

Available online on 15.03.2015 at <http://jddtonline.info>**Journal of Drug Delivery and Therapeutics**

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RESEARCH ARTICLE

HEPATOPROTECTIVE ACTIVITY OF *CHENOPODIUM ALBUM* LEAVES EXTRACT IN CCl₄ INDUCED HEPATOTOXICITY IN RATSJyoti Parkash^{*1}, Kannubhai Rameshbhai Patel²¹Research Scholar, Department of Pharmaceutical Science, JJT University, Jhunjhunu-333001, Rajasthan, India²Shri B.M. Shah College of Pharmaceutical Education and Research, Modasa-383315, Gujarat, India**Corresponding Author's Email address-* parkash981@yahoo.com

Received 16 Jan 2015; Review Completed 14 March 2015; Accepted 14 March 2015, Available online 15 March 2015

ABSTRACT**Objective-** Hepatoprotective activity of *Chenopodium album* leaves extract in CCl₄ induced hepatotoxicity in rats.**Method-** The present study has been undertaken to evaluate hepatoprotective activity of *Chenopodium album* leaves extract in CCl₄ induced hepatotoxicity in rats. The study was carried out by comparing SGOT, SGPT, Alkaline Phosphate, Direct Bilirubin, Total Bilirubin and Total proteins level in serum of different groups of rats. Histopathological study was also done on liver tissue of the all group of animals and compared with standard, positive control and negative control groups.**Result-** Rats treated with *Chenopodium album* leave extract caused a significant reduction in SGOT, SGPT, Alkaline phosphate, direct bilirubin, total bilirubin. Level of total proteins was found retrieving towards normalcy. Level of these enzymes was almost comparable to standard drug i.e. Silymarin. Hepatoprotective activity was confirmed by histopathological study of liver tissue of control and treated animals.**Conclusion-** From results it can be concluded that *Chenopodium album* possess hepatoprotective activity against CCl₄ induced liver toxicity in rats.**Keywords:** Hepatoprotective activity, *Chenopodium album* leaves extract, CCl₄ induced hepatotoxicity, significant reduction in SGOT, SGPT, Alkaline phosphate**INTRODUCTION**

The use of herbal drugs and natural remedies for the treatment of liver disorders has a long history. A number of recent drugs have been isolated from plants for thousands of years^{1, 2}. It was started with the Ayurvedic treatment, and extended to the Chinese, European and other systems of traditional medicines. There are about 45,000 plant species which possess medicinal properties.³ There are more than 700 mono and polyherbal preparations which are used in the treatment of liver disorders. Decoction, tincture, tablets and capsules from more than 100 plants are in clinical use.

The liver is a reddish brown organ with four lobes. A human liver normally weighs 1.44–1.66 kg (3.2–3.7 lb)⁴. Liver has a major role in regulation of physiological processes of our body. It plays many vital functions related to metabolism and clearance of most chemicals and toxins. Hepatotoxicity or liver dysfunction is a major health problem of society that challenges not only health care professionals or physicians but also the pharmaceutical industry and drug regulatory agencies of the world.

More than 500 vital functions have been identified with the liver. The liver is important because a person's health and nutritional level is not only determined by

what he eats, but by what the liver processes. Unfortunately it is extremely difficult to identify early symptoms specific to liver injury. Patients suffer from liver diseases for a long time without knowing its symptoms.

Because of its strategic position and multidimensional functions, the liver is prone to many diseases⁵. Liver toxicity is also produced from drugs, xenobiotics and oxidative stress. Certain drugs administered either in overdose or in therapeutic dose may produce liver injury. Other chemicals used in laboratories and industries, natural chemicals (e.g. microcystins) and herbal remedies can also induce injury to liver cells.

