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Antioxidant Activity of Aerial Parts of *Tecoma stans*

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Tecoma stans, from the family Bignoniaceae is an important medicinal plant. All parts are widely used in Ayurvedic system of medicines. The present study is designed to investigate the antioxidant activity of various extracts of aerial parts of *T. stans*. Plant extracts were screened using 1, 1-Diphenyl -2- picrylhydrazyl (DPPH) and nitric oxide as scavenging reagents. The antioxidant activity was tested spectrophotometrically. The results of both methods were compared with ascorbic acid as a standard. All extracts show significant antioxidant activity. The antioxidant activity of ethanol is higher than methanol and acetone extract. The IC_{50} values by DPPH method were found to be 3.03, 43.35, 95.02 and 103.41µg/ml and by nitric oxide method were found to 17.80, 4.60, 28.80 and 51.40 µg/ml for ascorbic acid, ethanol, methanol and acetone extract respectively. Owing to these properties, this plant has the potential as natural source of antioxidants, capable of protecting against free radical mediated damage and may have applications in preventing and curing various diseases.

Key words- Tecoma stans, Bignoniaceae, Antioxidant activity, DPPH, Nitric Oxide

INTRODUCTION

Free radicals contribute to more than one hundred disorders in humans including atherosclerosis, arthritis, ischemia and repercussion injury of many tissues, a central nervous system injury, gastritis and cancer. [1-4]

Due to environmental pollutants, radiation, chemicals, toxins, deep fries and spicy foods as well as physical stress, free radicals cause depletion of the immune system antioxidants, the change in gene expression and induce abnormal proteins. The oxidation process is one of the most important routes for producing free radicals in food, drugs, and even in living systems. [1, 5 and 6]

Antioxidants are important species which possess the ability of protecting organisms from damage, caused by free radical-induced oxidative stress. [7]The antioxidant activity of phenols is mainly due to their redox properties, which allow them to act as reducing agents, hydrogen donors, singlet oxygen quenchers and metal chelators. [7-9]

A number of synthetic antioxidants such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) have been extensively added to foodstuffs, although their use has begun to be questioned because of their toxicity, [10,11] so there is considerable interest in preventive medicine and in the food industry in the development of natural antioxidants obtained from natural sources, especially herbal plants. [12] Medicinal plants have been used for centuries as remedies for human diseases as they contain components of therapeutic value. [9, 13 and14]

Moreover, the increasing use of plant extracts in the food, cosmetic and pharmaceutical industries suggest that, in order to find active compounds, a systematic study of medicinal plants is very important. [7, 13]

Tecoma stans, belonging to family Bignoniaceae, is a semi evergreen ornamental shrub or tree. [15] It is used for a great range of action in traditional medicines. [16] Extracts of *T. stans* are known for the antimicrobial, [17] anti-inflammatory, [18] antirheumatic, [19] antinociceptive, [20] narcotic or antisyphilitic activity. [18]

MATERIAL AND METHODS

Phytochemical evaluation

Plant material: The aerial parts of *T. stans* were collected from Pune; Maharashtra, India during the month of September. The taxonomic identification is accomplished with the help of flora of Bombay Presidency **[22]** and Flora of Maharashtra **[23]** for identification. It was identified and authenticated at Botanical Survey of India, Pune, Maharashtra, India. Its voucher number is **BSI / WRC / Tech / 2010 /372.**

Extraction procedure: Air shade dried and pulverized aerial part (0.300 g) of *T. stans* was extracted with different solvents (20 ml) of increasing polarity from semi-polar to polar solvent. Material was ground, centrifuge for 20 minutes at room temperature in each solvent and filtered. The extract was evaporated to dryness in vaccum using a rotary evaporator. This extract was used to investigate the antioxidant activity of aerial parts.

Antioxidant activity by DPPH assay: The total antioxidant activities of extracts were measured in terms of hydrogen donating capacity using DPPH according to the standard method **[24]**. The absorbance was measured at 517 nm.

