Research Article

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HEPATOPROTECTIVE EFFECT OF *OLDENLANDIA UMBELLATA* LINN. ROOT

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Abstract

Ethanolic extract of *Oldenlandia umbellata* Linn. (rubiaceae) root was screened for its effect on carbon tetrachloride induced hepatotoxicity in rats. The result showed significant reduction ($p<0.01$) in various biochemical parameters (SGOT, SGPT, ALKP, TBIL and lipid peroxidation) which is supported by histopathological findings. Phytochemical analysis showed the presence of anthraquinone glycosides, flavonoids, phytosterols, saponins, tannins and phenolic compounds. The hepatoprotective activity may be due to the presence of flavonoids.

Keywords: *Oldenlandia umbellata* roots, Hepatoprotective activity.

Introduction

Oldenlandia umbellata linn. commonly known as Indian madder and Chay root is a small, stiff, highly branched, biennial or perennial herb with tuberous roots, distributed in India (from Assam to Travancore), Ceylon, Burma, Pakistan (Sind) and some parts of Africa, in dry sandy grassy places [1]. The leaves are reported to act as febrifuge, expectorant and also used in consumptive, asthmatic affections [2, 3]. Information of ethno-botanical survey has revealed the use of root in the treatment of fever, rheumatism and jaundice by the local communities in some parts of Ethiopia. Since there is a lack of scientific validation for hepatoprotective activity of the roots this project has been undertaken to explore this property by treating carbon tetrachloride induced hepatotoxicity in albino rats.

Materials and methods

Plant material

Fresh plants were collected from the University of Gondar (Ethiopia) campus in July and authenticated after conducting morphological and microscopical analysis. A voucher specimen was stored in the pharmacognosy department of the university, for reference. The roots were washed, dried in shade and powdered to 40 mesh size.

Preparation of the extract

Powdered material was soxhleted with 90% v/v ethanol for 72 hours. It was concentrated under vacuum.

Preliminary phytochemical analysis

The extract was subjected to qualitative chemical tests [4] and chromatographic (TLC) studies[5] to detect the phytoconstituents.

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Animals used

Wistar strain adult albino rats of either sex weighing 150-180 gm were procured and acclimatized to the laboratory conditions (temperature: 23 ± 2^0, relative humidity 55 ± 10% and 12 hour light and dark cycle). They were fed standard diet pellets and given tap water.

Acute toxicity studies

Albino rats of either sex weighing 150-180 gm were divided into isolated groups of six in each lot. After an overnight fast, 5% w/v suspension of the extract with acacia mucilage were administered to the isolated groups in graded doses of 0.2 to 04 g/ kg b.w.p.o. under continuous observation for the first two hours to observe any toxic symptoms and later up to 24 hours to record mortality [6].

Hepatoprotective activity

The rats were divided into four groups of six each. The first group (control group) was administered with the vehicle (5% w/v acacia mucilage at a dose of 1 ml / kg body weight) orally. Single oral dose of hepatotoxin (CCl_4 as a 1:1 solution in olive oil at a dose of 2.5 ml / kg body weight) was given to the second group animals. The effective dose of the extract was determined by conducting acute toxicity studies and fixed at 400 mg / Kg body weight. The test group animals (group-III) received the first dose of test suspension 30 minutes before the administration of a single oral dose of hepatotoxin. Two subsequent doses of test suspension were administered at 12 hours of interval. Three doses of standard drug silymarin (Microlabs Ltd., Bangalore) at 100 mg / kg were administered to the animals of group-IV orally at 12 hours of interval. First dose of silymarin was administered 30 minutes before the administration of CCl_4. After 12 hours of administration of last dose, blood was collected from all animals by puncturing the retro-orbital plexus and allowed to coagulate at 37^0C for 30 minutes[7]. The serum separated by centrifugation at 2500 rpm was analyzed for serum glutamic oxaloacetate transaminase (SGOT)[8], serum glutamic pyruvate transaminase (SGPT)[8], serum alkaline phosphatase (ALKP) [9] and total bilirubin[10]. After sacrificing the rats the liver homogenate was prepared to determine the extent of lipid peroxidation[11]. For histopathological studies liver lobes were fixed for 48 hours in 10% formalin and were embedded in paraffin. Subsequently, 5µ sections were cut on a microtome and stained with haematoxylin and eosin. These sections were observed under light microscope for histopathological changes and compared with normal liver histology. The animal experiments were conducted following the guidelines of animal experimentation and ethics.

