

A REVIEW ON THAR PLANTS USED IN LIVER DISEASES

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ABSTRACT

India is one of the richest floristic regions of the world and has been a source of plants and their products since antiquity and man uses them in different ways according to his needs, particularly as food or as medicine. The Thar desert of India is particularly important for its medicinal plant species. Generally whole plant is not used for the medicinal preparation. The parts used in the preparation are seeds, leaves, wood, rhizomes, fruits, bark, etc. Various Thar plants used to treat liver diseases are such as *Phyllanthus niruri*, *Glycyrrhiza glabra*, *Aloe vera*, *Solanum xanthocarpum*, *Boerhavia diffusa*, *Tehrosia purpurea*, *Capparis deciduas*, *Eclipta alba*, *Calotropis procera*, *Azadirachta indica*, *Cynodon dactylon*, *Euphorbia neriifolia*, *Leucas aspera*, *Lagenaria siceraria*, *Tinospora cordifolia*, *Lawsonia intermis*, *Calotropis gigantia*, *Tecomella undulate*, *Curculigo orchiodes*, *Peganum harmala*, etc. All these plants have some use in the liver diseases with fewer side effects in comparison to synthetic drugs.

Keywords: Hepatotoxicity, Thar dessert, liver diseases.

INTRODUCTION¹⁻⁴

Liver disease is a worldwide problem. Conventional drugs used in the treatment of liver diseases are sometimes inadequate and can have serious adverse effects. Therefore, it is necessary to search for alternative drugs for the treatment of liver disease in order to replace currently used drugs of doubtful efficacy and safety.

Acute renal failure- This is a general term applied to the rapid development of hepatic synthetic dysfunction associated with significant coagulopathy, usually defined by a prothrombin time or factor V level less than 50% of normal. The most common cause of acute renal failure is drugs and viral hepatitis.

Acute viral hepatitis- The agents of acute viral hepatitis can be broadly classified into two groups: Enterically transmitted agents like Hepatitis A virus, Hepatitis E virus and Blood-

borne agents like Hepatitis B virus, Hepatitis D virus and Hepatitis C virus.

Chronic viral hepatitis- This describes persistent inflammation of the liver for 6 months or more after initial exposure and/or initial detection of liver disease. The primary cause of chronic hepatitis is viral infection.

Drug induced hepatotoxicity- Hepatotoxicity may occur as an unexpected idiosyncratic reaction to a medication's therapeutic dose or as an expected consequence of the agent's intrinsic toxicity. Serum alanine and aspartate aminotransferase and lactate dehydrogenase levels may be elevated 10-100 times in acute hepatocellular injury, while alkaline phosphatase levels are usually less than 3 times the upper limit of normal. The serum bilirubin may be elevated or within the normal range.

Cirrhosis- The diffuse process characterized by fibrosis and the conversion of normal liver architecture into structurally abnormal

nodules that lack normal lobular organization. Structural changes in the liver may cause impairment of hepatic function manifested as jaundice, ascites, hepatorenal syndrome, hepatic encephalopathy, spontaneous bacterial peritonitis.

Portal hypertension- It is defined as an increase in the portal venous pressure gradient and is a function of portal venous blood flow and hepatic and portocollateral resistance.

Fatty liver and nonalcoholic steatohepatitis- Nonalcoholic fatty liver disease includes a spectrum of abnormalities from hepatic steatosis with associated necroinflammatory changes and varying degrees of fibrosis. Nonalcoholic steatohepatitis is a clinical pathological syndrome of steatosis and associated hepatic necroinflammatory changes that is diagnosed only by liver biopsy.

Budd-Chiari syndrome (BCS)- It results from obstruction to hepatic venous outflow and may result from either thrombotic or nonthrombotic occlusion.

Hepatic veno-occlusive disease (VOD)- It is also referred to as sinusoidal obstruction syndrome. VOD is most often seen in an acute form following bone marrow transplantation; thought to be due to toxicity from the preparative regimen of high dose cytoreductive therapy with or without hepatic irradiation.

ENUMERATION

Plant species are enumerated here with their biological source, names, constituents and uses⁵⁻¹³

1. Bhringaraja

Biological Source- It consists of whole plant of *Eclipta alba* Hassk. (Fam. Asteraceae).

Vernacular names-

Sanskrit : Kesaraja, Tekaraja, Bhrnja, Markava, Bhrngaja.

Bengali : Bheemraja, Kesuriya, Kesari.

Gujrati : Bhangaro, Bhangro.

Hindi : Bhangara, Bhangaraiya.

English : Trailing Eclipta Plant.

Constituents- Alkaloids, Ecliptine and Nicotine

Uses- Deobstruent, antihepatotoxic, anticatarrhal, febrifuge. Used in hepatitis, spleen enlargements, chronic skin diseases. Leaf—promotes hair growth. Its extract in oil is applied to scalp before bed time in insomnia. The herb is also used as an ingredient in shampoos.

2. Neem

Biological Source- Nimba (Leaf) consists of dried leaf of *Azadirachta indica* A. Juss Syn. *Melia azadirachta* Linn. (Fam. Meliaceae).

Vernacular names-

Sanskrit: Aritaa, Picumarda

Bengali : Nim, Nimgach

English : Margosa Tree

Gujrati : Limba, Limbado, Limado, Kohumba

Hindi : Nim, Nimba

Urdu : Neem

Constituents- Triterpenoids, sterols, bitter principles nimbin and nimbiol.