5% of deaths are the result of liver disease and is increasing year-on-year. Approximately 46000 deaths/year are due to liver diseases and ranks ninth in overall causes of death in U.S⁶ (). Approximately 31000 people die each year from liver cirrhosis and 2.7-3.9 million people are chronically infected with hepatitis C virus in U.S. Approximately 3000 people yearly die of hepatitis B and hepatitis C kills 12000 people yearly in US. Deaths due to liver disease have increased by 12% in just three years, since 2005, totaling 46,244 lives lost. If the rates continue, deaths from liver disorder are

predicted to double in twenty years. Hepatitis is estimated to affect over 10 million people in Europe.

Various liver diseases still have unknown causes but most of liver diseases are generally caused by many factors. Hepatitis A, B, and E can cause acute liver failure. Viruses that can cause acute liver failure include Epstein-Bar virus, herpes simplex virus and cytomegalovirus. Autoimmune hepatitis can also cause liver failure in which immune system attacks liver cells, causing inflammation and injury. Certain chemicals and medications can also cause acute or chronic liver failure as liver is responsible for processing most of chemicals and medications that enter the body. Certain chemicals such as Carbon tetrachloride, acetaminophen, antibiotics, non-steroidal anti-inflammatory drugs, anti tuberculosis drugs and anticonvulsants can cause acute liver failure.

MATERIALS AND METHODS

Collection and processing of plant materials

The plants were collected from local market of Nangal during September-October. The impurities from plant were removed and leaves were separated from the plant. The leaves of plant were shadow dried at room temperature and powdered by mechanical grinder. The powder was sieved by 20 mm and 40 mm sieve and intermediate was used for extraction.

Preparation of extract

The powdered plant material (250 gm) was extracted with methanol (3 Lts) by cold extraction (Maceration and Percolation) method at room temperature. The methanolic extract was concentrated to half of the volume at 40-50°C temperature.

Hepatoprotective activity

Experimental Design- Thirty Wistar rats were used in this study and were divided into five groups each containing six animals. Each group was treated as follow-

Group I (Positive control group): Positive control group were treated daily injection of carbon tetrachloride at a dose of 0.1 ml/kg/day for 14 days.

Group II (Negative control group): Received 2% acacia solution for 14 days.

Group III (Standard group): Standard group was administered Silymarin (50mg/kg/day p.o) and daily

injection of carbon tetrachloride at a dose of 0.1 ml/kg/day for 14 days. The Silymarin stock solution was prepared in double distilled water.

Group IV (Test Group A): 250mg/kg/day p.o was administered to this group along with daily injection of carbon tetrachloride at a dose of 0.1 ml/kg/day for 14 days.

Group V (Test Group B): 500mg/kg/day p.o was administered to this group along with daily injection of carbon tetrachloride at a dose of 0.1 ml/kg/day for 14 days.

Assessment of hepatoprotective activity:

All animals were killed on 14 days under light ether anesthesia. Blood samples were collected separately into sterilized dry centrifuge tubes and allowed to coagulate for 30 minute at 37° C. The clear serum was separated at 2500 rpm for 10 minute and biochemical investigations were carried out to assess liver function viz. SGOT, SGPT, Alkaline phosphate, total bilirubin, direct bilirubin and total proteins.

Data Analysis:

The data was expressed as MEAN±SEM for each group. Statistical analysis was performed by using student's "t" test.

