International Journal of Pharmaceutical and Medicinal Research

Journal homepage: www.ijpmr.org

Review article

Herbal remedies used in the treatment of liver disease and development of those remedies by the help of micro-propagation: A review

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ARTICLE INFO:

Article history:
Received: February 1, 2014
Received in revised form: February 6, 2014
Accepted February 24, 2014
Available online: February 26, 2014

Keywords:
Liver disease
Herbal remedies
Plant tissue culture

ABSTRACT

The 21st century has seen a paradigm shift towards therapeutic evaluation of herbal products in liver diseases by carefully synergizing the strengths of the traditional systems of medicine with that of the modern concept of evidence-based medicinal evaluation, standardization of herbal products and randomized placebo controlled clinical trials to support clinical efficacy. The present review provides the status report of herbal remedies using as a treatment of liver diseases and importance of Micro-propagation in the development of those remedies.

1. Introduction

Liver is the largest internal organ in our body, performing more than 5,000 separate bodily functions – from cleansing the blood of toxins to converting food into nutrients to controlling our hormone levels. Most people never give their liver a thought until something goes wrong. Yet, liver disease is on the rise, affecting one in 10 peoples In fact, there are many types of liver disease that can be caused by a virus, damage from drugs or chemicals, obesity, diabetes or an attack from our own immune system. Many common liver diseases can cause the organ to become inflamed. This inflammation can progress to scarring, or cirrhosis. It is critical that patients with cirrhosis, due to any type of liver disease, seek help because people with cirrhosis are at an increased risk for liver cancer or liver failure. Liver cancer and liver failure can be treated by a multidisciplinary approach including radiation, medication, or surgery, including transplant (**figure 1 and figure 2**)[2]

2. Herbal remedies used in the treatment of liver disease

The use of natural remedies for the treatment of liver diseases has a long history, starting with the Ayurvedhic treatment, and extending to the Chinese, European and other systems of traditional medicines. The 21st century has seen a paradigm shift towards therapeutic evaluation of herbal products in liver diseases by carefully synergizing the strengths of the traditional systems of medicine with that of the modern concept of evidence-based medicinal evaluation, standardization of herbal products and randomized placebo controlled clinical trials to support clinical efficacy (**Table 1**).

3. Use of herbal medicine in liver disease

The history of use of herbal medicine dates back to more than 4000 years[4]. A wide range of plants have been utilized for treatment of multiple disorders of the liver[5]. Herbal medicine has been categorically employed for a variety of medical problems and modem trends have even helped in extracting the active principles which have been classed into many chemicalgroups such as alkaloids, glycosides, resins and tannins[6]. It is a fact that earlier use of plants as medicines was devoid of any scientific explanations. The reason for this may be that even there was little known about the aetiology and pathology of disease. Now because tremendous advances had been made regarding many unanswered questions pertaining to the development of disease state, herbal medicine is also being explored by scientific protocols.

As is evident from old literature, liver disease in Greece-Arab era was recognized only by the symptomatic jaundice[7]. It is a very surprising fact that since the establishment of aetiology of infectious hepatitis during the decade 1930-1940[8], the use of herbal medicine for liver disorder took an upward surge which culminated to extremes when infectious hepatitis was found to have the viral aetiology (1960). This was obviously due to the fact that in viral hepatitis the role of allopathic medicine was not much encouraging. The research on hepatoprotective herbs have been done not only in vitro but also in vivo[10, 9]. The herbs have shown a potential of reversing liver damage caused by a

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number of hepatotoxic compounds. In-vitro studies include regenerating effects of the herbs on isolated hepatocytes and in vivo hepatoprotection studied in animals exposed to hepatotoxic poisons.

Human studies have also shown encouraging results in the clinical trials carried out in different parts of the world. There had been efforts of doing such studies in human subjects in Pakistan. but enough data has not been framed. There still is a need of exploring this important field of herbal medicine. As majority of the medicinal plants are indigenous to Pakistan being one of the developing countries. Modern lives saving drugs are beyond the reach of nearly three-quarters of the third world population.

