ABSTRACT

Medicinal plants have been playing a key role in maintaining human health since ancient times. Liver is a vital organ play a major role in metabolism and excretion of xenobiotics from the body. Liver diseases are among the most serious and a challenge to modern medical practitioners. Historically, several plants have been utilized for treating a number of liver disorders, particularly chronic hepatitis C and alcohol-induced liver disease. In recent years, researchers have focused on the efficacy of plants used traditionally by indigenous healers and herbalists. Many common liver diseases can cause the organ to become inflamed. This inflammation can progress to scarring or cirrhosis. The review covers the multipurpose medicinal uses of some plants species which act as hepatoprotective agents. The whole plant and plant parts are being utilized in herbal medications. The herbs have shown a potential of reversing liver damage caused by a number of hepatotoxic compounds.

KEYWORDS

Hepatoprotective; Cirrhosis; Alcoholism; Silymarin; Glycyrrhizin.

INTRODUCTION

Medicinal plants play a key role in the human health care system. Around 80% of the world population depends on medicine which is predominantly based on plant materials[1]. The conventional medicine refers to a broad range of ancient, natural health care practices including folk/tribal practices as well as Ayurveda, Siddha and Unani. It is estimated that around 7,500 plants are useful in traditional health systems, mostly in rural and tribal villages of India. Out of these, the real medicinal value of over 4,000 plants is either little known or unknown[2].

Historically, herbals have been utilized for a number of liver conditions, particularly chronic hepatitis C and alcohol-induced liver disease. The phytochemical constituents like silymarin and glycyrrhizin are important in formulation of herbal products in Chinese and other herbal systems[3]. In the USA, survey has shown that 21% of the population utilized herbal preparations to treat liver related diseases[4].

Hepatic disorders

Liver diseases are generally caused by toxic chemicals, excess consumption of alcohol, infections and autoimmune disorder. Most of the hepatotoxic chemicals damage liver cells primarily by lipid peroxidation and other oxidative damages[5,6]. Structural changes in the liver may cause impairment of
TABLE 1: List of plants with hepatoprotective properties

