DOI: 10.56511/JIPBS.2016.v3.i02.pp24-36

Journal of Innovations in Pharmaceuticals and Biological Sciences
www.jipbs.com

JIPBS

ISSN: 2349-2759

Review article

Liver diseases and herbal drugs:-A review

Jesika Rane*, Rajesh Jadhao, R. L. Bakal

K.Y.D.S.C.Ts College of pharmacy Sakegaon, Bhusawal, India.

Abstract

Liver is a vital organ play a major role in metabolism and excretion of xenobiotics from the body. Liver cell injury is generally caused by various toxic chemicals (certain anti-biotic, chemotherapeutic agents, carbon tetrachloride (CCl_4), thioacetamide (TAA) 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 get possible. The main reason for Liver injury is the toxins produced by our body metabolites. Herbal remedies are focused to give safe route for reliving liver disorders. Therefore, hepatoprotective natural products such as *Andrographis paniculata, Silymarine Pirorrhiza, Punarnava, Liquorcie, Azadirachta indica, Curcuma longa, Eclipta alba, Fumaria officinalis, Phyllanthus amarus, Phyllanthus niruri, Phyllanthus embellica , Solanum nigrum, Tinospora cordifolia, Uncaria gambir, Withania somnifera, Swertia chirata, Camellia sinensis, Ginkgo biloba.* Linn is reviewed. The present review is aimed at compiling data on promising phytochemical from medicinal plants that have been tested in hepatotoxicity models using modern scientific system.

Key words: Liver diseases, herbal drugs.

***Corresponding Author: Jesika Rane,** K.Y.D.S.C.Ts College of pharmacy Sakegaon, Bhusawal, India.

1. Introduction

The liver is a vital organ of vertebrates and some other animals [2]. In the human it is located in the upper right quadrant of the abdomen, below the diaphragm. The liver has a wide range of functions, including detoxification various metabolites, protein synthesis, and the production of biochemicals necessary for digestion. The liver's main job is to filter the blood from the digestive tract, before passing it to the rest of the body. The liver also detoxifies chemicals and metabolizes drugs. As it does so, the liver secretes bile that ends up back in the intestines. The liver also makes proteins important for blood clotting and other functions [1].

The Functions of the Liver

The liver has many essential roles in keeping us alive, including:

©JIPBS, All rights reserved

Blood Purification – as the journey of liver start throughout the body, the blood from stomach and intestine is the liver and it prevent the contaminants and also removes the waste product from the body such as :

- Drugs
- Bacteria
- Fungi
- Viruses
- Parasites
- Food Additives
- Pesticides and herbicides
- Chemicals
- Fats
- Alcohol
- Dead cells

Detoxification – Liver also perform the function of detoxification as it detoxifies alcohol, heavy metal, drugs, chemicals, toxic by product from the blood. Housing an ingenuous cleaning system, the liver detoxifies infectious organisms, alcohol, heavy metals, drugs, chemicals, toxic by products and other poisons from the blood [15].

Digestion – The liver produces bile, a substance needed to digest and absorb fats. Bile used in digestion by helping the body which absorb fat and certain vitamins, including Vitamins A, D, E and K.

Manufacturing –The liver manufactures a variable proteins, including enzymes, hormones, blood proteins, clotting factors and immune factors. The liver also produces cholesterol, which carries energy-supplying fats to the body.

Processing – The liver perform the most of the functions via different organs like skin, mouth, lung, Considered to be the biochemical factory of the body, the liver metabolizes substances in the blood stream [14].

Storage – The cells of the liver also act as a power house of body for many substances, such as iron, vitamins, minerals and glycogen until they are needed. When blood sugar levels drop and the body needs energy quickly, the liver converts the stored glycogen into glucose and releases it into the bloodstream. In this way, the liver supplies us with fast-acting energy.

In past work in identification, documentation and recognition of traditional medicine has been done in India. Investigation of traditional medicine is very important for the welfare of rural and tribal communities for the treatment of conventional illness. The manifestation of liver diseases such as hepatitis-B including jaundice, characterized by Hippocrates was found to be infectious as early as the eighth century. Thus viral hepatitis was known to mankind as Kavil (Jaundice) for more than 1,200 years. Yellowing of eyes and vomiting yellowish fluid are the initial external symptoms of hepatitis 1, 2 [13].



Figure 1. Stages of liver damages

Many plants and minerals are used as a source of herbal remedies for most of the illness like jaundice. This paper is an attempt to compile the ethno-medicinal information on hepatoprotective plants available in demographical area of Jalgaon [12].

