IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
Research Article
November 2022 Vol.:25, Issue:4

Study of Hepatoprotective Potential of Alcoholic Extract of *Atalantia monophylla* Leaves

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Urooj Hazara*[1], Shalini Singh[2], Abadhesh Kumar Niranjan[3]

[1] *Research Scholar, Institute of Pharmaceutical Science and Research, Unnao, U.P. India.*

[2] *Associate Professor, Institute of Pharmaceutical Science and Research, Unnao, U.P. India.*

[3] *Associate Professor, Hygia Institute of Pharmaceutical Education and Research, Lucknow, India.*

Submitted: 21 October 2022
Accepted: 27 October 2022
Published: 30 November 2022

Keywords: *Atalantia monophylla* leaves, hepatoprotective activity, hepatotoxicity

ABSTRACT

In hepatoprotective studies, the isoniazid and rifampic ininduced hepatotoxicity in G2 rats shows the presence of hepatic congestion at sinusoids and the portal vessel, pericentre globular micro-steatosis, Kuffecell proliferation, hepatocyte diffuse necrosis and mononuclear infiltrate. Infractionated treated G4, G5, G6 it shows the presence of moderate hepatic congestion at sinusoids and the portal vessel, pericentre globular micro-steatosis, less Kuffe cell proliferation, moderate hepatocyte diffuse necrosis and mononuclear infiltrate. Based on the above studies, it is concluded that the *Atalantia monophylla* leaves has significant hepatoprotective activity when compared with the standard

HUMAN JOURNALS
www.ijppr.humanjournals.com

INTRODUCTION

Hepatoprotective activity

Liver is easily the most crucial body organ, and that is the centre for metabolic process of vitamins and minerals like proteins and lipids, carbs in addition excretion of misuse metabolites. Furthermore, it metabolises and also excretes toxins and drugs assimilated through the intestinal area, therefore supply shelter against international things by detoxifying as well as getting rid of them (Saleem *et al*., 2010). Liver stands out as the primary goal body organ for toxicity of xenobiotics and also , drugs because hepatocytes, that form the vast majority on the liver system, are very productive within the metabolic process of exogenous chemical substances, that is exactly why liver may be the goal for deadly things (Timbrell, 1991). During the cleansing of medications, reactive much needed oxygen species (ROS) are made what because oxidative tension (Nyska and Kohen, 2002) that results on the hepatic deterioration. Hepatic sickness stands out as the primary reason for mortality and morbidity of individuals, of all-ages across the globe. Several of the typical liver problems are viral hepatitis, metabolic liver disease; medication induced liver injuries, gallstones, alcoholic beverages liver disorders, non alcoholic oily liver illness as well as autoimmune liver disorders and so on. Drug/chemical-mediated hepatic damage is definitely the widespread indication of medication toxicity as well as profiles for in excess of fifty % of intense liver disaster instances (Lee *et al.*, 2003). Allopathic and conventional medicines are sometimes inadequate or even could cause severe unwanted side effects, when utilized within the therapy of liver ailments. Likewise current medical therapies for liver ailments are frequently inadequate, along with consequently work are now being created searching for brand new powerful drugs (Seeff *et al.*, 2001). Pharmacologically effective elements coming from products that are natural have turned out to be interesting phenomena by virtue of the few side effects of theirs. Indeed medicines of plant based origins for liver ailments were used wearing India for decades. A lot of vegetation are examined through experimental examinations and also proved beneficial for possessing hepatoprotective potentials. Anti hepatotoxicity or hepatoprotection will be the capability to prevent harm on the liver.

When cells, tissue cells, functions or structures of the liver are affected, it's called as Hepatic condition (Liver disorders). The features of liver are proteins synthesis, production and detoxification of biochemical changes needed for digestion and synthesis and also break down of complicated particles, which can be needed for regular important tasks. For

hepatoprotective pastime, Herbal medicines are commonly used compared to allopathic prescriptions since they're affordable, far better suitable for the body, much better cultural acceptability, along with little complications. And so, for normal performance of liver with less negative effects these plant based medicines are utilized. For elimination and biotransformation of deadly things liver is definitely the major five body organ which plays an important function. Throughout the cleansing, reactive oxygen species (ROS) are produced within hepatocytes which lead to oxidative injury, yucky cellular alterations as well as cellular demise leading to hepatotoxicity or even liver injury (Hiraganahalli *et al.*, 2012) In absence associated with a dependable liver protective medication within the contemporary method of medication, a selection of therapeutic preparations within ayurveda, the Indian method of medication, are suggested for the therapy of liver problems.

