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HEPATOPROTECTIVE ACTIVITY OF MEDICINAL PLANT EXTRACTS ON ALBINO RATS

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ABSTRACT

Plants used in traditional medicine have stood up to the test of time and contributed many novel compounds for preventive and curative medicine to modern science. India is sitting on a gold mine of well recorded and traditionally well practiced knowledge of herbal medicine. The present experiment was conducted for 15 days to evaluate the hepatoprotective activity of plant *Elytraria acaulis* in CCl_4 (1ml/kg) treated rats. The extracts were prepared by the *Elytraria acaulis* whole plant extracts in methanol and aqueous solvents through maceration technique. The 6 groups were maintained as control, CCl_4 induced, CCl_4+ Liver tonic, CCl_4+*Elytraria acaulis* extracts (propanol 200mg/kg and aqueous 200mg/kg). On the 16th day blood was collected for the study of serum enzymes like SGOT (Serum Glutamate Oxaloacetic Transaminase), SGPT (Serum Glutamate Phosphate Transaminase) and bilirubin and then the separated liver is processed for the histological studies. The decreased levels of SGOT, SGPT and total bilirubin in the treated rats were an indication of the hepatoprotective activity of extracts of *Elytraria acaulis*. The histological changes are also evidence for hepatoprotective activity of extracts.

INTRODUCTION

Therapeutic efficacy of plant crude extracts and isolated compounds have been evolved in course of time and generated a number of popular modern day medicines[1]. Novel drug delivery systems have been utilized in the modern herbal formulations[2]. In several instances, safety and efficacy of herbal medicines have been investigated[3] and the World Health Organization (WHO) has estimated more than 4000 million people of the world is dependent on traditional medicine[4]. Liver is vital organ, which is maintaining of metabolic reactions in the human body. But unnecessary food habits, consuming of impure drinks may bring problems in functioning the liver. Consuming more number of drugs also cause the liver damage[5] intake of alcohols, junk food etc are also questioning the functional ability of the liver by damaging the liver architecture. Damage of liver can be assessed by the elevated levels of serum enzymes like SGOT, SGPT and bilirubin[7]. Though the huge utilities of allopathic drugs are available they are not fulfilling the solution. But the medicinally valued plants are capable to target these types of problems. In that attempt many plants are proved that they possess the hepatoprotective activity[3]. Plants having the capability of fighting against free radicals generated in the body leads to protection of vital organs like liver.

The present interest is to find out the free radical scavenging activity and liver protection activity of whole plant extracts of *Elytraria acaulis* against CCl_4 induced hepatic damage.

MATERIAL AND METHODS

Plant material:

The whole plant of *Elytraria acaulis* were brought from the forest area of the Jeelugula Village, Karimnagar district, Telangana State. The plants materials are generally practiced by the village tribal people for various ailments. (*Elytraria acaulis* is for asthma, migraine, snake bite, mammary tumor etc). The *Elytraria acaulis* plant is already proved its anti hyperglycemic activity. The collected plants were authenticated, given voucher number and preserved in the laboratory.

Hydroalcholic Extract:

The whole plant was dried under shade and the powder was prepared from extracts. The powder (50 gr) was kept in the hydroalcoholic (250 ml) solvent (70% of propanol, 30% of distilled water) and allowed for 24 hrs with the random shaking. Then the filtrate-I was collected and the marc again allowed in 250 ml of hydroalcoholic solvent for 6 hrs and collected the filtrate-II. Then the filtrates (I&II) were performed distillation to get extracts and stored in refrigerator prior to treatment.

Aqueous Extract:

The whole plant was dried under shade and the powder was prepared from extracts. The powder (50 gr) was kept in the aqueous (250 ml) extracts and allowed for 24 hrs with the random shaking. Then the filtrate-I was collected and the marc again allowed in 250 ml of aqueous extracts for 6 hrs and collected the filtrate-II. Then the filtrates (I&II) were performed distillation to get extracts and stored in refrigerator prior to treatment.

Animal models:

Albino rats (Wistar strain) weighing 150 to 180gr were brought from Mahaveer Enterprizers, Hyderabad. The rats were housed and acclimatized to standard laboratory conditions. The animals were fed with standard diet (Hypro rodent feed for animals, Pune) and water provided at ad libitum. The protocol approved by the Institutional Animal Ethical Committee (IASC/03/UCPSc/KU/10).

