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Ethno-botanical studies of some threatened medicinal plants and local perception of its population decline in Kargil, Ladakh UT

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Abstract
Kargil lies in the Trans-Himalayan region between 32°15`- 34°56`N latitude and 75°35`- 76°57` E longitude covering a geographical area of 14,086 Km^2 has a vast diversity of aromatic and medicinal plants. The traditional uses of medicinal plants to cure various ailments in the Kargil district have been practiced from ancient times. The present study was conducted to validate the information on ethnobotanical studies of some threatened medicinal plants in the region and local people's perception of its population decline. Therefore extensive field survey was conducted in a different region of district Kargil of Ladakh UT from May 2015- September 2020 to observe the habitat, altitudinal ranges, flowering, traditional uses of threatened medicinal plants, and the factors which are operating for the depletion of these important taxa from their natural habitat. Interviews were conducted in Local languages from more than 1000 informants as the corresponding author is a native of the study area. A total of 22 threatened plant species (21Angiosperms, 1 gymnosperm) belongings to 17 genera, 14 families were traditionally used tribal peoples of the valley to cure various ailments. Most of the threatened taxa belong to the family Ranunculaceae followed by Asteraceae. From local people's perception, land-use change, illegal exploitation, and the selling of plant parts in the black market are the worst threat to the depletion of these species.
Significance Statement: The flora of Ladakh is crying for Conservation due to factors such as climate change, bio-piracy, smuggling, pre maturation harvesting pressure, poverty, unemployment, human interference which leads to their extinction in the near future. Therefore it's very pertinent to develop conservation strategies and adopt Sustainable utilization practices. For this mass awareness programs on sustainable utilization and conservation of these threatened medicinal plants need to be conducted by involving various stakes-holders, universities, colleges, schools, and other various government and non-governmental organizations.

Keywords: Threatened plants, Kargil ethno-botany local perception conservation approaches.

1. Introduction
World Health Organization estimates that more than 75-80% population of the developing world depends on traditional medicine for primary healthcare [1, 2]. WHO recorded more than 20,000 plant species globally used as medicine [3]. Medicinal plants also become a source of income for millions of people. Ethno-medicine has kept its fame in all regions of the developing world and its use is tremendously increasing in industrialized countries [4]. Ladakh is a newly formed Union Territory (5th August 2019) separated from the state of Jammu & Kashmir. It is considered as the "cold desert of India" due to its unique topographic, physiographic, and climatic conditions. It consists of two districts *viz*; Leh and Kargil which covers an area of more than 78,000 Km^2 which lies between 32°15`50 – 34°38`11 N latitudes and 75°36`73 - 78° 22`11 E longitudes at an altitude of 2700- 7560m [5-7]. Kargil lies in the Trans-Himalayan region between 32°15`- 34°56`N latitude and 75°35`- 76°57` E longitude covering a geographical area of 14,086 Km^2 possess huge diversity of temperate, alpine, and subalpine flora. Ethnobotanically Ladakh is explored by various authors such as [8-12]. However, they stick to the specific ethnic group. Kargil district is the ethnobotanical least explored region of Ladakh despite being vast socio-cultural and religious diversity. Besides this maximum floristic diversity in Ladakh are occurred in the Kargil district. Therefore in this present work, an attempt has been made with the assistance and collaboration of local peoples, herbalists, old aged peoples and herbal experts of various social and cultural tribes of Kargil

district to substantiate a clear picture of traditional uses of some threatened medicinal plants and their perception and views on its population decline.