'As part of the strategy to reduce the financial burden in developing countries, it is likely that the increased use of traditional medicine be considered. If such a common medicine could be made available for a plethora of liver disorders it will help the common poor man who cannot afford costly therapies which too have a limited role[11].

4. Role of micropropation in development of those remedies which are useful in liver diseases

- To produce many copies of the same plants then which may be used to produce plants with better flowers, odours, fruits or any other properties of the plants that is beneficial to the human beings.
- To produce plants anytime we want although the climates are not appropriate to produce a plant. Moreover, if seed is not available, it is possible to produce a plant with this method.
- If there is plant with partially infected tissue, it is possible to produce a new plant without infection.
- Very helpful in the genetically modified organism studies.
- Very useful solution for the prevention of starvation in third world countries since the process id highly efficient, by using only one plant, it is possible to produce more than one thousand of the same plant with higher productive if its genome changed.
- The biochemical engineer can grow plant cells in liquid culture on a large scale—Bioreactor.
- The production of diploid plants from haploid cultures shortens the time taken to achieve uniform homozygous lines and varieties.
- The crossing of distantly related species by protoplast isolation and somatic fusion increases the possibility for the transfer and expression of novel variation in domestic crops.
- Cell selection increases the potential number of individuals in a screening program.
- Micro propagation using meristem and shoot culture techniques allows the production of large numbers of uniform individuals of species from limited starting material.
- Genetic transformation of cells enables very specific information to be introduced into single cells which can then be regenerated[12].

