Vol 3 | Issue 2| 2012 | 83-86.

e - ISSN 2249-7544
Print ISSN 2229-7464

INTERNATIONAL JOURNAL
OF
PHYTOPHARMACY RESEARCH
www.phytopharmacyresearch.com

A REVIEW ON HEPATOPROTECTIVE PLANTS

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ABSTRACT

Liver is a vital organ play an important role in metabolism and excretion of xenobiotics from the body. Liver injury or liver dysfunction is a major health problem that challenges not only health care professionals but also the pharmaceutical industry and drug regulatory agencies. Liver cells are damaged by various toxic chemicals (certain antibiotic, chemotherapeutic agents, carbon tetrachloride (CCL_4), thioacetamide (TAA) etc.), excessive alcohol consumption and microbes is well-studied. The available synthetic drugs to treat liver disorders also cause further damage to the liver. Hence, Herbal drugs have become increasingly popular and their use is wide-spread. Herbal medicines are used in the treatment of liver diseases for a long time. At present number of herbal preparations are available in the market. The present review is aimed at compiling data on promising phytochemicals from medicinal plants that have been tested for hepatotoxicity models using modern scientific system. A combination of different herbal extracts/fractions is likely to provide desired activities for the treatment of severe liver diseases. Development of such medicines with standards of safety and efficacy can revitalise treatment of liver disorders and hepatoprotective activity.

Keywords: Liver, Toxic Chemicals, Hepatoprotective Plants.

INTRODUCTION

Medicinal plants play an important role in the human health care. About 80% of the world population rely on the use of traditional medicine which are predominantly based on plant materials [1]. The traditional medicine refers to a broad range of ancient natural health care practices including folk or tribal practices as well as Ayurveda, Siddha, and Unani. These medical practices originated from time immemorial and developed gradually, to a large extent, by relying or based on practical experiences without significant references to modern scientific principles.

It is estimated that about 7,500 plants are used in local health traditions in, mostly, rural and tribal villages in India. Out of these, the real medicinal value of over 4,000 plants is either little known or unknown to the mainstream population. The classical systems of medicine such as Ayurveda, Siddha, Unani and Tibetan use about 1,200 plants [2].

Liver diseases and medicinal plants

Liver is considered to be one of the most vital organs that functions as a centre of metabolism of nutrients such as carbohydrates, proteins and lipids and excretion of waste metabolites. Additionally, it is also handling the metabolism and excretion of drugs and other xenobiotics from the body there,by providing protection against foreign substances by detoxifying and eliminating them.

Liver diseases are among the most serious ailment. They may be classified as acute or chronic hepatitis (inflammatory liver diseases), hepatosis (non inflammatory diseases) and cirrhosis (degenerative disorder resulting in fibrosis of the liver). Liver diseases are mainly caused by toxic chemicals (certain antibiotics, chemotherapeutics, peroxidised oil, aflatoxin, carbon-tetrachloride, chlorinated hydrocarbons, etc.), excess consumption of alcohol, infections and autoimmune/ disorder. Most of the hepatotoxic chemicals damage liver cells mainly by inducing lipid peroxidation and other oxidative damages in liver. Enhanced lipid peroxidation produced during the liver microsomal metabolism of ethanol may result in hepatitis and cirrhosis. It has been estimated that about 90% of the acute hepatitis is due to viruses. The major viral agents involved are Hepatitis A, B, C, D (delta agents), E and G. Of these, Hepatitis B infection often results in chronic liver diseases and cirrhosis of liver. Primary liver cancer has also been shown to be produced by these viruses.

The present review is aimed at compiling data based on reported works on promising phytochemicals from medicinal plants that have been tested in hepatotoxicity models (Table 1).

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Table 1. Some of the reported hepatoprotactive medicinal plants

