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Ethnomedicinal Plants Used Against Liver and Kidney Ailments by the Rural Population of Tehsil Paonta Sahib, District Sirmour, Himachal Pradesh (India)

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ABSTRACT

Knowledge on the specific applications of indigenous medicinal plants has been accumulated over the course of centuries. Indigenous medicinal knowledge may have practical implications for developing new medicines and provide further insights to support their continued use in society. Traditionally, native societies worldwide are dependent largely on plants for their sustenance, livelihood and health. Given that people continue to suffer from liver and kidney ailments and that these organs play a very important role in filtering blood and elimination of wastes from our body, an ethnobotanical survey was carried out in a specific region in India to collect information on plants used against liver and kidney ailments amongst the inhabitants of Tehsil Paonta Sahib. A total of 31 plant species belonging to 27 genera and 21 families (eg. *Ailanthus*, *Bryophyllum*, *Celastrus*, *Ficus*, *Pedalium*, *Solanum* sp. etc.) were reported in more than 300 medicinal plants to treat the problem in the region. Most of the plant species used were trees and herbs (38.71% each) followed by shrubs (12.91%), climbers (6.45%) and liana (3.22%).

In this study, we surveyed 320 households using a formal questionnaire to learn what plants were used for this medicinal purpose. The medicinal preparations include powder, decoction, juice, etc. Future work should confirm such practices with modern assays, as then the value of their traditional herbal

practices in treating or in some cases appearing to cure liver and kidney ailments would provide substantive benefits to society.

INTRODUCTION

Plants are the oldest connections of man from primitive times. Ethno botany is the first science that originated with the evolution or existence of man on this planet. Ethnobotany refers to the study of the knowledge system pertaining to the multidimensional perspective of life, culture, traditions as well as interaction of human communities with their local flora (Ethnobotany) or fauna (Ethno zoology) (Pushpangadan 1990). India is the largest producer of medicinal plants and is rightly called the Botanical Garden of the World. About three quarters of the world's population is currently using herbs and other traditional medicines to cure various diseases (Pandey, 2014). Plants have been used traditionally by herbalists and healers worldwide for the medical care (Luper, 1998). Considerable amount of knowledge on the traditional uses of plants is available with the indigenous people who are considered as the repository of accumulated experience and knowledge of indigenous flora and fauna (Jain, 2004). In fact, these societies are human conservatories which cannot be duplicated by application of science and technology. In this regard, Chandra (1990) states that these groups of people are not to be pitied for primitive existence; they rather deserve to be honored and respected for their richness of human existence in harmony with nature.

Nagoya Protocol came with an interest for sharing the ethno medicinal knowledge and their benefits to the world (Bubela and Gold, 2012). The ethno medicinal practices hold considerable value among the traditional knowledge of the local communities (Anderson, 1991; Garcia, 2010; Unikrishnan and Suneetha, 2012). China, Tibet and India are the nations which are known for traditional medicine systems and have actively utilized these treatments for health concerns. Kidney related ailments are affecting the mankind to a large extent which also disrupt liver metabolism (Yeung *et. al.*, 2014). Thus, an initiative was taken to record the ethno medicinal plants of the region particularly used for curing liver and kidney ailments.

The value and importance of traditional ethnobotanical knowledge is acknowledged all over the world (Verma *et. al.*, 2007). Therefore, documentation of the traditional knowledge through ethnobotanical studies among the diverse ethnic communities is important for the conservation and utilization of biological resources (Muthu *et. al.*, 2006). The main objective of the study was to explore the traditional medicinal wealth of plants of the region used to treat liver and kidney ailments which will definitely prove useful at both National and International level. Moreover, this study contains several plants along with their local names and proper dosage which can be accessible to any individual and also for pharmaceutical companies.

MATERIALS AND METHODS

Study Area. Paonta Sahib is a Tehsil in outer Himalayas commonly known as Shivalik lies in Sirmour district of Himachal Pradesh of India (Figures 1-3). The district shares its boundaries with Haryana to its west and south-west, Shimla in north-east, Solan in north-west, Uttar Pradesh to its south-east and Uttarakhand or Uttaranchal to its east (Figure 2). Tehsil Paonta Sahib is located between 30.43°N to 77.62° E at an altitude of 400 - 1,300m. Societal life comprises of combined family households. Due to traditional and ethnic lifestyle of the people, the region possesses a rich floral and cultural diversity.

Methodology. To document medicinal plants of Tehsil Paonta Sahib used for curing liver and

kidney ailments, comprehensive field surveys were undertaken in its various villages in different seasons during the years 2009-2012.

