Redox Chemistry of Plant extracts with special reference to the woody plant *Macaranga indica* Wt.

Short Report of the Minor Research Project

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Mohanakrishnan.M, Assistant Professor, Department of Chemistry

N.S.S College, Ottapalam, Palappuram P.O, Kerala

Affiliated to University of Calicut

Introducton : Plants produce secondary metabolites using the very primary metabolites, which are largely responsible for the plant's individual properties such as aroma, flavour, colour and medicinal actions. Secondory metabolites which are derived from the primary ones consists mainly of terpenes, alkaloids, phenyl propanoids, saponins, flavanoids, lignins and sterols. These compounds can be obtained by extracting plant parts with different solvents and isolating with various techniques like chromatography.

Besides antimicrobial and other medicinal properties plant extracts possess a variety of redox potentials like antioxidant property and corrosion inhibition. Also the plant extracts are widely used to synthesise nanoparticles of gold,silver and many other metals. These were investigated by different qualitative and quantitative methods .

Objectives : In this context the plant *Macranga indica* is subjected to phytochemical analysis especially to study its redox potentials. Macaranga is a large genus of tropical trees of the family Euphorbiaceae of which *M. indica* is an important member endemic to south and south east Asia.

The following objectives are to be met in this project: Preparation of polar and non-polar extracts and volatile oils from different parts of the plant *M. indica*, Phytochemical screening of each extract , Quantitative analysis of the extracts for phenolic content, flavanoid content, tannin content etc., Investigation of anti-oxidant property of the extracts using standard methods, Study of corrosion inhibition efficiency of different extracts at different conditons and Study of biocatalysis by the plant extracts in fabricating nano-particles.

Methodology : Plant parts were collected from different parts of Palakkad District, Kerala. They were washed carefully with water, dried under shade and ground into powder form using a grinder.

Extracts were prepared by the following solvents in turn: Petroleum ether, ethyl acetate and water. Fresh parts were also collected for extraction. Volatile oil from the leaves was obtained by steam distillation using a clevenger apparatus.

Phytochemical screening: Each of the plant extracts were subjected to the following standard screening tests for their composition.

1. Foam Test: for Saponin. 2. Salkowski Test: for phyto-sterols. 3. Molisch ring test: for carbohydrates 4. Hager's Test: for alkaloids. 5. Wagner's Test: for alkaloids 6. Copper acetate test: for diterpenes. 7. Xanthoproteic test: for proteins. 8. Lead acetate test: for tannins. 9. Ferric chloride test: for phenols and 10. Alkaline reagent test:for flavonoids.

GC-MS Analysis of volatile oil : GC-MS analysis of the volatile oil is carried out by using a Varian 4000 instrument with a VF5 (non polar) silica column (30m x 0.25 µm x 0.25mm) and Helium as the carrier gas .

Quantifications : Total Phenolic Content was determined by using Folin- Ciocalteu method with catechol as standard, total Flavanoid Content was determined by Aluminum chloride colorimetric assay and tannin contents were estimated by the method of Price and Butler .

Potentials : Antioxidant properties were determined by the scavenging of 1,1-Diphenyl-2-Picrylhydrazyl (DPPH). Corrosion inhibition by the extracts were studied by weight loss of commercially available mild steel coupons in 1N HCl . Fabrication of nano-particles were studied by the reduction of cupric ions by the extracts.

Results : From the present work following conclusions were deduced : a) active principals can be extracted from different parts of the plant *M.indica* by solvent extraction b) different parts of the plant yield different types of compounds on treatment with different solvents. c) it is the bark of the plant containing more types of potent compounds like tannins, phenolics and flavanoids d) it is the extracts from the bark possess maximum quantity of compounds like tannins, phenolics and flavanoids e) as producing better results on qualitative and quantitative analysis water and to some extent ethyl acetate are the solvent choices for the extraction of the active principals from different parts of this plant f) the leaves of this plant are not in a position to yield a reasonable quantity of volatile oil on steam distillation g) extracts from different parts respond differently towards anti-oxidant screening of which aq. extract of the bark containing more phenolics and flavanoids was most active h) every extract exhibited the tendency to inhibit the mild steel corrosion in acidic conditions. Among this the aq.extract of the leaves showed a very brilliant activity upto 90% inhibition and also showed a considerable inhibition capacity at elevated temperature. The leaf extract was also found capable of reducing cupric ions in solution to form copper nano-particles.

All the mentioned results justifies redox potentials of the solvent extracts of the woody plant *M.indica* in various in-vitro conditions.

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