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Effect of *Semecarpus anacardium* against lead induced toxicity in rats

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Abstract

The present study was carried out to understand the antioxidant and protective effect of *Semecarpus anacardium* against lead acetate induced toxicity. This was done by analyzing the phytochemicals (Flavanoids, alkaloids, resins, tannins, carbohydrates, proteins, etc.) present in the plant and by assessing the hepatoprotective efficacy of the plant against lead acetate induced albino rats. Histopathological examination was also carried out to have a supporting evidence for the study. It was observed that the nut milk extract contains flavanoids, phenols and carbohydrates and the drug was effective against lead acetate induced toxicity. The levels of the marker enzymes were increased in the lead acetate induced rats and after the treatment of *Semecarpus anacardium* the liver damage decreased.

Key words : Lead acetate, Male albino rats, *Semecarpus anacardium*, Hepatotoxicity.

Introduction

The liver is the largest gland in the body and is the major site for drug metabolism. A byproduct of chemical intermediate that can attack macromolecules leads to direct toxicity. Inflammation of the hepatic cells results in elevation in the alanine aminotransferase, aspartate aminotransferase and possibly the bilirubin [2]. Hepatotoxicity is chemical driven liver damage. The most

important susceptibility factor for hepatotoxicity is genetic variability [5]. Lead acetate is a chemical compound, a white crystalline substance with a sweetish taste. It is prepared by treating litharge (PbO) with acetic acid. Like other lead compounds, it is very toxic. Lead is not metabolized in the body, but it may be conjugated with glutathione and excreted primarily in the urine [1]. Lead acetate was chosen to induce hepatotoxicity in rats. Lead acetate of 10mg/kg body weight intra peritoneally is nephrotoxic to rats. Hence this dosage was chosen for intraperitoneal administration. Herbal medicines are unique and play a vital role in the indigenous system of medicine all over the world [3]. *Semecarpus anacardium* is considered beneficial in ascites, tumours warts, acute rheumatism, asthma, neuralgia, psoriasis is hepatoprotective. Although many medicinal plants have demonstrated hepatoprotective properties, the exact mechanism of this action need to be elucidated. The objective of the present study was to understand the antioxidant and protective effect of *Semecarpus anacardium* against lead acetate induced toxicity.

Materials And Methods

Chemicals used: ûþ- Glutamyl aminotransferase kit, p- Nitrophenyl D-Glucuronide was purchased from Hi Media Lab Pvt. Mumbai. Adenosine triphosphate(ATP), Nicotinamide adenine dinucleotide(NAD) was procured from LOBA Chemie Pvt. Ltd, Mumbai.

Animals used: Male albino rats of Wistar strain weighing between 100-150g were obtained from Small Animal Breeding Center, Kerala Agricultural University, Trissur.

Lead acetate was chosen to induce hepatotoxicity in rats. Lead acetate of 10mg/kg bw/i.p is nephrotoxic to rats. Hence this dosage was chosen for intraperitoneal administration.

Plant material used :

Semecarpus anacardium Linn nuts obtained from SKM Siddha and Ayurvedic, Erode. The nuts were homogenized to yield 10% solution.

Experimental set up:

Group I - Served as control
GroupII - Received *Semecarpus anacardium* (500mg/kg/ p.o) for 30days.
GroupIII - administered lead acetate (10mg/ kgbw/i.p) thrice
GroupIV - Rats were induced hepatotoxicity with lead acetate and treated with *Semecarpus anacardium.*

At the end of the experimental period the animals were killed by cervical decapitation. The serum was separated from the blood by centrifugation at 2500rpm. The serum was assayed for various enzymes such as aspartate aminotransfferase (AST), Alanine aminotransferase (ALT), Alkaline phosphatase (ALP), Acid phosphatase (ACP) [4] and Lactate dehydrogenase (LDH).

Statistical analysis All the values are presented as mean±SD. Students t test was used to arrive at the statistically significant changes associated with various treatments.

