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ETHNOMEDICINAL REMEDY FOR THE LIVER DISORDERS IN HIMACHAL PRADESH : A REVIEW

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Abstract

In the mountain areas people's dependent on plants for their sustenance especially for medicine and value of medicinal plants in traditional healthcare practises provides clues to latest areas of research in biodiversity conservation. However, information on the uses of plants for medicine is deficient from interior areas of Himalaya. Himachal Pradesh has a rich heritage of medicinal plants. Inspite of this, acute jaundice and viral hepatitis diseases are highly prevalent nowadays among the residents of the state. Total 57 plant families are used for the treatment of liver ailments. The majority of the medicinal plants belongs to the family Asteraceae followed by Berbridaceae, Fabaceae, Apiaceae, Gentianaceae, respectively. The present study aimed to review and highlight the available ethnomedicinal plants in Himachal Pradesh for the treatment of the liver disorders. The over-exploitation, habitat degradation and changing environmental conditions may lead to the extinction within few years. Therefore, regular monitoring of population habitats, development of conventional protocol, and establishment of species *in-situ* conditions and replication of this approach in other parts of Indian Himalayan region have been recommended.

Key words : Medicinal plants, Liver Disorders, Ethnobotany, Traditional healtcare, Himalaya.

Introduction

From medieval times, medicinal plants are used by people of different culture and region to cure different illnesses as medicines were not available at that time. Therapeutic plants were then a vital part of the customary Indian system of the drug, for example, Ayurveda, Siddha and Unani. The principal attestable record of curative use of plants is found in ancient Indian treatise Rigveda, 1500-400 BC (Hassan *et al.,* 2018). India is considered as a fortune place as it contains an ample number of medicinal plants. People have been utilizing plants since ages to cure various diseases and of the all-out 4, 80,000 plant species have been discovered worldwide and around 28, 187 species are used for the therapeutic purpose (Pullaiah *et al.,* 2015; SOTWP, 2017). In India around 9, 500 plant species have been found to have pharmaceutical significance (Chowti *et al.,* 2018).

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The State Himachal Pradesh is located in the province of Western Himalayan within Sino-Himalayan subzone which is 2800km long, 220-300 km wide and elevated about 200-8000m from the sea level (Kumar and Dogra, 2017). The forest areas cover about 38% of the State's total area and make it a rich reservoir of medicinal and aromatic plants (Balasubramaniam, 2013, HPFD, 2018). Around about 3324 plant species found in the State, approximately 800 species are attributed with medicinal value, and about 165 species are collected for commercial purposes (Rana and Rawat, 2017). The state has 24 species of plants that are amongst the most trade plants in India and harvest more than 2500 tonnes of medicinal plant annually (TERI, 2015).

According to the Integrated Disease Surveillance Program (IDSP), India reports from 2014 to 2018 about a total of 392 cases of Hepatitis A virus (HAV), 1961 cases of Hepatitis E virus (HEV) with 2 deaths, 220 case

Table 1: Reports of Hepatitis and Jaundice cases in Himachal Pradesh from 2014-2018.

Year	No. of Viral Hepatitis A cases	No. of Deaths	No. of Viral Hepatitis E cases	No. of of Deaths	No. of Suspected Hepatitis cases	No. of Deaths	No. of Jaundice cases	No. of of Deaths
2014	375	0	0	0	220	0	0	0
2015	0	0	83	0	0	0	0	0
2016	0	0	1878	2	0	0	0	0
2017	17	0	0	0	0	0	69	0
2018	0	0	0	0	0	0	0	0

Source: http://www.idsp.nic.in

of suspected hepatitis and 69 jaundice cases have been reported in the state itself as shown in table 1 (IDSP, 2019). Moreover, the HP state IDSP report presented the 2716 cases of viral hepatitis with 18 deaths in the year 2016, 1001 cases in 2017 with 2 deaths. In 2017, 281 HAV, and 82 HEV cases were reported, whereas, in 2018 54 HEV and 49 HAV cases with 1 death was reported (IDSP HP, 2017, IDSP HP, 2018). Considering drinking water and sanitation; the state has 55.5% availability of drinking water within premises, 30.9% have no toilet facility within premises, and 29.7% uses the open toilet (NHP, 2018). As per research report distribution of public healthcare services are not wise in the state (Suman and Bhutani, 2017). Only 3 districts Lahaul-Spiti, Kinnaur and Shimla, had relatively better health services in comparison with other districts in the state, whereas districts Kangra, Sirmaur, Mandi and Una on the other hand, had a low level of health services (Suman and Bhutani, 2017). The present study aimed to review and to highlight the available ethnomedicinal plants in Himachal Pradesh for the treatment of the liver disorders.