Histopathological Study

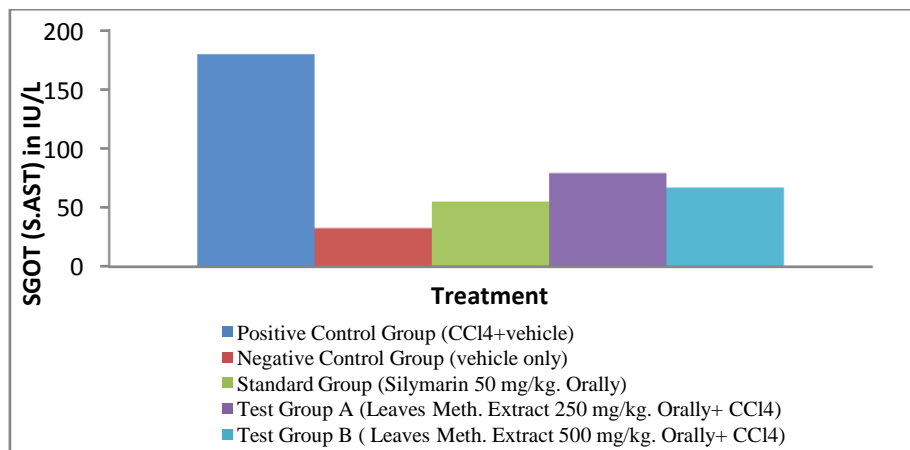
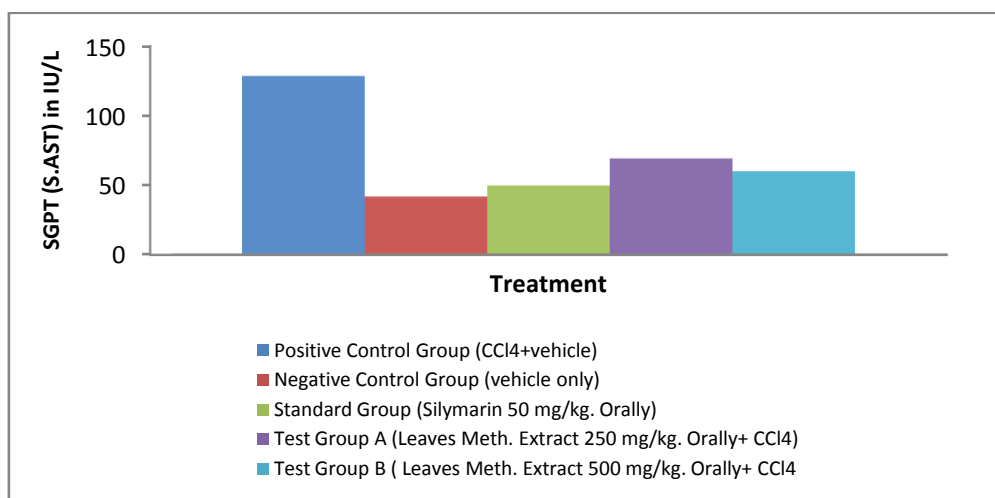
After 1 week of fixing in 10% neutral formalin solution, liver tissues was dehydrated with a sequence of ethanol solution, embedded in paraffin, cut into 5 µm. section, stained with haematoxylin-eosin dye (H & H stain) and then observed under a photomicroscope.

RESULTS

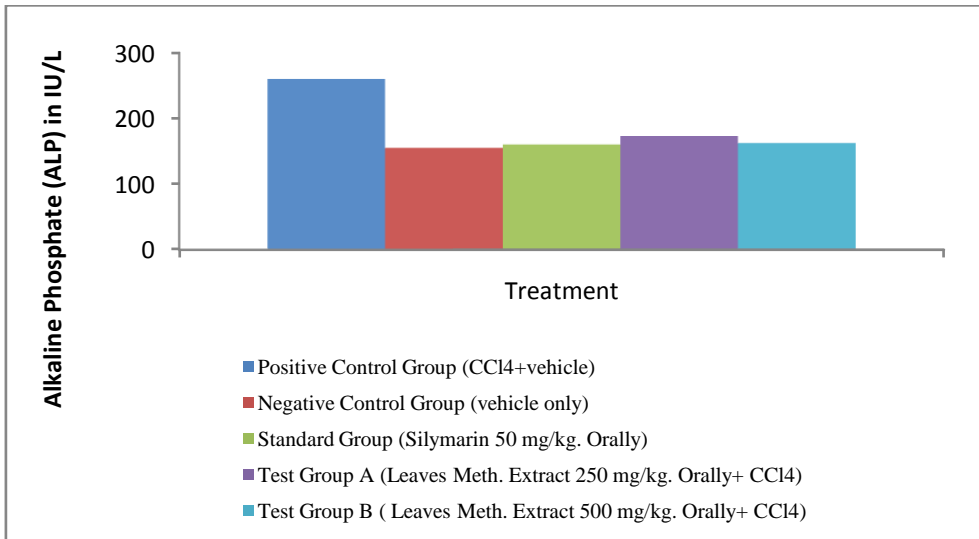
The effect of 50% methanolic extract of *Chenopodium album* on SGOT, SGPT, ALP, total Bilirubin, Direct Bilirubin and total proteins in carbon tetrachloride induced liver damage in rats are summarized in table 1.1. Administration of carbon tetrachloride resulted a significant elevation of hepatospecific serum markers SGOT, SGPT, SALP total Bilirubin and Direct Bilirubin in positive control group, in comparison with the negative control group. Level of total proteins was decreasing from normal level. On administration of crude extract of *Chenopodium album* at different doses of 250mg/kg and 500mg/kg body weight and Silymarin at the dose of 50mg/kg, the level of these enzymes were found retrieving towards normalcy.