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name</th>
<th>Botanical Name</th>
<th>Plant Part Used</th>
<th>Chemical Constituents</th>
<th>Uses</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bhringaraja</td>
<td>Eclipta alba</td>
<td>Whole Plant</td>
<td>Alkaloids: ecliptine, Nicotine</td>
<td>Jaundice, enlargement of liver and spleen, Antimicrobial, liver disease, antifungal, antipyretic, antiviral</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>2</td>
<td>Neem</td>
<td>Azadirachta Indica</td>
<td>Leaf and bark</td>
<td>Triterpenoids, sterols, nimbim and nimbimol</td>
<td>Jaundice, eye disorders, Antihelmintic</td>
<td>[23] [24]</td>
</tr>
<tr>
<td>3</td>
<td>Doob</td>
<td>Cynodon dactylon</td>
<td>Dried fibrous roots</td>
<td>Phenolic phytooxin and flavonoids</td>
<td>Jaundice, eye disorders, Antihelmintic</td>
<td>[23] [24]</td>
</tr>
<tr>
<td>4</td>
<td>Lauki</td>
<td>Lagenaria siceraria</td>
<td>Fresh fruit</td>
<td>Saponin and fatty Oil</td>
<td>Liver disease, antihaemorrhagic, antispasmodic</td>
<td>[25] [26]</td>
</tr>
<tr>
<td>5</td>
<td>Mehandi</td>
<td>Lawsonia inermis</td>
<td>Dried Leaves</td>
<td>Glycoside, lawson, hennatonic acid</td>
<td>Nerve, jaundice</td>
<td>Anti-inflammatory,</td>
</tr>
<tr>
<td>6</td>
<td>Kalimusli</td>
<td>Curculigo orchoides</td>
<td>Dried Rhizome and leaves</td>
<td>Tannin, resin, sapogenin, alkaloids</td>
<td>Bitter, jaundice, liver diseases</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>7</td>
<td>Aak</td>
<td>Calotropis procera</td>
<td>Dried roots and leaves</td>
<td>Glycosides: calotropin, ascorbic acid</td>
<td>Antipyretic, antiperiodic, Hepatoprotective, liver diseases</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>8</td>
<td>Giloe</td>
<td>Tinospora Cordifolia</td>
<td>Mature Stem</td>
<td>Terpenoids and Alkaloids</td>
<td>Antipyretic, antiperiodic, Hepatoprotective, liver diseases</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>9</td>
<td>Kantkari</td>
<td>Solanum surattense</td>
<td>Dried Whole Plant</td>
<td>Solasonine, quercetin diglycoside</td>
<td>Stimulant, expectorant, diuretic, laxative, bronchitis, liver diseases</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>10</td>
<td>Ghritkumari</td>
<td>Aloe barbadensis</td>
<td>Dried juice of leaves</td>
<td>Aloe emodin, aloin, enzymes, vitamins</td>
<td>Viral jaundice, diuretic, anti-inflammatory, spasmylocytic, Polyuria, liver disorder</td>
<td>[24] [25] [26]</td>
</tr>
<tr>
<td>11</td>
<td>Punarnava</td>
<td>Boerhaavia diffusa</td>
<td>Whole Plant</td>
<td>Flavonoids, alkaloids, lignins, carbohydrates</td>
<td>Dormant, expectorant, Hepatoprotective, leucoderm, diseases of spleen and liver</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>12</td>
<td>Thuhar</td>
<td>Euphorbia nerifolia</td>
<td>Stem</td>
<td>Triterpenoids, Euphol</td>
<td>Purgative, diuretic, Polyuria, liver disorder</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>13</td>
<td>Bhu amala</td>
<td>Phyllanthus niruri</td>
<td>Root, Stem and leaves</td>
<td>Phyllanthin, Hypophyllanthin</td>
<td>Liver disorders, hepatitis B Virus</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>14</td>
<td>Mulethi</td>
<td>Glycyrrhiza glabra</td>
<td>Dried stolon and root</td>
<td>Glycyrrhizin, Glabrolide</td>
<td>Demulcent, expectorant, Hepatoprotective</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>15</td>
<td>Madar</td>
<td>Calotropis gigantean</td>
<td>Dried Bark and root</td>
<td>Glycosides, Akudarin</td>
<td>Inflammation of spleen And liver, piles, boils and pimples</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>16</td>
<td>Biyani</td>
<td>Tephrosia purpurea</td>
<td>Whole Plant</td>
<td>Rutin and rotenoids</td>
<td>Bitter, diuretic, hepatic, spleen and renal disorders, liver diseases</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>17</td>
<td>Karer</td>
<td>Capparis deciduas</td>
<td>Fruit</td>
<td>Spermidine alkaloids, Glucocapparin</td>
<td>Relaxant, cardiotonic, choleretic, diseases of liver and spleen</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>18</td>
<td>Rohiro</td>
<td>Tecomella undulate</td>
<td>Fruit</td>
<td>Tecomin, Tecomelloside</td>
<td>Relieves pain in liver, jaundice, asthma</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>19</td>
<td>Harmal</td>
<td>Peganum harmala</td>
<td>Root</td>
<td>Harmane, Harmalline</td>
<td>Jaundice, anorexia, fever, skin diseases</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>20</td>
<td>Paniharin</td>
<td>Leucas aspera</td>
<td>Leaves</td>
<td>Urosolic acid, oleanolic acid</td>
<td>Anti-ischemic, hypertension, heart disease, cirrhosis</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>21</td>
<td>Arjuna</td>
<td>Terminalia arjuna</td>
<td>Dried stem, bark, whole plant</td>
<td>Ellagic acid, ß-sitosterol</td>
<td>Anti-ischemic, hypertension, heart disease, cirrhosis</td>
<td>[20] [21] [22]</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Name</td>
<td>Botanical Name</td>
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</tr>
<tr>
<td>22</td>
<td>Shatavari</td>
<td>Asparagus racemosus</td>
<td>Dried Root</td>
<td>Saponins, Shatavarin I-IV, Mucilage</td>
<td>Liver diseases, tumor, inflammation, disease of eye &amp; blood, tuberculosis, leprosy, nervous disorder, night blindness, infectious diseases</td>
<td>[29]</td>
</tr>
<tr>
<td>23</td>
<td>Halada</td>
<td>Curcuma longa</td>
<td>Ground rhizome</td>
<td>Volatile oils, Tumerone, Arabinose, Curcumin</td>
<td>Choleretic effect on liver, hepatoprotective, anti-inflammatory</td>
<td>[30], [31], [32], [33], [34], [35], [36], [37]</td>
</tr>
<tr>
<td>24</td>
<td>Milk Thistle</td>
<td>Silybum marianum</td>
<td>Leaves</td>
<td>Silymarin, Betaine, Flavonoligans</td>
<td>Anti-inflammatory, hepatoprotective, liver diseases, mushroom poisoning, antifibrotic, antioxidant</td>
<td>[38], [39], [40], [41], [42]</td>
</tr>
<tr>
<td>25</td>
<td>Green tea</td>
<td>Camellia sinensis</td>
<td>Leaves, Whole Plant</td>
<td>Caffeine, Epicatechin, Gallocatechin</td>
<td>Hepatoprotective activity, antioxidant</td>
<td>[43], [44], [45], [46], [47]</td>
</tr>
<tr>
<td>26</td>
<td>Katuka</td>
<td>Picrorrhiza kurroa</td>
<td>Stem</td>
<td>Ktukoside, Apocynin</td>
<td>Antioxidant, Detoxification, Liver diseases</td>
<td>[48], [49], [50], [51]</td>
</tr>
<tr>
<td>27</td>
<td>Berberry</td>
<td>Berberis lyceum</td>
<td>Leaves, Root</td>
<td>Berberine, Umbellitine, Tannins</td>
<td>Swollen &amp; sore eyes, jaundice, curative piles, ulcer, broken bones, wounds, Asthma, liver diseases abdominal pain, infection, antitussive, laxative activity, ulcer, pharyngitis, Nausea, bronchial asthma, vomiting, Liver diseases Halitosis, Nerve sedative, enlargement of liver, melancholia, stimulant properties</td>
<td>[52]</td>
</tr>
<tr>
<td>28</td>
<td>Licorice</td>
<td>Glycyrrhiza glabra</td>
<td>Leaves</td>
<td>Coumarins, chalcones, phytosterols</td>
<td></td>
<td>[53], [54], [55]</td>
</tr>
<tr>
<td>29</td>
<td>Kapur kachri</td>
<td>Hedychium spicatum</td>
<td>Whole Plant</td>
<td>Linalool, Camphor, D- sabinene</td>
<td></td>
<td>[56]</td>
</tr>
<tr>
<td>30</td>
<td>Saffron</td>
<td>Crocus sativus</td>
<td>Leaves</td>
<td>Glycosidecrocin, Lycopene</td>
<td></td>
<td>[57]</td>
</tr>
</tbody>
</table>