Plant families contributing to curing liver problems

The rigorous literature survey shows that, 57 plant families were found to be involved in treating liver problems. The major contribution was given by the family Asteraceae having 9 species, whereas, Berbridaceae, Fabaceae, Apiaceae, and Gentianaceae have 4 species each. Studies conducted by various research groups in the different regions of the State on various medicinal plants have been listed in table 2 (Vidyarthi *et al*., 2013, Rana *et al*., 2014, Boktapa and Sharma, 2010, Kaur *et al*., 2017, Singh, 2012, Arti *et al*., 2014, Paul and Khan, 2017, Sharma and Samant, 2014, Dutt *et al*., 2014, Singh and Thakur, 2014, Kumar and Sharma, 2014, Sharma *et al*., 2013, Rani and Rana, 2014, Bhardwaj and Seth, 2017, Thakur *et al*., 2017, Singh and Lal, 2008, Raman and Chaudhuri, 2018, Rana and Samant, 2011, Parkash and Aggarwal, 2010, Verma and Tewari, 2016, Kumar and Choyal, 2012, Rani *et al*., 2013, Pracheta *et al*., 2017, Rani *et al*., 2013, Rana *et al*., 2019). All parts of the plants have the medicinal importance, but the major phytochemicals are provided from leaves (21%), whole plant (16%), roots (5%), fruits (13%), flowers (8%), seeds (6%) and stems (6%) (Fig. 1).

Knowledge among villagers and tribal people

As the conventional therapeutic practices are the main human services available in numerous provincial and remote zones, thus, local people and tribal's are well versed with available medicinal plants and therapeutic usage. A study conducted on the rural areas of Kullu district reported that 67% of women had knowledge of a collection of plant material and its use as traditional medicine (Uniyal, 2003). Another report revealed that local people of Chamba and Kangra districts are well versed with the knowledge of ethnomedicinal plants (Thakur *et al*., 2016). Pangi valley tribal communities of district Chamba, have grown few medicinal plants in their kitchen garden (Rana *et al*., 2014). In reality, the traditional healthcare system is now facing solemn challenges as only older people are having more knowledge of ethnomedicinal plant species than younger people (Thakur *et al*., 2016). The indigenous knowledge about medicinal plants and their usage is declining among the younger generation, which may be due to the less interest of young generation to gather ethnomedicinal knowledge and learn about their usage (Kanwar *et al*., 2006, Rani *et al*., 2013). Additionally, the illiterate people have more knowledge about ethnomedicinal plants in comparison to the literate ones, which support the fact that literates are more likely, inclined towards the modernization.

Conservation and management of medicinal plants

The State government has become seriously concerned with rapid decrease in number of medicinal plants, due to large-scale illegal collection from the wild. In order to conserve these resources government have introduced various policy and measures like in-situ conservation and to promote their cultivation by farmers. For surveillance on illegal collection, re-organisation of the mechanism and institution involved in the collection of medicinal plant from forests are being done. Almost every state has formed the "State Medicinal Plant Board" which will coordinate in all the activities to promote the

Table 2: Plants for the treatment of Liver Disorders in Himachal Pradesh.

