

RESEARCH ARTICLE

Hepatoprotective Activity of *Aerva lanata* Linn. Against Paracetamol Induced Hepatotoxicity in Rats

Manokaran S^{1*}, Jaswanth A¹, Sengottuvelu S², Nandhakumar J², Duraisamy R², Karthikeyan D² and Mallegaswari R³

¹Srikrupa Institute Pharmaceutical Sciences, Velkatta Village, Medak District, Andhra Pradesh, India.

²Nandha College of Pharmacy and Research Institute, Koorapalayam Pirivu, Perundurai Main Road, Erode-638052,

³KM College of Pharmacy, Melur Main Road, Uthankudi Post, Madurai-625107, Tamil Nadu, India

*Corresponding Author E-mail: msellimuthu@gmail.com

ABSTRACT

The present study was conducted to evaluate the hepatoprotective activity of hydroalcoholic extract of *Aerva lanata* against paracetamol induced liver damage in rats. The hydroalcoholic extract of *Aerva lanata* (600mg/kg) was administered orally to the animals with hepatotoxicity induced by paracetamol (3gm/kg). Silymarin (25mg/kg) was given as reference standard. All the test drugs were administered orally by suspending in 0.5% Carboxy methyl cellulose solution. The plant extract was effective in protecting the liver against the injury induced by paracetamol in rats. This was evident from significant reduction in serum enzymes alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) and bilirubin. It was concluded from the result that the hydroalcoholic extract of *Aerva lanata* possesses hepatoprotective activity against paracetamol induced hepatotoxicity in rats.

KEY WORDS : *Aerva lanata*, Paracetamol, hepatoprotective and hepatotoxicity

INTRODUCTION:

Liver disease is still a worldwide health problem. Unfortunately, conventional or synthetic drugs used in the treatment of liver diseases are inadequate and sometimes can have serious side effects¹. In the absence of a reliable liver protective drug in modern medicine there are a number of medicinal preparations in Ayurveda recommended for the treatment of liver disorders². In view of severe undesirable side effects of synthetic agents, there is growing focus to follow systematic research methodology and to evaluate scientific basis for the traditional herbal medicines that are claimed to possess hepatoprotective activity. *Aerva lanata* Linn (Amaranthaceae) is an herbaceous perennial weed growing wild in the hot region of India. *Aerva lanata* has been claimed to be useful as diuretic, anthelmintic, antidiabetic, expectorant and hepatoprotective in traditional system of medicine³. Antimicrobial and cytotoxicity activity⁴, diuretic⁵, urolithiasis⁶ and anti-inflammatory⁷ activity of *Aerva lanata* has been reported.

Canthin-6-one and beta-carboline alkaloids were isolated from *Aerva lanata* leaves⁸. The study was conducted to establish the traditional use of *Aerva lanata* as hepatoprotective against paracetamol induced hepatotoxicity in rats.

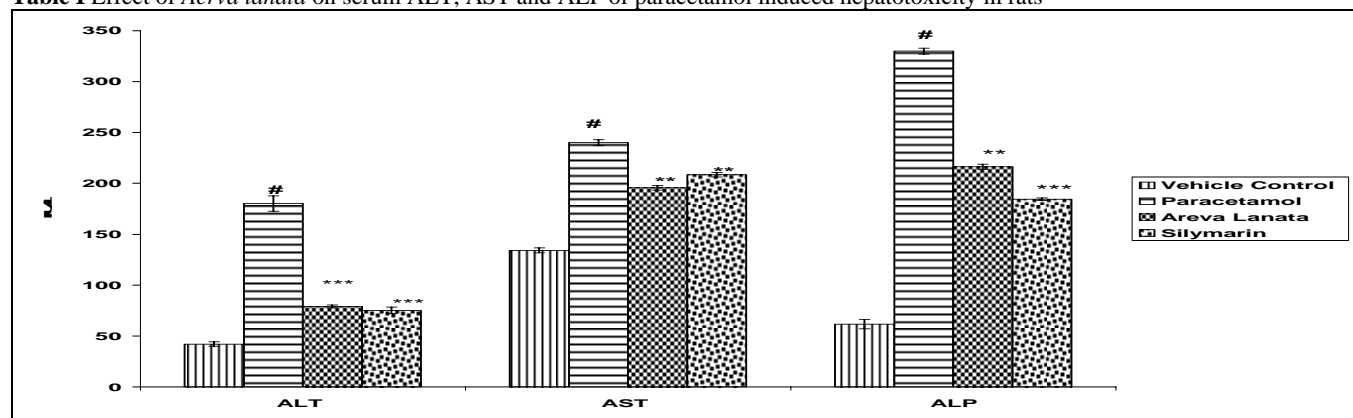
MATERIALS AND METHODS:

Animals

Male Wistar rats weighing between 150 – 220 gm were used for this study. The animals were obtained from animal house, KM College of Pharmacy, Madurai, Tamilnadu, India. The animals were placed at random and allocated to treatment groups in polypropylene cages with paddy husk as bedding. Animals were housed at a temperature of 24±2°C and relative humidity of 30 – 70 %. A 12:12 light: day cycle was followed. All animals were allowed to free access to water and fed with standard commercial pelleted rat chaw (M/s. Hindustan Lever Ltd, Mumbai). All the experimental procedures and protocols used in this study were reviewed by the Institutional Animal Ethics Committee (IAEC) and were in accordance with the guidelines of the IAEC.

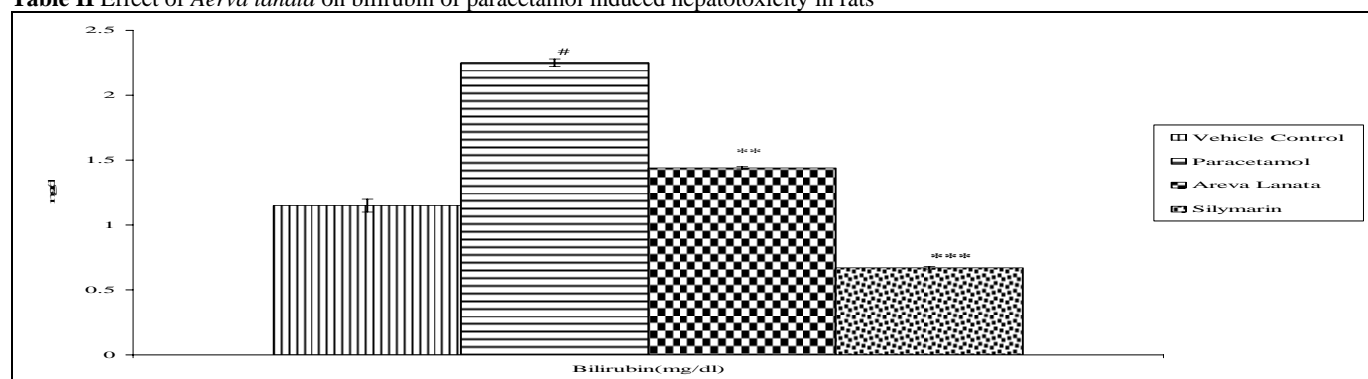
Received on 05.08.2008 Modified on 22.08.2008
Accepted on 10.09.2008 © RJPT All right reserved
Research J. Pharm. and Tech. 1(4): Oct.-Dec. 2008;Page 398-400

Table I Effect of *Aerva lanata* on serum ALT, AST and ALP of paracetamol induced hepatotoxicity in rats



Values are in Mean ± SEM (n=6) [#] P<0.001 Vs Control group ^{*} P<0.05; ^{**} P<0.01; ^{***} P<0.001 Vs Paracetamol group

Table II Effect of *Aerva lanata* on bilirubin of paracetamol induced hepatotoxicity in rats



Values are in Mean ± SEM (n=6) [#] P<0.001 Vs Control group ^{*} P<0.05; ^{**} P<0.01; ^{***} P<0.001 Vs Paracetamol group

Plant Material:

The fresh plants were collected in rural areas of Palani, Dindukal District, Tamilnadu. The plant was identified by a Botanist, and voucher specimen was deposited in the Department of Botany, Arulmigu Palaniandavar Arts and Science College, Palani. After authentication, the plants were cleaned and shade dried and milled into coarse powder by a mechanical grinder.