Indian medicinal plants and many herbal formulations belonging to the medications of standard methods are examined as liver safety medicines (Jose as well as 2000), Kuttan. remedies that are Natural coming from therapeutic vegetation are regarded as to always be safe and effective substitute therapies for hepatotoxicity (Navarro and Gutierrez, 2010).

Features of Liver

The liver is liable for vital features, and that includes:

• Bile generation as well as excretion

• Excretion of bilirubin, hormones and cholesterol drugs

• Metabolism of fat, protein-rich foods, various chemicals and carbohydrates

incorporating drugs

• Enzyme activation

• Storage of glycogen, and vitamins minerals

• Synthesis of plasma protein-rich foods, like albumin, clotting and globulin things

• Blood cleansing and also filtration.

The liver synthesizes as well as transportation bile pigments as well as bile salts which are required for body fat food breakdown. Bile is a mix of H_2O, bile acids bile pigments, potassium, phospholipids, bilirubin, cholesterol, chloride and sodium. Main bile acids are

made of cholesterol. When bile acids are switched into or maybe "conjugated" within the liver, they come to be bile salts.

Bilirubin may be the primary bile pigment which is created from description of heme wearing reddish bloodstream cells. The rest lower heme journeys into the liver, wherever it's released in the bile by the liver. Bilirubin generation as well as excretion observe a certain pathway. If the reticuloendothelial program breaks bad thirteen older white bloodstream cells, bilirubin is among the waste material. This particular "free bilirubin" is a lipid soluble type which should be produced drinking water soluble to always be excreted.

The conjugation procedure within the liver changes the bilirubin via the fat soluble to a water soluble type. The liver additionally plays a significant part in excreting drugs, hormones, and cholesterol in the body. The liver plays a crucial part within metabolizing nutritional value like carbs, fats and proteins. Hence liver aids within metabolizing carbs inside three ways:

• Through the procedure of glycogenesis i.e., fructose, glucose, and galactose are changed to glycogen as well as kept within the liver.

• Through the procedure of glycogenolysis, the liver breaks bad stored glycogen to keep blood stream sugar ranges when there's reduction in carb ingestion.

• Through the procedure of gluconeogenesis, the liver synthesizes sugar coming from protein-rich foods or maybe fatty acids are crucial that you preserve bloodstream sugar ranges.

The liver synthesizes approximately fifty gm of proteins every day, mainly within the kind of albumin. Liver cells likewise chemically transform amino acids to create ammonia and ketoacids, out of what urea is created as well as excreted within the urine. Stomach extra fat is switched into to the intestine to triglycerides, lipoproteins, phospholipids and cholesterol. These things are switched into within the liver into fatty acids and glycerol, via a procedure referred to as ketogenesis.

Fibrinogen and prothrombin, materials required to assist bloodstream coagulate, are each created by the liver. The liver additionally creates the anticoagulant heparin and also produces vasopressor things after hemorrhage.

Fourteen Liver cells defend the entire body from deadly damage by detoxifying the likely damaging materials. By producing poisonous materials much more drinking water soluble, they are able to be excreted from body within the urine. The liver also offers a crucial part of

vitamin storage space. Huge levels of vitamin or riboflavin B1 additionally created within the liver. Ninety five % on the entire body vitamin A shops are concentrated within the liver. The liver additionally consists of tiny quantities of vitamin C, nearly all almost all of the body 's vitamin D, vitamin E as well as K bilirubin have to be conjugated right into a lipid soluble type in order to be excreted.

The liver is provided with nutrition in the hepatic artery as well as the portal vein, that is totally different from some other inner organs. Bloodstream coming from the heart Moves via the aorta as well as within the hepatic artery. The hepatic artery provides a huge amount on the much-needed oxygen as well as nutrition on the hepatocytes employed in the course of metabolic process and around 1/3 from the bloodstream which passes in to the liver is produced by this particular hepatic artery.

Another supply of bloodstream of the liver is definitely the portal vein, providing 2/3 from the bloodstream which passes in to the liver. The nutrition within the portal vein originate through the intestinal area, for heart, raw meal that's assimilated out of the intestine moves straight to the liver. This exposes the liver to bacteria and toxins that are metabolized as well as detoxified by way of a typical liver just before they exit the liver as well as type in the normal blood circulation through the centre. This particular cleansing procedure shields some other organs, especially the human brain, coming from contaminants as well as germs which might hurt mind cells. If this method doesn't work, that occurs in liver shunts, excessive ammonia will generate within the blood stream as well as have an effect on the human brain (Lee *et al.*, 2007).

MATERIALS AND METHODS

Animals used for this study

16-19 weeks-old adult male Wistar rats, weighing approximately 150 to 200g, were acclimatized for 7 days at temperature (25±2°C) and relative humidity (55±1%) in a 12-hour light/dark cycle in a room under hygienic condition. They were given access to water and fed with standard pellet diet *ad libitum*. The experiments were carried out as per the guidelines of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), New Delhi, India and approved by the Institutional Animal Ethics Committee (IAEC).