Materials and Methods

Study area: Kargil district is located between 32°15`-34°56`N latitude and 75°35`- 76°57` E longitude (*Garmin etrex 10, 30*) covering a geographical area of 14,086 sq. Km and shares its boundaries with Pakistan in the North, Leh district in the East, and Kashmir in the West. Extensive field surveys were conducted in a different region of the Kargil district of Ladakh UT from Zojila-pass to Zanskar. Which include the main valleys such as Drass, Hundurman, Batalik, Gargardo, Darchiks, Darkon, Chiktan, Shargole, Sapi, Soth, Kargil, TSG, Sankoo, Barsoo, Suru, Rangdum, and Zanskar from May 2015- September 2020. A field survey was conducted every year from the commencement of spring to the onset of autumn to gain maximum information about the distribution, habitat, flowering season, traditional uses and causes of population decline and to cross-check the information of informants of former visits. The accuracy and reliability of gathered information were confirmed by visiting and interviewing the informants five to six times. Videos, Photographs, and live specimens were shown to the informants such as herbalists, older peoples, plant experts, "*Aabs, Amchis*", to get relevant and authentic information on traditional uses (table 2). One question is asked strictly to every informant I. e., Did you noticed that the population of this particular species is declined day by day?, What is your perception about this? Data on elevation, latitude, longitude were recorded by GPS (Garmin *etrex-30*) specimen habit, habitat, and flowering season were recorded on the spot by keenly observing the specimen. All specimens were identified on the spot with the help of local floras, databases, standard literature, and with the help of regional taxonomic experts. Voucher specimens were deposited in Kashmir University KASH Herbarium, Department of Botany. The scientific name is checked from the database *theplantlist.org*.

Result and Discussion

Total 22 threatened plant species (21Angiosperms, 1 Gymnosperm) belongings to 17 genera, 14 families were traditionally used by tribal peoples of Kargil to cure various ailments (Table 2). Most of the threatened taxa belong to the family Ranunculaceae followed by Asteraceae (Figure2). Maximum threatened plants were herbs (91%) followed by shrubs (9%) (Figure1). Roots were the most used parts followed by leaves and whole plants (Figure 3). Most of the threatened species belong to alpine vegetation and luxuriantly grows in mesic to wet habitats (Table 2). Every species is used to cure various types of diseases, but most of them used to cure digestive and respiratory-related diseases (Table 2). According to the informant's perception, collection of rhizomes of *Aconitum species* and *Dactylorhiza hatagirea*, *Arnebia euchroma*, *Bergenia sps*, *Picrorhiza kurrooa*, and selling it in the black market is the main cause for the depletion of these important Texas. To obtain this useful plant parts the smuggler targeted the primary and middle school children's, and unemployed youths, to collect the roots and other useful parts of these plants. Useful plant parts were sold at different costs which are mentioned in (Table 1). Besides this, another factor that we observed from the informants is the pre-harvesting pressure and introduction of exotic fodder plants. Elderly and uneducated women have great knowledge of the traditional uses of medicinal plants in Ladakh. The knowledge of medicinal plants decreases significantly with the increases in the educational level of the informants. The new generation did not even know the vernacular name of plants growing is in their vicinity.

Conclusions

Kargil has a rich cultural and floristic diversity. Most of the area in kargil district falls under the transitional zone which possesses unique diversity. Most of the threatened plants were used to cure several diseases. The plants of Kargil were facing the tremendous threat of their extinction due to factors such as land use-change, climate change, bio-piracy, smuggling, pre maturation harvesting pressure, poverty, unemployment, human interference. These plants were in need of. Therefore it's very pertinent to develop conservation strategies and adopt Sustainable utilization practices. For this mass awareness programs on sustainable utilization and conservation of these threatened medicinal plants need to be conducted by involving various stalk-holders, universities, colleges, schools, and other various government and non-governmental organizations.

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Table 1: Price of some threatened plant parts in local market

Scientific Name	Part sold	Local Price INR per kg
Aconitum heterophyllum	Root tubers	Rs. 2500
Aconitum violaceum	Root tubers	Rs. 1000
Dactylorhiza hatagirea	Rhizome	Rs. 800-1000
Hippophae rhamnoides	Fruits	Rs. 400