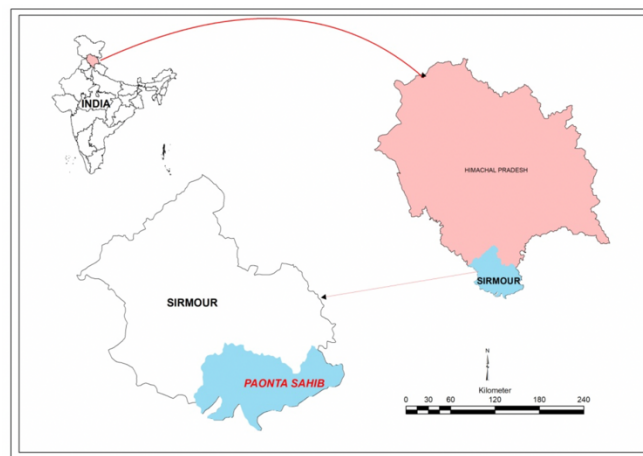


Figure 1: Map showing the location of Tehsil Paonta Sahib, district Sirmour and Himachal Pradesh State in India
(Source: ASTER(NASA)/NRSC([bhuvan](http://bhuvan.gov.in)))

A questionnaire format was also prepared in which vernacular name of the plant, area from where it was collected; morphology, folk uses and method of use of plant against liver and kidney ailments etc. were mentioned. The field surveys were designed in such a way so as to collect the plant species in reproductive stage i.e. either in flowering or fruiting stage. The required information on plants was collected through interviews from experienced farmers, village heads, traditional practitioners, housewives, well-known old and elderly persons of the community, etc. Amongst the total of 31,523 households in the region; 320 households were surveyed. The data collected were verified in different locations after showing the same specimen to different villagers. If at least three informants made similar comments about the uses, then the ethno botanical lore is considered legitimate.

The collected plant specimens were dried, preserved and mounted as outlined by Jain and Rao (1977) and deposited at Himachal Pradesh University, Shimla. The specimens were identified using regional floras and various revisionary and monographic works (Chauhan, 1999; Chowdhery and Wadhwa, 1984; Collett, 1902; Dhiman, 1976; Nair, 1977; Polunin and Stainton, 1987; Kaur and Sharma, 2004) and later got authenticated by carefully matching with the specimens at the herbaria of Forest Research Institute (FRI), and

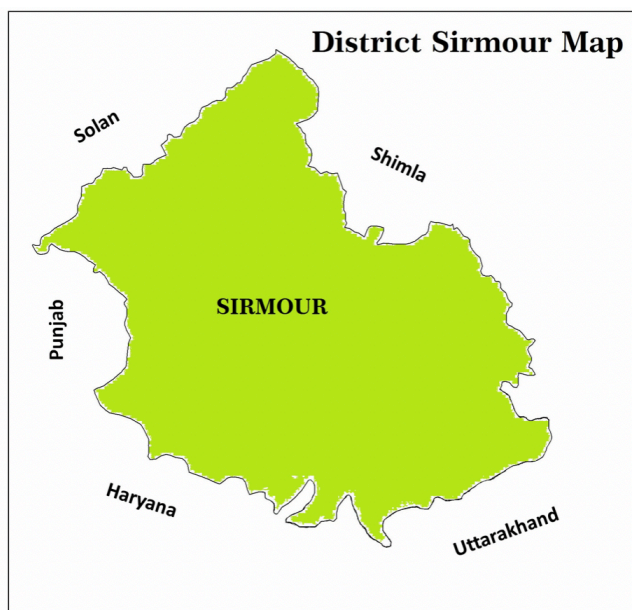


Figure 2: Map of district Sirmour of Himachal Pradesh (India) showing the adjoining states and regions.
(Source: hpsirmour.nic.in)

Botanical Survey of India (BSI), Dehradun. Nomenclature of these taxa was confirmed from Bennett (1987), Quattrocchi (2000) and International Plant Names Index (www.ipni.org).

The information on active constituents of the plant which are mentioned in the last column of table I; is based after Asolkar *et. al.* (1992) and four volumes of Rastogi and Mehrotra i.e. Volume I (1990), Volume II (1993a), Volume III (1993b) and Volume IV (1995).

RESULTS AND DISCUSSION

During present investigation, 31 species belonging to 27 genera and 21 families that are useful for the treatment of various liver and kidney related ailments were recorded (Table 1 and Plate 1). Twenty-nine (29) species under 25 genera and 20 families are dicotyledonous and remaining two species under two genera and one family are monocotyledonous. Out of these 31 species, three are cultivated (9.60%) whereas the remaining are wild (90.4%). Trees and herbs are dominating with 12 species each (38.7%) followed by 4 shrubs (12.9%), 2 climbers (6.4%) and one liana (3.2%) (Figure 4). Various methods of preparation of these herbal medicines have been recorded such as decoction of 51.6% species (*Ailanthus excelsa*, *Andrographis paniculata*).