METHODS

Collection and Identification of *Atalantia monophylla*

Atalantia monophylla leaves were collected from Lucknow, Uttar Pradesh India. The leaves parts of *Atalantia monophylla* were dried under shade, segregated, pulverized by a mechanical grinder and passed through a 40 mesh sieve. The powdered plant materials were stored in an airtight container.

Preparation of extracts from *Atalantia monophylla*

The above powdered materials were successively extracted with petroleum ether,benzene and ethanol by hot continuous percolation method in Soxhlet apparatus for 24 hrs (Harborne, 1984). The extract was concentrated by using a rotary evaporator and subjected to freeze drying in a lyophilizer till dry powder was obtained and the ethanolic extract was taken for further studies.

Acute toxicity activity of *Atalantia monophylla* leaves in albino wistar rats

Determination of acute oral toxicity is usually the initial screening step in the assessment and evaluation of the toxic characteristics of all compounds. The types of toxicity tests which are routinely performed by pharmaceutical manufacturers in the investigation of a new drug involve acute, sub-acute and chronic toxicity. Acute toxicity is involved in estimation of LD50 (the dose which has proved to be lethal (causing death) to 50% of the tested group of animals) (Shetty *et al.*, 2007).

The acute toxicity studies of ethanolic extract from of *Atalantia monophylla* leaves were carried as per (OECD) draft guidelines.

423 adopted on 17th December 2001 received from Committee for the purpose of Control and Supervision of Experimental Animals (CPCSEA). Depending on the mortality and/or the morbidity status of the animals, an average 2-4 step may be necessary to allow judgement on the acute toxicity of the substance/extracts. This procedure is reproducible, and uses very few animals and is able to rank substances/extracts in a similar manner to the other acute toxicity testing method. The acute toxic class method is based on biometric evaluation (Diener and Schlede, 1999) with fixed doses, adequately separated to enable a substance to be ranked for classification purpose and hazard assessment.

Acclimatization of Animals:

Albino Wistar rats (200-250g) were maintained under standard laboratory condition. After seven days of Acclimatization, the animals were randomly assigned for the acute toxicity groups. Each group containing 3 animals were housed individually in labelled cages with solid plastic sides and floor with stainless steel grid tops. Animals were allowed free access to standard pellet diet (Ashirwad Industries Ltd; Bangaluru, India) and water *ad libitum*. They were maintained in controlled laboratory conditions of 12hrs dark/light cycle, 22±2ºC temperatures and 45-60% humidity.

Administration of ethanolic extract of *Atalantiamono phylla*

Three animals were used for each step of the study. Animals made to fast prior to dosing (food was withdrawn overnight and water was withdrawn 3hrs before drug administration) following the period of fasting. The animals were weighed and the extracts were administered in a single dose, as 1% suspension in gum acacia, by oral intubation. Food was withheld for further one hour after the administration of drug. The starting dose levels selected for the study with a dose of 5mg/kg and the dose was increased step by step to 50,300 and 2000 mg/kg body weight. The mortality of the animals dosed at one step will determine the next step. The procedure flow chart described the procedure followed for each of the starting doses.

The time interval between treatment groups was determined by the onset, duration and severity of toxic signs. Treatment of animals at the next dose should be delayed until one becomes confident of survival of the previously dosed animals.

Evaluation of ethanolic extract of *Atalantia monophylla* leaves fractionated compounds in chromium (VI) induced oxidative stress in albino wistar rats

Experimental Design

Albino wistar rats each weighing 180-220g were obtained from animal house Rodent laboratory chow was access and water *ad libitum*, and rats were maintained on a 12 hour light/dark cycle in a temperature regulated room (20-25^{o}C) during the experimental procedures. The animals were cared for according to the guiding principles in the care & use of animals. Rats were divided randomly into six groups of six animals each and treated for four weeks i.e. 28 days as follows: (Joharapurkar *et al.*, 2003).

Table No. 1: Evaluation of ethanolic extract of *Atalantia monophylla* leaves fractionated compoundin hepatoprotective effect against isoniazid and rifampicin induced hepatotoxicity in albino wistar rats.