Toxic study of the extracts:

Hydroalcholic Extract:

To study the toxicology of hydroalcohoic whole plant extracts of *Elytraria acaulis,* the doses (150,200,250,300 mg/ kg) were administered to the rats (5 groups – 8 animals in each group) and put under observation for 72 hrs[6]. There was no toxic effect observed to the rats and the 200 mg / kg were selected for the treatment.

Aqueous Extract:

To study the toxicology of aqueous extract whole plant extracts of *Elytraria acaulis,* the doses (150,200,250,300 mg/ kg) were administered to the rats (5 groups – 8 animals in each group) and put under observation for 72 hrs[6]. There was no toxic effect observed to the rats and the 200 mg / kg were selected for the treatment.

Experimental Design:

The animals were divided into 5 groups of 8 in each

Group-1. Treated with dist. water for 15 days (Control).

Group-2. CCl_4 (Carbon tetra chloride) was given intra peritoneal (1ml/ kg) with 1:1 dilution of coconut oil on the 5^{th} day[3].

Group-3. Administered with liver tonic (5ml/kg) daily for 7 days and on 5^{th} day the CCl_4 is induced through i.p. (1 ml / kg).

Group - 4, 5 were treated with *Elytraria acaulis*'s hydro alcoholic whole plant extract-EAHE, aqueous extract-EAAE (200mg/kg, 200 mg/kg) for 7 days, CCl_4 is administered on the 5day[3].

On the 16th day, all rats were sacrificed and the blood collected, centrifuged and the collected serum samples were studied for SGOT, SGPT and bilirubin (through commercially available kits) tests for the study of the toxic effect of CCl_4 and also the therapeutic effect of the plant extracts. The livers were fixed in the fixative (Bouin's fluid) for the histological study. The results were analyzed by one way ANOVA and Dunnet multiple comparison test with the significant level at $p<0.05$.

RESULTS

The results were observed that the serum parameters like SGPT values were increased in the CCl_4 induced rats (112.50±3.40). SGOT, bilirubin values were also indicating the damage of the liver in the CCl_4 induced rats (102.77±1.68), (1.55±0.14) respectively. The values of SGOT (66.88±0.75), SGPT (69.43±1.52) and bilirubin (0.82±0.13) were noted in the group CCl_4 + Liver tonic. The decreased levels of SGPT, SGOT and bilirubin levels were seen in the CCl_4+ EAHE 200mg/kg (62.57±1.87, 58.77±1.01, 0.89±0.08), EAAE 200mg/kg (57.57±1.36, 54.37±1.06, 0.73±0.06) respectively.

DISCUSSION

CCl_4 damages the liver by its metabolite $CCl_3^{\cdot}$ free radical, with which the damage of cellular membranes occur through the lipid peroxidation[1,17]. The serum parameters like Serum Glutamate Oxaloacetic Transaminase (SGOT) or Aspartate Transaminase (AST), Serum Glutamate Phosphate Transaminase (SGPT) or Alaline transaminase (ALT), including the bilIrubin content also elevated because of their release into the blood in the CCl_4 induced hepatotoxic rats[4] (Table-1). Whereas, the EAHE, EAAE treated rats serum parameters revealed the significant decrease in the SGOT (66.88±0.75), SGPT (69.43±1.52) and bilirubin (0.82±0.13) levels compare to the CCl_4 induced rats (Table-1). These enzymatic values were also decreased in the liver tonic treated rats. The hepatoprotection of the drug depends on the reduced effects of toxic levels of the CCl_4 in the damaged liver[12,18]. The results that decreased levels of SGOT, SGPT and bilirubin in the EAHE, EAAE treated rats against CCl_4 were observed similar to the results of the hepatoprotective activity of poly herbal drug against CCl_4 damaged liver[14, 9, 19]. The histological sections are also revealed that the hepatocellular damage in the CCl_4 induced hepatotoxic group (group- 2) (figure-1). The EAHE + CCl_4, EAAE + CCl_4 (200mg/kg, 200mg/kg) i.e., group-4, group-5 were showed the rearrangement of damaged cells. The histology is more observed in the group – 5 (figure 3, 4). The histology can be easily comparable with the liver tonic+ CCl_4 group rats.

The results that observed were supporting the protective activity of the liver though they were damaged by the CCl_4. The plant extract of *Elytraria acaulis* are shown more protectiveness. Though the results are supporting the hepatoprotective activity further study is needed to confirm the activity.