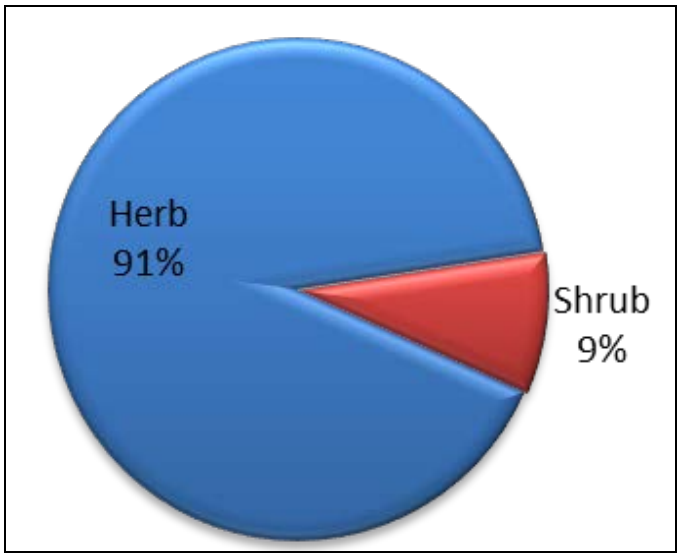


Fig 1: Pie chart showing habit of plant species in percentage

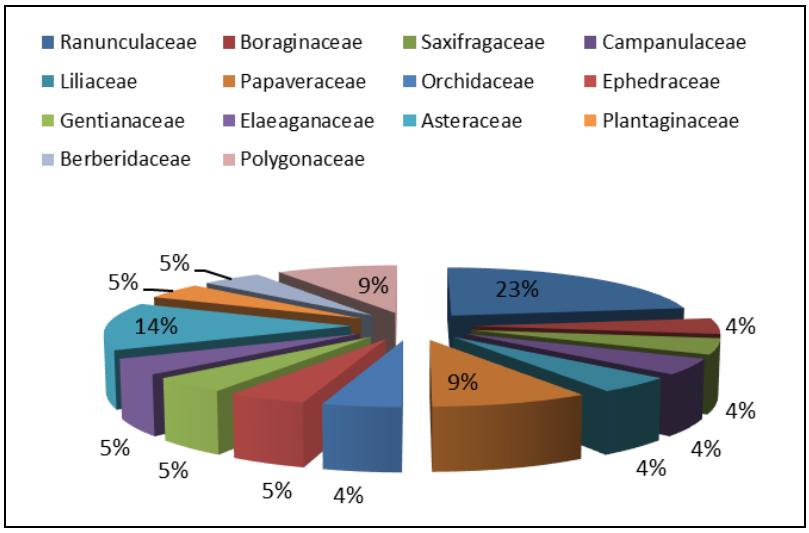


Fig 2: percentage contribution of threatened species

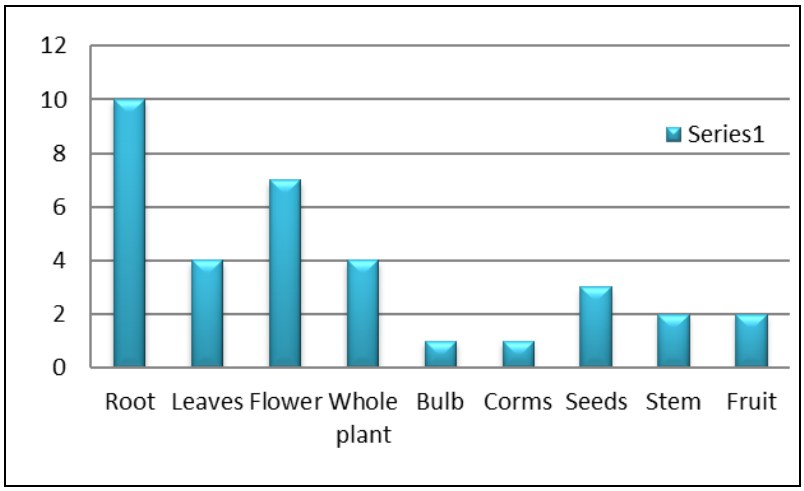


Fig 3: Plant parts used to cure ailments

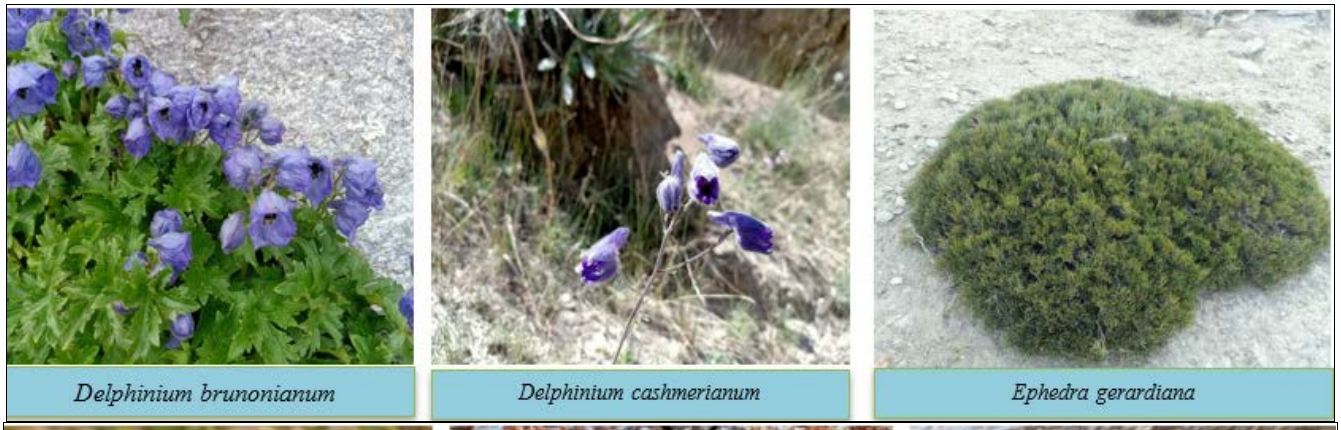
Table 2: Ethno-medicinal uses of threatened medicinal plants in Kargil district of Ladakh Himalaya to cure various ailments by indigenous tribes.

Scientific Name	Family	Local Name	Life form	Altitude (meter) asl	Flowering	Habitat	Part used	Medicinal uses/ and mode of administration	IUCN-Status
Aconitum heterophyllum Wall. ex Royle	Ranunculaceae	Karpo-Bova/ Bona-Karpo	Biennial or perennial herb	3200-3600	Mid-June - July	Moist damp soil, semi-shaded places, under the shade of Salix species, moist abandoned lands in villages.	Root tuber	**Powder:** Root tubers were ground into a fine powder. A half teaspoon full of this powder was taken orally along with one glass of milk with an empty stomach early in the morning to cure Toothache, gastric disorders, and expulsion of intestinal worms particularly *Ascaris lumbericoides*. **Decoction:** Root decoction is useful to relieve headache, intestinal complaint, fever, diabetes, vomiting, and diarrhea. A raw root tuber is kept between the teeth to cure toothache.	Endangered