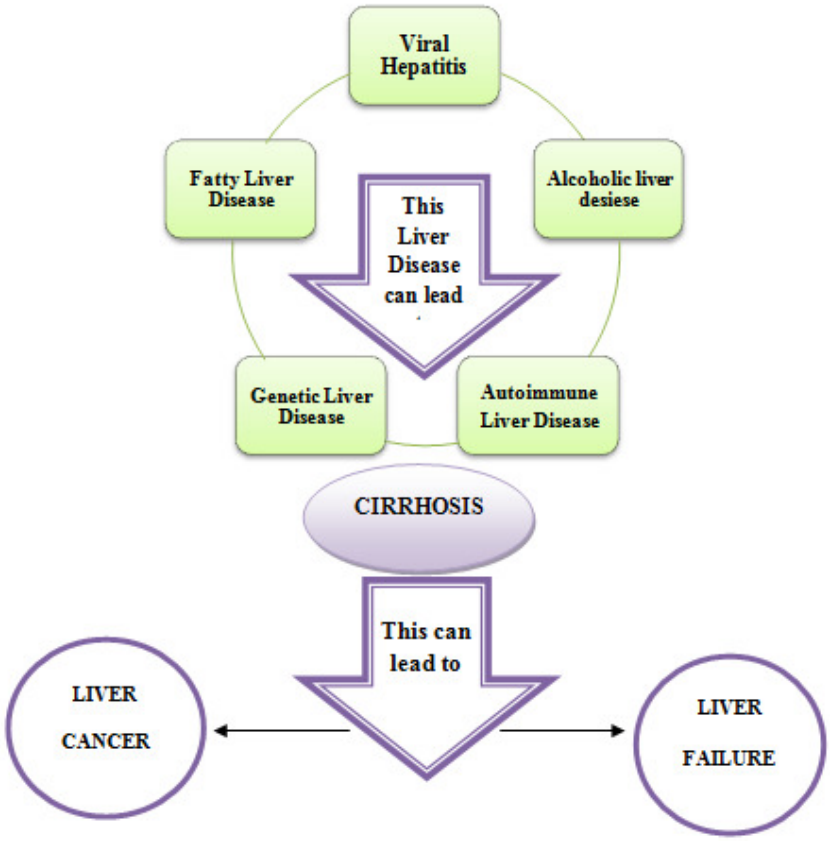

Figure 1: Types of liver disease

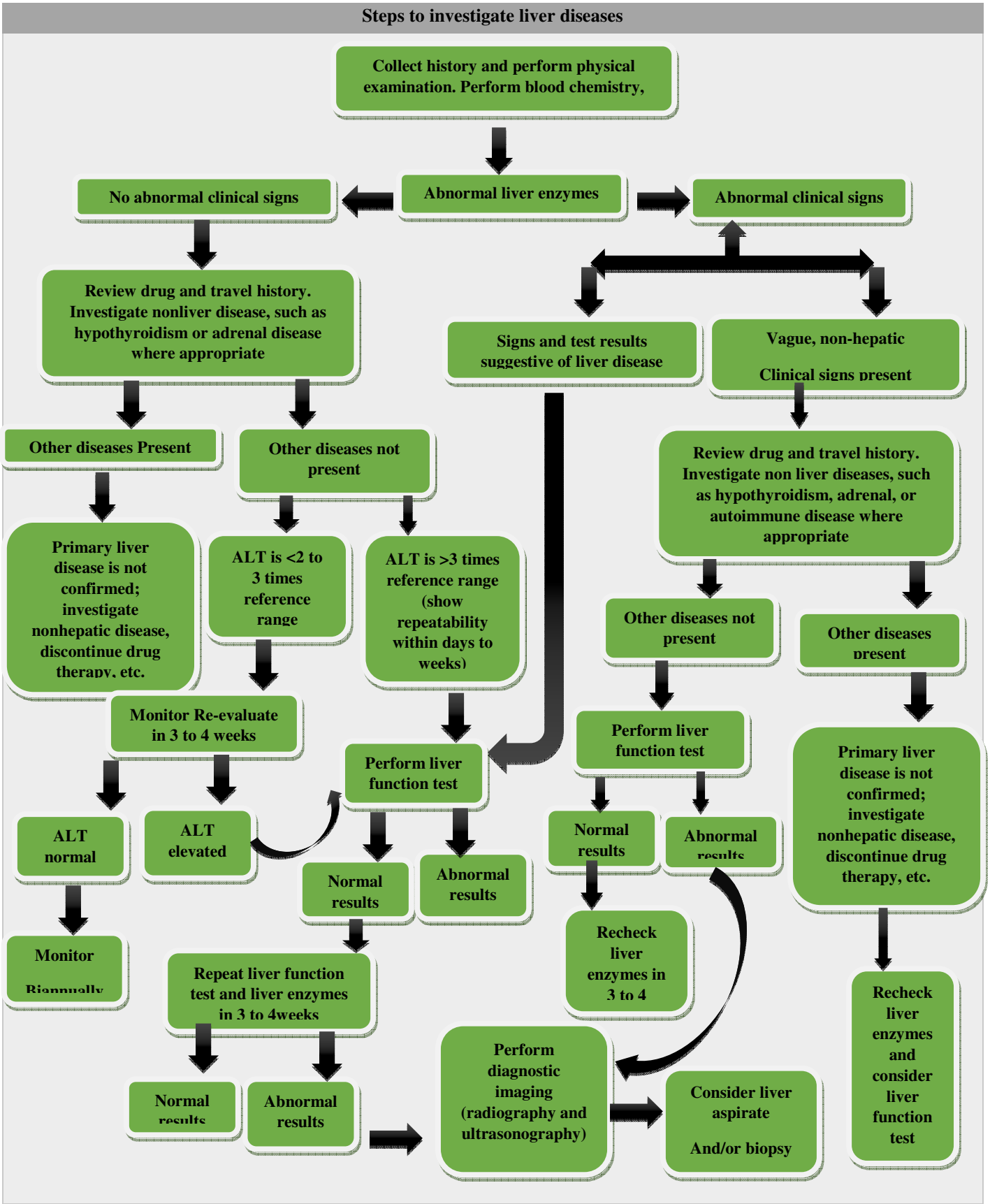

Figure 2: Steps to investigate liver diseases[1]

Table 1: Herbal remedies for liver diseases[3]

