

**Hepatoprotective activity of medicinal plants - a review**

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ABSTRACT

All plants have a potential medicinal significance. Medicinal plants are considered as important therapeutic aid for alleviating ailment of humankind. Numerous herbal plants or botanical medicines and polyherbal formulations are used for the treatment of liver diseases (Hepatoprotective). A number of herbal preparations are available in the market. Liver is a vital organ play a major role in metabolism and excretion of xenobiotics from the body. Liver cell injury caused by a range of toxic chemicals (certain chemotherapeutic agents, anti-biotic, carbon tetrachloride (CCl₄), paracetamol (PCM), thioacetamide (TAA) etc.), excessive alcohol consumption and microbes is well-studied. The present review is aimed at compiling data on promising phytochemicals from medicinal plants that have been tested in hepatotoxicity models using modern scientific system.

Keywords: Hepatoprotective, Medicinal plants, Liver injury, Carbon tetrachloride, Paracetamol.

INTRODUCTION:

The liver is the largest glandular organ in the body has more functions than any other body organ. A person's whole blood supply passes throughout the liver several times a day. The Liver has a fundamental role in human metabolism. Liver generate and secretes bile, it also generates prothrombin and fibrinogen (both blood clotting factors and heparin) ⁶. A mucopolysaccharide sulfuric acid and ester that helps to keeps blood from clotting within the circulatory system. The liver change sugar into glycogen, Liver diseases have one of the main causes of morbidity and mortality in man and animals all over globe and Hepatotoxicity due to drugs appears to be the most common contributing factor. Along with the various diseases that can affect the liver the most common is 'viral hepatitis' (Inflammation of liver caused by viral infection). Hepatitis can be source of drugs⁵, viruses, bacteria, and parasites like amoebas or giardiasis⁶. The danger of the liver intoxication has just increased by the higher exposure to pesticides, environmental toxins and repeated use of chemotherapeutics.² The liver is a vital body organ and principal importance is involved in the maintenance of metabolic functions and detoxification of the exogenous and endogenous challenges like xenobiotics, viral infections, drugs and chronic alcoholism.

The liver plays an amazing array of vital functions in the performance, maintenance and regulation of homeostasis of the body. It is concerned with all the

biochemical pathways to growth, clash in opposition to disease, energy provision, nutrient supply and reproduction. And the functions as a centre of metabolism of nutrients like proteins, carbohydrates and lipids and excretion of waste metabolites. The bile released by the liver, along with other things, plays an key role in digestion. As a result, maintenance of a healthy liver is necessary for the overall well being of an individual Medicinal plants play a key role in the human health care. About 80% of the world population relies on the use of traditional medicine which is predominantly based on plant resources. The conventional medicine refers to a wide range of ancient natural health care practices including folk/tribal practices as well as Ayurveda, Siddha, Amchi and Unani. The classical systems of medicine such as Ayurveda, Siddha, Amchi, Unani and Tibetan use about 1,200 plants.⁴ A detailed investigation and documentation of plants used in local health traditions and pharmacological evaluation of these plants and their taxonomical relatives can lead to the development of invaluable plant drugs for many dreaded diseases.

HEPATOTOXICITY:

Hepatotoxin is a toxic substance which damages the liver. Toxic liver injury created by drugs and chemicals may nearly mimic any form of naturally occurring liver disease. Hepatoprotective cause was studied against chemicals and drugs induced hepatotoxicity in rats like carbon tetrachloride (CCl₄), alcohol, paracetamol, galactosamine,

isoniazid, antibiotics, aflatoxin, rifampicin, peroxidised oil, etc.²

EXPERIMENTAL MODELS USED FOR HEPATOPROTECTIVE SCREENING:

Several chemical reagents and drugs which induce necrosis, liposis, carcinogenesis, cirrhosis and hepatobiliary dysfunctions in experimental animals are classified as hepatotoxins. There are following experimental models explained by employing some of the important hepatotoxins.

1) **Carbon tetra chloride (CCl₄) model:** A number of Carbon tetra chloride models are invented, depending upon its dosage through different routes of administration.

a) **Acute hepatic damage:** Acute liver damage, characterized by ischemia, hydropic degeneration and central necrosis is caused by oral or subcutaneous administration of CCl₄ (1.25ml/kg). The maximum elevation of biochemical parameters are found to be 24 hours after the CCl₄ administration normally administered as 50% v/v solution in liquid paraffin or olive oil.

b) **Chronic reversible hepatic damage:** Administration of CCl₄ (1ml/kg S.C.) twice weekly for 8 weeks generates chronic, reversible liver injury.

c) **Chronic, irreversible hepatic damage:** Administration of CCl₄ (1ml/kg S.C.) twice weekly for 12 weeks produce chronic, irreversible liver injury.