Table 1: Effect of Methanolic extract of plant *Chenopodium album* on serum enzyme level in Rats

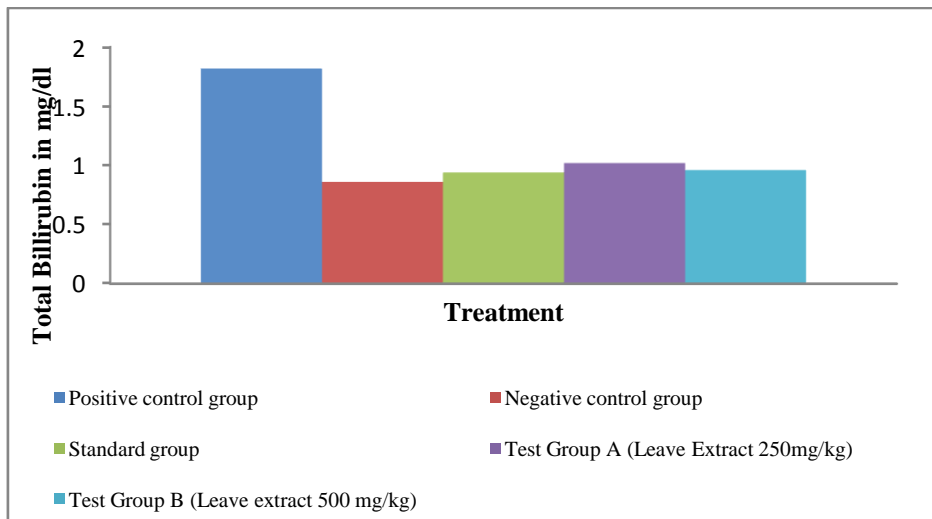
Group	SGOT (S. AST) in IU/L	SGPT (S. ALT) in IU/L	Alkaline Phosphate (ALP) in IU/L	Total Bilirubin in mg/dl	Direct Bilirubin	Total Protein
Positive Control Group (CCl ₄ +vehicle)	179.77±9.13	128.56±5.21	260.65±7.04	1.82±0.20	1.55±0.178	4.92±0.25
Negative Control Group (vehicle only)	32.58±3.84	41.77±2.45	155.56±3.99	0.86±0.14	0.72±0.15	6.88±0.29
Standard Group (Silymarin 50 mg/kg. Orally)	55.15±4.76	49.85±2.73	160.74±4.14	0.94±0.17	0.87±0.24	7.10±0.32
Test Group A (Leaves Meth. Extract 250 mg/kg. Orally+ CCl ₄)	79.13±2.10	69.17±2.27	173.47±4.63	1.02±0.18	1.03±0.27	5.49±0.45
Test Group B (Leaves Meth. Extract 500 mg/kg. Orally+ CCl ₄)	66.85±3.01	59.98±2.64	162.87±3.81	0.96±0.12	0.94±0.22	5.74±0.38