S. No.	Botanical name	Common name	family	Plant part used
1.	*Abelmoschusesculentus*	Lady's Finger	Malavaceae	Root, fruit, sees
2.	*Acacia catechu*	Cutch tree	Leguminosae/Mimosaceae	Stem bark
3.	*Achilleamillefolium*	Milfoil	Compositae/Asteraceae	Whole plant
4.	*AegleMarmelos*	Bael tree	Rutaceae	Pulp, seed
5.	*Aervalanata*	Chaya	Amaranthaceae	Root, whole plant
6.	*Agropyronrepens*	Couch grass	Gramineae/Poaceae	Root, rhizome
7.	*Agrostemmagithago*	Corn cockle	Caryophyllaceae	Seeds
8.	*Allium cepa*	Onion	Liliaceae/Alliaceae	Bulb
9.	*Allium sativum*	Garlic	Liliaceae/Alliaceae	Bulb
10.	*Alocasiaindica*	Giant taro	Araceae	Root,tuber,leaf
11.	*Aloe barbadensis*	Indian aloe	Liliaceae	Root ,pulp, aerial part
12.	*Aloe succotrina*	Mocha aloe	Liliaceae	Leaf, whole plant
13.	*Alstoniascholaris*	Dita bark	Apocynaceae	Stem bark
14.	*Amaranthusspinosus*	Prickly amaranth	Amaranthaceae	Whole plant
15.	*Andrographispaniculata*	Creat	Acanthaceae	Whole plant
16.	*Aphanamixispolystachya*	Amoora	Meliaceae	Stem bark
17.	*Apiumgraveolens*	Cerely	Umbelliferae/apiaceae	Seed
18.	*Aporosalindieyana*	Valaka	Euphorbiaceae	Root
19.	*Aquilegia vulgaris*	Common columbine	Ranunculaceae	Root, seed
20.	*Argemone Mexicana*	Prickly poppy	Papaveraceae	Whole plant
21.	*Aristolochiaindica*	Indian birthwort	Aristolochiaceae	Root, seeds. Rhizome
22.	*Artemisia absinthium*	Absinthe	Compositae/asteraceae	Aerial part
23.	*Asparagus officinale*	Asparagus	Liliaceae	Root
24.	*Asparagus recemosus*	Satawar	Liliaceae	Whole plant
25.	*Aspleniumadiantoides*	Nelapanna	Aspleniaceae/polypodiaceae	Whole plant
26.	*Aspleniumadiantum*	Black spleenwort	Aspleniaceae	Whole plant
27.	*Azadirachtaindica*	Neem	Meliaceae	Whole plant
28.	*Balanitesaegyptiaca*	Hing	Balanitaceae/simarubaceae	Stem bark, leaf, fruit
29.	*Baliospermummontanum*	Danti	Euphorbiaceae	Root
30.	*Balamcandacinensis*	Leopard lily	Iridaceae	Rhizome
31.	*Berbarisaristata*	Barberry	Berberidaceae	Root bark
32.	*Berbarisasiatica*	Sumlu	Berberidaceae	Root
33.	*Bixaorellana*	Annatto tree	Bixaceae	Leaf
34.	*Boerhaaviadiffusia*	Punarnava	Nyctaginaceae	Root,whole plant
35.	*Brideliastipularis*	Kangiabel	Euphorbiaceae	Leaf
36.	*Bupleurumfalcatum*	-	Umbelliferae/apiaceae	Root
37.	*Bupleurumjukundum*	-	Umbelliferae/apiaceae	Root
38.	*Cajanuscajan*	Arhar	Papilionaceae/ fabaceae/leguminosae	Leaf, seed
39.	*Callicarpatomentosa*	Bastra	Verbenaceae	Stem bark
40.	*Calotropisprocera*	Madar	Asclepiadaceae	Leaf, flower
41.	*Capparisspinosa*	Caper bush	Capparidaceae	Root bark
42.	*Carthamustinctorius*	Karrah	Compositae/asteraceae	Flower
43.	*Cassia fistula*	Amaltas	Leguminosae/caesalpiniaceae	Leaf
44.	*Cassia Occidentalis*	Negro coffee	Leguminosae/caesalpiniaceae	Leaf
45.	*Cassia tora*	Panewar	Leguminosae/caesalpiniaceae	Leaf
46.	*Casuarinaequisetifolia*	Beefwood	Casuarinaceae	Whole plant
47.	*Centaureabehen*	Safedbahman	Compositae/asteraceae	Root
48.	*Cichoriumintybus*	Chicory	Compositae/asteraceae	Leaf
49.	*Citrulluscolocynthis*	Indrayan	Cucubitaceae	Root, fruit
50.	*Citrus limettioides*	Sweet lime	Rutaceae	Fruit
51.	*Cleome viscosa*	Hulhul	Capparidaceae	Leaf
52.	*Clerodendruminerme*	sangkupi	Verbenaceae	Leaf
53.	*Colchicum luteum*	Hirantutiya	Liliaceae	Corm

