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Ethnomedicinal uses of plants close to rural habitation in Garhwal Himalaya, India

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The present study was conducted in three different altitudinal zones, tropical (300 TO 400 m), sub-tropical (900 to 1100 m) and temperate (2000 to 2400 m) zones of Garhwal Himalaya. A total of 61 plant species that were regularly used by the local inhabitants for curing various ailments such as digestive disorders, dysentery, wounds, swellings, cold, scabies, rheumatic, cholera, malaria were recorded within the study area. Of the recorded plants, 14 were trees, 10 shrubs, and 37 herbs. The species used most frequently were *Phyllanthus embelica* L., *Terminalia bellerica* Roxb., *Terminalia chebula* Retz., *Aegle marmelos* (L.) Correa, *Holarrhena antidysenterica* (L.) Wall. ex A. DC., *Adhatoda vasica* Nees in Wallich, *Berberis asiatica* Roxb., *Achyranthes aspera* L., *Boerhavia diffusa* L., *Sida acuta* Burm.f, and *Sida cordifolia* L. Twenty-seven species were common to the tropical and sub-tropical zones (trees = 5, shrubs = 4, and herbs/grasses = 18), one shrub occurred both in the sub-tropical and temperate zones, and none of the species were common to both the tropical and temperate zones. A total of 32 families were recorded, of which Lamiaceae was the dominant family (with 8 species). All but three of the species reported are well known, and widely used by communities in India. This indicated that the medicinal plant repertoire of non-specialists is limited to a very small number of species.

Key words: Ethnomedicinal plants, altitudinal zones, rural habitation, Garhwal Himalaya.

INTRODUCTION

Of the 15,000 species of flowering plants found in India, about 17% are considered to be of medicinal value (Nadkarni, 1954; Jain, 1968; Pei, 2001; Singh et al., 2005). Many species (1,745) are from the Indian Himalayan region, and most of these are found in Uttarakhand (Bentley and Trimen, 1980; Kirtikar and Basu, 1933; Nadkarni, 1954; Chopra, 1956). People in this region are partially or completely dependent on forest resources for medicine, food, and fuel (Gaur, 1999), and medicinal species are gradually diminishing due to anthropogenic activities (Chhetri et al., 2005). The Garhwal Himalaya is one of the richest floristic zones of India and provides more than 300 species of medicinal plants (Gaur, 1999; Parandial et al., 2005; Bhatt and Negi, 2006). This knowledge of using native plants and its associated medicinal practice have now become a part of the local tradition, culture, art, belief, and folklore

(Pushpangadan and Kumar, 2005).

During the last few decades, there has been an increasing interest in the study of medicinal plants and their traditional use in different parts of the world (Al-Quran, 2005; Hanazaki et al., 2000; Rossato et al., 1999). Documenting indigenous knowledge through ethnomedicinal studies is important for the conservation and utilization of biological resources. The World Health Organization (WHO) suggested that as many as 80% of the world's people depend on traditional medicine for their primary healthcare needs. There are considerable economic benefits in the development of indigenous medicines and in the use of medicinal plants for the treatment of various diseases (Azaizeh et al., 2003). Due to limited means of communication, poverty, and unavailability of modern health facilities, many people, especially in rural areas, still rely on traditional medicines to treat common ailments, and many of these people form the poorest link in the trade of medicinal plants (Khan, 2002). A vast knowledge of how to use the plants against different illnesses may be expected to have

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accumulated in areas where the use of plants is still of great importance (Diallo et al., 1999).

The earliest documentation of 67 medicinal plants in Hindu culture is found in the “*Rigveda*,” which is thought to have been written between 4,500 and 1,600 BC (Malla and Shakya, 1984). Collection and trade of medicinal plants to India is a historical fact (Shrestha, 1994). The trade of non-timber forest products is mentioned in the 3,000 years old *Ramayana* (Edwards, 1996). Similarly the *Urikshayarved* provides excellent information about plants and their medicinal properties (Sensarma, 1989). The *Charak* and the *Sushrut Samhitas* were written between 700-200 BC, and include accounts of the discovery of medicinal plants (Pandey and Verma, 2005).