Name of the plant species	Family	Local names	Plant parts used	Ailments treated	References
Populus alba	Siliaceae	Beli	Bark	liver disorders	Pracheta, 2017
Aquilegia fragrans Benth	Ranunculaceae	Zadul	Seeds	jaundice	Rani *et al*., 2013
Berberis ceratophylla G. Don	Berberidaceae	Kshamal	Roots	jaundice	Rani *et al*., 2013
Cassia fistula L.	Fabaceae	Kyar, Amaltas	Seeds, Roots, Leaves, Fruits, Bark	jaundice, liver disorders	Rani *et al*., 2013, *Sharma et al*., 2013
Tinospora cordifolia Miers	Menispermaceae	Gloe, Amrita bali, Galoy	Stems, Whole plant, Leaves, Roots	jaundice, hepatitis, hepatic fibrosis	Rani *et al*., 2013, Kumar and Choyal, 2012, Raman and Chaudhuri, 2018, Sharma *et al*., 2013
Adiantum capillus veneris L.	Adiantaceae	Dooman tuli	Leaves	jaundice	Kumar and Choyal, 2012
Aegle marmdos (L) Corr.	Rutaceae	Bil, Bil patri	Leaves, Fruits	jaundice, liver disorders	Kumar and Choyal, 2012
Argemone maxicana L.	Papaveraceae	Bharbhand	Whole plant	jaundice, liver disorders, hepatitis	Kumar and Choyal, 2012
Berberis lyceum Royle.	Berberidaceae	Kshmal, Daruhaldi, Kshambal, Kushmal	Roots, Stems, Whole plant, Fruits	jaundice, enlargement of liver	Kumar and Choyal, 2012, Vidyarthi *et al*., 2013, Singh and Thakur, 2014, Sharma *et al*., 2013
Colocia esculenta (L.) Schott	Araceae	Arbi kuchawari	Bulb	jaundice	Kumar and Choyal, 2012
Cuscuta reflexa Roxb.	Convalvulaceae	Akash bel, Amar bel	Whole plant, Seeds, Stems	indurations in liver, jaundice, liver complaints	Kumar and Choyal, 2012 , Rana and samant, 2011, Rana *et al*., 2014
Cucumis sativus L.	Cucurbitaceae	Kheera	Fruits	jaundice, hepatitis, liver disorders	Kumar and Choyal, 2012
Euphorbia hirta L.	Euphorbiaceae	Doodhli	Stems, Leaves	jaundice	Kumar and Choyal, 2012
Hordeum vulgare L.	Poaceae	Jou, Joui	Seeds	jaundice, hepatitis, liver disorders	Kumar and Choyal, 2012
Justacia adhatoda L.	Acanthaceae	Basuti	Roots	jaundice	Kumar and Choyal, 2012
Morus alba L.	Moraceae	Chitta toot	Fruits	jaundice, hepatitis, liver disorders	Kumar and Choyal, 2012
Phyllanthus emblica	Phyllanthaceae	Amla	Fruits, Roots, Seeds, Bark	jaundice	Kumar and Choyal, 2012, Bhardwaj and Seth, 2017, Singh and Thakur, 2014
Phyllanthus niruri L	Phyllanthaceae	Bhoomi Ambla	Roots, Whole plant	jaundice, hepatitis, liver disorders, hepatic problem	Kumar and Choyal, 2012, Kumar and Sharma, 2014
Picrohiza kurooa Royle ex.	Plantaginaceae	Karru, Kutki, Karroo, Karu, Kaur	Rhizome, Roots, Leaves, Stems	liver troubles, jaundice	Kumar and Choyal, 2012, Rana and Samant, 2011, Rana *et al*., 2019, Vidyarthi *et al*., 2013, Boktapa and Sharma, 2010, Paul and Khan, 2017, Sharma and Samant, 2014

Table 2 continued.....

Table 2 continued.....