S.No	Name of the Plant	Family	Plant Parts to Be Used	Extracts	Induced Agents
1	*Boerhaavia diffusa*	Nyctaginaceae	Roots	Aqeous extract	thioacetamide
2	*Eclipta alba*	Asteraceae	leaves	ethanol	Paracetamol,CCl_4
3	*Solanum nigrum*	solanaceae	leaves	Aqeous	Paracetamol CCl_4
4	*Annona squamosa*		Whole plant	Alcohol,aqeous	Isoniazid+rifampicin
5	*Wedelia calendulacea*	asteraceae	leaf	ethanol	CCl_4
6	*Apium graeolens linn*	apiaceae	Whole plant	Methonolic,pet ether, aetone	CCl_4
7	*Spermacoce hispida*	Rubiaceae	Whole plant	ethanolic	CCl_4
8	*Fumaria indica*	fumariceae		Pet ether	CCl4,paracetamol
9	*Mamordica subangulata*	cucurbitaceae	Leaves,whole plant	aqeous	Paracetamol
10	*Naragamia alata*	meliaceae	leaves	aqeous	Paracetamol
11	*Juncus subulatus*	juncaceae	Powdered tubers	70%methanol	Paracetamol
12	*Cassia fistula*	leguminosae	seeds	methanolic	Paracetamol
13	*Leucas aspera*	Lamiaceae	leaves	Fresh juice	CCl_4
14	*Leucas ciliate*	Lamiaceae	leaves	ethanol	CCl_4
15	*Andrographis paniculata*	acanthaceae	Whole plant	methanol	CCl_4
16	*Moringa olefera*	moringaceae	Leaves,fruits	water	Paracetamol
17	*Swertia chirata*	Gentianaceae			
18	*Azadirachta indica*	meliaceae	leaf	70%methanol	Paracetamol
19	*Aerva lanata linn*	amaranthaceae	Coarse powder plant material	Hydro alcoholic	Paracetamol
20	*Ricinus communis*	euphorbiaceae	leaves	Cold aqeous extract	CCl_4
21	*Feronia elephantum*	Rutaceae	Fruits	Methanolic extract	Paracetamol
22	*Ocimum sanctum*	lamiaceae	leaves	Hydro alcoholic	Paracetamol
23	*Ginkgo biloba*	ginkgoaceae	Dried extract	ethanol	CCl_4
24	*Acacia catechu*	leguminosae	Powdered pale catechu	Ethyl acetate	CCl_4
25	*Hibiscus esculentus*	malvaceae	roots	water	CCl_4
26	*Foeniculum vulgare*	Umbelliferae	seeds	Essential oil	CCl_4

Boerhaavia diffusa

An aqueous extract of roots of *B.diffusa* at a dose of 2 mg/kg exhibited the remarkable protection of various enzymes such as serum glutanic-oxaloacetic transaminase, serum glutanicpyruvic transaminase, and bilirubin in serum against hepatic injury in rats [3,4].

Eclipta alb

The hepatoprotective effect ofthe ethanol/water [1:1] ,extract of *Eclipta Alba* (Asteraceae) was studied at subcellular levels in rats. The study shows that hepatoprotective activity of *Eclipta alba* is by regulating the levels of hepatic microsomal drug metabolizing enzymes against carbon tetra chloride induced hepatotoxicity. *Eclipta alba* significantly counteracted carbon tetra chloride induced inhibition of the hepatic microsomal drug metabolizing enzymes. The loss of hepatic lysosomal acid phosphatase and alkaline phosphatase by CCl_4 was significantly restored by *Eclipta alba* [5].

Solanum nigrum

Solanum nigrum is the protective effects of aqueous extract of *Solanum nigrum*(ASNE) against liver damage were evaluated in carbon tetra chloride induced chronic hepatotoxicity in rats. The results showed that the treatment of ASNE significantly. Lowered the carbon tetra chloride induced serum levels of hepatic enzyme markers, superoxide and hydroxyl radicals. Liver histopathology showed that ASNE reduced the incidence of liver lesions including hepatic cells cloudy swelling, lymphocytes infiltration, hepatic necrosis, and fibrous connective tissue proliferation induced by carbon tetra chloride in rats. Therefore, the results of this study suggest that ASNE could protect liver against the carbon tetra chloride induced oxidative damage in rats [6,7].

Annona squamosa

The protective effect was evaluated in diethyl nitrosamine induced hepatotoxicity. This study revealed that the extracts of *Annona squamosa* exerted hepatoprotective effect and the plant extract could be an effective remedial for chemically induced hepatic damage (Raj *et al.*, 2009) .The extracts of *Annona squamosa* were used to study the hepatoprotective effect in isoniazid and rifampicin induced hepatotoxic model in albino Wistar rats. There was a significant decrease in total bilirubin accompanied by significant increase in the level of total protein and also significant decrease in ALP, AST, and ALT in treatment group as compared with the hepatotoxic group. In the histopathological study, the hepatotoxic group showed hepatocytic necrosis and inflammation in the

centrilobular region with portal triaditis. The treatment group showed minimal inflammation along with moderate portal triaditis and their lobular architecture was normal [8].

Wedelia calendulacea

The Hepatoprotective activity of the ethanol leaf extract of *W.calendulacea* (Asteraceae) (EEWC) was studied by estimating serum enzyme activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), protein and bilirubin. The treatment with EEWC showed dependent reduction of carbon tetra chloride induced elevated serum levels of enzyme activities with parallel increase in total protein and bilirubin, indicating the extract could preserve the normal functional status of the liver [9].

Apium graeolens linn

The hepatoprotective activity of the *Apium graeolens Linn* (Apiaceae) against carbon tetra chloride induced hepatotoxicity in albino rats. The degree of protection was measured by using biochemical parameters like serum transaminases like SGOT and SGPT, alkaline phosphatase, total protein and albumin. The methanolic extracts showed the most significant hepatoprotective activity comparable with standard drug silymarin. Other extracts namely petroleum ether and acetone also exhibited a potent activity on hepatic cells [10].

