

## Antioxidant Activity of the Successive Extracts of *Caesalpinia Pulcherrima* Leaves

Chakraborty GS\*, Badujar RS

SVKM'S, NMIMS University, School of Pharmacy and Technology Management, Department of Pharmacognosy, Shirpur Campus, Dist Dhulia, Shirpur, Maharashtra, 425 405, India

### ABSTRACT

Plants are the best source of active secondary metabolites which are beneficial to mankind. Many plant origin drugs have been reported with biological properties like Analgesic, Antiinflammatory, Antioxidant, hypoglycemic agents and many more. The successive extracts of *Caesalpinia pulcherrima* leaves were screened for *in vitro* antioxidant properties using the standard procedures. The successive extracts such as petroleum ether, ethyl acetate, methanol and water and 50 % crude methanol extracts exhibited IC<sub>50</sub> values of respectively in DPPH and respectively in nitric oxide radical inhibition assays. The values are comparable with the standards such as ascorbic acid and quercetin. The *Caesalpinia pulcherrima* leaves are showing antioxidant activity.

**Key words:** *Caesalpinia pulcherrima*, Antioxidant, DPPH, Nitric Oxided, Peroxidation, Free radical scavenging.

### INTRODUCTION

*Caesalpinia pulcherrima* leaves belong to the family *Caesalpinaceae*; commonly known as Red Bird of Paradise which is widely used in our Traditional System of Medicine. It is a shrub growing to 3 m tall, native to tropical America. The leaves are bipinnate, 20-40 cm long, bearing 3-10 pairs of pinnae, each with 6-10 pairs of leaflets 15-25 mm long and 10-15 mm broad. The leaves are borne in racemes up to 20 cm long, each flower with five yellow, orange or red petals. The fruit is a pod 6-12 cm long.<sup>[1]</sup> The leaves are used in the treatment of purgation, as antipyretic and sometimes used as a substitute for senna.

The dried leaves are used in the treatment of erysipelas. Leaves as anthelmintic, remedy for cough and catarrh. Root part is used for curing intermittent fevers. Bark is used as emmenagogue and abortifacient. The plant contains flavonoid as myricitroside. Tannins, benzoic acid and gallic acid are present in leaves, leaves and in fruits. Presence of cyaniding-3, 5- diglucoside is reported from leaves.<sup>[2]</sup> From the literature cited very few works has been carried out in this plant. Thus it was thought worthwhile to explore this plant for its therapeutic activity. Lipid peroxidation is the outmost important biochemical assay which is involved in pathogenesis of many diseases like diabetes mellitus, atherosclerosis, tumor, myocardial infraction and also in the process of ageing. Free radicals generally called as reactive

oxygen species (ROS) are synthesized *in vivo* from a various biochemical reactions and tends to form a chain in the system.<sup>[3-4]</sup> These free radicals are the major points in lipid peroxidation.<sup>[5-6]</sup> Plants containing Flavonoids have been reported to possess strong oxidant properties. Thus in the present investigation the successive extraction of *Caesalpinia pulcherrima* leaves was screened for *in vitro* antioxidant properties using standard operating procedures.

### MATERIAL AND METHODS

#### Chemicals

Chemicals used in this study were 1, 1-diphenyl-2-picrylhydrazyl (DPPH), potassium ferricyanide, sodium nitrite, trichloroacetic acid, Folin-Ciocalteu reagent, butylated hydroxyl anisole (BHA), ascorbic acid (Merck [India]), Gallic acid, linoleic acid (Sigma). All reagents used for the experiments were of analytical grade (AR).

**Collection of plant material:** The plant was collected from the wild sources of Shirpur forest, Maharashtra, India in the month of May 2008. The plant was identified and authenticated from standard resources.

**Preparation of extracts and Standards:** The successive extracts of the shade dried powdered leaves (500 g) of *Caesalpinia pulcherrima* was prepared with different solvents as per the order of their polarity in Soxhlet apparatus. The solvents were evaporated with the help of rotary evaporated to get a solid residue (12 g). The solid residue was placed in a vacuum desicator and was further used for the experiments.<sup>[7-9]</sup> The *in vitro* experiments, a weighed quantity (5 g) of the extract was dissolved in Dimethyl Sulphoxide (DMSO) or methanol and used. Solution of ascorbic acid and quercetin were used as

\*Corresponding author: Dr. G. S. Chakraborty, SVKM'S, NMIMS University, School of Pharmacy and Technology Management, Department of Pharmacognosy, Shirpur Campus, Dist Dhulia, Shirpur, Maharashtra, 425 405, India Email: - phdgs77@indiatimes.com

standards for *in vitro* studies were prepared in distilled DMSO.

**Estimation of total phenolics:** The total phenolic contents of ethanol extract was determined with Folin-Ciocalteu reagent according to Slinard & Singleton<sup>[10]</sup> and slightly modified. The stock solution of extract 1 mg/ml in water was prepared. From the stock solution, 5 ml was transferred to a 25 ml volumetric flask and made up with distilled water. Out of this 5 ml of sample and 2 ml of standard was taken in 25-ml volumetric flask, to this 10 ml of distilled water, and 2ml of phenol reagent (20 % v/v) was added, and then the volume was made up with 29 % sodium bicarbonate. The mixture was kept in the dark for 20 min. and the absorbance was read at 760 nm. The total phenolic content was calculated as gallic acid and expressed as percent of gallic acid detected. Standard used was gallic acid.

