

**AMELIORATION OF CCl₄-INDUCED HEPATOSUPPRESSION BY
NYCTANTHES ARBORTRISTIS LINN LEAVES IN WISTAR ALBINO RATS.**

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Summary

The present study deals with the amelioration by *Nyctanthes arbortristis* Linn. leaves extract against hepatosuppression induced by carbon tetrachloride (CCl₄), which was evaluated in terms of serum marker enzymes like viz. GOT, GPT, Alkaline phosphate, glucose, cholesterol, and total protein concentration in blood. These biochemical parameters were significantly ($P < 0.001$) altered by the single dose of CCl₄ (1.0 ml/kg) pretreatment with *Nyctanthes arbortristis* Linn. Prior to the administration of CCl₄, at the doses of 1000mg/kg.b.wt./day, P.O. for 7 days, significantly restored all the serum and liver parameters near to the normal levels, respectively. However, silymarin was used as a reference standard, prior to the administration of CCl₄ to rats. These findings indicate the hepatoprotective potential of *Nyctanthes arbortristis* Linn. against hepatosuppression possibly involve mechanism related to its ability to block the P-450 mediated CCl₄ bioactivation through selective inhibitors of ROS (reactive oxygen species) like antioxidants brought about significant inhibition of TBARS suggesting possible involvement of O₂⁻, HO₂, HO₂⁻, H₂O₂ and OH. . Thus *Nyctanthes arbortristis* Linn. showing protection in liver may prove promising as a rich source of antioxidants because its use is cost effective, especially for peoples in adverse and hazardous circumstances, who are living in poverty.

Key words : *Nyctanthes arbortristis* Linn, CCl₄, marker enzymes, hepatoprotection.

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Introduction

Nyctanthes Arbor -Tristis Linn widely found throughout India is known in Indian traditional medicine to possess immunotoxic [1], antiallergic [2], antihistaminic and purgative [3], antibacterial and cytotoxicity [4], antipyretic and ulcerogenic [5] and anti -Inflammatory [6] activity. Despite extensive research in medical field, no drug in the modern system of medicine can be claimed to cure liver disorders, which in many cases becomes fatal. Although plant extracts of *Picrorrhiza kurroa*, *Andrographis paniculata*, *Eclipta Alba*, [7] and *B.Valgaris* [8] have been reported to possess clinically useful hepatoprotective activity, many plants remain unexplored. At present, one of the plant-

derived medicines approved for use in liver cirrhosis and alcoholic liver diseases is silymarin. There are number of studies which conclude the efficacy of silymarin in these conditions [9]. Silymarin is a mixture of flavonolignans from the fruits of *Silybum marianum* that has been known since ancient time and recommended in traditional European and Asian medicine mainly for the treatment of liver disorder [10]. Therefore in the present study silymarin was used as positive control to compare the efficacy of *Nyctanthes Arbor –Tristis Linn* against CCl₄-induced hepatotoxicity.

Materials and Methods

Plant

Nyctanthes Arbor –Tristis Linn leaves were collected from the fields in and around Ahmednagar (District), Maharashtra, India and authenticated by the Botanical Survey of India, Pune. A voucher specimen is deposited in the Department of Organic Chemistry in Sangamner College, Sangamner.

Extraction

Leaves dried at 40⁰C and pulverized were extracted with 70% ethanol at room temperature for 72h and dried at 60⁰C to give a yellow colored residue. A portion of the residue was dissolved in distilled water, filtered and dried to determine the amount of the water-soluble fraction in the residue. Prior to the experiment residue was dissolved in a saline/Cremophor (0.025% v/v) solution and diluted to desired concentration to give a water soluble fraction (AFSC).

Animals

Wistar rats of either sex, weighing 150–250 g, were used. Animals were housed under controlled conditions of temperature (25±2⁰C) and photoperiod 12-h light/dark and fed with standard rodent pellet diet with tap water.

Induction of hepatic injury

Hepatic injury was induced in rats by subcutaneous administration of a single dose of 1.0 ml/kg CCl₄ mixed with 0.5ml liq. Paraffin on the 7th day, 2 h after the last treatment [11].

