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A REVIEW OF CLASSICAL, PROPRIETARY AND PATENTED AYURVED PRODUCTS AND THEIR INGREDIENTS IN LIVER / SPLEEN DISEASES

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ABSTRACT: Liver disease is the tenth most common cause of death in India as per the World Health Organization and may affect every one in Five Indians. In spite of consistent human effort and drug discovery, modern drug has very little to offer. Nonetheless, Ayurved classical proprietary and patented formulations have shown promising results. The present study provides a general review of the Ayurved products along with pharmacological actions of herbal medicines. Arogyavardhini vati, Liv 52 are the highest prescribing medicines in liver disorders. *Curcuma longa*, *Phyllanthus niruri*, *Tephrosia purpurea*, *Picrorrhiza kurroa*, *Swertia chirayata* are the commonest single herb used by the herbalist and Ayurved physician in the treatment of various liver disorders. An attempt has been made to compile classical, proprietary and patented Ayurved products. This may be useful to the clinicians, professionals, scientists and scholars working in the field of Ayurved for new product development.

INTRODUCTION: The Liver is a vital organ involved in the maintenance of metabolic functions and detoxification of the exogenous and endogenous challenges like xenobiotic, drugs, viral infections and chronic alcoholism¹. Liver disease is the tenth most common cause of death in India as per the World Health Organization and may affect every one in five Indians. Around 10 lakh patients of liver cirrhosis are newly diagnosed every year in India. Liver cirrhosis is the 14th leading cause of deaths in the world and could be the 12th leading cause of deaths in the world by 2020.²

Liver disorders like viral hepatitis, cirrhosis, alcoholic liver disease, fatty liver, jaundice *etc.* do not have specific treatment modalities in modern medicine even though they are the cause for death and secondary complications among the population of developed and developing countries. No any specific safe and no hepatic damage remedy has been found in conventional medicine. Medicinal products used are found to give only symptomatic relief to patient with hepatic disorder without managing the fundamental cause to the symptoms.

Ayurved herbal formulations are in great demand for primary healthcare because of their usefulness in various disorders and higher safety margins and lesser costs. These various formulations contain various plant drugs, and metals which could offer an opportunity to treat the various liver diseases and gives new hope for the future.

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Various scientific research and review articles / papers are available on Liver diseases / Liver disorders. Two review articles on Indigenous drugs for liver and hepatoprotective Ayurvedic plants based on plant drugs gave idea about role of indigenous drugs as hepatoprotective drugs^{3, 4}. In this paper, authors have reviewed all the available classical products, proprietary and patented products and their ingredients used for various liver diseases which may provide safe and cost-effective treatment modalities.

Liver- Ayurved and Modern Perspective: Liver and its dysfunctions are defined and well described in Ayurved in the context of blood as an important constituent of human biology. In Ayurved, the role of liver is explained in relation to pathogens (*dosa*), tissues (*dhatu*) and its development, muscle (*mamsa*), heart (*hrid*), blood (*rakta*), respiration (*pranavaha srotas*), and excretion (*mala*).

The liver may be affected in the diseases involving these systems. The liver is the largest organ of the body, contributing about 2% of the total body weight in the average human. It is connected with most of the physiological processes, which include growth, immunity, nutrition, energy metabolism and reproduction. Synthesis and excretion of bile, albumin, prothrombin and the production of the compliments which are the major effectors of the humoral branch of the immune system occur mainly in the liver⁵.

Liver Disorders According to Ayurved: The maintenance of a healthy liver is vital to overall health and well - being. Unfortunately, environmental toxins, poor eating habits, alcohol consumption, and therapeutic drug use often abuse this vital organ, and as a consequence there is an overall decline in metabolic function of the liver. This hepatotoxicity eventually leads to serious diseases like hepatitis, cirrhosis, alcoholic liver disease and ultimately results in hepatic cancers (liver tumors).

According to Ayurved, the accumulation of abnormal toxic fluids around the liver creates blockage (*srotorodh*) that inhibits the secretion of bile resulting in liver enlargement and various Liver disorders. Impaired digestive power (*agni*) has been considered the basic etiological factor⁶.

Gulma: The meaning of *Gulma* is *pindakara* [round and hard mass]. It is the abdominal lump which is caused due to aggravation and encapsulation of *Vata Dosha* (*kupita Anila moodhatwat*) which does not give clue about its site of origin (*Goodha Gulmodaya*) and spreads widely like the shrubs (*Gulmavat vishalatwaat*). It is usually known as gaseous tumour of abdomen.⁷

Udarroga: *Agnidosha* [defective digestion strength] and *Mala Vruddhi* [increase in waste products / morbid matter] are the reasons for diseases like *Udara* (abdominal diseases including ascites). If there is suppression of *Agni* (power of digestion and metabolism), and if the person takes Polluted food, this leads to indigestion as a result of which *Doshas* get accumulated. This causes vitiation of *Prana* (a variety of *Vata Dosha*), *Agni* (digestive enzymes) and *Apana* (another variety of *Vata*, related to expulsion of faeces, flatus, urine etc.) and obstruction to the upward and downward channels of circulation. The vitiated *Doshas* get lodged between the skin and the muscle tissue and cause extensive distension of lower part of abdomen. This gives rise to *Udara* (obstinate abdominal diseases including Ascites)⁸. *Yakrutodara* and *Pleehodara* are the types of eight *Udarroga*.

Panduroga: *Panduroga* is generally considered as anaemia. When the *pitta* predominant *doshas* get aggravated in the tissues, the tissues undergo inflammation and get weak and lax. Heaviness also develops in the tissues of the body. This pathological process leads to deterioration of *varna* (colour), *bala* (strength and immunity), *sneha* (unctuousness of the body, the protective fat buffer) and other qualities of *ojas* (*ojas* is the essence of all the tissues and hence represents immunity). The qualities of *ojas* go on deteriorating due to the complicated amalgamation of *doshas* and tissues (*dhatu*s) in a disease complex. The person ultimately gets *vaivarnya* (discoloured, mainly pallor) and such a condition is called *Pandu Roga*⁹.