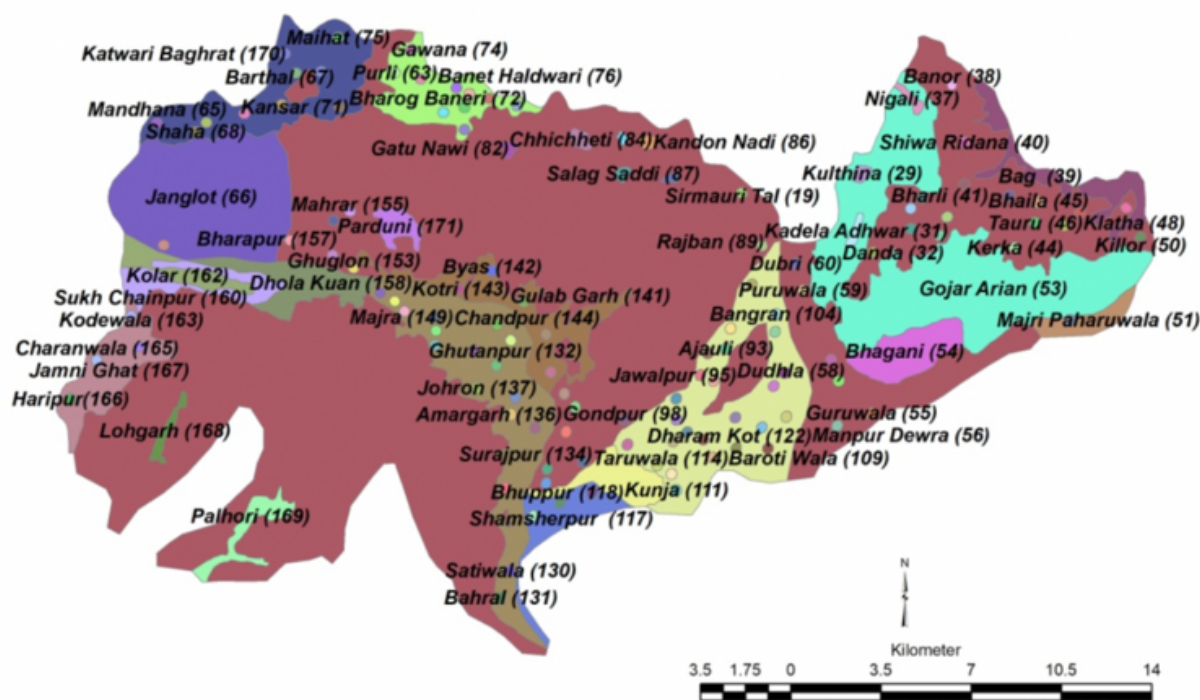


Figure 3: Map of Tehsil Paonta Sahib (Study Area) showing the villages visited.
(Source: ASTER(NASA)/NRSC(bhuwan))

Butea monosperma, *Combretum alatum*, *Cyanthillium cinereum*, *Ficus benghalensis*, *Mukia maderaspatana*, *Ocimum basilicum*, *Oxalis acetosella*, *Phyllanthus fraternus*, *Solanum americanum*, *Sonchus wightianus*, *Sorghum halepense*, *Tinospora cordifolia*, *Urtica dioica*, *Zea mays*) followed by powder of 19.36% species (*Ficus lacor*, *Mallotus philippensis*, *Pedaliium murex*, *Solanum anguivi*, *Syzygium cumini*, *Vitex negundo*), juice/paste/extract of 16.1% species (*Bryophyllum pinnatum*, *Calotropis procera*, *Celastrus paniculatus*, *Punica granatum*, *Terminalia bellerica*). Plant parts of 9.7% species are eaten raw (*Artocarpus lakoocha*, *Phyllanthus emblica*, *Syzygium jambos*) while exudation of 3.2% species is used (*Commiphora wightii*) for the cure of liver and kidney ailments.

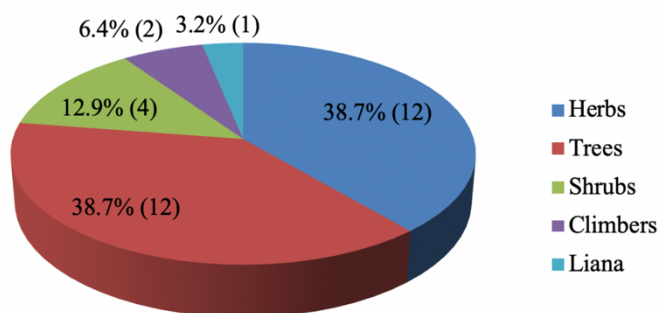


Figure 4: Habitat-wise distribution of plants of Tehsil Paonta Sahib used against liver and kidney troubles by the rural populace

Various plant parts are used for the preparation of traditional medicines (Figure 5). Preparations using the whole plant (31.2%) are used maximum by the rural people of that region for the cure of liver and kidney related ailments (*Andrographis paniculata*, *Cyanthillium cinereum*, *Mukia maderaspatana*, *Ocimum basilicum*, *Oxalis acetosella*, *Phyllanthus fraternus*, *Punica granatum*, *Sonchus wightianus*, *Sorghum halepense*, *Urtica dioica*) followed by fruits (25%) (*Artocarpus lakoocha*, *Ficus benghalensis*, *Ficus lacor*, *Phyllanthus emblica*, *Syzygium jambos*, *Terminalia bellirica*, *Vitex negundo*), leaves (12.5%) (*Bryophyllum pinnatum*, *Calotropis procera*, *Pedaliium murex*, *Solanum americanum*), bark (9.4%) (*Ailanthus excelsa*, *Combretum alatum*, *Ficus benghalensis*), flowers (6.2%) (*Butea monosperma*, *Zea mays*), seeds (6.25%) (*Celastrus paniculatus*, *Syzygium cumini*, stem (6.2%) (*Commiphora wightii*, *Tinospora cordifolia*), roots (3.13%) (*Solanum anguivi*).