2) **Thioacetamide model:** Thioacetamide (100mg/kg S.C.) induces acute hepatic damage after 48 hrs of administration by causing sinusoidal congestion and hydropic swelling with increased mitosis.

3) **Paracetamol model:** Paracetamol induces acute hepatotoxicity depending upon its dosage through different routes of administration, like

- Paracetamol (800mg/kg i.p.) induces centrilobular necrosis without steatosis.
- Paracetamol at a single dose (3g/kg p.o.) produces acute hepatic injury. It get 48 hours to provoke the toxicity.

4. **Chloroform model:** It produces hepatotoxicity with extensive central necrosis, hepatic cell degeneration, fatty metamorphosis and necrosis either by inhalation or by subcutaneous administration (0.4-1.5ml/kg).

5. **Ethanol model:** Ethanol induces liposis to a different degree depending on its dose, route and time of administration such as:

- A single dose of ethanol (1ml/kg) induces fatty degeneration.
- Administration of 40%v/v ethanol (2 ml/100gm per day p.o.) for 21 days makes fatty liver.
- Administration of country made liquor (3ml/100 gm per day p.o.) for 21 days makes liposis.

Table 1: Medicinal plants used for Hepatoprotective activity.

Sr. No.	Plant name	Family	Plant part used	Hepatotoxicity inducing agents	Screening methods	Ref. No.
1.	<i>Orthosiphon stamineus</i>	Lamiaceae	Leaves	Acetaminophen	Ast Alt alp	7
2.	<i>Baliospermum montanum</i>	Euphorbiaceae	Roots	Paracetamol	SGPT, SGOT and alkaline phosphate, Histopathological changes in liver	8
3.	<i>Tridax procumbens</i>	Asteraceae	Leaves	Carbon tetrachloride	Glutathione, superoxide dismutase and catalase	9
4.	<i>Acacia catechu</i>	Leguminosae	Powdered pale catechu	Carbon tetrachloride	SGPT, SGOT, Serum alkaline phosphatase and Bilirubin content	10
5.	<i>Phyllanthus niruri</i>	Euphorbiaceae	Leaves, fruits	Carbon tetrachloride	GOT, GPT, DPPH radical scavenging	11
6.	<i>Cochlospermum Planchoni</i>	Coclospermaceae	Rhizomes	Carbon tetrachloride	Total bilirubin Alkaline phosphatase Alanine aminotransferase	12
7.	<i>Glycyrrhiza</i>	Fabaceae	Root	Carbon	TBARS,CD,SOD,CAT,GST,	13

	<i>glabra</i> Linn.		powder	tetrachloride	GSH-Px, GSH,	
8.	V S N G P i t e l a a t e t y r v e r h c a i x a o c t b n s e h t a o i t a r r l d a i k e r S f s o u o , l r l y i s i a a t n w e d a r u n o c s i e h d d i s , , t 0 a 1 n 1 n i n s	KVerbenaceae	Leaves	Carbon tetrachloride	Total protein, Histopathological studies, ALP, AST, ALT.	14
9.	<i>Aloe barbadensis</i>	Liliaceae	Dried aerial parts	Carbontetra chloride	Serum transaminases, alkaline phosphatase, bilirubin and triglycerides.	15
10	<i>Anisochilus carnosus</i> Linn	Lamiaceae	Stems	Carbon tetra chloride	SGOT, SGPT and Total bilirubin.	16
11	<i>Andrographis paniculata</i>	Acanthaceae	Leaves	Carbon tetra chloride	serum transaminases, GPT and GOT, serum alkaline phosphatase	17
12	<i>Azadirachta indica</i>	Meliaceae	Dried powder	Carbon tetra chloride	AST, ALT and Bilirubin	18
13	<i>Tylophora indica</i>	Asclepidaceae	Leaves	Carbon tetra chloride	SGPT, SGOT, Serum alkaline phosphatase and Bilirubin content	19
14	<i>Hibiscus esculentus</i> Linn.	Malvaceae	Roots	Carbon tetra chloride	SGPT, SGOT, ALP, Total bilirubin (TB)	20
15	<i>Trianthema decandra</i>	Aizoaceae	Leaves	Carbon tetra chloride	AST, ALT and Bilirubin	21