54.	*Cordiamacleodii*	Dhaiman	Boraginaceae	Stem bark, leaf
55.	*Crataevanurvala*	Barun	Capparidaceae	Stem bark
56.	*Croton oblongifolius*	Chucka	Euphorbiaceae	Stem bark, aerial part
57.	*Curculigoorchioides*	Kali musli	Amaryllidaceae	Rhizome(tuber)
58.	*Curcuma longa*	Turmeric	Zingiberaceae	Rhizome(tuber)
59.	*Cuscutachinensis*	Agamulanetirvel	Convolvulaceae	Seed
60.	*Cuscutareflexa*	Akasbel	Convolvulaceae	Whole plant
61.	*Decalepishamiltonii*	Mahalikizhangu	Asclepiadaceae	Root
62.	*Delphinium zali*	Asbarg	Ranunculaceae	Flower, whole plant
63.	*Doremaammoniacum*	Ushak	Umbelliferae/apiaceae	Gum
64.	*Ecboliumviride*	Udajati	Acanthaceae	Root
65.	*Eclipta alba*	Bhangra	Compositae/asteraceae	Whole plant
66.	*Embeliaribes*	Baberang	Myrsinaceae	Fruit
67.	*Emblicaofficinalis*	Amla	Euphorbiaceae	Fruit
68.	*Equisetum arvense*	Field horsetail	Equisetaceae	Aerial part
69.	*Ficusasperrima*	Kalmnor	Moraceae	Stem bark
70.	*Ficusdalhousiae*	Samavalkhom	Moraceae	Bark, leaf
71.	*Ficusretusa*	Kamrup	Moraceae	Stem bark
72.	*Flacourtiajangomas*	Punela plum	Flacourtiaceae	Fruit
73.	*Flacourtiaramontchi*	Governor's plum	Flacourtiaceae	Fruit
74.	*Foeniculumofficinale*	Saunf	Umbelliferae/apiaceae	Seed
75.	*Fumariaindica*	Pitpapra	Papaveraceae	Whole plant
76.	*Fumariaofficinalis*	Pitpapra	Papaveraceae	Whole plant
77.	*Gardenia jasminoides*	Jasmine	Rubiaceae	Fruit
78.	*Geloniummultflorum*	Ban naringa	Euphorbiaceae	Stem bark
79.	*Gentianaolivieri*	Agherpanrae	Gentianaceae	Aerial part
80.	*Geranium robertianum*	Geranium	Geraniaceae	Whole plat
81.	*Ginkgo biloba*	Maidenhair tree	Ginkgoaceae	Fruit
82.	*Glycosmispentaphylla*	Ban nimbu	Rutaceae	Leaf
83.	*Glycyrrhiza glabra*	Liquorice	Papilionaceae/fabaceae/leguminosae	Root
84.	*Hackelochloagranularis*	Trinpali	Gramineae/poaceae	Whole plant
85.	*Hedyotiscorymbosa*	Daman papar	Rubiaceae	Whole plant
86.	*Hibiscus sabdariffa*	Lalambari	Malvaceae	Calyx
87.	*Hygrocotylesibthorpioides*	Khulkhuri	Umbelliferae/apiaceae	Root
88.	*Hygraphilaspinosa*	Talimakhana	Acanthaceae	Root, leaf, seed
89.	*Ichnocarpusfructescans*	Kalidudhi	Apocynaceae	Root, whole plant
90.	*Indigoferaoblongifolia*	Jhilla	Papilionaceae/fabaceae/leguminosae	Root, whole plant
91.	*Indigoferatinctoria*	Indian indigo	Papilionaceae/fabaceae/leguminosae	Root
92.	*Ipomoea digitata*	Bilaikhand	Convolulaceae	Root (tuber)
93.	*Iris ensata*	Sosun	Iridaceae	Root
94.	*Juniperuscommunis*	Common juniper	Cupressaceae/pinaceae	Fruit
95.	*Kalanchoepinnata*	Zakham-haiyat	Crassulaceae	Leaf
96.	*Lactucaremotiflora*	Undirachakan	Compositae/asteraceae	Whole plant
97.	*Lagenariasiceraria*	Kaddu	Cucurbitaceae	Leaf, fruit
98.	*Lepidumlattifolium*	Gonyuch	Cruciferae/ brassicaceae	Whole plant
99.	*Luffaechinata*	Bindal	Cucurbitaceae	Fruit, Whole plant
100.	*Lychniscoronaria*	Rose campion	Caryophyllaceae	Root
101.	*Momordicacharantia*	Karela	Cucurbitaceae	Leaf, fruit, seed
102.	*Momordicadioica*	Kaksa	Cucurbitaceae	Leaf
103.	*Moringaoleifera*	Mungna	Moringaceae	Fruit
104.	*Myrtuscommunis*	Vilayatimehndi	Myrtaceae	Leaf
105.	*Nelumbonucifera*	Kamal	Nymphaeaceae	Flower
106.	*Nigella damascene*	Love in amist	Ranunculaceae	Seed
107.	*Nigella sativa*	Kalonji	Ranunculaceae	Seed
108.	*Nymphoidesindicum*	Hinambala	Gentianaceae	Whole plant

