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HEPATOPROTECTIVE PLANTS IN ASHTANGA HRIDAYA: AN EVIDENCE-MAPPED REVIEW BRIDGING CLASSICAL AYURVEDA AND MODERN LIVER RESEARCH

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ABSTRACT

Background: *Ayurveda* describes medicinal plants through *Rasa, Guna, Virya, Vipaka* and *Karma*, with several drugs traditionally relevant to *Yakrit, Kamala, Halimaka* and related disorders. Objective: To map hepatoprotective plants identified from the *Ashtanga Hridaya* against contemporary evidence, drugs overlap in *Bhavaprakasha*, summarize effects on liver-profile markers and mechanisms, and prioritize future research. **Methods**: Classical drugs were identified from *Ashtanga Hridaya* which are used *Yakrit, Kamala, Halimaka* and related disorders, while modern mechanisms were included supported by identified peer-reviewed studies. Evidence was classified as clinical, in-vivo, in-vitro or classical-only. **Results**: Stronger translational candidates included *Picrorhiza kurroa* Royle ex Benth., *Phyllanthus emblica* L., *Glycyrrhiza glabra* L., and *Terminalia chebula* Retz. Additional experimental support exists for *Tinospora cordifolia (Guḍuchi*), *Zingiber officinale (Suṇṭhi*), *Cyperus rotundus Linn. (Musta), Piper longum* L. (*Pippali*), *Piper nigrum* L. (*Marica), Swertia chirata (Chirayata / Kiratatikta*), *Plumbago zeylanica (Chitraka)* and others. Common outcomes included reductions in ALT, AST, ALP, bilirubin and lipid peroxidation with restoration of *glutathione* and antioxidant enzymes. *Haritaki, Draksha* and *Guduchi* were the principal *Bhavaprakasha Kamalahara/Yakrit-Rogahara* overlaps with the *Ashtanga Hridaya*.

Conclusion: Classical plants provide a useful hypothesis-generating reservoir, but translation requires authentication, chemical standardization, mechanistic validation, toxicology and well-designed clinical trials.

KEYWORDS: *Ayurveda*; *Ashtanga Hridaya*; hepatoprotection; *Yakrit roga; Bhavaprakasha Nighantu*; medicinal plants.

INTRODUCTION

The liver is a central organ for metabolism, detoxification, bile formation, protein synthesis and immune regulation. Liver function can be adversely affected by a wide range of etiological factors, including viral infections, alcohol exposure, toxic metabolites, xenobiotics, and other pathogenic insults, potentially resulting in acute or chronic hepatic injury. Acute liver injury is most commonly associated with infections caused by hepatotropic viruses; however, drug-induced liver injury (DILI) has emerged as an increasingly recognized global health concern. In contrast, chronic liver diseases are frequently associated with prolonged alcohol consumption and persistent infections with hepatitis B virus (HBV) and hepatitis C virus (HCV), while metabolic dysfunction-associated steatotic liver disease (MASLD) is becoming increasingly prevalent worldwide. Persistent hepatic injury may progressively lead to advanced liver disease, including cirrhosis and hepatocellular carcinoma, thereby contributing substantially to global morbidity and mortality.[1]

Liver diseases remain a major global health burden, causing approximately 2 million deaths annually, with cirrhosis and hepatocellular carcinoma being major contributors.[2] The increasing prevalence of metabolic and alcohol-related liver diseases further emphasizes the need for safe and effective hepatoprotective therapies. *Ayurvedic* literature approaches hepatic disorders through concepts involving *Yakrit roga, Kamala, Halimaka* and *Kumbha-Kamala*, together with derangements of *Agni*, *Pitta* and tissue metabolism.

The present review therefore combines classical evidence, *Bhavaprakasha* cross-validation, contemporary biochemical outcomes, molecular mechanisms, safety signals and a translational research-priority framework.

OBJECTIVE

- To identify the hepatoprotective plant mentioned in *Ashtanga Hridaya.*
- Map published evidence to ALT, AST, ALP, bilirubin, albumin, oxidative-stress markers and histopathology.
- Identify plants with contemporary use and comparatively evidence.
- Identify overlap with hepatoprotective plants described in *Bhavaprakasha*.
- Distinguish evidence-supported plants from research gaps.