S. No.	Groups	Treatment
1.	Group I	Served as normal control group received normal saline in a dose of 10ml/kg orally
2.	Group II	Served as Toxic Control group and was administered chromium 30 mg/kg orally (Ping *et al*., 2006).
3.	Group III	Served as a standard group and was administered Vit. E in a dose of 200mg/kg orally(Vandanatayal *et al*., 2007).
4.	Group IV	Served as treatment group received fractionated compound-5 at a dose of 50 mg/kg administered orally
5.	Group V	Served as treatment group received fractionated compound-
6.	Group VI	6 at a dose of 50 mg/kg administered orally Served as treatment group received fractionated compound- at a dose of 50 mg/kg administered orally

EXPERIMENTAL DESIGN

Thirty six adult male albino wistar rats weighing 180-200g were procured for this study. Rats were divided into 6 groups, each having 6 animals. Before the commencement of the experiment, all animals were kept for one week under the same laboratory conditions, at a temperature of 22 ± 20C, relative humidity of 70± 4% and 12 hour light / dark cycle. They received nutritionally standard diet and tap water. The care and handling of rats were in accordance with the internationally accepted standard guidelines for use of animals.

Induction of experimental hepatotoxicity

Rifampicin and Isoniazid solution were prepared separately in sterile distilled water. Rats were treated with Isoniazid (100 mg/kg, orally) and co- administered with rifampicin (100 mg/kg, orally) for 28 days (Yue, *et al*, 2004 and Saleem, *et al*, 2008). In order to study the effect of fractionated compounds 5, 6, and 7 in rats, 50 mg/kg, orally were used. Silymarin (75 mg/kg orally.) was used as a standard drug in this study (Parthasarathy, *et al*, 2007).

TABLE NO. 2

S. No.	Groups	Treatment
1.	Group I	Served as normal control group received normal saline in a dose of 10ml/kg orally
2.	Group II	Served as toxic control group received Rifampicin and Isoniazid 100mg/kg administered orally.
3.	Group III	Served as standard group received Silymarin 75 mg/kg administered orally
4.	Group IV	Served as treatment group received fractionated compound- 5 at a dose of 50 mg/kg administered orally
5.	Group V	Served as treatment group received fractionated compound- 6 at a dose of 50 mg/kg administered orally
6.	Group VI	Served as treatment group received fractionated compound- 7 at a dose of 50 mg/kg administered orally

RESULT AND DISCUSSION

Animal experimentation

Animals

Male albino wistar rats each weighing 180-220g were used for this study. Rodent laboratory chow was allowed to access and water *ad libitum*, and rats were maintained on a 12 hour

light/dark cycle in a temperature regulated room (20-25^{o}C) during the experimental procedures. The animals were cared for according to the guiding principles in the care& use of animals.

Acute toxicity studies of ethanolic extract of *Atalantia monophylla* leaves

The acute toxicity of ethanol extract of *Atalantia monophylla* leaves was found to be non-toxic upto the dose of 2000mg/kg and did not cause any death of the tested animals. Therefore, one tenth of this dose (200mg/kg) was considered as the evaluation dose.

Treatment Protocol

Effect of ethanolic extract of Atalantia monophylla leaves fractionated compound in chromium (V1) induced oxidative stress in albino wistar rats.

Rats were divided randomly into six groups of six animals each and treated for four weeks i.e. 28 days as follows:

Group I Served as normal control group received normal saline in a dose of 10ml/kg orally.

Group II Served as Toxic Control group and was administered chromium30mg/kg orally.

Group III Served as a standard group and was administered Vit. E in a dose of 200mg/kg orally.

Group IV Served as treatment group received fractionated compound-5 at a dose of 50 mg/kg administered orally.

Group V Served as treatment group received fractionated compound-6 at a dose of 50 mg/kg administered orally.

Group VI Served as treatment group received fractionated compound-7 at a dose of 50 mg/kg administered orally.

On the 29th day all animal were killed by decapitation. Blood was collected and serum was separated for estimation of alanine aminotransferase (ALT) and aspartate aminotranferase (AST). The liver was rapidly excised rinsed in ice-cold saline and a 10%W/V homogenate was prepared using (0.15M KCl) potassium chloride and centrifuged at 800rpm for 10min at 4^{o}C. The supernatant obtained was used for the estimation of catalase, and lipid peroxidation.

Further the homogenate was centrifuged at 1000 rpm for 20 min at 4ºC and the supernatant was used for estimation of SOD and glutathione.

Results of gross behavioural studies in rats on administration of ethanolic extract of *Atalantia monophylla* leaves at the dose of 2000mg/kg.

Effect of ethanolic extract of Atalantia monophylla leaves fractionated compound in hepatoprotective effect against isoniazid and rifampicin induced hepatotoxicity in albino wistar rats.

Thirty six male albino wistar rats weighing 200-250g were procured for this study. They were kept in the experimental research laboratory rats were divided into 6 groups, each having 6 animals. Before the commencement of the experiment, all animals were kept for one week under the same laboratory conditions, at a temperature of 22 ± 2^0C, relative humidity of 70±4% and 12 hour light / dark cycle. They received nutritionally standard diet and tap water. The care and handling of rats were in accordance with the internationally accepted standard guidelines for use of animals.

