AMELIORATIVE ROLE OF *Vernonia cinerea* IN CARBON TETRACHLORIDE INDUCED HEPATIC DYSFUNCTION IN RATS

C. Gokilaveni, A. Nishadh and V. Selvi
Department of Biochemistry, Kongunadu Arts and Science College, Coimbatore – 641 029, Tamilnadu, India.

Received : 7-10-2005                                                                 Accepted : 12-12-2005

ABSTRACT

The ameliorative activity of herbal powder prepared from *Vernonia cinerea* leaves on CCl₄ (0.2ml/kg body wt. intraperitoneally (ip) and liquid paraffin (0.2 ml / kg body wt:ip) induced hepatotoxicity was studied in rats. The liver marker enzymes namely alanine transaminase (ALT), aspartate transaminase (AST), acid phosphatase and alkaline phosphatase (ALP) activities were decreased in 10% w/v liver homogenates of hepatotoxicity induced rats. The results of both post treated and pre treated groups suggest the hepatoprotective activity of *Vernonia cinerea* in CCl₄ induced rats.

KEYWORDS

CCl₄ liver marker enzymes, *Vernonia cinerea* and hepatotoxicity.

INTRODUCTION

The liver is an organ of paramount importance, which plays an essential role in the metabolism of foreign compounds entering the body. In addition, human beings consume a lot of synthetic drugs during diseased condition which are alien to body organs. All these compounds produce a variety of toxic manifestations (1). Conventional drugs used in the treatment of liver diseases are often inadequate. It is therefore necessary to search for alternative drugs for the treatment of liver diseases to replace the currently used drugs of doubtful efficacy and safety (2). Traditionally, plants have been used as medicines against various types of diseases (3). “Ayurveda” recommends many medicinal plants for the treatment of liver disorders. Use of herbal drugs in the treatment of liver diseases has a long tradition especially in Indian medicine (4). The plant *Vernonia cinerea* belongs to the *Asteraceae* family. It is popularly known as sahadevi (Tamil) (5) and occurs frequently in India. In the present study the hepatoprotective effect of *Vernonia cinerea* against CCl₄ induced liver damaged in rats was reported.
MATERIALS AND METHODS

Drugs and chemicals

All the chemicals used in the present study were of analytical grade.

Experimental animals

Wistar strains of adult male albino rats weighing 150 – 200g were obtained from PSG Institute of Medical Sciences, Coimbatore, Tamilnadu. These animals were fed with standard pellet diet from Hindustan lever limited (Mumbai, India) and water ad libitum. The pellet composition was found to be similar to RDA (Recommended Dietary Allowances) for laboratory animals. The study was carried out based on the guidelines for the use and care for laboratory animals.

Experimental induction of liver damage

Hepatic injury was induced in experimental rats by oral administration of CCl₄ diluted with liquid paraffin oil (1:1 ratio) in a dose of 1 ml/kg body wt for two days (7).

Preparation of herbal powder

The whole plants of Vernonia cinerea were collected from Anamalai hills, Valparai, Coimbatore, Tamilnadu, India and identified by Botanical Survey of India, Tamilnadu Agricultural University, India. The plants were picked up and dried under shade, powdered and passed through 40 mesh sieve and stored in a closed container for future use.

EXPERIMENTAL DESIGN

The selected rats were divided into five groups of six animals each as given below.

Group I : control group fed with normal diet.

Group II: toxic group (rats treated ip with CCl₄ diluted with liquid paraffin oil (1:1 ratio) in a dose of 1 ml/kg body wt for 2 days

Group III : post treated group (toxic group treated with herbal powder (10mg/100g body wt/day) orally as a suspension of water for 15 days from second day after sensitization)

Group IV: pretreatment group (the herbal powder was administered orally as a suspension of water for 15 days (10 mg/100g body wt/day); and treated with ip CCl₄ for next two days similar to group III)

Group V : positive control group (rats treated only with herbal powder (10 mg/100g body wt/day: orally as a suspension of water) for 15 days).

Collection of rat liver

After 12 hour of the last dose, the rats were sacrificed under mild chloroform anesthesia. The livers were immediately excised, washed with cold saline, blotted and weighed. Then 10% w/v liver homogenates were prepared with 0.1 M Tris HCl buffer (pH – 7.4) and used for the biochemical estimations.

Biochemistry assay
The 10% w/v liver homogenates of control and experimental rats were used for the assay of liver marker enzymes namely alanine transaminase (ALT) and separate transaminase (AST) (8), acid phosphatase (ACP) and alkaline phosphatase (ALP) (9) as per standard methods.

**Statistical analysis**

Results of the biochemical estimations were reported as mean±SD and the data obtained were analyzed by one-way analysis of variance (ANOVA) (10).

**RESULTS AND DISCUSSION**

Effects of aqueous herbal powder of *Vernonia cinerea* on CCl₄ induced liver damage in rats with reference to biochemical changes in liver are shown in Table 1.