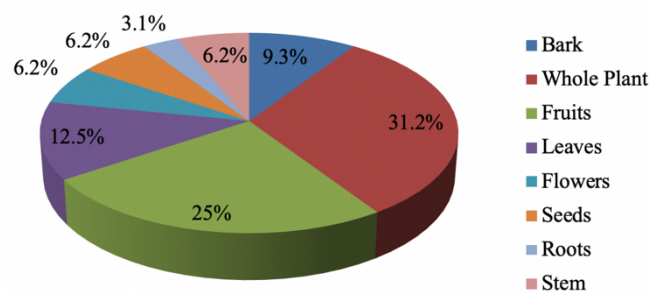


Figure 5: Relative percentage of plant parts used against liver and kidney troubles by the rural populace of Tehsil Paonta Sahib.

In the present research, highest number of plant species (34%) were applied to cure liver cirrhosis or inflammation (*Combretum alatum*, *Mukia maderaspatana*, *Ocimum basilicum*, *Oxalis acetosella*, *Phyllanthus emblica*, *Solanum americanum*, *Sonchus wightianus*, *Sorghum halepense*, *Syzygium cumini*, *Tinospora cordifolia*, *Vitex negundo*) followed by kidney and bladder affections (15%) (*Cyanthillium cinereum*, *Oxalis acetosella*, *Solanum americanum*, *Solanum anguivi*, *Zea mays*), liver tonic (15%) (*Andrographis paniculata*, *Artocarpus lakoocha*, *Phyllanthus fraternus*, *Punica granatum*, *Syzygium cumini*), increased uric acid (12%) (*Ailanthus excelsa*, *Commiphora wightii*, *Ficus benghalensis*, *Ficus lacor*), expelling urinary stones (9%) (*Celastrus paniculatus*, *Bryophyllum pinnatum*, *Urtica dioica*), jaundice (9%) (*Calotropis procera*, *Mallotus philippensis*, *Terminalia bellirica*), difficulty in urination (6%) (*Butea monosperma*, *Pedaliium murex*) (Figure 6).

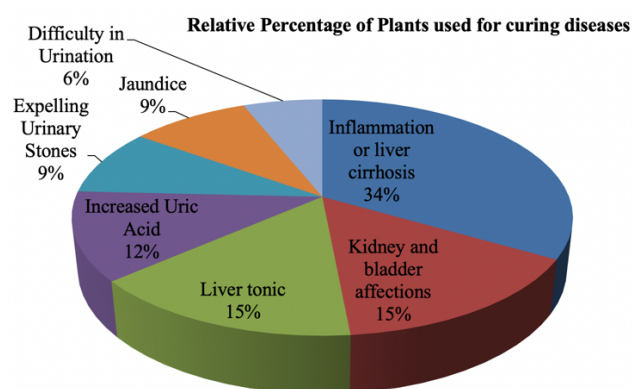


Figure 6: Relative percentage of plants used for curing various problems related to liver and kidneys by the rural populace of Tehsil Paonta Sahib

Combination of different plants is also used by traditional practitioners for the cure of various diseases. Leaves of *Bryophyllum pinnatum* (pattharchat) with single seed of *Celastrus*

paniculatus ('Malkanghni') fried with paste of 'rye' (*Secale cereale*) and taken with curd on empty stomach for 10-25 days is used to remove urinary stones. In summary, a total 19 species are used for curing liver ailments and 14 species for kidney ailments and two species are commonly used for curing both ailments.

CONCLUSION

This research is the first study to record and analyze ethno medicinal practices as treatment for liver and kidney disorders within the communities of Paonta Sahib Tehsil of Sirmour district of Himachal Pradesh. The indigenous people of the region gave the most significant evidence of using herbal medicines. The authentic potential of these species needs to be analyzed and assessed in a systematic manner to find out bioactive compounds. Unfortunately, some of these native species are on the verge of extinction. Thus, the species and their habitats need to be protected and managed by following protection oriented practices.

Although some work on this aspect was done by researchers (Musabayane, 2012; Mahmoud, 2013) but the study area i.e. Tehsil Paonta Sahib was still unexplored. Moreover, folk uses with the dosage regarding liver and kidney ailments were not mentioned anywhere. It has been found that the vast knowledge about medicinal use of plants lies within the rural population and among them the

elder people know more about the different plants used as medicines. However, in an urban area, people know little about the traditional uses of plants of their locality. Moreover, they rely on allopathic medicines and thus the traditional knowledge about medicinal plants here also is only confined to the elder members of the family which they seldom pass on to the next generation. The present work is an attempt to collect information and to make it available to others for further research and future use. This documentation of data will preserve the ever disappearing knowledge about plants and their medicinal use among indigenous people and make us aware with the flora that has been in practice for years. It has become necessary to take suitable measures for the conservation of these ethno- medicinal practices.

