

Current status, distribution and ethno-medicinal values of medicinal plant in hilly regions of Darjeeling district of West Bengal

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Eastern Himalayas region is presumed to be a potent source of medicinal plants due to wide variations-both in topography of land, soil type and their climatic conditions. Nature has been particularly generous in her gift of sylvan treasures to the Darjeeling district. Studies of flora related to medicinal values have become immensely important particularly in northern tract of West Bengal zone especially in the context of hilly area. The Hill zone mainly comprised of three hilly subdivisions, Darjeeling, Kalimpong and Kurseong, situated in the northern part of the state of West Bengal, India lying between 20°31' and 27°31' North latitude and between 87°59' and 88°53' East longitudes respectively. The geographical area of this zone is about 3115 sq km which is 3.5% of the state area. Several known weeds found in these area have been put to certain economic use since ages, and their medicinal use is perhaps the most ancient one of India (Jain, 1968). Many weeds have made good contribution to the development of ancient India *Materia medica*. The *Charaka Samhita*, one of the earliest treaties on Indian medicine records the use of several drugs of weed origin. Even now tribal doctors gather several weeds to meet the demand of their medical profession in remote villages (Gupta, 2003). Many plant which grow as weed in this area also gets important as medicinal plant (Mukherjee, 2008).

Information on the ethno-medicinal value of plants is very scanty. It is very important for local people to know about plants with its medicinal value and its importance in the present context. In view of these facts, the present study was undertaken to investigate the distribution pattern and ethno-medicinal values of various endangered medicinal plant in hilly tracts of Darjeeling district of West Bengal.

The studies of medicinal plant communities in the hilly tracts and adjoining area were conducted under the Regional Research Station (RRS) (Hill zone) of Uttar Banga Krishi Viswavidyalaya, which is located at Kalimpong. It is one of the three hilly subdivisions, at an altitude of approximately 1250 m. There are two more substations, Dalapchand and Pedong, under RRS, Kalimpong, situated at a distance of 10 km and 25 km respectively from the main
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station and at an altitude of 1600m each. Collection of necessary information was done through survey by specially designed pretested schedule by following interview method with local people, Vaidya and Scientist. Thirty five medicinal plants were identified. Purposive sampling method was followed and mostly confined to adjoining areas of research stations and forest area of Mongpoo, Lava, and Lolegaon region. Detailed studies on medicinal flora and their distribution pattern and medicinal values were studied during the year of 2005 to 2008, with main objective was to conservation of important medicinal plants which are becoming day by day on the verge of extinction stage.

During survey soil sample taken in zig zag pattern. A representative composition of soil sample can be composed of 8 to 20 sub sample from terrace land. Soil sample were analyzed as per standard procedure by Jackson (1973). Medicinal plant was collected and morphological characteristics, life cycle, habitat and ethno-medicinal values were noted after proper identification. The nomenclature and author citation of the species was done as per Moody (1981) and Nayarko (1991). The vegetation of different parts of the study area was thoroughly explored by repeated visits during different season of the year, covering all ecological habitats represented in the area. For the status survey, population of selected species in various habitats of were identified using vertical belt transects, 60 m long and 30 m wide as suggested by Misra (1968). Ten quadrat of 1X1 m size were laid randomly in each stand. Individuals of all species were counted in each quadrat. Analytical feature for the population study was calculated following Misra (1968).

The soil in these hilly zones is mostly categorized as brown forest soil due to their characteristic reddish brown or brownish colour. A perusal of soil fertility classes suggest that soil of this zone are high in organic carbon and potassium content but deficient in available phosphorous. The soil reaction varies from highly acidic to neutral in nature. About 80% of soil are highly acidic (pH <4.9), 60% of the remaining soil are moderately acidic (pH 5.0-5.9) and rest are neutral (pH 6-6.5). The soils of the zone mostly categorized as brown forest (typical