Uses- Neem bark is cool, bitter, astringent, acrid and refrigerant. It is useful in tiredness, cough, fever, loss of appetite, worm infestation. It heals wounds and vitiated conditions of kapha, vomiting, skin diseases, excessive thirst, and diabetes. Neem leaves are reported to be beneficial for eye disorders and insect poisons. It treats Vatik disorder. It is anti-leprotic. It's fruits are bitter, purgative, anti-hemorrhoids and anthelmintic'. It is claimed that neem provides an answer to many incurable diseases. Traditionally neem products have been used against a wide variety of diseases which include heat-rash, boils, wounds, jaundice, leprosy, skin disorders, stomach ulcers, chicken pox, etc

3. Doob

Biological Source- Durva consists of dried fibrous roots of *Cynodon dactylon* Linn. fam. Poaceae).

Vernacular names-

Sanskrit: Satavirya

Bengali : Durva

English : Conch grass

Gujrati : Dhro, Lilidhro, Khadodhro

Hindi : Doob

Constituents- Phenolic phytotoxins and flavonoids.

Uses- In ethnomedicinal practices the juice of the plant *Cynodon dactylon* Pers. is used as astringent and is applied to fresh cuts and wounds. It is used internally in the treatment of chronic diarrhoea and dysentery. It is also useful in the treatment of Catarrhal ophthalmia. The leaves of *Cynodon dactylon* Pers. are also used in the treatment of hysteria, epilepsy and insanity. The plant *Cynodon dactylon* Pers. is also a folk remedy for anasarca, calculus, cancer, carbuncles, convulsions, cough, cramps, cystitis, diarrhoea, dysentery, headache, haemorrhage, hypertension, kidneys, laxative, measles,

rubella, sores, stones, tumours, uro-genital disorders, warts and wounds.

4. Lauki

Biological Source- It consists of fresh fruit (devoid of stalk) of *Lagenaria siceraria* Syn. *L. leucantha* Rusby., *L. vulgaris* Ser. (Fam. Cucurbitaceae).

Vernacular names-

Sanskrit: Alabu, Tumbi Ishavaaku,

Bengali : Laus, Lokitumbi,

English : Bottle Gourd

Gujrat : Dudi, Tumbadi

Hindi : Lauki, Ghia

Urdu : Ghiya, Lauki

Constituents- Analysis of edible portion of the fruit contains protein, fat (ether extract), carbohydrates, mineral matter like calcium and phosphorus. Glucose and fructose have been detected. The amino acid composition of the fruit is leucines, phenylalanine, valine, tyrosine, alanine, threonine, glutamic acid, serine, etc. The fruit is a good source of B vitamins and a fair source of ascorbic acid. Bitter fruits yield of solid foam containing cucurbitacins B, D, G and H, mainly cucurbitacin B; these bitter principles are present in the fruit as aglycones.

Uses- The plant has various pharmacological activities like antioxidant, antihyperglycemic, antihyperlipidemic, cardio protective, immunomodulatory effects, hepato protective, in hyperthyroidism, hyperglycemia and lipid peroxidation, analgesic and anti-inflammatory, diuretic, cytotoxic activity.

5. Mehandi

Biological Source- *Lawsonia inermis* L. is a much branched glabrous shrub or small tree, cultivated for its leaves although stem bark, roots, flowers and seeds have also been used in traditional medicine.

Vernacular names-

Sanskrit : Nil Madayantika

Bengali : Mehadi

English : Henna

Gujrati : Mendi

Hindi : Mehandi

Constituents- The plant is reported to contain carbohydrates, proteins, flavonoids, tannins and phenolic compounds, alkaloids, terpenoids, quinones, coumarins, xanthenes and fatty acids.

Uses- The plant has been reported to have analgesic, hypoglycemic, hepatoprotective, immunostimulant, anti-inflammatory,

antibacterial, antimicrobial, antifungal, antiviral, antiparasitic, antitrypanosomal, antidermatophytic, antioxidant, antifertility, tuberculostatic and anticancer properties.

6. Kalimusli

Biological Source- it consists of dried rhizome of *Curculigo orchioides* Gaertn. (Fam. Amaryllidaceae)

Vernacular names-

Sanskrit: Bhumitil

English : English- curcuglio golden eye grass.

Bengali : Talmalu, Tallur

Gujrati : Kalimusali

Hindi : Syahmusali, Kalimusli

Constituents- Flavone, glycosides 5, curculigo saponins, hentria contanol, alkaloid lycorine, 2-methoxy-4-acetyl-5-methyltriacontane, behenic acid.

Uses- It cures different sexual disorders in men such as low sperm count, piles, blood related disorders, skin disorders, jaundice, gonorrhoea, joint pain. The roots of this plant are a nice stimulant, appetizer, carminative, tonic and aphrodisiac.

7. Aak

Biological Source- Arka consists of dried roots of *Calotropis procera* (Ait.) R. Br. (Fam. Asclepiadaceae) found wild more or less throughout India.

Vernacular names-

Sanskrit: Ravi, Bhinu, Tapanā

Bengali : Akanda, Akone

English : Madar Tree

Gujrati : Aakado

Hindi : Aak, Madar, Akavana

Urdu : Madar, Aak

Constituents- Glycosides (calotropin). The leaves contain ascorbic acid, calatropagenin and root has benzolisolineolone.

Uses- The root skin, latex, flowers, leaves and the ksara of arka are used for medicinal purpose. The poultice of its leaves effectively reduces the pain and swelling in rheumatic joints and filariasis. The medicated oil is beneficial in otitis and deafness; The topical sprinkle of dried leaves powder hastens the wound healing. In glandular swellings the topical application of latex reduces the inflammation. In skin diseases, associated with depigmentation, the latex combined with mustard oil, works well. The fomentation with its leaves, slightly warmed with thin coat of castor oil, is beneficial to relieve the abdominal pain. The local application of latex is

recommended in hairfall and baldness. It also, is useful in piles. The latex also mitigates the dental aches.