The indigenous knowledge of traditional communities has sometimes been subject to misappropriation (Pushpangadan and Kumar, 2005). The India co-ordination project on ethnobiology (AICRPE, 1992-1998) reported the use of over 10,000 wild plant species by tribal communities in India to meet their primary healthcare, food, and other material requirements. Out of 8,000 wild plant species used by them for medicinal purposes (with over 175,000 specific preparations and applications), about 2,000 seem worthy of scientific scrutiny (AICRPE, Final Technical Report, 1992-1998). The medicine and aromatic plants sector has traditionally occupied an important position in the socio-cultural, spiritual, and medicinal arena of rural and tribal lives of India (Bhattacharya et al., 2005).

Keeping in view the importance of rich flora of Himalaya and its medicinal value to the local inhabitants, the present study asked the question: How dependent the villagers are on the flora for their medicines? Also, how and what parts(s)/produce of the plants were collected? And which particular plants were collected for particular diseases?

MATERIALS AND METHODS

The ethnomedicinal information on plant species was collected in six villages, two each at three different altitudinal zones (tropical (300 to 400 m), sub-tropical (900 to 1100 m) and temperate (2000 to 2400 m)), in the Garhwal Himalaya (Figure 1). The information was collected through general conversation with informants selected at random (10% of the total households) during different seasons of a year. The informants included adult male and female inhabitants at an equal ratio to avoid any possible gender bias. Youngsters were excluded from the survey as they could not provide proper information on ethnomedicinal plants. The first author conducted the interviews of the informants in their local dialect, after establishing oral prior informed consent. During the course of interview, structured questionnaires were used to obtain information on medicinal plants with the local name of the plants, name of the particular disease for which a particular plant is used, part of the plant used for particularly disease and so on. The informants were requested to show the plants in their natural habitat and the specimens were collected. The collected plant specimens were brought to the Garhwal University Herbarium (GUH) and identified. Other taxonomic information of plant was verified from the relevant flora of Garhwal Himalaya (Gaur, 1999).

RESULTS AND DISCUSSION

The scientific names of plants, their vernacular names, and medicinal uses are presented in Table 1. A total of 61 plant species of medicinal value were recorded from the different zones. The total numbers of species of medicinal value were 32, 36, and 20 for the tropical, sub-tropical and temperate zones, respectively. Of the total species, 14 were trees, 10 shrubs, and 37 herbs. *Acacia catechu*, *Aegle marmelos*, *Cassia fistula*, *Phyllanthus embelica*, and *Terminalia bellirica* were common trees, and *Adhatoda vasica*, *Calotropis procera*, *Berberis asiatica*, and *Colebrookea oppositifolia* were common shrubs in the tropical and sub-tropical zones. *Rhus parviflora* was common shrub in both the sub-tropical and temperate zones. Eighteen herbs were common to both the tropical and sub-tropical zones. None of the species were common to all three zones (Table 2). Of the total 30 families recorded, taxonomically Lamiaceae was the dominant family, with 8 species. All but three of the species were well known and have been reported in major publications covering India and the Himalayas (Ambasta, 1986, Uniyal 1989; Jain and DeFillip, 1991; Jain et al., 1991). This indicates that the medicinal plant knowledge of lay-people is very limited, and almost entirely restricted to a set of common, widely used species. In a similar study conducted for Jaunsari tribal of Uttarakhand region, Bhatt and Negi (2006) recorded 66 plant species (9 trees, 11 shrubs and 46 herbs) of medicinal value. Among the growth forms (that is, trees, shrubs and herbs), the maximum contribution was of herbs (60.65%), followed by trees (22.95%) and shrubs (16.39%). The dominance of herbs is also reported in a study of Bangladesh (Ghani, 2003). Due to the unavailability of modern health facilities, poverty, connectivity with urban centre, awareness, etc. people in rural areas are still relying on traditional medicines for their health care. Many communities use wild plant parts for the primary healthcare, due to belief in its effectiveness, lack of modern medicines and medication and poor economic status of people (Verma et al., 2007). Similar studies were also carried out by Chettri et al. (2005) in the north-eastern part of the country.

A review of the plant parts used for medicine (Figure 2) showed that the whole plant is used in 31.2% species, a single above ground part (e.g., seed, leaf, fruit etc.) is used in 37.7% species, a single below ground part (root) is used in 13.1% species, a single above ground and below ground plant part is used in 8.2% species, and two or more above ground parts are used in 9.8% species. Of all the species used, the root is used for medicine in 52.5% of the species, and in the remaining species (47.5%), the above ground part of the plant is used.