MATERIALS AND METHODOLOGY

Classical source and data handling-

Plants were identified from *Ashtanga Hridaya* used in *Yakrita Vikara*, *Kamala Roga, Halimaka* etc. *Bhavaprakasha* was used as a supplementary classical source to identify *Rasa, Guna, Virya, Vipaka* and *Karma* of plants.

Literature search-

Final database searches include PubMed/MEDLINE, Scopus, Web of Science and ScienceDirect. Plant specific searches should combine botanical synonyms with hepatoprotective, liver injury, hepatotoxicity, ALT, AST, bilirubin, NAFLD/MASLD and mechanistic terms.

Evidence hierarchy used in this study is given in **Table 1**.

Table 1: Evidence hierarchy.

Level	Evidence	Interpretation
I	Human randomized/controlled studies	Highest translational relevance
II	Human observational/clinical studies	Clinical relevance with greater confounding
III	Animal in-vivo studies	Pharmacological proof-of-concept
IV	In-vitro/mechanistic studies	Mechanistic support
V	Classical/traditional evidence alone	Hypothesis-generating
VI	No reliable modern evidence	Research gap

RESULTS

Total 46 plant names were mentioned in *Ashtanga Hridaya* which are used in *Yakrit Roga, Kamala, Halimaka* and related disorders, out of which 23 plants are repeated in different formulations. The compilation of botanical nomenclature, family and *rasadi-panchaka* of these 23 plants are given in **(Table no 2)**.

Table 2: Botanical nomenclature, family and *Rasadi-panchaka* selected plants.

S. No.	Drug name	Botanical name	Family	*Rasa*	*Guna*	*Virya*	*Vipaka*
1	*Munakka (Drakṣa)*	*Vitis vinifera* L.	Vitaceae	*Madhura*	*Guru, Snigdha*	*Sheeta*	*Madhura*
2	*Muleṭhi (Yaṣṭimadhu)*	*Glycyrrhiza glabra* L.	Fabaceae	*Madhura*	*Guru, Snigdha*	*Sheeta*	*Madhura*
3	*Nagarmotha (Musta)*	*Cyperus rotundus* L.	Cyperaceae	*Tikta, Kaṭu, Kaṣhaya*	*Laghu, Rukṣa*	*Sheeta*	*Kaṭu*
4	*Amalaki (Amla)*	*Phyllanthus emblica* L.	Phyllanthaceae	*Pancharasa except Lavana; Amla-pradhana*	*Laghu, Rukṣa*	*Sheeta*	*Madhura*
5	*Pippali*	*Piper longum* L.	Piperaceae	*Kaṭu*	*Laghu, Snigdha, Tīkṣṇa*	*Anuṣṇa-Sheeta*	*Madhura*
6	*Indrajau (Indrayava)*	*Holarrhena pubescens* Wall. ex G.Don	Apocynaceae	*Tikta, Kaṣhaya*	*Laghu, Rukṣa*	*Sheeta*	*Kaṭu*
7	*Kuṭaki (Kaṭuka)*	*Picrorhiza kurroa* Royle ex Benth	Plantaginaceae	*Tikta*	*Laghu, Rukṣha*	*Sheeta*	*Kaṭu*
8	*Trayamaṇa*	*Gentiana kurroo* Royle	Gentianaceae	*Tikta, Kaṣhaya*	*Laghu, Rukṣa*	*Uṣhṇa*	*Kaṭu*
9	*Vasa (Aduṣa)*	*Adhatoda vasica* Nees	Acanthaceae	*Tikta, Kaṣhaya*	*Laghu, Rukṣa*	*Sheeta*	*Kaṭu*
10	*Parmal/Paṭola*	*Trichosanthes dioica* Roxb.	Cucurbitaceae	*Tikta*	*Laghu, Rukṣa*	*Uṣhṇa*	*Kaṭu*
11	*Nimba*	*Azadirachta indica* A.Juss.	Meliaceae	*Tikta, Kaṣhaya*	*Laghu, Rukṣa*	*Sheeta*	*Kaṭu*
12	*Kiratatikta (Chirayata)*	*Swertia chirata* (Roxb. ex Fleming) Karsten	Gentianaceae	*Tikta*	*Laghu, Rukṣa*	*Uṣhṇa*	*Kaṭu*
13	*Daruharidra (Daruhaldi)*	*Berberis aristata* DC.	Berberidaceae	*Tikta, Kaṭu*	*Laghu, Rukṣa*	*Uṣhṇa*	*Kaṭu*
14	*Shunṭhi (Sonth)*	*Zingiber officinale* Roscoe	Zingiberaceae	*Kaṭu*	*Laghu, Snigdha*	*Uṣhṇa*	*Madhura*
15	*Marica (Kali Mirch)*	*Piper nigrum* L.	Piperaceae	*Kaṭu*	*Laghu, Tīkṣṇa*	*Uṣhṇa*	*Kaṭu*
16	*Citraka*	*Plumbago zeylanica* L.	Plumbaginaceae	*Kaṭu*	*Laghu, Tīkṣṇa*	*Uṣhṇa*	*Kaṭu*
17	*Haritaki (Harada)*	*Terminalia chebula* Retz.	Combretaceae	*Pancharasa except Lavana;*	*Laghu, Rukṣa*	*Uṣhṇa*	*Madhura*