The latex as a strong purgative and accumulations breaking imparts excellent results in ascites of kapha type and hepatosplenomegaly with ascites. To alleviate the oedema in such conditions, of kapha origin, the decoction of its roots combined with triphala and honey, is salutary. In asthma and cough, the flowers and the root skin of arka are commonly used. As a blood purifier, it is benevolent in filariasis and syphilis, The red flowers alleviate raktapitta. In chronic dermatoses, the root skin is recommended with honey.

8. Giloe

Biological Source- It consists of dried, matured pieces of stem of *Tinospora cordifolia* (Wild.) Miers. (Fam, Menispermaceae).

Vernacular names-

Sanskrit: Amratavalli, amrata, Madhuparni, Guducika, Chinnobhava.

Gujrati : Galac, Garo

Hindi : Giloe, Gurcha

Urdu : Gilo

Constituents- Terpenoids and alkaloids. The stem contains alkaloidal constituents, including berberine; bitter principles, including columbin, chasmanthin, palmarin and tinosporin, tinosporic acid and tinosporol.

Uses- It is useful herbal remedy for infections, recurrent fevers, it act as immunomodulator-useful in low immunity, it is useful for cancer of all types, high uric acid and in flu of all types.

9. Kantkari

Biological Source- It consists of mature, dried whole plant of *Solanum surattense* Burm. f., Syn. *Solanum xanthocarpum* Schrad . & Wendl , (Fam. Solanaceae).

Vernacular names-

Bengali : Kantkari

English : Febrifuge plant

Gujrati : Bharingani

Hindi : Katai, Katali, Ringani, Bhatakataiya, Chhotikateri

Constituents- Glucoalkaloids and sterols. Fruits give solasonine, solamargine, beta-solamargine, and solasodine; petals yielded apigenin; stamens gave quercetin diglycoside and sitosterol. (+)- solanocarpine, carpesterol, solanocarpidine, potassium nitrate, fatty acid, diosgenin, sitosterol, isochlorogenic acid,

neochronogenic acid, chronogenic acid, caffeic acid, solasodine, solasonine, solamargine, quercetin, apigenin, histamine, acetylcholine.

Uses- Kantkari is useful in treating worms, cold, hoarseness of voice, fever, dysuria, enlargement of the liver, muscular pain, spleen and stone in the urinary bladder. Nasal administration of kantkari is beneficial in migraine, asthma and headache. The juice of the berries is used in curing sore throat. The fumigation of kantakari is helpful in piles. The herb is made to a paste and applied on swollen and painful joints to reduce the pain and swelling in arthritis. Roots and seeds are used as an expectorant in asthma, cough and pain in chest. The root is ground to a paste and mixed with lemon to cure snake and scorpion bites. Its stem, flowers and fruits, being bitter and carminative, are used for relieving burning sensation in the feet. Kantakari fruits also facilitate seminal ejaculation, alleviate worms, itching, and fever and reduce fats. The fruit works as an aphrodisiac in males. Its seeds are helpful for treating irregular menstruation and dysmenorrhoea in females. The herb is beneficial in the treatment of cardiac diseases associated with edema, since it is a stimulant to the heart and a blood purifier.

10. Ghritkumari

Biological Source- It consists of dried juice of leaves of *Aloe barbadensis* Mill. Syn. Aloe vera Tourn.ex Linn, *Aloe indica* Royle. (Fam. Liliaceae).

Vernacular names-

English : Indian Aloe

Gujrati : Eliyo, Eariyo

Hindi : Musabhar, Elva

Urdu : Musabbar, Ailiva, Siber

Constituents- The major constituents are Anthraquinone glycoside- Aloe emodin, aloetic acid, anthrol, aloin A and B, isobarbaloin, emodin, ester of cinnamic acid.

Uses- Dried juice of leaves are used in dysmenorrhoea and diseases of liver. It is used in jaundice due to viral hepatitis. It is also useful in spleen disorders. Gel topically is emollient, anti-inflammatory, antimicrobial used for wound healing, sunburn. *Aloe vera* detoxifies the body and is considered as best colon cleanser. It prevents constipation, controls diabetes, clear acne and skin allergies, dark spots.

11. Punarnava

Biological Source- Punarnava consists of dried, matured whole plant of *Boerhaavia diffusa* Linn. (Fam Nyctaginaceae).

Vernacular names-

English : Horse Purslane, Hog Weed

Gujrati : Dholisaturdi, Motosatodo

Hindi : Gadapurna, Lalpunarnava

Constituents- It contains flavonoids, alkaloids, steroids, triterpenoids, lipids, lignins, carbohydrates, proteins and glycoproteins. Punarnavine, punarnavoside and a glycoprotein have been isolated.

Uses- It is a good liver stimulant and cures viral jaundice. It acts diuretic, anti-inflammatory, antiarthritic, spasmodic, antibacterial. Roots are used anticonvulsant, analgesic, laxative, diuretic, abortifacient.

12. Thuhar

Biological Source- It consists of stem of *Euphorbia neriifolia* Linn. (Fam. Euphorbiaceae), a large branched, erect, glabrous, succulent, xerophytic shrub occurring wild on rocky ground throughout central India and extensively grown as a hedge plant.

Vernacular names-

English : Milkhedge

Gujrati : Thor, Kantalo

Hindi : Thuhar, Sehunda

Constituents- Resin, gum and triterpenes. The triterpenoids, euphol, 24-methylenecycloartenol, euphorbol hexacosonate, taraxerol, glut-5(10)-en-1-one, glut-5-en-3-beta-yet-acetate, friedelan-3-alpha-ol and -3-beta-ol have been reported.