Aconitum violaceum Jacq.ex Stapf	Ranunculaceae	Nagpo Bova/ Boma-nagpo	Biennial herb	3200-3800	Mid-June-August	Moist damp soil along the bank of irrigation canal, bank of streams, springs, semi-shaded damp places. It is strictly distributed along the edges of continuous springs and streams.	Root tubers	**Powder:** 10-15 mg of root powdered is used along with honey or milk to cure cough, asthma, high fever, lung problem, rheumatism, gastric problems. **Root paste:** Paste of root powdered is applied to cure boils and sciatic pains. **Decoction:** Dried root powdered is used to kill intestinal parasites.	Vulnerable
Aconitum rotundifolium Kar. & Kir.	Ranunculaceae	Ree- Bova/ Ree-boma	Biennial herb	3800 – 4440	Mid-July – August	Alpine grasslands, bank of alpine streams, stabilized mesic to wet habitats.	Root tubers	**Powder:** Half tea-spoon root powdered is taken along with warm milk to cure stomach trouble, intestinal worms, abdominal pains, dizziness, indigestion, blood purifier, and cough.	Vulnerable
Arnebia euchroma	Boraginaceae	Sgrons/ sbrons/	Perennial herbs	3550-4840	Mid May-August	Stabilized sandy or gravel slopes, screes,	Root, leaves	**Decoction:** Dry root decoction is very effective to cure Lungs problems,	Endangered

