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RESEARCH ARTICLE

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HEPATOPROTECTIVE ACTIVITY OF CHENOPODIUM ALBUM AGAINIST CARBONTETRA CHLORIDE-INDUCED HEPATOTOXICITY IN RATS

SUGANTHI. V AND ATHIRA. L. R.NAIR*

Department of Biochemistry, Dr. N.G.P. Arts and Science College , Coimbatore.

ATHIRA. L. R.NAIR
Department of Biochemistry, Dr. N.G.P. Arts and Science College , Coimbatore.

***Corresponding author**

ABSTRACT

Many hepatoprotective herbal preparations have been recommended in alternative systems of medicine for the treatment of hepatic disorders. No systematic study has been done on protective efficacy of *Chenopodium album* to treat hepatic disease. Protective action of *Chenopodium album* methanol extract was evaluated in animal model of hepatotoxicity induced by carbon tetrachloride (CCl_4). The experiments were performed using five groups of animals. The experimental animals were administered with 30 % CCl_4 for 14 days and the crude plant extract and the silymarin , a standard drug 25mg/kg/ bwt were fed into the CCl_4 treated animals. Liver marker enzymes such as aspartate transaminase (AST), alanine transaminase (ALT), acid phosphatase (ACP), alkaline phosphatase (ALP), lactate dehydrogenase (LDH) were estimated. serum bilirubin and protein levels were evaluated. The present study scientifically validates the traditional use of *Chenopodium album* for liver disorders.

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KEYWORDS

Chenopodium album, CCl_4, hepatoprotective and hepatotoxicity

INDRODUCTION

The liver is a vital organ present in vertebrates and other animals[1].Liver plays a pivotal role in regulating various physiological processes in several vital functions, such as metabolism, secretion, and storage. It has a great capacity to detoxicate toxic substances. Therefore, damage to liver infection by hepatotoxic agents is of a grave consequence[2]. In view of severe desirable side effects of synthetic, there is a growing focus to follow systematic research methodology and evaluate scientific basis for the traditional herbal medicines that are claimed to posses hepatoprotective activity. Traditional medicines and plants still present a large source of natural antioxidants that might serve as leads for the development of novel drugs. Several anti inflammatory, digestive, ant necrotic, neuro and hepatoprotective drugs have been considered to have an antioxidant or antiradical scavenging mechanism as part of their activity [3]. Conventional medicine is now pursuing the use of natural products such as herbs to provide the support that the liver need on a daily basis [4].Herbal drugs are frequently to be less toxic and free from side effects than synthetic drugs [5]

Chenopodium album (Amaranthaceae) is popularly known as “Fat hen” in English, “parupu keerai” in tamil and “Bathu” in Hindi. It is very bioactive plant and used in various diseases. The leaves are used in antihelminthic and antirheumatic, mildly laxative. The seeds are chewed in treatment of urinary problems and are considered useful for relieving the discharge of semen though urine[6]. Due to the wide spread use of this plant by the rural communities to treat several diseases the objective of the present study was framed too determine the effect of methanolic leaf extract of *Chenopodium album* on CCl_4 induced hepatotoxicity in rats.

MATERIALS AND METHODS

Plant material

The plant material of “*Chenopodium album*” was collected from the Coimbatore district of tamilnadu, India. Authentication of plant material was carried out at the herbarium center of Botanical survey of India, Coimbatore where the herbarium voucher specimen (BSI/SRC/5/23/09-10/Tech-514) have been kept identifying the plant species. The leaves of the investigated plant was dried and reduced to a coarse power.

Extraction

The “*Chenopodium album*” leaves were extracted with methanol for 48 hours. The solvent was completely removed under reduced pressure. The remaining extracts were dried and stored in vacuum desiccators

Experimental animals

Studies were carried out using male Wistar albino rats (175 -200gm). They were obtained from Small Animal Breeding Centre of Kerala, Agricultural University, Mannuthi. Thrissur. The animals were grouped and housed in standard laboratory conditions with dark and light cycle. They were allowed to have free access to standard pellet diet and water. Animals were acclimatized to their environment for one week prior to experiments

Experimental design

Animals were randomized and divided into five groups of six animals in each groups. Group I served as control and fed orally with normal saline 5ml/kg /bwt daily for 14 days. Group II, toxic group was administrated with CCl_4 (250µg/kg/ip) as a single dose. Group III rats were induced with CCl_4 (250πg/kg/ip) and received (250mg/kg/ bwt) of methanolic extract of *Chenopodium album* .Group IV received *Chenopodium album* (250mg/kg/bwt). Group V rats were induced with CCl_4 (250µg/kg/ip) and were made to receive 25mg/kg /bwt Silymarin. Treatment duration was 14 days. Animals were sacrificed 24 hr after the last injection. Blood was collected and were allowed to clot and serum was separated. The liver was dissected out and used for various biochemical studies.