Uses- Latex used as purgative, diuretic, antiasthmatic, expectorant, rubefacient. It is used in ascites, polyuria, anasarca, chlorosis, tympanitis, externally warts, cutaneous eruptions, scabies, unhealthy ulcers. It is used as drastic purgative in the enlargement of liver and spleen, syphilis, dropsy, leprosy, etc.

13. Bhui amala

Biological Source- It consists of root, stem and leaf of *Phyllanthus fraternus* Webst. Syn. *Phyllanthus niruri* Hook. f. non Linn. (Fam. Euphorbiaceae), an annual herb, 20-60 cm high, found in Central and Southern India extending to Ceylon.

Vernacular names-

Sanskrit: Mahidhitriki, Bhumyimalaki, Bahuphali

Bengali : Bhumamla, Bhumi amalaki

Gujrati : Bhoi Amali, Bhony amari, Bhonyamali

Hindi : Bhui Amala

English : Chanca piedra

Constituents- Lignans, alkaloids and bioflavonoids. The antihepatotoxic activity of Phyllanthus was attributed to two compounds in the plant called phyllanthin and hypophyllanthin.

Uses- It is used in liver disorders and hepatitis B virus. It is also used as diuretic, deobstruent, astringent, anti-inflammatory, styptic. It is used in prescriptions for dyspepsia, indigestion, chronic dysentery, urinary tract diseases, diabetes, skin eruptions.

14. Mulethi

Biological Source- It consists of dried, unpeeled, stolon and root of *Glycyrrhiza glabra* Linn, (Fam. Leguminosae), a tall perennial herb, upto 2 m high found cultivated in Europe, Persia, Afghanistan and to little extent in some parts of India.

Vernacular names-

Sanskrit: Yastimadhuka, Yastika, Madhuka, Madhuyasti

Bengali : Yashtimadhu

English : Liquorice root

Gujrati : Jethimadha, Jethimard, Jethimadh

Hindi : Mulethi, Mulathi, Muleti,

Jethimadhu, Jethimadh

Urdu : Mulethi, Asl-us-sus

Constituents- Glycyrrhizin, glycyrrhizic acid, glycyrrhetic acid, asparagine, sugars, resin and starch.

Uses- Demulcent, anti-inflammatory, expectorant, antiviral, hepatoprotective, antispasmodic, choleric, mildly laxative, anti-mutagenic, immunomodulating, steroidal modulation, phytoestrogen.

15. Madar

Biological Source- It consists of dried root and bark of *Calotropis gigantea* (Fam. Asclepiadaceae).

Vernacular names-

Sanskrit: Aditya, Aharmani, Arka, Divakar, Bhanu

Bengali : Akanda, Gurtakand, Swetakond

English : Madar tree

Gujrati : Akado, Ratoakdo

Hindi : Ak, Madar, Akan, Lalak, Mudhar

Constituents- The root contains glycosides 0.60-1.42 % on dry basis. The latex contains akudaric. Flowers contain beta-amyrin and stigmaterol.

Uses- The plant is purgative, alexipharmatic, antihelmintic, cureleprosy, leucoderma, ulcers, piles, diseases of the spleen, the liver and the abdomen. The juice is antihelmintic and laxative, cures piles and "Kapha". The root bark is diaphoretic, cures asthma, syphilis. The flower is sweet, bitter, antihelmintic, analgesic, astringent, cures inflammation, tumours, rat bite. The milk is bitter, heating, oleaginous, purgative, cures leucoderma, diseases of abdomen.

16. Biyani

Biological Source- It is perennial herb obtained from *Tephrosia purpurea* (Fam. Papilionaceae).

Vernacular names-

Sanskrit: Sharpunka

Hindi : Sarphonka, Sarponka

Bengali : Bannilgachh

English : Wild indigo

Constituents- The leaves contain rutin and rotenoids, triterpenoids, lupeol. Seeds contain a diketone-pongamol, a flavanone purpurin and sitosterol. The roots gave a prenylated flavanone 7-methylglabranin. Pods contain rotenoids such as villosin, Villon, villosil, villosinol, villinol and villosone.

Uses- Dried herb is diuretic, deobstruent, laxative. It is given for the treatment of cough, bronchitis, bilious febrile attacks, insufficiency of the liver, jaundice, kidney disorders and for the treatment of bleeding piles, boils, pimples.

17. Karer

Biological Source- It is fruit obtained from *Capparis deciduas* (Fam. Capparidaceae).

Vernacular names-

Sanskrit : Granthila, Karaka.

Hindi : Karer, Karel, Karu

English : Caperberry

Gujrati : Ker, Kera

Constituents- The root bark contains spermidine alkaloids. Stachydrine, glucobrassicin, glucocapparin and glucocleomin.

Uses- The bark is bitter and diuretic. It is given in hepatic, spleen and renal complaints. It is used as anti-inflammatory used for enlarged cervical glands, sciatica, rheumatoid arthritis, externally on swelling. Fruits and seeds are used for urinary purulent discharges and dysentery and antimicrobial.

18. Rohiro

Biological Source- It is fruit obtained from *Tecomella undulate* (Fam. Bignoniaceae).

Vernacular names-

Sanskrit: Kushalmali, Rohi, Rohina, Rohita

English : Rohida tree

Hindi : Rugtrora

Constituents- The bark contains teconin, alkanes, alkanols, and beta-sterols. The bark also yielded chromone glycosides such as undulatosides A and B, and iridoid glycosides such as tecomelloside and tecoside. A quinonoid such as lapachol, vatic and dehydrotectol are also reported from the bark.