(Royle) I.M. Johnst		Demok				moistly found on brownish sandy soil on rocks, between boulders, Arid to semi-arid habitat.		pulmonary diseases, and purification of blood, nose bleeding. **Extract:** Roots were rinsed in mustard oil for a week, and then it is applied to overcome hair loss, strengthening hair, and remove dandruff. Leaf powdered is taken orally against dry cough. Root and leaf paste is applied externally to relieve back pains and healing of cuts and wounds.	
Bergenia stracheyi (Hook.f. & Thomson) Eng.	Saxifragaceae	Gatikpa/ Shapur	Perennial herb	3680-4300	June-August	Moist rocky slopes, snow or stream-fed rocks cervices, damp sloppy steppes, semi-arid to mesic habitat.	Rhizome, leaves, flowers	**Powder:** Roots are collected in the month of August-September and shade dried. A pinch of dried rhizome powdered is then taken orally to dissolve kidney stone, cure lung inflammation, heartburn, menorrhagia, and urinary related problems. Leaf paste is applied externally on cuts and wounds. Root paste is beneficial to relieve body pains. **Decoction:** A cup of leaf and flower decoction is effective against indigestion and fever.	Vulnerable
Codonopsis clematidea Schrenk & C.B. Clarke	Campanulaceae	Fak-fak/ Mokhting	Perennial herbs	3150-4100	July-August	Semi-arid to mesic habitat, Mostly present under the shade of boulders, stabilized moist semi-shaded places near inhabitants, along the margins of cultivated fields, Near alpine stream banks.	Whole plant	**Decoction:** Root decoction is helpful to cure stomach ulcer, GERD, Whole plant part decoction is used to treat gout, liver disorders, chest conjunction, nerves disorder, rheumatism. **Paste:** Root pastes are applied on cuts and wound portions to stop bleeding and healing of wounds. Flower and root are consumed as raw by local peoples.	Rare
Colchicum luteum Baker	Liliaceae	Tukapa/ Kapi-cherik	Biennial or perennial herb	3300-3800	May-early June	Stabilized and un-stabilized gravel or sandy slopes when melting of snow brought abundant moisture.	Bulb, corms, seeds, flower	Blub is directly consumed as it is claimed to cure gout. Corms and seeds are the rich sources of drug “colchicine” which is used to treat inflammation, cough, and fever.	Endangered
Corydalis govaniana Wall	Papaveraceae	Maqshang/ Stongzil	Perennial herb	3780-4550	July-August	Arid to mesic habitat, Alpine meadows, stony moist slopes nearer to alpine streams.	Whole plant parts	**Decoction:** plants were collected early morning and sun-dried, then the decoction of dries aerial shoots such as leaves, flowers were given to a patient suffering from back pain, joint pains, cold, cough, abdominal pain, gastric problems, constipation and also acts as a blood purifier. Tribal peoples collected them during the summer season and stored them in dried shaded places for usage in winter when getting necessary.	Vulnerable
Dactylorhiza hatagirea (D.Don) Soo	Orchidaceae	Angu-lakpa	Perennial herbs	3100-3800	Mid-June-July	Wet muddy damp soil, wet alpine meadows, Banks of streams and springs.	Root tubers	Roots are directly consumed as it is considered as rich sources of vitamins and minerals. **Powder**: Tubers are dried and ground into powdered than it is given to pregnant ladies, weak child, and old aged peoples. It acts as a health tonic. Besides this, its rhizome is claimed to be highly beneficial to cure Kidney disorders, fever, sedative, dysuria, diarrhea, cuts, wounds, and roundworms.	Critically Endangered
Delphinium brunonianum Royle	Ranunculaceae	Bila-mindok	Perennial herbs	3900-4900	July-August	Arid to mesic habitat, screes, cervices of big rocks, between boulders on sandy soil.	Flower and Seed	Flower juice is used for curing colic disorders. It is considered poisonous and used as an insecticide and antiseptic.	Vulnerable
Delphinium cashmerianum Royle	Ranunculaceae	Chagotpa/ Bila-mindok	Perennial herbs	3200-4350	July-August	Mesic habitat, turf soil along the banks of irrigation canal, moist stabilized slopes on gravel soil.		Flower juice is used for curing colic disorders. It is considered poisonous and used as an insecticide and antiseptic.	Vulnerable
Ephedra gerardiana Wall. ex Stapf	Ephedraceae	Chepaat/ Tsepath	Shrub	3250-3540	August-September	Hard stony stabilized places, arid habitat, screes at lower elevation in Suru valley and Rangdum	Whole plant	**Decoction:** decoction of aerial shoots is given to the patient suffering from asthma, cough, rheumatism, pneumonia, Ripened fruits are consumed as raw, as it is claimed to be very beneficial for blood purification, menstrual irregularities, anti-cancerous and liver tonic.	Endangered
Gentiana algida Pallas	Gentianaceae	Chukiting	Perennial herbs	3300-3900	Mid-July-September	Wet alpine meadows, grasslands, bank of streams, damp snow	Flowers	**Decoction:** Flower decoction was taken orally before sleep to cure ailments like esophagus infection inflammation of	Endangered