Antioxidant activity by Nitric Oxide assay: Nitric oxide scavenging activity was measured according to the standard method. [25] The absorbance was measured at 546 nm.
The free radical scavenging activity (% antiradical activity) was calculated using the equation:

$$\% \text{ Antiradical Activity} = \frac{\text{Control Absorbance} - \text{Sample Absorbance}}{\text{Control Absorbance}} \times 100$$

IC_{50} value is used to measure the free radical scavenging activity. Each experiment was carried out in triplicates

RESULT AND DISCUSSION

The DPPH test is based on the exchange of hydrogen atoms between the antioxidant and the stable DPPH free radical. Practically, the reaction brings about the reduction of DPPH radicals to the corresponding hydrazine, which is manifested

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by a color change from violet to yellow and is monitored spectrophotometrically. The IC_{50} value is a widely used parameter to measure the free radical scavenging activity. A decrease by 50% of the initial radical concentration is defined as the IC_{50}. The IC_{50} value (µg/ml) was determined for all the extracts. A lower IC_{50} value indicates a higher antioxidant activity. [21]

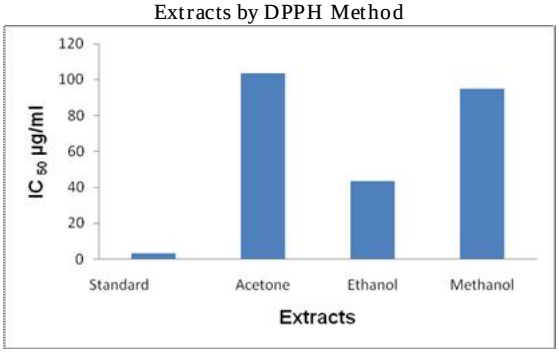
The IC_{50} values of various extracts by DPPH and nitric oxide methods are recorded **[Table 1]** .The results by DPPH method were found to be 3.03, 43.35, 95.02 and 103.41µg/ml for ascorbic acid, ethanol, methanol and acetone extract respectively. Each value is mean ± SD of three measurements. IC_{50} value of the investigated extracts slightly differs depending on the solvent applied. IC_{50} value of ethanol is higher than methanol and acetone extract.

The IC_{50} values by Nitric Oxide method were found to be 17.80, 4.60, 28.80 and 51.40 µg/ml for ascorbic acid, ethanol, methanol and acetone extract respectively. Each value is mean ± SD of three measurements. An IC_{50} value of the investigated extracts slightly differs depending on the solvent applied. IC_{50} value of ethanol is higher than methanol and acetone extract.

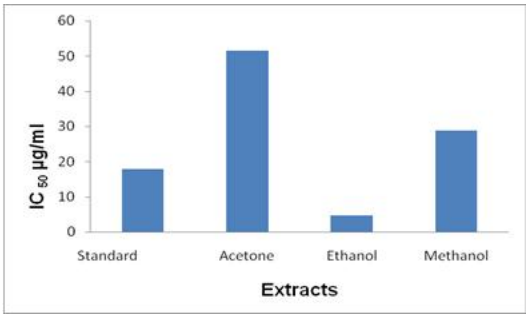
Table 1- IC_{50} Values of Various Extracts

Extracts	Anti-oxidant Capacity (IC_{50} µg/ml)	
	DPPH Assay	Nitric Oxide Assay
Standard	3.03 ± 0.05	17.80 ± 0.05
Acetone	103.41 ± 1.20	51.40 ± 1.02
Ethanol	43.35 ± 1.05	4.60 ± 1.27
Methanol	95.02 ± 1.35	28.80 ± 1.3

Graph 1a Comparative Study of IC_{50} Values of Various Extracts by DPPH Method



Graph 1b Comparative Study of IC_{50} Values of Various Extracts by Nitric Oxide Method



Statistical Analysis:

Results are expressed as the mean ± S.D. of three independent experiments. Student's *t*-test was used for statistical analyses; P values > 0.05 were considered to be significant.

CONCLUSION

This study indicates that the extracts obtained from the aerial parts of *T. stans* have significant free radical scavenging activity on stable DPPH and high reactive hydroxyl radical. Since reactive oxygen species are important contributors to several serious ailments, aerial parts of *T. stans* might be useful for the development of novel and more potent natural antioxidant.

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