Preparation of Extract:

The coarse powder plant material was extracted with ethanol: water (1:1) by using soxhlet apparatus. The solvent were removed under reduced pressure to get semisolid mass. Standard methods were used for preliminary phyto chemical screening of the extract was performed to know the phytoconstituents in the extract⁹, it was found that the extract contains alkaloid, flavonoides, glycosides, steroid, and tannins.

Hepatoprotective Activity:

A total of 24 animals were equally divided into 4 groups of six each. Group – I served as normal control received 0.5% (CMC) carboxy methyl cellulose solution (1 ml/kg) once daily for 3 days. Group – II served as paracetamol control, administered with paracetamol (3gm/kg) as single dose on day 3. Group –

III received, *Aerva lanata* extract (200 mg/kg) once daily for 3 days. Group – IV served as reference control, received Silymarin (25mg/kg) once daily for 3 days. Group III and IV received paracetamol (3gm/kg) as single dose on day 3, thirty minutes after the administration of *Aerva lanata* and Silymarin respectively. All the test drugs and paracetamol were administered orally by suspending in 0.5% CMC solution. After 48h of paracetamol feeding, the blood was collected by direct cardiac puncture under light ether anesthesia and serum was separated for the estimations of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP)^{10,11} and bilirubin¹²

Statistical Analysis:

The values were expressed as mean ± SEM. The statistical analysis was carried out by one way analysis of variance (ANOVA) followed by Dunnet’s ‘t’ - test. P values <0.05 were considered significant.

RESULT:

The results of hepatoprotective activity of hydro-alcoholic extract of *Aerva lanata* on Paracetamol treated rats are shown in Figure I and II. The hepatic enzymes ALT, AST, ALP and bilirubin in serum was significantly (P <0.001) increased in paracetamol treated animals when compared to control. The hydro-alcoholic extract of Avera lanata treatments significantly (P < 0.01) reversed the levels of AST, ALP and bilirubin

($P < 0.01$) and ALT($P < 0.001$) when compared to paracetamol alone treated rats. Silymarin (25 mg/kg) treated animals also showed significant decrease in AST ($P < 0.01$), ALT, ALP and bilirubin ($P < 0.001$) levels when compared to paracetamol alone treated rats.

DISCUSSION:

Paracetamol hepatotoxicity is caused by the reaction metabolite N-acetyl-p-benzo quinoneimine (NAPQI), which causes oxidative stress and glutathione depletion. It is a well-known antipyretic and analgesic agent, which produces hepatic necrosis at higher doses¹³. Paracetamol toxicity is due to the formation of toxic metabolites when a part of it is metabolized by cytochrome P-450. Introduction of cytochrome¹⁴ or depletion of hepatic glutathione is a prerequisite for paracetamol induced hepatotoxicity^{15,16}.

Normally, AST and ALP are present in high concentration in liver. Due to hepatocyte necrosis or abnormal membrane permeability, these enzymes are released from the cells and their levels in the blood

increases. ALT is a sensitive indicator of acute liver damage and elevation of this enzyme in non hepatic diseases is unusual. ALT is more selectively a liver parenchymal enzyme than AST¹⁷.

Assessment of liver function can be made by estimating the activities of serum ALT, AST, ALP and Bilirubin which are enzymes originally present higher concentration in cytoplasm. When there is hepatopathy, these enzymes leak into the blood stream in conformity with the extent of liver damage¹⁸. The elevated level of these entire marker enzymes observed in the group II, paracetamol treated rats in this present study corresponded to the extensive liver damage induced by toxin. The reduced concentrations of ALT, AST and ALP as a result of plant extract administration observed during the present study might probably be due in part to the presence of flavonoids. Liver protective herbal drugs contain a variety of chemical constituents like phenols, coumarins, lignans, essential oil, monoterpenes, carotenoids, glycosides, flavanoids, organic acids, lipids, alkaloids and xanthines¹⁹.