Dystrochrepts – Haplaquepts) with organic carbon ranging from 1.11 to 1.42%, light textured, highly porous and very low in water holding capacity. The average rainfall varies from 2500-3000 mm of which 80% is received during June to September. Snowfall during January to March is also very common in areas above 2200 m. The average maximum and minimum temperatures recorded round the year was 20° and 2°C respectively. The temperature in this zone also varies from month to month due to altitude. The relative humidity also varies from 70 to 80% depending on the locality and season of the year. At higher altitudes humidity often causes accumulation of fog and thereby inhibiting the intensity of light

Studies conducted in this region revealed that there were 35 medicinal plants (Table 1) belong to 25 families (Table 3). The species of medicinal plants found in this hilly area comprised of mainly *Aconitum ferox*, *Acorus calamus*, *Artemisia nilagrica*, *Astilbe rivularis*, *Bergenia ciliate*, *Cephaelis ipecacuanha*, *Ceritella asiatica*, *Clematis buchanaria*, *Dioscorea composite*, *Dichroa febrifuga*, *Drymaria diandra*, *Digitalis purpurea*, *Eupatorium cannabinum*, *Ficus semicordatus*, *Fraxinus floribunda*, *Gentiana kurro*, *Heracleum wallichii*, *Litsaea cubeba*, *Nardostachys grandiflora*, *Oroxylum indicum*, *Panax pseudo-ginseng*, *Paederia foetida*, *Phytolacca acinosa*, *Picrorhiza kurrooa*, *Podophylum hexandrum*, *Przewalskia tangutica*, *Pteris biaurita*, *Rheum modi*, *Rhus semialata*, *Rumex nepalensis*, *Swertia chirata*, *Thysamolaena maxima*, *Urtica dioica*, *Viscum articulatum*, *Valeriana officinalis*. Out of this plant species *Gentiana kurro*, *Heracleum wallichii*, *Nardostachys grandiflora*, *Picrorhiza kurrooa*, *Podophylum hexandrum* and *Swertia chirata* are severely under threat due to over exploitation from this range (Table 2). Low density of *Abutium indicum*, *Swertia chirata* and *Podophylum hexandrum* in the present study site may be due to restricted distribution and high pressure, legal and illegal exploitation by local inhabitants for use in the local health system and also high demand in the market (Semwal *et al*, 2007).

Survey revealed that phyto diversity of medicinal plant in the hills of Darjeeling is under threat due to (i) Habitat loss and fragmentation of land (ii) Introduced species of new genotype (iii) Over exploitation of plant and animal species, (iii) Heavy eroded area (iv) Erratic use of natural resources (v) Deforestation going on large verge (vi) Heavy exploitation of threatened species such as *Nardostachys grandiflora*, *Picrorhiza kurrooa*, *Podophylum hexandrum* and *Swertia chirata* from high altitude (such as Lava, Rishab and Ghum region) by modern pharmaceutical industry.

The ecotone regions in the hills of Darjeeling district are richest zone of various medicinal plant and deserve immediate preservation. Diversity of plant will mean diversity of insect birds and animals. It can be inferred from study that as we are losing lots of our plant sources day by day due to deforestation, changing microclimate or by large scale dissemination of this invaluable medicinal plant by unauthorized person from this area. In order to safeguard this knowledge, it should be documented, preserved and patented. Further, the alkaloids, metabolites and other complex chemical substances that are responsible for curing diseases and have aesthetic importance need to be identified for the use of pharmaceutical industry and for domestic purpose also. A concentrated effort by scientist, farmers, financiers and political leaders is called for, to benefit from the knowledge and resource nurtured on the lap of this part of Himalayas, over thousand of years.

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Table 1. Plant species found in the hilly tracts of Darjeeling district and their medicinal property.