The number of family, genera, and species was higher in sub-tropical zone compared to the other two zones (Figure 3). However, families to genera, families to species, and genera to species ratios were higher for the temperate zone: ratios were similar for tropical and

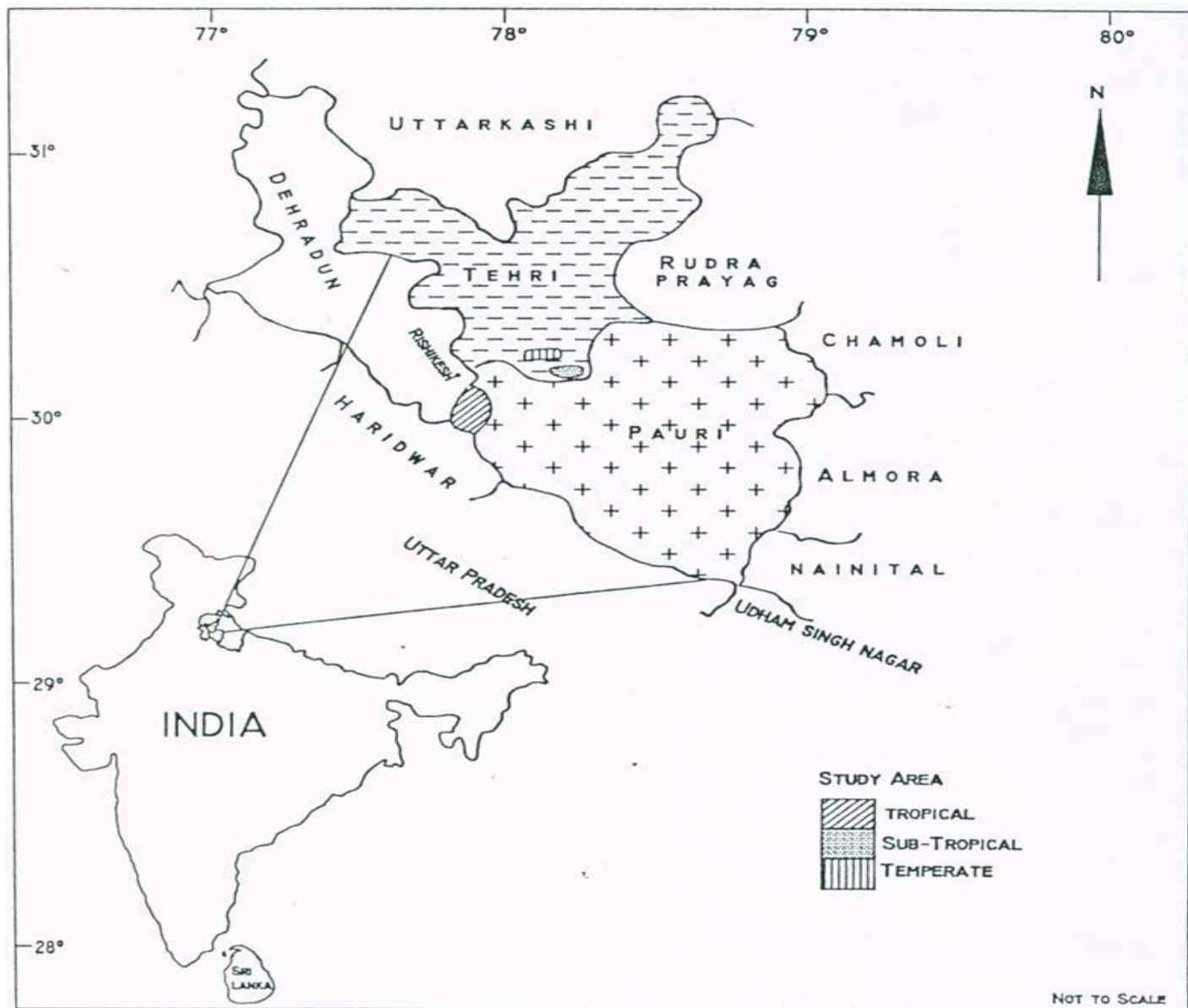


Figure 1. Location map of the study area.

sub-tropical zones (Table 3). Plants commonly used for traditional medicines are collected from the nearby forests. The widespread use of medicinal species might conflict with other uses, in particular grazing (Singh and Singh, 1987).

