

Phytomedicodiversity of Some Pharmaceuticals Angiosperms Having Hepatoprotective Properties

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ABSTRACT

The present paper describes for the first time an illustrated account of some hepatoprotective plants of Bhadohi region. In the present study, nearly 28 medicinal plant species belonging to 23 families and 28 genera collected. The plants have been extensively collected from different parts of the district. Their biodiversity, taxonomy, ecology, economic uses and conservation have been discussed in detail

Introduction - In spite of enormous progress in modern medical system, about 80% of the world population still depends on traditional systems of medicine for primary health care, which is true in Indian scenario also (Anonymous 2000, Agharkar, 1954). Medicine in contemporary India is a fascinating blend of traditional system with conventional one and often been used for various historical, cultural and ecological and socio economical reasons (Mishra 2016, 2017). The liver is the second largest and most important organ in the body. It plays an important role in maintaining various physiological processes in the body (1). It is involved in several vital functions, such as metabolism, secretion, and storage. Liver regulate carbohydrate, protein and fat metabolism. It plays a key role in the detoxification and excretion of many harmful toxic compounds which may be produced inside the body or coming outside (2). Hence, any injury to or impairment of its function has grave implications for the health of the affected person. Every year large number of people are die due to liver cirrhosis caused by hepatitis. Viral infection also play a important role in liver injury. Liver acts as a storage depot for proteins, glycogen, various vitamins, and metals. It also has a role in the regulation of blood volume by transferring the blood from the portal to the systemic circulation and its reticulo-endothelial system and participates in the immune mechanism. The human body identifies almost all drugs as foreign substances and subjects them to various chemical processes (such as metabolism) to make them suitable for elimination. Although almost all tissues in the body have some ability to metabolize chemicals, smooth endoplasmic reticulum in liver is the principal "metabolic clearing house" for both endogenous chemicals (e.g., cholesterol, steroid hormones, fatty acids, and proteins), and exogenous substances (e.g., drugs).

Material and methods- The hepatoprotective medicinal plant species have been collected from different parts of Bhadohi district, namely Bhadohi, Suriyawan, Gyanpur, Deegh, Abholi and Aurai (Figure-1) covering three seasons, summer, winter and rainy season. . Collected plants were processed and their herbaria were prepared by standard Lawrance methods (Lawrance, 1951) with slight modifications. Plants were properly dried up by changing a number of newspapers and poisoned with mercuric chloride solution

in alcohol. Later on, the dried specimens were mounted on standard herbarium sheets, labelled properly and arranged alphabetically according to their botanical names. . These plant specimens have been identified with the help of Keys and regional Floras and confirmed with the authentic herbarium specimens at BSI Prayagraj and Duthie herbarium at University of Allahabad, Prayagraj. The voucher specimens were deposited in the Deptt of Botany KN Govt. PG college Gyanpur, Bhadohi District.

Observation:- In the present study, nearly 28 hepatoprotective plants species belonging to 23 families and 28 genera collected ,from various parts of the Bhadohi district, have been enumerated and documented, see Table – 1. Some of the significant trees are described and illustrated below with their botanical name, vernacular name, family, habit, phenology and taxonomical description. See **Table- 1**

Abutilon indicum (L) Sweet., Malvaceae Juss., Vern. Kanghi (H)- A robust shrub or undershrub, branches many, leaves ovate to orbicular – cordate , soft. Flower buds drooping . Flowers orange- yellow, on long pedicels. Ripe carpels 15 -20, black at maturity, reniform. Short beaked, seeds black, tubercled. Flowering and Fruiting. Sept – March

Phytochemicals : Gossypetin – 8 and 7- glucosides, cynadin 3- rutinoside, alkanol, b- sitosterol, tocopherol, asparagine and p- coumaric acid.

Achyranthes aspera., Amaranthaceae, Chirchita and Apamarg- Erect annual herb, leaves large, ovate, acute or acuminate, glabrous. Flowers greenish white, deflexed , in terminal spikes elongating in fruits, bracts and bracteoles persistent, ending in a spine, utricle oblong, seeds sub cylindrical, brown. Flowering and Fruiting. Phytochemicals: Achyranthin, saponin, ecdysterone, ecdstone, amino acids. Pharmacological uses: Plant is carminative, diuretic, purgative, bitter and pungent. Whole plant is used in snake bite and cure from poisonous insects. The powder from the root is used in wounds, sores, toothache, leprosyulcer and menstrual disorders.

