

Conservation of Phyto-diversity of Parvati Valley in Northwestern Himalayas of Himachal Pradesh-India

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ABSTRACT

This study provides information about the traditional indigenous uses of plants by the inhabitants of the Parvati Valley of Kullu district in the western Himalayas of India. Since no published literature from the past 10 years exists, an ethnobotanical survey was conducted among the ethnic groups of the Parvati valley and first hand information on these plant species was recorded. A total of 266 species belonging to 180 genera and 71 families (including 44 species as recorded for the first time in the area) were collected. Out of these, 223 species within 152 genera of 61 families belong to dicots; 31 species and 22 genera under 7 families belong to monocots and 10 species with 6 genera in 3 families belong to gymnosperms.

Keywords: biodiversity, Himalayan medicinal plants, plant resources

INTRODUCTION

The Himalayas is a biodiversity hotspot and a storehouse of endemic medicinal plants, which grow in valleys, hills, terraces and on the exposed flat mountain tops and valleys (Myers *et. al.* 2000). The famous valleys like Kashmir in Jammu and Kashmir, and Lahaul-Spiti, Kinnaur, Kangra, and Kullu valleys of Himachal Pradesh are located in the western Himalayan region and are well-known for their scenic beauty. Parvati valley is among such beautiful but lesser known valleys and falls under the geographical jurisdiction of Kullu district (31°20'21"-32°25'0" N and 76°56'30"-77°52'20" E) in the state of Himachal Pradesh, India. The valley is situated in the south-east of Kullu district within the Sino-Himalayan subzone of the Boreal biogeographic zone (Khoshoo 1993). The valley is rich in natural resources like flora, fauna, minerals, perennial sources of water and many hot springs. Due to a wide range in altitudinal variations (1100-5500 m), the Parvati valley harbors a variety of natural flora comprising subtropical to temperate alpine floral elements. The climate of the study area is generally cool and dry. Snowfall is generally received during the period from November to March on the higher reaches. Forests occupy a prominent place in the economy of the Kullu district and extensive tracts of forests exist throughout the district. The reserve forests spread over an area of 15618 ha, while the protected forests constitute 193,495 ha of land. Unclassified forests account for 146,580 ha. The valley is also rich in wildlife. A sanctuary named *Kanawar* has been established in the valley for the protection and conservation of wildlife (Anonymous 1992). The forests of Kullu district are rich in various kinds of medicinal herbs like Karu, Dhoop, Muskwal and Kakarsingi. Mushrooms, especially 'guchi', are also readily available and extracted in large quantity. Deodar attains considerable dimensions in the upper Beas and Parvati valleys.

The Kullu district in its present form constitutes the central part of Himachal Pradesh. Lahaul and Spiti district

surrounds it from north and east, while Shimla and Kinnaur districts from the south and southeast, and Kangra and Mandi districts on the west and southwest. Parvati valley starts from Bhuntar where Beas and Parvati rivers have their confluence, and stretches from Bhuntar to Mantalai in an area of 80 km (Janartha 2000).

Due to the remoteness of the area and lack of modern medical facilities, the local people still depend upon local traditional healers, called *Vaids*, who are considered as experts in medicinal uses of plants. Parvati valley is inhabited by different communities i.e. native people like Malanis, Kulluvis and migratory people like *Gaddis* and *Gujjars*, who supplement their earning by selling medicinal and aromatic plants. Because of the richness in plant resources, there is a need to harness their potential for life-saving drugs and day to day medicines, so that the raw material is available on a sustainable basis for the service of mankind.

The history of plant exploration of the Parvati valley is quite old and several teams have made significant contributions to the botany of the Parvati valley (Jain and Bhardwaj 1951; Puri 1952; Uniyal and Chauhan 1972; Chowdhery and Wadhwa 1984; Badola 1998; Singh 1999; Dhaliwal and Sharma 1999; Singh and Rawat 2000). However, the valley remained unexplored from the point of view of ethnobotanical studies and could not be ignored any further as the rapid increase in anthropogenic activities like the construction of a hydroelectric project, roads, tunnels, housing colonies, etc. is causing an unquantifiable loss of genetic resources. With this in mind, the present investigation was carried out in the Parvati valley of Kullu district, Himachal Pradesh. The inventorization and documentation of these plant resources will be useful in establishing future strategies for their conservation and management.

MATERIALS AND METHODS

Extensive field surveys were carried out in various parts of the study area. Starting from the lower elevation i.e. Bhunter, Jari,

Table 1A Medicinal and aromatic plants of commercial importance from the study area (Parvati Valley) and their economic uses. Grey indicates medically important plants. Underlined indicates plants with ethnobotanical importance.

Name of species	Common names	Official parts used	Economic uses (based on their commercial importance)
<u><i>Abies spectabilis</i></u>	Tosh	Leaves	Considered carminative used for cough and phthisis; cones yield a violet coloured dye. Tree yields a white resin.
<i>Acer capadocicum</i>	Dhadonga	Leaves, bark	Leaves are used to raise blisters. Bark is used as an astringent.
<u><i>Achillea millefolium</i></u>	Biranjaisif, Millefoeil	Whole herb	Bitterish, pungent and aromatic aerial parts are used as a flavouring agent. The herb is also substituted for hops in the preparation of beer. Decoction of leaves is carminative and stimulant. Herb is considered astringent, tonic, diaphoretic, vulnerary and styptic.
<i>Achyranthes bidentata</i>	Puthkanda	Whole herb	From the seeds, two saponins; saponin A and saponin B have been isolated, which have shown cardiotoxic activity. Decoction of the entire plant, Panchang is used in asthma and the root of the plant is used in snakebites.
<u><i>Aconitum heterophyllum</i></u>	Atish, Patish	Roots	The alkaloids isolated from the roots include aconine, heteratisine, heterophylline, heterophylline, atidine and hetidine. The alkaloid content is 0.79%. Roots used for hysteria, throat infections, dyspepsia and vomiting, abdominal pain and diabetes.
<u><i>Aconitum violaceum</i></u>	Kali-Patish	Roots	Roots are reported to contain the alkaloid Indaconitine and used as a tonic. Also used as a substitute for <i>Aconitum heterophyllum</i> .
<i>Acorus calamus</i>	Bach	Rhizomes	The dry rhizomes contain 2-3% of yellow bitter aromatic volatile oil. The roots also contain a glucoside, acorin, calamene, tannin, mucilage, starch, vitamin C, fatty acids, sugar and calcium oxalate. Essential oils finds used in insecticides/pesticide, cosmetics and perfumery industry.
<u><i>Aesculus indica</i></u>	Bankhor, Indian horse-chestnut	Seeds	The seeds contain a mixture of saponins, one of, which is described as aescine, which easily crystallizes. Also contains flavonoid glycosides, aesculine, albumin and fatty oils.
<i>Ajuga bracteosa</i>	Nilkandhi	Whole herb	Contains glycosides and tanins. Herb is astringent febrifuge, apparent, tonic and diuretic. Used in gout, rheumatism, palsy and amenorrhoea.
<i>Anaphalis contorta</i>	Rui-Ghass	Whole herb	Herb yields an essential oil having anti-bacterial properties.
<i>Anemone obtusiloba</i>	Laljari	Rootstocks	Rootstock of the plant is used for concussions. The oil extracted from the seeds is used in rheumatism.
<i>Anemone rivularis</i>	Laljari	Rootstocks	Extract gave positive test for saponin.
<u><i>Arctium lappa</i></u>	Jungli-kuth, burdock	Roots	It has diuretic properties and has been used for cutaneous eruptions, rheumatism, cystitis, gout and specifically for eczema and psoriasis. The plant extract has been found to cause sharp, long lasting reduction of blood sugar within increase in carbohydrate tolerance and less toxicity.
<i>Arisaema tortuosum</i>	Samp-ki-Kumb	Tubers	Tubers are used as insecticides. Seeds are cooked like vegetable and eaten.
<u><i>Arnebia benthami</i></u>	Ratanjot	Roots	The roots are considered expectorant and used for cardiac disorders. Aqueous extracts, syrup and jam prepared from the flowering shoots are considered useful in disease of the tongue, throat and are also useful in fever. Used as a colouring matter in hair oils, cookeries and for dyeing of silk. Root is frequently used as an antiseptic and antibiotic.
<i>Artemisia roxburghiana</i>	Kundia	Whole plant	Leaves and flowering tops yield an essential oil having thujone-like flavour.
<u><i>A. vulgaris</i></u>	Nagdana	Whole plant	Leaves contain essential oil up to 0.35%. Infusion of leaves is given in asthma, nervous and spasmodic affections. Roots are used as tonic and antiseptic.
<u><i>Asclepias curassavica</i></u>	Kaktundi	Roots, leaves	Roots are emetic and cathartic. Used in piles and gonorrhoea. Juice from the leaves is anthelmintic, antidysenteric and also used against cancer. Latex is used to remove warts and corns. Plant is used as substitute/adulterant for Ipecac (<i>Cephaelis ipecacuanna</i> Tussac) and as a fish poison.
<u><i>Asparagus filicinus</i></u>	Satavar	Tuberous roots	Root contains asparagine, saponin. Fruits contain diosgenin. Root is used as appetizing, diuretic, aphrodisiac, laxative, astringent and is useful in dysentery, diarrhoea; throat complaints and leprosy. It is an ingredient of GERIFORTE used against fatigue and senile pruritus. Also used as demulcent in veterinary medicines.
<i>Aster mollusculus</i>	-	Roots	Used for cough and pulmonary affections. Also used in malarial fever and haemorrhage.
<i>Atropa acuminata</i>	Indian-belladonna	Roots, leaves	Indian belladonna is used in India for the manufacture of tinctures, plasters etc. Ethyl alcohol extract (50%) of leaves is antiprotozoal, antiviral and hypoglycaemic. Atropine, hyocyanine, hyoscyne are the most important alkaloids present in leaves and roots. Seeds contain fatty oil (25%) and also essential oil.
<u><i>Berberis aristata</i></u>	Daru-haldi	Roots, fruits, stem	Dried stems are used as bitter tonic for intermittent fevers. The dried fruits are edible. Root-bark contains principle alkaloid berberine. Roots and stems yield a yellow die. The fruits contain malic acid, citric acid and tannins. The extract from root-bark is known as <i>Rasount</i> .
<u><i>Bergenia ciliata</i></u>	Pashan-bhed	Rhizomes	Rhizomes are astringent, diuretic, antiscorbutic, and laxative, used in diarrhea, spleen enlargement, renal and pulmonary affections. Rhizomes yield tannin.
<u><i>Bergenia stracheyi</i></u>	Gatikpa	Rhizomes	Rhizomes and roots are bitter, astringent, diuretic aphrodisiac, tonic, also used in fever and applied to boils and ophthalmia. Rhizomes contain gallic acid, tannic acid, glucoside, mucilage, wax, starch, calcium oxalate and mineral salts.
<i>Betula utilis</i>	Bhoj-patra	Papery bark (Bhojpatra) and fungal growth (Bhurja-granthi)	The plant contains betulin, lupeol, olenolic acid and acetyle oleolic acid in addition to leucocyanadin in the outer bark and polymeric anthocyanidins in the inner bark. Infusion of the bark is aromatic, antiseptic and used as a carminative.
<i>Bistorta affinis</i>	Sarbguni	Whole plant	Plant is used as an astringent and is useful in curing diarrhoea.
<i>Bistorta amplexicaulis</i>	Sarbguni	Root stock	Rootstock constitutes a drug Anjubar, used medicinally both in Unani and Ayurvedic system of medicine. Also contains tannin.

Table 1A (Cont.)