Statistical analysis

All the values expressed as mean ± SD. The results were analyzed statistically by Analysis of Variance (ANOVA) followed by On way Analysis. P values <0.005 were considered significant.

RESULTS AND DISCUSSION

Table 1

Effect of "Chenopodium album" on marker enzymes in serum of control and experimental rats

Groups	AST (U/l)	ALT (U/l)	ACP(U/l)	ALP(U/l)	LDH (U/L)
I	65.21±0.93	35.14±1.05	32.59±1.42	133.08±5.42	3.46±1.34
II	129.14±1.02^{a*}	97.1±2.3 ^{a*}	45.5±1.248 ^{a*}	220.22±12.67^{a*}	5.80±0.10 ^{a*}
III	85.14±2.4^{b*}	40.42±1.2 ^{b*}	30.05±1.54 ^{b*}	95.23±6.17 ^{b*}	2.84±0.86 ^{b*}
IV	65.14±2.01 cns	36.92±1.18 cns	33.01±2.01^{cns}	92.57±8.42 ^{cns}	3.02±0.77 cns
V	90.53±0.78 ^{b*}	42.00±2.09 ^{b*}	80.27±2.71 ^{b*}	95.15±2.92 ^{b*}	5.00±1.51 ^{b*}

Values are expressed as ± SD of six animals. Statistical comparison a: represent comparison between group I & II. b: represents comparison between group II & III.c: represents comparison between I & IV. n: non significant

From the table 1 and 2, the activities of marker enzyme such as AST, ALT, ACP, ALP, LDH were significantly increased (p<0.005>) in serum of CCl_4 induced hepatic damaged rats but after the treatment with "*Chenopodium album*" extracts the values showed near normal range in group III rats in serum. The standard drug Silymarin treated group (group V) also showed normal activities. The group IV rats which were treated with plant extracts alone showed protective side effects without any side effects

Liver is an important metabolic organ involved in the synthesis of a large number of metabolites. It contains a large amount of marker enzymes [7]. Hepatocellular necrosis leads to very high levels of AST and ALT in blood released from liver. Between the two alanine, transaminase is a better index of injury as its activity represents 90% of total enzymes present in the body. The normalization of AST and ALT in plant treated group indicated the stabilization of plasma membrane and protection of hepatocytes against the damage caused by CCl_4 [8]. ALP activity, on other hand, is related to the functioning of hepatocytes and increase in its activity is due to increase synthesis in presence

of increased pressure [9]. ALP is a phosphatase which acts to liberate free phosphates groups from other molecules. It is stored in lysosomes and functions when they fuse with endosomes they are acidified while they function.

Table 2
Effect of "Chenopodium album" on bilirubin and total protein in serum of control and experimental animals.

Groups	Bilirubin (mg/dl)	Protein(g/dl)
I	1.41±0.03	7.12±1.21
II	2.40±0.01^{a*}	2.6±2.1 ^{a*}
III	1.24±0.02^{b*}	6.15±2.41 ^{b*}
IV	1.36±0.01^{cns}	6.91±1.5 ^{cns}
V	0.89±0.02^{ens}	8.7±1.5 ^{ens}

Values are expressed as ±SD of six animals in each group .statistical comparison are in the table1.

From the table 2 it is understood that values of bilirubin and total protein were significantly increased (p<0.005>) in serum of CCl_4 is induced hepatic damaged rats .after the treatment with "*Chenopodium album*" extracts. The values showed near normal range in group III rats in serum. The standard drug Silymarin treated group (group V) also showed normal activities. The group IV rats which were treated with plant extracts alone showed protective side effects without any side effects

Bilirubin is one of the clinical clues to the severity of necrosis and its accumulation is a measure of binding, conjugation and excretory capacity of hepatocytes. Heapato biliary disease is indicated when conjugated fraction of bilirubin exceeds the upper limit of normal even if the total serum of bilirubin is normal or near normal [10].The decline in total protein content can be deemed as useful index of the severity of cellular dysfunctions in chronic liver disease. The lowered level of total protein required in the serum of CCl_4 treated rats raveled the severity of hepatopathy. The attainment of near normality in total protein content of serum of polyhedral treated rats confirms the hepatoprotective effect of the selected herbs [11].

CONCLUSION

The present study reveals plant extract with hepatoprotective properties against toxic chemicals that cause liver injury, seems to validate which were used in folk medicine. Our result demonstrates a very good protective effect of *Chenopodium album* leaf extract against CCl_4 induced liver injury, which is probably due at least partly to its antioxidant properties , scavenging CCl_4 associated free radicals.

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