The CCl₄- mediated hepatotoxicity was taken here as the experimental model for liver injury. It has been established that CCl₄ is accumulated in hepatic parenchymal cells and metabolically activated by cytochrome p-450 dependent mono oxygenases to form a trichloromethyl free radical (CCl₃), which alkylates cellular proteins and other macromolecules with a simultaneous attack on polyunsaturated fatty acids in the presence of oxygen to produce lipid peroxides leading to liver damage (11). In the present study, toxic group rats (group II) showed a significant reduction in the activities of liver marker enzymes namely ALT, AST, ACP and ALP in the liver homogenate. At the same time, pre treatment with the herbal powder (group IV) prior to CCl₄ administration significantly inhibited the CCl₄ mediated leakage of liver marker enzymes in serum and thus restored these levels to near normal thereby showing that *Vernonia cinerea* has hepatoprotective action. When there is hepatopathy, these enzymes leak into the blood stream in conformity with the extent of liver damage.

The post treated group of rats (group III) has shown a significant increase in ALT, AST, ACP and ALP activities when compared to group II rats, which might be an indication of recovery from liver damage. When the extract was along administered to rats in-group V, they showed no significant difference in the activities of ALT, AST, ACP and ALP as compared to control group rats. This indicates that the plant by itself does not cause any side effects.

**CONCLUSION**

The results of the present study indicated that the herbal powder of *Vernonia cinerea* showed hepatoprotective effect against carbon tetrachloride induced liver damage in albino Wistar rats.

**ACKNOWLEDGEMENT**

The authors would like to thank our secretary and director Dr. M. Aruchami and principal T. Kulandaivel for their constant encouragement and providing laboratory facilities.
## Table - 1

**ACTIVITIES OF LIVER MARKER ENZYMES IN LIVER OF CONTROL AND EXPERIMENTAL RATS**

| MARKER ENZYMES | GROUP I CONTROL | GROUP II TOXIC | GROUP III POST TREATMENT | GROUP IV PRE TREATMENT | GROUP V POSITIVE CONTROL |
|----------------|-----------------|----------------|--------------------------|------------------------|--------------------------|
| ALT            | 14.7±0.84       | 8.84±2.98a*    | 7.96±1.00b*              | 11.3±2.35c*            | 14.5±1.60d<sup>ns</sup>  |
| AST            | 16.1±1.33       | 9.60±1.07a*    | 11.3±0.75b*              | 11.5±1.92c*            | 15.4±0.97d<sup>ns</sup>  |
| ACP            | 29.8±3.92       | 21.6±1.91a*    | 26.0±2.93b*              | 25.1±2.20c*            | 29.0±2.08d<sup>ns</sup>  |
| ALP            | 9.06±.067       | 7.38±0.99a*    | 8.83±0.88b*              | 8.85±1.66c*            | 9.30±1.06d<sup>ns</sup>  |

Values are expressed as mean ± SD of six replicates

ALT, AST = n moles pf pyruvate / min / mg protein

ACP, ALP = µ moles of phenol / min / mg protein

* - Significant at 5% level (p<0.05) : ns – non significant.

Statistical group comparison : a – group I with group II, b-group II with group III, c-group II with group IV, d – group I with group V.

## REFERENCES

1. Athar, M., Zakir Hussain, S and Hassan, N., Drug metabolizing enzymes in the liver. In: Rana, S.V.S., Taketa, K. editors. Liver and environmental xenobiotics. New Delhi : Narosa publishing house (1997).
2. Rajesh, M.G and Latha, M.S., Protective activity of *Glycyrrhiza glabra* Linn on carbontetrachloride induced peroxidative damage, Indian J. Pharmacol., 36(5) 284-287 (2004).
3. Gole, M.K., Dasgupta, S., Sur, S.K. and Ghosal, J., Hepatoprotective effect of *Amoora rohituka*, Int. Pharmacog., 35, 381, (1997).
4. Narayanasamy, K and Selvi, V., Studies on the hepatoprotective activity of an ayurvedic formulation (Ayusliv) on ethanol and CCl<sub>4</sub> induced hepatic damage in albino rats, Drug lines., 8(1), 12-15. (2005).
5. Iwalewa, E.O., Iwalewa, O.J. and Adeboye, J.O., Analgesic, antipyretic, anti-inflammatory effects of *Vernonia cinerea* less leaf, J. Ethnopharmacol., 86(3), 234, (2003).
6. Thomas, R., Martin., Leonard, C., Altman, and Olav. F. Alvares, Recommended dietary allowances, Am. Rev. Respir. Dis., 128, 1013 – 1019, (1983).
7. Recknagel, R.O., Glende, E. A Jr., Dolak, J.A. and Waller, R.L., Mechanism of carbon tetrachloride toxicity, Pharmacol Ther., 43, 154, (1989).
8. Reitman, S. and Frankel, A.S., A calorimetric method for the determination of serum glutamic oxaloacetic and glutamate pyruvic transaminase, Am.J.Clin. Path., 28, 56, (1957).
9. Kind, P.R.N. and King, A.J., Estimation of plasma phosphate by determination of hydrolyzed phenol with amino antipyrine, J. Clin. Path., 7, 322, (1954).
10. Snedecor, G.W. and William, G.C., Statistical methods, 8th edition (Lowa state university press), 476, (1994).
11. Recknagel, R.O., A new direction in the study of carbon tetrachloride hepatotoxicity, Life sciences., 33, 408, (1983).