Uses- Bark is used as relaxant, cardiotoxic, choleric. It is used for treatment for leucorrhoea, diseases of liver and spleen, leucoderma, syphilis and other skin diseases.

19. Harmal

Biological Source- It is perennial herb obtained from *Peganum harmala* (Fam. Nitrariaceae).

Vernacular names-

Hindi : Harmal. Kaladana

English : Foreign Henna

Bengali : Isband

Gujrati : Ispum

Constituents- Harmone, harmine, harmaline, harmalol, vasicine, vasicinone. The plant gave flavonoids such as kaempferol, quercetin and acacetin. Aerial parts and seeds contain alkaloids like harmine, harmaline, harmalol.

Uses- Inhalation of the smoke relieves pain in the liver. It is also employed in jaundice, asthma and colic. The powder of the seeds and watery infusion are given for treatment of these diseases. The alkaloids exhibit antibacterial and antifungal activity.

20. Paniharin

Biological Source- It is obtained from *Leucas aspera* (Fam. Lamiaceae). It is found throughout India, cultivated in fields, wastelands and roadsides.

Vernacular names-

Sanskrit: Dronapushpi

Hindi: Chothalkusa

English: White dead nettle

Constituents- The plant gave oleanolic acid, ursolic acid and beta-sitosterol. The root contains a terpenoid, leucolactone and the sterols, sitosterols, stigmasterol and campesterol.

Uses- It is used in jaundice, anorexia, dyspepsia, fever, helminthic manifestation,

respiratory and skin diseases. Leaves are used as an external application for psoriasis, chronic

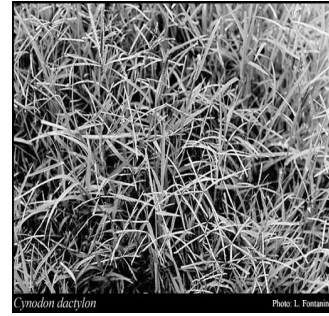
skin eruption and painful swellings.



(a) *Eclipta alba*



(b) *Azadirachta indica*



(c) *Cynodon dactylon*



(d) *Lagenaria siceraria*



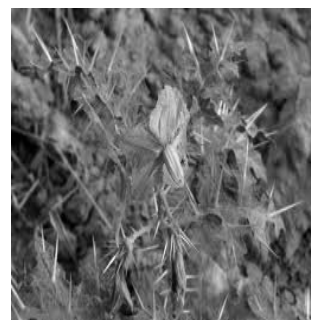
(e) *Calotropis procera*



(f) *Curculigo orchoides*



(g) *Tinospora cordifolia*



(h) *Solanum surattense*



(i) *Aloe barbadensis*



(j) *Boerhaavia diffusa*



(k) *Euphorbia nerifolia*



(l) *Phyllanthus niruri*



(m) *Glycyrrhiza glabra*



(n) *Calotropis gigantea*



(o) *Tephrosia purpurea*



(p) *Capparis deciduas*



(q) *Tecomella undulata*



(r) *Peganum harmala*

Figures (a)-(r): Photos of plants

Table 1: General plant description

S. No.	Name	Botanical name	Plant part used	Chemical Constituents	Uses
1	Bhringaraja	<i>Eclipta alba</i>	Whole plant	Alkaloids: ecliptine, nicotine	Jaundice, enlargement of liver and spleen
2	Neem	<i>Azadirachta indica</i>	Leaf and bark	Triterpenoids, sterols, nimbin and nimbiol	Antimicrobial, antifungal, antipyretic, antiviral
3	Doob	<i>Cynodon dactylon</i>	Dried fibrous roots	Phenolic phytotoxin and flavonoids	Jaundice, eye disorders, antihelmintic
4	Lauki	<i>Lagenaria siceraria</i>	Fresh fruit	Saponin and fatty oil	Jaundice, purgative, emetic, bronchitis
5	Mehandi	<i>Lawsonia inermis</i>	Dried leaves	Glycoside, lawsone, hennatonic acid	Liver enlargement, antihemorrhagic, antispasmodic
6	Kalimusli	<i>Curculigo orchioides</i>	Dried rhizome	Tannin, resin, sapogenin, alkaloids	Nervine, sedative, anti-inflammatory, jaundice, urinary disorders
7	Aak	<i>Calotropis procera</i>	Dried roots and leaves	Glycosides: calotropin, ascorbic acid	Bitter, pungent, laxative, skin disease, liver diseases
8	Giloe	<i>Tinospora cordifolia</i>	Mature stem	Terpenoids and alkaloids	Antipyretic, antiperiodic, hepatoprotective
9	Kantkari	<i>Solanum surattense</i>	Dried whole plant	Solanosine, quercetin diglycoside	Stimulant, expectorant, diuretic, laxative, bronchitis