Spermacoce hispida

The Ethanolic extract of the *Spermacoce hispida Linn* (SHE) against carbon tetra chloride induced hepatotoxicity in rats. Liver functions were assessed by the determination of SGOT, SGPT, ALP and bilirubin. The serum biochemical analysis results suggest that the use of Ethanolic extract of *Spermacoce hispida Linn* exhibited significant protective effect from hepatic damage in carbon tetra chloride induced hepatotoxicity model. Histopathological studies revealed that concurrent administration of the extract with carbon tetra chloride exhibited protective effect on the liver, which further evidenced its hepatoprotective activity [11].

Fumaria indica

The *Fumaria indica* (Fumariceae) were studied for their hepatoprotective activity against carbontetrachloride, paracetamol and rifampicin induced heptatotoxicites in albino rats. The petroleum ether extract against carbonetrachloride, total aqueous extract against paracetamol and methanolic extract against rifampicin-induced hepatotoxicities showed similar reductions in the elevated levels of some of the serum biochemical parameters in a manner similar that of the standard drug like silymarin indicating its potential as a hepatoprotective agent.[12]

Mamordica subangulata

The *Mamordica subangulata* leaf suspension protected rats from Paracetamol induced liver damage as judged from serum marker enzyme activities. It also stimulated bile flow in normal rats [13].

Naragamia alata

Naragamia alata was inactive in protecting rats from paracetamol induced hepatotoxicity. *Naragamia alata* whole plant suspension was studied using paracetamol overdose induced liver damage in rats, the effect of the plant suspensions on bile flow was studied in anaesthetised normal rats by surgical cannulation of bile duct with polyethylene tubing. The drug was given intraduodenally after 1 hour bile collection [13].

Juncus subulatus

The volatile oil, ethyl acetate, n-butanol and total alcoholic extracts of *J. subulatus* were evaluated for their hepatoprotective and antioxidant activity in female rats against ethanol induced hepatic injury Serum Liver enzymes (AST, ALT and ALP), total protein, albumin, cholesterol, triglycerides, nitric oxide, malondialdhyde (MDA) and total antioxidant capacity (TAC) were measured colorimetrically. The results showed that extracts of *Juncus subulatus* exhibited hepatoprotective activity in the following order: volatile oil extract > ethyl acetate extract > n-butanol extract > total alcoholic extract [14].

Cassia fistula

Hepatoprotective activity of the n-heptane extract of Cassia fistula (Fabaceae) leaves was investigated by the inducing hepatotoxicity with paracetamol in rats. The extract with significant dose by orally shows protective effect by lowering the serum levels of transaminases (SGOT and SGPT), bilirubin and alkaline phosphatase (ALP). The effects produced were comparable to that of a standard silymarin [15].

Leucas aspera

The effect of *Leucas aspera* leaves fresh juice against carbon tetrachloride induced liver damage. The evaluation markers used were SGOT, SGPT, Alkaline phosphate, glucose, bilirubin, cholesterol and total protein. These biochemical parameters were significantly changed due to single dose of carbon tetra chloride, but the treatment of *Leucas aspera* leaves fresh juice significantly recovers all markers to normal levels. In this study silymarin was used as a standard for comparison. The observation of markers as well as Light & electron microscope photographs supports the regeneration of liver parenchyma. This proves overall promising effect against liver disorders. [16]

Leucas ciliata

The Hepatoprotective activity of the ethanolic extract of *Leucas ciliata* leaves extract was evaluated by carbon tetrachloride induced liver damage model in rats. In hepatoprotective activity study, carbon tetra chloride significantly increased the levels of serum glutamate pyruvate transaminase (SGPT), serum glutamate oxaloacetate transaminase (SGOT), alkaline phosphatase (ALP) and total bilirubin. Pre-treatment of the rats with

ethanolic extract of *L. ciliata* inhibited the increase in serum levels of SGPT, SGOT, ALP and total bilirubin and the inhibition was comparable with silymarin .The present study revealed that *L. ciliata* leaves have significant hepatoprotective activity [17].

Andrographis paniculata

Andrographolide, the major antihepatotoxic component of the plant, exerted a pronounced protective effect in rats against hepatotoxicity induced by carbon tetra chloride, D galactosamine, paracetamol and ethanol. Andrographolide inhibited the carbon tetra chloride induced increase in the activity of serum glutamate oxaloacetate transaminase, serum glutamate pyruvate transaminase, alkaline phosphatase, bilirubin and hepatic triglycerides. Oxidative damage through free radical generation involved in the hepatotoxic effect of carbon tetrachloride and paracetamol [18-21].