Name of the plant species	Family	Local names	Plant parts used	Ailments treated	References
Pistacia intergerrima Stewart ex.	Anacardiacceae	Kakar singhi	Fruits	jaundice, hepatitis, liver disorders	Kumar and Choyal, 2012
Prunus domestica L	Rosaceae	Alubhukhara, Palam	Fruits	jaundice, hepatitis, liver disorders	Kumar and Choyal, 2012
Punica granatum L.	Punicaceae	Daran	Fruits, Seeds	jaundice, hepatitis, liver disorders	Kumar and Choyal, 2012
Raphanus sativus Linn.	Brassicaceae	Mooli	Roots	jaundice	Kumar and Choyal, 2012
Saccharum officinarum L.	Poaceae	Ganna, Kamandi	Stems	jaundice	Kumar and Choyal, 2012
Sesamum indicum Linn	Pedaliaceae	Til	Leaves	liver complaints	Kumar and Choyal, 2012
Solanum nigrum Linn	Solanaceae	Makoi, Khatmalu	Whole plant, Fruits, Seeds, Leaves	cirrhosis of liver, jaundice, liver complaints, liver infections,cirrhosis, liver enlargements	Kumar and Choyal, 2012, Rana and Samant, 2011, Arti *et al*., 2014, Singh and Thakur, 2014
Tamarindus indica L.	Caesalpinaceae	Imli	Fruits, Roots	jaundice	Kumar and Choyal, 2012
Taraxacum officinale Weber.	Asteraceae	Dulal, Dudhli, kanphul Dudhli, Metok	Rhizome, Leaves, Whole plant, Flowers	jaundice, hepatitis, liver disorders, liver trouble	Kumar and Choyal, 2012 , Rana and Samant, 2011, Singh and Lal, 2008, *Rana et al*., 2014, Singh, 2012, Sharma *et al*., 2013
Viola serpens Wall.	Violaceae	Bhanaksha	Whole plant	jaundice, hepatitis, liver disorders	Kumar and Choyal, 2012
Woodfordia fruticosa (L) S.	Lythraceae	Dahvi	Flowers	jaundice	Kumar and Choyal, 2012
Heracleum candicans	Apiaceae	NS	Flowers, Leaves	liver complaints	Verma and Tewari, 2016
Aerva koenigii (Linn.) Juss.	Amaranthaceae	Kangnis	Leaves	liver disorders	Parkash and Aggarwal, 2010
Deeringia amaranthoides (Lamk) Merr.	Amaranthaceae	Piringya	Leaves	liver disorders	Parkash and Aggarwal, 2010
Bupleurum falcatum	Apiaceae	Nimla	Roots	liver complaints	Rana and Samant, 2011
Berberis jaeschkeana Schneid	Berberidaceae	Kashambl, Kaymali	Roots, Fruits, Bark, Stems, Leaves	jaundice	Rana and Samant, 2011, Sharma and Samant, 2014
Betula utilis D.Don	Betulaceae	Bhojpatra	Bark, Twigs, Leaves	jaundice	Rana and Samant, 2011, Sharma and Samant, 2014
Chenopodium botrys L.	Chenopodiaceae	Sokana	Whole plant, Leaves, Flowers	liver complaints	Rana and Samant, 2011, Sharma and Samant, 2014, Sharma *et al*., 2013
Corydalis govaniana Wall.	Fumariaceae	Bhutkeshi	Whole plant	liver complaints	Rana and Samant, 2011, Sharma and Samant, 2014
Fumaria indica (Hausskn.) Pugsley	Fumariaceae	NS	Seeds, Whole plant	liver complaints	Rana and Samant, 2011, Sharma *et al*., 2013

Table 2 continued.....

Table 2 continued.....

