A review on hepatoprotective activity of medicinal plants

Rachna Verma

Abstract
Liver is vital organ play a major role in metabolism and excretion of xenobiotics from the body. Liver cell injury caused by various toxic chemicals (certain antibiotic, chemotherapeutic agents, carbon tetrachloride, thioacetamide etc.), excessive alcohol consumption and microbes is well studied. The available synthetic drugs to treat liver disorders in this condition also cause further damage to the liver. Hence, Herbal drugs have become increasingly popular and their use is wide-spread. Herbal medicines have been used in the treatment of liver diseases for a long time so the maintenance of a healthy liver is essential for the overall well-being of an individual. Liver injury induced by toxins is more common nowadays. Herbal remedies are focused in the pharmaceutical industry to evolve a safe route for liver disorders. Therefore, hepatoprotective natural products such as *Boerhaavia diffusa*, *Baliospermum montanum*, *Tridax procumbens*, *Glycyrrhiza glabra*, *Phyllanthus niruri*, *Cochlospermum planchonii*, *Cordia macroedii*, *Piper chabu*, *Acacia catechu*, *Ginkgo biloba*, *Scoparia dulcis*, *Vitex trifolia*, *Trialthema decandra*, *Tylorhona indica*, *Hoslandia opposita* is reviewed. The present review is aimed at compiling data on promising Phytochemical from medicinal plants that have tested in hepatotoxicity models using modern scientific system.

Keywords: Liver diseases, Hepatoprotection, Hepatotoxicity, Herbal drugs

Introduction
Man’s existence on this earth has been made possible only because of the vital role played by plant kingdom. Nature always stands as golden mark to amplify the outstanding phenomenon of symbiosis. Medicinal plants existing even before human being made their appearance on the earth.

Traditional medicines using herbal drugs exist in every part of world. Global estimates indicate that over 3/4th of the 5 billion world population cannot afford the products of Western Pharmaceutical Industry and rely upon the use of traditional medicines derived from plants [1]. Every country develops its own medicinal system, which include China, Egypt and India. Thus, the Indian medicinal system came into existence. Raw materials are obtained from plants sources in the form of crude drugs such as dried herbal powders (or) extracts (or) mix of products [2]. Siddha, Unani and Tibetan are traditional health care systems which have been flourishing for many centuries. These practices incorporated ancient beliefs and were passed on from one generation to another by oral tradition and/or guarded literature. Although herbal medicines are effective in the treatment of various ailments very often these drugs are unscientifically exploited and/or improperly used. Therefore, these plant drugs deserve detailed studies in the light of modern science.

Liver diseases and medicinal plants
Liver has a pivot role in regulation of physiological processes. It is involved in several vital functions such as metabolism, secretion and storage. Furthermore, detoxification of a variety of drugs and xenobiotics occurs in liver. The bile secreted by the liver rats has, among other things, an important role in digestion. Liver diseases are among the most serious ailment. They may be classified as acute or chronic hepatitis (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 [3]. It has been estimated that about 90% of the acute hepatitis is due to viruses. The major viral agents involved are hepatitis B, A, 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 shown to be produced by these viruses. When they present there still lacks a consensus on how to manage these patients he hepatocellular carcinoma. In the HBeAg genotype, mutant variants and the development of needed to clarify whether there is an association between conquer hepatitis B infection. For instance, more studies, mutant variants, knowledge regarding host, viral infection, we still have a long way to go before we can arrange them in the systemic order as shown in table 1

