Medicinal plants as hepatoprotective agents in Indian systems of medicine: A review

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Received on: 03-April-2018, Accepted and Published on: 18-May-2018

ABSTRACT

Liver is a most important organ of the body. It plays an important role to maintaining various physiological processes in the body. It is involved in several vital functions, such as metabolism, secretion and storage. It plays a central role in the detoxification and excretion of many exogenous and endogenous compounds. Hence, any injury or impairment of its function has grave implications for the health of the affected person. Many more drugs or therapies are available for the treatment of hepatic disorders, but still there is a need for the novel drug discovery which can target multiple disease pathways. In the 21st century there is a great that paradigm shift towards therapeutic evaluation of herbal products. The use of herbal products has a great role in the treatment of liver diseases and has no side effects. There are a number of hepatoprotective plants have been reported. In this review article, effort has been taken to collect and compile the details of hepatoprotective plants, which will be helpful in the field of Indian system of medicines.

Keywords: Hepatoprotective plants, Liver, Indian systems of medicine.

INTRODUCTION

Liver is a paramount organ of the body and is strategically positioned to perform its task of maintaining the body’s metabolic homeostasis. It is susceptible to persistent attack by offending agents like chemicals and other toxins. It has been estimated that approximately 14-16 million people are infected with hepatitis B virus in South East Asia region and about 6% of the total population in the region are carriers of this virus. About 20,000 deaths occur every year due to liver diseases (World Health Organization). Hepatocellular carcinoma is one of the ten most common tumors in the world with over 2,50,000 new cases each year.

Ayurveda is a traditional Indian medicinal system being practiced for thousands of years. It has been estimated that more than 750,000 species of higher plants exist on earth from which many more plants have been used in traditional system of medicine. The World Health Organization estimates that about three quarters of the world’s population currently use herbs and other forms of the traditional medicines to treat their diseases, as they are cheap and easily available. Faith in these traditional systems of medicine is related to cultural practices and belief. Review has introduced hepatoprotective medicinal plants that are used mainly for the treatment of liver disorders.

HEPATOPROTective MEDICINAL PLANTS:

Traditional herbal drugs are wonderful remedies for the treatment of various devastating disorders. Various herbs viz Andrographis paniculata, Cyperus longus and Asteracantha longifolia are known to possess therapeutic efficacy of cure liver diseases. Several hundred plants have been examined for use in a wide variety of liver disorders. Following are the few important hepatoprotective plants.

**Taraxacum officinale:** It is commonly known as Dandelion, has been widely used as a folkloric medicine for the treatment of liver and kidney disorders.

**Wilkstroemia indica:** W. indica is a Chinese herb and has been evaluated in patients suffering from hepatitis B. A dicoumarin, daphnoretin are the active constituents of the herb. The drug has shown to suppress HbsAG in Hep3B cells. It activates protein kinase C.

**Tephrosia purpurea:** In animal models, it offered protective action against carbon tetrachloride and D-galactosamine poisoning. The roots, leaves and seeds contain tephrosin, deguelin and quercetin.

**Glycyrrhiza glabra:** It is extensively used in Japan for the treatment of patients with liver diseases. A significant reduction of serum aminotransferases and suggested that long-term usage of glycyrrhizin prevents development of hepatocellular carcinoma in chronic hepatitis.
Phyllanthus niruri / Phyllanthus amarus: Phyllanthus niruri and Phyllanthus amarus are known to possess hepatoprotective activity12. Geetha et al., (1992) found improved liver function in patients treated with Phyllanthus amarus bringing about a significantly faster normalization of biochemical changes than control groups13.

Bupleurum falcatum: The crude drug, saiko from the roots of Bupleurum falcatum has been widely used in oriental medicine for the treatment of hepatobiliary diseases. Active components responsible for the alleviation of liver dysfunction have been identified to be a mixture of saikosaponins14.

Schizandra chinensis: The seed extract of Schisandra chinensis was investigated in the rats for its therapeutic effect on phase I hepatic drug metabolism against CCl4 intoxication. Data suggested Schisandra chinensis as a promising agent for the improvement of Phase 1 oxidative metabolism in liver damaged by CCl4 15.

Andrographis paniculata: Andrographis paniculata is popularly known as Kalmegh and grows wildly in India. Hepatoprotective effect of Kalmegh has been reported to be quite significant against acute hepatitis induced by carbon tetrachloride, paracetamol and D-galactosamine as is evident from morphological, biochemical and functional parameters16.