Adhatoda vasica., Acanthaceae , Adusa- A diffused , branched, ever green shrub, internodes short, leaves ovate or elliptic – lanceolate, acuminate. Flowers white , with pink or purple stripes, in dense, axillary, spikes at the ends of branches, bracts conspicuous, capsules long, clavate, seeds sub orbicular rugose. Flowering and Fruiting: Nov – Mar.

Phytochemicals: vasicol, vasicinolone, vasicine, vasicinone, vasicinol, adhatonine, daucosterol, triterpenes, Apigenin, Astragalin, Kaempferol, Quercetin and Vitexin.

Aegle marmelos(L.) Correa Rutaceae Juss Bel- Spreading trees, up to 25m tall. Leaflets, lanceolate or elliptic- lanceolate, glabrous, terminal one and largest. Flowers greenish- white, 4-5 merous; pedicels articulates. Calyx pubescent, lobes flat. Petal free, coriaceous. Fruit globose, 5-20 cm across. Pulp thick, tasty, orange coloured. Seeds numerous, embedded in mucilage. Flowering and fruiting may-feb

Allium cepa. Liliaceae , Pyaaz- Erect annual herb, bulbs large, leaves radical, hollow, bifarious, flowers many , white in colour in dense umbels with both flowers and bulbils, stamen exerted. Flowering and Fruiting Oct- March.

Phytochemicals: organic sulphides, catechol, kaemferol, quercetin, diosgenin, essential oil, tryptophane

Allium sativum., Liliaceae, Lahsun- Annual herb, bulb short, with bulblets enclosed in a white or pink envelope, leaves flat, flowers often displaced by bulbils , pinkish in a lax umbels on a long , terete scape exceeding the leaves, anthers and style exerted. Flowering and Fruiting Sept- Mar

Phytochemicals : Xylitol, Allicin, allisatin, quercetin, prostaglandin and kaempferol

Aloevera(L.) Webb.& Berth.(non Mill). Liliaceae Juss., Ghrithkumari- Perennial herb, stoloniferous plant, leaf rosettes arising from ground, 60-80 cm height, leaves erect, thick, numerous glaucous- green lanceolate, long- acuminate, thorn-edged, flowers vermilion coloured, in simple, racemes, the lower flowers falling

off as the racemes elongates. Stamens equal in the perianth. Flowering & fruiting Nov-Mar
Phytochemicals: aloin, isobarbaloin, emodin, chrysophanic acid, aloesin, aloesone, glycosides and barbaloin.

Andrographis paniculata(Burm. F) wall.ex.Nees. **acanthaceae Juss., Kalmegh**- An erect annual herb, 40-100cm in height ,branches herbaceous, greenish, sharply 4- angled or winged. Leaves 5-10 x 2.0-2.5cm, ovate, lanceolate, inflorescence a lax, axillary and terminal, unilateral raceme, forming a panicle, flowers whitish, spotted with rose- purple, bracts opposite, paired, capsules tapering at ends. Flowering & fruiting Oct- Mar. Phytochemicals: andrographin, panicolin, b-sitosterol, glucoside, polyphenol, caffeic acid and panicolide.

Azadirachta indica L., Meliaceae Juss., Neem- A large tree, leaves 20-30 cm long, crowded near the ends of the branches, pinnate. Leaflets 10-12 serrate, flowers white, scented, anthers 10, ovary 3 celled, drupes ovoid-oblong, smooth, yellow when ripe. Flowering & fruiting Mar-July.

Phytochemicals: nimidol, nimbolin A&B, nimboesterol, nimbin, nimbidin, nimbolide, azadiradione, azadirone, meliantriol, meldonin, naheedin, meliacarbin, nimbiol, quercetin and - nimbin.