Kamla: It is a term used in Ayurveda to describe a disease which resembles Jaundice. *Pandu* and *Kamala* are said to be the diseases which are interrelated. They are also said to be have common origin. When *Pandu* is not treated properly it can lead to *Kamala*. Thus, *Kamala* can be considered as

an effect of untreated *Pandu* or *Pandu* which runs a chronic course.

Kumbha Kamala- Halimak, Alasa: When jaundice continues for more than one month and symptoms become serious with dark yellow colored urine, feces, deep yellow colored eyes, general swelling (edema) of the body, a crushing pain in the joints, it is called *Kumbha-Kamala*, which, when it develops in its course such symptoms as fever, aching pain in the limbs, vertigo, physical languor, drowsiness and emaciation comes to be known as *Lagharaka*. This, in its turn, when marked by an excessive preponderance of the deranged *Vayu* and *Pitta* is called *Alasa*, otherwise known as *Halimaka*^{10, 11}.

Madatyaya: *Madatyaya* comprises of two words *Madaa* and *Atyay*. *Mada* means *Harsh* (Excitement) *Atyay*¹² means *Atikrama* (excess). This over excitement is caused by excess consumption of *Madya* [alcohol]. Depending on the involvement of the *Dosha*, its toxic effects occur, due to^{13, 14}. Due to excessive and the improper use of alcohol caused '*Madatyaya*'. It is *Tridoshaja Vyadhi* (disease caused by involvement of all three *Doshas* - *Vata*, *Pitta* and *Kapha*).

Granthi / Arbud specific to Yakrit / Pleeha: *Granthi*, [minor neoplasm] is a localized small swelling within the subcutaneous fat tissue, muscle or blood veins; it is round, erect, and knotted.

Arbuda [major neoplasm] is a spherical, stable, massive, painless swelling occurring at one site; it expands slowly with deeper roots.

It originates due to metabolic changes. *Vata dosha* is responsible for cell division. Aggravation of *vata dosha* and suppression of *kapha doshas* or both the *doshas* interacting with one another may result in proliferation of cells. However, the *Ekadesavridhi* (growth at a specific part) is a part of abnormal cell division resulting in benign or malignant tumors.

Ayurveda Products / Herbs for Liver Diseases: In Ayurvedic classical texts, purification process (*sodhana chikitsa* including *panchakarma*) using internal and external medications which can eliminate pathogens (*dosas*), curative therapy (*shamana chikitsa*) pacifies pathogens (*dosas*), correction of metabolic defects (*dhatwagni chikitsa*), immunotherapy (*rasayana*), anticancerous

drugs (*vyadhipratyanika chikitsa*) and symptomatic treatment (*lakshanika chikitsa*) and surgical treatment with herbal and mineral medicines (*Shastra chikitsa*), these are the general line of treatment for any type of liver disorders. The fundamental principles of Ayurveda are finding the cause of an illness and restoring the balance between the three major bodily systems by supplying deficient substances and by reducing the excessive ones (*tridosha siddhanta*).

The Indian Traditional Medicine like *Ayurveda*, *Siddha* and *Unani* are predominantly based on the use of plant materials and treating various types of Liver disorders. Plant drugs formulations have gained importance and popularity because of their safety, efficacy and cost effectiveness. Various formulations are prepared on the principle of synergetic actions as phenomenon of positive herb-herb interaction.

Nonetheless, some herbs and classical formulations have shown promising results. The present study provides a general review of the classical Ayurved products, patented Ayurved products along with pharmacological actions of herbal medicines.

Methodology: For the present review, A literature search was conducted for product and medicinal plants used for liver disorders from Ayurved classical texts, PubMed and Google Scholar. Various scientific research and review articles published from 2001 to 2017 were identified through PubMed and Google scholar websites using MeSH terms. The search included the following keywords: medicinal plants, formulations, liver diseases, Hepatoprotective, hepatic disorders.

Available formulations are classified in three categories; Ayurved classical products, patented products and Medicinal plants used in the formulations of Liver diseases. Details of pharmacological and clinical research profiles are summarized and tabulated.

Observations: After going through classical text and other literature, it is observed that Liver/ Spleen are directly or indirectly involved in the following diseases.

Liver Disorders and Comparison with Modern Science:

TABLE 1: VARIOUS TYPES OF LIVER DISORDERS AS PER AYURVED AND MODERN SCIENCE

Ayurved- Yakrut – Pleeha Vyadhi	Liver disorders- Modern Science
Gulma	Jaundice
Udarroga	Hepatitis
Yakritodara- Hepatomegaly [Enlargement of liver]	Viral hepatitis
Pleehodara- Splenomegaly [Enlargement of the spleen]	Parasitic Liver Infections
Jalodara- Ascites	Alcoholic hepatitis and toxic hepatitis
Pandu-Anemia	Alcoholic liver diseases (ALD)
	Fatty liver disease- non-alcoholic
	Alcoholic hepatitis, alcoholic cirrhosis
	Cirrhosis
Kamla - Jaundice	
Koshthashrit Kamla- Hemolytic jaundice	
Shakhashrit Kamla- Hepatic jaundice	
Kumbhakamla-Chronic non obstructive jaundice with oedema,	Hepatic coma
Halimak, Alasa- Chronic obstructive jaundice	
Madatyaya- Alcoholism	Liver cancer
	Hepatocellular carcinoma (HCC)-
	Drug induced hepatotoxicity
Granthi- Neoplasm- Minor Arbuda- Neoplasm- Major,	
Yakridvidradhi- Abscess of the liver	
Plihavidradhi- Abscess of the spleen	
	Genetic liver problems

Classical Ayurved Liver Products: A number of classical and significant formulations in the various dosage forms are mentioned in Ayurved classics for liver diseases. The basic approach is to formulate various compounds to select several herbs with properties that address key aspect of the individual case, such as involvement of *Dosha*, digestive power, symptoms, tissue, organs and

channels involved. Single herb can have many properties; herbs can choose to address more than one particular element of the overall treatment.