Graph 1: Effect of Methanolic extract of leaves of *Chenopodium album* on SGOT Level in rats**Graph 2: Effect of Methanolic extract of leaves of *Chenopodium album* on SGPT Level in rats**

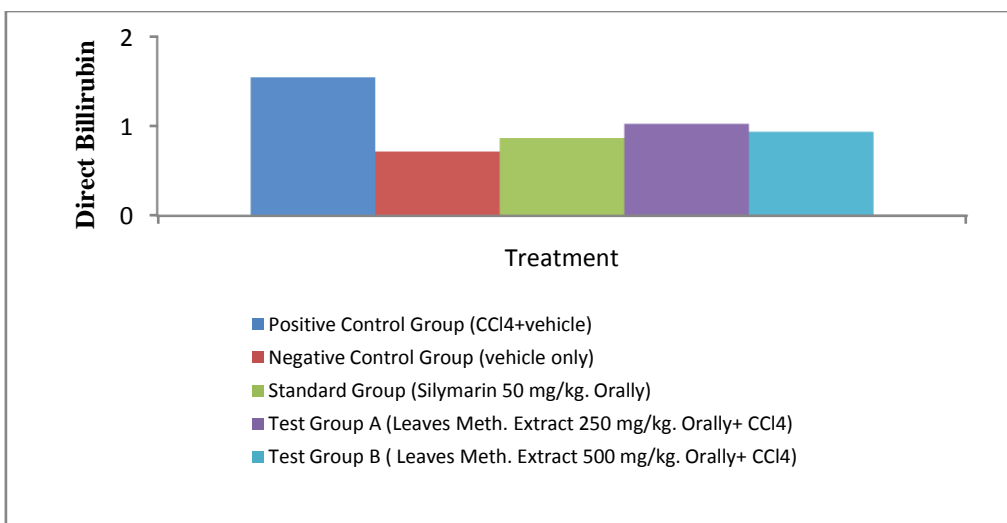
Graph 3: Effect of Methanolic extract of leaves of *Chenopodium album* on Alkaline Phosphate Level in rats



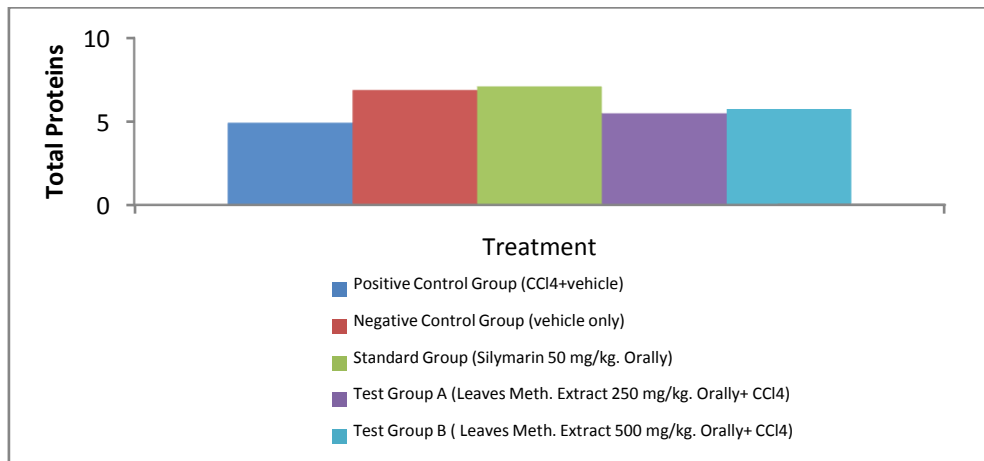
Graph 4: Effect of Methanolic extract of leaves of *Chenopodium album* on Total Billirubin (mg/dl) Level in rats