hepatic function manifested as jaundice, ascites, hepatorenal syndrome, hepatic encephalopathy, spontaneous bacterial peritonitis\[^7-10\]. Liver is exposed to drugs in higher concentration as whole of the drug pass through liver to reach systemic flow.\[^11\] Alcohol affects many organ systems of the body, particularly the liver. These are fatty liver, hepatitis and cirrhosis. Fatty liver (steatosis), the most com-
Review

mon alcohol-induced disorder, is distinct by the excessive accumulation of fat inside the liver cells. Alcoholic hepatitis is inflammation and more severe injury of the liver while in cirrhosis; normal liver cells are replaced by scar tissue. Considering the high level of alcohol consumption in South Africa coupled with the associated effect of liquor especially on the liver of heavy drinkers, there is a need to identify indigenous medicinal plants with hepatoprotective properties, document information on them as well as the ingredients that bring relief and possible toxic implications of these plants.

Causes of hepatic diseases

- Long term alcohol consumption
- Hemochromatosis (an inherited disorder that causes the body to absorb and store to much iron)
- Malnutrition
- Autoimmune diseases
- Exposure to toxins through ingestion, inhalation or skin absorption
- Hereditary conditions
- Long term use of certain medication
- Undergoing abdominal surgery that results in rapid weight loss

Plant with hepatoprotective properties

Liver disease is a worldwide problem. Conventional drugs used in the treatment of liver diseases are sometimes inadequate and can have serious adverse effects. Treatment options for common liver diseases such as cirrhosis, fatty liver, and chronic hepatitis are problematic. The efficiency of treatments such as interferon, colchicine, penicillamine, and corticosteroids are inconsistent at best and the incidence of side-effects profound. Conservative physicians often counsel watchful waiting for many of their patients, waiting in fact for the time when the disease has progressed to the point that warrants the use of heroic measures. Physicians and patients are in need of effective therapeutic agents with a low incidence of side-effects. Liver is the most important organ where drugs are structurally altered resulting in biologically inactive or active metabolites and some of these are toxic.

Many plants potentially constitute such a group of phytochemicals which act as therapeutic agents for liver disorders. Silymarin was the most reported herb used (12%), followed by garlic (8%), ginseng (6%), green tea (5%), ginkgo (5%), echinacea (5%), and St. John’s wort (4%), licorice root (1%). Herbal drugs were utilized as juice, latex or in dried powder form. Liver protective herbal drugs contain a variety of chemical constituents like phenols, coumarins, lignins, essential oils, monoterprenes, crotenoids, glycosides, flavanoids, organic acids, lipids, alkaloids and xanthines. Plant extracts in the form of crude drugs are also used for the treatment of liver disorders. Such plants have been enumerated in Table 1.

CONCLUSION

Hepatic disorders have become a major cause of human deaths in recent times and are a challenge to medical practitioners. Modern medicine, though effective to some extent have exhibited negative side effects. Crude drug derived from some plants have offered better alternative therapy as practised in the past. Refining such crude drugs to develop more effective treatment is required by doctors and researchers.

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Role of plants as hepatoprotective agents – a brief review


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