

In Vivo antioxidant activity of Ethyl acetate extract of *Bauhinia tomentosa* L. in lead induced toxicity

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Abstract

In vivo antioxidant activity of ethyl acetate extract of *Bauhinia tomentosa* L. was studied. Ethyl acetate extract of *Bauhinia tomentosa* L. was administered orally to evaluate the antioxidant activity in lead induced toxicity. It was evaluated by measuring the changes in the biochemical parameters such as SOD, CAT, GSH, GPx, GR and Vitamin C. Significant increase in antioxidant enzymes were observed, which indicates the antioxidant activity of *Bauhinia tomentosa* L.

Keywords : *Bauhinia tomentosa* L., Lead, Antioxidant activity.

INTRODUCTION

Environmental contamination and exposure to heavy metals is a serious growing problem throughout the world. Toxic metal pollution of the biosphere has intensified since the onset of the industrial revolution. Lead is one of the important heavy metals that enter into the environment through various ways, which causes serious health problems. Oxidative stress is proposed as an important mechanism in lead toxicity, which suggests that antioxidants might play a role in the treatment of lead poisoning. Lead has been mixed and used in industry and in house hold products for centuries. It has been used in hundred of ways, i.e. water pipes, and lead absorption mainly occurs through the respiratory and gastrointestinal systems. After absorption into blood plasma, it equilibrates rapidly with extracellular fluid, crosses membranes and accumulates in soft and hard tissues. Lead impairs the activity of calcium dependent intracellular messengers and of brain protein kinase and stimulates the formation of inclusion bodies that may translocate the metal into cell nuclei and alter gene expression.

Lead affects the various systems of the body including central nervous system, the hemopoietic system, the renal system and the gastrointestinal system (Pande and Flova., 2002). Finding a promising drug for alleviating lead poisoning has been a challenging problem. Indian health care consists of both traditional and modern systems of medicine. The side effects of modern medicine make the people to return to the ancient system of medicine. Many plant extracts and phytochemicals have been shown to have antioxidant properties. All parts of the plants are recommended in combination with other drugs for the treatment of various ailments (The Wealth of India, 1988). The present paper deals with the effect of flower extracts

of *Bauhinia tomentosa* L. against lead induced toxicity in male albino rats.

MATERIALS AND METHODS

Experimental animal

Male albino rats weighing 120-150g were purchased from the Department of Biochemistry, Tamil University, Thanjavur. The animals were housed in polypropylene cages and maintained in controlled temperature at 37°C. The animals fed with commercial pellet diet, and water was provided *ad libitum*.

Collection and Preparation of Plant Extract

The fresh flowers (1kg) of *Bauhinia tomentosa* L. were collected in and around Mannargudi. The yellow petals of the flowers were carefully separated and extracted with boiling methanol (85%, 4×500ml) under reflux. The methanolic extract was concentrated in reduced pressure and the concentrated extract was successively fractionated with benzene (2×250ml), peroxide free diethyl ether (2×250ml) and ethyl acetate (3×200ml). The ethyl acetate fraction was concentrated in reduced pressure. The solid thus obtained was separated and filtered and used for the experiment.

Experimental design

Body weight of the animals was recorded and they were divided into four Groups of 6 animals each.

Group I : Rats received with standard feed and water to allow *ad libitum*.

Group II : Rats received single intraperitoneal infection of lead (10mg/Kg b.w.).

Group III : Rats received oral administration of flower extract of *Bauhinia tomentosa* L. (500mg/Kg b.w).

Group IV : Rats received oral administration of *Bauhinia tomentosa* L. (500mg/Kg b.w).

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The animals were observed for 25 days and the changes in the body weight and various biochemical parameters in liver were recorded. Superoxide dismutase (Kakkar *et al.*,1984),catalase (Sinha,1972), glutathione peroxidase (Rotruck *et al.*,1973), glutathione reductase (Dulber and Anderson,1981),Vitamin C (Omaye *et al.*,1979) and reduced glutathione (Ellman,1959) were analysed.