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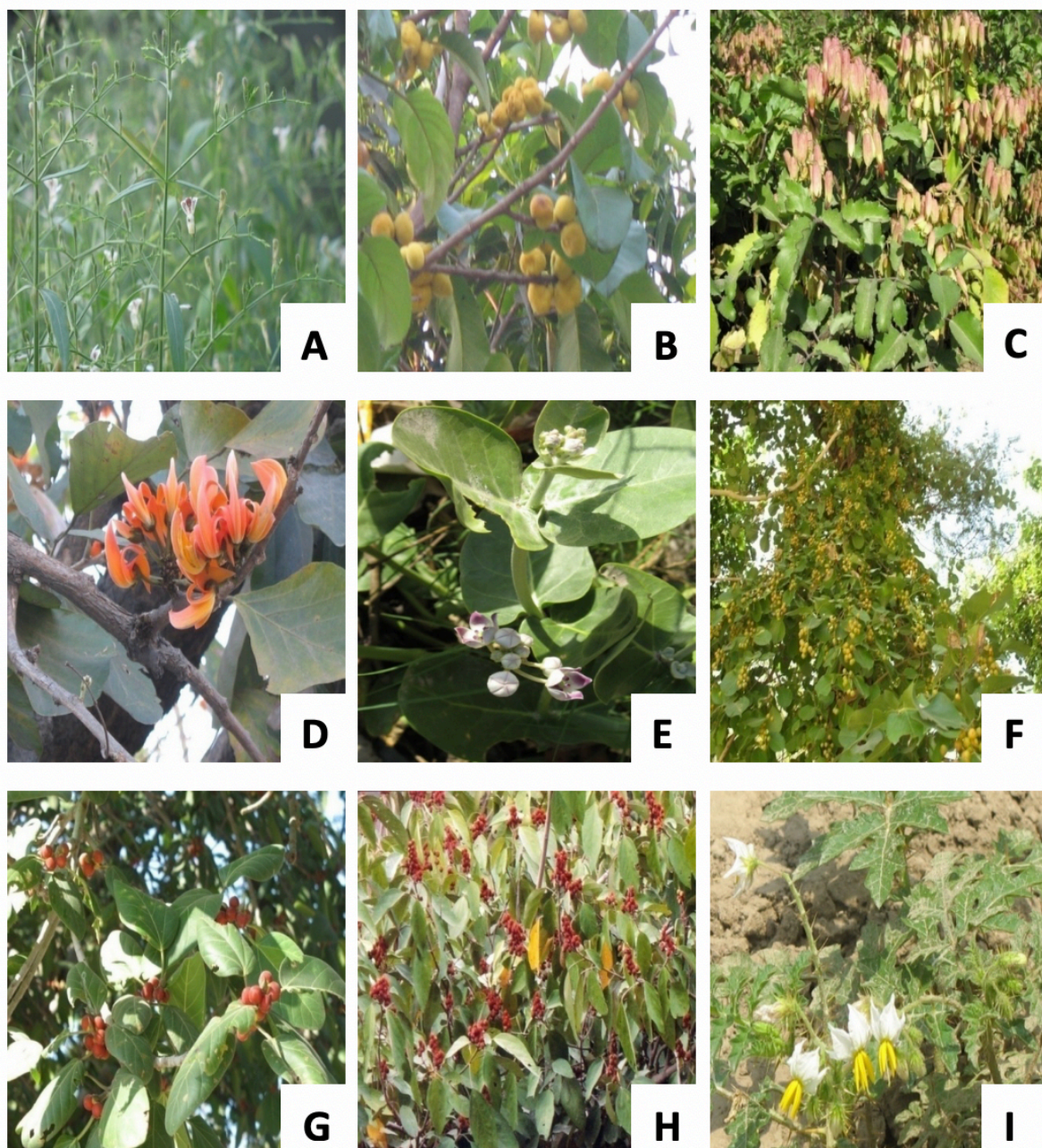


Plate 1. Selected Ethno-medicinal plants used against liver and kidney troubles by the rural populace of Tehsil Paonta Sahib of district Sirmour, Himachal Pradesh (India).
 A. *Andrographis paniculata* B. *Artocarpus lakoocha* C. *Bryophyllum pinnatum*
 D. *Butea monosperma* E. *Calotropis procera* F. *Celastrus paniculatus* G. *Ficus benghalensis* H. *Mallotus philippensis* I. *Solanum anguivi*

Table 1. Ethno-medicinal Plants used against liver and kidney ailments of Tehsil Paonta Sahib, District Sirmour, Himachal Pradesh, India