				Kaṣhaya-pradhāna			
18	*Vibhitaki (Baheda)*	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	*Kaṣhaya*	*Laghu, Rukṣa*	*Uṣṇa*	*Madhura*
19	*Nishotha (Trivṛt)*	*Operculina turpethum* (L.) Silva Manso	Convolvulaceae	*Madhura*	*Rukṣa*	*Uṣhṇa*	*Kaṭu*
20	*Danti*	*Baliospermum montanum* (Willd.) Müll.Arg.	Euphorbiaceae	*Kaṭu*	*Guru, Tīkṣṇa*	*Uṣhṇa*	*Madhura*
21	*Guḍuchi*	*Tinospora cordifolia* (Willd.) Hook.f. & Thomson	Menispermaceae	*Tikta, Kaṣhaya*	*Laghu, Snigdha*	*Uṣhṇa*	*Madhura*
22	*Parpataka (Pitta papada)*	*Fumaria indica*	Fumariaceae	*Tikta, Madhura*	*Laghu, Ruksha*	*Sheeta*	*Katu*
23	*Peepal*	*Ficus religiosa*	Moraceae	*Kaṣhaya, Madhura*	*Guru, Ruksha*	*Sheeta*	*Katu*

Below shows plants having evidence published as clinical, in-vivo, in-vitro studies along with their effect on liver profile supported by proposed mechanism and level of evidence (Table-3).

Highest-priority evidence-supported plants (Table-3):

No.	Drug	Botanical name	Evidence level	Evidence-based effect on liver / liver profile	Proposed mechanism supported by study
1	*Munakka / Draksa*	*Vitis vinifera* L.	III	In CCl_4-induced liver injury, *V. vinifera* extract reduced ALT/SGPT, AST/SGOT, ALP and total bilirubin. Leaf extract also reduced hepatic/plasma MDA and improved hepatic GSH.[3]	Mainly antioxidant and membrane-protective action; reduction of lipid peroxidation and preservation/restoration of GSH.[4]
2	*Mulethi / Yastimadhu*	*Glycyrrhiza glabra* L.	II–I	Glycyrrhizin-containing preparations have clinical evidence across liver diseases, including reduction of ALT/AST and inflammatory activity in selected liver disorders.	Anti-inflammatory, antioxidant, anti-apoptotic, membrane-stabilizing and antifibrotic effects; glycyrrhetinic acid/glycyrrhizin modulates inflammatory signaling and oxidative stress.[5]

