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Hepatoprotective activity of selected medicinal plants: A Review

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ABSTRACT

Liver damage is an epidemic disease, which effects essential biochemical activities in all age group. The liver abnormalities caused by synthetic drugs are found to be broad. Conventional drugs used for the treatment of liver disorders are inadequate. In view of the undesirable side effects of synthetic drugs, it is necessary to search for alternative drugs for the treatment of hepatic diseases and replacement of the currently used drugs. Herbal drugs have become very popular for their use in the treatment of liver diseases. Therefore, there is need to focus on systematic research methodology to evaluate scientific basis for the traditional herbal medicines that are claimed to possess hepatoprotective activities. The present review is aimed at providing an overview of the most prospective medicinal plants having pharmacologically reputable antihepatotoxic activities such as *Andrographic paniculata*, *Boerhaavia diffusa*, *Ocimum sanctum*, *Tinospora cordifolia*, *Phyllanthus emblica*, *etc.*

Introduction

Liver play a vital function in regulation of metabolism and excretion of toxins from the body. Liver damage is now a common disease that affects the biochemical activities of all age groups. In severe damage of liver, liver cells die or become fibrotic (Agrawal, 2001). This injury may be due to toxic chemicals (eg. carbon tetrachloride (CCl_4), thioacetamide (TAA) and antibiotics etc.) The above chemicals induces lipid per oxidation and oxidative damages in liver (Smuckler, 1975). Therefore therapeutic agents which increases liver cell proliferation should be included in treatment of liver damage and search for alternative drugs to replace the currently used drugs, must be encouraged as liver abnormalities and undesirable side effects of allopathic or synthetic drugs is found to be broad. Herbal drugs is now becoming prominent in combating liver problems as they are found to be inexpensive, better compatibility with the human body and minimal side effects than allopathic drugs (Thyagarajan, 2002).

Herbal medicinal plants that can be used for preventing liver damage must have properties such as antiviral activity (Hepatitis B, Hepatitis C, etc) or antihepatotoxicity (antioxidants and others) or liver regeneration activity. As single plant generally does not have all the above properties therefore use of two or more different herbs can provide the above effects but the combination of herbs must prove standards of safety for hepatoprotective activity. The plants possesses medicinal properties due to the presence of variety of chemical compounds phenols, carotenoids, flavonoids and alkaloids (Chatterjee, 2000).

Plants having hepatoprotective activity-

According to literature there is large number of plants and formulations that have been claimed to have hepatoprotective activity. Some of the major herbs with hepatoprotective activity studied here are *Tinospora cordifolia* (Guduchi) *Andrographis paniculata* (Kalmegha), *Boerhaavia diffusa* (Punarnava), *Ocimum Sanctum* (Tulsi), *Phyllanthus emblica* (Amla) and *Azadirachta indica* (Neem).

Tinospora cordifolia (Guduchi) is one of the extensively used herb and famous for its hepatoprotective activity, antioxidant, antidiabetic, anti-inflammatory, antiaging and memory enhancing properties. The active adaptogenic constituents in stem are alkaloid berberine, giloin,and diterpene compounds (Singh et.al. 2003). *Andrographis paniculata* (Kalmegha) is herb and known for its hepatoprotective, antihepatitis B, antioxidant and anticancer activity. The active compounds in leaves are andrographolides, kalmeghin, and andrographin (Sastry 2008). The leaves contain the highest amount of andrographolide, the most medicinally active phytochemical in the plant, while the seeds contain the lowest (Sastry, 2008). *Boerhaavia diffusa* is also known for its hepatoprotective activity, antioxidant and anti inflammatory action. The active compound mainly present in leaves and roots of the plant is alkaloid punarnavine (Rawat, 1997). *Ocimum Sanctum* has good antioxidant activity and leaves are natural sources of many important antioxidant compounds, alkaloids, glycosides & tannins that provide a wide variety of health benefits. Besides this the plant also contains alkaloid glycosides & tannins (Chattopadhyay, 1992). *Phyllanthus emblica* has been found to exhibit marked inhibitory effect on hepatitis B virus which is evident by its wide application in cases of chronic jaundice (Dweck AC, 2002). *Azadirachta indica* leaves are also used to treat liver disorders, hyperglycaemia, diabetes and hypertension. The leaves also prevent damage caused by free radicals in the body by neutralizing them (Sotheeswaran S, 1998).