Bilirubin is one of the most useful clinical clues to the severity of necrosis and its accumulation is a measure of binding, conjugation and excretory capacity of hepatocyte. Decrease in serum bilirubin after treatment with the extract in liver damage induced by paracetamol, indicated the effectiveness of the extract in normal functional status of the liver.

CONCLUSION:

The hydro-alcoholic extract has shown the ability to maintain the normal functional statuses of the liver. From the above preliminary study, we conclude that

the hydro alcoholic extract of *Aerva lanata*, is proved to be one of the herbal remedies for liver ailment.

REFERENCES:

- Guntupalli M et al. Hepatoprotective effects of rubiadin, a major constituent of *Rubia cordifolia* Linn. J. Ethnopharmacol. 2006; 103: 484–490.
- Chatterjee TK. Medicinal plants with hepatoprotective properties. In: Herbal Options. 3rd Edn. Books and Allied (P) Ltd. Calcutta. 2000; 135.
- Kiritkar KR and Basu BD. Indian Medicinal Plants. International book distributors. Dehradun, India. 1996. 2064 – 2065.
- Dulaly Chowdhury et al. Antimicrobial activity and cytotoxicity of *Aerva lanata* *Fitoterapia*. 2002; 73: 92-94.
- Udupihille M and Jiffry MTM. Diuretic effect of *Aerva lanata* with water, normal saline and coriander as controls. Indian J Physiol and Pharmacol. 1986; 30: 91-97.
- Rao SG et al. Evaluation of an experimental model for studying urolithiasis effect of *Aerva lanata* on urinary stones. Indian Drugs. 1985; 22: 640-643.
- Vetrichelvan T et al. Diuretic and anti inflammatory activities of *Aerva lanata* in rats. 2000; 62:300-302.
- Zapesochayna G et al. Canthin-6-one and beta-carboline alkaloids from *Aerva lanata*. *Planta Medica*. 1992; 58: 192-196.
- Harborne JB “Phyto – Chemical Methods; A guide to modern techniques of plant analysis” 2nd edn; Chapman and hall, New York. 1984. 85.
- Reitman S and Frankel S. *In vitro* determination of transaminase activity in serum. Am. J. Clin. Pathol. 1957; 28: 56.
- Kind PRN and King EJ. Estimation of plasma phosphatase by determination of hydrolysed phenol with amino antipyrine. J Clin Pathol. 1954; 7: 322.
- Jendrassik L and Grof P. *Biochemische Zeitschrift*. 1938; 297: 81-89.
- Boyd EH and Bereczky GM. Liver necrosis from paracetamol. Br J Pharmacol. 1966; 26: 606-614.
- Dahlin D et al. N-acetyl- p-benzoquinone imine: A cytochrome P-450- mediated oxidation product of acetaminophen. Proc Natl Acad Sci. 1984;81: 1327-1331.
- Moron MS, Depierre JW and Mannervik B. Levels of glutathione, glutathione reductase and glutathione-S-transferase activities in rat lung and liver. *Biochem Biophys Acta*. 1979; 582: 67-78.
- Gupta AK et al. Hepatoprotective activity of *Rauwolfia serpentina* rhizome in paracetamol intoxicated rats. J. Pharmacol. Toxicol. 2006; 1: 82-88.
- Shah M et al. Evaluation of the effect of aqueous extract from powders of root, stem, leaves and whole plant of *Phyllanthus debilis* against CCL₄ induced rat liver dysfunction. Indian Drugs. 2002; 39: 333-337.
- Nkosi CZ, Opoku AR and Terblanche SE. Effect of pumpkin seed (*Cucurbita pepo*) protein isolate on the activity levels of certain plasma enzymes in CCl₄-induced liver injury in low-protein fed rats. *Phy.the.Res.*2005; 19: 341–345.
- Gupta AK and Misra N. Hepatoprotective Activity of Aqueous Ethanolic Extract of *Chamomile capitula* in Paracetamol Intoxicated Albino Rats. *American Journal of Pharmacology and Toxicology*. 2006; 1: 17-20.