3	*Nagarmotha / Musta*	*Cyperus rotundus* L.	III–IV	In CCl_4-treated rats, extracts significantly normalized SGOT, SGPT, GGT, ALP and bilirubin, and improved lipid profile, hepatic MDA, non-protein sulfhydryl and total protein. HepG2 studies demonstrated cytoprotection.	Antioxidant/cytoprotective activity, reduction of lipid peroxidation, restoration of cellular thiols; additional experimental anti-HBV activity and PXR/CYP3A4 modulation were reported.[6]
4	*Amalaki*	*Phyllanthus emblica* L.	III–IV	Experimental models demonstrate reduction of ALT/AST and oxidative injury, with improvement in hepatic steatosis and antioxidant status.	Polyphenol/tannin-rich antioxidant activity; enhancement of endogenous antioxidant defenses, reduction of lipid peroxidation and inflammatory signaling; effects on PPAR-α/SREBP-1c have been proposed in NAFLD models.
5	*Pippali*	*Piper longum* L.	III–IV	Piperine, an important constituent of *P. longum*, reduced GPT/ALT and ALP leakage, lipid peroxidation and depletion of GSH/thiols in experimental t-BHP/CCl_4 hepatotoxicity.	Reduction of oxidative stress and lipid peroxidation, preservation of GSH/thiols and hepatocyte membrane integrity.[7]
6	*Kutaki / Katuka*	*Picrorhiza kurroa* Royle ex Benth.	I + III	In a randomized double-blind placebo-controlled trial in acute viral hepatitis, *Kuṭakī* significantly improved bilirubin, SGOT and SGPT; bilirubin reached 2.5 mg/dL substantially faster than placebo. Animal studies showed reduced hepatic lipid content and transaminases.[8]	Picroside I/II-associated antioxidant, anti-inflammatory and hepatocellular membrane-protective actions; reduction of lipid peroxidation and enhancement of hepatic defense/detoxification pathways.
7	*Vasa / Adusa*	*Adhatoda vasica* Nees / *Justicia adhatoda* L.	III	Experimental hepatotoxicity studies demonstrate reduction in biochemical liver injury, supporting a protective effect, but evidence remains preclinical.	Predominantly antioxidant and hepatocellular membrane-protective effects; attenuation of toxin-induced oxidative damage.
8	*Parpaṭa / Parmal*	*Fumaria parviflora* Lam.	III	In paracetamol-induced hepatotoxicity, extract treatment reduced elevation of transaminases and ALP,	Likely antioxidant and hepatocellular protective effects; precise molecular target remains

				although activity varied according to hepatotoxin/model.	inadequately established.
9	*Nimba*	*Azadirachta indica* A. Juss.	III–IV	In paracetamol-induced hepatic injury, neem extract reduced elevated GOT/AST, GPT/ALT, acid phosphatase and ALP and improved histopathological changes. It also restored hepatic/blood GSH and altered TBARS and Na^+/K^+-ATPase activity.[9]	Protection appears strongly related to antioxidant defense, restoration of GSH, reduction of lipid peroxidation and maintenance of membrane-associated Na^+/K^+-ATPase activity.[10]
10	*Kiratatikta / Chirayata*	*Swertia chirata* Buch.-Ham. ex Wall.	III	Extracts protected rats against paracetamol-, galactosamine- and CCl_4-induced hepatotoxicity. The chloroform fraction produced substantial protection against paracetamol and galactosamine injury.[11,12]	Broad antihepatotoxic and antioxidant activity is suggested because protection occurred against hepatotoxins with different mechanisms.
11	*Daruharidra*	*Berberis aristata* DC.	IV/VI	Berberine has hepatometabolic/anti-inflammatory properties.	Potential AMPK/antioxidant/anti-inflammatory and lipid-metabolism mechanisms of berberine, but plant-specific hepatoprotection needs further research.
12	*Shunthi*	*Zingiber officinale* Roscoe	I + III	In a randomized double-blind placebo-controlled NAFLD study, 2 g/day ginger for 12 weeks significantly reduced ALT, HOMA-IR and inflammatory markers; another RCT reported improvements in metabolic parameters.[13,14] A meta-analysis of RCTs found a significant reduction in ALT, but not consistently in AST.[15]	Likely insulin-sensitizing, antioxidant and anti-inflammatory effects; reduction of hepatic metabolic stress/steatosis and inflammatory signaling. The clinical evidence supports improvement in selected biochemical/metabolic endpoints, not reversal of fibrosis.
13	*Marica*	*Piper nigrum* L.	III–IV	Piperine has experimental hepatoprotective activity, reducing GPT/ALT and ALP leakage, lipid peroxidation and depletion of GSH/thiols.[16]	Antioxidant and membrane-protective activity; inhibition of lipid peroxidation and preservation of intracellular thiols.
14	*Chitraka*	*Plumbago*	III	Detoxified *P. zeylanica* root	Antioxidant/hepatocellular