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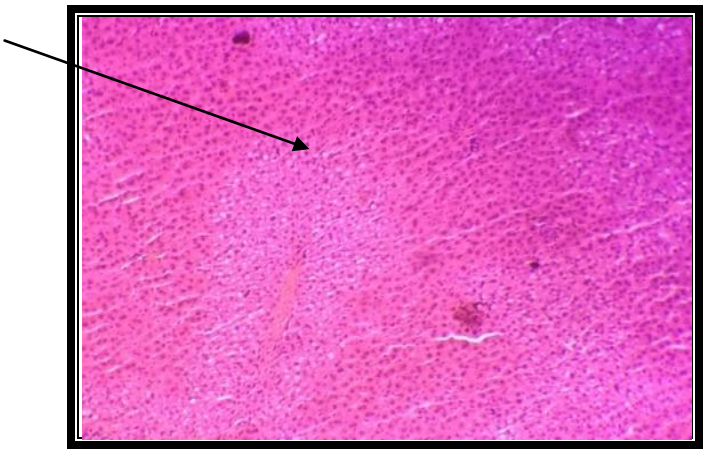
Histological sections of liver

FIG. 1: LIVER CROSS SECTION (CCl_4 INDUCED RAT)

Damaged hepatocytes



Liver section shows the histology with damaged hepatocytes.

FIG. 2: LIVER CROSS SECTION (CCl_4 +LIVER TONIC)

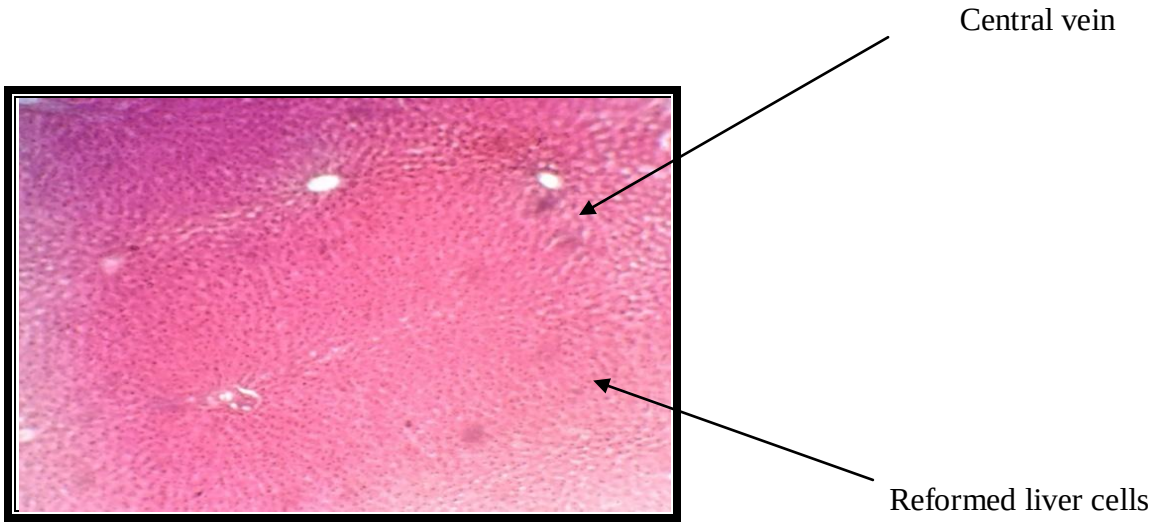
Regenerated liver cells

Central vein

Sinusoids

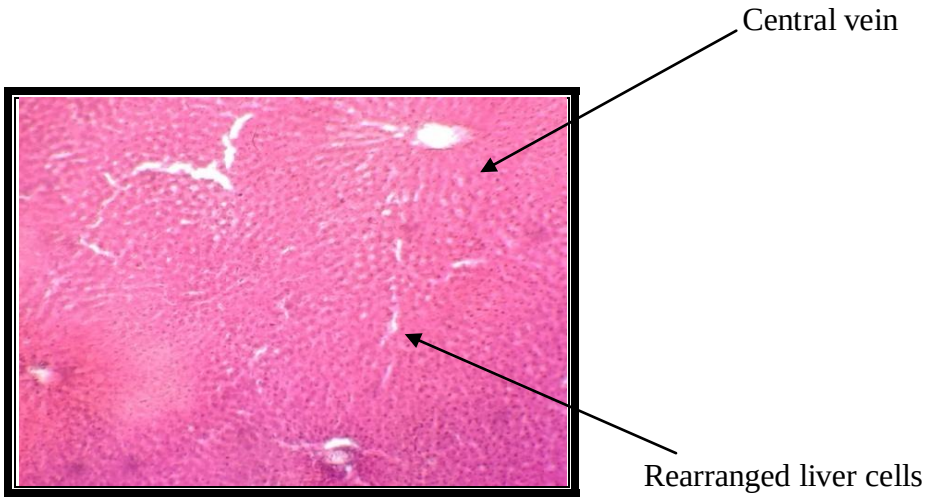
Liver section shows the histology with rearranged sinusoids and hepatocytes.