Name of the plant species	Family	Local names	Plant parts used	Ailments treated	References
Geranium nepalense Sw.	Geraniaceae	Tirahni	Roots	jaundice	Rana and Samant, 2011, Sharma *et al*., 2013
Prunella vulgarsi L.	Lamiaceae	Pethughas, Syangave	Whole plant	liver complaints	Rana and Samant, 2011, Sharma and Samant, 2014
Thymus linearis Benth.	Lamiaceae	Ban ajwain	Whole plant	liver complaints	Rana and Samant, 2011, Sharma and Samant, 2014
Epilobium angustifolium L.	Ongraceae	NS	Aerial parts	hepatic disorder	Rana and Samant, 2011
Podophyllum hexandrum Royle	Podophyllacaeae	Ban kakri, Bankadi	Roots, Fruits, Flowers, Leaves, Whole plant	hepatic disorder, jaundice	Rana and Samant, 2011, Boktapa and Sharma, 2010, Sharma and Samant, 2014
Rubia manjith Roxb. Ex Fleming	Rubiaceae	Jamithi, Manjit	Roots, Stems, Leaves, Whole plant	jaundice, liver complaints, hepatic obstructions	Rana and Samant, 2011, Sharma and Samant, 2014, Singh and Thakur, 2014
Bergenia ligulata Bladder.	Saxifragaceae	Pashan ved, Pashanbhed	Roots, Rhizome, Leaves	liver complaints	Rana and Samant, 2011, Sharma and Samant, 2014, Sharma *et al*., 2013
Datura stramonium L.	Solanaceae	Dhatura	Leaves, Fruits, Seeds	jaundice	Rana and Samant, 2011, Sharma and Samant, 2014, Sharma *et al*., 2013
Urtica dioica L.	Urticaceae	Aan	Leaves, Whole plant	jaundice	Rana and Samant, 2011, Sharma *et al*., 2013
Acorus calamus	Acoraceae	Bach, Vacha	Whole plant	liver troubles	Raman and Chaudhuri, 2018
Aspargus racemosus	Asparagaceae	Satmul, Bojhidan	Roots	liver cancer	Raman and Chaudhuri, 2018
Justicia adhatoda	Acanthaceae	Basak, Vasa	Leaves, Fruits	hepatoprotective, jaundice	Raman and Chaudhuri, 2018
Dioscorea deltoidea	Dioscoreacea	Singli-mingli	Tubers	chronic liver pain	Raman and Chaudhuri, 2018
Trillium govanianum	Melanthiaceae	Nag chhatri	Leaves, Fruits	hepatoprotective	Raman and Chaudhuri, 2018
Aconitum rotundifolium Kar & Kir	Ranunculaceae	Bonkar	Whole plant, Roots	liver disorder, jaundice	Singh and Lal, 2008, Singh, 2012
Capparis spinosa Linn.	Capparidaceae	Martokpa	Shoots, Fruits	liver disorder, liver pain	Singh and Lal, 2008 , Singh, 2012
Crepis flexuosa (DC.) Benth.	Asteraceae	Homa-Sili	Whole plant	liver disorder, jaundice	Singh and Lal, 2008 , Singh, 2012
Gentiana moorcroftiana Wall. Ex G.Don	Gentianaceae	Santik	Aerial parts, Leaves, Whole plant	liver disorder, jaundice	Singh and Lal, 2008, Rana *et al*., 2014, Singh, 2012
Gentiana tubiflora (G.Don)	Gentianaceae	Chatik	Aerial parts, Whole plant	liver disorder, jaundice	Singh and Lal, 2008, Singh, 2012
Gentianopsis detonsa (Rottb.)	Gentianaceae	Chatik	Leaves, Flowers	liver disorder	Singh and Lal, 2008
Gentianopsis paludosa (Hk.f.) Ma.	Gentianaceae	Khilche	Leaves, Flowers	liver disorder	Singh and Lal, 2008, Singh, 2012
Geranium pratense Linn.	Geraniaceae	Podh-Lo, Tapan	Whole plant	liver disorder, Jaundice	Singh and Lal, 2008, Singh, 2012
Hippophae rhamnoides Linn.	Elaeagnaceae	Cherma	Fruits	liver disorder, Jaundice	Singh and Lal, 2008, Singh, 2012
Hippophae tibetana Schlecht.	Elaeagnaceae	Chha-Tuan	Fruits	liver disorder, Jaundice	Singh and Lal, 2008, Singh, 2012

Table 2 continued.....

Table 2 continued.....