Rifampicin and isoniazid solution were prepared separately in sterile distilled water. Rats were treated with isoniazid (100 mg/kg, orally) and co-administered with rifampicin (100 mg/kg, orally) for 28 days. In order to study the effect of fractionated compounds 5, 6, and 7 in rats, 50 mg/kg, orally were used. Silymarin (75mg/kg orally.) was used as a standard drug in this study.

Treatment Protocol

Rats were divided into six groups each having six animals.

Group I	Served as normal control group received 10ml/kg normal saline.
Group II	Served as toxic control group received Rifampicin and Isoniazid 100mg/kg administered orally.
Group III	Served as standard group received Silymarin 75 mg/kg administered orally.
Group IV	Served as fractionated compound-5 treatment group received 50mg/kg administered orally.
Group V	Served as fractionated compound-6 treatment group received 50mg/kg administered orally.

Group VI Served as fractionated compound-7 treatment group received 50mg/kg administered orally.

	PROTEIN(g/dl)	GROUPS TOTAL TOTAL ALBUMIN (g/dl)	AST(u/l)	ALT(u/l)	ALP(u/l)
G1	9.30±0.70	6.30±0.70	150.20±6.50	82.45±3.75	124.40±3.15
G2	5.35±0.30*a	4.50±0.40*a	255.25±8.50*a	165.25±5.65*a	267.40±6.25*a
G3	7.95±0.50*b	5.55±0.60*b	180.50±6.85*b	89.25±3.86*b	212.90±5.30*b
G4	7.15±0.42*b	5.05±0.50*b	205.30±7.35*b	110.15±4.36*b	245.45±5.42*b
G5	7.30±0.46*b	5.36±0.48*b	220.20±7.20*b	100.65±4.05*b	225.45±5.05*b
G6	7.50±0.55*b	5.25±0.40*b	202.05±7.00*b	115.90±4.10*b	220.05±4.90*b

All values are expressed as Mean ± SEM (n=6). Values are expressed as Mean ± SEM.

Values were found out by using ONE WAY ANOVA followed by Dunnett's tests.

(a) Values were significantly different from normal control at $p<0.01$.

(b) Values were significantly different from toxic control at $p<0.01$.

Weights of these rats were monitored sequentially in control and experimental animals for a period of 28 days.

Rats were sacrificed 1 h after administration of drug on day 28. The blood was collected by retro-orbital artery puncture. Blood samples were centrifuged for 10 min at 3000rpm to separate the serum. AST, ALT, ALP, total Protein and albumin, GGT, TB, TC, TG, urea, creatinine levels were estimated from the serum by using standard kits.

Effect of ethanolic extract of Atalantia monophylla leaves on hepatoprotective activity

The hepatoprotective activity showed a significantly increased ($p<0.01$) level of serum AST, ALT, ALP, total protein, and total albumin in rats of G2 as compared to G1 (control) due to rifampicin and isoniazid, but these levels were significantly reduced ($p<0.01$) in rats of G3, G4, G5 and G6 treated with Silymarin and fractionated compounds at a dose of 50mg/kg.

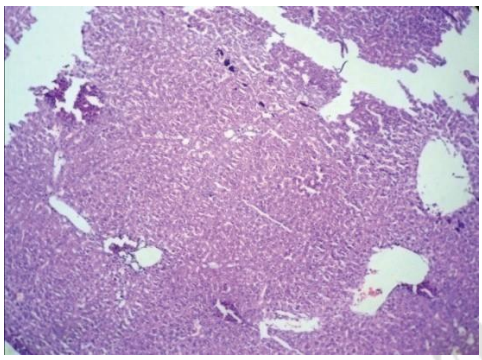
The study revealed that the hepatoprotective effect of fractionated compounds 5, 6 and 7 in rifampicin and isoniazid induced hepatotoxicity in rats. A significant elevation was observed in the levels of serum AST, ALT, ALP and significant decrease level total protein and total albumin in G2 which received rifampicin and isoniazid as compared to G1 rats who received normal saline. Elevated levels of these parameters in serum are presumptive markers of hepatotoxic lesions in the liver.

Co-administration of Silymarin and fractionated compounds 5, 6 and 7 at a dose of 50mg/kg with INH and RIF in G3, G4, G5 and G6, maintained the levels of AST, ALT, ALP, and serum total Protein and total albumin towards normally as compared to G2 rats. This was most likely due to the antioxidant effect of fractionated compounds 5, 6 and 7 constituents. The results are in accordance with some previous studies. On morphological examination in G4, G5 and G6 showed partial recovery in some liver. In this study flavonoids and phenolic compounds in fractionated compounds 5, 6and 7 might have a role in the recovery in rifampicin and isoniazid induced hepatotoxicity in rats.