Statistical Analysis[12]

Results of estimation of biochemical and functional parameters have been reported as mean value ± standard deviation (S.D.). Percentage of reduction in biochemical parameters was calculated by considering the differences in biochemical parameters between the hepatotoxin treated and control group as 100% level of reduction. The variation in a set of data has been estimated by performing one way analysis of variance (ANOVA) and individual comparisons of group mean values were done using Dunnet's test.

Results and discussion

Preliminary phytochemical analysis

Reports of preliminary phytochemical analysis indicated the presence of anthraquinone glycosides, flavonoids, phytosterols, saponins, tannins and phenolic compounds.

Acute toxicity studies

Ethanolic extract of *Oldenlandia umbellata* root was found to be non-toxic since no toxic symptoms and mortality was observed even at the dose of 4g/ kg b.w.p.o. in rats. A dose of 400 mg/ kg, b.w.p.o. was fixed for all the screening experiment.

The rats treated with CCI_4 developed significant ($p<0.01$) liver damage as observed from the elevated serum levels of hepato-specific enzymes as well as severe alteration in other biochemical parameters. A pronounced elevation in the concentration of bilirubin was observed in the CCI_4 intoxicated rats. The level of lipid peroxidation was also increased markedly in the intoxicated rats (table 1).

Treatment with the ethanolic extract of *Oldenlandia umbellata* root and sylimarin decreased the CCl_4 induced SGOT, SGPT, ALP and total bilirubin in blood. The level of lipid peroxidation was also found to decreased in the extract and sylimarin treated rats (table 1). The T.S. of liver sections showed normal parenchymal architecture with cords of hepatocytes, portal tracts and central veins in the control group (Fig.1A).

Centrilobular necrosis accompanied by fatty changes and ballooning degeneration were seen in the liver of the rats treated with carbon tetrachloride (Fig.1B). The toxin mediated changes in liver of test group (group-III) were of much less intensity than those observed in the livers of the group-II animals, showing regeneration of hepatocytes (Fig.1C) which is comparable with that of the livers of silymarin treated group (Fig.1D). These findings from the histopathological studies too provided supportive evidence for the biochemical analysis.

Results showed hepatoprotective effect against CCl_4 induced liver damage in rats which is comparable with the standard drug silymarin.

Table No. 01: Effect of silymarin and ethanolic extract of *Oldenlandia umbellata* roots on rat liver biochemical parameters in CCl_4 induced hepato toxicity

Groups	Biochemical parameters, mean ï S. D.				
	SGOT (Units / ml)	SGPT (Units / ml)	ALKP (Units / l)	Total Bilirubin (Mg/dl)	Lipid Peroxidation Values (Millimoles/gms)
Group- I	85.1 ± 6.97	57.3 ± 5.76	75 ± 8.35	0.19 ± 0.02	54.98 ± 6.48
Group- II	308 ± 14.25	329 ± 19.01	332.1 ± 12.64	1.63 ± 0.15	132.77 ± 11.46
Group- III	152.1 ± 15.23* (69.56)	114.2 ± 12.01* (78.75)	157.8 ± 7.94* (67.69)	0.53± 0.05* (75.00)	69.27 ± 7.02* (81.53)
Group- IV	93.3 ± 8.26* (95.67)	68.9 ± 6.14* (96.26)	118.4 ± 9.67* (83.00)	0.29 ± 0.02* (93.05)	58.03 ± 4.32* (97.86)