Boerhaavia diffusa L. Punarnava , Nyctaginaceae- Plant description – diffuse herb, stem prostrate, divaricately branched, slender, purplish, swollen at nodes, spreading to 30-60 cm. leaves opposite, in unequal pairs, at each node. Larger 3-4 cm, the smaller 1-2 cm, broadly ovate, obtuse, base rounded, margins pink, undulate, petioles 2-4 cm, flowers dark pink, funnel shaped, very small, sessile, 4-10 in umbels 5-8 mm diameter, arranged in terminal panicles. Perianth 5 lobed, stamens 2-3, exserted.. Plant parts used- fresh whole plant, root, leaves and flowers

Chemical constituents- punarnavine, sterol, beta- sitosterol, stearic acid, palmitic acid, minerals, sodium sulphate, potassium nitrate

Calotropis gigantea (L.) R.Br. Asclepiadaceae R.Br., safed madar- Large shrub, reaching small tree size. Leaves elliptic to obovate, 10-20 cm long, amplexicaul or cordate at base, with a ring of glandular lateral hairs at the base of lamina. Flowers white, sub umbellate cymes. Sepals cottony. Corolla campanulate, divided more than half- way down, lobes revolute and twisted in age. Follicles in pairs, boat shaped, with a hooked tip, cottony pubescent. Seeds with long silky coma. Flowering and fruiting throughout the year.

Phytochemicals: calotoxin, calotropin, syriogenin, proceroiside, uscharidin, voruscharin, theaspirone and calactinic acid.

Carica papaya L., Caricaceae Dum., papita

A rapidly growing tree, 4-5 m in height, weak, succulent trunk and milky sap. Leaves palmately lobed. Flowers creamy yellow. Male flowers in long, drooping panicles and female in short clusters. Flowering and fruiting Aug- Nov.

Phytochemicals: papain, carpain, carposide, glycoside, carpaine and chymopapain.

Eclipta alba (L.) Hassk. Asteraceae Dum., Bhringraj

Prostrate, decumbent- ascending or erect, annual herb, stem often creeping and rooting at the base, appressed- pubescent. Leaves sessile, ovate lanceolate, elliptic- oblong, acute or obtuse, narrowed to the base, entire- faintly serrate, appressed- hispidulous. Heads axillary and terminal, 0.6-1cm across, on 5-7cm long peduncles. Marginal flowers white, 2- dentate, 0.25cm long ligules. Corolla of disc- flowers 0.2 cm long. Achenes oblong- turbinate, tuberculate, with a thickened margin, 0.2- 0.25cm long. Flowering and fruiting April- Dec.

Phytochemicals: stigmasterol, a-ter- thienylmethanol, ecliptine and nicotine.

Mimosa pudica L., Mimosaceae R.Br., Chui-mui, Lajwanti

young branches red, closely ribbed, beset with short recurved prickles, rachis upto 20 cm long, prickly; pinnae with 16-20 pairs of oblong unequal sided, obtuse, mucronate, leaflets. Flower tetramerous, pink in globose, pedunculate heads at branch ends forming a leafy, terminal panicle. Stamens 8 long exerted. Pods falcate, glabrous, 4-10 jointed. Flowering and fruiting Aug- Mar.

phytochemicals: L-mimosine, b-sitosterol, d-pinitol, nor-epinephrine, glycosides, saponins and coumarin.

Ricinus communis L. Euphorbiaceae Juss., Arandi

Erect, glabrous, pruinose, perennial shrub, stem fistular, often red suffused, leaves peltate, orbicular in outline, palmatifid, green, often suffused with red; lobes ovate lanceolate to oblong, caduate-acuminate, coarsely serrate. Flowers in subsessile cymes, combined into erect, pruinose. Male flowers in 3 to 25 flowered cymes. Pedicels jointed a little above the middle, 0.5-0.6 cm long, glandular pruinose. Female flowers in 1 to 7 flowered cymes. Pedicels jointed at the top, 0.5 cm long at first, afterwards elongate. Perianth spathaceous or divided irregularly in to 2-3 lobes, caduceus. Fruit sub globose, muricate, pruinose, 1-2 cm long. Seeds oblong, carunculate. Flowering and fruiting Sept- Apr.

Phytochemicals: ricin, campesterol, ricin A,B, C & D, palmitic acid, arachidic acid, kaempferol, coumarin, oleic, linoleic, lupeol, 30- norupan-3b-20-one, and ricinoleic acid.