Name of the plant species	Family	Local names	Plant parts used	Ailments treated	References
Polygonum tortuosum D. Don.	Polygonaceae	Nayalo	Aerial parts	liver disorder, Jaundice	Singh and Lal, 2008, Singh, 2012
Rosa webbiana Wall. Ex Royle	Rosaceae	Seva, Susli, T-siya, Chawag	Fruits, Flowers, Aerial parts	liver disorder, Jaundice, hepatitis	Singh and Lal, 2008, Singh, 2012
Scorzonera divaricata Turcz.	Asteraceae	Thunpu	Leaves, Shoots	liver disorder, jaundice	Singh and Lal, 2008, Singh, 2012
Trigonella emodi Benth.	Fabaceae	Rebuksu	Leaves, Flowers	liver disorder, jaundice	Singh and Lal, 2008, Singh, 2012
Artemisia capillaris Thunb.	Asteraceae	Malaria buti	Whole plant	jaundice, hepatitis, liver problems	Thakur *et al*., 2016
Calotropis procera (Aiton)	Apocynaceae	Aak	Flowers	jaundice	Thakur *et al*., 2016
Geranium wallichianum D.Donex Sweet	Geraniaceae	Ratanjot	Roots	jaundice	Thakur *et al*., 2016
Persicaria amplexicaulis (D.Don) Ronse Decr.	Polygonaceae	Kutrya/Amli	Whole plant	jaundice, liver disorders	Thakur *et al*., 2016
Boerhaavia diffusa L.	Nyctaginaceae	Punarnava	Leaves, Roots	jaundice, liver complaints	Vidyarthi *et al*., 2013, Sharma *et al*., 2013
Centella asiatica (L.) Urb.	Apiaceae	Brahmi	Leaves, Whole plant	jaundice, liver complaints	Vidyarthi *et al*., 2013, Sharma *et al*., 2013
Inula racemosa Hook.f.	Asteraceae	NS	Roots	liver complaint	Rana *et al*., 2014
Capsella bursa-pastoris (L.) Medik.	Brassicaceae	Jangli Sarson	Stems	jaundice, liver diseases	Kaur *et al*., 2017
Conyza japonica (Thunb.) Less.	Asteraceae	Gaddi	Leaves	jaundice	Kaur *et al*., 2017
Berberis aristata DC.	Berberidaceae	Kashmal	Whole plant	jaundice	Paul and Khan, 2017
Adhatoda vasica Nees.	Acanthaceae	Arusha	Flowers, Fruits, Leaves, Roots	jaundice	Bhardwaj and Seth, 2017
Carissa opaca Stapf. Ex Haines	Apocynaceae	Karaunda	Roots	jaundice	Bhardwaj and Seth, 2017
Flacourtia rhamontchii L.	Salicaeae	Bilangra	Bark, Fruits, Roots	jaundice	Bhardwaj and Seth, 2017
Sonchus oleraceus L.	Asteraceae	NS	Flowers, Aerial parts, Leaves, Latex	jaundice, liver complaints	Sharma and Samant, 2014
Primula denticulata Sm.	Primulaceae	NS	Aerial parts, Flowers, Roots	liver problem	Sharma and Samant, 2014
Juniperus communis L.	Cupressaceae	Petada	Whole plant, Stems, Fruits	jaundice	Sharma and Samant, 2014
Bargenia strachey (Hook F. & Thomas.) Engl	Saxifragaceae	Shamlot	Rhizome, Leaves	jaundice	Dutt *et al*., 2014
Aloe vera (L.) Burm. f.	Liliaceae	Ghikumari	Leaves	jaundice	Singh and Thakur, 2014
Hedychium spicatum Smith	Zingiberaceae	Kapurkachri	Rhizome	liver complaints	Singh and Thakur, 2014
Valeriana jatamansi Jones	Valerianaceae	Mansi	Whole plant	liver diseases	Singh and Thakur, 2014
Mangifera indica L.	Anacardiaceae	Amb	Leaves, Fruits, Seeds	jaundice	Sharma *et al*., 2013

Table 2 continued.....

Table 2 continued.....

Name of the plant species	Family	Local names	Plant parts used	Ailments treated	References
Bupleurum hamiltonii N.P. Balkr	Apiaceae	NS	Aerial parts, Roots	liver complaints	Sharma *et al*., 2013
Eclipta alba (L.) Hassk.	Asteraceae	Bringraj	Whole plant	jaundice	Sharma *et al*., 2013
Elephantopus scaber L.	Asteraceae	NS	Leaves, Roots	liver complaints	Sharma *et al*., 2013
Cassia occidentalis L.	Fabaceae	NS	Roots, Leaves, Flowers, Seeds	liver complaints	Sharma *et al*., 2013
Azadirachta indica L.	Meliaceae	Darek	Leaves, Bark, Fruits	jaundice	Sharma *et al*., 2013
Oxalis corniculata L.	Oxalidaceae	Malori	Whole plant	jaundice	Sharma *et al*., 2013
Oldenlandia corymbosa L.	Rubiaceae	NS	Whole plant	jaundice	Sharma *et al*., 2013
Curcuma angustifolia Roxb.	Zingiberaceae	Chudidar Haldi	Rhizome	jaundice	Sharma *et al*., 2013
Curcuma longa L.	Zingiberaceae	Haldi	Rhizome	jaundice	Sharma *et al*., 2013
Allium sativum L.	Amaryllidaceae	Lashun	Flowers	acute hepatitis	Rani and Rana, 2014
Bacopa monnieri (L.) Wettst.	Plantaginaceae	Brami	Leaves, Stems	chronic and acute liver disorders	Rani and Rana, 2014
Cajanus cajan (L.) Millsp.	Fabaceae	Arehar chana	Leaves, Seeds	jaundice, acute hepatitis	Rani and Rana, 2014

NS-Not specified.