109.	*Ocimum sanctum*	Tulsi	Labiatae/lamiaceae	Leaf
110.	*Orthosiphonspiralis*	Java tree	Labiatae/lamiaceae	Leaf
111.	*Oxystelmasecamone*	Dudhialata	Asclepiadaceae	Root
112.	*Pavettaindica*	Katha-champa	Rubiaceae	Root
113.	*Phlogacanthusjenkinsil*	Titagachh	Acanthaceae	Leaf
114.	*Phyllanthusniruri*	Jangliamli	Euphorbiaceae	Root
115.	*Physalis minima*	Tulatipati	Soanaceae	Leaf, fruit
116.	*Picrorrhizakurroa*	Kutki	Scrophulariaceae	Root, rhizome
117.	*Piper chaba*	Java long pepper	Piperaceae	Fruit
118.	*Piper longum*	Indian long pepper	Piperaceae	Root, fruit
119.	*Plantago major*	Isafghol	Plantaginaceae	Seed
120.	*Polycarpaeacorymbosa*	Machechi	Caryophyllaceae	Leaf
121.	*Polygonumglabrum*	Bihagni	Polygonaceae	Root
122.	*Pongamiapinnata*	Karanj	Papilionaceae/ fabaceae/leguminisae	Root, seed
123.	*Portulacaoleraceae*	Khursa	Portulacaceae	Whole plant
124.	*Prongospabularia*	Komal	Umbelliferae/ Apiaceae	Fruit
125.	*Pterocarpusmarsupium*	Bijasal	Papilionaceae/ fabaceae/leguminisae	Stem bark
126.	*Pterospermum acerifolium*	Kanakchampa	Sterculiaceae	Leaf
127.	*Rheum emodi*	Himalayan rhubarb	Polygonaceae	Root, rhizome
128.	*Ricinuscommunis*	castor	Euphorbiaceae	Leaf
129.	*Rubiacordifolia*	Indian madder	Rubiaceae	Root
130.	*Rubiatinctorum*	Bacho	Rubiaceae	Root
131.	*Saponariaofficinalis*	Bounching bet	caryophyllaceae	Root, leaf
132.	*Sarcostemmabrevistigma*	Somlata	Asclepiadaceae	Stem
133.	*Scopariadulcis*	Sweet broomweed	Scrophulariaceae	Whole plant
134.	*Silybummarianum*	Milk thistle	Compositae/asteraceae	Leaf
135.	*Solanumdulcamara*	Dulcamara	solanaceae	Fruit (berry)
136.	*Solanummelongena*	Brinjal	solanaceae	Fruit
137.	*Solanumnigrum*	Makoi	solanaceae	Whole plant
138.	*Sphaeranthusindicus*	Mundi	Compositae/asteraceae	Leaf, fruit, whole plant
139.	*Spondiaspinnata*	Amara	Anacardiaceae	Stem bark, fruit
140.	*Sutherlandiafrutescens*	Bladderseena	Papilionceae/fabaceae/leguminosae	Leaf
141.	*Swertiachirayita*	Chirayita	Gentianaceae	Whole plant
142.	*Symplocosracemosa*	Lodh	Symplocaceae	Stem bark
143.	*Tanacetumvulgare*	Peilmundi	Compositae/asteraceae	Leaf, flower
144.	*Taraxacumofficinale*	Dulal	Compositae/asteraceae	Root, rhizome
145.	*Tecomellaundulata*	Rugtrora	Bignoniaceae	Stem bark, whole plant
146.	*Tephrosiapurpurea*	Sarphonka	Papilionceae/fabaceae/leguminosae	Aerial part
147.	*Terminaliaarjuna*	Arjun	Combretaceae	Stem bark, fruit
148.	*Terminaliachebula*	harra	Combretaceae	Stem bark, fruit
149.	*Tinosporacordifolia*	Giloe	Menispermaceae	Stem bark, fruit
150.	*Trachyspermumammi*	Ajowan	Umbelliferae/apiaceae	Fruit , seed
151.	*Tragopogonporrifolius*	Salsify	Compositae/asteraceae	Root
152.	*Trichosanthescordata*	Bhumikumra	Cucurbitaceae	Root
153.	*Trianthemadacandra*	Gadabani	Aizoaceae	Root, leaf
154.	*Trichosanthescucumerina*	Jangli-chachinda	Cucurbitaceae	Stem, leaf, whole plant
155.	*Tridax procumbens*	Coat buttons	Asteraceae	Leaf
156.	*Trigonellafoenum-graecum*	Methi	Papilionceae/fabaceae/leguminosae	Leaf, seed
157.	*Tylophoraindica*	Indian ipecauanha	Asclepiadaceae	Leaf
158.	*Urariacrinita*	Dieng-kha-riu	Papilionceae/fabaceae/leguminosae	Whole plant
159.	*Urticadioica*	Bichchu grass	Urticaceae	Whole plant
160.	*Urarianarum*	Pulichan	Annonaceae	Leaf
161.	*Viscum album*	Banda	Viscaceae	Whole plant
162.	*Vitexnegundo*	Nirgundi	Verbenaceae	Root, leaf, flower
163.	*Vitextrifolia*	Panikisanbhalu	Verbenaceae	Leaf