Name of species	Common names	Official parts used	Economic uses (based on their commercial importance)
<i>Boeninghausenia albiflora</i>	Pissu-mar-buti	Whole plant	Leaves have insect repellent properties. Extract from the herb has shown Chemosterilant against harmful insects.
<i>Bupleurum candolli</i>	Kaligewar	Whole plant	Plant is a source of rutin, which is used as an anticoagulant.
<i>Caltha palustris</i>	Marsh-marigold	Whole plant	Plant is considered poisonous. Root contains important Helleborin and Veratrin contents. The flowering buds are also kept in vinegar and used as cappers.
<i>Cannabis sativa</i>	Chara, Bhang, Ganja	Whole plant	Source of hemp fibre and also of narcotics bhang, charas and ganja. Dried flowering, tops of female plants are used as sedative and analgesic and narcotic. Seeds are source of hemp seed oil, used in paints, varnishes and soaps.
<i>Cedrus deodara</i>	Devdar	Wood and oil	Wood oil contains oleo-resin and essential oil while the needles contain ascorbic acid. The wood is carminative, diaphoretic and diuretic. The tar is used as alterative and given in chronic skin diseases. In large doses, it is used in leprosy. Also applied externally to ulcers.
<i>Chenopodium album</i>	Bathu	Whole herb	Used as a pot-herb and accredited in the laxative and anthelmintic properties. Also yields an essential oil.
<i>Chenopodium foliolosum</i>	Bathu	Whole herb	The plant is an anthelmintic and its oil is used in medicines. The oil is effective against many forms of intestinal parasites. Shoots and roots extract has shown nematocidal properties.
<i>Cissampelos pareira</i>	Batindu, Patindu	Stems, roots, leaves	The alkaloids isoquinoline, pelosine and berberine are present in roots. Also contains reserpine and cissampeline. The root is regarded as anthelmintic and antidote to poison. Useful in asthma, cold and cough and inflammation of kidney and bladder.
<i>Codonopsis ovata</i>	SardandaSardandi	Roots and leaves	Roots and leaves are used for ulcers, bruises and wounds.
<i>Corydalis govaniana</i>	Bhutjata	Root and juice	The root is considered tonic, diuretic, alterative and antiperiodic. It is prescribed in syphilitic, scrofulose and cutaneous infections.
<i>Corylus colurna</i>	Bhutia-badam	Nuts (seeds)	Nuts (seeds) are edible and regarded as tonic.
<i>Cotoneaster microphylla</i>	Riu	Stolons	Used as an astringent. Twigs used for making baskets.
<i>Cyathula capitata</i>	Silath	Whole plant	Plant is a source of asterone and showed moulting hormone activity in Calliphor bioassay.
<i>Cyathula tomentosa</i>	Silath	Roots	Decoction used in dysentery. Also used for skin complaints.
<i>Dactylorhiza hatagirea</i>	Salam-panja, Hatpanja	The roots	The roots are used as a farinaceous food, nervine tonic and aphrodisiac, Mucilage jelly is nutritious and useful in diarrhoea, dysentery and chronic fevers. In Unani system of medicines, it is used in seminal debility, chronic diarrhoea and general weakness in debilitated women after delivery.
<i>Delphinium denudatum</i>	Salyan	Leaves	Juice of leaves used to destroy ticks, regarded as cardiac and respiratory depressant.
<i>Delphinium vestitum</i>	Nirbishi	Whole plant	Plant is used for cardiac ailments and as a respiratory depressant. Leaves are poisonous to goats.
<i>Desmodium tiliaefolium</i>	Kathi	Roots and leaves	Leaves lopped for fodder. Roots carminative, tonic and diuretic, used in bilious complaints.
<i>Dicliptera bupleuroides</i>	Ludra-buti	Whole herb	Used as a tonic.
<i>Dioscorea deltoidea</i>	Singli-mingli	Rhizomes	A rhizome of good quality is reported to contain from 4-8% of diosgenin content, which is used in the partial synthesis of modern drugs like cortisone and other steroids. Being rich in saponin, the rhizome are used for washing silk, wool and hair and also in dyeing. They are reported to kill lice. Plant contents are used in manufacturing tablets and injections for the uses in modern medicines including birth control pills.
<i>Echinops niveus</i>	Oont-kandara	Roots	Plant is diuretic, nerve tonic, and used in cough, indigestion and ophthalmia. Powdered roots are applied to wounds in cattle to destroy maggots.
<i>Elscholtzia fruticosa</i>	Pothi	Leaves and fruits	Fruiting tops and leaves yield essential oil.
<i>Elscholtzia strobilifera</i>	Rangchari	Leaves	Used for choleric diarrhoea, contains an essential oil.
<i>Euphorbia cognata</i>	Dudhla	Roots	Juice is acidic and irritant. Roots are used for fistular sores.
<i>Fagopyrum esculentum</i>	Buckwheat	Whole plant	Important source of glucoside – rutin used in the modern medicines as an anticoagulant.
<i>Fragaria vesca</i>	Wild strawberry	Roots	Procynadins extracted from roots showed anti-bacterial and angioprotective properties. Fruit esteemed as a dessert. Used to prepare jams, jellies and syrups. Also used in ice creams, soda, beverages and strawberry wine. Leaves yield an essential oil. Leaves are also used as an astringent and diuretic.
<i>Fritillaria cirrhosa</i>	Hadjod	Corms	Dried corms are used in asthma, bronchitis and tuberculosis.
<i>Geranium wallichianum</i>	Ratanjot	Rootstock	Used as an astringent, in toothaches and eye troubles. Rootstock is sometimes substituted with those of <i>Coptis teeta</i> (Wallich). Roots are also used as a tanning material.
<i>Geum elatum</i>	Masreen	Whole herb	Used as an astringent, in diarrhoea and dysentery.
<i>Habenaria intermedia</i>	Ridhi-Vridhi	Tubers	An ingredient of Ashtawarga, regarded as tonic.
<i>Habenaria pectinata</i>	Ridhi-Vridhi	Tubers	Tubers are regarded as tonic.
<i>Hedychium acuminatum</i>	Kapur-Kachri	Rhizomes	Aromatic rhizomes are employed in the preparation of Abir, a fragrant; coloured powder used during holy festivals and in religious ceremonies. They are considered stomachache, carminative, stimulant and tonic. Used in dyspepsia. Yields an essential oil used in soaps, hair oils and face powders. Leaves woven into mats.
<i>Heraclium candicans</i>	Patrala	Roots	Plant yields xanthotoxin, useful in the treatment of leucoderma and psoriasis. Also used in the preparations of sun tan lotions.

Table 1A (Cont.)

Name of species	Common names	Official parts used	Economic uses (based on their commercial importance)
<i>Hypericum choisianum</i>	Bassant	Flowers	Astringent, expectorant and diuretic, used in diarrhoea, pulmonary and urinary troubles. An oil is prepared by infusing fresh flowers which is used externally for wounds, sores, ulcers, swellings and sometimes against rheumatism and lumbago.
<i>Impatiens urticifolia</i>	-	Whole plant	An alcoholic extract of flower is reported to possess marked antibiotic activity against some pathogenic fungi and bacteria.
<i>Inula grandiflora</i>	Poshkar	Roots	Aromatic roots employed as an adulterant of kuth.
<i>Jasminum officinale</i>	White jasmine	Flowers	Flowers are known to yield an essential oil used in the perfumery. Root extracts of the plant yield a dye. Used for ringworm. Leaves are effective to cure stomachache and toothache, when chewed.
<i>Juglans regia</i>	Akhrot	Leaves	Leaves are valued for alternative properties and given in scrofula, leucorrhoea and rickers. Oil is used as a mild laxative and given in torpid liver. Decoction of the bark is used to stop mammary secretions. Also used as an astringent to check diarrhoea and menorrhagia and as a gargle in sore throat. The dried kernel is valued in confectionery and ice cream, as an article of food. Bark is used as a dye and also for cleaning teeth.
<i>Juniperus communis</i>	Bethar, Haubar	Fruits	Sweet, aromatic fruits are used for flavouring gin, liqueurs and cordials; contain an essential oil fermentable sugar and fatty oil. Bark contains tannin. Needles are rich in vitamin-C. Fruits and roots yield dyes.
<i>Juniperus macropoda</i>	Indian juniper, Dhoop	Wood	Wood is used for making pencils, pen-holders and walking stick. Volatile oil from fruits has been used as a substitute for oil of <i>J. communis</i> .
<i>Juniperus recurva</i>	Weeping-blue-juniper, Dhoop	Wood, leaves, twigs	Wood is locally used as fuel; suitable for pencils. Wood, leaves and twigs are used as incense; smoke from green wood, however is said to be emetic. Fruit yield an essential oil.
<i>Jurinea dolomiaea</i>	Dhoop	Roots	The aromatic roots are used as incense and form a chief ingredient of dhoop industry. The roots are considered stimulant and given in fever after child birth. A decoction of the root is given in colic. Aromatic oil from the roots is useful in gout and rheumatism.
<i>Lactuca lessertiana</i>	-	Leaves	Leaves possess tonic and having digestive properties. Dried latex is reported to be used as substitute for opium.
<i>Leonurus cardiaca</i>	-	Flowering- tops	Flowering tops are used in medicines as diaphoretic, stomachic, tonic and antispasmodic.
<i>Leucas lanata</i>	Dhorighas	Tender shoots	Tender shoots used as a vegetable, also given for cough after frying.
<i>Litsea consimilis</i>	-	Seeds	Seeds yield an aromatic wax, which is used for preparing candles and soap. Refined fat is a rich source of lauric acid, which may be utilized for making detergents. Fat is also used in medicines for curing rheumatism and bark is used in diarrhoea and dysentery. The leaves are used as fodder.
<i>Malaxis muscifera</i>	Jeevak	Tuberous roots	Used as tonic and lactagogue.
<i>Malva verticillata</i>	Laffa	Leaves, roots	Roots used for whooping cough and the ash of dried leaves are used in scabies.
<i>Meconopsis aculeata</i>	Himalayan-blue-poppy	Roots	Roots are used as narcotic.
<i>Morina longifolia</i>	Bish-kandara	Roots	Used as incense in the preparation of dhoop and agarbatties etc. Yields an essential oil.
<i>Nardostachys grandiflora</i>	Jatamansi	Roots	The hairy roots contain essential oil having jatamansone, jatamansinol and jatamansin. The roots are considered as tonic, stimulant, anti-spasmodic and laxative. The roots remarkable properties to tone up the brain.
<i>Nasturtium officinale</i>	Chuuch	Entire plant	Consumed as salad. Chopped leaves incorporated in fruit and vegetable juice, cocktails, soups and biscuits. Plant also used in asthma and tuberculosis.
<i>Nepeta linearis</i>	Catmint	Leaves, flowering tops	The dried leaves and flowering tops yield an essential oil.
<i>Nicandra physaloides</i>	Apple-of-Peru	Whole plant	The plant possesses diuretic, anthelmintic and insecticidal properties. Used as a fly-poison. A decoction of the leaves is used for killing head lice.
<i>Nicotiana tabacum</i>	Ban-tambaku	Leaves	The leaves are used for smoking and also contain alkaloids, which are used as insecticides. The oil, obtained from the seeds, is used as an illuminant, and is also used in the manufacture of paints and varnishes.
<i>Olea ferruginea</i>	Kau	Entire plant	The timber is used chiefly for tool-handles, walking sticks, toys, ploughs and boat-buildings. The fruits are edible. Leaves and bark are used as antiperiodic in fever and debility.
<i>Origanum vulgare</i>	Sathra	Leaves	Leaves and tops cut prior to blooming are used as a flavouring agent, origanum oil is carminative, stomachache, diuretic, diaphoretic and emmenagogue, used as a stimulant and tonic in diarrhoea and earache. Given in whooping cough and bronchitis because of its spasmolytic action. Also employed in cosmetics and soaps.
<i>Orobanche cernua</i>	-	Entire plant	Plant is used as cure for boils in the throat of cattle.
<i>Osyris arborea</i>	Ban-chai	Leaves	An infusion of the leaves has powerful emetic properties; the wood is used for making walking-sticks and reported to be used for adulterating sandalwood.
<i>Oxyria digyna</i>	Amlu	Leaves	Leaves have sorrel-like pleasantly acidic taste and consumed as a vegetable or used in salads and chutneys. Herb is regarded as antiscrobutic and refrigerant.
<i>Parnassia rubicola</i>	-	Entire plant	Decoction of plant is used as sedative in nervous palpitation and epileptic convulsions. Flowers yield a dye.
<i>Pedicularis siphonantha</i>	-	Whole plant	Plant is used as diuretic.
<i>Phytolacca acinosa</i>	Jharka	Entire plant	Herb has narcotic effect. Fruits are occasionally used as a flavouring agent. Seeds yield fatty oil.

