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Hepatoprotective Activity of *Coccinia grandis* (Linn.) Fruit Extracts on Carbontetrachloride Induced Liver Damage in Rats

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In hepatotoxic rats, liver damage was studied by assessing functional parameters like pentobarbitone sleeping time and biochemical parameter like serum alanine transaminase, aspirate transiminase, serum alkaline phosphate, serum acid phosphate, serum bilirubin, serum cholesterol and serum triglycerides. Methyl alcohol extract and aqueous extract of *Coccinia Grandis* inhibited CCl_4 induced liver toxicity in albino rats as assessed by the functional values and biochemical values, which show the significant hepatoprotective activity.

Key Words: Hepatoprotective activity, *Coccinia grandis*, Rats.

INTRODUCTION

Liver, the largest organ in vertebrate body, is the major site of intense metabolic activities. Liver injury caused by toxic chemicals and cetain drugs has been recognized as a toxicological problem. Herbal drugs are playing an important role in health care programs worldwide and there is a resurgence of interest in herbal medicines for treatment of various ailments including hepatopathy. India, the abode of Ayurvedic system of medicine, is the home of many plants. Hepatoprotective effect of some plants like *Andrographis paniculata*[1], *Acanthus ilicifolius*[2], *Cassia foro*[3], *Picorhiza huroa*[4], etc., has been well established.

Coccinia grandis (Linn.) of family Cucurbitaceae is being used by local folks for treating jaundice and other liver ailments since early days[5,6] and is also used as aphrodisiac, astringent, antipyretic, expectorant and for treating vomiting, leprosy, skin diseases[7], etc. The fruits and leaves are used in treatment of snake bite[8].

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EXPERIMENTAL

Fruits of *Coccinia grandis* were collected from the surrounding fields of Harapanahalli, Devanagere district of Karnataka, India. The plant was previously identified and authenticated by Dr. K. Krupanidhi, Head Department of Botany, T.M.A.E. Science College, Harapanahalli. The fruits were cut into pieces an shade dried. The dried fruits were subjected to size reduction using hammer mill to a coarse powder. The powder obtained was successively extracted in petroleum ether, chloroform, methanol and water. The extracts were concentrated. Fruit of *Coccinia grandis* yielded 1.4, 0.6, 3.1 and 3.7 (w/w) powdered extract with petroleum ether, chloroform, methanol and water respectively. Powders were stored in a desiccator for further use.

Forty-two male albino rats (weighing 150–200 g) were purchased from M/s. Venkateshwara Enterprises, Bangalore. They were housed under standard conditions for one week to get acclimatized with the laboratory environment and maintained on commercial pelleted feed (M/s. Lipton India Ltd., Bangalore) and water *ad libitum*. Initial body weight of each animal was recorded. Ethical clearance for the use of animals was obtained from the committee constituted for the purpose.

Acute toxicity[9]: The toxicity of petroleum ether, chloroform, methanol and aqueous extracts of *Coccinia grandis* were determined in albino rats of either sex, up and down or staircase method was adopted.

Experimental Design 10[5]: Rats were divided into seven groups consisting of six rats each. Group-I was normal control without any treatment. All other groups had received carbon tetrachloride (1 mL/kg p.o.) with equal volume of liquid paraffin for two successive days. Group-II animals were maintained as toxic control (CCl_4) without any pretreatment with the drug. Group-III, a standard control and the animals were treated with silymarin (100 mg/kg p.o.). Groups IV, V, VI and VII were the experimental group animals and these groups were pretreated with petroleum ether, chloroform, methanol and aqueous extracts, respectively. The drug treatment was carried out orally from 1st day to 9th with concurrent administration of carbon tetrachloride on 7th and 9th day. After 9th day, animals were sacrificed by decapitation. The blood was collected and serum obtained after centrifugation (3000 rpm for 15 min) was used for various biochemical estimations.

Pentobarbitone induced sleeping time: All the groups were treated individually with pentobarbitone sodium (35 mg/kg body weight IP) and the duration of sleep time between loss of righting reflex and regaining it of each rat was recorded. The animal exhibiting a sleeping time of 40–50 min was selected[11]. The sleep time of animals of Group I to VII was measured on 1st and 9th day.

