µg/ml respectively where as IC50 value for standard ascorbic acid was 76.756µg/ml.

Table 2: IC 50

Sl .No.	Sample	IC 50 Value (µg/ml)
1	Ascorbic acid (standard)	76.756
2	Maceration	36.506
3	Decoction	155.162

values for Standard and aqueous extract of *Swietenia macrophylla*

Leaves by CUPRAC assay.

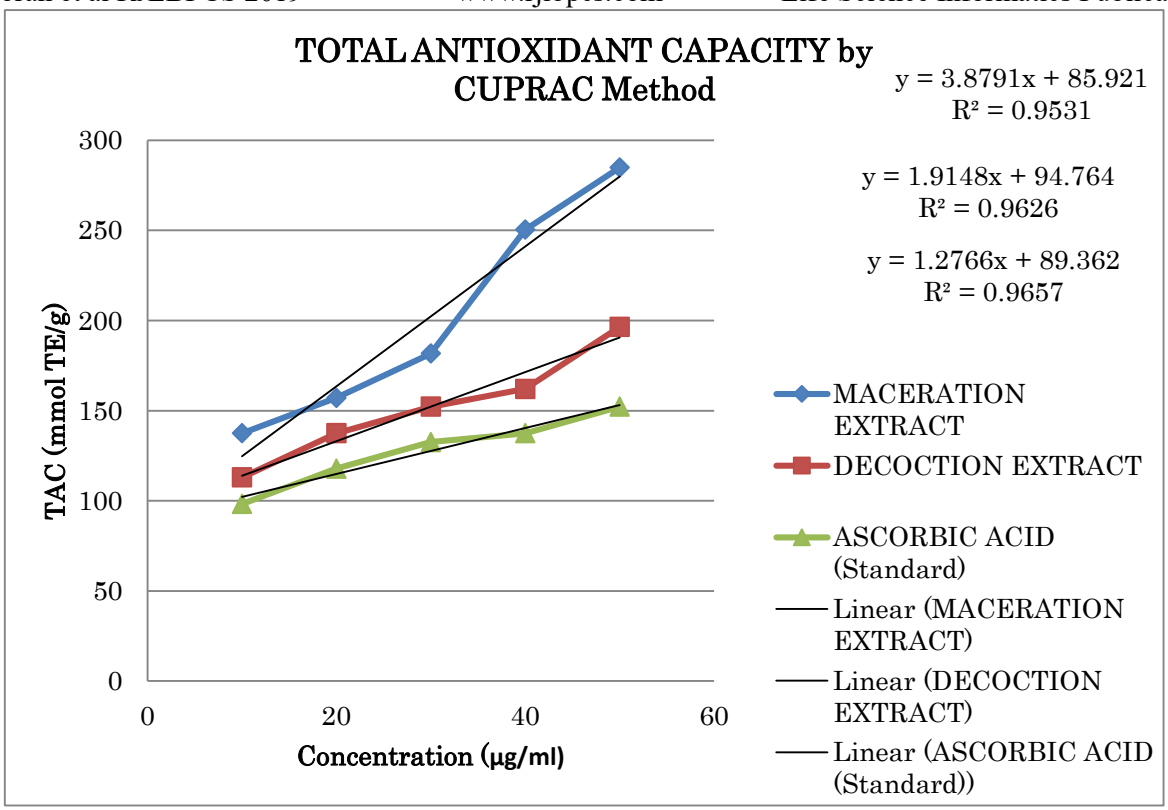

Fig 1: Total antioxidant capacity of aqueous extract of*Swietenia macrophylla* leaves and standard ascorbic acid

3.2.Phosphomolybdenum Assay (PM)

The Total antioxidant capacity of aqueous extract of ***Swietenia macrophylla*** leaves were evaluated by phosphomolybdenum assay.The concentration ranging from 10 – 50µg/ml of aqueous extract of ***Swietenia macrophylla*** leaves were compared with the standard ascorbic acid. The total antioxidant capacity performed by Phosphomolybdenum reduction assay increases with increase in concentration of both aqueous extracts of leaves of Mahogany and standard ascorbic acid as shown in Table.3.