The liver is the second largest organ in the body. It works hard, performing hundreds of complex functions, including:

- fighting infections and illness
- removing toxins (poisons), such as alcohol, from the body
- controlling cholesterol levels
- helping blood to clot (thicken)
- releasing bile, a liquid that breaks down fats and aids digestion

Liver disease doesn't usually cause any obvious signs or symptoms until it's fairly advanced and the liver is damaged.

At this stage, possible symptoms can include loss of appetite, weight loss and jaundice.

Enhanced lipid peroxidation during metabolism of ethanol may result in development of hepatitis leading to cirrhosis. Since time immemorial, mankind has made the use of plants in the treatment of various ailments. The Indian Traditional Medicine like Ayurveda, Siddha and Unani are predominantly based on the use of plant materials. Herbal drugs have gained importance and popularity in recent years because of their safety, efficacy and cost effectiveness. The association of medical plants with other plants in their habitat also influences their medicinal values in some cases. One of the important and well-documented uses of plant-products is their use as hepato-protective agents. Hence, there is an ever in-creasing need for safe hepato-protective agent [2].

2. Review of Literature

Plants Used in Hepato-protective Remedies in Traditional Indian Medicine

All the plants in universe has some importance of having medicinal properties. Medicinal plants have been considered as important therapeutic agent for alleviating ailment of humankind. Herbal plants or botanical medicines have been used traditionally by herbalist worldwide for the prevention and treatment of liver disease. Medicinal plants play a key role in human health care. About 80% of the world population relies on the use of traditional medicine, which is predominantly based on plant material. The present review discusses different types of medicinal plants containing hepato-protective activity [20].

Important hepatoprotective botanicals in ISM

Liver diseases are among the most serious ailment and can be classified as acute or chronic hepatitis (inflammatory liver disease), hepatosis (non-inflammatory diseases) and cirrhosis (degeneration disorders resulting in fibrosis of the liver). By proper identification and standardization, the herbal treatment can be used as best remedies for human being. This review is focused on important botanicals standardized for chemical markers, which have shown promising results as hepato-ptotective agents [11].

A comprehensive review on herbal drugs for hepato-protection of 21st Century

Liver is a vital organ that plays a major role in metabolism and excretion of xenobiotics from the body. Liver injury or liver dysfunction is a major health problem that challenges not only health care professionals but also the pharmaceutical industry and drug regulatory agencies. Liver cell injury caused by various toxic chemicals (certain antibiotics, chemotherapeutic agents, carbon tetrachloride (CCl_4), thioacetamide (TAA) etc.), excessive alcohol consumption and microbes is well studied. The synthetic drugs in practice has side effect on lungs and sometimes may fatal to liver. Hence, to

avoid this herbal drugs have become increasingly popular. Herbal medicines have been used in the treatment of liver diseases for along time. A number of herbal preparations are available in the market. The present review is aimed at compiling data on promising phytochemicals from medicinal plants that have been tested in hepato-toxicity models using modern scientific system.

Hepato-toxicity and its mechanism

Hepatotoxicity is the term used for the liver damage which is caused by the use of certain allopathic medication as those used for HIV, cancer. Some potential symptoms may include nausea, abdominal pain, or fatigue. Treatment often involves changing the medications which may be causing the hepato-toxicity [16].

Prescription medications, herbal remedies, and natural chemicals can each lead to hepato-toxicity. In fact, this is the most common reason for a medication to be taken off the market [17].

Acetaminophen is also another example of hepato-toxicity because of this body is not able to get rid of the drug before it begins to cause the damage.

Signs and symptoms of drug induced hepato-toxicity

It can be as mild as a change in liver function tests presenting no viable symptoms in the patient, to full blown hepato-toxicity and liver failure. The earlier the problem is diagnosed, the greater enhance of survival for the patient. There is usually an increase in the liver function tests when hepato-toxicity is present. The problem with this is that many drugs on the market increase the Aspartate aminotransferase AST and Alanine aminotransferase [ALT] levels in patients, knowing when the increase is substantial enough to have to discontinue the drug is essential. A drug should be discontinued if the ALT levels are elevated more than two times the normal limit while the AST levels remain within normal limits or slightly elevated. An increase in bilirubin levels will follow the increase in ALT levels as the condition worsens.

Many drugs present the symptoms of rash, fever and an increase in eosinophils in the blood when ALT levels are increased (this happens in about 30% of cases). The symptoms usually occur within 4 weeks of starting a drug and can seize 8 weeks out [18].