16	<i>Hoslundia opposita</i>	Lamiaceae	Stem	Carbon tetrachloride and paracetamol	AST, ALT and Bilirubin	22
17	<i>Plantago Major</i> L.	Plantaginaceae	Seeds	Carbon tetrachloride	AST, ALT, ALP and Bilirubin	23
18	<i>Ginkgo Biloba</i>	Ginkgoaceae	Dried extract	Carbon tetrachloride	SGPT, SGOT, SPA and Bilirubin content, Histopathological studies	24
19	<i>Scoparia dulcis</i>	Scrophulariaceae	Whole plant	Carbon tetrachloride	AST, ALT, ALP, Total Bilirubin content, Histopathological studies	25
20	<i>Vitex trifolia</i>	Verbenaceae	Leaves	Carbon tetrachloride	AST, ALT, ALP, Total protein, Histopathological studies	26
21	<i>Pterospermum acerifolium</i>	Sterculiaceae	Leaves	Carbon tetrachloride	AST, ALT, ALP	27
22	<i>Ocimum sanctum</i>	Lamiaceae	Leaves	Paracetamol	AST, ALT, ALP, Total protein, Histopathological studies	28
23	<i>Ricinus Communis</i>	Euphorbiaceae	Leaves	Carbon tetrachloride	AST, ALT, ALP, Total protein, Histopathological studies.	29
24	<i>Picrorhiza Kurroo</i>	Scrophulariaceae	Root and rhizomes	Alcohol-carbon tetrachloride	GOT, GPT and Total bilirubin.	30
25	<i>Cleome viscosa</i> Linn.	Capparidaceae	Leaf powder	Carbon tetrachloride	AST, ALT, ALP and Histopathological studies	31
26	<i>Phyllanthus polyphullus</i>	Euphorbiaceae	Leaves	Acetaminophen	GGTP, LPO, SOD, GPx, GST	32
27	<i>Embelia ribes</i>	Myrsinaceae	Fruits	Paracetamol	SGPT, SGOT, ALP, Total bilirubin (TB) and Histopathological studies	33
28	<i>Capparis spinosa</i>	Capparidaceae	Root bark	Carbon tetrachloride	AST, ALT, ALP	34
29	<i>Juncus subulatus</i>	Juncaceae	Powdered tubers	Paracetamol	AST, ALT, ALP, NO, MDS, TAC.	35
30	<i>Spondias pinnata</i>	Anacardiaceae	Stem heart wood	Carbon tetrachloride	SGPT, SGOT, ALP, Total bilirubin (TB)	36
31	<i>Alocasia indica</i> Linn.	Araceae	Leaves	Paracetamol	AST, ALT, ALP, SGPT, Total bilirubin	37
32	<i>Cassia fistula</i>	Leguminosae	Seeds	Paracetamol	SGOT, SGPT, ALP and Billirubin	38

33	<i>Piper longum</i>	Piperaceae	Fruits and roots powder	Carbon tetrachloride	SGOT, SGPT, ALP and Billirubin	39
34	<i>Chamomile capitula</i>	Asteraceae	Fresh natural mature capitula	Paracetamol	Liver glutathione, Na+ K+ ATPase activity, serum bilirubin, serum marker enzymes and glycogen.	40
35	<i>Calotropis procera</i>	Apocynaceae	Flowers	Paracetamol	SGPT, SGOT, ALP, bilirubin, cholesterol, HDL and tissue GSH.	41
36	<i>Aerva lanata Linn.</i>	Amaranthaceae	Coarse powder plant material	Paracetamol	AST, ALT, ALP, Total bilirubin.	42
37	<i>Acacia confuse</i>	Leguminosae	Bark	Carbon tetrachloride	AST, ALT, MDA, CYP2E1, SOD, GPX, CAT in erythrocytes.	43

CONCLUSION:

Medicinal plants are the most resourceful source of medicinal substances, nutrients, natural supplements and pharmaceutical compounds. Many plants are used for their compounds in perfume and food industry, cosmetics and complementary therapy. In this review article, effort has been taken to collect and compile the details regarding a few hepato – protective natural products, which will be useful to the society to venture in to a field of alternative systems of medicine. Although experimental evaluations were carried out on a number of these plants and formulations. The therapeutic values were checked against a only some chemicals-induced subclinical levels of liver damages in rodents.

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