<table>
<thead>
<tr>
<th>Name of Plant</th>
<th>Source or Family</th>
<th>Plant parts used</th>
<th>Hepatotoxic inducing agents</th>
<th>Extracts studied</th>
<th>Biochemical and Histopathological Parameters studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boerhaavia diffusa</td>
<td>Nyctaginaceae</td>
<td>Roots</td>
<td>Thioacetamide</td>
<td>Aqueous</td>
<td>Aspartate amino transferase and Alanine amino transferase</td>
</tr>
<tr>
<td>Baliospermum montanum</td>
<td>Euphorbiaceae</td>
<td>Roots</td>
<td>Paracetamol</td>
<td>Alcohol, chloroform extract</td>
<td>Glutamate oxaloacetate transaminase and Glutamate pyruvate transaminase</td>
</tr>
<tr>
<td>Tridax procumbens</td>
<td>Asteraceae</td>
<td>Leaves</td>
<td>Carbon tetrachloride</td>
<td>Ethanolic extract</td>
<td>Glutathione, superoxide dismutase and catalase</td>
</tr>
<tr>
<td>Glycyrrhiza glabra</td>
<td>Fabaceae</td>
<td>Root powder</td>
<td>Carbon tetrachloride</td>
<td>Root powder mixed with animal feed</td>
<td>Lipid peroxidation</td>
</tr>
<tr>
<td>Phyllanthus niruri</td>
<td>Euphorbiaceae</td>
<td>Leaves and fruits</td>
<td>Carbon tetrachloride</td>
<td>Methanolic and aqueous</td>
<td>Glutamate oxaloacetate transaminase and Glutamate pyruvate transaminase</td>
</tr>
<tr>
<td>Cochlospermum planchonj</td>
<td>Coclospermaeae</td>
<td>Rhizomes</td>
<td>Carbon tetrachloride</td>
<td>Aqueous</td>
<td>Total bilirubin, Alkaline phosphate and Alamine aminotransfer</td>
</tr>
<tr>
<td>Cordia macleodii</td>
<td>Boraginaceae</td>
<td>Leaves</td>
<td>Carbon tetrachloride</td>
<td>Ethanolic</td>
<td>Glutamate pyruvate transaminase and Serum glutamate oxaloacetate transaminase</td>
</tr>
<tr>
<td>Piper longum</td>
<td>Piperaceae</td>
<td>Fruit</td>
<td>Carbon tetrachloride</td>
<td>Milk extract</td>
<td>Serum glutamic oxalactic transaminase, Serum glutamic pyruvate transaminase and Bilirubin</td>
</tr>
<tr>
<td>Acacia catechu</td>
<td>Leguminosae</td>
<td>Powdered pale catechu</td>
<td>Carbon tetrachloride</td>
<td>Ethyl acetate</td>
<td>Serum glutamic oxalactic transaminase, Serum glutamic pyruvate transaminase, Serum alkaline phosphate and Bilirubin</td>
</tr>
<tr>
<td>Ginkgo biloba</td>
<td>Ginkgoaceae</td>
<td>Dried extract</td>
<td>Carbon tetrachloride</td>
<td>Ethanolic</td>
<td>Serum glutamic oxalactic transaminase, Serum glutamic pyruvate transaminase, Serum alkaline phosphate and Bilirubin</td>
</tr>
<tr>
<td>Scoparia dulcis</td>
<td>Scrophulariaceae</td>
<td>Whole plant</td>
<td>Carbon tetrachloride</td>
<td>Methanol, diethyl ether and petroleum ether</td>
<td>Aspartate amino transferase, Alanine amino transferase, Alkaline phosphate and Total bilirubin</td>
</tr>
<tr>
<td>Vitex trifolia</td>
<td>Verbenaceae</td>
<td>Leaves</td>
<td>Carbon tetrachloride</td>
<td>Ethanol and water</td>
<td>Total protein, Histopathological studies, Aspartate amino transferase and Alanine amino transferase</td>
</tr>
<tr>
<td>Triantehema decandra</td>
<td>Aizoaceae</td>
<td>Leaves</td>
<td>Carbon tetrachloride</td>
<td>Aqueous</td>
<td>Aspartate amino transferase and Alanine amino transferase and Bilirubin</td>
</tr>
<tr>
<td>Tylophora indica</td>
<td>Asclepidaceae</td>
<td>Leaves</td>
<td>Carbon tetrachloride</td>
<td>Methanolic</td>
<td>Serum glutamic oxalactic transaminase, Serum glutamic pyruvate transaminase and Total Bilirubib</td>
</tr>
<tr>
<td>Hoslandia opposite</td>
<td>Lamiaceae</td>
<td>Stem</td>
<td>Carbon tetrachloride</td>
<td>Methanol and ethyl acetate</td>
<td>Aspartate amino transferase and Alanine amino transferase and Bilirubin</td>
</tr>
</tbody>
</table>

3. Conclusion
It has been encouraging to witness the recent discoveries in HBV infection with insights into the existence of genotype subgroups, mutant variants, knowledge regarding host, viral and environmental factors on the disease course, as well as advances in new treatment modalities. However, despite the much progress in understanding the natural history of HBV infection, we still have a long way to go before we can conquer hepatitis B infection. For instance, more studies are needed to clarify whether there is an association between genotype, mutant variants and the development of hepatocellular carcinoma. In the HBeAg-positive sub group, there still lacks a consensus on how to manage these patients when they present with signs of mild liver disease activity with alanine amino transferases less than two fold increase; future studies with longer follow-up may help us gain knowledge about the HBV behaviour in these individuals. There is much more to be understood about mutations and their impacts on the clinical course and long-term outcome of hepatitis B infection. For instance, it has been suggested that mutations can arise from vaccine-induced antibodies and this renders the immune response generated by the vaccination ineffective. Therefore, mutations may play a key role in the difficulties of managing hepatitis B infection. Hence, further research and understanding in this sector may bring exciting new information and better understanding of the natural history of HBV and supplement our existing armamentarium to combat this persistent worldwide prevalent disease.