Table 1A (Cont.)

Name of species	Common names	Official parts used	Economic uses (based on their commercial importance)
<i>Picrorrhiza kurrooa</i>	Karu, Kutki	Roots	Constitute the drug picrorrhiza, used as a substitute of Indian gentian (<i>Gentiana kurroo</i>) in liver problems. Contains picrorrhizin, kutkin and other compounds.
<i>Pimpinella diversifolia</i>	-	Entire plant	Carminative, roots yield essential oil.
<i>Pinus roxburghii</i>	Chirpine	Oleo-resin/ Turpentine oil	Tree is an important source of oleo-resin, which yields turpentine oil and rosin. Turpentine oil contains 20-30% α -pinene, The turpentine oil is used in pharmaceutical preparations, perfumery industry, synthetic pine oils, disinfectants, insecticides and denaturants. The oil is valued in medicines. It is especially recommended in the treatment of gangrene of the lungs and has been found beneficial as a carminative.
<i>Pinus wallichiana</i>	Kail, blue pine	Resin	The yield is oleo-resin and turpentine oil is about half than that of chir pine, but the oil is of superior quality and has high α -pinene contents.
<i>Plantago depressa</i>	Isabgol	Herb	Leaves and roots are astringent and vulnerary. Used in cough, asthma and other pulmonary diseases.
<i>Plantago major</i>	Isabgol	Herb	In homoeopathy, it is used in disorders of epidermis, headache, earache and toothache. Leaves and roots are also used for dyeing cotton.
<i>Pleurospermum brunonis</i>	Nesar, Lossar	Whole plant	The dried herb is used as a preserving agent against the attack of moth, silver fish etc. to protect woolen garments. Essential oil is of great value in perfumery industry.
<i>Podophyllum hexandrum</i>	Bankakri	Roots, rhizomes	Constitute a compound, podophyllin, which is commonly used as a purgative; Podophyllotoxin is the active principle. Podophyllin is an effective vermifuge. Recently it has acquired importance because of its possible use in controlling some forms of cancer. Fruits are edible.
<i>Polygonatum cirrhifolium</i>	Salam-misri	Rhizomes	Valued as a <i>salep</i> , a strength-giving food; plant is diuretic and contain a glucoside of the <i>digitalis</i> group.
<i>P. multiflorum</i>	Salam-misri	Rhizomes	Rhizomes are edible and in the powdered form, it is used for piles, tumours and inflammations.
<i>P. verticillatum</i>	Mahameda, Salam-misri	Rhizomes	Physical tonic and under the name of Mahameda, it is an ingredient of Ashtawarga, a principle constituent of Chyavan-prash.
<i>Polygonum plebeium</i>		Leaves	Leaves are applied to swellings.
<i>Potentilla atrosanguinea</i>	Ratanjot	Rootstock	Rootstock is depurative. Ash of the plant mixed with oil is applied to burns. Root yields red dye.
<i>Primula denticulata</i>	-	Roots	Powdered roots are used for killing leeches. Also used as substitute for Senega.
<i>Prinsepia utilis</i>	Bhekhal	Seed oil	Oil from the seed (35-40% pale yellow fatty oil) is used for the hydrogenation and soap making. Also possesses rubefacient properties and is applied externally in rheumatism and pains resulting from fatigue.
<i>Prunella vulgaris</i>	Ustakha-ddus	Whole herb	Herb is considered antiseptic, anti-rheumatic, expectorant, alternative, tonic, astringent, carminative, anti-spasmodic and stimulant. Useful in fevers and cough. Infusion is effective in haemorrhages, diarrhoea and bleeding piles. Used as a mouthwash. Applying the juice of plant, mixed with rose oil cures headache.
<i>Prunus cornuta</i>	Jamun	Fruits	Fruits are edible and used for brewing liquors. Kernels yield oil, used as a substitute for oil of bitter almond.
<i>Punica granatum</i>	Daru	Anardana, pomegranate rind	The rind contains about 28% of gallotannic acid together with a yellow colouring matter. Useful in brain affection, coughs, colds, diarrhoea and dysentery, heart tonic, stops bleeding from the nose. The fruit is a good source of sugar and vitamin C.
<i>Quercus semecarpifolia</i>	Kharsu	Wood	Wood is source of good charcoal
<i>Ranunculus arvensis</i>	Buttercup	Whole plant	Plant is used for its acrid and toxic properties.
<i>Rhamnus virgatus</i>	Pajji	Fruit	Fruit is valued as emetic, purgative and also used in spleen affections.
<i>Rheum australe</i>	Chuchi, Chukri	Roots	Used as astringent, laxative and also as tonic. The extract made out from the roots known as USHARE-REVAND is used in Unani medicines.
<i>Rheum moorcroftianum</i>	Rhubarb, Revadchini	Roots	Roots are valued as purgative. Roots are used for dyeing woolen clothes (since it contains tannins).
<i>Rhododendron anthopogon</i>	Talispatra	Leaves	Leaves possess stimulant properties, these are aromatic and administered as an errhine to produce sneezing.
<i>Rhododendron arboreum</i>	Buras	Flowers	A sub-acidic jelly or preserve is made from the petals, used in diarrhoea and dysentery.
<i>Rhododendron companulatum</i>	Kashmiri-patha	Leaves, flowers	Leaves are used as a nervine sedative. Also employed as incense; yield an essential oil with hypotensive, sedative and analgesic properties.
<i>Rhododendron lepidotum</i>	Simrish	Leaves	Leaves are stimulant and yield essential oil. Used in perfume and incense.
<i>Ricinus communis</i>	Arandi, Erand	Seeds	Seeds contains about 45-40% of fixed oil known is castor oil. Castor seed is poisonous and two or three seeds have been known to prove fatal. Castor oil is used as purgative.
<i>Rosa macrophylla</i>	Jungli-gulab	Fruits	Fruit is rich in Vitamin C. Flowers yield essential oil, used in the manufacture of perfumes.
<i>Roscoea alpina</i>	Kakoli	Roots	Root is used as a tonic in general debility. Beneficial in impotency, diabetes, leucorrhoea, diarrhoea and dysentery. Plant also finds use in veterinary medicines.
<i>Roscoea capitata</i>	Kakoli	Roots	A substitute of Safed musli in Ashtavarga and used in Chyavanprash-avleha.
<i>Roscoea purpurea</i>	Kakoli	Roots	Used as substitute for Safed musli.
<i>Rumex hastatus</i>	Khatti-imli	Whole plant	The bark of the roots is used to cure fire burns. Leaves are acidic in taste.

Table 1A (Cont.)

Name of species	Common names	Official parts used	Economic uses (based on their commercial importance)
<i>Rumex nepalensis</i>	Albare, Jungli-palak	Leaves	Infusion of leaves is given in colic and applied to syphilitic ulcers. Leaves are rubbed on the affected parts for the relief from irritation caused by stinging nettle (<i>Urtica dioica</i>).
<i>Salvia nubicola</i>	-	Leaves and flowers	Leaves and flowers are very aromatic and yield essential oil.
<i>Sarcococca saligna</i>	-	Leaves	Several alkaloids, isolated from the leaves induce a non-recoverable fall in blood pressure in dogs, and are toxic to paramoecia.
<i>Scutellaria angulosa</i>	-	Entire plant	Used as laxative, febrifuge, antispasmodic, astringent, nervine, anodyne and stomachic.
<i>Sedum ewersii</i>	Hiunshai	Whole plant	Important glucosides rutin, quercetin and asbatin have been isolated from the plant. Rutin is used as anticoagulant.
<i>Selinum tenuifolium</i>	Muramansi	Roots	Roots are employed as incense. Also used as sedative. Oil from the roots showed anti-bacterial properties.
<i>Selinum vaginatum</i>	Bhutkesi	Roots	Roots are used as a nervine sedative. Roots yield an essential oil having hypotensive, sedative and analgesic properties. Also employed as incense.
<i>Senecio chrysanthemoides</i>	-	Whole plant	Plant is toxic to cattle's. Yield an essential oil, which may be found suitable as a perfumery material.
<i>Silene edgeworthii</i>	-	Whole plant	Plant is used as an emollient and as fumigant. Juice of the plant is used in ophthalmia. Contains saponins.
<i>Skimmia laureola</i>	Dhoop	Leaves	Leaves are aromatic and used as an incense and flavouring agent. Yields an essential oil, a source of potential linalyl acetate and is used in the perfumery as a substitute for Petit grain oil (<i>Citrus aurantium</i> Linn.)
<i>Solidago virga-aurea</i>	-	Whole plant	Leocarpozide at 0.1 g/kg showed anti-phylogistic and analgesic activities in rats for inflammation and pains.
<i>Sorbus mycrophylla</i>	-	Leaves, fruits	Fruits are edible and are considered to be a very rich source of Pro-vitamin A and vitamin C. An infusion of the leaves is used as pectoral in cough and is given in diarrhoea.
<i>Swertia angustifolia</i>	Chirata	Whole plant	Infusion of plant is used as tonic and febrifuge. Plant is also used as a substitute for <i>S. chirata</i> , but exhibit inferior bitter tonic properties.
<i>Swertia chirata</i>	Chirayita	Whole herb	Ophelic acid (yellowish and bitter), two bitter glucosides (chiratin and amarogentin), gentiopicrin, two yellow crystalline phenols and a new xanthone, swerchirin have been isolated from the plant. In Indian medicines, chirata is prescribed in a variety of forms and combinations in chronic fevers and anaemia. It has got the special reputation as a remedy for bronchial asthma and liver disorders. Chirata is said to be used for dyeing cotton cloth yellow and is used in the liquor industry as a bitter ingredient.
<i>Swertia paniculata</i>	Chirata	Whole plant	Plant is used as substitute for <i>Swertia chirata</i> .
<i>Swertia purpurascens</i>	Chirata	Whole plant	Plant is used as substitute for <i>Swertia chirata</i> .
<i>Swertia racemosa</i>	Chirata	Whole plant	Plant is used as substitute for <i>Swertia chirata</i> .
<i>Tanacetum longifolium</i>	Langri	Roots	Roots are used as incense. A gum resin Gogul is obtained, which is used as incense.
<i>Taraxacum officinale</i>	Kanphool	Rhizomes	Resh and dried rhizomes constitute the drug, Taraxacum, which is used as a mild laxative. Also used as a diuretic, stomachic, hepatic, stimulant and tonic. The roots and leaves are eaten as salad, used in soups and cooked as vegetable. Leaves and open flowers are used in the manufacture of beer, wines and other dietary drinks.
<i>Taxus wallichiana</i>	Talispatra, Rakhai	Entire plant	Leaves are antispasmodic and emmenagogue, used for nervousness, hysteria and as a tithontriptic. An extract of various parts of the tree is added to hair lotions, beauty and shaving creams and dentifrices.
<i>Thalictum foliolosum</i>	Pilijari	Roots	Roots are much valued for ophthalmia used as extract, decoction or powder. Also used as diuretic, purgative and bitter tonic during convalescence and atonic dyspepsia.
<i>Thymus serpyllum</i>	Banjwain	Entire plant	Plant is used both for culinary and medicinal purposes. Shoots are used for flavouring. Leaves are used for the preparation of non-alcoholic beverages. Plant is bitter and posses anti-spasmodic, antiseptic, expectorant, carminative, anthelmintic and stimulant properties. Infusion of the plant is useful in the treatment of itch and eruptions of skin. Thyme oil is used in toothaches. Ethanolic extracts of the herbaceous plant are used in hair lotions.
<i>Trifolium pratense</i>	Red clover	Flowers	Flowers exhibit depurative, alterative and sedative properties. An extract of the flowers is used as a remedy for cancerous ulcers and corns.
<i>Trillidium govianum</i>	-	Roots	Roots contain Trilarin, which on hydrolysis yields 2.5% diosgenin – a corticosteroidal hormone. This hormone is used in preparations like sex hormones, birth control and regularization of menstrual flow.
<i>Valeriana hardwickii</i>	Nihani, Tagar	Roots	Same properties and uses as those of <i>Valeriana jatamansi</i> and are therefore a good substitute of the drug valeriana.
<i>Valeriana jatamansi</i>	Nihani, Muskabala, Tagar	Roots	Roots are known as Indian valerian, yields an essential oil, used as an adjunct to certain flavours in tobacco, honey etc. also used as heart tonic and stimulant.
<i>Verbascum thapsus</i>	Ban-tambaku	Entire plant	Leaves and fruits are used in diarrhoea and pulmonary disease of cattle. Leaves are also used as demulcent, in pectoral complaints and as local application in piles, sunburns and inflammation of mucus membrane. Dried leaves are smoked, relieve irritation. Decoction of the leaves is used as a heart stimulant. Roots show febrifuge properties. Seeds are narcotic. The herb yields oil used as a bactericide. The oil is used as a suitable remedy for frostbite, piles and bruises in Europe.