Results are expressed as mean ± S.D., n = 6, one way ANOVA followed by Dunnet's t-test.
*P< 0.01 compared with CCl_4 treated group. Value in parenthesis indicates percentage of reduction

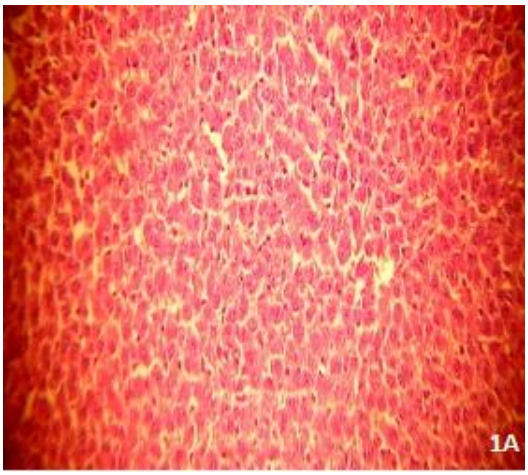

Fig. No. 01-A: Photomicrographs of liver T.S. of control group; 100X magnification.

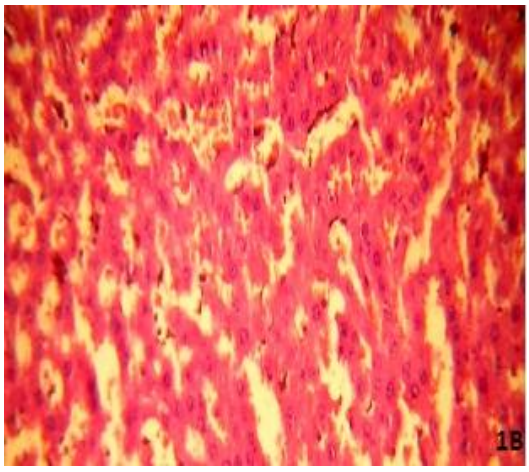

Fig. No. 01-B: Photomicrographs of liver T.S. of CCl_4 treated rats; 100X magnification.

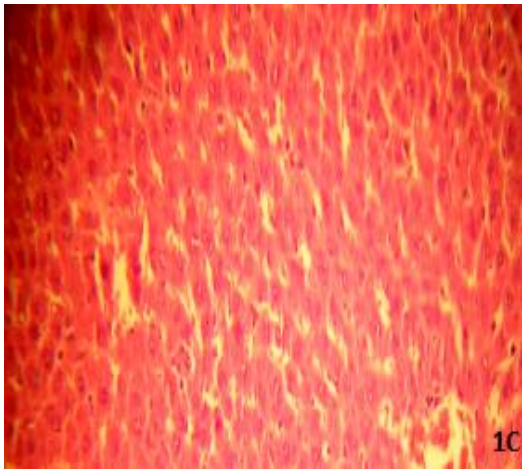

Fig. No. 01-C: Photomicrographs of liver T.S. of ethanolic extract of *Oldenlandia umbellata* roots and CCl_4 treated rats.

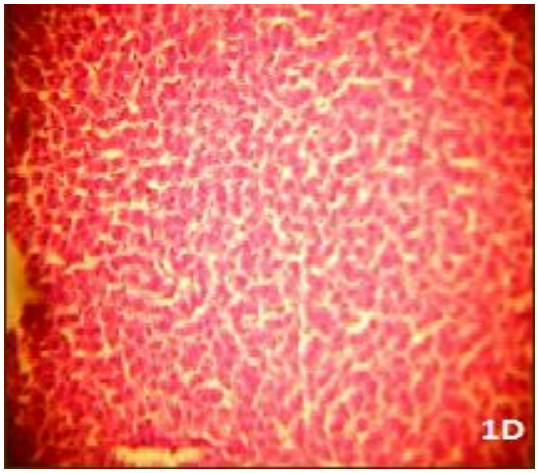

Fig. No. 01-D: Photomicrographs of liver T.S. of silymarin and CCl_4 treated rats; 100X magnification.

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