Phyllanthus niruri L. Euphorbiaceae Juss., bhui-awla

Erect, glabrous, branched herb, upto 45 cm high, branchlets compressed trigonous. Leaves distichous, upto 2cm long, ovate elliptic or acute, cuneate at base. Male flowers fascicled, short stalked; bracts lanceolate; perianth segments 5-6, subequal, 2- seriate; stamens 3; disc lobes 6, glandular yellowish. Female flowers solitary; styles free; capsule globose, glabrous; seeds trigonous, longitudinally ribbed, disc shallowly 5- lobed. Flowering and fruiting June- Dec.

Phytochemicals: phyllanthin, hypophyllanthin, niranthin, nirtetralin, phyltetralin, kaempferol, b-sitosterol, eriodictyol- rhasmnopyranoside and saponins.

Pharmacological uses: whole plant is used in cure of gonorrhea, dyspepsia, dysentery

Plumbago zeylanica L., Plumbaginaceae Juss., Chitrak

Perennial, erect undershrub, 1m tall; young shoots clothed with stalked glands. Leaves ovate, apex, sub acute, base narrowed, white punctuate beneath. Flower 7-20 cm long, terminal spikes, calyx long, tubular, 5- toothed, red tipped glands. Corolla tubular, white, obovate- oblong, acute. Capsule 8-10mm long, oblong, seeds solitary, oblong, reddish black. Flowering and fruiting Apr- Oct.

Phytochemicals: plumbagin, suberosis, isoshinanolone, plumbaginic acid, b-sitosterol, trans- cinnamic acid, vanillic acid, 2,5-di methyl-7- hydroxyl chromone, indole -3- carboxaldehyde.

Solanum nigrum L. Solanaceae Juss., Makoy

Diffused much branched herbs upto 1m height; leaves ovate to ovate- lanceolate, sinuate or lobed; flower in umbeliform, extra- axillary cyme; peduncle 1-5cm long, appressed hairy, calyx lobes ovate rounded, corolla pubescent; berries round, smooth up to 7mm across, seeds minutely pitted, yellow. Flowering Oct- June

Phytochemicals: solasomine, solamargine, soladulcidine, tomatidine, 5a-solasodanol and demissidine

Syzygium cumini (L.) Skeels., myrtaceae Juss., jamun

A medium sized tree, bark smooth grey; leaves simple, large, obovate, panicles lateral, from the scars of fallen leaves; flowers greenish- white, berries ovoid or oblong, dark purple, juicy, 1- seeded. Flowering May-Sept

Phytochemicals: glycoside, jambolin, ellagic acid, gallic acid, resin, isoquercetin, kaempferol and myricetin.

***Tinospora cordifolia*(Willd.) Hook.F. & Thoms., Menispermaceae Juss., Gurach**

A glabrous, climbing shrub. Leaves cordate, petiolateous beneath, cordate and 7- nerved, membranous; flowers small, yellow; male ones in fascicled in the axils of bracts, outer 3 sepals ovate- oblong, inner 3 broadly elliptic to suborbicular, female flowers petals flat, staminode 6; carpels 3, style short, stigma lobed. Drupelets 1-3 , orange red. Flowering Feb- Aug.

Phytochemicals: glucosides, giloin, syringing, palmarin, protoberberine, gilenin, columbin, tinocordifolin and tinosporic acid.

Results and Conclusion

In the present study, nearly 28 hepatoprotective plants species belonging to 23 families and 28 genera collected ,from various parts of the Bhadohi district, have been enumerated and documented, The liver is a vital organ that plays a crucial role in maintaining overall body function. Located in the upper right side of the abdomen, it is the largest solid organ in the body and weighs around 3 pounds. One of the liver's key functions is detoxification. It acts as a filter for harmful substances, converting toxins into less harmful compounds that can be excreted by the body. This includes metabolizing drugs, alcohol, and environmental pollutants. Additionally, the liver produces bile, which helps in the digestion and absorption of fats. The liver also plays a critical role in metabolism. It regulates the levels of glucose, amino acids, and fats in the bloodstream. It stores excess glucose in the form of glycogen and releases it when the body needs energy. Moreover, the liver synthesizes important proteins, including blood clotting factors and immune system components. Furthermore, the liver aids in nutrient storage. It stores vitamins (such as A, D, and B12), iron, and other essential minerals needed for bodily functions. When the body requires these nutrients, the liver releases them into the bloodstream. Another important function of the liver is the production of cholesterol. While cholesterol has a bad reputation, it is necessary for the production of hormones and cell membranes. The liver balances cholesterol levels in the body by producing and removing it as needed. In conclusion, the liver is a multitasking marvel that performs essential functions for overall health. From detoxification and metabolism to nutrient storage and cholesterol regulation, this exceptional organ ensures the body runs smoothly and maintains optimal well-being.