Table 1A (Cont.)

Name of species	Common names	Official parts used	Economic uses (based on their commercial importance)
<i>Viola biflora</i>	Pila-banaksha	Whole herb	Herb is used as one of the adulterant of <i>Viola odorata</i> . Roots are emetic. Flowers are known to possess emollient, pectoral and diaphoretic properties. Leaves are used as an emollient and laxative.
<i>Viola serpens</i>	Banafsha, Banaksha	Flowers, roots	Constitute a part of commercial Banafsha and is considered to possess medicinal properties more or less similar of <i>V. odorata</i> . A decoction of flowers is given for improvement in general complications. Herb is the main ingredient of joshanda – a Unani medicine used in the form of decoction for cough and colds.
<i>Vitex negundo</i>	Bana	Leaves	Leaves are used as tonic and vermifuge, smoked for relief in catarrh and headache. Leaves also yield an essential oil (0.05%).
<i>Withania somnifera</i>	Ashwa-gandha, Ashgandh	Roots	The roots are aphrodisiac, tonic, deobstruent, diuretic, narcotic, hypnotic, sedative, restorative and abortifacient. These are used in rheumatism, cough, debility from old age, dropsy, emaciation of children, consumption and general weakness.
<i>Woodfordia fruticosa</i>	Dhai	Flowers	Flowers as well as practically the whole plant yields tannin up to 20%. Flowers are valued for dyeing. Also used against diarrhoea and dysentery, complaints of the liver; stimulant in pregnancy and for skin diseases.
<i>Xanthium strumarium</i>	Banokra	Entire plant	The seeds on solvent extraction yield 30-35 per cent of semi drying oil, resembling sunflower oil. The herb is reputed as a medicine in Europe, China, Indo-China, Malaysia and America. The drug is credited with powerful diaphoretic properties. The dose of half to one ounce is recommended in chronic malaria, leucorrhoea and urinary diseases.
<i>Zehneria umbellata</i>	Jungli-kheera	Fruits	The ripe fruits are edible for their sweet taste. The root extract is useful to cure seminal debility, spermatorrhoea and also improves vitality.

Sources: Trease 1952; Chopra *et al.* 1958; Anonymous 1986; Schultes 1987; Paroda and Mal 1989; Chauhan 1995; Natarajan *et al.* 2000.

Kasol Manikaran and moving up to the higher elevation i.e. Chanderkhani jot, Tosh nalah, Khirganga, Tunta bhoj, Pandu pul and Mantalai the range of elevation is approximately 1400 to 5400 m amsl (Janartha 2000). The information regarding traditional knowledge, local uses of the plants of the study area, local names of the plants, parts used, purpose of use, mode of administration and curative properties were recorded through interviews and informal discussion with elderly people, herbal healers, local Vaidis and rural women. These are documented in the results.

Voucher specimens were collected in the flowering/fruitlet period to facilitate the process of identification. Specimens of angiosperms and woody plants were collected and identified according to Bentham and Hooker's system of classification. These were then processed and deposited in the Herbarium of Dr. Y. S. Parmar University of Horticulture and Forestry, Solan.

RESULTS AND DISCUSSION

The Western Himalayas, of which Himachal Pradesh forms a central part, is a vast repository of healing herbs (Chauhan 1999). The age-old practice of plant use as medicine forms a part of culture of this hilly state. The tribal ways of life, adherence to the primitive myths and legends, custom and beliefs, nearness to forests and daily encounters with wild plants seem to be the basic reasons for the persisting herbal lore and mores in the state. The area still maintains rich biodiversity, in addition to rich cultural heritage.

Surveys were conducted during the flowering and fruiting period of plants from April-May to September-October in 2000, 2001 and 2002. During the study, a total of 266 species belonging to 180 genera and 71 families (including 44 species as first time record from the area) were collected from different areas and locations of the study area of the Parvati valley. The species surveyed included: 223 species in 152 genera from 61 dicot families; 31 species in 22 genera from 7 monocot families; 10 species in 6 genera from 3 gymnosperm families. Thus, it is clear from these figures that high species diversity is exhibited by dicots in this area. Two species of ferns namely, *Dryopteris barbigera* and *Diplazium esculentum* were also collected from the area (Table 1).

Among the dicots, the dominant families include: Asteraceae (19 genera, 32 species), Labiatae (12 genera, 15 species), Rosaceae (10 genera, 15 species), Leguminosae (9 genera, 9 species), Ranunculaceae (7 genera, 14 species), Polygonaceae (8 genera, 13 species), Umbeliferae (7 genera, 9 species), Solanaceae (5 genera, 5 species), Scrophulari-

aceae (4 genera, 7 species), Gentianaceae (3 genera, 11 species), Boraginaceae (3 genera, 5 species), Asclepiadaceae (3 genera, 3 species), Oleaceae (3 genera, 3 species), Ericaceae (2 genera, 5 species), Valerianaceae (2 genera, 3 species), Saxifragaceae (3 genera, 6 species), Primulaceae (2 genera, 3 species), Crassulaceae (2 genera, 4 species), Amaranthaceae (2 genera, 3 species), Euphorbiaceae (2 genera, 3 species), Urticaceae (2 genera, 2 species), Berberidaceae (2 genera, 3 species), Rutaceae (2 genera, 2 species), Complanaceae (2 genera, 2 species), Geraniaceae (1 genus, 4 species), Violaceae (1 genus, 4 species), Chenopodiaceae (1 genus, 2 species), Hypericaceae (1 genus, 2 species), Plantaginaceae (1 genus, 2 species), Betulaceae (1 genus, 2 species), Fumariaceae (1 genus, 2 species). Menispermaceae, Papaveraceae, Cruciferae, Caryophyllaceae, Malvaceae, Balsaminaceae, Rhamnaceae, Hippocastanaceae, Aceraceae, Parnassiaceae, Lythraceae, Punicaceae, Onagraceae, Cucurbitaceae, Cornaceae, Caprifoliaceae, Dipsacaceae, Orobanchaceae, Acanthaceae, Verbenaceae, Phytolaccaceae, Lauraceae, Thymelaeaceae, Santalaceae, Buxaceae, Salicaceae, Cannabinaceae, Juglandaceae, Corylaceae and Fagaceae all contained 1 genus and 1 species each and were among the least represented families among the dicots.

Among the monocots, the dominating families are Orchidaceae (9 genera, 10 species), Liliaceae (5 genera, 9 species), Araceae (3 genera, 4 species), Zingiberaceae (2 genera, 4 species), Iridaceae (1 genus, 2 species). Dioscoriaceae and Juncaceae contained 1 genus and 1 species each and were the least represented families among the monocots. The gymnosperms were represented by the following families: Pinaceae (4 genera, 5 species), Cupressaceae (1 genus, 4 species), Taxaceae (1 genus, 1 species).

Out of the total of 266 species, 157 were classified as medicinal and aromatic plant on the basis of their economic importance for the pharmaceutical (Ayurveda, Sidha, Unani) and perfumery industries (highlighted in grey in Table 1).

Being very near to nature and having daily encounters with plant life, there is an intimate relationship between herbs and the people of Parvati valley. Of the 266 plant species collected around 100 have ethnobotanical importance (species names underlined in Table 1A). Local inhabitants use these herbs in their daily life for the remedy of various diseases. Many of these plant species exhibit high medicinal and aromatic properties and need extensive screening for clinical use. Only after proper elucidation and authentication can such claims be accepted for human welfare.

Table 1B Plants of traditional importance from the study area (Parvati Valley).