FIG.3: LIVER CROSS SECTION (CCl_4 +EAAE)



Liver section shows the histology with rearranged sinusoids and hepatocytes.

FIG. 4: LIVER CROSS SECTION (CCl_4 +EAHE)



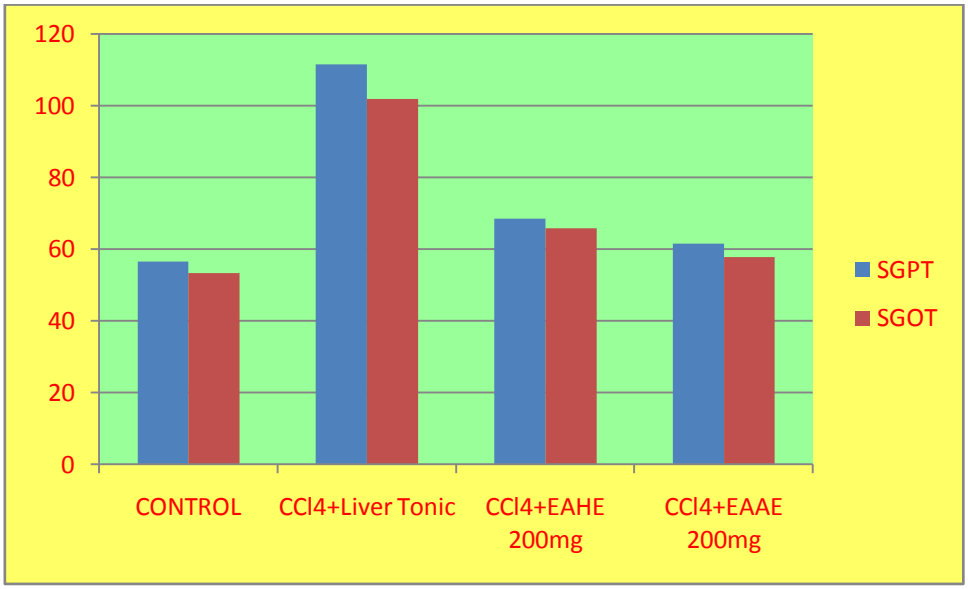
Liver section shows the histology with rearranged sinusoids, hepatocytes and central vein.

Table - 1: Hepatoprotective Activity of *Elytraria acaulis* in CCl_4 induced Hepatotoxicity of Albino rats

GROUPS	SGPT (IU/L)	SGOT (IU/L)	BILIRUBIN (mg/dL)
1.CONTROL	52.13±0.13	42.16 ± 0.15	0.55±0.07
2.CCL_4	112.50±3.40	102.77±1.68	1.55±0.14
3.CCL_4 + Liver Tonic	69.43±1.52	66.88±0.75	0.82±0.13
4.CCL_4 + EAHE 200mg	62.57±1.87[a]	58.77±1.01[a]	0.89±0.08[c]
5.CCL_4 + EAAE 200mg	57.57±1.36[a]	54.37±1.06[b]	0.73±0.06[c]

All values are expressed in mean ± SD; n=8, a= p <0.01 compare to CCl_4 induced group, b= p <0.01 compare to CCl_4+ liver tonic treated group, c= not significant (p >0.05) compare to CCl_4+ liver tonic treated group, EAHE- *Elytraria acaulis* hydro alcoholic extract, EAAE- *Elytraria acaulis* aqueous extract.

CHANGES IN SGOT, SGPT OF CCL4 INDUCED, CCL_4+LIVER TONIC, CCL_4+EAHE, CCL_4+EAAE TREATED RATS



CHANGES IN BILIRUBIN OF CCL_4 INDUCED, CCL_4+LIVER TONIC, CCL_4+EAHE, CCL_4+EAAE TREATED RATS