10	Ghritkumari	<i>Aloe barbadensis</i>	Dries juice of leaves	Aloe emodin, aloin, enzymes, vitamins	Dysmenorrhoea, liver diseases, emollient, anti-inflammatory
11	Punarnava	<i>Boerhaavia diffusa</i>	Whole plant	Flavonoids, alkaloids, lignins, carbohydrates	Viral jaundice, diuretic, anti-inflammatory, spasmolytic
12	Thuhar	<i>Euphorbia nerifolia</i>	Stem	Triterpenoids, euphol	Purgative, diuretic, polyuria
13	Bhui amala	<i>Phyllanthus niruri</i>	Root, stem and leaves	Phyllanthin, hypophyllanthin	Liver disorders, hepatitis B virus
14	Mulethi	<i>Glycyrrhiza glabra</i>	Dried stolon and root	Glycyrrhizin, glabrolide	Demulcent, expectorant, hepatoprotective
15	Madar	<i>Calotropis gigantean</i>	Dried bark and root	Glycosides, akudarin	Purgative, antihelmintic, leucoderma, diseases of spleen and liver
16	Biyani	<i>Tephrosia purpurea</i>	Whole plant	Rutin and rotenoids	Inflammation of spleen and liver, piles, boils and pimples
17	Karer	<i>Capparis deciduas</i>	Fruit	Spermidine alkaloids, glucocapparin	Bitter, diuretic, hepatic, spleen and renal disorders
18	Rohiro	<i>Tecomella undulata</i>	Fruit	Tecomin, tecomelloside	Relaxant, cardiotoxic, choleric, diseases of liver and spleen
19	Harmal	<i>Peganum harmala</i>	Root	Harmine, harmaline	Relieves pain in liver, jaundice, asthma
20	Paniharin	<i>Leucas aspera</i>	Leaves	Urosolic acid, oleanolic acid	Jaundice, anorexia, fever, skin diseases

Hepatoprotective activity reported so far

1. Hepatoprotective activity of *Lawsonia inermis*-

Alcoholic extract of the bark of *Lawsonia inermis* showed hepatoprotective effect against the carbon tetrachloride induced elevation in serum marker enzymes (GOT and GPT), serum bilirubin, liver lipid peroxidation and reduction in total serum protein, liver glutathione, glutathione peroxidase, glutathione-s-transferase, glycogen, superoxide dismutase and catalase activity. The ethanolic extract and its fractions reduced the total bilirubin content and SGOT, SGPT and SAL activities, and reduced liver weight compared to LIV-52 (control)¹⁴.

2. Hepatoprotective activity of *Capparis deciduas*-

The aqueous and methanolic extracts of *Capparis decidua* stems locally were screened for their hepatoprotective activity against CCl₄-induced hepatotoxicity in rats. The hepatotoxicity was found to be inhibited by simultaneous oral administration of aqueous and methanolic extracts of *C. decidua* stems (200, 400 mg kg⁻¹ b.wt.) for 10 days, with evidence of decreased level of serum aspartate amino transferase, alanine amino transferase, alkaline phosphatase and bilirubin. In addition, the concurrent administration of both extracts with CCl₄ for 10 days masked the liver fatty changes induced by the hepatotoxic compound observed in the intoxicated control

rats. The results were compared with the hepatoprotective effect of the standard drug silymarin¹⁵.

3. Hepatoprotective and immunomodulatory properties of *Tinospora cordifolia*-

Effect of *Tinospora cordifolia* extract on modulation of hepatoprotective and immunostimulatory functions in carbon tetrachloride (CCl₄) intoxicated mature rats was reported. The treatment with *T. cordifolia* extract (100 mg/kg body weight for 15 days) in CCl₄ intoxicated rats was found to protect the liver, as indicated by enzyme level in serum. A significant reduction in serum levels of SGOT, SGPT, ALP, bilirubin were observed following *T. cordifolia* treatment during CCl₄ intoxication. The results of experiment suggest that treatment by *T. cordifolia* extract may be the critical remedy for the adverse effect of CCl₄ in liver function as well as immune functions¹⁶.

4. Antioxidant activity of *Curculigo orchioides*-

The antioxidant activity of methanol extract of rhizomes of *Curculigo orchioides* (MEC) was investigated using carbon tetrachloride (CCl₄)-intoxicated rat liver as the experimental model. In CCl₄ + MEC – treated rats these biochemical parameters attained an almost normal level. The decreased activity of antioxidant enzymes, such as superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPX) and glutathione reductase

(GRD) in CCl₄ -intoxicated rats, and its retrieval towards near normalcy in CCl₄ + MEC- administered rats revealed the efficacy of MEC in combating oxidative stress due to hepatic damage. Elevated level of glutathione transferase(GTS) observed in hepatotoxic rats too showed signs of returning towards normalcy in MEC co-administered animals, thus corroborating the antioxidant efficacy of MEC¹⁷.

5. Hepatoprotective activity of *Cynodon dactylon*-

The ethanolic extract of *Cynodon dactylon* against hepatic complications in streptozotocin (STZ) induced type 2 diabetic models was evaluated. The dose of 500mg/kg body weight given once daily for 14 days reduced the levels of serum glutamate oxaloacetate transaminase, serum glutamate pyruvate transaminase, alkaline phosphatase, creatinine and urine sugar significantly (P<0.05) with increase in total protein, haemoglobin and body weight was increased. High LD50 validates its high margin of safety¹⁸.

6. Hepatoprotective activity of *Eclipta alba* Hassk.-

The effect of *Eclipta alba* extract was studied on paracetamol induced hepatic damage in mice. Treatment with 50% ethanol extract of *E. alba* (100 and 250mg/100g body weight) was found to protect the mice from hepatotoxic action of paracetamol as evidenced by significant reduction in the elevated serum transaminase levels. Histopathological studies showed marked reduction in fatty degeneration and centrilobular necrosis, in animals receiving different doses of *E. alba* along with paracetamol as compared to the control group. The mice administered Liv-52, used for comparative evaluation, showed a significant reduction in serum enzyme activity and normal livers. It is stipulated that the extract treated groups were partially protected from hepatocellular damage caused by paracetamol¹⁹.