Although a difference of signs and symptoms can vary so much from one drug to the next, and one patient to the next some common signs associated with drug induced hepato-toxicity include:

Non-specific symptoms-- ones that may not directly pinpoint the problem.

- fatigue
- weakness
- vague abdominal pain
- loss of appetite

Signs and symptoms specific for hepato-toxicity--

- Jaundice
- Itching
- Easily bruising

When the liver is severely damaged cirrhosis can occur. Symptoms of cirrhosis include-

- Edema (often times in the legs)
- Mental confusion
- Kidney failure
- Gastrointestinal bleeding
- Vulnerability to bacteria infections

Some drugs may cause hepatitis (inflammation of liver cells that can result in the death of the cells. Symptoms of hepatitis include-

- Loss of appetite
- Nausea

- Vomiting
- Fever
- Weakness
- Fatigue
- Abdominal pain

Hepatotoxicity caused by the intake of commonly used drugs can be difficult to diagnose due to the vast number of symptoms the patient may experience. Hence, it is important to get the medical history report while consuming any medication. The treatment for each different hepatotoxicity case can vary as well but the first and best solution is to discontinue the drug that is causing the liver damage. Often times this will eliminate the symptoms but there are times where the damage is too extensive or that an antidote to a particular drug may be administered. Treatment is then varied on an individual basis [10].

Causes of Liver Disease

The two most common reasons a liver might have difficulty fulfilling its long list of chores are when it:

1. Tries to filter out an excessive amount of poisons.
2. Is battling a chronic liver disease.

Excessive Amount of Poisons

Although the liver has a great capacity for regeneration, constant exposure to toxic substances can cause serious – and sometimes irreversible – harm. By overloading the liver's ability to detoxify with an excessive onslaught of toxins, adequate blood purification cannot occur. This overload causes waste to build up in the blood stream and will progressively worsen a person's health. While each liver has its own definition of what is excessive, people imbibe, ingest, absorb and inhale poisons around the clock [20].

Accumulated toxins in the body place a constant drag on the immune system, setting the stage for autoimmune diseases and cancer. If anyone organ is compromised, others will be affected, eventually leading to a cumulative negative effect on health. Some of the most toxic legal substances people flood their liver with are alcohol and medications [19].

Alcohol – acetaldehyde is a highly toxic substance which obtain from metabolism of alcohol , is the molecule that causes impairment or drunkenness. Scientists have discovered that when acetaldehyde is bound to human liver plasma membranes, liver cells die.

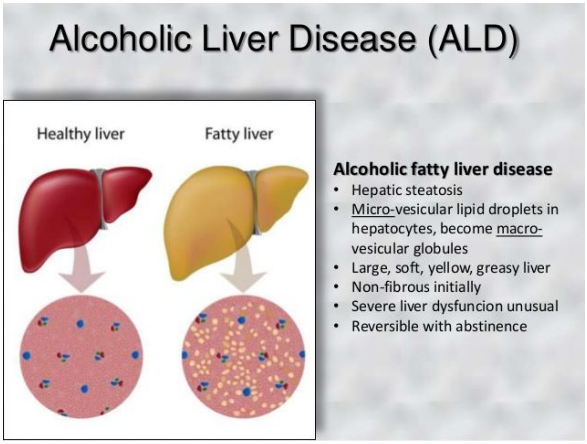


Figure 2. Alcoholic liver diseases.

Medications

There are so many drugs and chemicals that are used to cure the liver diseases and in treatment of injury to the liver. Probably the best-known medication that can damage the liver is acetaminophen, also known as Tylenol®. However, medications used to treat insomnia, nail fungus, high cholesterol, hypertension, cancer, seizures, pain, infections and many other conditions put an excessive strain on the live [5].

Table 1. Allopathic medicine can also induce hepatotoxicity

Chemical	Consequence
Acetaminophen	Cytochrome P-450-2E1 generates a toxic metabolite NAPQI and this produces hepatic necrosis.
Amoxicillin	Moderate rise in SGOT and SGPT level, hepatic dysfunction including jaundice, hepatic cholestasis and acute cytolytic hepatitis.
Chlorpromazine	Infectious hepatitis with laboratory features of obstructive jaundice.
Ciprofloxacin	Cholestatic jaundice elevated SGPT, SGOT and alkaline phosphatase level.
Diclofenac	Elevation of ALT and AST level, liver necrosis, jaundice and fulminant hepatitis.
Erythromycin	Increased level of SGPT, SGOT, hepatocellular and/or cholestatic hepatitis with or without jaundice.
Fluconazole	Elevated transaminase level, hepatitis, cholestasis and fulminant hepatic failure
Isoniazid	Elevation of serum transaminase level, severe and fatal hepatitis
Oral contraceptives	Intrahepatic cholestasis with pruritus, jaundice, benign neoplasm, rarely neoplasm of the liver and hepatic vein occlusion.
Rifampin	Hepatitis, hyperbilirubinemia and cholestasis.

