

Evaluation of hepatoprotective activity of aqueous extract of *ricinus communis* in Wistar rats

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ABSTRACT

Background: The aim of the present study was to evaluate hepatoprotective activity of aqueous extract of *ricinus communis* in wistar rats.

Methods: Liver, the key organ of metabolism and excretion, is constantly endowed with the task of detoxification of xenobiotics, environmental pollutants and chemotherapeutic agents. The animals were divided into six groups with six rats in each group. First group were taken as control, and they received 0.9% normal saline 10ml/kg body weight orally. Second group was taken as CCl₄ control group and treated with normal saline (10 ml/ kg, p.o.) and CCl₄: olive oil (1:1, 2 ml/ kg, i.p. on 2, 5 and 8th day) daily for 20 day. The third group of six rats were treated with Liv 52- 100 mg/kg orally and CCl₄: olive oil (1:1, 2 ml/ kg, i.p. on 2, 5 and 8th day) for 20 days. The fourth and fifth groups were taken as test groups and they received crude extract of *ricinus communis* orally once daily for 20 days at the dosage of 250 and 500mg/kg respectively. CCl₄: olive oil was given i.p on 2, 5 and 8th day. On the 21st day, blood samples were collected by cardiac puncture method. The blood samples were used estimate biochemical parameters like serum AST and ALT.

Results: It was found that the *ricinus communis* at the doses of 250 and 500mg/kg exhibited moderate protective effect by lowering the serum levels of ALT and AST (P<0.001).

Conclusions: *Ricinus communis* has dose dependant hepatoprotective activity.

Keywords: Carbon tetrachloride, Hepatoprotective activity, *Ricinus communis*

INTRODUCTION

Plants have been used to treat diseases such as diabetes, jaundices, cardiovascular diseases, heavy metal poisoning, congestion of abdominal and pelvic cavities and scarlet fever.¹ It is estimated that out of 250,000 to 500, 000 species of plants only 1 to 2% of the terrestrial plants have been reasonably well investigated. Although today the synthetic drugs are larger in their number than the natural ones but still many synthetic drugs have their origin in the natural source and have been derived from plants and animals.²

Liver, the key organ of metabolism and excretion, is constantly endowed with the task of detoxification of xenobiotics, environmental pollutants and chemotherapeutic agents.³ Therefore, damage to the liver

inflicted by hepatotoxic agents is of grave consequence. As such liver is highly affected primarily by toxic agents such as CCl₄, paracetamol, D-galactosamine, alcohol, rifampicin and thioacetamide through different mechanisms.⁴

The castor oil plant, *Ricinus communis*, is a species of flowering plant in the spurge family, Euphorbiaceae.⁵ Methanolic extract of leaves is supposed to have antimicrobial property.⁶ Water extract of root-bark has showed some analgesic activity in rats.⁷ It also has anti-inflammatory and anti-histaminic properties.⁸ Very Based on the above medicinal properties, the present study has been undertaken to investigate the hepatoprotective activity of aqueous extract of leaves of *Ricinus communis* against CCl₄ induced hepatic damage in rats.

METHODS

Animals selected for the study

Animals: All the animals included in the study were procured from animal house of Mamata Medical College, Khammam. Laboratory breed wistar rats of either sex, weighing 100-200gm were used for the study. The animals were maintained under standard laboratory conditions at 27-29°C. Experimental protocol has been approved by the institutional animal ethics committee.

Drugs used in the study

Carbon tetrachloride manufactured by Molychem and Tab. Liv 52 manufactured by The Himalaya Drug Company were used in the study.

Extraction procedure

The preparation of crude extract of leaves of *Ricinus communis* was done in Department of Pharmacology, Mamata Medical College, Khammam. The powdered leaves were extracted with distilled water by a process of continuous hot percolation process or Soxhlet extraction or Soxhletion or simple maceration.

Experimental design

Wistar rats of both sexes weighing between 100-200gm were used. Food was restricted 18hours prior to the experiment, but free access to water was allowed. The animals were divided into six groups with six rats in each group. All the animals were hydrated orally with 10ml/kg of 0.9% normal saline for 7 days.