The present study fits well into the framework of the array of papers published on medicinal plant use by tribal communities in India, and in particular the Himalayan region, in the last decade. The vast majority of the species recorded were well known and commonly used, with a wide distribution. Most of them had been reported in a variety of encyclopedic works on the medicinal flora of India or the Himalayas. This indicates clearly that the medicinal plant portfolio of laypeople is limited to a very

narrow range of common, easily recognizable species that are mainly used to treat simple every-day afflictions.

Conclusion

The current over-exploitation and soil compaction due to trampling seem to limit the ability of some species to regenerate. Efforts should be made to start sustainable cultivation and harvesting programs for the plants of ethnomedicinal values of this region. Research on exploitation mechanisms, marketing and strategies to improve the livelihoods of the local population is needed to contribute to a plan for the long term sustainable

Table 1. Ethnomedicinal uses of species.

Scientific name	Vernacular name	Family	Part(s)/ produce used	Ethnomedicinal uses	*Region of occurrence
Tree					
<i>Holarrhena antidysenterica</i> (L.) Wall. ex A. DC.	Kura	Apocynaceae	Bark, leaf, seeds	Bark is used in dysentery, leaf and seeds as febrifuge	1
<i>Terminalia bellerica</i> Roxb.	Bahera	Combretaceae	Fruit	Fruit is ingredient of "Trifala"-an ayurvedic medicine	1,2
<i>Terminalia chebula</i> Retz.	Haira	Combretaceae	Fruit	Fruit is ingredient of "Trifala"	1
<i>Terminalia tomentosa</i> (Roxb.) Wight and Arn.	Asin	Combretaceae	Bark	Bark is used in liver troubles	2
<i>Lyonia ovalifolia</i> (Wall.) Drude	Anyar	Ericaceae	Seed	Seed paste is applied on wounds and boils	3
<i>Rhododendron arboreum</i> Sm.	Burans	Ericaceae	Flower, bark	Flower and bark used for digestive and respiratory disorders	3
<i>Phyllanthus embelica</i> L.	Anwala	Euphorbiaceae	Fruit	Source of vitamin C and ingredient of "Trifala"	1,2
<i>Acacia catechu</i> (L.f.) Willd.	Khair	Fabaceae	Wood, bark	Wood is used for digestive and respiratory diseases, bark used in diarrhea, dysentery, bronchitis, menstrual disorder	1,2
<i>Cassia fistula</i> L.	Amaltas	Fabaceae	Fruit, bark	Fruit and bark used as antiseptic, fruit pulp used in asthma, respiratory disorder	1,2
<i>Ougeinia oojeinensis</i> Hochr.	Sandan	Fabaceae	Produce	Gum is used in digestive troubles	2
<i>Quercus leucotrichophora</i> A. Camus	Banj	Fagaceae	Produce	Gum is used for gonorrhoeal and digestive disorders	3
<i>Prunus cerasoides</i> Buch.-Ham. ex D. Don	Panyyan	Rosaceae	Bark	Bark juice is applied on body swellings and contusions	3
<i>Pyrus pashia</i> Buch.-Ham. ex D. Don	Mehal	Rosaceae	Fruit	Fruit is used in digestive disorders	3
<i>Aegle marmelos</i> (L.) Correa	Bel	Rutaceae	Fruit	Fruit pulp is used in digestive disorders	1,2
Shrub					
<i>Adhatoda vasica</i> Nees in Wallich	Baisingu	Acanthaceae	Flower, twigs	Young twigs are used in cough, cold, juice of flowers useful in pulmonary affections, leaves and roots infusion useful in bronchitis and fever	1,2
<i>Rhus parviflora</i> Roxb.	Tungla	Anacardiaceae	Leaf	Infusion of leaves is given in Cholera	2,3
<i>Calotropis procera</i> (Aiton) W.T. Aiton	Madar	Asclepiadaceae	Root, flower	Latex and root bark used as expectorant, flower in cough, cold and asthma	1,2
<i>Berberis asiatica</i> Roxb.	Kilmora	Berberidaceae	Root	Root extract is used in ophthalmic	1,2

Table 1. Contd.