Name of species	Local name(s)	Uses
<i>Achillea millefolium</i>	Chuabu, Saijum	The leaves and the flowering tops are used to cure gastric problems and fever. Leaves are chewed in the severe toothache to relief pain. A decoction of whole plant is employed for bleeding piles and is good for kidney diseases.
<i>Achyranthes bidentata</i>	Umblakanta, Puthkanda	About 3-mashes of root powder is mixed with equal quantity of smoked tobacco from <i>Hooka</i> and is applied as a paste to the snake bitten organ after giving a proper cross cut. Sufficient ghee is given to the patient orally. The patients are not allowed to sleep at least for 12 hours.
<i>Aconitum heterophyllum</i>	Atish, Patish, Pongar	Root of the herb is used to cure diarrhoea, fever and abdominal pains.
<i>Aconogonum rumicifolium</i>	Nyelo, Choarh	The leaves are cooked and squeezed. The water is thrown away and the cooked leaves are prepared as vegetable by the fuals (shepherds). The paste of the leaves is applied locally in abscesses and boils.
<i>Acorus calamus</i>	Bach, Bare	Locally, the root paste is applied on chest to treat pneumonia in children. A small piece of rhizomes is rubbed over stone together with fruit of Jaiphal (<i>Myrstica fragranse</i>) and Rada (<i>Calumarejan spinosa</i>) and given with mother's milk to children suffering from cold, cough and fever.
<i>Aesculus indica</i>	Khanor	The fruits are dried and beaten into flour, washed several times in water to remove the bitter taste, dried and kept for use as tonic for ladies. Leaves are used as dried fodder. The oil extract from the fruits is used in healing of wounds and the bark is applied in the form of a paste in dislocated joints.
<i>Ajuga bracteosa</i>	Nilkanthi, Ratpacho	The leaves are used to erase deposition on tongues of children suffering form stomach complaints and fever. The pounded leaves are given in pneumonia and typhoid fever.
<i>Androsace rotundifolia</i>	Nirodhak buti	The leaves of the herb along with needles of deodar are powdered. With some amount of ghee and Gur it is given to the women's from the first day onset of menses for affecting birth control.
<i>Angelica glauca</i>	Chora	Used as condiment in cookery also used in dyspepsia and stomachache. Small quantity is also collected and sold in the market.
<i>Arctium lappa</i>	Jangli-kuth	Root extract is used as diuretic, diaphoretic, in gout and skin affections. Tincture of the seeds is used for psoriasis and toothache.
<i>Arnebia benthami</i>	Ratanjot	Red dye from the roots is used for dyeing silk and wool. Roots are used against toothache, earache and the paste is applied to cuts and wounds and also in fire burns.
<i>Artemisia vulgaris</i>	Chhambar	The leaves of the plant are crushed and the paste is applied on the cuts and wounds, to check bleeding. The wound is fastened with a cloth, after few minutes, bleeding stops.
<i>Asparagus filicinus</i>	Sansbai	The roots are used to increase the milk yield in cattle and also to get the milk germ-free.
<i>Berberis aristata</i>	Kashmal	The roots are used as fuel wood, while the extract of the root bark called as <i>Rasount</i> is used to cure eye diseases, skin diseases, jaundice, piles and malaria. Fruits are eaten as laxative and anti-scorbutic.
<i>Bergenia ciliata</i>	Pashanbhed, Takli	The crushed roots mixed with milk are given in backache. On burns, it is applied after mixing with curd. Rhizomes are also used against kidney stone, piles, diabetes and heart diseases. The paste of fresh rhizome is very effective in the treatment of swellings etc. in livestock.
<i>Betula utilis</i>	Takpa, Bhojpatra	The bark of the tree is burnt and the bhasma is used to cure rheumatic pains. It is also used as healing agents against deep cuts. Bhujera, a fungal formation on the tree is used for alimentary disorders in animals.
<i>Bistorta affinis</i>	Chunru	Plant is used as a medicine for cough and diarrhoea. Roots are chewed to relieve irritation of throat.
<i>Bistorta amplexicaulis</i>	Sarbguni	The root paste is applied on sores and wounds. The roots are also given with the milk to the women to check extract bleeding during menstruation period.
<i>Boehmeria platyphylla</i>	Samrala	Fibres from the stem are used for making fishing-nets.
<i>Boenninghausenia albiflora</i>	Pisumar-buti	The entire aerial part is used to repel lice, fleas and other insects.
<i>Bupleurum candolli</i>	Kaligewar	Herb is used to induce perspiration and for stomach and liver complaints.
<i>Caltha palustris</i>	Horgul	The herb is used for the treatment of leprosy and rheumatism. Young flower tops are pickled in the vinegar and used as capers. The herb is poisonous.
<i>Cannabis sativa</i>	Bhang, Charas	The paste of fresh leaves is used to resolve tumors. Leaf powder is useful for dressing wounds and sores. Seeds are roasted and eaten as culinary by the local people. The resinous exudation commonly known as charas is also taken with tobacco as a sedative.
<i>Cassiope fastigata</i>	Hieunshelo	The leafy twigs are ground into a paste and applied to fire burns. It exerts immediate cooling effect and is effective in healing the wound also. It is kept in houses as an emergency medicine for this purpose.
<i>Cedrus deodara</i>	Diar, Devdar	The oil is used as an effective insect repellent in cattle wounds, especially in sheep and goats.
<i>Chenopodium album</i>	Bathu	The young leaves are used in vegetable and given to patients suffering from leucoderma. The decoction of seeds is given in large doses to induce abortion in women.
<i>Cissampelos pareira</i>	Patindu	The leaves are crushed and then given to the children in case of heat with milk of honey.
<i>Codonopsis ovata</i>	Sardanda, Sardandi	The roots are considered as a good physical and sexual tonic.
<i>Corydalis govaniiana</i>	Inder-jata	The decoction of the whole plant is given in chronic fevers and liver complaints.
<i>Cotoneaster microphylla</i>	Ruins	The bright-red fruits are eaten. The pulp is used to prepare chutney and jams.
<i>Cyathula tomentosa</i>	Silath	Locally, flowering spike is used to repel away the mouse.
<i>Cynoglossum denticulatum</i>	Kumbru, Kuri	The juice of the leaves is applied like eye drops in conjunctivitis and reddening of the eyes. The crushed leaves are also effective on cut wounds.
<i>Dactylorhiza hatagirea</i>	Panja, Hathpanja	Locally, the tubers are used in general weakness or loss of sexual power and nerve debility.
<i>Delphinium vestitum</i>	Changuthpa, Salyan	Leaves of the plant are poisonous to goats. Root powder is also helpful in healing of ulcers and wounds in cattle.
<i>Dicliptera bupleuroides</i>	Ludra-buti	Paste of leaves and new shoots is applied against the wounds of snakebite and yellow secretion is reported to ooze out the poison.
<i>Dioscorea deltoidea</i>	Singli-mingli	Locally the tubers are used to kill lice's and to poison fish. It is also used for washing the woolen clothes.
<i>Echinops niveus</i>	Oontkatara	Root bark is powdered and mixes with honey, taken internally to cure cough and asthma.
<i>Fragaria vesca, F. indica</i>	Wild strawberry	The local people eat fruits.

Table 1B (Cont.)

Name of species	Local name(s)	Uses
<i>Fritillaria cirrhosa</i>	Hadjod	The paste of the bulbs is applied on fractured bones and it is reported that minor fractures are fully recovered in 15-20 days.
<i>Geranium wallichianum</i>	Ratanjot	Herb is used against toothache and eye troubles. Roots yield tanning material and red dye.
<i>Geum elatum</i>	Masrean	It is a very useful drug for wounds and cuts. It induces quick healing of the wounds.
<i>Girardinia diversifolia</i>	Bara-bichua	Leaves are used in headache and swollen joints, to activate blood circulation. Its decoction is given in fever. The bark forms a very good fibre for making ropes and cordage's.
<i>Habenaria pectinata</i>	Meda	Its tubers is mixed with Khoya and greater cardamom and eaten, to get relief from joint pains.
<i>Heracleum candicans</i>	Rasal	Roots are considered poisonous. The powder of the plant is given in giddiness. Leaves and shoots are often used as fodder.
<i>Indigofera heterantha</i>	Surmai	The plant is considered to be a good fodder, and also used as green-manure.
<i>Inula grandiflora</i>	Poshkar	The roots are aromatic and are used to cure cough, cold and throat irritations.
<i>Iris hookerana</i>	Iris	Paste of flowers and leaves is given to a person suffering from fever.
<i>Juniperus communis</i>	Bethar	Twigs are used as incense and in oracle rites in driving away the evil spirits. Also known to be a useful remedy in joint pains (rheumatic arthritis).
<i>Juniperus recurva</i>	Dhoop, Shur	People regard this plant as a repellent of evil spirits. The twigs are used as incense and commonly used in Havans.
<i>Jurinea dolomiaea</i>	Dhoop	Used in the preparation of Dhoop, which is used to purify the air and employed in worships and prayers.
<i>Leucas lanata</i>	Dhurlughas	The roasted leaves in ghee have been successfully tried as a remedy to expel the placenta as after delivery in cattle's. The plant is also used in the remedy of diarrhoea and dysentery in cattle's.
<i>Morina longifolia</i>	Bishkandara, Chow	Root powder is applied as poultice in boils for sucking the puss out of it and facilitates healing of wounds. The flowers eaten by the shepherds during their visit to high altitude areas so that they are protected from high altitude problems.
<i>Nardostachys grandiflora</i>	Nihani	A small piece of the root is powdered and mixed with tobacco and smoked in cases of palpitation of heart and mental tension.
<i>Nasturtium officinale</i>	Chuuch	The young shoots are used as leafy vegetables and its use is said to act as appetizer, laxative and diuretic. It is believed to increase blood circulation.
<i>Origanum vulgare</i>	Sathra, Banajwain, Baslughas	The plant is regarded an important house hold remedy for various purposes. The paste of leaves and terminal shoots is applied to boils, ulcers, wounds, cuts and weeping eczema. The paste of leaves is reported to be highly useful in healing the wounds caused by fire-burns. The root pieces of plant is bound in a cloth piece and tied to the necks of infants as a protective measure against conjunctivitis.
<i>Oxyria digyna</i>	Suma, chucha	The leaves are considered as carminative and digestive. Useful in abdominal problems. Leaves are also used as vegetable and for making chutney.
<i>Phytolacca acinosa</i>	Jharka	The tender leaves and twigs are cooked as vegetable. The herb is believed to have narcotic effect, which is destroyed on boiling.
<i>Picrorrhiza kurrooa</i>	Karu, Kutki	The roots are used in abdominal pains and as a purgative too. In case of nose bleeding, leaves are crushed and 1-2 drops of the juice are put in the nose to stop bleeding.
<i>Pinus wallichiana</i>	Kail	The bark taken out in the form of long circular cylinders is used to bandage the dislocated/fractured/fractured organs both in cattle, sheep and goats and on human beings after setting the dislocated or broken bone in proper place.
<i>Plantago depressa</i>	Musalniani	The paste of the roots and leaves is applied to skin eruptions, boils and rashes. Seeds are used to cure dysentery. The root of the plant is tied to the button hole of the infants as a protective measure against infection of stomach disease. Whole plant also used to cure tail gangrene of cattle.
<i>Plantago major</i>	Luhuriya, isabgol	Seeds are used in gastric complaints, burning sensation in stomach and dysentery.
<i>Pleurospermum brononis</i>	Nesar, Losar	The powder of the flowering shoots is mixed in cow's fresh butter and massaged over the entire body to allay fevers. The dried herb or the dried garland is kept in the boxes containing clothes as a preservative against the attack of moths and silver fish.
<i>Podophyllum hexandrum</i>	Shathjalari, Bankakri, Rodhari	The root powder is administered internally for gastric ulcers. It is applied as a paste on cuts and wounds for regeneration of the tissues. Decoction of roots is used to cure liver problems. Shepherds eat fruits.
<i>Polygonatum cirrhifolium</i>	Salam-misri	The local people eat rhizomes to cure blood pressure problem. It is believed that this application keeps the blood pressure in equilibrium.
<i>Polygonatum verticillatum</i>	Salam-misri	Rhizomes are used to cure kidney problems. The local people eat the rhizomes being sweet in taste.
<i>Potentilla atosanguinea</i>	Larsu	The decoction of root is used as gargle to cure toothache.
<i>Primula denticulata</i>	Keecha	The flowering tops are used to cure cough and paralysis.
<i>Prinsepia utilis</i>	Bhekhal	The oil extracted from the seeds is taken internally as tonic and is considered useful in general debility and rheumatism. The oil is also massaged on rheumatic joints for relief. Children's make the hollow branches into flutes. The long hollow tubes are also used as pipes for smoking tobacco in <i>hookas</i> .
<i>Punica granatum</i>	Daru	The fruit rinds are dried and powdered and taken with cold water to relieve cough. When children (new borne) start cutting out teeth, the peels are powdered mixed with Kashmal (<i>Berberis</i> sp.) roots, made into a paste and applied on the palate to ease the process of emergence of teeth.
<i>Rheum australe</i> , <i>R. moorcroftianum</i>	Chukri, Leechu	The paste of the root in water is applied externally in muscular injury, cuts, wounds and mumps and to forehead in headache. The watery extract is given orally in stomach pains, constipation dysentery, swelling of the throat and tonsillitis. Lotion is dropped in ears in earache. It purifies the blood and being astringent, reduces the swellings and rheumatic pains quite effectively.
<i>Rhododendron anthopogon</i>	Tali, Tama	The decoction of the leaves is used in cold, cough and chronic bronchitis. People prepared tea from the leaves. Excess dose is regarded poisonous. The powder of the dried flowers mixed in bland oil is used as massage over the entire body in post delivery complications like, fevers, cough and cold. The plant is also used as incense.
<i>Rhododendron arboreum</i>	Buras	The fresh petals are used in chutneys. The powder of the dried flowers is used as an efficacious drug to check bloody and chronic dysentery.

Table 1B (Cont.)

