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SCImago Journal Rank 0.129
Impact factor 0.67*

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Int J Pharm Bio Sci 2013 Oct; 4(4): (P) 807 - 811

Research Article **Pharmacognosy**

International Journal of Pharma and Bio Sciences **ISSN 0975-6299**

HEPATOPROTECTIVE ACTIVITY OF SEMECARPUS ANACARDIUM FRUIT EXTRACTS AGAINST CARBON TETRACHLORIDE INDUCED HEPATOTOXICITY IN RATS

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ABSTRACT

The objective of the present study was to evaluate hepatoprotective activity of fruit extracts of semecarpus anacardium against the damage caused by carbon tetrachloride (1.25mg/kg, p.o.). Aqueous and ethanolic extracts of semecarpus anacardium fruits were administered in the dose of 250 and 500mg/kg/day orally for 7 days. Silymarin (50mg/kg) was used as standard drug. The hepatoprotective effect was assessed by biochemical parameters such as serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), alkaline Phosphatase (ALP), total bilirubin and serum protein. It was concluded that both aqueous and ethanolic extracts showed significant hepatoprotective activity.

KEY WORDS: Hepatoprotective, Semecarpus anacardium, Carbon tetrachloride, Silymarin

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INTRODUCTION

Liver residing at the crossroads between the digestive tract and the rest of the body has enormous task of maintaining body's metabolic homeostasis. It is susceptible to a wide variety of metabolic, toxic and microbial insults. The functional reserve of the liver masks to some extent the clinical impact of early liver damage. However, with progression of disease or disruption of circulation or bile flow, the consequences of deranged liver functions become life threatening[1]. There is no rational therapy available in modern medicine to prevent such life threatening impact[2, 3].So there is an ever increasing need for an agent to prevent the liver damage. Semecarpus anacardium tree is found in abundance in Assam, Bihar, Bengal, Orissa, Chittagong and central India[4]. The nut is commonly known as 'marking nut' and in the vernacular as "Bhallataka" or "Bhilwa". It has high priority and applicability in indigenous system of medicine[5,6]. The nut milk extract of semecarpus has been shown to have anticancer, hepatoprotective activity, anti-inflammatory and antioxidant property[7]. Hence the present study was planned to investigate the hepatoprotective activity of semecarpus anacardium fruit extracts.

MATERIALS AND METHODS

Preparation of Semecarpus anacardium fruit extract

Semecarpus anacardium fruits were collected from the local market of Bidar city in the month of January and authenticated. Fruits were shade dried and made into coarse powder. Aqueous and ethanolic extracts of fruits were obtained by using soxhlet apparatus. Suspensions of extracts were freshly prepared using 0.1% Tween 80 for experimental purpose.

Animals

Albino rats of wistar strain of either sex with body weight of 150-200 grams were used for this study. Animals were obtained from central animal house of department of pharmacology, Bidar Institute of Medical Sciences, Bidar, after the approval of Institutional Animal Ethics Committee. Animals were housed at a temperature of 24±2ºC, at a relative humidity of 50% maintained on 12 hours light/dark cycle and allowed food and water ad libitum.

Acute toxicity study

Acute toxicity studies were carried out for both aqueous and ethanolic extracts as per OECD guideline 425[8] in Swiss mice weighing 25 to 30 grams by administering a dose 2000mg/kg orally. The groups were continuously monitored for any behavioural changes and mortality during the first 24 hours and then daily for a fortnight. Two submaximal doses $1/10^{th}$ cut off dose for extracts 250 and 500 mg/kg, p.o. were found to be safe ($1/10^{th}$ of LD50) and were used for further study.

Experimental design

Animals were randomly divided into seven groups of six animals in each. Group I taken as control and received normal saline. Group II taken as toxic control and received 1:1(v/v) mixture of CCl4 in olive oil at a dose of 1.25ml/kg. Group III standard group and received silymarin 50mg/kg, while group IV and V were treated with ethanolic extract of semecarpus anacardium fruit at the dose of 250 and 500 mg/kg/day respectively. Group VI and VII were treated with aqueous extract of semecarpus anacardium fruit at the dose of 250 and 500mg/kg/day respectively. All the drugs were administered orally for a period of 7 days. 24 hours after CCl4 treatment (day 8) blood was drawn from cardiac puncture and biochemical parameters like SGOT, SGPT, ALP, Total bilirubin (TB) and total protein(TP) were assessed.

Statistical analysis

All the results were expressed as mean± SEM.Statistical analysis was done by ANOVA and Dunnett's multiple comparison test. $P< 0.05$ was considered as significant.

RESULTS

Group II receiving carbon tetrachloride showed elevated total bilirubin, serum amino transferases (SGOT, SGPT), and serum ALP.

The serum total protein level was decreased when compared to group I (vehicle control) [Table 1]. The oral administration of ethanolic and aqueous extracts of semecarpus anacardium and silymarin reduced the CCl4 induced increase in SGOT, SGPT and total bilirubin levels (P<0.01). The extracts also restored the depletion of total protein significantly (P<0.05 and P<0.01 respectively) when compared with group II [CCl4 received group].