		zeylanica L.		decoction reduced SGOT, SGPT, ALP, total and direct bilirubin in paracetamol-induced hepatotoxicity and was supported by histopathology.[17]	protective effect is proposed. Importantly, the study used detoxified root, so the result should not be generalized to raw Citraka.
15	*Haritaki*	*Terminalia chebula* Retz.	III–IV	Chebulinic acid from *T. chebula* protected hepatocytes against oxidative injury and protected mice against CCl_4-induced liver injury, reducing ALT, AST and MDA, increasing SOD and improving histopathology.[18]	Strong mechanistic evidence for MAPK/Nrf2/HO-1/NQO1 signaling, reduction of ROS and lipid peroxidation, and enhancement of endogenous antioxidant defenses. HepG2 studies also demonstrated increased GSH and nuclear Nrf2 translocation.[19]
16	*Vibhitaki*	*Terminalia bellirica* (Gaertn.) Roxb.	III–IV	In diclofenac-induced hepatotoxicity, fruit extracts and ellagic acid reduced abnormal ALP, GPT/ALT, GOT/AST, LDH and GGT, restored SOD/CAT and reduced hepatic fibrosis on histology.[20]	Antioxidant, anti-inflammatory, antifibrotic effects; ellagic acid showed particularly strong radical-scavenging and protective activity.
17	*Nishotha / Trivrit*	*Operculina turpethum* (L.) Silva Manso	III/IV	Preclinical studies suggest protection against chemically induced hepatic injury.	Proposed antioxidant and anti-inflammatory actions; constituent-specific mechanisms require further confirmation.
18	*Danti*	*Baliospermum montanum* (Willd.) Müll.Arg.	III + IV	Particularly useful evidence: both animal and cell-based paracetamol models showed hepatoprotection. Extract fractions restored GOT, GPT, ALP, bilirubin, total protein and albumin and improved hepatocyte viability; effects were comparable with silymarin in the experimental system.[21]	Protection appears related to reduction of oxidative hepatocellular injury and restoration of hepatocyte functional integrity. Exact active molecules/pathways remain to be established.
19	*Guduchi*	*Tinospora cordifolia* (Willd.) Hook.f. & Thomson	II/III–IV; safety concern	Experimental studies report hepatoprotective/antioxidant effects.	Proposed beneficial mechanisms include antioxidant and immunomodulatory effects.
20	*Parpataka*	*Fumaria*	V/VI	Insufficient reliable modern	Mechanism cannot be

	(Pitta-papada)	*indica*		evidence to establish a hepatoprotective liver-profile effect with confidence.	reliably assigned without resolving botanical identity and obtaining authenticated pharmacological evidence.
21	*Peepal*	*Ficus religiosa* L.	III	In INH+rifampicin- and paracetamol-induced hepatotoxicity in rats, methanolic leaf extract reduced abnormal serum liver enzymes and TBARS, increased total protein and GSH, and improved histopathology.[22]	Protection was attributed mainly to flavonoid/phenolic antioxidant activity, reduction of lipid peroxidation and restoration of GSH.

Haritaki, Draksha and *Guduchi* were the principal *Bhavaprakasha Kamalahara/Yakrit-Rogahara* overlaps with the *Ashtanga Hridaya*. There were 10 plants with particularly strong published evidence-

1. ***Glycyrrhiza glabra (Yashtimadhu)***

It has *Madhura Rasa, Guru-Snigdha Guna, Sheeta Virya, Madhura Vipaka* and *Rasayana/Vata-Pittahara* actions. It also shows antioxidant and anti-inflammatory hepatoprotection, including reductions in ALT, AST and ALP. It has also been used in the clinical treatment of hepatitis, bronchitis, gastric ulcer, AIDS, certain cancers and skin diseases, as well shows direct effect on anti-HBV (hepatitis B virus) via affecting the HBsAg (hepatitis B surface antigen) to extracellular secretion, improving liver dysfunction in patients with chronic hepatitis B, and ultimately improving the immune status of HBV.[23]