Hepatic Disease

Hepatic disease (Liver disease) is a term generally use for conditions, diseases, and infections that affect the cells, tissues, structures, or functions of the liver and can be defined as an alanine aminotranferase (ALT)/ SGPT level of more than three times the upper limit of the normal range, an alkaline phosphatases (ALP) level of more than twice the upper limit of normal, or a total bilirubin level (TBL) of more than twice the upper limit of normal if associated with any elevation of the alanine aminotransferase or alkaline phosphatase level Liver has a wide range of functions, including detoxification, protein synthesis, production of biochemical necessary for digestion and synthesis as well as breakdown of small and complex molecules, many of which are necessary for normal vital function [2]. A hepatic injury can disturb all these functions of liver. Liver disease and infections are caused by a various conditions including viral infections, bacterial invasion, malnutrition, alcoholism and chemical or physical changes within the body. There are many disease and condition which are responsible for hepatic disease or hepatic injury like Hepatotoxicity tendency of an agent, usually a drug or alcohol, to have a destructive effect on the liver; Hepatic necrosis- death of liver cells; Hepatic steatosis- too much fat in the liver; may be associated with a life threatening condition called lactic acidosis; Alcoholic cirrhosis- A condition of irreversible liver disease due to the chronic inflammatory and toxic effects of ethanol on the liver; hepatitis- Inflammation of the liver due to viral infection, larger intake of alcohol, drug adverse drug reaction and toxicity, toxic agent obtained from drugs, chemical agent and viruses; Jaundice- A morbid condition, characterized by yellowness of the eyes, skin, and urine, whiteness of the feces, constipation, queasiness, loss of appetite, and general languor and lassitude; Fatty Liver-Disorders associated with fat metabolism.

Alcoholic Liver Diseases (ALD)

Alcoholic liver disease (ALD) is injury or damage to the liver caused by chronic alcohol consumption. One of the most common causes of liver disease in the United States, ALD can manifest itself as three separate conditions and any or all of these three conditions can occur at the same time, in the same patient. Alcoholic liver disease is the fourth most common cause of death among middle-aged peoples.

Pathogenesis of ALD

Pathogenesis of ALD is multifactorial Hepatocytes and parenchymal cells are the main targets of alcohol and its toxic metabolites, producing an excessive generation of molecules called free radicals, known as reactive oxygen species (ROS). ROS modify the signaling pathways regulating lipid or glucose metabolism, and can directly modulate proteins and DNA. Alcohol can also induce the permissiveness of the intestine cell wall, allowing larger amounts of endotoxins to pass into the blood. The body coordinated immune response by activation of immune cells residing in the liver (Kupffer cells), which affect the liver tissue by two mechanisms: a) become inflammatory cytokines, and their excessive amount have dire consequences, pushing the immune system response into overdrive, promoting the progression of liver disease b) Kupffer cells are the major source of ROS in the liver, leading to oxidative stress [10]. The spectrum of ALD ranges from fatty liver (steatosis), present in most, if not all heavy drinkers, through steatohepatitis, fibrosis and ultimately cirrhosis.

Alcoholic Fatty Liver

Alcoholic fatty liver is predominantly an asymptomatic condition that develops in response to a short duration (a few days) of alcohol abuse. Patients with fatty liver are asymptomatic so that they rarely present with liver related problems.

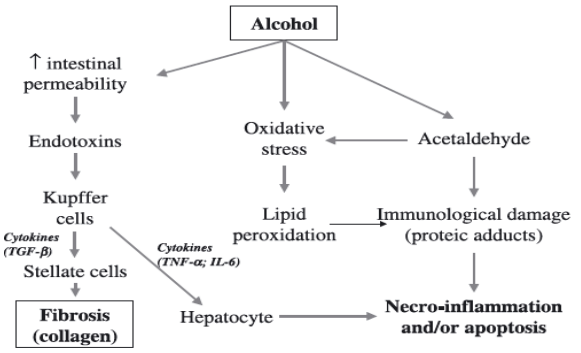


Figure 3. Mechanism of alcohol-induced hepatic damage: a unifying view.