Table 1

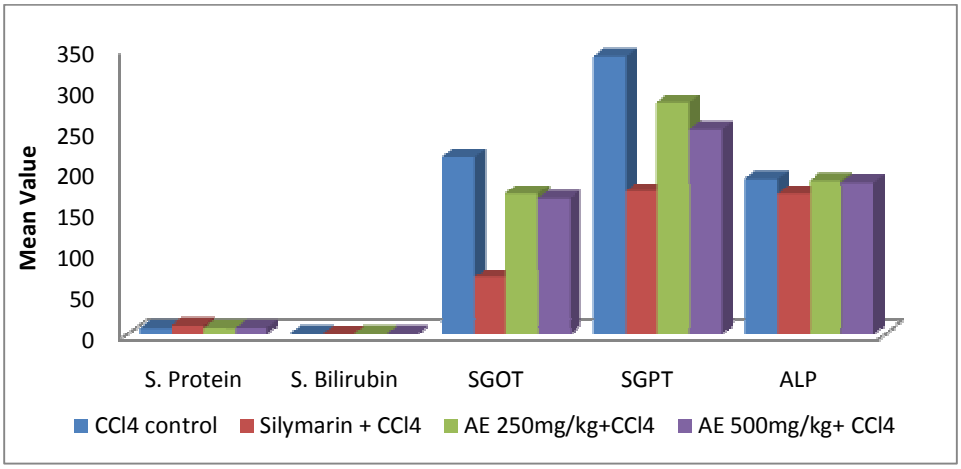
Effect of semecarpus anacardium extracts on CCl4 induced liver toxicity in rats.

Group	Drugs	Total protein(g/dl)	Total bilirubin(mg/dl)	SGOT (U/L)	SGPT (U/L)	ALP (U/L)
I	Vehicle Control	10.86±0.20	0.69±0.02	51.06±0.61	40.00±1.90	94.80±3.41
II	CCl4 control	7.16±0.09*	0.85±0.07*	217.28±4.50*	340±3.48*	190.50±7.50*
III	Silymarin + CCl4	9.85±0.16**	0.50±0.01**	69.04±0.40**	174.04±0.92**	170.66±0.52**
IV	EE 250mg/kg	8.18±0.11**	0.82±0.01**	115.28±1.16**	197.34±0.42**	185.18±0.30**
V	EE 500mg/kg	8.88±0.14**	0.50±0.08**	85.38±0.26**	183.38±0.11**	180.15±0.10**
VI	AE 250mg/kg	7.25±0.05**	0.78±0.20**	170.90±0.45**	282.36±0.40**	188.30±0.28**
VII	AE 500mg/kg	7.50±0.10**	0.73±0.01**	165±.31**	250.20±.20**	186.50±0.66**

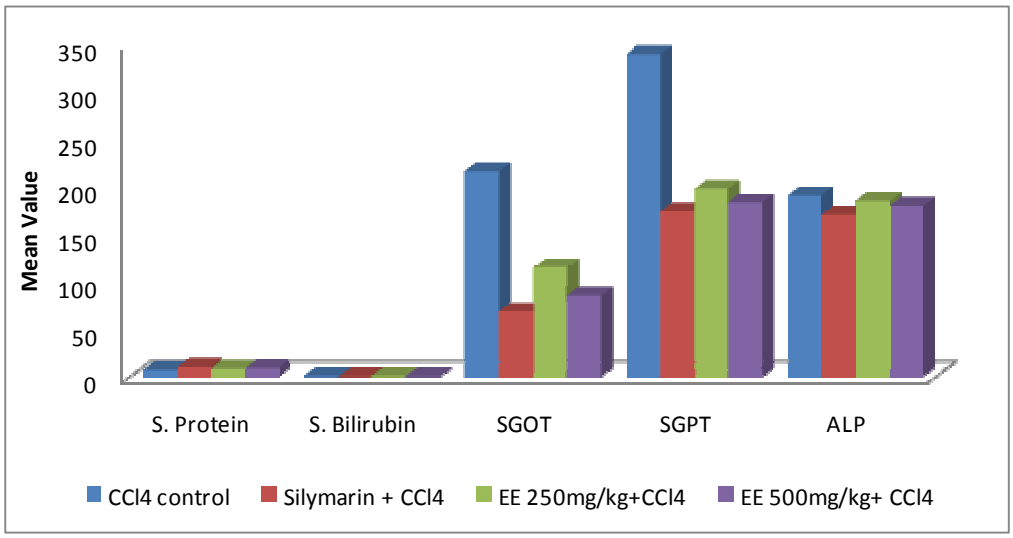
Values are mean ± SEM; N = 6; * P≤0.01 compared with group I; **P≤0.05 compared with group II;
EE – Ethanolic extract; AE – Aqueous extract; CCl4 – Carbon tetrachloride

Graph 1

Effect of administration of aqueous extract of semecarpus anacardium on liver function tests in CCl4 treated rats.



Graph 2
Effect of co- administration of ethanolic extract of semecarpus anacardium on liver function tests in CCl4 treated rats.



DISCUSSION

Carbon tetrachloride is commonly used for induction of experimental liver toxicity.This toxic chemical causes liver damage. It releases metabolites like trichloromethyl radical and trichloromethyl peroxy radical which are involved in pathogenesis of liver damage. It causes oxidative damage with the release of marker enzymes aminotransferases and alkaline phaosphatase in the serum, increase in serum total bilirubin levels and decrease in serum total protein[9, 10]. Administration of aqueous and ethnolic extracts of semecarpus anacardium fruit showed significant hepatoprotective activity, which was near to the standard drug silymarin.The most significant components of semecarpus anacardium linn are bhilwanols, phenolic compound[11, 12], biflavonoids[13]. It has been reported that extracts of semecarpus anacardium nuts possess antioxidant property[14]. Hepatoprotection offered by semecarpus extracts could be attributed to these constituents, since antioxidants have been reported to possess hepatoprotective activity[15].

CONCLUSION

The results of the present study suggest that the aqueous and ethanolic extracts of semecarpus anacardium fruits have significant hepatoprotective activity and ethanolic extract offers a greater hepatoprotection than aqueous extract.However in order to find out the exact mechanism of action further studies will be required.

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