2. ***Phyllanthus emblica (Amalaki)***

Amalaki is described as *amla rasa pradhana*, *panch-rasa* (except *lavana rasa*), *laghu-ruksha guna*, *sheeta virya, madhura vipaka* and *rasayana/tridoshashamaka*. Modern studies report antioxidant, anti-steatotic and metabolic effects, including PPAR-α/adiponectin enhancement and SREBP-1c reduction.[24]

3. ***Picrorhiza kurroa (Kutaki)***

Kutaki is *tikta rasa, laghu-ruksha guna, sheeta virya, katu vipaka* and *Yakrituttejaka/Kamalahara* actions. A randomized, double-blind, placebo-controlled clinical trial in acute viral hepatitis showed significant improvement in bilirubin, SGOT and SGPT. The study also demonstrated activity in a galactosamine-induced rat liver injury model.[25] There is additional animal and ex-vivo evidence for picroliv/picrosides, including protection

against ethanol, oxytetracycline and CCl_4-induced liver injury, antioxidant effects and anticholestatic activity.[26]

4. *Terminalia chebula (Haritaki)*

Haritaki is *kashaya rasa pradhana panchrasa,* except *lavana, laghu-ruksha guna, ushna virya and madhura vipaka.* Experimental studies on *T. chebula* fruit have demonstrated protection against anti-tubercular-drug-induced liver injury.[27] As well, chebulinic acid has been studied in hepatocytes, zebrafish and mice, with evidence involving the Nrf2/HO-1 pathway, reduction of ROS and improvement in ALT/AST and histopathology.[28] It has also demonstrated antioxidant and hepatocyte-protective activity in vitro and in rat liver.

5. *Tinospora cordifolia (Guduchi)*

Research on obstructive jaundice showa *T. cordifolia* as an adjunct to conventional management.[29] Its hepatoprotective effects might be attributed to alkaloids (berberine, palmatine, and jatrorrhizine) and sinapic acid. Berberine present in *T. cordifolia* decreases inflammation by inhibiting the proinflammatory cascade triggered by TNF-α and reduces nitrosative stress by inhibiting iNOS. *T. cordifolia* also exhibits anticancer, anti-inflammatory, antimicrobial, antioxidant, and other activities T. cordifolia has also been found to be an active ingredient in several polyherbal formulations used to treat chemical-mediated hepatotoxicity.[30]

6. *Zingiber officinale (Shunthi)*

Animal studies demonstrate protection against acetaminophen-induced liver injury and CCl_4-induced fibrosis, including modulation of antioxidant, NF-κB/IκB and TGF-β1/Smad3 pathways.[31]

7. *Cyperus rotundus* Linn. *(Musta)*

Musta is *tikta, kashaya and katu rasa pradhana*, with *laghu-ruksa guna, sheeta virya and katu vipaka*. It is traditionally described as *deepana*, *pachana, grahi* and *jvaraghna*. Experimental studies on *C. rotundus* rhizome fractions demonstrated dose-dependent hepatoprotection in DCFH-injured HepG2 cells and significant normalization of SGOT, SGPT, GGT, ALP and bilirubin in CCl_4-induced liver injury in rats. The study also reported improvement in lipid profile, MDA, tissue NP-SH and total protein. The hepatoprotective activity was associated with attenuation of oxidative injury and restoration of cellular antioxidant/thiol defenses.[32]

8. *Piper longum* L. (*Pippali*)

Pippali is *kaṭu rasa pradhana*, with *laghu, snigdha* and *tikshna guna, ushna/anusna virya* and *madhura vipaka*; it is traditionally regarded as *deepana, pachana, vatakaphahara* and

rasayana. Experimental studies on piperine, a major active alkaloid of *P. longum* and *P. nigrum*, demonstrated significant protection against tert-butyl hydroperoxide- and CCl_4-induced hepatotoxicity, with reduction in lipid peroxidation, GPT and alkaline-phosphatase leakage and preservation of GSH and total thiols. However, its hepatoprotective potency was lower than silymarin, and the evidence remains predominantly preclinical.[33]

9. *Piper nigrum* L. (*Maricha)*

Maricha is *kaṭu rasa pradhana*, with *laghu, tiksna (and ruksa) guna, ushna virya and katu vipaka*; it is traditionally described as *deepana, pachana, shoolahara, krimighna* and *svasahara*, with predominant *Kapha-Vatahara* action. It shows antioxidant and hepatocellular membrane-protective activity through inhibition of lipid peroxidation and preservation of endogenous GSH/thiol defenses.[34]