7. Protective effects of *Peganum harmala*-

The putative protective effect of ethanol and chloroform extracts of *Peganum harmala* on thiourea-induced diseases in adult male rat was studied. The observed-hepatocytotoxicity after thiourea treatment was greatly reduced (AST and ALT activities were respectively 270 IU/l and 60 IU/l and in the same order of

magnitude as in the untreated rats) as well as the bilirubin levels (63mol/l) especially for animals receiving the chloroform preparation. Therefore the extracts of *Peganum harmala* are efficient to reduce the toxicity induced by thiourea in male rat²⁰.

8. Antioxidant activity and hepatoprotective potential of *Phyllanthus niruri*-

Antioxidant activity and hepatoprotective potential of *Phyllanthus niruri*, a widely used medicinal plant, were investigated. Methanolic and aqueous extract of leaves and fruits of *P. niruri* showed inhibition of membrane lipid peroxidation (LPO), scavenging of 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical and inhibition of reactive oxygen species (ROS) in vitro. Antioxidant activity of the extracts were also demonstrable in vivo by the inhibition of the carbon tetrachloride (CCl₄) - induced formation of lipid peroxides in the liver of rats by pretreatment with the extracts. CCl₄ - induced hepatotoxicity in rats, as judged by the raised serum enzymes, glutamate oxaloacetate transaminase (GOT) and glutamate pyruvate transaminase (GPT), was prevented by pretreatment with the extracts, demonstrating the hepatoprotective action of *P. Niruri*²¹.

9. Hepatoprotective activity of *Boerhaavia diffusa* L.-

The effect of seasons, thickness of roots and form of dose (either aqueous or powder) were studied for their hepatoprotective action to prove the claims made by the different tribes of India. The hepatoprotective activity of roots of different diameters collected in three seasons, rainy, summer and winter, was examined in thioacetamide intoxicated rats. The results showed that an aqueous extract (2 ml/kg) of roots of diameter 1-3 cm, collected in the month of May (Summer), exhibited marked protection of a majority of serum parameters, i.e. GOT, GPT, ACP and ALP, but not GLDH and bilirubin, thereby suggesting the proper size and time of collection of *B. diffusa* L. roots for the most desirable results. Further, the studies also proved that the aqueous form of drug (2 ml/kg) administration has more hepatoprotective activity than the powder form; this is probably due to the better absorption of the liquid form through the intestinal tract²².

10. Hepatoprotective potential of *Aloe barbadensis* Mill.-

The shade dried aerial parts of *Aloe barbadensis* were extracted with petroleum ether (AB-1), chloroform (AB-2) and methanol (AB-3). All the extracts were evaluated for hepatoprotective activity on limited test models as hexobarbitone sleep time, zoxazolamine paralysis time and marker biochemical parameters. AB-1 and AB-2 were observed to be devoid of any hepatoprotective activity. These showed significant hepatoprotective activity against CCl₄ induced hepatotoxicity as evident by restoration of serum transaminases, alkaline phosphatase, bilirubin and triglycerides. Hepatoprotective potential was confirmed by the restoration of lipid peroxidation, glutathione, glucose-6-phosphatase and microsomal aniline hydroxylase and amidopyrine *N*-demethylase towards near normal. Histopathology of the liver tissue further supports the biochemical findings confirming the hepatoprotective potential. The study shows that the aqueous extract of *Aloe barbadensis* is significantly capable of restoring integrity of hepatocytes indicated by improvement in physiological parameters, excretory capacity (BSP retention) of hepatocytes and also by stimulation of bile flow secretion²³.

11. Hepatoprotective Properties of *Azadirachta indica* A. Juss.-

The hepatoprotective role of leaf extracts of *Azadirachta indica* A. Juss. was evaluated. Hepatoprotective activities of ethanolic and aqueous extracts of *A. indica* were examined against carbon tetrachloride induced liver damage in mice using silymarin as control. Enzyme activities of Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT) and Alkaline Phosphatase (ALP) were analyzed. Phytochemical leaf extracts of *A. indica* exhibited significant hepatoprotective activity. Ethanolic and aqueous leaf extracts of *A. indica* exhibited moderate activity over carbon tetrachloride treated animals. Results confirm the traditional - ethnomedicinal use of *A. indica* as a potential source of hepatoprotective agent²⁴.

12. Hepatoprotective and immunomodulatory properties of *Tinospora cordifolia*-

Treatment with *T. cordifolia* extract (100 mg/kg body weight for 15 days) in CCl₄ intoxicated

rats was found to protect the liver, as indicated by enzyme level in serum. A significant reduction in serum levels of SGOT, SGPT, ALP, bilirubin were observed following *T. cordifolia* treatment during CCl₄ intoxication. Treatment with *T. cordifolia* extract also deleted the immunosuppressive effect of CCl₄, since a significant increment in the functional capacities of rat peritoneal macrophages (PM phi) was observed following *T. cordifolia* treatment. The results of experiment suggest that treatment by *T. Cordifolia* extract may be the critical remedy for the adverse effect of CCl₄ in liver function as well as immune functions²⁵.

SUMMARY

The arid area of Rajasthan, Gujarat, Punjab and Haryana together constitute the great desert better known as Thar. Plant plays a vital role for existence of the life on the earth. They not only provide food and shelter to living being rather provide medicines as the major source. The drugs used for the treatment of human ailments are the plant product.

Herbal drugs are now a day very popular among users. They are preferred mainly due to easy availability in market, cheaper as compare to synthetic, least side effects and toxicity, desirable effects, etc.