Table 3: TAC of aqueous extract of *Swietenia macrophylla* leaves by PM

Reduction Assay

Sl.No.	Concentration (µg/ml)	Absorbance		
		Leaf extract by Maceration	Leaf extract by Decoction	Ascorbic acid
1.	10	0.005	0.005	0.003
2.	20	0.007	0.006	0.004
3.	30	0.010	0.007	0.006
4.	40	0.013	0.009	0.007
5.	50	0.015	0.011	0.008

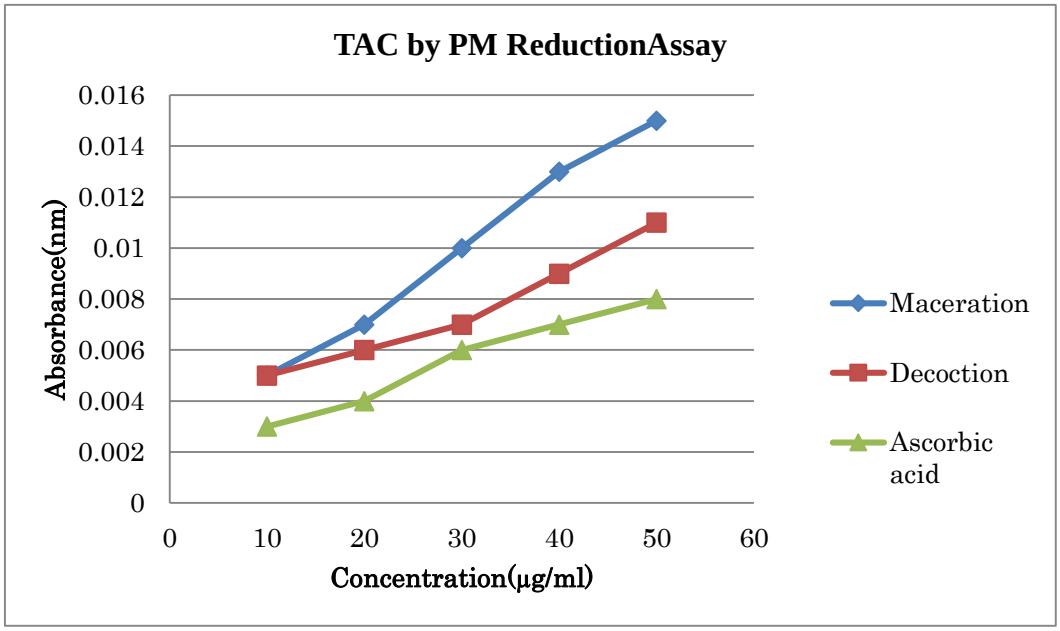

Fig2: Total antioxidant capacity of aqueous extract of *Swietenia macrophylla* leaves and standard ascorbic acid

4. CONCLUSION

The research work was performed to explore the antioxidant activities ofthe aqueous extract of ***Swietenia macrophylla*** leaves. On the basis of results obtained from different antioxidant capacity assays, both the aqueous extracts shows a significant total antioxidant capacity. Aqueous extract ***Swietenia macrophylla***leavesshowsthe reducingcapacity and reduction capacity of free oxidative metallic ionssuch ferric and cupric ions by extracts of ***Swietenia macrophylla*** can be approximated through PM assay and CUPRAC assays. The statistical analysis showed siginificant antioxidant capacity ($p<0.05$).Over viewing the reducing capacity, the use of ***Swietenia macrophylla*** might contribute a certain level of health protection against oxidative damages with the stablished antioxidant activity of these extracts.From the present study it was revealed that the aqueous extracts of ***Swietenia macrophylla*** leaves firmly possess strong antioxidant effects and can be a potential natural antioxidantsource.

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CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

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