Sl. No.	Name of the medicinal plant and its family	Common name	Type	Habitat	Use
1	<i>Aconitum ferox</i> (Ranunculaceae)	Bikh, Bikhma (Nepali)	Perennial erect herb, 1-1.5m	2100-4000m	Root used to treat Rheumatism
2	<i>Acorus calamus</i> (Araceae)	Bojho (Nep)	Perennial erect herb, 1m	1000-2000m	The extract of fresh rhizomes applied in the forehead to treat fever
3	<i>Artemisia nilagrlica</i> <i>A. vulgaris</i> (Asteraceae)	Titay patee (Nep)	Perennial erect herb, 1-1.5m	1500-2000m	Extract used on cuts and bruises to stop bleeding, nose bleeding in particular
4	<i>Astilbe rivularis</i> (Saxifragaceae)	Buriokhati (Nep)	Shrub, 1-2m	1600-3300m	Flowers edible; root extract consumed to cure dysentery and diarrhoea
5	<i>Bergenia ciliata</i> (Saxifragaceae)	Pakhanbed (Nep)	Perennial herb with creeping rhizomes	1500-3000m	Fresh leaves chewed to stop diarrhoea and vomiting
6	<i>Cephaelis ipecacuanha</i> (Rubiaceae)	Ipecac	Trailing herb	600-1400m	The dried rhizome is used as remedy in dysentery, cold, cough and asthma. It is also used to treat piles and gonorrhoea.
7	<i>Ceritella asiatica</i> (Apiaceae)	Golpatta, Ghoratapray (Nep)	Creepers	Marshy banks of rivers, streams and pond	Decoction of aerial parts taken orally to cure blood pressure
8	<i>Clematis buchannaria</i> (Ranunculaceae)	Pinasay Lahara (Nep)	Climbers	1800-2800m	Smashed roots inhaled after warming to cure nasal congestion
9	<i>Dioscorea composita</i> (Dioscoreaceae)	Dioscorea	Twining herb	200-1500m	Diosgenin obtained from the tubers are used in treatment of rheumatic arthritis and in preparation of sex hormones
10	<i>Dichroa febrifuga</i> (Hydrangeaceae)	Basak (Nep)	Shrub, upto 2m	900-2400m	Decoction of leaves taken orally to cure fevers
11	<i>Drymaria diandra</i> , <i>D. cordata</i> (Caryophyllaceae)	Abijal (Nep)	Procumbent herb, upto 20 cm	1000-2000m	Juice of the aerial part useful as laxative and antifebrifuge
12	<i>Digitalis purpurea</i> (Scrophulariaceae)	Foxglove	Biennial or perennial herb, upto 1.2m	1500m	The dried leaves helps in restoration and regulation of the function of the heart

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Sl. No.	Name of the medicinal plant and its family	Common name	Type	Habitat	Use
13	<i>Eupatorium cannabinum</i> (Asteraceae)	Banmara, Kalijhar (Nep)	Erect herb, upto 1m	1000-2000m	Leaves extract used on cuts and bruises to stop bleeding and infection
14	<i>Ficus semicordatus</i> <i>F. cunia</i> (Moraceae)	Rai Khanu, Khasaray, Khanu (Nep)	Tree, about 13m high	300-1000m	Latex from bark applied to treat boils
15	<i>Fraxinus floribunda</i> (Oleaceae)	Lakoore (Nep)	Deciduous tree, 14m high	300-1000m	Bark applied on gout after boiling; bark exudates used as laxatives
16	<i>Gentiana kurro</i> (Gentianaceae)	Karu, kutki, Nilkanth, kamalphul	Perennial herb	1500-3500m	The dried rhizomes of the plant is used for improving appetite and stimulating gastric secretion
17	<i>Heracleum wallichii</i> (Apiaceae)	Chimping (Nep)	Herb, upto 1m	1500-2500m	Fruits made into paste consumed to treat cough; root extract used as tonic
18	<i>Litsaea cubeba</i> (Lauraceae)	Siltimur, Timur (Nep)	Tree, upto 20m	1500-2500m	Fruits (dried or fresh) consumed to treat stomach disorder
19	<i>Nardostachys grandiflora</i> <i>N. jatamansi</i> (Valerianaceae)	Jatamansi (Nep)	Perennial herb	3600-4800m	Extract of underground portion used to stop hair loss; to cure epilepsy and palpitation
20	<i>Oroxylum indicum</i> (Bignoniaceae)	Totola (Nep)	Tree, upto 8m	Terai to 900m	Seeds pious to Buddhists and used in their religious ceremonies. Dry seeds used to treat throat infection
21	<i>Panax pseudo-ginseng</i> (Araliaceae)	Ginseng	Perennial herb	1800-3600m	Roots used as aphrodisiac
22	<i>Paederia foetida</i> (Rubiaceae)	Bael (Nep)	Climber	Foot hills	Extract of fruits applied to treat toothache
23	<i>Phytolacca acinosa</i> (Phytolaccaceae)	Jaringo (Nep)	Herbaceous plant, upto 1.5m	1500-2700m	Fresh leaves (collected without using any iron utensil) consumed orally to cure bodyache
24	<i>Picrorhiza kurrooa</i> (Scrophulariaceae)	Pennall kutki (Nep)	Perennial herb, upto 15cm	3000-5000m	Dried root extract consumed to cure fever, used to cathartic and purgative; and also used to treat dyspepsia
25	<i>Podophyllum hexandrum</i> (Podophyllaceae)	Papri (Nep)	Erect herb, to 50cm	3000-4000m	Roots decoction used as purgative
26	<i>Przewalskia tangutica</i> (Solanaceae)	-	Erect succulent herb, upto 35cm	5200-5400m	Dried root paste applied on swelling; also used to treat spasms