#### ANTIOXIDANT ASSAY

**Free radical scavenging activity using DPPH radical:** The antioxidant activity of the plant extract and the standards were assessed on the basis of the radical scavenging effect of the stable DPPH free radical.<sup>[11-12]</sup> A total of 100  $\mu$ L of the methanolic extract (from 20 to 40  $\mu$ g/ml in DMSO solution). After the incubation period at 37°C for 50 min. The absorbance of each solution was determined at 490 nm the corresponding blank readings were also noted and the remaining DPPH was calculated and tabulated in Table 1. An IC<sub>50</sub> value is the concentration of sample required to scavenging 50 % DPPH free radical.

**Table 1: Antioxidant activity of *Caesalpinia pulcherrima* leaves extracts using DPPH method**

S. No.	Test Compound	IC <sub>50</sub> values $\pm$ SE *( $\mu$ g/mL)
1.	Petroleum ether extract	249.12 $\pm$ 1.57
2.	Ethyl acetate extract	18.00 $\pm$ 0.57
3.	Methanol extract	28.67 $\pm$ 1.20
4.	50% Methanol crude extract	29.34 $\pm$ 1.86
5.	Aqueous crude extract	178.82 $\pm$ 1.35
6.	Ascorbic acid	77.66 $\pm$ 1.52
7.	Quercetin	58.00 $\pm$ 0.77

**Table 2: Antioxidant activity of *Caesalpinia pulcherrima* leaves extracts using Nitric Oxide Radical Inhibition method**

S. No.	Test Compound	IC <sub>50</sub> values $\pm$ SE *( $\mu$ g/mL)
1.	Petroleum ether extract	25.00 $\pm$ 0.85
2.	Ethyl acetate extract	44.02 $\pm$ 0.57
3.	Methanol extract	53.09 $\pm$ 1.23
4.	50% Methanol crude extract	70.68 $\pm$ 1.05
5.	Aqueous crude extract	153.33 $\pm$ 0.84
6.	Ascorbic acid	22.66 $\pm$ 0.98
7.	Quercetin	18.50 $\pm$ 0.88

**Nitric oxide scavenging activity:** Aqueous solution of Sodium nitropruside at physiological pH spontaneously released nitric oxide, which can be estimated with oxygen to produce nitrite ions, which can be estimated by the use of Griess Ilosvoy reaction.<sup>[13]</sup> The scavengers of nitric oxide reduce the production of nitric oxide. The reaction mixture (3 mL) containing sodium nitropruside (10 mM, 2 ml), phosphate buffer saline (0.5) and the extract or the standard solution (0.5 ml) was incubated at 25 C for 2.5 h. After incubation, 0.5 ml of the reaction mixture containing nitric was pipette out and were mixed with 1 ml of sulphanilic acid reagent (0.33 % in 20 % glacial acetic acid) and allowed to stand for 5 min. for completion diazotization. 1 ml of 1-naphthylamine (5 %) was added, mixed and allowed standing for 30 min. a pink coloured chromophore was formed in diffused light. The absorbance of these solutions was

measured at 540 nm against the corresponding blank solutions and is tabulated in Table 2. An IC<sub>50</sub> value is defined as the concentration of sample required to inhibit 50 % of the nitric oxide radical.

#### RESULTS AND DISCUSSION

***In vitro* assay:** The successive extracts of *Caesalpinia pulcherrima* exhibited antioxidant activity in DPPH and nitric oxide radical inhibition assay as evidence by the lowering of IC<sub>50</sub> values (Table 1 and 2). The successive extracts such as petroleum ether, ethyl acetate, methanol, water and 50 % crude methanol extract exhibited IC 50 values 249.12  $\pm$  1.57, 18.00  $\pm$  0.57, 28.67  $\pm$  1.20, 178.82  $\pm$  1.35 and 29.34  $\pm$  1.86  $\mu$ g/mL respectively in DPPH and 25.00  $\pm$  0.85, 44.02  $\pm$  0.57, 53.09  $\pm$  1.23, 153.33  $\pm$  0.84 and 70.68  $\pm$  1.05.98  $\mu$ g/mL respectively in nitric oxide radical inhibition assay. These values were observed to be more than those which were obtained from the ascorbic acid and quercetin used as standards. Thus it can be stated that free radical oxidative stress has a major role in the pathogenesis of a wide range of clinical disorders resulting from different natural antioxidant defences. Among the five extracts of *Caesalpinia pulcherrima* leaves and 2 standards tested for antioxidant activity using DPPH method, the ethyl acetate successive extract showed the maximum antioxidant activity with IC 50 values of 18.00  $\pm$  0.57  $\mu$ g/mL respectively. The methanol extract showed antioxidant activity with IC 50 values 28.67  $\pm$  1.20  $\mu$ g/mL. The 50 % crude methanolic extract showed IC<sub>50</sub> values 29.34  $\pm$  1.05.98  $\mu$ g/mL respectively. However petroleum ether extract exhibited the lowest antioxidant activity with an IC<sub>50</sub> value of 249.12  $\pm$  1.57  $\mu$ g/mL. The standards exhibited IC 50 values 77.66  $\pm$  1.52 and 58.00  $\pm$  0.77  $\mu$ g/mL respectively. Thus from the above investigation it can be stated that antioxidant are essential as they play an important role in the immune system and in ageing process.

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