All these herbal formations and Herbomineral formulations are compiled and classified in different disease categories as follows-

TABLE 2: CLASSICAL AYURVEDIC HERBAL FORMULATIONS FOR LIVER DISORDERS [SINGLE DISEASE CONDITION]¹⁵

Name of formulations	Pandu	Kamla	Udarroga	Pleeha	Yakrit	Arbuda
Abhayadi Chatussama Vati		√				
Abhayarishta			√			
Agnikumar Rasa				√		
Agasti Rasa			√			
Arbudahar Rasa						√
Arkadi Tail				√		
Arogyavardhini Vati		√		√		
Ayorajadi Churna, Yoga		√			√	
Bhallatak Modak				√		
Bivladhya Ghrut				√		
Dhatari Loha		√				
Erاند bhasma yoga				√		
Haridradi Churna		√				
Haridradi Ghrut		√				
Haridradi Lepa						√
Indravarunayadi Kashay	√					
Kshara Gutika					√	
Kushthadi lepa				√		
Laghuhingvadi Churna				√		
Lashuna Yoga				√		
Lokanath Rasa					√	
Moolaka Ksharadi Lepa						√
Moolakabeejadi Lepa						√

Panchamootrasava		✓				
Pippali Yoga		✓				
Panchashya Rasa	✓					
Pippali Loha Yoga		✓				
Pleehari Vatika		✓				
Pleeharnavo Rasa		✓				
Rohitak Ghrit						
Raudra Rasa						✓
Saurashtadi Kwath					✓	
Shankhanabhi Churna		✓				
Shankha Yoga	✓					
Shankhadi Lepa						✓
Shargeshthadi Kwath					✓	
Sharpunka Yoga					✓	
Sharpunkhadi Kalka				✓		
Shigru Kawath					✓	
Shigrumooladi Lepa						✓
Shilajtavadi Yoga trayam	✓					
Shilajatu Yoga	✓					
Shuktikshardi Yoga				✓		
ShwetPunarnava Moola Yoga				✓		
Sindhavadi Churna				✓		
Sitadya Avaleh	✓					
Sor Gutika					✓	
Swajikdi Lepa						✓
Tryashunadi Churna				✓		
Upodikadi Abhyang Lepa						✓
Vatadi Lepa						✓
Vasuki Bhooshano rasa				✓		
Yavanikadi Churna				✓		
Yakrit Plihantak Churna				✓	✓	

TABLE 3: CLASSICAL AYURVED PRODUCTS- CONDITION WHERE SYMPTOMS OF TWO DISEASES SEEN

Name of formulations	Pandu, Kamla	Pleeha, Gulma	Pleeha, Pandu	Pleeha, Udarroga	Udarroga, Gulma	Yakrit, Pleeha
Abhayadi Modak			✓			
Agnigarbha Vati						✓
Arogyavardhini Vati						✓
Brahma Ghrit				✓		
Chittrakadi Loha						✓
Chitaka Pippli Ghrit						✓
Darvyadi Mandoor Vatak	✓					
Dravyadi Loha	✓					
Gandhkadi Potali,						✓
Gudpippali modak						✓
Guduchyadi Churna						✓
Kirattiktadi Churna	✓					
Kshara Pippali						✓
Ksharadi Yoga						✓
Lavanadi Yoga,						✓
Lavanphalatrikadi Churna						✓
Lohamrutyunjya Rasa						✓
Manakadi Gutika						✓
Mahadravakam						✓
Mahakshar		✓				
Nishadi Loham	✓					
Pandukuthat Rasa			✓			
Pippali Ghrit						✓
Pippalayadi Ghrit				✓		
Pippalichitrak Ghrit						✓

Pleehantako Rasa			√				
Pleehari Vatika							√
Prabhavati Gutika						√	
Punarnavadi Churna			√				
Praneshvaro rasa			√				
Sammoha Lauham	√						
Rasaraj							√
Rohitak Ghrut							√
Rohitakavaleha							√
Rohitakasav							√
Rohitakarishtha							√
Rohitakadhya Ghrut							√
Rohitakadi Yoga			√				
Sarvatobhadra Rasa							√
Shankha Drav							√
Vahanikumar Rasa							√
Yakrit Plihintak Churna							√
Yakrut Pleehari Loha							√

TABLE 4: CLASSICAL AYURVED PRODUCTS- [COMBINATION OF THREE DISEASES CONDITIONS]

Name of formulations	Gulma, Pleeha, Udarroga	Pandu, Kamla, Halimak	Pleeha, Gulma, Udarroga	Pandu, Kamla, Udarroga	Pleeha, Udarroga, Kamala	Yakrut, Pleeha, Gulma	Ykrut, Pleeha, Udarroga
Abhayadi Vati							√
Adrakmatulungavaleha				√			
Agnimukha Lavana							√
Chitrak Ghrut						√	
Eladi Churna					√		
Hansa Mandoor		√					
Khandasam Churna		√					
Kravadi Rasa			√				
Lashun Tail							√
Mahadravak Rasa						√	
Marichadi Churna	√						
Narach Churna	√						
Navayasa Churna		√					
Navayasa Loham		√					
Pleehari Rasa						√	
Pranvallabho Rasa		√					
Punarnava Mandoor		√					
Savitra Vatak				√			
Sudhapanchak Rasa		√					
Udamayakumbhakesari Gutika							√
Tamra Kalpa							√
Tiladi Kshar						√	
Vangeshwar Rasa			√				