10. *Swertia chirata (Chirayata / Kiratatikta*)

Chirayata is *tikta rasa pradhana*, with *laghu-ruksa guna, sheeta virya and katu vipaka* and is traditionally considered *Kaphapittahara*, *deepana, pachana* and *jvaraghna*. *S. chirata* have demonstrated hepatoprotective activity against CCl_4-, paracetamol- and galactosamine-induced liver injury, with improvement in biochemical parameters and hepatic histopathology.[35]

11. *Plumbago zeylanica (Chitraka)*

Chitraka is *kaṭu rasa pradhāna*, with *laghu, ruksa and tikshna guna, ushna virya and katu vipaka*; it is traditionally described as *deepana, pachana* and *Vata-Kaphahara*. Studies have demonstrated hepatoprotective activity of detoxified Citraka root decoction against paracetamol-induced hepatotoxicity in Wistar rats, with significant reduction in SGOT, SGPT, ALP and total/direct bilirubin and improvement in hepatic histopathology.[36]

RESEARCH GAP:

There was total 46 plant names were mentioned in *Ashtanga Hridaya* which are used in *Yakrit Roga, Kamala, Halimaka* and related disorders. **Table-3** represents the research gap of some of those mentioned plants.

Table-3: Research gap.

Botanical identity	Common/Ayurvedic name	Key interpretation
Vitis vinifera	*Munakka/Draksha*	No directly verified article in targeted set; plant-part issue
Madhuca longifolia	*Mahua flower*	Limited recent in-vivo evidence
Gmelina arborea	*Gambhari*	No direct article verified.
Mesua ferrea	*Nagakesara*	Evidence gap
Prunus cerasoides	*Padmaka*	Evidence gap
Grewia asiatica	*Phalsa*	Evidence gap
Desmodium gangeticum	*Shalaparni*	Evidence gap
Ailanthus excelsa	*Aralu*	Evidence gap
Lens culinaris	*Masura*	Evidence gap
Baliospermum montanum	*Danti*	Evidence gap
Pistacia integerrima	*Karkatashringi*	Evidence gap
Embelia ribes	*Vidanga*	Plant-specific evidence limited.

DISCUSSION

From an Ayurvedic perspective, hepatic pathology can be interpreted through disturbances of *Pitta*, *Ranjaka Pitta*, *Agni*, *Rakta* and *Meda* along with impairment of *Yakrita* function. Therefore, the pharmacological profile of a drug cannot be evaluated solely on the basis of direct hepatocyte protection. Properties such as *Deepana*, *Pachana*, *Pittahara*, *Raktaprasadana*, *Rasayana* and *Amapachana* may provide a broader conceptual framework for understanding the traditional use of these drugs. The modern evidence, particularly antioxidant, anti-inflammatory, antifibrotic and membrane-stabilizing activities, provides possible biological correlates for some of these classical actions.

A significant observation of this review is that not all classical drugs have equivalent modern evidence. Drugs such as *Indrajau, Trayamana, Nagkeshar and Gambhari* etc, currently have insufficient direct evidence to establish hepatoprotective efficacy. In some cases, the major limitation is not necessarily absence of pharmacological potential but inadequate botanical authentication, paucity of experimental studies or absence of studies specifically examining hepatic outcomes. This distinction is important because absence of evidence should not be interpreted as evidence of absence. Such plants may represent valuable candidates for future pharmacological investigation.

CONCLUSION

Ashtanga Hridaya provides a substantial classical reservoir of medicinal plants that can be evaluated through modern hepatology. The strongest translational candidates identified in this

review include *Picrorhiza kurroa, Phyllanthus emblica, Glycyrrhiza glabra* and *Terminalia chebula,* supported by additional experimental evidence for several other classical plants. *Haritaki, Draksha* and *Guduchi* represent the principal *Bhavaprakasha Kamalahara/Yakrit-Rogahara* overlaps. Future Ayurvedic hepatoprotective research should progress toward authenticated, standardized, mechanism-based, disease-specific and clinically validated interventions.

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