Biochemical estimations: Serum was separated from the blood and subjected to various biochemical parameters like aspartate aminotransferase (AST)[11], alanine aminotransferase (ACT)[12], alkaline phosphatase (ALP)[13], acid phosphotase (ACP)[14], serum bilirubin[15], cholesterol[16] and triglycerides[17] were estimated.

Statistical analysis: Values are expressed as Mean ± SEM, ANOVA followed by the Students 't' test.

RESULTS AND DISCUSSION

The sleeping time in the chloroform treated animals was observed as high when pentobarbitone sodium, a sedative drug was administered, whereas a significant decrease in the sleeping time was observed in the animals of sylimarin, methanol and aqueous extract treated groups (Table-1). All the maker enzymes, *viz.*, AST, ACT, ALP and ACP registered high values in chloroform treated group, but were found normal in the groups treated with methanolic and aqueous extracts (Table-2).

TABLE-1
EFFECT OF *COCCINIA GRANDIS* FRUIT EXTRACT ON PENTOBARBITONE INDUCES SLEEP TIME IN CHLOROFORM INDUCED HEPATOTOXICITY IN RATS

Group	Treatment	Sleeping time in min (Mean ± SEM)
A	Control	44.83 ± 1.10
B	Chloroform	106.50 ± 6.10
C	Silymarin + Chloroform	64.66 ± 2.76
D	Petroleum ether extract + Chloroform	93.16 ± 4.49
E	Chloroform extract + Chloroform	91.16 ± 4.49
F	Methanol extract + Chloroform	62.66 ± 2.76
G	Aqueous extract + Chloroform	69.83 ± 1.93

TABLE-2
EFFECT OF FRUIT EXTRACT OF *COCCINIA GRANDIS* ON CHLOROFORM INDUCED HEPATOTOXICITY

Group	Biochemical parameters (Mean ± SEM)			
	ASTΦ U/L	ALTΦ U/L	ALPΦ U/L	ACPΦ U/L
A	38.16 ± 0.77	82.16 ± 2.96	117.68 ± 2.75	30.91 ± 1.74
B	327.10 ± 10.91	592.25 ± 8.84	288.0 ± 5.94	73.83 ± 2.00
C	71.93 ± 1.38***	121.12 ± 5.99***	142.05 ± 3.05***	34.66 ± 1.64***
D	309.88 ± 5.13	558.40 ± 15.24	276.1 ± 5.50	68.20 ± 2.57
E	307.68 ± 10.06	599.48 ± 5.34	272.27 ± 4.06	70.96 ± 2.37
F	80.58 ± 2.58***	160.98 ± 6.16***	171.22 ± 3.23***	54.56 ± 1.91***
G	95.40 ± 1.96***	174.52 ± 6.09***	181.97 ± 5.30***	58.01 ± 1.77***

Significant reduction compared to CCl_4 treated group at $P < 0.05$*, 0.01** and 0.001***.

AST—Asparate aminotransferase
ALT—Alanine aminotransferase
A—Normal control
B—Chloroform
C—Chloroform + Silymarin
D—Chloroform + Petroleum ether extract
ALP—Alkaline phosphatase
ACp—Acid phosphatase
E—Chloroform + Chloroform extract
F—Chloroform + Methanol extract
G—Chloroform + Aqueous extracts
Φ—Serum enzymes levels after 9th day

The levels of direct bilirubin, total bilirubin, cholesterol and triglycerides in chloroform treated group were reduced by pre-treating the animals with methanol and aqueous extracts (Table-3).

TABLE-3
EFFECT OF FRUIT EXTRACT OF *COCCINIA GRANDIS* ON CHLOROFORM INDUCED HEPATOTOXICITY

Group	Biochemical parameters Mean ± SEM			
	Direct bilirubin U/L	Total bilirubin U/L	Cholesterol U/L	Triglycerides U/L
A	0.19 ± 0.02	1.18 ± 0.02	157.67 ± 1.05	111.03 ± 6.33
B	1.83 ± 0.02	3.31 ± 0.01	272.33 ± 1.94	204.53 ± 3.09
C	0.24 ± 0.00***	1.37 ± 0.01***	182.00 ± 2.97***	141.57 ± 1.63***
D	1.71 ± 0.03	3.13 ± 0.03	265.50 ± 3.24	198.12 ± 3.71
E	1.71 ± 0.03	3.16 ± 0.02	267.33 ± 1.49	194.70 ± 2.02
F	0.80 ± 0.04***	1.59 ± 0.04***	195.67 ± 1.22***	162.77 ± 2.40***
G	0.94 ± 0.02	1.79 ± 0.06***	200.17 ± 130***	178.62 ± 2.53

Significant reduction compared to CCl_4 treated group at $P < 0.05$*, 0.01** and 0.001***.