Name of species	Local name(s)	Uses
<i>Rhododendron companulatum</i>	Shargar	Roots are used to cure boils. Buds are considered poisonous for sheep and goats.
<i>Rosa macrophylla</i>	Jungli-gulab	Flowers are used by local voids to make medicines to cure stomachaches.
<i>Rumex hastatus</i>	Khatti	The bark of the root is used to cure fire burns and is applied as 'lep' (paste). Leaves are used in chutneys, being acidic in taste.
<i>Rumex nepalensis</i>	Palak	Locally, leaves are commonly used to cure constipation. Also used as vegetable.
<i>Saussurea gossypiphora</i>	Gugghi-badshah	The plant is regarded as sacred. Its fumigation is employed to allay the affects of evil spirits. The woolly hairs mixed with ghee are given to the asthma patients.
<i>Saussurea obvallata</i>	Dodaphool	The root paste is applied in cuts and bruises. Also offered as worship to the deities.
<i>Sedum ewersii</i>	Hiunsheli	The chutney of the whole plant is useful in acute gastric problems. Paste of the plant is also used to heal burns.
<i>Selinum tenuifolium</i>	Mathosal	The smoke produce from the roots is used for killing and repelling the insects, for purifying the atmospheric air. Roots are also used as a substitute for 'Bhutkesi' and used an ingredient in Dhooop preparation.
<i>Selinum vaginatum</i>	Bhutkesi, Bhutjata	Rhizomes are used to prepare local liquors and for treating the patient with mental disorder.
<i>Senecio chrysanthemoides</i>	Semgebala	Decoction of the whole plant is used to cure fever and abdominal pains. Essential oil obtained from the plant is used as perfumery material. The herb is toxic to animals.
<i>Skimmia laureola</i>	Dhooop	The leaves of the plant are used to produce aroma. Dried leaves are used in havens, while worshiping deities.
<i>Swertia chirata</i> and other <i>Swertia</i> species	Chirayita	The plant is a bitter tonic used to cure fevers, stomachache, febrifuge and laxative.
<i>Tanacetum longifolium</i>	Langri	Its aroma, especially when found bruised and crushed by sheep is said to cause giddiness. The leaf juice is useful as an antispasmodic, carminative and antipyretic.
<i>Taraxacum officinale</i>	Aachak	The sheep and goats browse it as a potent fodder. The whole plant is crushed into a mesh and given internally in snakebites. The paste is applied externally on the wound. Leaves are effectively used for fomentation in swollen parts, boils and sprains.
<i>Taxus wallichiana</i>	Rhakhal	Leaves are used as sedatives, antiseptic and emmenagogue; its tea is used to cure asthma, bronchitis, epilepsy and cough, etc.
<i>Thalictrum foliolosum</i>	Pilijari	Used internally in abdominal pains and as a blood purifier. The paste of the roots is applied on the eyelids to cure eye diseases. The poultice of the root is applied to cure the boils and ulcers. Also beneficial to cure foot and mouth disease of animals.
<i>Thymus serpyllum</i>	Ban-ajwain	The decoction of the plant is an effective home remedy for colds, cough, fever and stomach problems. The local people drinks tea with this herb regularly to cure from common colds and different stomach ailments.
<i>Valeriana jatamansi</i>	Nihani	Locally, used as antispasmodic, carminative and in acute stomachaches. Decoction is a beneficial remedy in insomnia and nervous exhaustion due to heavy mental work.
<i>Verbascum thapsus</i>	Kolomasta	The crushed leaves are given in constipation and allied stomach pains. Dhuni (smoke) of the plant is used by the tantrics to drive away the ghostly instincts, especially in the children's, where bad spirit is evolved.
<i>Viola serpens</i> and other <i>Viola</i> species	Banaksha	The decoction prepared is given for expulsion of phlegm. It is a good cure for sore throat.
<i>Vitex negundo</i>	Bana	The leaves are boiled in cow's urine and when half the quantity is left, a paste is made and applied on wounds and painful body organs to get relief. Boil leaves in water and apply with the help of cloth on swellings to get relief. Young shoots are also used in tantra-mantra.
<i>Withania somnifera</i>	Ashganth	Root powdered is given with milk/water to cure sexual weakness, loss of appetite, cough, dropsy and general debility.
<i>Woodfordia fruticosa</i>	Dhai	The young leaves are cooked as vegetable and regarded as blood purifier. It is said to be a cure for skin diseases. The fine paste of the plant, especially of the root part, is applied in hidden muscular pains. The shocks of the stings of its twigs two to three times are applied in swollen, rheumatic joints for relief from pain and swelling.
<i>Zehneria umbellata</i>	Jangli-kakri	The ripe fruits are edible for their sweet taste. Dried powdered and taken with milk in the dose of about two grams twice a day as a cure for seminal debility, spermatorrhoea and its use improves vitality.

The predominant woody tree species include *Abies spectabilis*, *Acer pictum*, *Betula alnoides*, *B. utilis*, *Cedrus deodara*, *Corylus colurna*, *Juglans regia*, *Picea smithiana*, *Pinus roxburghii*, *Prunus cornuta*, *Quercus semecarpifolia*, *Rhododendron arboreum* and *Taxus baccata* ssp. *wallichiana*. Among the cultivated plants, apple, apricots, plums, cherries and japaniphal grow abundantly in the lower valley and are a good source of revenue.

The total plant species collected were further classified as medicinal and aromatic (184), fodder (53), fuel wood (45), timber (21), fibre (9), yielding tans and dyes (27), gums and resins (4), bee flora (31), edible (43), ornamental (123), use in tantra-mantra i.e. ethno botanical uses (24) and oil yielding (essential 32; others 9) (Table 2).

As a result of continuous and relentless extraction over many decades, many valuable species are facing danger to their survival in their natural habitats. Some of the threat-

ened species are *Aconitum heterophyllum*, *Atropa acuminata*, *Dioscorea deltoidea*, *Dactylorhiza hatagirea*, *Jurinea dolomiaea*, *Nardostachys grandiflora*, *Picrorrhiza kurrooa*, *Podophyllum hexandrum*, *Rheum australe*, *Swertia chirayita*, *Valeriana hardwickii*, *Saussurea royleii*, *Saussurea gossypiphora*, *Saussurea obvallata*, *Pleurospermum brunonis*, *Polygonatum cirrhifolium*, *Fritillaria cirrhosa*, and *Codonopsis ovata*. Unregulated exploitation and disorganized trades are responsible for the sharp decline in the herbal wealth of the area.

During our investigation, we found that a wealth of knowledge regarding the ethno botanical and medicinal uses of plant species lies with shepherds (*Gaddies*, *Gujjars*), healers (*Vaids*) and the old people living in the area. However, these people seldom agree on revealing the information and only through persistent requests and motivation do they share their knowledge about the use of herbs. One

Table 2 Economic importance of different plant species in the Parvati valley.

Latin name	Timber/ Furniture	Fuel wood	Fodder	Fibre and flosses	Gums and resins	Tans and dyes	Ornamental landscape	Bee flora	Medicinal and Aromatic	Edible	Tantra- Mantra/ Ethno- botanical importance	Oil
<i>Abies spectabilis</i>	+	+	-	-	+	-	+	-	-	-	-	-
<i>Acer pictum</i>	+	+	+	-	-	-	+	-	-	-	-	-
<i>Achillea millefolium</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Achyranthes bidentata</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Aconitum heterophyllum</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Aconitum violaceum</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Aconogonum rumicifolium</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Acorus calamus</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Actaea spicata</i>	-	-	+	-	-	-	+	-	+	-	-	-
<i>Aesculus indica</i>	+	+	+	-	-	-	+	-	-	+	-	-
<i>Ajuga bracteosa</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Anaphalis busua</i>	-	-	-	+	-	-	+	-	+	-	+	-
<i>Anaphalis contorta</i>	-	-	-	+	-	-	+	-	-	-	+	-
<i>Anaphalis triplinervis</i>	-	-	-	+	-	-	+	-	-	-	+	-
<i>Androsace lanuginosa</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Androsace rotundifolia</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Anemone obtusiloba</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Anemone rivularis</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Anemone tetrasepala</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Angelica glauca</i>	-	-	-	-	-	-	+	-	+	-	-	+
<i>Arctium lappa</i>	-	-	-	-	-	-	-	-	+	+	-	+
<i>Arisaema tortuosum</i>	-	-	-	-	-	-	+	-	-	+	-	-
<i>Arisaema wallichianum</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Arnebia benthami</i>	-	-	-	-	-	+	-	-	+	-	-	-
<i>Artemisia dubia</i>	-	-	-	-	-	-	-	-	-	-	-	+
<i>Artemisia gmelinii</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Artemisia roxburghiana</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Artemisia vulgaris</i>	-	-	-	-	-	-	-	-	-	-	-	+
<i>Asclepias curassavica</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Asparagus filicinus</i>	-	-	-	-	-	-	-	-	+	+	+	-
<i>Aster himalaicus</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Aster trinervius</i>	-	-	-	-	-	-	+	-	-	+	-	-
<i>Astragalus concretus</i>	-	-	+	-	-	-	+	-	-	-	-	-
<i>Atropa acuminata</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Benthamida capitata</i>	-	+	+	-	-	-	+	-	-	+	-	-
<i>Berberis aristata</i>	-	+	+	-	-	+	-	+	+	+	-	-
<i>Berberis edgeworthiana</i>	-	+	+	-	-	+	-	+	+	+	-	-
<i>Bergenia ciliata</i>	-	-	-	-	-	+	+	-	+	+	-	-
<i>Bergenia stracheyi</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Betula alnoides</i>	+	+	-	-	-	-	-	-	-	-	+	-
<i>Betula utilis</i>	+	+	-	+	-	-	+	-	+	-	+	-
<i>Bistorta affinis</i>	-	-	-	-	-	+	+	-	-	-	-	-
<i>Bistorta amplexicaulis</i>	-	-	-	-	-	+	-	-	+	-	-	-
<i>Bistorta vivipara</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Boehmeria platyphylla</i>	-	-	+	+	-	-	-	-	+	-	-	-
<i>Boeminghausenia albiflora</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Bupleurum candolli</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Calanthe tricarinata</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Caltha palustris</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Campanula pallida</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Cannabis sativa</i>	-	-	-	+	-	-	-	-	+	+	-	+
<i>Cassiope fastigata</i>	-	-	-	-	-	-	+	-	+	-	+	-
<i>Cedrus deodara</i>	+	+	-	-	-	-	+	-	+	-	+	+
<i>Cephalanthera longifolia</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Chaerophyllum reflexum</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Chenopodium album</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Chenopodium foliosum</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Cicer microphylla</i>	-	-	+	-	-	-	-	-	-	+	-	-
<i>Cissampelos pareira</i>	-	-	+	-	-	-	+	-	+	-	-	-
<i>Codonopsis ovata</i>	-	-	-	-	-	-	+	-	+	+	-	-
<i>Colutea multiflora</i>	-	+	+	-	-	-	+	-	-	-	-	-
<i>Corydalis flabellata</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Corydalis govaniatum</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Corylus colurna</i>	+	+	+	-	-	-	-	-	+	+	-	+
<i>Cotoneaster acuminatus</i>	+	+	+	-	-	-	-	-	+	-	-	-

Table 2 (Cont.)