TABLE 5: CLASSICAL AYURVED PRODUCTS- [SYMPTOMS OF FOUR DISEASES CONDITIONS]

Formulations	Yakrut, Pleeha, Gulma, Pandu	Yakrut, Pleeha, Gulma, Halimaka	Yakrut, Pleeha, Pandu, Udarroga
Abhaya Lavana	√		
Agnigarbha Gutika	√		
Agnikumar Lauha		√	
Mahamrutyunjya Rasa	√		
Tamrshwar Gutika			√

Proprietary Ayurved Products for Liver Disorders: ¹⁶ After searching on Google search, in the list of Ayurved manufacturers, more than 200

Liver products are available of various pharmacies. The popular description regarding ingredients and indications of products are selected for the review.

TABLE 6: AYURVED PROPRIETARY PRODUCTS FOR LIVER DISORDERS

Products	AH	ALD	CH	CCY	DIH	EL	FL	HT	JD	LD	LF	PLD	SL	TL	VH
Abhiliv Syrup	√				√							√			√
Adiliv Syrup	√													√	
Alarsin Liv Compound			√					√	√	√	√		√		
Arogyliv-Z Syrup										√					
Amlycure Desired Strength Capsules								√	√						√
Asliv										√	√				
BioLiv Syrup									√						√
Culiv plus							√	√							√
Cytozen Forte Herbal Syrup		√			√			√							√
Eliver Capsules	√				√					√					√
Feeliv-DS							√		√						√
Herboliv				√			√	√			√				√
Hepalive Syrup & Drops		√						√	√					√	√
Hepasin Vati										√					√
Hepatin capsules	√		√	√					√		√				√
Hep Plus			√				√			√	√			√	√
Heposem			√												√
Heptonrm		√	√				√	√	√	√					√
Liv- 7									√	√					√
Livcare DS Syrup			√				√	√	√	√				√	√
Liver Care Syrup & Tablet					√				√	√				√	√
Liver-Kidney Care			√						√	√					√
Liver mex syrup			√		√	√									√
Livotex syrup			√		√	√									√
Yarkan Syrup			√		√	√									√
Livgard for kids		√						√	√					√	√
Livex Syrup									√	√					√
Liviksha Syrup						√			√	√					√
Livmex			√			√			√	√					√
Livokot Tablet			√					√	√	√	√				√
Livonex						√		√	√	√					√
Livorem DS										√					√
Livos			√					√	√	√			√		√
Livrosun Drops, Tablets							√							√	√
Livray		√	√			√			√				√		√
LivTone Capsules													√		√
Livwin Syrup		√	√				√							√	√
Proliv						√			√				√		√
Sriliv syrup		√	√						√						√
Tocolev										√					√
V-Liv Syrup										√	√				√
Virgoliv Syrup														√	√

AH- Alcoholic Hepatitis; ALD- Alcoholic Liver Disorders; CH- Cirrhosis; CCY- Cholecystitis; DIH- Drug induced Hepatitis; EL- Enlargement of Liver; FL- Fatty Liver; HT- Hepatotoxicity; JD- Jaundice; LD- Liver disorders; LF- Liver dysfunction; PLDT- Patients on long term drug therapy; SL- Sluggish Liver; TL-Tonic for Liver boosting; VH- Viral Hepatitis

Ayurved Patented products for Liver diseases: liver products. Following products listed as 17,18 Review was also taken to find out the patented patented products for various Liver disorders.

TABLE 7: REVIEW OF PATENTED AYURVEDIC LIVER RELATED PHARMACEUTICAL PRODUCTS

Products	AH	ALD	CH	CCY	DIH	EL	FL	HT	JD	LD	LF	PLD	SL	TL	VH
Arka Liv Tablet ¹⁹									√						√
Ayu Liv Tablet ²⁰									√	√			√		√
Culiv Capsules, syrup							√	√							√
Herbo-mineral ²¹															√
Cytozen Capsules Herbo-mineral ²²	√						√	√							√
Hepabex ²³									√						√
Hepa Cap ^{24,25}			√						√						√
Hepatovit ²⁶			√			√									√
Hepax ²⁷			√												√
Hepin ^{28,29}															√
Herboliv ³⁰					√										√

Kamilar Capsules ²⁸	√	√	√	√	√	√	√	√	√	√	√
Liv 52 Tablet/ Syrup ^{27,31}	√		√	√	√	√	√	√		√	√
Livotrit Forte Capsules Herbal ³²			√				√	√	√	√	√
Livomyn Tablet Herbal ³³	√			√	√			√	√		√
Livomap Tablet Herbal ³⁴									√		
N-LIV Syrup ³⁵			√		√						√
Stimuliv ^{36,37}						√					√
Vasuliv ^{38,39}			√			√		√	√		√

Medicinal plants listed in Classical products, proprietary and patented products: Many of the medicinal plants have been mentioned in various formulations. They are scientifically proven and used for the treatment of liver disorders as

ingredients for various products. After going through ingredients used for the preparation of various formulations, it is observed that total 74 plants drugs are used as ingredients in the various formulations.