First group of six rats were taken as control, and they received 0.9% normal saline 10ml/kg body weight orally. Second group of six rats was taken as CCl₄ control group and treated with normal saline (10 ml/ kg, p.o.) daily for 20 days. CCl₄: olive oil (1:1, 2 ml/ kg, i.p.) 2nd, 5th and 8th day, 30 min after administering of normal saline. The third group of six rats were treated with Liv 52 100 mg/kg orally for 20 days and Carbon tetrachloride diluted with olive oil was given intra-peritoneally (1:1, 2 ml/ kg) on 2nd, 5th and 8th day, 30 mins after the administration of the standard drug.

The fourth and fifth groups were taken as test groups and they received crude extract of *Ricinus communis* obtained in liquid form along with normal saline orally once daily for 20 days at the dosage of 250 and 500mg/kg respectively. Carbon tetrachloride diluted with olive oil was given intra-peritoneally (1:1, 2 ml/ kg) on 2nd, 5th and 8th day, 30 mins after the administration of the test drug.

Estimation of biochemical parameters

On the 21st day, all animals were anesthetized with mild ether and blood samples were collected by cardiac

puncture method. The blood samples were collected separately from ventricle into sterilized dry centrifuge a tube which was heparinised. The clear serum was separated at 2000 rpm for 15 min and biochemical investigations were carried out to assess liver function Biochemical parameters like serum Aspartate aminotransferase (AST) and Alanine transaminase (ALT) were assayed by standard methods.

Statistical analysis

Analysis of the data was done using one way ANOVA and Turkey test. P values of less than 0.05 were considered significant.

RESULTS

Aspartate aminotransferase (AST) levels

The AST levels in blood sample of control group were 112 ± 29.02. The AST levels in blood sample of Standard group treated with CCl₄ were 266.7 ± 25.68. The AST levels in blood sample treated with Liv 52 before CCl₄ administration were 144.5 ± 12.92. The AST levels in blood sample of Group-IV were 179 ± 21.59. The AST levels in blood sample of Group-V were 161.7 ± 11.92. There was decrease in AST levels of animals treated with Liv-52, 250 mg, and 500mg of test drug as shown in Table 1 and Figure 1 which is significant when compared to standard. There is significant decrease in AST levels with 500 mg of test drug as shown in Table 1 and Figure 1 which is comparable to decrease in AST levels with Liv-52.

Table 1: Effect of aqueous extract of *Ricinus communis* leaves on aspartate aminotransferase (AST) level in rats with CCl₄ induced hepatotoxicity.

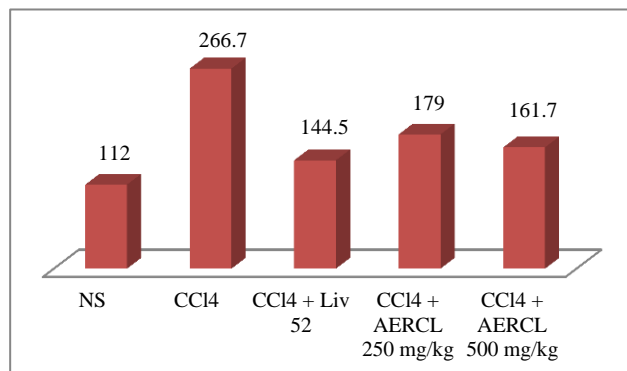
Groups (n=6)	Treatment	AST levels
Group-I (control)	NS 10ml/kg	112 ± 29.02
Group-II (standard)	CCl ₄ 1mg/kg	266.7 ± 25.68
Group-III	CCl ₄ 1mg/kg + Liv 52 100 mg/kg	144.5 ± 12.92
Group-IV (test-I)	CCl ₄ 1mg/kg + AERCL 250 mg/kg	179 ± 21.59*
Group-V (test-II)	CCl ₄ 1mg/kg + AERCL 500 mg/kg	161.7 ± 11.92*

AERCL = Aqueous extract of *Ricinus communis* Leaves, CCl₄ = Carbon tetrachloride All the values are represented as Mean ± SEM. *P<0.001

Alanine transaminase (ALT) levels

The ALT levels in blood sample of control group were 27.17 ± 2.949. The ALT levels in blood sample of Standard group treated with CCl₄ were 86.67 ± 4.47. The ALT levels in blood sample treated with Liv 52 before CCl₄ administration were 30.67 ± 3.565. The ALT

levels in blood sample of Group-IV were 45 ± 3.992 . The ALT levels in blood sample of Group-V were 42 ± 2.828 . There was decrease in ALT levels of animals treated with Liv-52, 250 mg and 500mg as shown in Table 2 and Figure 2 which is significant when compared to standard. There is significant decrease in ALT levels with 400 mg of test drug as shown in Table 2 and Figure 2 which is comparable to decrease in ALT levels with Liv-52.