<i>Indigofera gerardiana</i> Wall. ex Baker	Sakina	Fabaceae	Leaf	Leaf juice is used in diarrhea, dysentery and cough	2
<i>Colebrookea oppositifolia</i> Sm.	Bindu	Lamiaceae	Leaf	Leaf paste is applied on wounds	1,2
<i>Woodfordia fruticosa</i> L.	Dhaulta	Lythraceae	Leaf	Leaves and bark are used as febrifuge	2
<i>Cotoneaster bacillaris</i> Wall. Kurz ex Lindl.	Ruins	Rosaceae	Leaf	Leaf paste with cow urine applied externally on scabies and rheumatic arthritis	3
<i>Prinsipia utilis</i> Royle	Bhainkal	Rosaceae	Seed, bark	Seed is used in rheumatic pains, root bark in diarrhea	3
<i>Leptodermis lanceolata</i> Wall.	Padar	Rubiaceae	Bark	Bark paste is externally applied in migraines	3
Herb					
<i>Barleria cristata</i> L.	Saundi	Acanthaceae	Root, leaf	Root decoction is used in bronchitis and pneumonia. Leaves and root paste are applied on wound-swelling	1,2
<i>Barleria prionitis</i> L.	Peela Bansa	Acanthaceae	Root, bark	Root and bark are used for cough and cold	1,2
<i>Achyranthes aspera</i> L.	Apamarga	Amaranthaceae	Whole plant	Root infusion is used for malarial fever, leaf extract facilitate delivery, plant decoction used in dropsy and bronchitis	1,2
<i>Aerva sanguinolenta</i> (L.) Blume	Sufedphulia	Amaranthaceae	Whole plant	Plant used as diuretic and demulcent.	1,2
<i>Pimpinella diversifolia</i> DC.	Teroi	Apiaceae	Whole plant	Plant extract is given in cough and cold and in digestive disorders	2
<i>Ageratum conyzoides</i> L.	Gundrya	Asteraceae	Whole plant	Plant with root of <i>Thalictrum foliolosum</i> made into paste and applied on sores, cuts and various skin ailments	3
<i>Bidens bipinnata</i> L.	Kura	Asteraceae	Leaf	Medicinally used in initial stages of leprosy and cures several ailments in women.	1,2
<i>Launaea asplenifolia</i> Hook f.	Dudhliya	Asteraceae	Root	Root juice is given to infants in diarrhea	3
<i>Tridax procumbens</i> L.	Kanphuli	Asteraceae	Whole plant	Plant paste is used to heal wounds and cuts	1,2
<i>Vernonia anthelmintica</i> (L.) Willd.	Ghrajiri	Asteraceae	Whole plant	Used in intestinal disorders, fever and skin ailments particularly in infants	3
<i>Cynoglossum glochidiatum</i> Wall. ex Benth.	Lichkura	Boraginaceae	Root	Root extract used in dyspepsia and digestive disorders	1,2
<i>Drymaria cordata</i> (L.) Willd. ex Schubert	Pithpara	Caryophyllaceae	Whole plant	Plant paste is given in bile complaints	2

Table 1. Contd.