TABLE 8: PLANT DRUGS USED FOR VARIOUS CLASSICAL, PROPRIETARY AND PATENTED LIVER PRODUCTS

S. no.	Sanskrit name	Scientific Name & Family	Parts used	Classical	Proprietary	Patent
1	Common yarrow	<i>Achille millefolium</i> Linn. Compositae	Plant		√	
2	Ativisha	<i>Aconitum herterophyllum</i> wall. Ranunculaceae	Root	√	√	
3	Bilva	<i>Aegle marmelos</i> Corr. Rutaceae	Leaves, root	√	√	√
4	River Mangrove or Khalsi,	<i>Aegiceras corniculatum</i> Aegicerataceae	Stem		√	
5	Rason	<i>Allium sativum</i> Linn. Liliaceae	Bulb	√		
6	Kumari	<i>Aloe barbadensis</i> Mill. Liliaceae	Plant		√	
7	Rohitak	<i>Amoora rohituka</i>	Plant	√	√	√
8	Kalmedha	<i>Andrographis paniculata</i> Nees. Acanthaceae	Plant	√	√	√
9	Pithraj	<i>Aphanamixis polystachya</i> Wall. Parkar Meliaceae	Bark		√	
10	Ajamoda	<i>Apium graveolens</i> Linn. Umbelliferae	Seeds	√	√	
11	Afsantin	<i>Artemisia absinthium</i>	plants			√
12	Kokilaksha	<i>Asteracantha longifolia</i> Nees. Acanthaceae	Leaves, root & seeds	√		
13	Nimba	<i>Azadirachta indica</i> A. Juss Meliaceae	Leaves, root & seeds		√	
14	Daruharidra	<i>Berberis lycium</i> Royle. Berberidaceae	Stem, Root	√	√	√
15	Punarnava	<i>Boerhaavia diffusa</i> Linn. Nyctaginaceae	Root	√	√	√
16	Arka	<i>Calotropis gigantea</i> Linn. R.Br. Asclepiadaceae	latex, flower, stem	√		
17	Himsra	<i>Capparis spinosa</i>	Palnts			√
18	Papita	<i>Carica papaya</i>	Fruits		√	
19	Argavadha	<i>Cassia fistula</i>	Fruits,	√		
20	Kasamarda	<i>Cassia occidentalis</i>	Whole plant		√	√
21	Kusum	<i>Carthamus tinctorius</i> Linn. Compositae	Flower	√		
22	Devadaru	<i>Cedrus deodara</i>	Bark	√		
23	Kasani	<i>Cichorium intybus</i> Schard. Compositae	Plant		√	√
24	Indravaruni	<i>Citrullus colocynthis</i> Schrad. Cucurbitaceae	Root	√	√	
25	Celandine or tetterwort	<i>Chelidonium majus</i>	Plant		√	
26	Suranjan	<i>Colchicum luteum</i> Baker. Liliaceae	Corms and seed		√	
27	Mamira	<i>Coptis teeta</i> Wall. Ranunculaceae	Rhizomes,		√	
28	Nagdanti	<i>Croton oblongifolius</i> Roxb. Euphorbiaceae	Bark		√	
29	Varuna	<i>Crataeva religiosa</i>	Bark	√	√	
30	Amarwel	<i>Cuscita reflexa</i> Roxb. Convolvulaceae	Stem		√	√
31	Musta	<i>Cyprus rotundus</i> Cyperanceae	Plant	√		
32	Bhrungaraj	<i>Eclipta alba</i> Hassk. Compositae	Plant	√	√	√
33	Ela	<i>Elattaria cardamomum</i>	Seed	√	√	√
34	Vidanga	<i>Embelia ribes</i>	Seed	√	√	√

35	Amalaki	<i>Emblica officinalis</i> Gaertn. Euphorbiaceae	Fruit	✓	✓	✓
36	Snuhi	<i>Euphorbia nerifolia</i> Linn. Euphorbiaceae	Fruit		✓	
37	Hingu	<i>Ferula narthex</i> . Umbelliferae	Gum resin	✓		
38	Nandi Vruksha	<i>Ficus asperrima</i> Roxb. Moraceae	bark	✓		
39	Nandarukha	<i>Ficus benjamina</i> Linn. Moraceae	Bark	✓		
40	Parpat	<i>Fumaria parviflora</i> Lam. Fumariaceae	Whole plant	✓	✓	
41	Vrukshamla	<i>Garcinia indica</i> chois. Guttiferae	Fruit		✓	
42	Trayaman	<i>Gentiana kurroo</i> Royld. Gentianaceae	Root	✓	✓	✓
43	Yashtimadhu	<i>Glycyrrhiza glabra</i>	Root	✓	✓	✓
44	Sariwa	<i>Hemidesmus indicus</i> Asclepiadaceae	Roots	✓		
45	Jivanti	<i>Leptadenia reticulata</i>	Root	✓		
46	Koshataki	<i>Luffa echinata</i> Roxb. Cucurbitaceae	Fruit , seed		✓	
47	Luffa	<i>Luffa bindal</i>	Fruit		✓	
48	Lycopodium	<i>lycopodium clavatum</i>	Plants		✓	
49	Pootiha	<i>Mentha longifolia</i> Linn. Labiatae	Leaves	✓	✓	
50	Shigru	<i>Moringa oleifera</i> Lam. Moringaceae	Root	✓	✓	
51	Mitha Neem	<i>Murraya koenigii</i> Linn. Rutaceae	Leaves		✓	
52	Jatiphal	<i>Myristica fragrans</i> Houtt. Myristicaceae	Seed	✓	✓	
53	Upakunchika	<i>Nigella sativa</i> Ranunculaceae	Seed	✓	✓	✓
54	Tulasi	<i>Ocimum sanctum</i>	Leaves	✓	✓	
55	Bhumi Amalaki	<i>Phyllanthus niruri</i> Linn. Euphorbiaceae	Plant	✓	✓	✓
56	Katuki	<i>Picrorhiza kurroa</i> Royle. Scrophulariaceae	Root	✓	✓	✓
57	Pippali	<i>Piper longum</i> Piperaceae	Fruit	✓	✓	✓
58	Chitrak	<i>Plumbago zeylanica</i> Plumbaginaceae	Root	✓	✓	✓
59	Pilu	<i>Salvadora persica</i> Linn.	Root		✓	
60	Bhallatak	<i>Semicarpus anacrdium</i> Anacardiaceae	Fruit	✓	✓	✓
61	Kakamachi	<i>Solanum nigrum</i> Linn. Solanaceae	Dried fruit	✓	✓	✓
62	Gorakhamundi	<i>Sphaeranthus hirtus</i> Willd. Compositae	Herb		✓	
63	Kirattikta	<i>Swertia chirata</i> Buch Ham.	Plant	✓	✓	✓
64	Lodhra	<i>Symplocos racemosa</i> Roxb. Symplocaceae	Bark	✓		
65	Jhavuka	<i>Tamarixg allica</i>	Plant		✓	
66	Arjuna	<i>Terminalia arjuna</i>	Bark	✓	✓	✓
67	Haritaki	<i>Terminalia chebula</i> Retz. Combretaceae	Fruit	✓	✓	✓
68	Sharpunkha	<i>Tephrosia purpurea</i> , Fabaceae	Root	✓	✓	✓
69	Guduchi	<i>Tinospora cordifolia</i> Willd. Menispermaceae	Stem	✓	✓	✓
70	Patol	<i>Trichosanthes cordata</i> Roxb. Cucurbitaceae	Root	✓		
71	Godhum	<i>Triticum sativum</i> Lam. Gramineae	Roots	✓		
72	Nirgundi	<i>Vitex negundo</i> Linn. Verbenaceae	Plant	✓	✓	
73	Dhataki	<i>Woodfordia fruticosa</i> Kurz. Lythraceae	Flower	✓		
74	Sunthi	<i>Zinziber officinale</i> Rose. Zingiberaceae	Rhizome	✓	✓	✓