Figure 3. Mechanism of alcohol-induced hepatic damage: a unifying view

Fatty liver is reversible with abstention but it is a risk factor for progression to fibrosis and cirrhosis in those patients who continue drinking [11].

Alcoholic Hepatitis (AH)

Between 20- 40% of persistent heavy drinkers will develop more serious liver disease. In some of these patients, they will get AH, while others will present with complications of portal hypertension, and other conditions. People with ALD can also be asymptomatic and may even have normal liver blood tests [11]. The level of alcohol consumption necessary for the development of these advanced forms of ALD is probably 80 g of alcohol per day, the equivalent to six to eight drinks daily for several years [12].

Alcoholic Cirrhosis (AC)

Alcoholic cirrhosis may occur at any time before, during, after, or independent of a bout of AH. Liver fibrosis and cirrhosis (clinically distinct conditions but, unless specifically mentioned, they are used

interchangeably in this report) represent a continuous disease spectrum characterized by an increase in total liver collagen and other matrix proteins which disrupt the architecture of the liver and impair liver function[13]. Fibrosis results from sustained wound healing in the liver in response to chronic or iterative injury. The wound healing response is an integral part of the overall process of inflammation and repair: it is dynamic and has the potential to resolve without scarring [12], however, hepatic fibrosis is a healing process gone awry in response to ongoing liver injury in ALD[14]. As the liver becomes increasingly fibrotic, the number of functional hepatocytes decreases and the liver loses its capacity to remove toxic substances from the blood. At present, there are few interventions available to alter the underlying fibrotic process in many patients with liver disease, although data from clinical and laboratory based research show that cirrhosis may be reversible.

Liver Cancer begins when abnormal cells grow out of control and invade other tissues in the body and continue to multiply. Many different cancers can affect the liver. Cancer of the liver can originate in the liver itself (primary liver cancer) or originate in other parts of the body, then spread to the liver through the bloodstream (metastatic cancer).

Types of primary liver cancer

Hepatocellular carcinoma (HCC) (also called hepatoma because it comes from hepatocytes, the main type of liver cells). HCC is the most common form of primary liver cancer in children and adults and one of the most frequently occurring cancers in the world. Some hepatocellular cancers begin as a single tumor that grows larger and spreads to other parts of the body late in the disease. Other hepatocellular cancers begin as many, small cancer nodules throughout the liver, rather than a single tumor and is seen predominantly in people with chronic liver damage (cirrhosis).

Intrahepatic cholangio carcinoma: Also known as bile duct cancer, this cancer can appear in both the liver and the bile ducts outside the liver. Bile ducts are tubes that carry bile to the gallbladder. Seen mostly in older people (average age of 73), about 2,000 to 3,000 people in the United States develop bile duct cancer.

Hepatoblastoma: This rare type of cancer essentially develops only in children usually before the age of four years. If diagnosed early, the survival rate is high for children with hepatoblastoma. However, for hepatoblastomas that are large or have spread beyond the liver, prognosis is poor.

About Metastatic Cancer : Metastatic cancer (secondary liver cancer) is not actually known as liver cancer. Most cancer that occurs in the liver begins in another part of the body. Some of the most common cancers that metastasize to the liver are those originating in the colon, pancreas, lung and the breast. These cancers are named after the organ in which the cancer originated. So cancer that starts in the colon and spreads to the liver is known as metastatic colon cancer, not liver cancer. Lymphomas and leukemias, cancers that originate in the lymph nodes and bone marrow, respectively, can also invade the liver. In the United States and Europe, secondary (metastatic) liver tumors are more common than primary liver cancer. The opposite is true for many areas of Asia and Africa.

Fibrosis of the liver

It is excessive accumulation of scar tissue that results from ongoing inflammation and liver cell death that occurs in most types of chronic liver diseases. Nodules, abnormal spherical areas of cells, form as dying liver cells are replaced by regenerating cells. This regeneration of cells causes the liver to become hard. Fibrosis refers to the accumulation of tough, fibrous scar tissue in the liver.

Hepatitis A virus (HAV)

It is a member of the picornavirus family, which invades liver cells and causes inflammation. Considered the least serious of all hepatitis viruses, HAV does not cause chronic liver disease. This disease usually lasts no longer than six months. Cirrhosis and its complications, as well as liver cancer, do not occur from contracting HAV. Fortunately, Hepatitis A is the most common vaccine-preventable disease in the entire world, and those who get HAV develop immunity from ever contracting it again.