NS - Normal saline, CCl4 - Carbon tetrachloride, AERCL - Aqueous extract of Ricinus Communis Leaves. For all observations n = 6

Figure 1: The dose dependent effect of test drug on AST levels in rats.

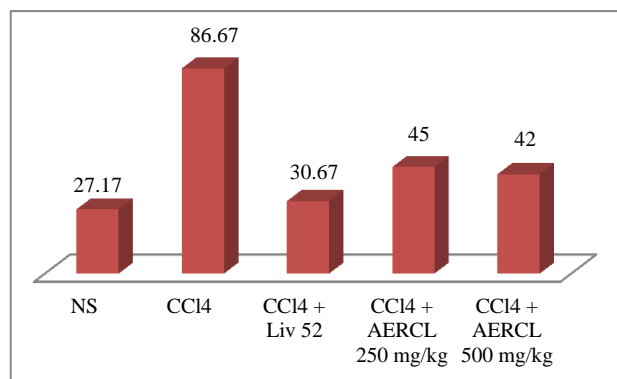
Table 2: Effect of aqueous extract of Ricinus communis leaves on alanine transaminase (ALT) level in wistar rats with CCl4 induced hepatotoxicity.

Groups (n=6)	Treatment	AST levels
Group-I (control)	NS 10ml/kg	27.17 ± 2.949
Group-II (standard)	CCl4 1mg/kg	86.67 ± 4.47
Group-III	CCl4 1mg/kg + Liv 52 100 mg/kg	30.67 ± 3.565
Group-IV (test-I)	CCl4 1mg/kg + AERCL 250mg/kg	45 ± 3.992
Group-V (test-II)	CCl4 1mg/kg + AERCL 500mg/kg	42 ± 2.828

AERCL = Aqueous extract of Ricinus communis Leaves, CCl4 = Carbon tetrachloride. All the values are represented as Mean ± SEM. *P<0.001

DISCUSSION

One of the most commonly used chemical agents for liver damage in hepatoprotective study is CCl4.⁹ The extent of hepatic damage was assessed by the elevated levels of serum marker enzyme AST and ALT which was significantly lowered by the extract administration of *Ricinus communis* in the tested groups of rats showing its hepatoprotective potential. It has been shown that administration of CCl4 lowers the total protein levels and it is presumed that after treatment with *Ricinus communis* extract the protein levels may be significantly elevated indicating its protective role against liver cell damage.¹⁰



NS - Normal saline, CCl4 - Carbon tetrachloride, AERCL - Aqueous extract of Ricinus Communis Leaves. For all observations n = 6

Figure 2: The dose dependent effect of test drug on ALT levels in rats.

In hepatoprotective study, these phytoconstituents play a vital role in inducing microsomal enzymes, thereby accelerating the excretion of CCl4, or inhibiting the lipid peroxidation induced by CCl4.¹¹

It has been reported that fractionation of aqueous extract of *Ricinus communis* leaves and subsequent chromatographic fractionation and testing in the galactosamine model lead to isolation of two active fractions which in turn yielded two-pure compounds:¹² ricinine, N-Demethyl-ricinine. N-Demethyl-ricinine was found to be more active and it reversed the biochemical changes produced by galactosamine induced hepatotoxicity.

As our study also provides a proof of hepatoprotective effect of *Ricinus communis* leaf extract, it is presumed that the mechanism of action and phytochemical substance are the same has reported.¹²

CONCLUSION

It is observed that there was significant decrease in 2 parameters (AST, ALT) at 250 and 500 mg/kg dose of *Ricinus communis* leaf extract. The present study has demonstrated that the aqueous extract of *Ricinus communis* has hepatoprotective effect against CCl4 - induced hepatotoxicity in rats. Thus, this result suggests that the ricinine, N-Demethyl-ricinine present in *Ricinus communis* aqueous extract might efficiently increase the regenerative and reparative capacity of the liver. Although *Ricinus communis* aqueous extract has comparable hepatoprotective effect with Liv-52 in our study, clarification of the hepatoprotective mechanism and the active components of the *Ricinus communis* extract need further investigation.¹³

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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