Scientifically Proven Anticancer Activity of Plant Drugs: Following 23 medicinal plant drugs are important and widely used in various products

out of above mentioned 75 medicinal plants. These plants have been scientifically proven and used for various conditions of liver disorders.

TABLE 9: LIST OF MEDICINAL PLANTS COMMONLY USED IN AYURVEDIC LIVER DISEASES WITH ACTIVITIES

S. no.	Botanical Name and Family	Properties	Action	Activity
1	Amalaki <i>Emblica officinalis</i> Phyllanthaceae,	Sour, Sweet, Pungent, Bitter, Astringent, Dry,	Pacify all dosha, reduces swellings, rejuvenator	Antioxidant, antitumor, chemo preventive, prostate cancer, immunomodulator, anticlastogenic

2	Fruits Arjuna <i>Terminalia arjuna</i> Combrataceae Bark	Cold Astringent, Dry, Cold	Pacify Kapha pitta, cardiovascular disease, high blood pressure, and high cholesterol, dysentery, diseases of the urinary tract,	radiation protection ^{40,41} Improved in hyper lipidemic and in markers of liver functions ⁴²
3	Bhallataka <i>semecarpus anacardium</i> Linn. Anacardiaceae Fruit	Pungent, Astringent, Sweet, Light, Hot	Pacify Kapha, Vata, Lekhana (excises unhealthy tissues), rejuvenator	antitumor activity against experimental mammary carcinoma in animals ^{43,44}
4	Bhringaraj <i>Eclipta alba</i> Asteraceae Whole plant	Pungent, bitter, Light, dry, hot	rejuvenating, anti- inflammatory, anti-aging, anti- poisonous, anti-toxic	Reversed the toxicant induced inhibition of the hepatic microsomal drug in CCl ₄ induced liver damage in guinea pigs ^{45,46}
5	Bhumyamalaki <i>Phyllanthus niruri</i> , All parts Euphorbiaceae	Bitter, Astringent, Sweet, Light, dry, cold	Pacify Kapa, pitta, Appetizer, Digestive, Useful in Jaundice, dysentery, blood disorders, fever, enlargement of spleen	Reduces rate of lipid peroxidation, increases Antioxidant defense mechanism in Ethanol induced oxidative damage in Wister albino rats ^{47,48}
6	Bhunimba <i>Swertia chirata</i>	Bitter, Dry, Light, Cold	Pacify Kapha pitta, strengthening the stomach and it helps in promoting its action, beneficial in for relieving high fever	Decreased serum aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase activities and bilirubin level in CCl ₄ induced hepatotoxicity and Hepatocytic necrosis in rats ^{49,50}
7	Chitrak <i>Plumbago zeylanica</i> Linn. Plumbaginaceae Root	Pungent, Light, dry, hot	Pacify <i>Vata Kapha, Lekhana</i> (excises unhealthy tissue), reduces swellings, rasayana (rejuvenator)	Functional improvement of hepatocytes may be by an accelerated regeneration of Parenchymal cells. Early improvement in the secretory mechanism of the hepatic cell ^{51,52}
8	Daruharidra <i>Berberis aristata</i> Berberidaceae, Bark	Bitter, Astringent, Light, Dry, Hot	Pacify Kapa, pitta, anti- inflammatory, anti-toxic	Anti-oxidant, inhibition of inflammatory response in the liver ⁵³
9	Guduchi, <i>Tinospora cordifolia</i> , Menispermaceae, Stem	Bitter, Pungent, Sweet, Heavy, Unctuous, hot	Pacify all dosha, promotes digestion, alleviates bleeding disorders, anti-ageing, alleviates thirst, burning sensation	Immune stimulating properties ⁵⁴ , scavenging of free radicals and elevated concentration of endogenous antioxidant system in inhibiting the radiation- induced biochemical alterations in Liver ⁵⁵ . Modulation of Kupffer cell activity in CCl ₄ induced Hepatotoxicity in mice, rats and rabbits ^{56,57}
10	Haritaki <i>Terminalia chebula</i> Combrataceae, Fruit	Astringent, Bitter, Sweet, Pungent, Sour	Pacify all dosha, inflammation, blood disorders, improves digestion, anti-aging, rejuvenate, improves life expectancy, helps in normalizing bowel movements	Reversed t-BHP induced Cell cytotoxicity and lactate dehydrogenase leakage, reduced the incidence of liver lesions, including hepatocyte swelling and neutrophilic infiltration and repaired necrosis induced by t-BHP ⁵⁸
11	Kakamachi <i>Solanum nigrum</i>	Bitter, Pungent, Unctuous, Hot	Pacify all dosha, liver cirrhosis, emollient, diuretic, antiseptic and laxative	Fruit extract could be used as an antioxidant and cancer chemo- preventive agent ⁵⁹
12	Kalmegh <i>Andrographis paniculata</i> Acanthaceae All parts	Bitter, Light, Dry, Hot	purifies vitiated blood, reduces swellings	Increased biliary flow and liver weight in CCl ₄ and alcohol induced liver damage in rats ^{60,61,62}
13	Kalaunji <i>Nigella sativa</i> , Ranunculaceae, Seeds	Pungent, Bitter, Light, Hot	pacifies vitiated kapha, excises unhealthy tissue, reduces swellings	protects hepatic tissue from deleterious effects of toxic metals such as lead, and attenuates hepatic lipid peroxidation following exposure to chemicals such as carbon tetrachloride ⁶³
14	Kasani <i>Cichorium intybus</i> Compositae	Bitter, Light, Dry, Cold	Pacify Kapha, helpful in treating an enlarged liver and protects against alcohol- induced hepatic damage, central nervous system	Protects the liver against alcohol toxicity. potent antioxidant, hepatoprotective property suppresses the oxidative degradation of DNA in tissue debris ⁶⁴