Experimental protocol

Animals were grouped as follows:

Normal Control group: Treated with vehicle (1.0ml,liq.paraffin i.p.) on first day. Followed by 2ml D/W daily for 7 days.

CCl₄ control group: Treated with 1.0ml/kg CCl₄ in 1.0ml. Liq.paraffin i.p. Followed by 2.0ml D/M water oral dose daily for 7 days.

CCl₄ Recovery group: Treated with 1.0ml/kg CCl₄ in 1.0ml. Liq.paraffin i.p on first day, Followed by 2.0ml D/M water oral dose daily for 7 days.

Silymarin control group: Treated with 1.0ml/kg CCl₄ in 1.0ml. Liq.paraffin i.p. and 0.07g/kg silymarin daily for 7 days.

Plant extract group: Treated with 1.0ml/kg CCl₄ in 1.0ml. Liq.paraffin i.p.and 1.0g/kg plant extract dose daily for 7 days.

On day 9, 48 h after CCl₄ administration, blood sample of each animal was taken from abdominal aorta under pentobarbitone anesthesia (350 mg/kg i.p.) and serum cholesterol [12], GOT, GPT, Bilirubin [11], serum glucose, total protein [12] and alkaline phosphates [13] were evaluated.

Statistical analysis

All values are expressed as means \pm S.D. The results were calculated and subjected to analysis of variance (ANOVA) considered significant [14].

Results

Food consumption and weight gain

We observed that there was significant decrease in body weight of CCl₄ treated group as compared to normal control group. Treatment of rats with silymarin and plant extract showed significant increase in body weight as compared to CCl₄ treated group (Table 1).

Table 1 Effect of *Nyctanthes Arbor-Tristis* Linn ethanolic extract on body weight

Groups	Body weights of rats (g) [#]						
	1 st Day	2 nd Day	3 rd Day	4 th Day	5 th Day	6 th day	7 th Day
Normal control	160.9 \pm 3.2	161.33 \pm 3.3	161.5 \pm 3.5	162 \pm 3.6	162.9 \pm 3.2	163.9 \pm 4.2	164.5 \pm 2.6
CCl ₄ control	155.1 \pm 4.2**	146.2 \pm 4.6*	140.2 \pm 5.0**	135.0 \pm 5.0*	130 \pm 5.1**	127.5 \pm 4.5*	122.9 \pm 5.0**
CCl ₄ recovery	154.1 \pm 5.0*	156.5 \pm 4.5**	158.5 \pm 4.8***	158.9 \pm 5.0*	159.2 \pm 5.2**	160.1 \pm 3.2**	160.2 \pm 4.3**
Silymarin control	158.1 \pm 3.2***	160.2 \pm 9.0***	161.1 \pm 6.2**	161.5 \pm 7.5***	162.0 \pm 8.0***	162.5 \pm 3.2***	163.0 \pm 3.6***
Plant extract control	160.1 \pm 4.0**	160.5 \pm 3.2**	161.8 \pm 4.0**	161.8 \pm 4.5**	162.2 \pm 3.2**	162.9 \pm 2.6**	163.2 \pm 5.9***

N=6 [#]Values are expressed as mean of \pm S.D.***P <0.001, **P <0.01, *P <0.05 in comparison to Normal control group.

Serum marker enzymes

All the marker enzymes, viz., AST, ALT, ALP and GGT registered enhanced activity in CCl₄-treated rats as compared to control group (Table 2). In MEC co-administered group, the levels of these enzymes were found retrieving towards normalcy.