Graph 5: Effect of Methanolic extract of leaves of *Chenopodium album* on direct Billirubin (mg/dl) Level in rats



Graph 6: Effect of Methanolic extract of leaves of *Chenopodium album* on Total proteins (mg/dl) Level in rats



Histopathological study of *Chenopodium album*

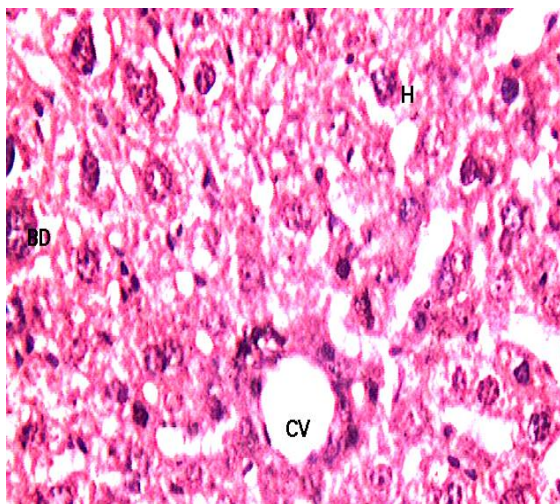


Figure 1: Normal Control (vehicle only)

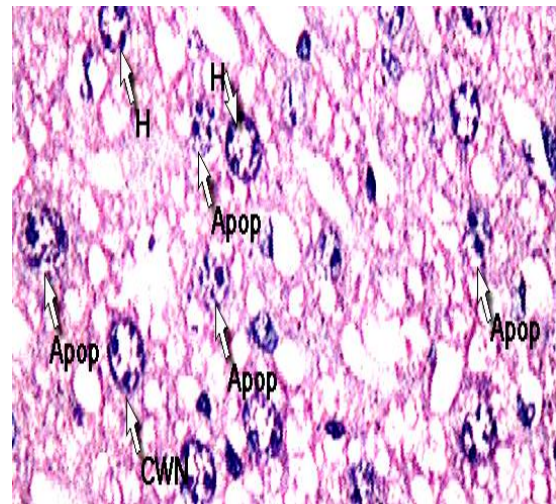


Figure 2: Positive Control (CCI₄+vehicle)

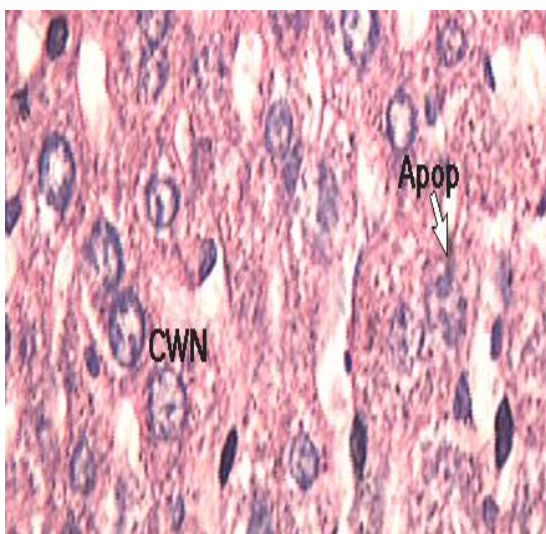


Figure 3: Standard group (Silymarin 50 mg/kg).