Hepatitis B

It is inflammation of the liver due to a virus called the Hepatitis B virus (HBV), belonging to the family hepadnaviridae. Originally known as serum hepatitis, HBV was the first hepatitis virus to be identified. It is preventable with safe and effective vaccines that have been available since 1982. According to the World Health Organization, of the approximately 2 billion people worldwide who have been infected with the Hepatitis B virus, more than 350 million have chronic (lifelong) infections. Approximately 1.25 million of those infected with the Hepatitis B virus live in the United States. These chronically infected persons are at high risk of cirrhosis and liver cancer, diseases that kill about 1 million people worldwide each year.

Hepatitis C virus (HCV) is a spherical, enveloped, single-stranded RNA virus belonging to the family flaviviridae. Discovered in 1989, HCV explained 90 percent of non-A non-B (NANB) cases of hepatitis.

Hepatitis C

Virus is the most common cause of chronic liver disease in the United States and the prevalence of Hepatitis C virus infection is increasing worldwide.

The World Health Organization estimates that more than 170 million individuals throughout the world are infected with HCV.

3. Herbal Drugs Treatment

The Indian Traditional Medicine like Ayurveda, Siddha and Unani are predominantly based on the use of plant materials. Herbal drugs have gained importance and popularity in recent years because of their safety, efficacy and cost effectiveness. Several Indian medicinal plants have been extensively used in the Indian traditional system of medicine for the management of liver disorder.

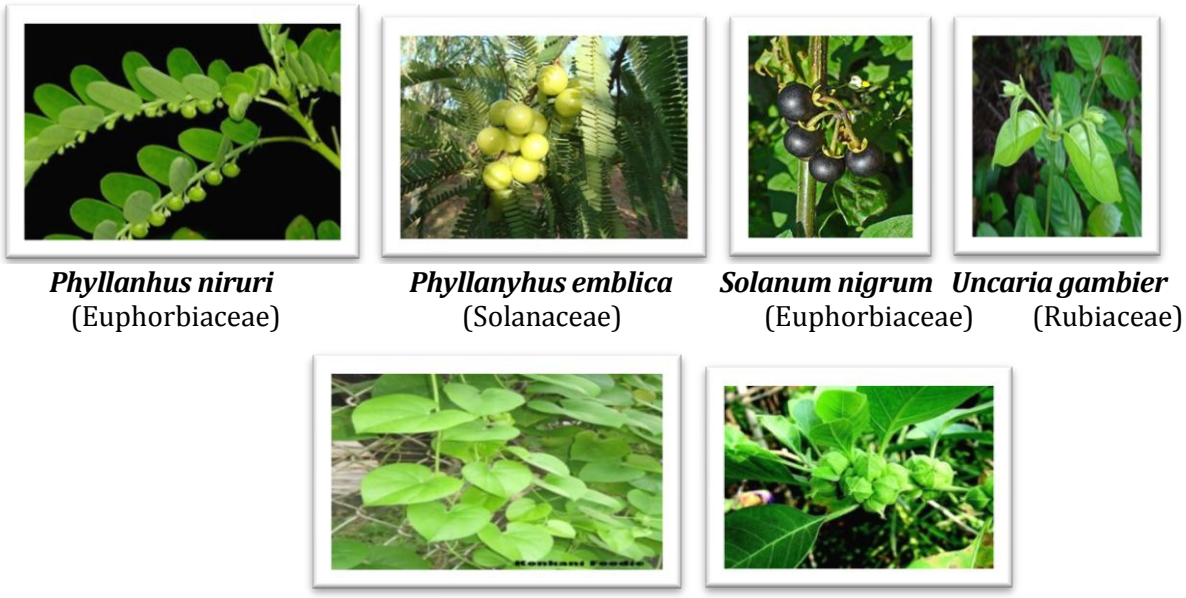
The use of natural remedies for the treatment of liver diseases has a long history and medicinal plants and their derivatives are still used all over the world in one form or the other for this purpose. Scientific evaluation of plants has often shown that active principles in these are responsible for therapeutic success.