Management of liver disorders is still a challenge to the moderate medicine. Lack of reliable allopathic liver protective drugs, herbal drugs is only alternative for the effective and safe therapy in hepatic ailments.

The purpose of this study is to explore whether the *Coccinia grandis* extracts could prevent the hepatic damage caused by chloroform induced toxicity. The hepatotoxin used is well recognized and very extensively employed for induction of experimental hepatitis. It is well established that toxic metabolites of CCl_4, free radicals CCl_3 and O_2CCl_3 are responsible for damage to liver cells. The elevated enzymes leak out in circulation denotes damage to hepatic cells.

The present study shows that all chloroform exposed rats displayed liver as shown by their elevated sleeping time and elevated levels of AST, ALT, ALP, ACP, direct bilirubin, total bilirubin, cholesterol, triglycerides. The methanolic and aqueous extracts of *Coccinia grandis* caused a significant decrease in elevated enzyme levels.

REFERENCES

1. S.S. Handa and A. Sharma, *Indian J. Med. Res.*, **92**, 276 (1990).
2. H.B. Babu, S.B. Shylesh and J. Padihhala, *Fitoterapia*, **72**, 272 (2001).
3. K. Upadhyay, K.V. Disit and A.Z. Bhatt, *Indian J. Natural Product*, **16**, 27 (2000).
4. R. Anandan and T. Devahi, *Fitoterapia*, **70**, 54 (1999).
5. G.P. Kumar, S. Sudheesh and N.R. Vijayalakshmi, *Planta Medica*, **59**, 330 (1993).
6. S. Venkateswaran and L. Pari, *J. Ethnopharmacol.*, **84**, 163 (2003).
7. P.K. Warrier, V.P.K. Nambiar and C. Ramanshetty, Indian Medicinal Plants, Vol. 2, Orient Longmann Ltd., Channai, pp. 133–137 (1994).
8. K.R. Kirtihar and B.D. Basu, Indian Medicinal Plants, Vol. 2, Lalit Mohan Basu, M.B., Dehradun, pp. 1151–1154 (1998).
9. M.N. Ghosh, Fundamentals of Experimental Pharmacology, 2nd Edn., Scientific Book Agency, Kolkata, pp. 153–158 (1984).

10. M. Nadeem, *Indian drugs*, **33**, 390 (1996).
11. D.W. Bradley, *Clin. Chem.*, **18**, 19 (1972).
12. R. Rej, C.F. Fasce and R. Venderlinde, *Clin. Chem.*, **19**, 92 (1973).
13. J.H. Wilkinson, J.H. Bautwell and S.Winsten, *Clin. Chem.*, **15**, 487 (1969).
14. L.A. Kaplan and D.C.Hohnadel, *Clin. Chem.*, **29**, 1463 (1983).
15. P.C. Pearlman and R.T. Lee, *Clin. Chem.*, **20**, 447 (1974).
16. P. Roeschlan, E. Bernt and W.A. Giruber, *Clin. Chem.*, **20**, 226 (1974).
17. M.W. McGowan, *Clin. Chem.*, **29**, 538 (1983).
18. T. Susan and A. Saraswathy, *Clin. Chem.*, **38**, 143 (2000).
19. Z.H. Huang, T. Murakami, A. Okochi, R. Yomoyo, J. Nagai and M. Takano, *J. Pharm. Pharmacol.*, **53**, 873 (2001).
20. D.K. Curtis, in: Goodman and Gill, Nonmetallic Environmental Toxicants, McGraw-Hill, New York, Ch. 68, pp. 1877–1902 (2001).
21. W.C. Maddrey, *J. Chin. Gastroenterol*, **39** (2005) (in press).

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