harvesting of endangered medicinal plants (Sharma *et al*., 2012). Moreover, they have involved local people and gave panchayats power to issue permit for trading including export and trade the non-banned species. The forest department will maintain the record regarding the collection and shipment of endangered species. The panchayats are allowed to give permit the trading of 31 species out of 53 species of medicinal plant as 22 medicinal plant species are endangered species. Only Divisional Forest Officer is allowed to grant the permission to export the endangered species. Even, the forest department can restrict the collection and trading of 31 species, if over-exploitation of resources is observed. Along with that governments of Himachal Pradesh have take measures by preparing policies to promote cultivation in order to prevent the excessive collection of medicinal plants from the wild. Various government departments like Department of Rural Development and Research Institutes, Forest Department, and Horticulture Department are promoting these policies. The policy formed to promote cultivation of medicinal plants *i.e.* research activities, financial support to farmers, promotion and make farmers familiar with market value of medicinal plants as cash crops, equip the framers with new post-harvesting and cultivation techniques and set up nurseries and other facilities for the propagation and transporting of plant material to farmers.

The government has also taken an initiative to involve NGOs (Non-government organization) and private organization to promote the growth of medicinal plants. Recently, government has given government farms to NGOs, private-sector companies, and research institutes to carry out research on medicinal plants and increase their cultivation. Another, emphasis is given to increase number of nurseries to meet the demand of plant material. Himachal state government has started setting up herbal gardens in their states which are known as 'Vanaspati vanas' with the help of Union Health Ministry. These herbal gardens will provide training to farmers to grow these medicinal plants as cash crop on their land. Besides these government agencies, NGOs and research institute are promoting cultivation and determining the suitable cultivation practices that can employed to grow endangered species.

Conclusion

In spite of the fact, that the Himachal Pradesh state blossoms different therapeutic plants. However, the knowledge about medicinal plants is restricted to local residents and nomadic people residing there. Presently, the modern generation is not well-aware with the

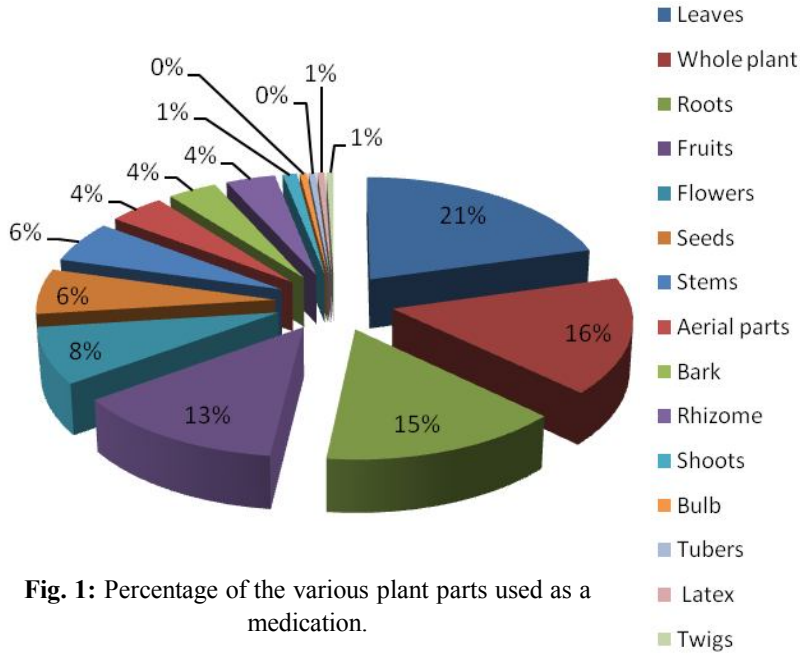

Fig. 1: Percentage of the various plant parts used as a medication.

indigenous plant available in their region. Despite the presence of great medicinal flora people of Himachal Pradesh suffering a lot of acute hepatitis and jaundice aliments. Government alongside research networks ought to make awareness and build trust in pharmaceutical industries to utilize these medicinal plants at a commercial level. The over-exploitation, habitat degradation and changing environmental conditions may lead to the extinction within a few years. Therefore, regular monitoring of population and habitats, development of conventional protocol, establishment of species *in-situ* conditions and associated habitats and replication of this approach in other parts of Indian Himalayan Region have been recommended.

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