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Table- 1. Showing list of some Hepatoprotective plants

Botanical name	Vernacular name	Family	Habit/habitat	Plant parts used	Pharmacological uses
<i>Achyranthes aspera</i> L. SM	chirchita	Amaranthaceae Juss	H/W	root	Liver disorder
<i>Adhatoda vasica</i> Nees.	adusa	Acanthaceae Juss.	S/W	Leaves, flower	jaundice
<i>Aegle marmelos</i> (L.) Correa	bel	Rutaceae Juss	T/C	leaves	jaundice
<i>Allium sativa</i> L.	Lahsun	Liliaceae Juss	H/W	Bulb	Liver disorder
<i>Aloe barbadense</i> L.	Gheekumar	liliaceae	H/C	leaf	
<i>Andrographis paniculata</i> (Burm. F) Wall. Ex. Nees	kalmegh	Acanthaceae Juss	H/W	root	Liver inflammation
<i>Azadirachta indica</i> L.	neem	Meliaceae Juss	T/C	bark	jaundice
<i>Boerhaavia diffusa</i> L.	punarnava	Nyctaginaceae Juss	H/W	Stem, leaves root	Chronic liver disorder, jaundice cure
<i>Calotropis procera</i> (Aiton) R. Br.	Safed madar	Asclepiadaceae R.Br	H/W	Root bark	jaundice
<i>Carica papaya</i> L.	papita	Caricaceae Dum	T/C	Fruit latex	Liver enlargement
<i>Cuscuta reflexa</i> Roxb.	Amar-bel	Convolvulaceae Juss	C/C	stem	Liver inflammation
<i>Eclipta alba</i> (L.) Hassk	bhrangraj	Asteraceae Dum	H/W	Leaves, stem	Liver disorder, jaundice
<i>Indigofera tinctoria</i> L.	leel	Fabaceae Lindle	H/W	Leaves juice	Liver inflammation
<i>Lawsonia inermis</i>	Mehendi	Lythraceae	H/W	leaf	Liver inflammation
<i>Leucas cephalotes</i>	Goma	Lamiaceae	H/C	stem	Liver enlargement
<i>Luffa acutangula</i>	lauki	Cucurbitaceae	H/C	fruit	jaundice
<i>Mimosa pudica</i>	chuimui	Fabaceae	H/C	stem	Liver disorder

<i>Ricinus communis</i> L.	arandi	Euphorbiaceae Juss	H/C	leaf	Liver disorder
<i>Phyllanthus niruri</i> L.	Bhui- awla	Euphorbiaceae Juss	H/W	leaf	Liver disorder
<i>Polygonum tortuosum</i>	knotweed	polygonaceae	H/W	root	Liver disorder
<i>portulaca</i>	purslane	portulacaceae	H/W	leaf	Liver disorder
<i>Plumbago zeylanica</i> L.	Chitrak	Plumbaginaceae Juss	H/W	root	Reduce inflammation of liver
<i>Sphaeranthus indicus</i> L.	Mundi	Asteraceae Dum	H/W	Whole plant	Jaundice, liver problem
<i>Solanum nigrum</i> L.	Mokoiya	Solanaceae Juss.	H/W	leaf	Liver disorder
<i>Syzygium (L.)Skeels</i>	jamun	Mryrtaceae Juss	T/C	fruit	Jaundice, liver disorder
<i>Tephrosia</i>	Sharapunka	fabaceae	H/W	root	Liver enlargement, jaundice
<i>Thespesia(L.)Sol.ex.correa</i>	Paras pipal	Malvaceae Juss	H/W	Leaf	Liver disorder
<i>Tinospora cordifolia</i> (Willd.) Hook. F. <i>Thoms</i>	Gurach	Minispermaceae Juss	C/W	stem	jaundice