Table 1: Hepatoprotective activity of the medicinal plants

- **Boerhaavia diffusa**
  - Source or Family: Nyctaginaceae
  - Plant parts used: Roots
  - Hepatotoxic inducing agents: Thioacetamide
  - Extracts studied: Aqueous
  - Biochemical and Histopathological Parameters studied: Aspartate amino transferase and Alanine amino transferase

- **Baliospermum montanum**
  - Source or Family: Euphorbiaceae
  - Plant parts used: Roots
  - Hepatotoxic inducing agents: Paracetamol
  - Extracts studied: Alcohol, chloroform extract
  - Biochemical and Histopathological Parameters studied: Glutamate oxaloacetate transaminase and Glutamate pyruvate transaminase

- **Tridax procumbens**
  - Source or Family: Asteraceae
  - Plant parts used: Leaves
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Ethanolic extract
  - Biochemical and Histopathological Parameters studied: Glutathione, superoxide dismutase and catalase

- **Glycyrrhiza glabra**
  - Source or Family: Fabaceae
  - Plant parts used: Root powder
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Root powder mixed with animal feed
  - Biochemical and Histopathological Parameters studied: Lipid peroxidation

- **Phyllanthus niruri**
  - Source or Family: Euphorbiaceae
  - Plant parts used: Leaves and fruits
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Methanolic and aqueous
  - Biochemical and Histopathological Parameters studied: Glutamate oxaloacetate transaminase and Glutamate pyruvate transaminase

- **Cochlospermum planchonj**
  - Source or Family: Coclospermaeae
  - Plant parts used: Rhizomes
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Aqueous
  - Biochemical and Histopathological Parameters studied: Total bilirubin, Alkaline phosphate and Alamine aminotransferase

- **Cordia macleodii**
  - Source or Family: Boraginaceae
  - Plant parts used: Leaves
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Ethanolic
  - Biochemical and Histopathological Parameters studied: Glutamate pyruvate transaminase and Serum glutamate oxaloacetate transaminase

- **Piper longum**
  - Source or Family: Piperaceae
  - Plant parts used: Fruit
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Milk extract
  - Biochemical and Histopathological Parameters studied: Serum glutamic oxalactic transaminase, Serum glutamic pyruvate transaminase and Bilirubin

- **Acacia catechu**
  - Source or Family: Leguminosae
  - Plant parts used: Powdered pale catechu
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Ethyl acetate
  - Biochemical and Histopathological Parameters studied: Serum glutamic oxalactic transaminase, Serum glutamic pyruvate transaminase, Serum alkaline phosphate and Bilirubin content

- **Ginkgo biloba**
  - Source or Family: Ginkgoaceae
  - Plant parts used: Dried extract
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Ethanolic
  - Biochemical and Histopathological Parameters studied: Serum glutamic oxalactic transaminase, Serum glutamic pyruvate transaminase, Serum alkaline phosphate and Bilirubin content

- **Scoparia dulcis**
  - Source or Family: Scrophulariaceae
  - Plant parts used: Whole plant
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Methanol, diethyl ether and petroleum ether
  - Biochemical and Histopathological Parameters studied: Aspartate amino transferase, Alanine amino transferase, Alkaline phosphate and Total bilirubin

- **Vitex trifolia**
  - Source or Family: Verbenaceae
  - Plant parts used: Leaves
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Ethanol and water
  - Biochemical and Histopathological Parameters studied: Total protein, Histopathological studies, Aspartate amino transferase and Alanine amino transferase

- **Triantehema decandra**
  - Source or Family: Aizoaceae
  - Plant parts used: Leaves
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Aqueous
  - Biochemical and Histopathological Parameters studied: Aspartate amino transferase and Alanine amino transferase and Bilirubin

- **Tylophora indica**
  - Source or Family: Asclepidaceae
  - Plant parts used: Leaves
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Methanolic
  - Biochemical and Histopathological Parameters studied: Serum glutamic oxalactic transaminase, Serum glutamic pyruvate transaminase and Total Bilirubin

- **Hoslandia opposite**
  - Source or Family: Lamiaceae
  - Plant parts used: Stem
  - Hepatotoxic inducing agents: Carbon tetrachloride
  - Extracts studied: Methanol and ethyl acetate
  - Biochemical and Histopathological Parameters studied: Aspartate amino transferase and Alanine amino transferase and Bilirubin
4. Acknowledgement
I take this opportunity to express my profound gratitude and regards to my guide Dr. R.B. Sharma for his exemplary guidance, monitoring and constant encouragement throughout the course of this article.

5. References
4. WHO, Regional Health Report. South East Asia Region Viral Hepatitis. Regional Office for South-East Asia, New.