			stimulants, lower blood sugar levels	
15	Katuki <i>Picrorrhiza kurroa</i> Scrophulariaceae Rhizomes	Bitter, Dry, Light, Cold	pacifies vitiated kapha, reduces swellings, purifies vitiated blood, excises unhealthy tissue	Protective role against ethanol and carbon tetrachloride induced toxicity ⁶⁵ , normalized liver function enzymes and reduced liver enlargement and hepatic nodular formation ⁶⁶ Hepatic cancers ⁶⁷
16	Kumari <i>Aloe vera</i> , Liliaceae, Leaves	Bitter, Sweet, Heavy, Unctuous, Hot	pacifies vitiated kapha, Pitta, reduces swellings, heals wounds, purifies vitiated blood	Yoshida AH-130 ascitehepatoma (pleural tumour) ⁶⁸ , human neuroectodermal tumors ⁶⁹
17	Nimba <i>Azardirachta Indica</i> , Meliaceae	Bitter, Pungent, Light, Dry, Cold	Pacify Kapha, pitta, A bitter tonic and a stimulant, arrests secretions and bleeding besides counter acting any spasmodic disorders	Anti-oxidant Paracetamol Induced hepatotoxicity activity in rats ⁷⁰
18	Pippali <i>Piper longum</i> , Piperaceae, Fruits	Pungent, Light, Hot	Pacify kapha, vata, Carminative, Appetizer, digestive, stimulant for both the digestive and the respiratory systems	Decreased level of serum enzymes, total bilirubin and direct bilirubin in CCl ₄ Induced hepatic damage ⁷¹
19	Punarnava <i>Boerhaavia diffusa</i> , Nyctaginaceae, Root	Bitter, Sweet, Light, Dry, Hot	Pacify Kapha, Vata, used to rejuvenate liver and detoxify it. It helps in jaundice and hepatitis, Anti-inflammatory, Diuretics	Reduction in serum alanine aminotransferases, triglycerides, cholesterol and total lipid levels in both serum and tissues, marked reduction in fat deposits in CCl ₄ intoxication and Country made liquor induced hepatotoxicity ^{72, 73}
20	Rohitak <i>Amoora rohitaka</i> , Bignoniaceae, Bark	Pungent, Astringent, Light, Dry, Cold	Pacify Kapha, Pitta, Used in spleen and Liver disorders, blood purifier, digestive action	Cytotoxic effects on breast and pancreatic cancer cells ⁷⁴
21	Sharapunkha <i>Tephrosia purpurea</i> , Fabaceae, All parts	Bitter, Astringent, Pungent, Light, Hot	Pacify Kapha, Vata, cures diarrhea, asthma, liver and spleen diseases, inflammation	anti-cancer activity in hepatocellular carcinoma cells, and the activity is mediated through apoptosis by induction of caspase-3 ⁷⁵
22	Vidanga <i>Embelia ribes</i> , Myrsinaceae Fruits, Roots	Pungent, Bitter, Dry, Light, Hot	intestinal worms, skin diseases, leprosy, pruritus, nervous debility, dyspepsia, jaundice, flatulence, colic, constipation, tumors, asthma, bronchitis, cardiac diseases, psychological disorders,	Antioxidant potential in CCl ₄ -treated male wistar rats ⁷⁶
23	Yashtimadhu <i>Glycyrrhiza glabra</i> , Fabaceae, Root	Sweet, Heavy, Unctuous, Cold	Pacify Vata, Pitta, anemia, gout, sore throat, tonsillitis, flatulence, debility, , fever, coughs, swellings, acidity, bleeding, jaundice, vitiated conditions of vata dosha,	Anti-lipid peroxidation Effect in CCl ₄ induced hepatotoxicity in mice ^{77, 78}

DISCUSSION: 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.

Review suggested that more than 126 liver products are described in various Ayurvedic classical texts, more than 150 products are prepared

as proprietary medicines by pharmacies and 18 are patented. More than 75 medicinal plants are used for the preparation of various Liver products. Amongst all, 23 plant drugs are used frequently in various products.