RESULTS AND DISCUSSION

Toxicity of lead and the suppressive effect of ethyl acetate flower extract of *Bauhinia tomentosa* L. in male albino rats were evaluated by assessing the parameters such as SOD, CAT, GPx, GR, GSH and vitamin C and the results are summarized in Table 1. The levels of SOD,CAT,GPx,GR and vitamin C and reduced glutathione were significantly decreased in lead intoxicated rats (Group II) as compared to Group I rats. Administration of ethyl acetate extract of *Bauhinia tomentosa* L. (Group III) showed a remarkable increase in the level of SOD and CAT as compared to lead intoxicated Group II rats.

Superoxide dismutase enzymes contain metal ion cofactors depending on the type of isoenzyme, copper, zinc, manganese. In humans, copper/ zinc containing SOD is present in the cytosol, while manganese

containing SOD is present in the mitochondria (Nozik - Grayck, 2005). Catalase is found to act 10⁴ times faster than peroxidase. Catalase converts hydrogen peroxide to water and oxygen, in fact, catalase co-operates with superoxide dismutase in the removal of the H₂O₂ resulting from the dismutation reaction (Venukumar and Latha, 2002). GPx is selenium containing tetrameric glycoprotein. The dominant level of enzyme is present in liver (Jollow, 1973), two third of glutathione peroxidase is present in cytosol and third is present in mitochondria (Paglia and Valentine *et al.*, 1988). Glutathione reductase catalyses the conversion of oxidised glutathione (GSSH) into reduced glutathione (GSH) and helps in the regeneration of reduced glutathione for the conversion of the hydroxyl radical into normal metabolite, thereby protects the cell membrane from oxidative damage. The availability of reducing equivalents NADPH plays a crucial role in the action of glutathione reductase (Woods, *et al.*, 1990). Vitamin C is regarded as the first line of antioxidant substance and a powerful of the process of lipid peroxidation. The end product of ascorbic acid oxidation is dehydroascorbic acid, which appears to have some activity in own right as a antioxidant (Johnston *et al.*, 1993).

Table 1: Effect of ethyl acetate flower extract of *Bauhinia tomentosa* L. on SOD, CAT,GPx,GR, Vitamin C, and Reduced Glutathione in Experimental rats

Experimental animals	SOD (Units /mg protein)	CAT(nmoles/ min/mg protein)	GPx (nmoles/ min/mg protein)	GR (nmoles/ min/ mg protein)	Vitamin C (mg/dl)	GSH(mmoles/ g of tissue)
Group - I	9.45±0.51	88.71±5.31	56.7±3.21	0.73±0.02	1.4 ± 0.08	28.38 ± 1.55
Group - II	6.28±0.40	53.97±4.45	2.55±1.35	0.47±0.01	0.89 ±0 .03	16.75 ± 1.36
Group - III	8.30±0.53δ	75.44±6.18δ	4.89±2.71δ	0.59±0.01δ	1.17 ± 0.06*	24.78 ± .63*
Group - VI	10.09±0.75	95.36±8.2	5.48±3.12	0.66±0.02	1.48 ± 0.10	30.40 ± 2.21

Values are expressed as mean ± SD.

* Significantly different from Group II (P<0.05).

- SOD – superoxide dismutase
- CAT – Catalase
- GPx – Glutathione peroxidase
- GR- Glutathione reductase
- GR – Glutathione reductase
- GSH- Reduced glutathione

The ethyl acetate extracted compound of *Bauhinia tomentosa* L. was found to be effective in increasing glutathione, superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase levels, which had been decreased by lead exposure. As a result, *Bauhinia tomentosa* L. seems to be producing protective effect against lead induced oxidative stress. Hence it is concluded that, lead seems to contribute to the oxidative stress which induces damage, even in animals with a moderate dosage (100mg/ml). *Bauhinia tomentosa* L. flower extract, showed promising antioxidant effect against oxidative damage induced by lead. It is due to the phytochemical constituents like flavanoids, quercetin, tannins and other polyphenolic compounds, which reduce the oxidative stress by converting the reactive oxygen free radicals to non reactive products and the molecular mechanisms of effect of flowers of *Bauhinia tomentosa* L. need future investigation.

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