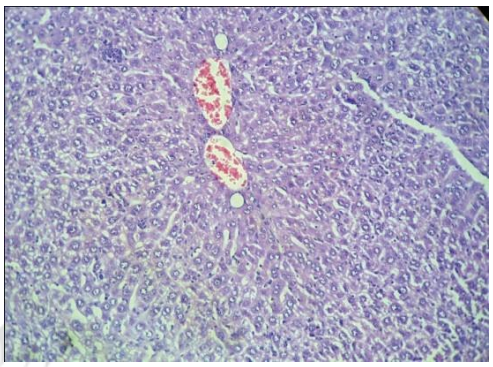
In this study all the groups were compared with G1, the p value is < 0.05 is consider as significant the elevated level of the serum enzyme GGT is in theG2 and in G4, G5, G6 the elevated serum levels is decreased as an effect of fractionated compound 5, 6, 7 and also may be due to the inhibitory effects on cytochrome P-450 or /and promotion of its glucuronidation in non-serum enzyme marker the increased level of G2 is reduced by the fractionated compound 5,6,7 and it may be also bring the liver damaged one into normal function by means of the fractionated compound. In lipid profile the elevated level of G2 is bring back to the normal by G4, G5, G6 because of the toxic substance of liver the lipid profile is increased and also by means of disrupted cholesterol metabolism by liver cells, Kupffer cells and hepatic cells. All the disrupted increased elevated level of lipid profile becomes normal by the fractionated compound.

Histopathological study in hepatoprotective activityof Atalantia monophylla leaves

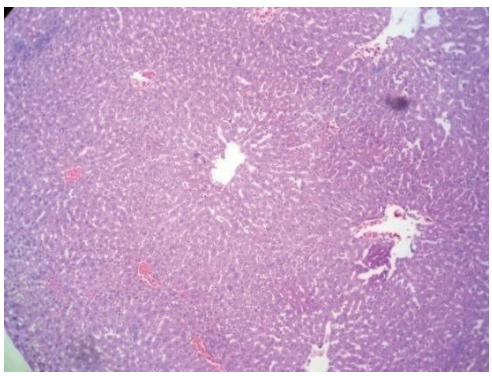
In histopathological study, the chromium induced 30mg/kg rats for antioxidant in vivo studies G2 shows the presence of hepatic congestion at sinusoids and the portal vessel, pericentre globular micro-steatosis, Kuffecell proliferation, hepatocyte diffusene crosis and mononuclear infiltrate. The fractionated treated G4, G5 shows mild hepatic congestion at sinusoids and the portal vessel, pericentre globular micro-steatosis, less Kuffe cell proliferation, mild hepatocyte diffuse necrosis and mononuclear infiltrate. Infractionated treated G6 it shows the presence of normal liver architecture central vein, no evidence of cirrhosis.



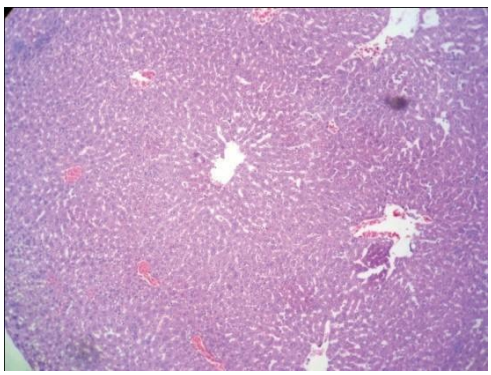
(a) Normal control



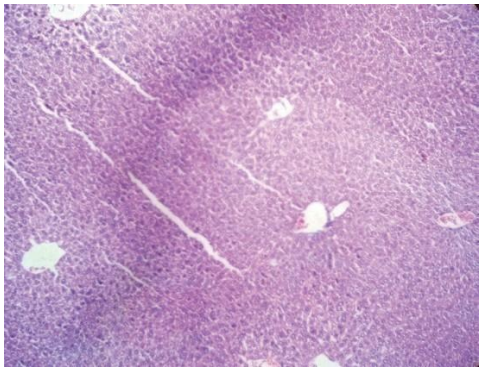
(b) Toxic control

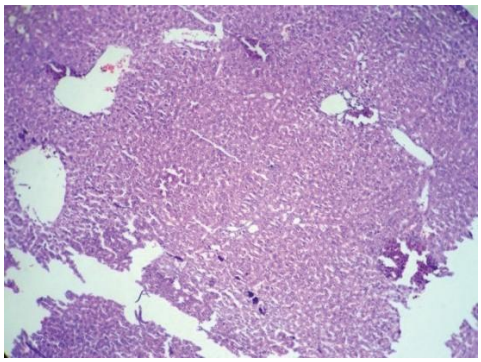


(c) Standard



(d) Fractionated compound 5





(e) Fractionated compound 6 **(f) Fractionated compound 7**

Figure No. 1: Histopathological study for hepatoprotective activity of *Atalantia monophylla* leaves