It is observed that maximum Ayurved classical products are used in liver disorders specifically in jaundice, hepatitis, alcoholism, cirrhosis and ascites conditions. These products are the combination of herbs and minerals. *Arogyavardhini vati*, *Draksadi*

arkom, Gudapippali, Kumaryasava, Kumari Asava, Punarnava Mandoora, Udrarnit vati are the common classical products which are used in various types of conditions related with Liver.

40 proprietary products are used in various Liver disorders such as alcoholic liver, ascites, cirrhosis, jaundice; Drug induced hepatotoxicity, fatty liver, viral hepatitis, sluggish liver.

Liv 52, Cytozen, Kamilariv Livotrit Forte, Culiv, Vasuliv, Hepabex, Hepa Cap, Livotrit Forte, Livomyn are the patented products used in hepatitis, Jaundice, drug induced hepatotoxicity, Alcoholic liver, Cirrhosis, fatty liver.

Mode of Action of Some Products: *Arogyavardhini vati* is a classical polyherbal-mineral formulation mentioned in Ayurvedic formulary. It has been used for centuries with excellent efficacy and safety in treatment of jaundice, liver disorders, and various skin disorders. An experimental study clearly demonstrated the protective effect of well-known *Arogyavardhini vati* against CCL₄ induced hepatotoxicity in rats^{79, 80}. It has proven antioxidant properties. It is safe in use although contains copper and mercury. *Argyavardhini vati* along with *Bhumyamalaki* leaves juice (*Phyllanthus frataruns* L.) and *Triphala* powder have a significant role of clearing; and normalizing liver transaminase in hepatitis B infected patient within 45 days⁸¹. It has good therapeutic utilities in nonalcoholic liver disorders also.

Roudra rasa is a novel Herbo-mineral product of Ayurveda mentioned to treat Arbuda [all types of Cancer]. This product is evaluated clinically and has shown highly encouraging results in the management of liver and G. I. cancer⁸².

Navjeevan rasa can increase the functional efficiency of liver, increase enzyme efficiency and increase serum albumin. Thus, arouses appetite which builds up the body strong⁸³.

Yakritplihariloha is used in the Ayurvedic treatment of all types of ascites, fever, edema, jaundice, bloating, anemia, anorexia, indigestion⁸⁴.

Liv 52 is the important formulation used in liver diseases. Usage of Liv 52 can help regulate levels of enzymes and optimize assimilation and improve

the functional efficiency of the liver. It helps restore the functional efficiency of the liver by protecting the hepatic parenchyma and assists in promoting hepatocellular regeneration. It facilitates rapid elimination of acetaldehyde, the toxic intermediate metabolite of alcohol metabolism, and helps ensure protection from alcohol-induced hepatic damage. It helps diminish the lipotropic activity in chronic alcoholism and prevents fatty infiltration of the liver. In pre-cirrhotic conditions, helps arrests the progress of the disease and prevents further liver damage⁸⁵.

Amlycure D.S. helps in regeneration & repair of hepatocytes by increasing the nucleic acid content – RNA, DNA & Protein. It accelerates repair & regeneration of liver cells by assuring liver protection by acting as an anti-oxidant, accelerates repair and regeneration of liver cells from alcohol induced liver damage by increasing the level of alcohol metabolizing enzymes, thus benefits chronic alcoholic patients. It protects liver from toxins, boosts immunity, promotes & enriches hepato-biliary secretions thus accelerating fat digestion and retards fat deposits in Liver tissues, fights fatty liver condition⁸⁶.

Heptovit SGC and syrup contain powerful and proven herbs to repair the damaged liver cells and restore the liver functions. It is a proven liver-protective, liver corrective and anti-viral herbal product. It efficiently lowers the raised levels of liver enzymes. It therefore stimulates appetite and improves the digestive functions.

Arkaliv is formulated as ‘Liver Protective’ with incorporation of drugs like Guduchi, Kutaki, Amalaki, Rohitaka etc. Guduchi is well known as hepatoprotective and it regulates bile flow. Kutaki is stomachic, bitter in taste and useful in infective and amoebic type of liver. Daruhalad is effective in treating hepatic splenic enlargements and catarrhal jaundice. Rohitak is blood purifier and hepatic stimulant. Shankh and Kapardik bhasma acts as antacid. Arkaliv is useful in dyspepsia, peptic acid disorders, constipation, malnutrition and other digestive disorders. This is the drug of choice in epidemic jaundice (Hepatitis-A) caused by water pollution and liver protective for alcohol addicts.

Over all Mode of Action of Liver Products: The liver is a unique organ in body it can strengthen itself. However, when the damage is severe, scar tissue is formed causing cirrhosis at which point; the liver is unable to function effectively. Ayurvedic liver products help restores the effectiveness of the liver, protect the loss of functional integrity of the cell membrane, protect hepatic parenchyma against toxins, promotes regeneration of liver cells, control the progress of the disease and protect further liver damage and ensures early restoration of hepatic role in ineffective hepatitis. They help in the prevention and treatment of Alcoholic liver, viral hepatitis, Pre-cirrhotic conditions and early cirrhosis Protein energy malnutrition, less appetite, liver damage due to Radiation and chemotherapy-induced.

CONCLUSION: Today various liver diseases are one of the foremost health troubles worldwide, with liver cirrhosis and drug induced hepatotoxicity. liver cirrhosis is the 14th leading cause of deaths in the world and could be the 12th leading cause of deaths in the world by 2020. Conventional treatment modalities are limited, costly and risk of adverse effects seen. Various formulations prepared from herbal and minerals play important role for the treatment of Liver diseases.

In this review article, an attempt has been made to compile classical, proprietary and patented Ayurved classical products and may be useful to the clinicians, professionals, scientists and scholars working the field of Ayurved.

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