Latin name	Timber/ Furniture	Fuel wood	Fodder	Fibre and flosses	Gums and resins	Tans and dyes	Ornamental landscape	Bee flora	Medicinal and Aromatic	Edible	Tantra- Mantra/ Ethno- botanical importance	Oil
<i>Cotoneaster microphyllus</i>	-	+	+	-	-	-	-	-	+	-	-	-
<i>Cremanthodium arnicoides</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Cryptolepis buchanaani</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Cyathula capitata</i>	-	-	+	-	-	-	-	-	-	-	-	-
<i>Cyathula tomentosa</i>	-	-	+	-	-	-	-	-	-	-	-	-
<i>Cynoglossum denticutatum</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Cynoglossum wallichii</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Cynoglossum zeylanicum</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Dactylorhi hatagirea</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Daphne canabina</i>	-	+	-	+	-	-	-	-	+	-	+	-
<i>Delphinium denudatum</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Delphinium vestitum</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Desmodium tiliacifolium</i>	-	+	+	-	-	-	-	-	-	-	-	-
<i>Dicliptera bupleuroides</i>	-	+	+	-	-	-	-	+	+	-	-	-
<i>Dioscorea deltoidea</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Ehinops niveus</i>	-	+	+	-	-	-	+	+	+	-	-	-
<i>Elsholtzia fruticosa</i>	-	-	-	-	-	+	-	+	+	-	-	+
<i>Elsholtzia strobilifera</i>	-	-	-	-	-	-	-	+	+	-	-	+
<i>Epilobium cylindricum</i>	-	+	+	-	-	-	+	-	-	-	-	-
<i>Epipactis royleana</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Euphorbia cognata</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Euphorbia wallichii</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Fagopyrum esculentum</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Fragaria indica</i>	-	-	-	-	-	-	-	-	-	+	-	-
<i>Fragaria vesca</i>	-	-	-	-	-	-	-	-	-	+	-	-
<i>Fritillaria cirrhosa</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Fritillaria roylei</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Gentiana venusta</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Gentianella falcata</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Geranium donianum</i>	-	-	-	-	-	+	+	-	-	-	-	-
<i>Geranium himalayense</i>	-	-	-	-	-	+	-	-	-	-	-	-
<i>Geranium refractum</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Geranium wallichianum</i>	-	-	-	-	-	+	-	-	-	-	-	-
<i>Gerardinia diversifolia</i>	-	-	-	+	-	-	-	-	+	-	-	-
<i>Geum alatum</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Habenaria intermedia</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Habenaria pectinata</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Hackelia uncinata</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Hedychium acuminatum</i>	-	-	-	-	-	-	+	-	+	-	-	+
<i>Heracleum candicans</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Herminium lanceum</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Hypericum choisianum</i>	-	-	-	-	-	-	+	+	-	-	-	-
<i>Hypericum elodeoides</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Impatiens urticifolia</i>	-	-	-	-	-	-	+	+	+	-	-	-
<i>Indigofera heterantha</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Inula grandiflora</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Iris hookerana</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Iris kemaonensis</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Jasminum officinale</i>	-	-	-	-	-	-	+	+	+	-	-	+
<i>Juglans regia</i>	+	+	-	-	-	-	-	-	+	+	-	-
<i>Juncus leucanthus</i>	-	-	+	-	-	-	-	-	-	-	-	-
<i>Juniperus communis</i>	+	+	-	-	-	-	+	-	+	-	+	+
<i>Juniperus indica</i>	+	+	-	-	-	-	+	-	+	-	+	+
<i>Juniperus macropoda</i>	+	+	-	-	-	-	-	-	-	-	+	+
<i>Juniperus recurva</i>	-	+	-	-	-	-	+	-	+	-	+	+
<i>Jurinea dolomiaea</i>	-	-	-	-	-	-	-	-	+	-	+	-
<i>Lactuca bracteata</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Lactuca decipines</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Lactuca lessertiana</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Lathyrus humilis</i>	-	-	+	-	-	-	+	-	-	-	-	-
<i>Leonurus cardiaca</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Leucas lanata</i>	-	-	-	-	-	-	-	+	+	-	-	-
<i>Litsea umbrosa</i>	+	+	-	-	-	-	-	-	+	-	-	-
<i>Lonicera spinosa</i>	-	+	+	-	-	-	-	-	-	+	-	-
<i>Meconopsis aculeata</i>	-	-	-	-	-	-	+	-	+	-	-	-

Table 2 (Cont.)

Latin name	Timber/ Furniture	Fuel wood	Fodder	Fibre and flosses	Gums and resins	Tans and dyes	Ornamental landscape	Bee flora	Medicinal and Aromatic	Edible	Tantra- Mantra/ Ethno-botanical importance	Oil
<i>Malaxis muscifera</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Malva verticillata</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Morina longifolia</i>	-	-	+	-	-	-	+	+	+	-	-	-
<i>Myriactis wallichii</i>	-	-	-	-	-	-	+	-	-	+	-	-
<i>Nardostachys grandiflora</i>	-	-	-	-	-	-	-	-	+	-	+	+
<i>Nasturtium officinale</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Nepeta govaniana</i>	-	-	-	-	-	-	-	+	+	-	-	-
<i>Nepeta leucocephalla</i>	-	-	-	-	-	-	-	+	+	-	-	-
<i>Nepeta linearis</i>	-	-	-	-	-	-	-	+	+	-	-	+
<i>Nicandra physalodes</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Nicotiana tabacum</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Olea ferruginea</i>	+	+	-	-	-	-	-	-	+	+	-	+
<i>Origanum vulgare</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Orobancha cernua</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Osyris arborea</i>	-	+	-	-	-	-	+	-	+	-	-	-
<i>Oxyria digyna</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Oxytropis cachemiriana</i>	-	-	+	-	-	-	+	-	-	-	-	-
<i>Parnassia nubicola</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Pedicularis longifolia</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Pedicularis oederi</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Pedicularis pyramidata</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Pedicularis siphonantha</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Persicaria polystachya</i>	-	-	+	-	-	-	-	-	-	-	-	-
<i>Phlomis bracteosa</i>	-	-	-	-	-	-	-	+	-	-	-	+
<i>Phytolacca acinosa</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Picea simithiana</i>	+	+	-	-	+	-	-	-	-	-	-	-
<i>Picrorrhiza kurrooa</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Pimpinella diversifolia</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Pinus roxburghii</i>	+	-	-	+	+	-	-	-	+	-	-	+
<i>Pinus wallichiana</i>	+	+	-	+	+	-	-	-	+	-	-	+
<i>Plantago dipressa</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Plantago major</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Pleurospermum brunonis</i>	-	-	-	-	-	-	-	-	+	-	+	+
<i>Pleurospermum govanianum</i>	-	-	-	-	-	-	-	-	+	-	+	+
<i>Podophyllum hexandrum</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Polygonatum cirrhifolium</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Polygonatum hookeri</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Polygonatum multiflorum</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Polygonatum verticillatum</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Polygonum plebeium</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Potentilla atosanguinea</i>	-	-	+	-	-	+	+	-	-	-	-	-
<i>Potentilla cuneata</i>	-	-	+	-	-	-	-	-	-	-	-	-
<i>Potentilla polyphylla</i>	-	-	+	-	-	-	+	-	-	-	-	-
<i>Potentilla siboldi</i>	-	-	+	-	-	-	-	-	-	-	-	-
<i>Prenanthes brunoniana</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Primula denticulata</i>	-	-	-	-	-	-	+	-	-	+	-	-
<i>Prinsepia utilis</i>	-	+	+	-	-	+	-	-	+	+	-	+
<i>Prunella vulgaris</i>	-	-	-	-	-	-	+	+	+	-	-	+
<i>Prunus curnuta</i>	+	+	-	-	-	-	-	-	-	+	-	+
<i>Punica granatum</i>	-	+	-	-	-	+	-	+	+	+	-	-
<i>Quercus semecarpifolia</i>	+	+	+	-	-	+	-	-	-	-	-	-
<i>Rabdosia rugosa</i>	-	-	+	-	-	-	-	+	-	-	-	-
<i>Ranunculus arvensis</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Ranunculus diffusus</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Rhamnus virgatus</i>	+	+	+	-	-	-	-	-	+	-	-	-
<i>Rheum australe</i>	-	-	-	-	-	+	+	-	+	+	-	-
<i>Rheum moorcroftianum</i>	-	-	-	-	-	+	+	-	+	+	-	-
<i>Rhodiola bupleuroides</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Rhodiola himalensis</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Rhodiola imbricata</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Rhododendron anthopogon</i>	-	+	-	-	-	-	-	-	+	-	-	-
<i>Rhododendron arborium</i>	-	+	-	-	-	+	+	-	+	-	-	-
<i>Rhododendron campanulatum</i>	-	+	-	-	-	-	-	-	+	-	-	-
<i>Rhododendron lepidotum</i>	-	+	-	-	-	-	-	-	+	-	-	-

Table 2 (Cont.)

Latin name	Timber/ Furniture	Fuel wood	Fodder	Fibre and flosses	Gums and resins	Tans and dyes	Ornamental landscape	Bee flora	Medicinal and Aromatic	Edible	Tantra- Mantra/ Ethno- botanical importance	Oil
<i>Rhynchospermum verticillatum</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Ribes himalyense</i>	-	-	-	-	-	-	-	-	-	+	-	-
<i>Ricinus communis</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Rosa macrophylla</i>	-	+	+	-	-	-	+	+	-	+	-	-
<i>Roscoea alpina</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Roscoea capitata</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Roscoea purpurea</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Rumex acetosa</i>	-	-	+	-	-	-	-	-	+	+	-	-
<i>Rumex hastatus</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Rumex nepalensis</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Salix lindleyana</i>	-	+	+	-	-	-	-	-	-	-	-	-
<i>Salvia nubicola</i>	-	-	-	-	-	-	-	+	+	-	-	-
<i>Sarcococca saligna</i>	-	+	+	-	-	-	-	-	+	-	-	-
<i>Satyrium nepalense</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Sauromatum venosum</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Saussurea auriculata</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Saussurea gossypiphora</i>	-	-	-	-	-	-	+	-	+	-	+	-
<i>Saussurea obvallata</i>	-	-	-	-	-	-	-	-	+	-	+	-
<i>Saussurea roylei</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Saxifraga diversifolia</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Saxifraga moorcroftiana</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Saxifraga parnassifolia</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Scutellaria angulosa</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Sedum ewersii</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Selinum tenuifolium</i>	-	-	-	-	-	-	-	+	+	-	-	-
<i>Selinum vaginatum</i>	-	-	+	-	-	-	-	+	+	-	-	-
<i>Senecio cappa</i>	-	-	-	-	-	-	-	+	+	-	-	-
<i>Senecio chrysanthemoides</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Senecio rufinervis</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Silene edgeworthii</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Skimmia laureola</i>	-	-	+	-	-	-	+	+	+	-	+	+
<i>Smilacina purpurea</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Solanum pseudo-capsicum</i>	-	+	-	-	-	+	+	-	-	-	-	-
<i>Solidago virga-aurea</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Sorbaria tomentosa</i>	-	-	-	-	-	-	+	+	-	-	-	-
<i>Sorbus macrophylla</i>	-	-	-	-	-	-	+	+	-	-	+	-
<i>Spiranthes sinensis</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Spirarea bella</i>	-	-	-	-	-	-	+	+	-	-	-	-
<i>Swertia alternifolia</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Swertia angustifolia</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Swertia chirata</i>	-	-	-	-	-	+	-	-	+	-	-	-
<i>Swertia cordata</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Swertia paniculata</i>	-	-	-	-	-	+	-	-	+	-	-	-
<i>Swertia petiolata</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Swertia purpurascens</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Swertia racemosa</i>	-	-	-	-	-	+	-	-	+	-	-	-
<i>Swertia speciosa</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Syringa emodi</i>	-	+	+	-	-	-	+	-	+	-	-	-
<i>Tanacetum longifolium</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Taraxacum officinale</i>	-	-	-	-	-	-	-	-	+	+	-	-
<i>Taxus wallichiana</i>	+	+	+	-	-	+	-	-	+	-	+	-
<i>Thermopsis inflata</i>	-	-	+	-	-	-	+	-	+	-	-	-
<i>Thalictrum alpinum</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Thalictrum foliolosum</i>	-	-	-	-	-	+	-	-	+	-	-	-
<i>Thalictrum javanicum</i>	-	-	-	-	-	+	-	-	+	-	-	-
<i>Thymus serpyllum</i>	-	-	-	-	-	-	+	+	+	-	-	+
<i>Trifolium pretens</i>	-	-	+	-	-	-	+	+	-	-	-	-
<i>Trillidium govanianum</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Valeriana hardwickii</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Valeriana Jatamansii</i>	-	-	-	-	-	-	-	-	+	-	-	+
<i>Verbascum thapsus</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Vincetoxicum hirundinaria</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Viola biflora</i>	-	-	-	-	-	-	+	-	+	-	-	-

Table 2 (Cont.)