In hepatoprotective studies, the isoniazid and rifampicin induced hepatotoxicity in G2 rats shows the presence of hepatic congestion at sinusoids and the portal vessel, pericentre globular micro-steatosis, Kuffecell proliferation, hepatocyte diffuse necrosis and mononuclear infiltrate. Infractionated treated G4, G5, G6 it shows the presence of moderate hepatic congestion at sinusoids and the portal vessel, pericentre globular micro-steatosis, less Kuffe cell proliferation, moderate hepatocyte diffuse necrosis and mononuclear infiltrate.

CONCLUSION

Based on the above studies, it is concluded that the *Atalantia monophylla* leaves has significant hepatoprotective activity when compared with the standard.

REFERENCES:

1. Abdel-Wahhab MA, Hassan NS, El-Kady AA, Khadrawy YA, El-Nekeety AA, Mohamed SR, Redginseng extract protects against aflatoxin B1 and fumonisins-induced hepaticpre-cancerous lesions in rats. *Food and chemical toxicology*. 2010; 48:733–742.
2. Ahmed E, Arshad M, Ahmad M, Saeed M, Ishaque, M. Ethanopharmacological survey of some medicinally important plants of Galliy at areas of NWFP, Pakistan. *Asian Journal Plant Science*.2004; 3(4):410-415.
3. Anil Kumar. A review on hepatoprotective herbal drugs International *Journal of Research in Pharmacy and Chemistry*. 2012;2(1):92-102.
4. Bagchi D, Hassoun E. A, Bagchi M, Stohs S. J. Chromium-induced excretion of urinary lipid metabolites, DNA damage, nitric oxide production, generation of reactive oxygen species in Sprague Dawley rats. Composite Biochemistry and Physiology Part C Pharmacology. *Toxicology & Endocrinology*. 1997;110:117-187.
5. Bagchi, D, Stohs S. J, Downs B. W, Bagchi M, Preuss H.G. Cytotoxicity and oxidative mechanisms of different forms of Chromium. *Toxicology*. 1990;180:5-22.
6. Baskar K, Kingsley S, Vendan S E, Paulraj M G, Duraipandiyan V, Ignacimuthu S. Antifeedant, larvicidal and pupicidal activities of *Atalantia monophylla* (L) Correa against *Helicoverpa armigera* Hubner