Results And Discussion

The present study deals *Semecarpus anacardium* against lead toxic rats and the mode of action is discussed as follows.

Phytochemical Analysis :

The plant *Semecarpus anacardium* was determined for the presence of phytochemicals. The plant extract contains flavanoids, carotenoids, rtocopherols, proteins, phenols,etc.

Animal Studies

The activity of Semecarpus anacardium in the serum of lead induced hepatotoxicity rats :

The activity of marker enzymes such as acid phosphatase,alkaline phosphatase, alanine amino transferase and lactate dehydrogenase in the serum is significantly increased in the lead induced rats, when compared to control rats (Group I &III). The increased level of the lactate dehydrogenase in the blood circulation, indicating the disease in the liver cells. Inflammation of the hepatic cells results in elevation in the alanine aminotransferase, aspartate amino transferase and possibly the bilirubin [2].

From table-2, the groupIV shows that pretreatment with the nut milk of *Semecarpus anacardium* prior to lead administration significantly inhibited the lead acetate mediated leakage of liver marker enzymes in serum and thus restored these levels to near normal there by showing that *Semecarpus anacardium* has hepato protectivity.

Conclusion

Semecarpus anacardium Linn (Family:Anacardiacaceae) also called the "markernut" is considered beneficial in ascites, neuralgia, epilepsy and psoriasis. The present study was therefore designed to study the effect of *Semecarpus anacardium* against lead toxic rats. However from the study all the marker enzymes were significantly increased in the serum of lead acetate induced rats. Histopathological studies shows abnormality of the cell after induced toxicity. After administration of *Semecarpus anacardium* to the lead acetate induced rats, the marker enzymes were brought to near normal conditions compared to control and histopathological cells examined cells attain the normal condition. The observed hepatoprotective activity of *Semecarpus anacardium* against the lead acetate induced albino rats may be due to the presence of certain phyto chemicals present in the extract.

TABLE - 1 :
Phytochemicals found in *Semecarpus anacardium*

COMPOUNDS	TESTS	RESULTS
Flavanoids	Dilute HCl	+
	Saponins	+
	Sodium Bicarbonate test	+
Carbohydrates	Fehlings test	+
	Benedicts Test	+
	Molisch's Test	+
Protein	Million's test	+
Phenols	Ferric chloride test	+
	Lead acetate test	+
	Libermans's test	+

Table4 : The Levels of acid phosphatase, alkaline phosphatase, aspartate Trans aminase, alanine Trans aminase, lactate dehydrogenase are shown in the table.

Parameter	Group I	Group II	Group III	Group IV
ACP	1.614± 0.480	$1.776 \pm 0.6221^{a*}$	$2.46 \pm 1.317^{b\Psi}$	$0.236\pm 0.1768^{c*}$
ALP	2.0 ± 0.8438	$3.88 \pm 1.804^{a\Psi}$	$4.12 \pm 0.6910^{b*}$	$1.74 \pm 0.8616^{c\$}$
AST	0.37 ±0.190	$0.328 \pm 0.2320^{a\Psi}$	$0.466 \pm 0.240^{b*}$	0.318 ± 0.382^{cNS}
ALT	2.04 ± 0.6019	2.45 ± 1.80^{aNS}	2.88 ± 0.259^{bNS}	$1.99\pm 1.642^{c*}$
LDH	415.12 ± 0.19	2.36 ± 1.615^{aNS}	$4.26 \pm 2.497^{b\Psi}$	0.173 ± 0.12^{cNS}

Enzyme units are expressed as μ mole of phenol liberated / litre.
Values are Mean ±SD for six animals each
The symbols represent statistical significance.

* P < 0.1 Ψ - P <0.05 $ P < 0.01 NS p< Non significant
Comparisons are made between

a-GroupI & Group II, b- GroupI & Group III, c- GroupIII & GroupIV