

Graafian follicle of >10 mm diameter followed by ovulation and formation of functional corpus luteum establishing pregnancy.

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Effect of Extracts of *Crataeva religiosa* on Hepatic Markers in Liver Intoxication

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Abstract

The study was conducted to evaluate the hepatoprotective potentials of extracts of *Crataeva religiosa* in liver damaged rats and also to compare the efficacy of two extracts viz., aqueous and ethanolic extracts. Thirty six female Wistar rats used for the study were intoxicated on the first day of the study with an oral acute toxic dose of paracetamol at the rate of 3 g/kg b.w. Treatments were given from day 2

to day 8, with standard drug (silymarin at 100 mg/kg b.w.), test drug 1 at two doses (aqueous extract of *C. religiosa* at 200 and 400 mg/kg b.w.) and test drug 2 at two doses (ethanolic extract of *C. religiosa* at 200 and 400 mg/kg b.w.) respectively. Hepatic microsomal assays viz., lactate dehydrogenase (LDH) and gamma glutamyl transpeptidase (GGT) were carried out to test the efficacy of drugs. It was found that both the standard and test drugs were significant in restoring the elevated enzyme levels. It was further noticed that the ethanolic extract at 400

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mg/kg b.w. had excelled as good as the standard drug, silymarin in restoring the elevated blood parameters.

Key words: *Crataeva religiosa*, paracetamol, LDH and GGT.

Liver, the key organ of metabolism and excretion is highly vulnerable to disorders. A reliable hepatoprotective drug was yet to be explored in modern medicine. Meanwhile, potent indigenous hepatoprotective herbal medicines are available, but most of them have not yet been validated scientifically. Hence, an attempt was made to evaluate the hepatoprotective potential of the common medicinal herb *Crataeva religiosa*.

Materials and Methods

Dried stem bark of the plant *C. religiosa* was obtained and ground to a fine powder. Aqueous and ethanolic extracts of the plant material was prepared by maceration method. Qualitative analysis of the extract was carried out to estimate the phytochemicals. The animal experiments were carried out after the approval by Institutional Animal Ethical Committee (IAEC) of Madras Veterinary College, Chennai-7 (Approval Lr. No. 1831/DFBS/E/IAEC/2010 dated 24/06/2011). Thirty six female Wistar rats of same age and size were divided into six groups. On the first day of the trial, all the 36 animals were given paracetamol orally with selected acute toxic dose of 3 g/kg b.w. Then from 2nd day to 8th day treatments were given to the

animals daily viz., Group I (water p.o.), Group II (Silymarin 100 mg/kg b.w. p.o.), Group III & IV (200 & 400 mg/kg b.w. of aqueous extract of *C. religiosa* p.o.), Group V & VI (200 & 400 mg/kg b.w. of ethanolic extract of *C. religiosa* p.o.).

Before starting the trials, representative animals from each group were taken and blood was collected from these animals by retro-orbital puncture and normal levels of LDH and GGT were estimated. On the 9th day, the animals were fasted overnight and anaesthetized. Blood samples were collected by intra-cardiac aspiration for the estimation of LDH and GGT. Results were analyzed by complete randomized design using SPSS software (version 20) and comparison of the means was done by using Duncan's Post-Hoc test (multiple comparison tests). The results were expressed as mean $\pm$ S.E.

Results and Discussion

Qualitative analysis of both aqueous and ethanolic extracts showed the presence of phytochemicals viz., flavonoids, saponins, terpenoids and quinones. The effect of extracts of *C. religiosa* on hepatic markers LDH and GGT are given in the Table I.

Treatment with standard drug silymarin resulted in significant restoration of LDH and GGT levels when compared to paracetamol group. Groups treated with aqueous extract of *C. religiosa* at the dose rate of 200 and 400 mg/kg b.w. showed a dose dependent decrease in the levels of LDH and GGT. Similarly, groups

Table I. Effects of aqueous and ethanolic extracts of *Crataeva religiosa* on hepatic markers LDH and GGT in paracetamol induced hepatotoxicity in rats (n=6).

Groups	LDH (IU/L)	GGT (IU/L)
Control (Blood parameters before Starting trial)	543.05 ^a $\pm$ 14.67	1.35 ^a $\pm$ 0.12
Paracetamol control	1,006.50 ^c $\pm$ 29.006	5.33 ^d $\pm$ 0.55
Silymarin	687.50 ^b $\pm$ 23.29	2.00 ^{ab} $\pm$ 0.36
Aq <i>C. rel</i> 200	1,005.50 ^c $\pm$ 16.24	3.33 ^c $\pm$ 0.21
Aq <i>C. rel</i> 400	922.50 ^c $\pm$ 23.64	2.50 ^{abc} $\pm$ 0.61
Eth <i>C. rel</i> 200	926.50 ^c $\pm$ 23.34	2.83 ^{bc} $\pm$ 0.30
Eth <i>C. rel</i> 400	640.83 ^b $\pm$ 51.72	1.83 ^{ab} $\pm$ 0.30

All values are Mean $\pm$ S.E of 6 animals

Means bearing different superscripts in a column differ significantly between groups

treated with ethanolic extract of *C. religiosa* at the dose rate of 200 and 400 mg/kg b.w. also showed a dose dependent decrease in the levels of LDH and GGT. It was noticed that ethanolic extract of *C. religiosa* at the dose rate of 400 mg/kg b.w. exhibited a highly significant ($P < 0.01$) decrease in the levels of these hepatic markers when compared to paracetamol group. Its effect was as good as that of the standard drug, silymarin.

LDH is an intracellular enzyme which catalyses the conversion of lactate to pyruvate using NAD⁺ as coenzyme of NAD (Burtis and Ashwood, 1986). LDH is increased in acute necrosis of the liver and is a sensitive intracellular enzyme which increases in serum indicating liver damage (Kim *et al.*, 2001). GGT is a microsomal enzyme, which is widely distributed in tissues including liver. Its activity is elevated in all forms of liver diseases (Chander *et al.*, 1994). GGT rises earlier than all other enzymes and persists longer.

In the present study, it was found that the group treated with paracetamol resulted in increase in LDH and GGT levels when compared to the control group. This indicated that paracetamol treatment might have caused ischemic necrotic injury in the liver leading to rise in their levels. Silymarin treatment reduced

the elevated levels of LDH and GGT and this may be mainly due to the anti inflammatory and membrane stabilizing effects of flavanoids and flavonolignans content in silymarin which causes hepatic membrane stabilization.

In the present study, the groups treated with both aqueous and ethanolic extracts of *C. religiosa* showed a dose dependent decrease in the levels of LDH and GGT. This restoring effect of the extracts indicate that the phytochemicals present in both the extracts such as flavonoids, saponins and terpenoids might have acted in a coherent manner to neutralize the toxicity of paracetamol and also they may have exhibited a stabilizing effect on the plasma membranes of hepatocytes to restore the levels of serum enzymes.

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Cost and Return Traits of Milk Production in Indigenous and Crossbred Cows of Assam*

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Abstract

The present study was conducted to study different cost and return traits of milk production in indigenous and crossbred cows of Assam. The ROFC, the feed cost efficiency, ROVC, FC:VC,

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break-even output, per cent of break-even output to total output, input-output ratio were recorded as Rs. 18,979.35, 53.74%, Rs. 12,880.68, 1:7.01, 929.36 litres, 62.04, 1: 1.15 in crossbred cows and Rs. 6,270.80, 129.82%, Rs. 2,883.30, 1:4.91, 262.34 litres, 93.44, 1: 1.12 in indigenous cows.

Key words: Cost and return, milk production,