Table 2. List of medicinal plants used to protect liver damage

Scientific Name	Common name	Family	Part used	Dose	Toxicant
Silymarine	Milk thistle	Asteraceae	Ripen seeds	600 or 1200 mg daily in patients chronically infected with hepatitis C virus	Carbon tetra Chloride
Andrographis	Bhuinimb	Acanthaeae	Leaves & tender shoot	Oral administration extract (100-200 mg/kg)	Paraetamol
Pirorrhiza	kutki	Srophulariaeae	Dried rhizomes	Oral administration dose of 200 mg/kg	Carbon tetra Chloride
Punarnava	Rakta punarnava	Nytaginaeae	Dried herb	Oral administration dose of 200-400 mg/kg	Alcohol
Liquorcie	Jeshta madhu	Leguminosae	Dried rhizomes	Oral administration dose of 200-400 mg/kg	Carbon tetra Chloride
Azadirachta indica	Neem	Meliaceae	Aerial parts	Oral administration extract (100-200 mg/kg)	Paracetamol , Thioacetamide
Curcuma longa	Haldi	Zingiberaceae	Rhizome.	Oral administration extract (100-200 mg/kg)	Paracetamol
Eclipta alba	Bhringraj	Asteraceae	Leaves, flower.	Oral administration extract (200-400 mg/kg)	Carbon tetra chloride
Fumaria officinalis	Earth smoke	Fumariaceae	Whole plant	Oral administration extract (200-500 mg/kg)	Carbon tetra chloride
Phyllanthus amarus	bhuiamla	Euphorbiaceae	Whole plant	Oral administration extract (100-200 mg/kg)	Paracetamol
Phyllanthus niruri	stonebreaker	Euphorbiaceae	Whole plant	administered orally 100 mg and 200 mg/Kg)	Paracetamol
Phyllanthus embellica	Amla	Euphorbiaceae	Fruits	administered orally 100 mg and 200 mg/Kg)	Paracetamol
Solanum nigrum	Black Night Shade	Solanaceae	Fruits	administered orally 100 mg and 200 mg/Kg)	Carbon tetra chloride
Tinospora cordifolia	Gulvel	Mennispermaceae	Whole plant	administered orally 100 mg and 200 mg/Kg)	Paracetamol
Uncaria gambir	Kattha	Rubiaceae	Leaves, shoots	administered orally 200 mg and 400 mg/Kg)	Carbon tetra chloride

Withania somnifera	Ashwagandha	Solanaceae	Leaves	100 mg/kg, p.o.	Carbon tetra chloride
Swertia chirata	Clearing nut	Gentianaceae	entire herb	administered orally 100 mg and 200 mg/Kg)	Ethanol
Camellia sinensis	Tea plant	Theaceae	Seeds & leaves	administered orally 100 mg and 200 mg/Kg)	Carbon tetra chloride
Ginkgo biloba	Maiden hair tree	Ginkgoaceae	Leaves & bark	25 mg/kg and 50 mg/kg, i.p.	Carbon tetra chloride

A large number of medicinal plants have been tested and found to contain active principles with curative properties against a variety of diseases. Liver protective plants contain a variety of chemical constituents like phenols, Coumarins, Lignans, essential oil, monoterpenes, carotinoids, glycosides, flavonoids, organic acids, lipids, alkaloids and xanthenes. Therefore a large number of plants and formulations have been claimed to have hepato-protective activity so the development of plant based hepato protective drugs has been given importance in the global market. This review article has been presented to enumerate some indigenous plants that have hepato-protective properties such as shown in following figure.



Phyllanhus niruri (Euphorbiaceae) ***Phyllanyhus emblica*** (Solanaceae) ***Solanum nigrum*** (Euphorbiaceae) ***Uncaria gambier*** (Rubiaceae)

Tinospora cordifolia (Mennispermaceae) ***Withania somnifera*** (Solanaceae)

Figure 4. Plants showing hepato-protective Activity

Conclusion

Chronic hepatic diseases stand as one of the foremost health troubles worldwide, with liver cirrhosis and drug induced liver injury accounting ninth leading cause of death in india and developing countries. Therapies developed along the principles of western medicine are often limited in efficacy, carry

the risk of adverse effects, and are often too costly, especially for the developing world. Therefore, treating liver diseases with plant-derived compounds which are accessible and do not require laborious pharmaceutical synthesis seems highly attractive. In this review article, an attempt has been made to compile the reported hepato-protective plants from India and abroad and may be useful to the health professionals, scientists 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.