Botanical Name	Family	Vernacular/ Local Name	Plant part used	Folk Uses	Active Constituents (Reference)
<i>Ailanthus excelsa</i>	Simaroubaceae	Maharukh	Bark	15-20 ml bark decoction prescribed empty stomach for 10-15 days for increased uric acid	excelsin, glaucarubol, malanthine (<i>Rastogi and Mehrotra 1990; 1993b</i>)
<i>Andrographis paniculata</i>	Acanthaceae	Kalmegh	Whole Plant	2-3 tsp decoction of the plant given twice a day for 15-30 days as liver tonic	carvacrol, eugenol, myristic acid, hentriacontane and tritriacontane (<i>Rastogi and Mehrotra, 1993b</i>)
<i>Artocarpus lakoocha</i>	Moraceae	Dheu	Fruits	Fruits considered tonic to the liver	hydromethanol extracts (<i>Ambasta, 1986</i>)
<i>Bryophyllum pinnatum</i>	Crassulaceae	Pattharchat	Leaves	1 tsp mixture of grinded leaves with single seed of <i>Celastrus paniculatus</i> ('Malkanghni') fried with paste of 'rye' (<i>Secale cereale</i>) taken with curd empty stomach for 10-25 days to remove urinary stones	p-coumaric, ferulic, syringic, caffeic and p-hydroxybenzoic acids, quercetin and kaempferol (<i>Rastogi and Mehrotra, 1993a</i>)
<i>Butea monosperma</i>	Fabaceae	Dhak	Flowers	Decoction of 4-5 flowers given to patients having difficulty in urination	3- β -glucoside, butein, isomonospermoside, coreopsin, sulphurein, palasitrin, butrin, isobutrin (<i>Rastogi and Mehrotra, 1990; 1993a; 1995</i>)
<i>Calotropis procera</i>	Asclepiadaceae	Ak	Leaves	Mashed small-sized leaf alongwith 'gur' prescribed once daily for three days against effective cure for jaundice	Quercetin-3-rutinoside, β -amyrin, ascorbic acid, calactin, calotoxin, calatropagenin, calotropin (<i>Asolkar et. al., 1992; Rastogi and Mehrotra, 1990, 1993a, 1995</i>)

Table 1. Ethno-medicinal Plants used against liver and kidney ailments of Tehsil Paonta Sahib, continuation

Botanical Name	Family	Vernacular/ Local Name	Plant part used	Folk Uses	Active Constituents (Reference)
<i>Celastrus paniculatus</i>	Celastraceae	Malkanghni	Seeds	100g paste prepared from single seed of the plant with two leaves of 'pattharchat' (<i>Bryophyllum pinnatum</i>) and 'rye' (<i>Secale cereale</i>) given on empty stomach for at least 11 days for expulsion of stones from urinary tract.	polar triglycerides, polar nonglyceridic esters and nonpolar nonglyceridic esters, celapanine, celapanigine, celastrol, celastrine, paniculatine, malkanguinol, malkangunin
<i>Combretum alatum</i> (<i>Terminalia alata</i>)	Combretaceae	Sain	Bark	Decoction of bark (15-20ml, once daily, 7-10 days) given for internal liver ailments	β -sitosterol, oleanolic acid, arjunic acid, arjunolic acid, betulinic acid, ellagic acid, tomentosic acid
<i>Commiphora wightii</i>	Burseraceae	Guggul	Resin from stem	Gum-resin from stem taken in dose of a small tablet with milk once daily till cure to check increased level of uric acid	α -camphorene, cembrene, three new sterols – guggulsterols I,II,III, guggulsterol-VI and Z-guggulsterol (<i>Rastogi and Mehrotra, 1993b</i>)
<i>Cyanthillium cinereum</i>	Asteraceae	Sahadevi	Whole Plant	25-30ml decoction of the plant given twice or thrice a day for bladder affections	β -amyrin benzoate, lupeol and its acetate, β -sitosterol and stigmasterol (<i>Rastogi and Mehrotra, 1990</i>)
<i>Ficus benghalensis</i>	Moraceae	Bargad	Bark, Fruit	1/2 cup decoction of bark or 1/2 tsp powdered fruit given for 8-10 days once daily after meals for increased uric acid	three new methyl ethers of leucoanthocyanins – delphinidin-3-O- α -L-rhamnoside (I), pelargonidin-3-O- α -L-rhamnoside (II), leucocyanidin-3-O- β -D-galactosylcellobioside (III) alongwith a methyl ether of leucoanthocyanidin (<i>Rastogi and Mehrotra, 1990; 1993a; 1993b</i>)

Table 1. Ethno-medicinal Plants used against liver and kidney ailments of Tehsil Paonta Sahib, *continuation*