<i>Saponaria vaccaria</i> L.	Musna	Caryophyllaceae	Whole plant	The aqueous paste is given in bile complaints	3
<i>Commelina benghalensis</i> L.	Kanjula	Commelinaceae	Whole plant	Plant juice is given in dysentery and paste applied on body swelling and ache.	1,2
<i>Euphorbia hirta</i> L.	Dudhi	Euphorbiaceae	Whole plant	Plant is used in bronchial infection and asthma, latex is applied on warts	1,2
<i>Phyllanthus amarus</i> Schumach. & Thonn.	Jarmala anwala	Euphorbiaceae	Whole plant	Used as an astringent, stomachic, diuretic and febrifuge	1,2
<i>Desmodium elegans</i> DC.	Chamlai	Fabaceae	Root	Root are used as carminatives	1,2
<i>Swertia angustifolia</i> Buch.-Ham. ex D. Don	Chirata	Gentianaceae	Whole plant	Used in blood diseases and as febrifuge	3
<i>Geranium ocellatum</i> Cambess.	Kaphlya	Geraniaceae	Whole plant	Extract is given in liver troubles and fever	3
<i>Ajuga brachystemon</i> Maxim.	Neelkanthi	Lamiaceae	Leaf	Leaves are used as febrifuge	1,2
<i>Epimeredi indicus</i> (L.) Rothm.	Goplya	Lamiaceae	Whole plant	Extract is used as carminative and astringent	3
<i>Leucus indica</i> (L.) R. Br. Ex Vatke	Guma	Lamiaceae	Leaf	Leaves are applied on wound and sores	1
<i>Mentha arvensis</i> L.	Paudina	Lamiaceae	Whole plant	Extract is given in vomiting and indigestion	3
<i>Micromeria biflora</i> (Buch.-Ham. ex D. Don) Benth.		Lamiaceae	Leaf	Leaf extract with milk is given in gastroenteritis	2
<i>Origanum vulgare</i> L.	Bantulsi	Lamiaceae	Whole plant	Plant extract is used in bronchitis, colic and diarrhea	1
<i>Roylae cinerea</i> (D.Don) Baill.	Titpatti	Lamiaceae	Leaf	Leaf decoction is used in malarial fever	1
<i>Sida acuta</i> Burm.f	Karenti	Malvaceae	Leaf , root	Leaves are demulcent and diuretic, root extract is given in leucorrhoea	1,2
<i>Sida cordifolia</i> L.	Balu	Malvaceae	Seed, root	Seed and flower are given in dyspepsia, root astringent, diuretic	1,2
<i>Urena lobata</i> L.	Unga	Malvaceae	Root	Root paste is applied on body pain and in rheumatism flower expectorant	2
<i>Boerhavia diffusa</i> L.	Pundera	Nyctaginaceae	Whole plant	Plant infusion is used in asthma and bronchitis. Leaf extract is used in eye complaints, root is chewed as energy tonic	1,2
<i>Oxalis corniculata</i> (DC.) Raeusch	Bhilmori	Oxalidaceae	Leaf	Leaf juice is used in cataract and conjunctivitis	1,2

Table 1. Contd.

<i>Cynodon dactylon</i> (L.) Pers.	Dubla	Poaceae	Root	Roots are used in fever and in internal injury	1,2
<i>Imperata cylindrica</i> L.	Sauraun	Poaceae	Root	Root is used as tonic	3
<i>Rumex hastatus</i> D. Don	Kilmori	Polygonaceae	Leaf	Leaf extract is applied on cuts and wounds to check bleeding	1,2
<i>Anagallis arvensis</i> L.	Jonkmari	Primulaceae	Whole plant	Extract/paste is used in leprosy, dropsy and cerebral affections	3
<i>Ranunculus sceleratus</i> L.	Jaldhniya	Ranunculaceae	Whole plant	Used as vermifuge and in skin disorders	1
<i>Potentilla gerardiana</i> Lindey ex Lehmann	Bajradanti	Rosaceae	Root	Root paste is applied on wounds	3

1: Tropical; 2: Sub-tropical, and 3: Temperate.

Table 2. Plant species common between the zones.

Strata	Tropical and sub-tropical	Sub-tropical and temperate	Temperate and tropical
Trees	5	0	0
Shrubs	4	1	0
Herbs/grasses	18	0	0
Total	27	1	0