Sl. No.	Name of the medicinal plant and its family	Common name	Type	Habitat	Use
27	<i>Pteris biaurita</i> (Petridiaceae)	Thaday Uniu (Nep)	Perennial erect fern upto 1m	1600-2200m	Extract of stem applied on cuts and wounds to stop bleeding and to avoid infection
28	<i>Rheum modi</i> (Polygonaceae)	Padamchal (Nep)	Annual, 0.5m	1800-2000m	Root extract used as a purgative and astringent
29	<i>Rhus semialata</i> (Anacardiaceae)	Bhakimlo (Nep)	Tree, upto 10m	650-2000m	Extract of dry fruits consumed to treat diarrhoea and dysentery
30	<i>Rumex nepalensis</i> (Polygonaceae)	Halhaley (Nep)	Herb, upto 1m	1800-3000m	Extract of roots consumed to treat liver complaints; also applied to cure loss of hair
31	<i>Swertia chirata</i> (Gentianaceae)	Karst, Chirowto (Nep)	Herb, upto 60cm	1600-2600m	Decoction of leaves and stems consumed orally to treat fever
32	<i>Thysamolaena maxima</i> (Poaceae)	Amliso (Nep)	Perennial shrub, upto 2m	Foothills to 1800m	Root past applied to check boils
33	<i>Urtica dioica</i> (Urticaceae)	Sisnu (Nep)	Perennial herb, upto 1m	1000-2000m	Roots paste applied on minor bone fractures and dislocations
34	<i>Viscum articulatum</i> (Loranthaceae)	Harchur (Nep)	Leafless parasitic herb	300-2000m	Paste of the entire plant is applied on minor bone fractures
35	<i>Valeriana officinalis</i> (Valerianaceae)	Billilotan (Hindi), Badrangboya (Hindi), Kalavala (Marathi)	Perennial herb	2500m	Rhizomes and roots of the plant has depressant action on the central nervous system and is used in the treatment of hysterical fits, other nervous disorders and flatulence

Table 2: Status of endangered medicinal plant in Lava and Rishav region (2100 m asl).

Sl. No.	Medicinal plant	Population density (Individual / sq.m)
1	<i>Nardostachys grandiflora</i>	2.23
2	<i>Gentiana kurro</i>	1.73
3	<i>Podophylum hexandrum</i>	0.30
4	<i>Picrorhiza kurrooa</i>	2.01
5	<i>Swertia chirata</i>	2.93
6	<i>Gloriosa superba</i>	1.13
7	<i>Abution indicum</i>	0.56