(*Lepidoptera:Noctuidae*)*Chemosphere*.2009;75:355–359.
7. Baskar K,Muthu C, Raj GA, Kingsley S, Ignacimuthu S. Ovicidal activity of *Atalantia monophylla* (L) Correa against *Spodoptera litura* Fab. (*Lepidoptera*: Noctuidae). *Asian Pacific Journal of Tropical Biomedicine*. 2012;2:987–991.
8. Benzie IEF and Strain JJ. The ferric reducing ability of plasma (FRAP) as a measure of "antioxidant power" the FRAP assay. *Analytical Biochemistry*.1996;239:70-76.
9. Bishayee A, Darvesh A. S, Politis T, McGory R. Resveratrol and liver disease from bench to bedside and community. *Liver International*. 2010; 30:1103–1114.
10. Brinda R, Vijayanandraj S, Uma D, Malathi D, Paranidharan V and Velazhahan R. Role of *Adhatoda vasica* (L.) Nees leaf extract in the prevention of aflatoxin-induced toxicity in Wistar rats. *Journal of the Science of Food andAgricultur*.2013;93(11):2743-2748.
11. Brower V. Nutraceuticals, Nutritional Therapy, Phytonutrients, and Phytotherapy for Improvement of Human Health. *Nature BioTechnology.*1998;16: 728–731.
12. Cameron GR, Milton RF and Allen J W. Measurement of flavonoids in plant samples.*Lancet*.1943;179.
13. Carl WC. Indian *Atalantia*, An ornamental tree for landscaping in southern florida. *Process Florida State Horticultural Society.*1979;92:215.
14. Chukaew A, Ponglimanont C, Karalai C, Tewtrakul S. Potential anti-allergic acridone alkaloids from the roots of *Atalantia monophylla*. *Phytochemistry*. 2008;69:2616–2620.
15. Corcoran RM, Durnan SM. Albumin determination by modified bromcresol green method. *Clinical Chemistry*.1977;23:765-766.
16. Cullen J. M, and Miller R. T. The role of pathology in the identification of drug-induced hepatic toxicity. *Expert Opinion on Drug Metabolism and Toxicology*. 2006;2(2):241-247.
17. Cupp MJ. Herbal remedies: adverse effects and drug interactions. *American family physician.* 1999; 59:1239– 1244.
18. Danjanov I. Anderson pathology 10th edition, Mosby, London. 1996:1835.
19. Dartsch P. C, Hildenbrand S, Kimmel R, Schmahl F.W. Investigations on the nephrotoxicity and hepatotoxicity of trivalent and hexavalent Chromium compounds, *International Archives of Occupational and Environmental health.*1998;71: 40-45.
20. De Smet PAGM, Keller K, Hansel R, Chandler RF. eds adverse effects of herbal drugs. Berlin, Germany. *Springer–Verlag*.1997;3:94-98.
21. Dey PM and Harborne JB. Methods in Plant Biochemistry: Academic Press, London. 1987; 253-284.
22. Diener Wand Schlede E. Acute Toxic Class Methods: Alternatives to LD/LC50 Tests, *ALTEX*. 1999;16(3):129-134.
23. Dilcher D.L., Approaches to the identification of angiosperm leaf remains. *Botanical Review*.1974;40: 1-157.
24. Duh PD, Tu YY, Yen GC. Antioxidant activity of water extract of *Harng Jyur* (*Chrysanthemum morifolium* Ramat). LMT-*Food Science and Technology*.1999;32: 269-277.
25. Ebrahimzadeh MA, Pourmorad Fandbekhradnia AR. Iron chelating activity, phenol and flavanoid content of some medicinal plants from Iran. *African Journal of Biotechnology*. 2008;7(18):3188-3192.
26. Edrington TS, Kamps-Holtzapple CA, Harvey RB, Kubena LF, Elissalde MH and Rottinghaus GE. Acute hepatic and renal toxicity in lambs dosed with fumonisin containing culture material. *Journal of animal science*.1995;73:508–515.
27. Eleni Kyriakou, Alexandra Primikyri, Pantelis Charisiadis, Maria Katsoura, Ioannis P, Gerothanassis, Haralambos Stamatis, Andreas G, Tzakos. Unexpected Enzyme-Catalyzed Regioselective Acylation of Flavonoid Aglycones. *Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry*.2012; 1-26.
28. Elizabeth Kand Rao MNA. Oxygen radical scavenging activity of Curcumin. *International Journal of Pharmaceutics*.1990**;**5:237-240.
29. Elman GI. Tissue sulphydryl groups. *Archives of Biochemistry and Biophysics.*1959;82: 70-77.
30. Evans W. C. An index of medicinal plants. A Text book of Pharmacognosy.14thed.1997; 7(5): 12-14.
31. Evans, W. C. Pharmacognosy. 15th ed. English Language Book, Society Baillere Tindall, Oxford University Press. 2002;15-18

32. Evans, W. C. Plants in medicine: the origins of pharmacognosy. In: Trease and Evans's Pharmacognosy. 15th ed. W. B. Saunders, London, U.K. 2002; 3– 4.
33. Fabricant S. D, Fransworth R. N. The value of plants used in Traditional Medicine for Drug Discovery. *Environmental Health Perspectives*.2001;109:69– 75.
34. Finar G. Plants of economic importance. Medicinal Plants and Medicine in Africa. Spectrum Books Ltd. Ibadan.1986;78:150-153.
35. Foster CS and Dunn O. Stable reagents for determination of Serum triglyceride by a colorimetric Hantzsch condensation method. *Clinical Chemistry*.1973;19:338-340.
36. Gilani, S. A, Qureshi R. A, Gilani S. J. Indigenous uses of some important ethnomedicinal herbs of Ayubia National Park, Abbottabad, Pakistan. *Ethnobotany Leaflets*.2006;10:285- 293.
37. Jaishree V, Badami S. Antioxidant and hepatoprotective effect of swertiamarin from *Enicostemm axillare* against D-galactosamine induced acute liver damage in rats. *Journal of Ethnopharmacology*. 2010;130:103–106.
38. Jarald E. E, Jarald S. E. A text book of pharmacognosy and phytochemistry (1st Ed.) CBS Publisher and distributers, New Delhi, India.2007;6.
39. Jia X.Y, Zhang Q.A, Zhang Z.Q, Wang Y, Yuan Y.F, Wang H.Y, Zhao D. Hepatoprotective effects of almond oil against carbon tetrachloride induced liver injury in rats. *Food Chemistry*.2011;125:673–678.