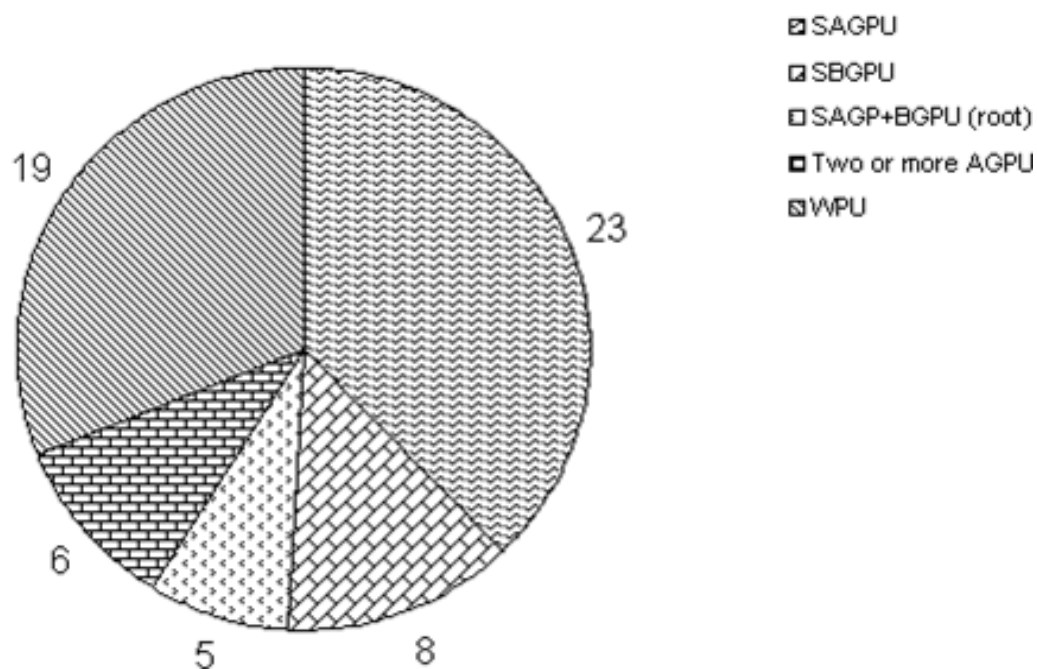


Figure 2. Pattern of plant part used for medicinal purposes. SPGPU: Single above part used; WPU: Whole part used; SBGPU (root): Single above ground part (root) used; SAGP+BGP (root): Single above ground part below ground part (root) used; Two or more AGPU: Above ground parts used.

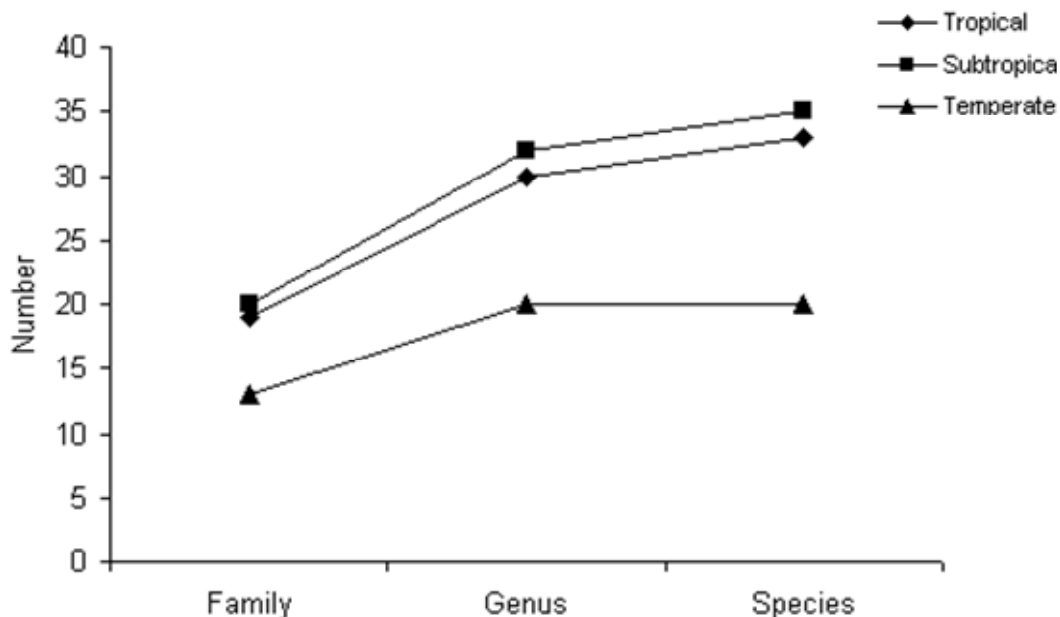


Figure 3. Indicating number of family, genera and species in three different zones.

Table 3. Ratio of family, genera and species in three different zones.

Zone	Family: Genera	Family: Species	Genera: Species
Tropical	0.63	0.57	0.91
Sub-tropical	0.63	0.57	0.91
Temperate	0.65	0.65	1.00

management of this important resource.

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