CONCLUSION

Chronic hepatic diseases stand as one of the foremost health troubles worldwide, with liver cirrhosis & drug induced liver injury accounting ninth leading cause of death in western and developing countries. Therapies developed along the principles of western medicine are often limited in efficacy, carry the risk of adverse effects, & are often too costly, especially for the developing world. Therefore, treating liver diseases with plant-derived compounds which are accessible and do not require laborious pharmaceutical synthesis seems highly attractive. In this review article, an attempt has been made to compile the reported hepatoprotective plants in India and abroad & may be useful to the health professionals, scientists and scholars working the field of pharmacology and therapeutics to develop evidence based alternative medicine to cure different kinds of liver diseases in man and animals.

REFERENCES

1. WHO, Regional Office For The Western Pacific, Research Guidelines For Evaluating The Safety And Efficacy Of Herbal Medicines, Manila, WHO, 1993.
2. Pushpangadan P. Role of Traditional Medicine in Primary Health Care. In: Iyengar PK, Damodaran VK, Pushpangadan P, Editors. Science for Health. Published By State Committee On Science, Technology And Environment, Govt. Of Kerala, 1995.
3. Rawat AKS, Mehrotra S, Tripathi SK and Shama U. Hepatoprotective activity inpunarnava – a popular Indian ethnomedicine. *Journal of Ethnopharmacology*, 56(1), 1997, 61-68.
4. Chakraborti KK and Handa SS. Antihepatotoxic investigations of Boerhaaviadiffusa L. *Indian Drugs*, 27, 1989, 161-166
5. Saxena AK, Singh B, Anand KK. Hepatoprotective effects of *eclipta alba* on subcellular levels in rats. *Journal of ethnopharmacology*, 40(3), 1993, 155-61.
6. Chang-Chi H, Hsun-Lang F, Wen-Chuan L. Inhibitory effect of *Solanum nigrum* on thioacetamide-induced liver fibrosis in mice. *J Ethnopharmacol*, 119, 2008, 117–121.
7. Hui-Mei L, Hsien-Chun T, Chau-Jong W, Jin-Jin L, Chia-Wen L, Fen-Pi C. Hepatoprotective effects of *Sola-num nigrum* Linn extract against CCl_4-iduced oxida-tive damage in rats. *Chemico-Biological Interactions*, 171, 2008, 283–293.
8. Saleem MTS, Christina AJM, Chidambaranathan N, Ravi V and Gauthaman K. Hepatoprotective activity of Annona squamosa (Linn) on experimental animal model. *Int J Applied Res Nat Pro*, 1(3), 2008, 1-7.
9. Murugaian P, Ramamurthy V, and Karmegam N. Hepatoprotective Activity of Wedelia calendulacea L. against Acute Hepatotoxicity in Rats. *Research Journal of Agriculture and Biological sciences*, 4, 2008, 685-87.
10. Ahmed B et al. Hepatoprotective activity of two plants belonging to the Apiaceae and the Euphorbiaceae family. *Journal of Ethnopharmacology*, 79, 2002, 313–316.
11. Karthikeyan M et al. hepatoprotective activity ofethanolic extract of spermacoce hispida.linn against carbon tetrachloride (CCl_4) induced hepatotoxicity on albino wistar rats. *IJPRD*, 2, 2006, 45-52.
12. Rao KS, Mishra SH. Hepatoprotective activity of the whole plants of *Fumaria indica*. *Indian journal of pharmaceutical science*, 59(4), 1997, 165-70.
13. Asha VV. Preliminary studies on the hepatoprotective activity of *mamordica subangulata* and *naragamia alata*. *Indian Journal of Pharmacology*, 33, 2001, 276-279.
14. Abdel-razik AF et al. Chemical constituents and hepatoprotective activity of *Juncus subulatus*. *Rev. Latinoamer. Quim*, 37, 2009, 70-84.
15. Bhakta T, Banerjee S, Subhash CM, Tapan K. Maity, Saha BP, Pal M. Hepatoprotective activity of Cassia fistula leaf extract. *Phytomedicine*, 8, 2001, 220-24.
16. Shirish S. Pingale Hatoprotection by fresh juice of *Leucas Aspera* leaves. *Der Pharmacia Sinica*, 1, 2010, 136-140.
17. Mohammad N, Qureshi et al. In-vitro Antioxidant and In-vivo Hepatoprotective activity of Leucas ciliate leaves Rec. *Nat. Prod*, 4: 2010: 124-130.
18. WHO monographs on selected medicinal plants; volume- II; WHO Geneva; AITBS publishers, India; p12-21, 300-310.
19. Kanokwan Jarukamjorn et al. *Journal of health science*, 54(4), 2008, 370-381.
20. Niranjan A. *Indian Journal of Natural Products and Resources*, 1(2), 2010, 125-135.
21. Handa SS and Sharma A. *Indian J Med Res*, 92, 1990, 276-83.