Latin name	Timber/ Furniture	Fuel wood	Fodder	Fibre and flosses	Gums and resins	Tans and dyes	Ornamental landscape	Bee flora	Medicinal and Aromatic	Edible	Tantra- Mantra/ Ethno- botanical importance	Oil
<i>Viola canescens</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Viola kamawarensis</i>	-	-	-	-	-	-	+	-	+	-	-	-
<i>Viola serpens</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Vitex negundo</i>	-	+	-	-	-	-	+	+	+	-	+	+
<i>Withania somnifera</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Woodfordia fruticosa</i>	-	+	-	-	-	+	+	+	+	-	-	-
<i>Wulfenia amherstiana</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>Xanthium strumarium</i>	-	-	-	-	-	-	-	-	+	+	-	+
<i>Zehneria umbellata</i>	-	-	-	-	-	-	-	-	+	+	-	-

superstitious belief is that the herbs loose healing power if their 'secret' is shared with 'outsiders' and another reason they cite is that herbs are useful only when used in combination with 'tantra-mantra' (i.e., occult practices).

CONCLUSION

The Parvati valley is very rich in plants with medicinal value and a concerted effort is needed for their conservation. To check the loss of biodiversity owing to overexploitation and habitat degradation, effective measures for conservation and management need to be put in place. Priority should be given for conservation of high-value species listed in this study (Figs. 1, 2). The involvement of local inhabitants with their local tradition and culture (Fig. 3) is very important for conservation of indigenous knowledge and traditional practices. The present study will serve as baseline information for planning and policy regarding the Parvati valley, rich in aesthetic and historically important places (Fig. 4).

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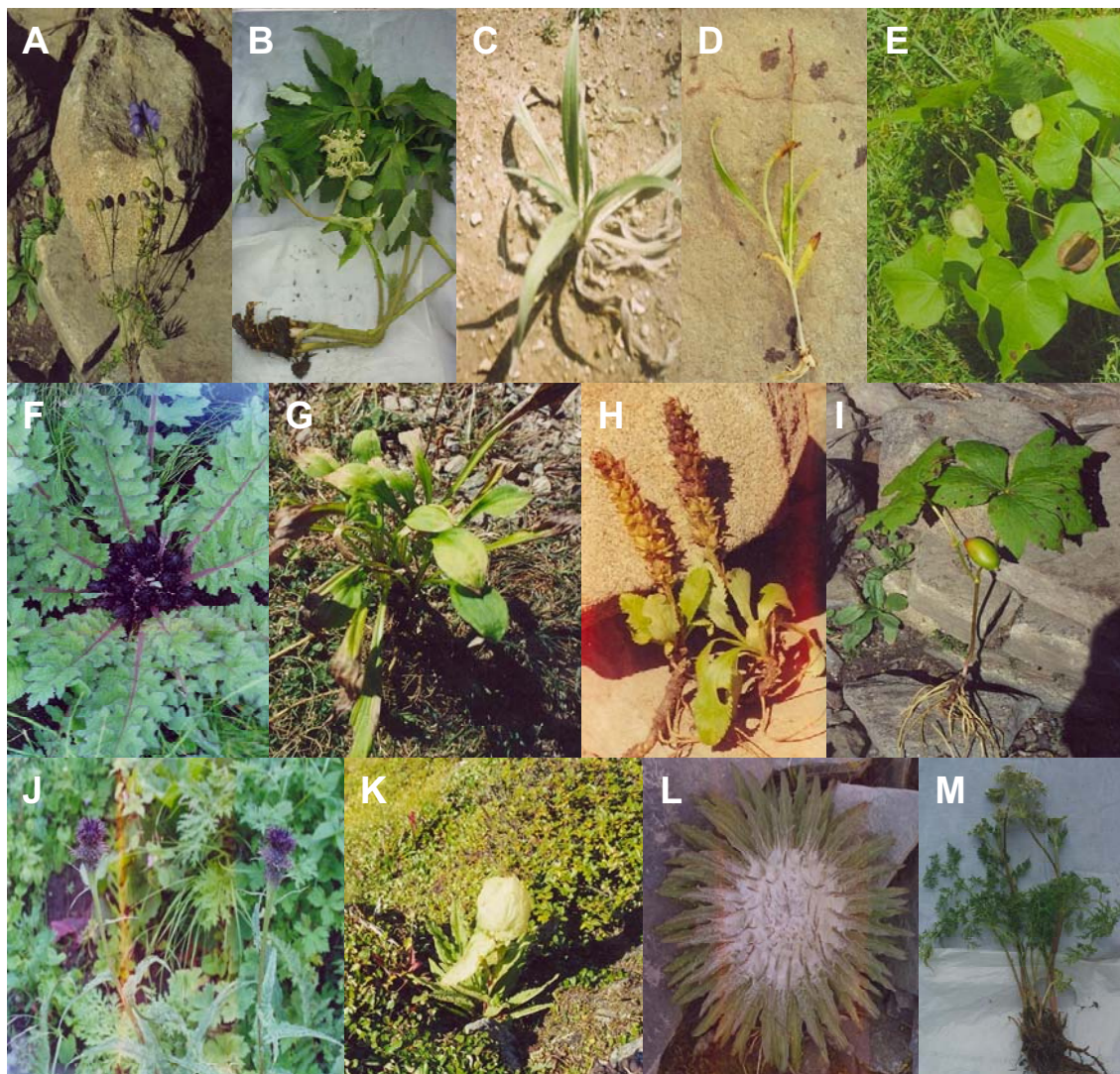


Fig. 1 Threatened species with high commercial value. (A) *Aconitum violaceum*; (B) *Angelica glauca*; (C) *Arnebia benthamii*; (D) *Dactylorhiza hatagirea*; (E) *Dioscorea deltoidea*; (F) *Jurinella macrocephala*; (G) *Nardostachys grandiflora*; (H) *Picrorhiza kurrooa*; (I) *Podophyllum hexandrum*; (J) *Saussurea roylei*; (K) *Saussurea obvallata*; (L) *Saussurea gossypiphora*; (M) *Selinum vaginatum*.

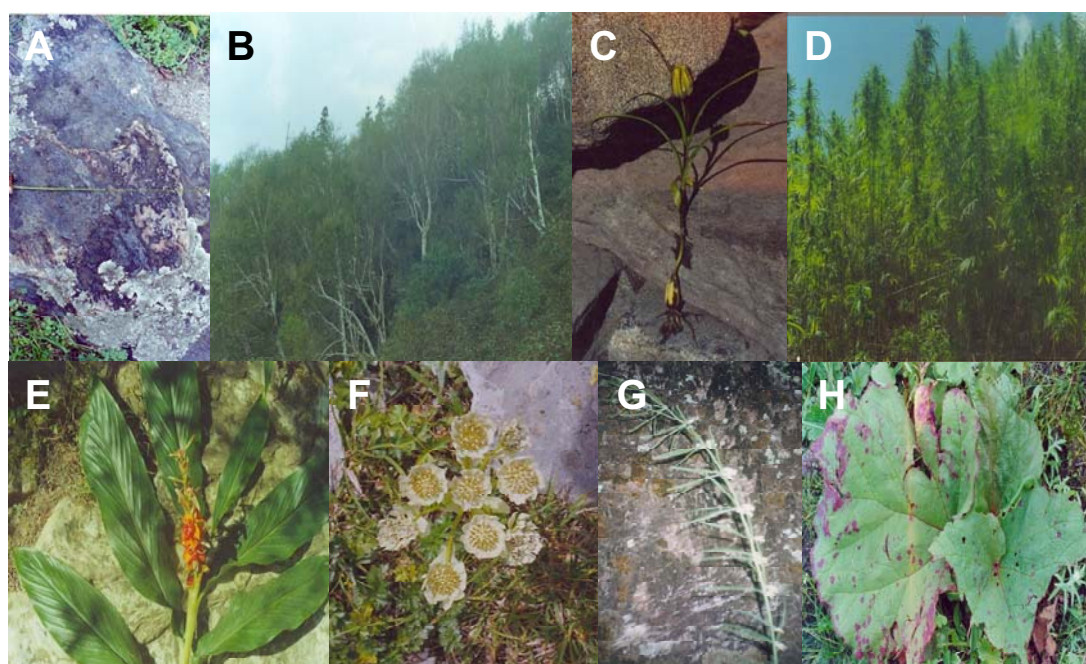


Fig. 2 Other high value economical important species. (A) *Acorus calamus*; (B) *Betula utilis*; (C) *Fritillaria cirrhosa*; (D) *Cannabis sativa* (Malana Village); (E) *Hedychium spicatum*; (F) *Pleurospermum candolii*; (G) *Polygonatum cirrihifolium*; (H) *Rheum webbianum*.



Fig. 3 Traditional culture and custom. (A) Musical instrument of local deity Jamlu, Malana village; (B) Local festival *Phagli* in Malana Village.

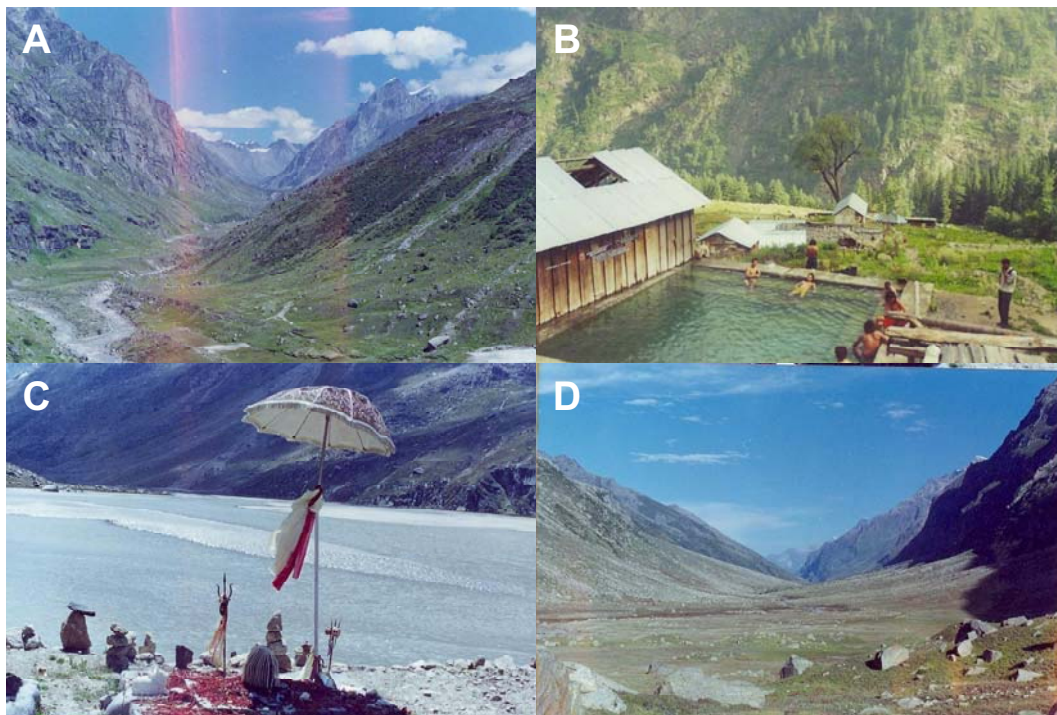


Fig. 4 Aesthetic and historically important places. (A) Dibinallah (proposed hydroelectric project site); (B) Khirganga (hot water spring); (C) Mantallai lake (source of Parvati river); (D) Udithach (largest alpine pasture in the valley).