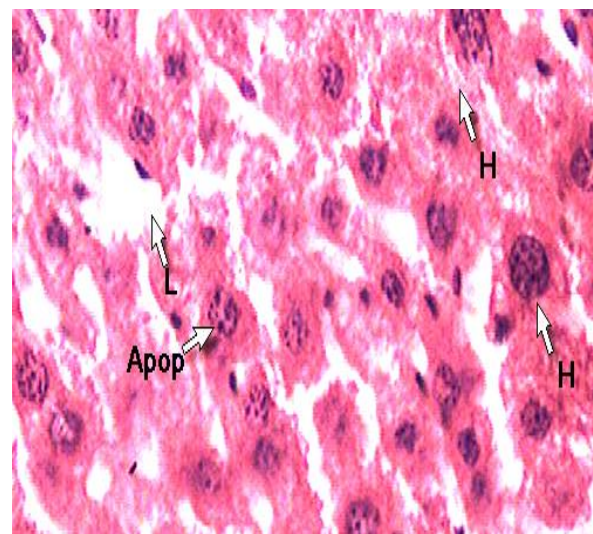


Figure 4: Test group A Met. Ext.250mg/kg

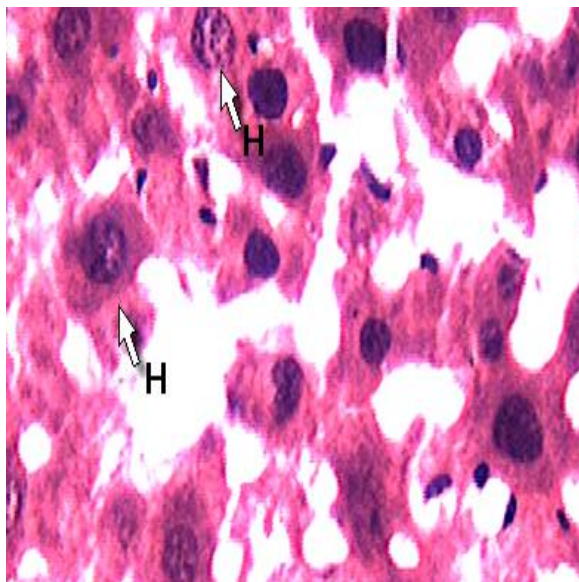


Figure 5: Test group B Met. Ext .500 mg/kg.

DISCUSSION

The present investigation indicated that the extract of *Chenopodium album* provide significant protection against CCl_4 induced hepatotoxicity in rats. In living systems, liver is considered to be highly sensitive to toxic agents. The study of different enzyme activities and total protein have been found to be great value in the assessment of clinical and experimental liver damage¹⁰. CCl_4 is widely used as hepatotoxin in experimental studies of liver disease⁷. The CCl_4 is metabolized by enzyme cytochrome P450 to trichloromethyl free radicals⁸. This is followed by chloromethylation, saturation and destruction of the unsaturated fatty acid of the endoplasmic reticulum membrane phospholipids by peroxidation⁹. Acute poisoning with CCl_4 becomes manifested as a multisystem disorder involving liver, kidney, brain, lung, adrenal gland and myocardium. Protection to hepatic damage induced by CCl_4 administration was observed by evaluating SGOT, SGPT, Alkaline phosphate, Total Bilirubin, Direct Bilirubin and Total proteins level in treated, CCl_4 control and normal control rats. Since these enzymes are cytoplasmic in

nature, upon liver injury these enzymes enter into the circulatory system due to altered permeability of membrane. Marked increase of SGOT, SGPT, Alkaline phosphate, Total Bilirubin, Direct Bilirubin and marked decrease in Total protein level indicates severe damage to tissue membrane during, Direct Bilirubin. It is concluded that *Chenopodium album* has shown potential hepatoprotection in liver damage subjects; however, it failed to be proven as better hepatoprotective than a gold standard Silymarin. More differential dosing is required to CCl_4 induced liver damage. Administration of methanolic extract of *Chenopodium album* significantly prevented CCl_4 induced elevation of SGOT, SGPT, Alkaline phosphate, Total Bilirubin determine its potentiality as hepatoprotective in future.

ACKNOWLEDGEMENT

The author is thankful to Principal Dr. D.N. Prasad, Shivalik College of Pharmacy, Nangal and Vice-Chancellor, Registrar and Ph.D. Coordinator, JJT University, Jhunjhunu, Rajasthan for providing necessary facilities.

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