In Thar there are various herbs which are used in many liver diseases, most widely used plants are *Phyllanthus niruri*, *Glycyrrhiza glabra*, *Aloe vera*, *Solanum xanthocarpum*, *Boerhavia diffusa*, *Tehrosia purpurea*, *Capparis deciduas*, *Eclipta alba*, *Calotropis procera*, *Azadirachta indica*, *Cynodon dactylon*, *Euphorbia neriifolia*, *Leucas aspera*, *Lagenaria siceraria*, *Tinospora cordifolia*, *Lawsonia intermis*, *Calotropis gigantea*, *Tecomella undulate*, *Curculigo orchiodes*, *Peganum harmala*, etc. Many research work has been done on these plants regarding their hepatoprotective activity. *Phyllanthus niruri* reported as an effective single drug in treatment of jaundice in children.

Many more herbal plants are present in Thar but here in this paper those plants are discussed which have some use in the management of liver diseases. This report give the information about hepatoprotective plants and their biological source, vernacular names, chemical constituents and medicinal uses.

REFERENCES

1. Friedman LS, Keefe EB. Handbook of liver diseases. 2 Ed. Churchill

- Livingstone – An imprint of Elsevier Inc. 2004:17-406.
2. Eric TH, Dick RG. Textbook of therapeutics, drug and disease management. 6 Ed. Williams and Wilkins. 1996:533.
 3. Luper S. A review of plants used in the treatment of liver disease: Part 1. Alternative Medicinal review. 1998;3:410-421.
 4. Luper S. A review of plants used in the treatment of liver disease: Part 2. Alternative Medicinal review. 1999;4:178-188.
 5. The Ayurvedic pharmacopoeia of India, Part-I, Volume-I, Government of India, Ministry of Health and Family Welfare, Department of Ayush. 6, 27, 38, 39, 60, 63, 70, 79.
 6. The Ayurvedic pharmacopoeia of India, Part-I, Volume-II, Government of India, Ministry of Health and Family Welfare, Department of Ayush. 10, 56-57.
 7. Kare CP. Indian Medicinal Plants- an illustrated dictionary, Springer-verlag berlin/Heidelberg. 2007:75-663.
 8. Kirtikar KR, Basu BD. Indian medicinal plants, Volume-III. 2 Ed. International book distributors. 2005; 1607-1609, 1841-1842, 2019-2020.
 9. Kirtikar KR, Basu BD. Indian medicinal plants. Volume-I. 2 Ed. International book distributors. 2005; 197-199, 456-458, 724-725.
 10. Kirtikar KR, Basu BD. Indian medicinal plants. Volume-II, 2 Ed. International book distributors. 2005:1077-1079.
 11. <http://www.goherbalremedies.com/product/liver-cirrhosis.htm> accessed on 27.08.2010.
 12. Khan TI, Dular AK. Biodiversity conversation in the Thar desert; with emphasis on Endemic and Medicinal plants. The Environmentalist. 2003;23:137-144.
 13. Upadhyay B, Roy S and Kumar A. Traditional uses of medicinal plants among the rural communities of Churu district in the Thar desert, India. Journal of Ethnopharmacology. 2007;113(3):387-399.
 14. Hemalatha K, Natraj HN and Kiran AS. Hepatoprotective activity of leaves of *Lawsonia alba*. Indian Journal of Natural Products. 2005;22:336-339.
 15. Ali SA and Al-Amin TH. Hepatoprotective activity of aqueous and methanolic extracts of *Capparis decidua* against carbon tetrachloride induced liver damage in rats. Indian Journal of Pharmacology and Toxicology. 2009;4:167-172.
 16. Bishayi B, Roychowdhury S, Ghosh S and Sengupta M. Hepatoprotective and Immunomodulatory properties of *Tinospora cordifolia* in carbon tetrachloride intoxic albino rats. Journal of Toxicology Science. 2002;27:139-146.
 17. Venukumar MR and Latha MS, Antioxidant activity of *Curculigo orchoides* in carbon tetrachloride induced hepatopathy in rats. Indian Journal of Clinical Biochemistry. 2002;17:80-87.
 18. Singh SK, Rai PK, Mehta S and Singh RK. Curative effect of *Cynodon dactylon* against STZ induced hepatic injury in diabetic rats. Indian Journal of Clinical Biochemistry. 2009;24:410-413.
 19. Tabassum N and Agarwal SS. Hepatoprotective activity of *Eclipta alba* Hassk. against paracetamol induced hepatocellular damage in mice. Experimental medicine. 2004;11:278-280.
 20. Hamden K, Masmoudi H and Ellouz F. Protective effects of *Peganum harmala* extracts on thiourea induced diseases in adult male rat. Journal of Environmental Biology. 2008;29:73-77.
 21. Harish R and Shivnandappa T. Antioxidant activity and hepatoprotective potential of *Phyllanthus niruri*. Food chemistry. 2006;95(2):180-185.
 22. Rawat AKS, Mehrotra S, Tripathi SC and Shome U. Hepatoprotective activity of *Boerhavia diffusa* L. roots – a popular Indian ethnomedicine. Journal of Ethnopharmacology. 1997;56:61-66.
 23. Chandan BK and Saxena AK. Hepatoprotective potential of *Aloe barbedensis* Mill. Against carbon tetrachloride induced hepatotoxicity. Journal of Ethnopharmacology. 2007;111:560-566.

24. Kalaivani T, Meiganam E, Premkumarpattinam N and Siva R. Studies on Hepatoprotective properties of leaf extracts of *Azadirachta indica* A. Juss (Meliaceae). *Ethnobotanical leaflets*. 2009;13:165-170.
25. Bishayi B, Roychowdhury S, Ghosh S and Sengupta M. Hepatoprotective and Immunomodulatory properties of *Tinospora cordifolia* in carbon tetrachloride intoxicated albino rats. *Journal of Toxicology Science*. 2002;27:139-146.