Hepatoprotective activity of selected medicinal plants-

Hepatoprotective activity of plants and their extracts were tested against the sub clinical levels of liver damages in rodents which are chemical induced. The experimental evaluations were reviewed as shown in table 1.

Mechanism of action

As chemicals damages the liver by causing lipid peroxidation and production of free radicals due to chemical attack, destruction of cellular membranes that surround liver cells takes place.

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Table 1: Hepatoprotective activity of selected medicinal plants

Name of the Plant	Source or Family	Plant parts used	Hepatotoxicity inducing agents	Extracts studied	Biochemical and Histopathological Parameters studied
Boerhaavia diffusa	Nyctaginaceae	Leaves and Roots	Thioacetamide	Aqueous and ethanolic extract	SGOT, SGPT
Andrographis paniculata	Acanthaceae	Leaf	Carbon tetrachloride	Ethanolic extract	serum transaminase, SGOT and SGPT, serum alkalinephosphatase, serum bilirubin and hepatic triglycerides
Tinospora cordifolia	Menispermaceae	Stem	Carbon tetrachloride	Ethanolic & Methanolic extract	serum transaminase, SGOT and SGPT, serum alkaline phosphatase
Ocimum sanctum	Lamiaceae	Leaf	Paracetamol	Aqueous	Aspartate amino transferase (AST), alanine amino transferase (ALT), alkaline phosphatase (ALP), total bilirubin
Phyllanthus emblica	Euphorbiaceae	Aerial part	Ethanol	Aqueous	serum transaminases (AST and ALT), serum triglyceride (STG), hepatic triglyceride (HTG)
Azadirachta indica	Meliaceae	Leaf	Paracetamol	70% ethanol	serum transaminases (AST and ALT), serum triglyceride (STG), hepatic triglyceride (HTG)

Source: C.Hari Kumar, et.al., (2011), IJPSR

But when herbal compounds were given to animals three days before the toxic chemicals, there was a significant protective effect in the liver due to the antioxidant ability of the herbal compounds (Kapil, 1993). Herbal compounds significantly increase the bile flow, bile salts, and bile acids which is produced in the liver and stored in the gallbladder and aids in digestion. In case of Infective hepatitis and liver cirrhosis, it was found that there was marked improvement in patients when herbal compounds were given, having improvement in appetite and diminished jaundice. Use of herbs also decreased the probability of gallstone formation and aid fat digestion (Zheng, Z.Y., (1983). Morevover, berberine reduces hepatic fat content in the rats of non-alcoholic fatty liver disease (NAFLD), berberine also prevents proliferation of hepatic stellate cells (HSCs), which are central for the development of fibrosis during liver injury (Chang, X.X., (2009). Ayurvedic or natural herbal medicines and its extract strengthens, tones and balances the liver (hepatotonic) and shows hepatoprotective activity (Das and Agarwal, 2011).Herbal medicines and its extract exhibited a significant protective action of liver evident by a reduction in elevated levels of serum lysosomal enzymes namely serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT), Alkaline Phosphate (ALP) in both CCl_4 and rifampicin-isonizid induced hepatotoxicity (Desai *et al*., (2008).

Conclusion

There is large number of plants and formulations that have been claimed to have hepatoprotective activity. Herbal compounds significantly increase the bile flow, bile salts, and bile acids which are produced in the liver and stored in the gallbladder and aids in digestion having improvement in appetite and diminished jaundice. Use of herbs also decreased the probability of gallstone formation and aid fat digestion. Herbal drugs have become increasingly popular and their use is wide-spread in the treatment of liver diseases for the maintenance of a healthy liver. Therefore, there is growing focus to follow systematic research methodology to evaluate scientific basis for the traditional herbal medicines that are claimed to possess hepatoprotective activities.

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