Botanical Name	Family	Vernacular/ Local Name	Plant part used	Folk Uses	Active Constituents (Reference)
<i>Ficus lacor</i>	Moraceae	pilkhan	Fruits	1/2tsp powdered fruit given twice daily for fifteen days to check high level of uric acid in blood	Epoxyhenicosadiene, steroidal sapogenins, agrostistachin, tetrahydrocannabinol, 2-Methyl-(2)-7-octadecene (<i>Rastogi and Mehrotra, 1993b; 1995</i>)
<i>Mallotus philippensis</i>	Euphorbiaceae	Kamela	Fruit	1/2 tsp powdered fruit mixed with betel leaves given once daily for three days considered good against jaundice	rottlerin, isorottlerin, kamalins I and II, C-methylated cinnamoylchromene, flavanone chromene (<i>Rastogi and Mehrotra, 1990</i>)
<i>Mukia maderaspatana</i>	Cucurbitaceae	Parwal	Whole Plant	15-20ml decoction consumed twice daily for 7-10 days for liver cirrhosis, and as appetizer and blood purifier	cucurbitacins, nicotinic acid, riboflavin, vitamin C, thiamine, 5-hydroxytryptamine (<i>Ambasta, 1986; Farooq, 2005</i>)
<i>Ocimum basilicum</i>	Lamiaceae	Marmari	Whole Plant	20-30ml decoction of plant prescribed daily on empty stomach for hepatic ailments and enlarged spleen	linalool, cineole, eugenol, sesquiterpenes, d-terpene, methyl cinnate, 1-linalool, terpinene, methyl cinnamate, methylchavicol, ocimene, borneol, sambulene, sarole, juvocimene I, juvocimene II, estragole, eucalyptol, ocimene, linalool acetate, eugenol, menthol, menthone, cyclohexanol, cyclohexanone, myrcenol, nerol, thymol, xanthomicrol and butyl caffeate (<i>Rastogi and Mehrotra, 1990; 1993a; 1993b; 1995</i>)
<i>Oxalis acetosella</i>	Oxalidaceae	Khatti	Whole Plant	Hot decoction of the plant is useful for kidney affections and the decoction of leaves (20-30ml) taken twice a day for 3-5 days) is taken for liver cirrhosis	Therapeutic properties due to a new compound – 2''-O-(β-D-glucopyranosyl) isovitexin, vitamin C, potassium oxalate, oxalic acid (<i>Rastogi and Mehrotra, 1993a</i>)

Table 1. Ethno-medicinal Plants used against liver and kidney ailments of Tehsil Paonta Sahib, continuation

Botanical Name	Family	Vernacular/ Local Name	Plant part used	Folk Uses	Active Constituents (Reference)
<i>Pedaliium murex</i>	Pedaliaceae	Gokhru	Leaves	1-3g powdered leaves with honey prescribed twice daily for 7-10 d. for promoting urination	Main constituents are pedalitin (3',4',5,6-tetrahydroxy-7-methoxyflavone), diosmetin, dinatin and a gum (<i>Rastogi and Mehrotra, 1993a; 1993b</i>)
<i>Phyllanthus emblica</i>	Euphorbiaceae	Amla	Fruit	One pickled fruit in sugary syrup given on empty stomach for liver ailments	Associated properties due to trigalloylglucose, terchebin, corilagin, ellagic acid, two growth inhibitors- R1 and R2 (fruits), indole acetic acid, four other auxins – a1, a3, a4 and a5 (immature fruit) (<i>Rastogi and Mehrotra, 1990; 1993b</i>)
<i>Phyllanthus fraternus</i>	Euphorbiaceae	Amla	Whole Plant	1/2 cup decoction of the plant taken once daily for 15-20 days as liver tonic.	corilagen, ellagic acid, gallic acid, geraniin, an angiotensin converting enzyme inhibitor, the flavonoids-FG ₁ and FG ₂ nirphylline and phyllinirurin (<i>Rastogi and Mehrotra, 1993a; 1995</i>)
<i>Punica granatum</i>	Lythraceae	Anar	Whole Plant	Juice considered tonic and good for liver and biliousness	nicotinic acid, pectin, protein, riboflavin, thiamine, vitamin C, aspartic, citric, ellagic, gallic and malic acids, glutamine, isoquercetin (fruits), punicalagin and punicalin, sitosterol (peels), asiatic and maslinic acids, pelargonodin-3,5-diglucoside, sitosterol and its β – D –glucoside, steroidal estrogens (seeds), betulic acid, granatins A and B and punicatolin, 2-propenyl-3,4,5,6-tetrahydropyridine (<i>Rastogi and Mehrotra, 1993a; 1995</i>)
<i>Solanum americanum</i>	Solanaceae	Makoi	Leaves	Half cup decoction of leaves given for 3 days for inflammation of liver, kidney and urinary bladder.	vitamin C, tomatidenol, tiogenin, solamargine, solasonine, α -carotene, citric acid, flavokinase, quercetin-3-O-(2-gal- α -rhamnosyl)- β -glucosyl (1 \rightarrow 2)- β -galactoside, quercetin-3-glucosyl (1 \rightarrow 6)-galactoside, 3-gentiobioside, 3-galactoside, 3-glucoside (leaves)
<i>Solanum anguivi</i>	Solanaceae	Brihati	Roots	1-3g powdered roots with sugar pellets given on empty stomach for kidney affections.	diosgenin, β -sitosterol, lanosterol, solasonine, solamargine, solasodine, methylprotoprosapogenin A of dioscin, methylprotodiosine, protodiosin and vitamin C (<i>Rastogi and Mehrotra 1993b</i>)
<i>Sonchus wightianus</i>	Asteraceae	Sadhi	Whole Plant	Decoction of the plant taken twice daily for 10 days is	Plant contains phenolic compounds (<i>Ambasta, 1986</i>)

taken for liver
inflammation

Table 1. Ethno-medicinal Plants used against liver and kidney ailments of Tehsil Paonta Sahib, *continuation*