164.	*Vitisvinifera*	Grapes	Vitaceae	Leaf
165.	*Wedeliacalendulaceae*	Pilabhangra	Compositae/asteraceae	Whole plant
166.	*Withaniasomnifera*	Ashwagandha	Solanaceae	Root
167.	*Woodfordiafruticosa*	Dhai	Lythraceae	Flower
168.	*Zanthoxylumarmatum*	Tejbal	Rutaceae	Stem bark, fruit, seed
169.	*Zingiberofficinale*	Ginger	zingiberaceae	Rhizome

5. Conclusion

Botanicals have been used traditionally by herbalists and indigenous healers worldwide for the prevention and treatment of liver disease. In this century, Literature survey has confirmed Silybummarianum (milk thistle) has been shown to have clinical applications in the treatment of toxic hepatitis, fatty liver, cirrhosis, ischemic injury, radiation toxicity, and viral hepatitis via its antioxidative, anti-lipid peroxidative, antifibrotic, anti-inflammatory, immunomodulating, and liver regenerating effects. The present review revealed that the status report of herbal remedies using as a treatment of liver diseases and micropropation playing a very important role in the development of those remedies.

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Source of support: Nil, Conflict of interest: None Declared

Cite this article as: Amita Pandey. Herbal remedies used in the treatment of liver disease and development of those remedies by the help of micro-propagation: A review. **Int. J. Pharm. Med. Res., 2014; 2(1):8-14.**