Table 2 Effect of *Nyctanthes Arbor-Tristis Linn* ethanolic extract on CCl₄-induced liver damage in rats

Groups	BILI	GOT	GPT	Alk- PO ₄	Serum Glucose (mg/dl)	Serum cholesterol (mg/dl)	Total protein
Normal control	0.525 ± 0.03	157.89± 19.31	92.24± 4.46	147.75± 9.07	146.44± 11.55	72.14± 5.16	5.65± 0.6
CCl ₄ control	0.49± 0.03	247.06± 14.26**	184.4± 12.11***	171.33± 11.39	180.47± 6.92	73.61± 2.59	3.29± 1.38**
CCl ₄ Recovery	0.53± 0.02	217.98± 27.35*	155.83± 12.61***	171.33± 20.69	222.73± 14.8*	71.79± 6.2	2.26± 0.20***
Silymarin control	0.53± 0.03	248.75± 20.18**	179.83± 15.91***	141.33± 7.37***	190.9± 18.15	61.11± 7.30	6.43± 0.70
Plant extract control	0.47± 0.05	186.83± 15.62*	165.33± 13.11*	128.83± 6.58***	249.40± 21.6**	78.63± 3.02	4.11± 0.35*

N=6, Values are expressed as mean of ± S.D. ***P < 0.001, **P < 0.01, *P < 0.05 in comparison to Normal control group.

Other biochemical parameters:

The total protein concentration of the serum and liver was lesser in Group II animals, when compared with normal control. (Tables 3) and it attained an almost normal value in group III rats. The level of total lipids, triglycerides and cholesterol in serum as well as liver recorded significant increment in CCl₄- administered rats as compared to those of group I. All these biochemical changes showed signs of returning towards the normalcy in-group III animals. There was a significant decline in the concentration of phospholipids in liver tissues of CCl₄-treated rats as compared to normal control. In group III animals phospholipid concentration attained normalcy.

Table 3 Effect of *Nyctanthes Arbor –Tristis Linn* ethanolic extract on liver weight and volume

Groups	Liver Weight [#] (gm)	Liver Volume [#] (ml)
Normal control	6.32± 0.05	7.95± 0.05
CCl ₄ control	7.752± 0.04 **	11.01± 0.07***
CCl ₄ Recovery	7.269± 0.06**	9.05± 0.07***
Silymarin control	6.63± 0.09***	8.45± 0.05**
Plant extract control	6.07± 0.10**	7.75± 0.12**

N=6 [#]Values are expressed as mean of ± S.D.***P <0.001, **P <0.01, *P <0.05 in comparison to Normal control group.

Discussion

Carbon tetrachloride is one of the most commonly used hepatotoxin. It is well documented that carbontetrachloride is biotransformed under the action of cytochrome P-450 in the microsomal compartment of liver to trichlomethyl radical which readily reacts with molecular oxygen to form trichloromethyloeroxy radical [12]. This free radical in the presence of oxygen may cause peroxidation of lipid on target cell resulting in extensive damage [13]. Administration of CCl₄ (1.0 ml s.c.) to rats produced hepatotoxicity showed by significant increase in the serum levels of GOT, GPT and alkaline phosphate in comparison to control group. Also total protein levels were significantly decreased to 3.29g/dl in CCl₄ control groups from the level of 5.65g/dl in normal control group as shown in the Table 2. Ethanolic extract of *Nyctanthes Arbor –Tristis Linn* given at dose 1000mg/kg not only prevented the rise in serum level of GOT, GPT, alkaline phosphates but also improved serum lipid profile. The results are well comparable with silymarin (standard drug) treated group [14].

Conclusion

Based on the present findings, it can be concluded that the probable mechanism by which the *Nyctanthes Arbor –Tristis Linn* leaves exerts its protective action against CCl₄-induced hepatocellular metabolic alterations could be by the stimulation of hepatic regeneration through an improved synthesis of proteins, or due to its ability to block the bioactivation of CCl₄ by inhibiting the P 450 2E1 activity and/or its accelerated detoxification and the potential to minimise the deleterious effects of free radicals including the peroxy radicals and its antioxidant activity in combination with the inhibition of lipid peroxidation, thereby the *Nyctanthes Arbor –Tristis Linn* leaves can be ranked as hepatoprotective agent by the combined synergistic effect of its constituents and micronutrients rather than to any single factor through free radicals scavenging activity. Further work is going on to isolate the active components, which are responsible for hepatoprotection.

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