Botanical Name	Family	Vernacular/ Local Name	Plant part used	Folk Uses	Active Constituents (Reference)
<i>Sorghum halepense</i>	Poaceae	Baru	Whole Plant	Decoction of the plant (10-15ml) taken twice a day for 3-5 days with a pinch of black pepper good against liver cirrhosis	Rhizomes contain HCN (<i>Ambasta, 1986</i>)
<i>Syzygium cumini</i>	Myrtaceae	Jamun	Seeds	1tsp of powdered seeds taken on empty stomach in the morning with lukewarm water for three months to check pancreatic disorders	ellagic acid, gallic acid, 3,4'-di-O-methyl- and 3,3',4-tri-O-methyl-ellagic acids, caffeic acid, feruic acid, corilagin guaiacol, resorcinol dimethyl ether, veratrole, jamboline, myricyl alcohol, quercetin, 1- and 3-galloyl glucose, 3,6-hexahydroxydiphenyl glucose (seeds) (<i>Rastogi and Mehrotra, 1990; 1993a</i>)
<i>Syzygium jambos</i>	Myrtaceae	Jamoya	Fruits	Fruits edible and act as liver tonic	Isolated constituents are alanine, glutamine, threonine, tyrosine, aspartic acid and cysteine (fruits) (<i>Rastogi and Mehrotra, 1990</i>)
<i>Terminalia bellirica</i>	Combretaceae	Bahera	Fruits	'Trifla' prepared from fruits of <i>Phyllanthus emblica</i> , <i>T. bellirica</i> and <i>T. chebula</i> . (One spoon with one cup milk, 5-10 days) considered good for jaundice	β -sitosterol, ethyl gallate, galloyl glucose, chebulagic acid, mannitol, glucose, galactose, fructose and rhamnose (fruits) (<i>Rastogi and Mehrotra, 1990; 1993a</i>)
<i>Tinospora cordifolia</i>	Menispermaceae	Giloy	Stem	20-30ml decoction of stem prescribed on empty stomach for 3-4 months to cure liver and spleen disorders	tinosporin, columbin, chasmanthin, palmarin, berberine, cordifolide, tinosporide, tinosporon, tinosporol, tinosporic acid, giloin, gilioinisin, substituted pyrrolidine, furanolactone, 18-norclerodane, diterpene-O-glucoside, octacosan-15-one and β -sitosterol, magnoflorine, tinosporidine, β -sitosterol, a new furanoid diterpene glycoside - tinosporide, palmatosides C and F (stem) (<i>Rastogi and Mehrotra, 1990; 1993a; 1993b; 1995</i>)

Table 1. Ethno-medicinal Plants used against liver and kidney ailments of Tehsil Paonta Sahib, *continuation*

Botanical Name	Family	Vernacular/ Local Name	Plant part used	Folk Uses	Active Constituents (Reference)
<i>Urtica dioica</i>	Urticaceae	Bichhubooti	Whole Plant	Decoction of the plant consumed as tea for expelling kidney stones	Reported to contain β - carotene, hydroxyl – α - carotene, luteoxanthin, lutein epoxide, violaxanthin (fresh leaves), kaempferol, its 3 – O - glucoside, 3 – O - rutinoside, isorhamnetin, its 3 – O - glucoside, 3 – O - rutinoside and 3 – O - neohesperidoside, isoquercitrin, rutin, quercetin, its 3 – O - rutinoside and 3 – O - glucoside (flowers, foliage) (<i>Rastogi and Mehrotra, 1993a; 1995</i>)
<i>Vitex negundo</i>	Lamiaceae	Nirgundi	Fruits	2-5g powdered fruits consumed with lukewarm milk against liver ailments	β -sitostreol, p-hydroxy benzoic and 5-hydroxyisophthalic acids, linoleic, palmitic, oleic, stearic acids, a flavonoid-artematin (<i>Rastogi and Mehrotra, 1993a; 1993b; 1995</i>)
<i>Zea mays</i>	Poaceae	Makki	Flower	Decoction of silky stigmas given for kidney affections (lesions)	Grains contain oxalic acid, carbohydrate, protein, fat, minor amount of vitamins like ascorbic acid, thiamine, nicotinic acid, riboflavin, pyridine, vitamin A, zeatin (<i>Rastogi and Mehrotra, 1993a; 1993b</i>)

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