Picrorhiza kurroa: Picrorhiza kurroa, a well reputed Indian medicinal plant popularly known as kutki has been extensively worked up for hepatoprotective activity in a wide variety of experimental models by a number of researchers 17, 18.

Artemisia scoparia / Artemisia iwayomongi: Extract from Artemisia iwayomongi inhibits liver fibrosis induced by carbon tetrachloride in rats19. The study supports the folkloric use of the plant Artemisia scoparia in liver damage due to the presence of this compound20.

Boerhaavia diffusa Linn.: Boerhaavia diffusa abundantly occurs as a weed throughout India. The chlororom and methanolic extract of the roots and aerial parts of Boerhaavia diffusa exhibited hepatoprotective activity against carbon tetrachloride, paracetamol and D-galactosamine intoxication in experimental rats21.

Eclipta alba: Eclipta alba exhibited antihapatotoxic activity against carbon tetrachloride, D-galactosamine and phalloidin induced toxicity against rat hepatocytes22. The study shows that hepatoprotective activity is due to the regulation of hepatic microsomal drug metabolizing enzymes.

Wedelia calendulacea: The active constituent wedelolactone isolated from Wedelia calendulacea is known to possess significant hepatoprotective activity23. The leaves of Wedelia calendulacea afforded a significant protection against paracetamol induced hepatocellular injury24.

Apium graveolens: Hepatoprotective activity of Apium graveolens was monitored for several liver function tests. Researchers confirmed the hepatoprotective potential of methanolic extract of Apium graveolens12.

Garcinia kola: Kolaviron (active constituent of Garcinia kola) recoupe the CCl4 induced liver damage25. Kolaviron also protects erythrocyte membrane from free radical attack on both lipids and proteins26.

Curcuma longa: Hepatoprotective activity of Curcuma longa and curcuminoids against carbon tetrachloride and galactosamine induced liver damage has been reported27. Curcumin also has been found to inhibit the activity of glutathione-s-transferase28.

Pistacia lentiscus: Aqueous extract of Pistacia lentiscus showed marked antihapatotoxic activity by reducing the activities of ALP, ALT, AST and the level of bilirubin29.

Arctium lappa: Arctium lappa significantly improved various pathological and biochemical parameters, which were disturbed by ethanol and CCl4 induced liver damage30.

Carica papaya: Ethanolic and aqueous extract of Carica papaya was evaluated for its antihapatotoxic activity against CCl4 induced liver damage. The activity was measured by using biochemical parameters such as AST, ALT, ALP, total bilirubin and GGT31.

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Gentiana oligeria Griseb.: Hepatoprotective effect of Gentiana oligeria Griseb. against carbon tetrachloride induced hepatic damage in rats has been evaluated. Results of biochemical tests and histopathological examination confirmed the hepatoprotective potential of Gentiana oligeria33.

Foeniculum vulgare: The hepatotoxicity produced by CCl4 was inhibited by essential oil of Foeniculum vulgare with evidence of decreased levels of ALT, AST and bilirubin34.

Aquilegia vulgaris L.: Ethanolic extract of Aquilegia vulgaris L. showed significant reduction in the barbiturate induced sleeping time which was prolonged by CCl4 in mice was observed indicating protective effect on microsomal drug metabolizing enzymes35.
HEPATOPROTECTIVE PLANTS WITH THEIR ACTIVE CONSTITUENTS:

<table>
<thead>
<tr>
<th>Name of the plant</th>
<th>Active constituents</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Eclipta alba</em></td>
<td>Wedelactone and dimethylwedelactone, Andrographolide, Kolaviron, Silybin, Picroside I; Picroside II; Kutkoside; Gomishins; Schisandrin A; Wuweizisu C</td>
</tr>
<tr>
<td><em>Andrographis paniculata</em></td>
<td>Glycyrrhizin; Glycyrrhetic acid, Saikosaponins, Sarmentosins, Catechin, Ursolic acid, Curcumin, Fumaric acid, Wedelactone, Myristicin</td>
</tr>
<tr>
<td><em>Garcinia kola</em></td>
<td><em>Silybum marianum</em></td>
</tr>
<tr>
<td><em>Picrorhiza kurroa</em></td>
<td><em>Schizandra chinensis</em></td>
</tr>
<tr>
<td><em>Glycyrrhiza glabra</em></td>
<td><em>Bupleurum falcatum</em></td>
</tr>
<tr>
<td><em>Sesamum indicum</em></td>
<td><em>Talinum officinale</em></td>
</tr>
<tr>
<td><em>Curcuma longa</em></td>
<td><em>Vitis vinifera</em></td>
</tr>
<tr>
<td><em>Sida cordifolia</em></td>
<td><em>Punica granatum</em></td>
</tr>
<tr>
<td><em>Wedelia calendulacea</em></td>
<td><em>Myristica fragrans</em></td>
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<tr>
<td><em>Camellia sinensis</em></td>
<td><em>Phyllanthus niruri</em></td>
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SOME MORE PLANTS EVALUATED FOR LIVER PROTECTION:

<table>
<thead>
<tr>
<th>Plants / Authors</th>
<th>Toxicants</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Trianthema portulacastrum</em> L.</td>
<td>Acetaminophen, Thioacetamide</td>
<td>AST, ALT, ALP, bilirubin and protein content.</td>
</tr>
<tr>
<td><em>Bupleurum kaoi Liu.</em></td>
<td>CCl4</td>
<td>AST, ALT, LPO, antioxidative enzymes and histopathology.</td>
</tr>
<tr>
<td><em>Salvia officinalis</em> (Lima et al., 2004)</td>
<td>Tert-butyl hydroperoxide</td>
<td>Cell viability, LDH leakage, LPO and glutathione status.</td>
</tr>
<tr>
<td><em>Hypericum androsalorum</em> (Valentao et al., 2004)</td>
<td>Tert-butyl hydroperoxide</td>
<td>LDH, LPO, GSH and GSSG.</td>
</tr>
<tr>
<td><em>Acanthopanax sp.</em></td>
<td><em>D</em>-galactosamine</td>
<td>AST, ALT, TUNEL and DNA fragmentation assay.</td>
</tr>
<tr>
<td><em>Helminthostachys zeylanica</em> L.</td>
<td>CCl4</td>
<td>AST, ALT, choleretic activities, hexobarbitone induced sleeping time, LPO in vitro and histopathology.</td>
</tr>
<tr>
<td><em>Nymphaea stellata</em> Wild.</td>
<td>CCl4</td>
<td>Serum marker enzymes, LPO, GSH, glutathione peroxidase, bilirubin, glycogen, SOD and catalase activity.</td>
</tr>
<tr>
<td><em>Phyllanthus maderaspatensis</em> Lin.</td>
<td>Acetaminophen</td>
<td>Choleretic activity, serum marker enzymes, in vitro hydroxyl radical scavenging activity and LPO.</td>
</tr>
<tr>
<td><em>Rosa damascena</em> (Achuthan et al., 2003)</td>
<td>CCl4</td>
<td>AST, ALT, ALP, LPO and hydroxyl peroxide radical.</td>
</tr>
<tr>
<td><em>Astercantha longifolia</em> (Hewawasam et al., 2003)</td>
<td>Acetaminophen and CCl4</td>
<td>AST, ALT, ALP, GSH and histopathology.</td>
</tr>
<tr>
<td><em>Salvia miltiorrhiza</em> (Lee et al., 2003)</td>
<td>CCl4</td>
<td>AST, ALT, LDH, GSH and GST activity.</td>
</tr>
<tr>
<td><em>Rhodiola sachalinensis</em> (Nan et al., 2003)</td>
<td>CCl4</td>
<td>AST, ALT, Albumin, hydroxyproline, TBARS and histopathology.</td>
</tr>
<tr>
<td><em>Angelica archangelica</em> (Yeh et al., 2003)</td>
<td>Ethanol</td>
<td>AST, ALT, Cytochrome c test and in vitro &amp; in vivo LPO.</td>
</tr>
</tbody>
</table>
**Paederia foetida**, a herbs used as food in north east region of India, has shown promising hepatoprotective activity. Chanda and coworkers reported its hepatoprotective activity against H. pyroli.

**CONCLUSION:**

Hepatic diseases are one of the foremost health problems in recent years. Therefore, treating liver diseases with plant derived compounds, which are more accessible. Considering the enormous biodiversity resources of Indian traditional system and the high incidence of liver complications, the present review focused on collection of data of the hepatoprotective herbal plants, which are available in India. This review article may be useful to the health professionals, scientist 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.

**ACKNOWLEDGEMENT:**

I take this opportunity to express my gratitude and regards to my guide Prof. Sangeeta Shukla, vice chancellor Jiwaji university Gwalior for her exemplary guidance, monitoring and constant encouragement.

**REFERENCES AND NOTES**