References

1. Dienstag JL, Isselbacher KJ, Toxic and drug-induced hepatitis, 15th edn. Chapter 296, In: Harrison's Principles of Internal Medicine. Braunwald E, et al, The McGraw-Hill Companies, In, 2001; 2:737-1742.
2. Chattopadhyay RR, Bhattacharyya SK, *Terminalia chebula*: Anupdate, Pharmacog 2007; 1(1):439–45.
3. Hikino H, Kiso Y. Natural products for liver diseases. Economic and Medicinal Plant Research. Vol. II, Academic Press, London 1988; 39-67.
4. Mohammed Rageeb Mohammed Usman, Chhaya G, Surekha S, Lalit S, Rashmi S, Samadhan B "Pharmacognostical Evaluations of Some Herbal Plant" In IJARPB 2012; 1(3):302-310.
5. Raj DS, Vennila JJ, Aiyavu C, Panneerselvam K. The he-patoprotective effect of alcoholic extract of *Annonasquamosa*leaves on experimentally induced liver in-jury in Swiss albino mice. Int J Int Bio 2009; 5(3): 162-166.
6. Madani H, Talebolhosseini M, Asgary S, Nader GH. Hepato-protective activity of *Silybummarianum* and *Ci-choriumintybus* against thioacetamide in rat. Pak J Nutrition 2008; 7(1): 172-176.
7. Maheswari C, Maryammal R, Venkatanarayanan R. Hepato-protective activity of "*Orthosiphonstami-neus*" on liver damage caused by paracetamol in rats. Jordan J Biological Sciences 2008; 1(3): 105-108.
8. Marina N, Abdul MM, Joydev KK, Sitesh CB, Farida B, Bidyut KD. Protective effects of *Flacourtiaindica* aerial parts extracts against paracetamol-induced hepato-toxiciy in rats. JTUSCI 2009; 2: 1-6
9. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 37th ed. Nirali Prakashan, 2006, 232, 233, 248, 249, 251.
10. Niranjan A. Biological activity of kalmegh *Indian Journal of Natural Products and Resources* 2010; 1(2): 125-135.
11. Sampath KP. Swertia chirata, A traditional herb and its medicinal uses, *J Chem Pharm Res*, 2010; 2(1): 262-266.
12. National Workshop "Identification of Herbal Drugs" held at S. K. B. College of Pharmacy, Kamptee, Nagpur, Associated by Indian Society of Pharmacognosy 17-18th February 2007.
13. Suman Pattanayak, Siva Sankar Nayak, Durga Prasad Panda, Subas Chandra Dinda, Vikas Shende, Amol Jadav, Hepato-protective activity of crude flavonoids extract of *Cajanusscarabaeoides*(L) in paracetamol intoxicated albino rats, Asian J Pharm Biol Res 2011; 1(1): 22-27.
14. Shivananda Nayak B, Julien R. Marshall, Godwin Isitor, Andrew Adogwa, Hypoglycemic and hepatoprotective activity of fermented fruit juice of *Morindacitrifolia* (Noni) in diabetic rats, Evidence-Based Complementary and Alternative Medicine 2011; 1-5.
15. Oluseyi Adeboye Akinloye, Moshood Olajire Olaniyi, Hepato-protective effect of *Cajanuscajan*on tissue defense system in D-galactosamine-induced hepatitis in rats, Turk J Biochem 2011; 36(3): 237–241.
16. Gupta Amartya K, Ganguly Partha, Majumder Upal K, Ghosal Shibnath, Hepato-protective & antioxidant effect & stereoidalsaponins of solanum of *Solanumxanthocarpum* & *Solanumni grum*in Paracetomol induced

hepatotoxicity in rats, Pharmacology online 2009; 1: 757-768.
17. Arthika S, Shanthammal Y, Sheryl Igal N, Elankini P, Pramod Reddy G, Gaidhani SN, Ganesan R, Hepatoprotective activity of the ethanolic extract of *Azimatetracantha* against paracetamol-induced hepato-toxicity in wistar albino rats, Journal of Advances in Pharmacy and Healthcare Research 2011; 1(2):14-20.
18. Pawar S, Patil DA. Certain unconventional food plants of Jalgaon district (MS). J Non-Timber For Products 2000; 7:229-32.
19. Kirtikar KR, Basu BD. Indian Medicinal Plants, 2nd ed, Vol. 1-4, Allhabad: LM Basu Press; 1933.
20. Tandon VR, Khajuria V, Kapoor B, Kour D, Gupta S. Hepatoprotective activity of Vitexnegundo leaf extract against anti‐tubercular drugs induced hepato-toxicity. Fitoterapia 2008; 79:533‐8
21. Tang X, Gao J, Wamg Y, Fan YM, Xu LZ, Zhao XN, *et al*. Effective protection of Terminaliacatappa L. Leaves from damage induced by carbon tetrachloride in liver mitochondria. J Nutr Biochem 2006; 17:177‐82.