						bed pastures. Mosses rich springs		stomach, lung, cough, sore throat, and epidemic fevers.	
Hippophae rhamnoides L	Elaeagnaceae	Chak-ldum /Cherma /Sastaluloo	Perennial Shrubs	2850-3800	Mid-June-September	Arid to mesic habitat, along the bank river deposited sandy and gravel soil, stony area, and abandoned lands.	Leaves, flower, fruits, seeds	**Decoction:** leaves and flower decoction are used to cure ailments like lung infection, cardiac disorders. Fruit and seeds are consumed as it is claimed to be rich sources of vitamins Such as Va, Vb, Vc, Vk, carotenoids, and minerals. It is believed to have anti-aging, anti-cancerous properties, immune booster, Fruit juice extract has been claimed to be beneficial for diabetic patients, against ulcers, joint pains, blood pressure, and wounds.	Rare
Inula racemosa Hook.f	Asteraceae	Manu	Perennial herbs	2800-3500	July to Late August	Mesic habitat, mostly cultivated in Kargil and Leh	Root, Leaves	**Powder:** Dried root powdered were taken along with warm water or milk to cure stomach trouble, acidity, chest pain, cold, fever. Root or leaf paste is applied externally to heal the wound.	Endangered
Meconopsis aculeata Royle	Papaveraceae	Achay-na numo-mindok	Perennial herbs	4300-4650	July-September	High Alpine screes, between large rock boulders, Semi-arid to mesic habitat. Moist snow beds between	Whole plant parts	**Extract:** whole plant part extract is given to the patient in small doses for a week against gastric related discomforts. Leaf paste is applied externally on swelling portions of legs caused due to long walks.	Critically Endangered
Picrorhiza kurrooa Royle ex Benth	Plantaginaceae	Kaor	Perennial herbs	3850-4200	June-August	Alpine meadows, moist alpine pastures	Root	Rhizomes are collected washed and shade dried completely and ground into fine powdered which is then taken orally along with one cup of warm water or milk to kill roundworms and other intestinal parasites, stomachs, and intestinal infection. A decoction of root powdered is considered to be beneficial for diabetic and jaundice patients. It is also used to cure burning urination and kidney disorders.	Endangered
Podophyllum hexandrum Royle	Berberidaceae	Dainmi-koshu / Tandik	Perennial herbs	3300-4000	May-June	Mesic habitat, semi-shaded damp soils, under the shade of *Salix Species*,	Flower, Fruit	Dried as well as raw fruit was consumed directly as it is believed to be helpful for curing gynecological disease like menstrual irregularity, improves lung and blood circulation, helps in parturition, skin diseases, anti-cancerous	Endangered
Rheum spiciforme Royle	Polygonaceae	Lhachu	Perennial herb	3500-4800	July-August	Mesic alpine stony slopes	Root, Stem	The stem is consumed as raw as it has a sour taste. It is used to treat swelling wounds, rheumatism, fever, Internal damages, chronic bronchitis, and piles.	Vulnerable
Rheum webbianum Royle	Polygonaceae	Oma-khul/ Lachoo	Perennial herb	3500-4200	July-August	Alpine stony mesic slopes, between boulders. Screes, alpine pastures	Root, Stem	Root and stem were consumed as raw as it was claimed to be rich sources of vitamin C and ascorbic acid. A paste of stem is applied to cure boils. Besides this, it also acts as an appetizer, astringent, purgative, health tonic.	Vulnerable
Saussurea bracteata Decne	Asteraceae	Spangsi-tawo	Perennial herb	4200-4800	Mid-July-August	Alpine meadows, stony moist slopes	Leaf, flower buds	**Paste:** a paste of flower buds is applied externally to cure boils, cuts, and wounds, applied on the forehead to relieve headache.	Vulnerable
Saussurea costus (Falc.) Lipsch.	Asteraceae	Rulta	Perennial herb	2700-3600	July-September	Mostly cultivated in Leh and Kargil	Root	Roots were used to cure various ailments such as cancer, diabetes, ulcer, kidney disorders, central nerve problems, Gastric troubles and dysentery	Critically Endangered


Arnebia euchroma
Bergenia stracheyi
Codonopsis clematidea
Colchicum luteum
Corydalis govaniana
Dactylorhiza hatagirea


Delphinium brunonianum
Delphinium cashmerianum
Ephedra gerardiana


Gentiana algida
Hippophae rhamnoides
Meconopsis aculeata
Podophyllum hexandrum
Rheum spiciforms
Rheum webbianum

References

1. Famsworth NR, Akerele O, Bingel AS *et al*. Medicinal plants in therapy. Bulletin of the world health Organization 1985;63:965-981.
2. Singh JS. The biodiversity crisis. A multifaceted review. Curr Sci 2002;82(6):638.
3. Pandey MM, Rastogi S, Rawat AK. Indian herbal drug for general health care- An overview. The Internet Journal of Alternative Medicine 2008;6(1):1-10.
4. WHO World Health Organization Traditional Medicine Strategy 2002, 11.
5. Kala CP. Floral Diversity and Distribution in the High Altitude Cold Desert of Ladakh, India. J. Sustain. For. 2011;30:360-369. https://doi.org/10.1080/10549811.2011.534036
6. Stewart JL. I. Notes of a Botanical Tour in Ladak or Western Tibet. Trans. Bot. Soc. Edinburgh 1870;10:207-239. https://doi.org/10.1080/03746607009468684
7. Hartmann H. A summarizing report on the phytosociological and floristical explorations (1976 - 1997) in Ladakh, India, 2009.
8. Angmo K, Adhikari BS, Rawat GS. Changing aspects of Traditional Healthcare System in Western Ladakh, India. J Ethnopharmacol 2012;143:621-630. https://doi.org/https://doi.org/10.1016/j.jep.2012.07.017
9. Ballabh B, Chaurasia OP. Herbal Formulations from Cold Desert Plants Used For Gynecological Disorders 2011;9:59-66.
10. Ballabh B, Chaurasia OP, Singh SB. Traditional medicinal plants of cold desert Ladakh-Used against kidney and urinary disorders 2008. https://doi.org/10.1016/j.jep.2008.04.022
11. Navchoo IA, Buth GM. Medicinal system of Ladakh, India. J Ethnopharmacol 1989;26:137-146. https://doi.org/https://doi.org/10.1016/0378-8741(89)90061-5
12. Namtak S, Sharma RC. Medicinal plant resources in Skuru watershed of Karakoram wildlife sanctuary and their uses in traditional medicines system of Ladakh India 2018. https://doi.org/10.15406/ijcam.2018.11.004