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Diversity of Traditional Medicinal Plants in Agro Forestry Landuse in Govind Pashuvihar Wildlife Sanctuary Uttarakhand India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation was carried out to document ethano-medicinal plant diversity in agroforestry land-use in Govind pashuvihar wildlife sanctuary Uttarakhand. For the present study 10 sample plots of 1 hectare each were randomly placed in 5 selected villages across the wildlife sanctuary. A total of 29 plant species including 22 herbs, 5 shrubs and 2 tree species were recorded to have medicinal importance in the local recipe. Asteraceae (4), Rosaceae (4) and Polygonaceae (4) form the dominant families of medicinal importance. These plants were used to treat a total of 17 different diseases. The medicinal plants in high altitudes are facing multiple threats due to multiple causes and it is thus imperative to have alternative land-use for conservation of these medicinal plants and agroforestry being the prominent land-use could be precursor for the conservation of medicinal plants and evade pressure from the natural habitat.

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1. INTRODUCTION

Indigenous medicinal plants play pivotal role in primary health care of 80% of world's population [1]. Medicinal plants have been harvested from the wild since ancient times [2,3]. The trade of herbal medicines is about Rs. 27 billion per year in global market [4]. A medicinal plant contributes 15–30 % to the total income of poorer households [5]. About 25% of drugs in modern pharmacopoeia are derived from plants [6]. The importance of medicinal plants is increasingly being recognized from ecological, social and economic perspectives [7,8]. The reliance on medicinal plants as primary source of healthcare [9,10] and meeting the growing demand of industries is creating heavy pressure on medicinal plant populations due to over-harvesting [11]. Unprecedented harvesting of medicinal plants by anthropogenic intervention have not only led to loss of genetic diversity but have seriously pretentious the livelihood of indigenous communities living in propinquity to forest [12]. It is thus imperative to conserve these scarce resources not just in their natural habitat but create an alternative for sustainable conservation in a manner that the continuous supply can be maintained. Realizing the gravity of ongoing decline in medicinal plants agroforestry may provide congenial condition for growth and development of medicinal plants as they are naturally getting in the wild [13]. Incentivizing the cultivation of medicinal plants within agroforestry systems may reduce pressure on wild populations and create alternate habitat for threatened species [14,15].

Agroforestry systems are dynamic systems and are highly acknowledged for retaining higher diversity [16]. Thus keeping in view the role of agroforestry in conservation of medicinal plants present study were undertaken on the possibility of documentation of ethno-medicinal plant diversity in agroforestry land-use in Govind Pashuvihar wildlife sanctuary.

2. METHODOLOGY

2.1 Study Area

The present study was carried out in the Govind Pashuvihar Wildlife which is one of the important protective areas of Uttarakhand. Govind Pashuvihar Wildlife Sanctuary and National Park, covering about 957.969 km2, with altitudes ranging from 1290 m to 6387 m asl. The sanctuary is one of the most biologically diverse areas of the Central Himalaya (Fig. 1). Vegetation varies according to both altitude and climatic conditions; from tropical deciduous forest in the foothills, to temperate forest at middle altitudes, coniferous, subalpine and alpine forest at higher attitudes, giving way to alpine grasslands and high altitude meadows, and finally scrublands lead up to the permanent snowline [17]. The area supports luxuriant genetic diversity including a huge number of threatened plant Taxa of high medicinal value owing to its unique physiognomy and wide range of altitudinal gradients [18,19]. The sanctuary contains 42 villages, at altitudes of 1290 m to 3500 m amsl. The people living in these villages are by and large poor, lead a traditional life, are known as 'Parvati' and follow their own culture and community life. At present, resource-poor people in the region collect plants from the wild in order to complement their meager incomes and for treatment of various diseases [17].

2.2 Method

The study was carried out in traditional agroforestry land-use maintained by local inhabitants of Govind Pashuvihar wildlife sanctuary. The sampling plots were randomly laid and more than 10 plots of one hectare were selected from five selected villages and each one hectare sampling plot were then stratified into quadrats 20 m ×20 m for trees 5 m × 5 m for shrub layer and 1 m × 1 m for herbs. The plants were then individually counted for abundance and density. The plants recorded in each quadrat were also further evaluated for their medicinal value on the basis of information gathered locally through oral discussions with the local Vaidas and elderly people of the villages selected and subsequently the relevant available literature regarding the concerned wildlife sanctuary were consulted [20,21]. The unidentified specimens were collected and herbarium was made and submitted in the Botanical Survey of India. The data were analyzed using MS Excel (2010) software of office package.

3. RESULTS

3.1 Medicinal Plant Diversity

The present study was carried in agroforestry landuse in Govind Pashuvihar Wildlife Sanctuary

that is one of the important habitats of high altitude medicinal plants. The present investigation appraise that floristic composition revealed the presence of 16 Families, 26 Genera and 29 species of ethano-medicinal importance found in the agroforestry landuse (Fig. 2). A total of 29 plant species (Fig. 3; Table 1) of medicinal value were recorded in the present study including 22 herbs, 5 shrubs and 2 tree species with maximum (75.86%) contribution of herbs followed by shrubs (17.24%) and trees (6.89%). The herbs thus form the prominent growth form for treatment of various ailments followed by shrubs and trees.

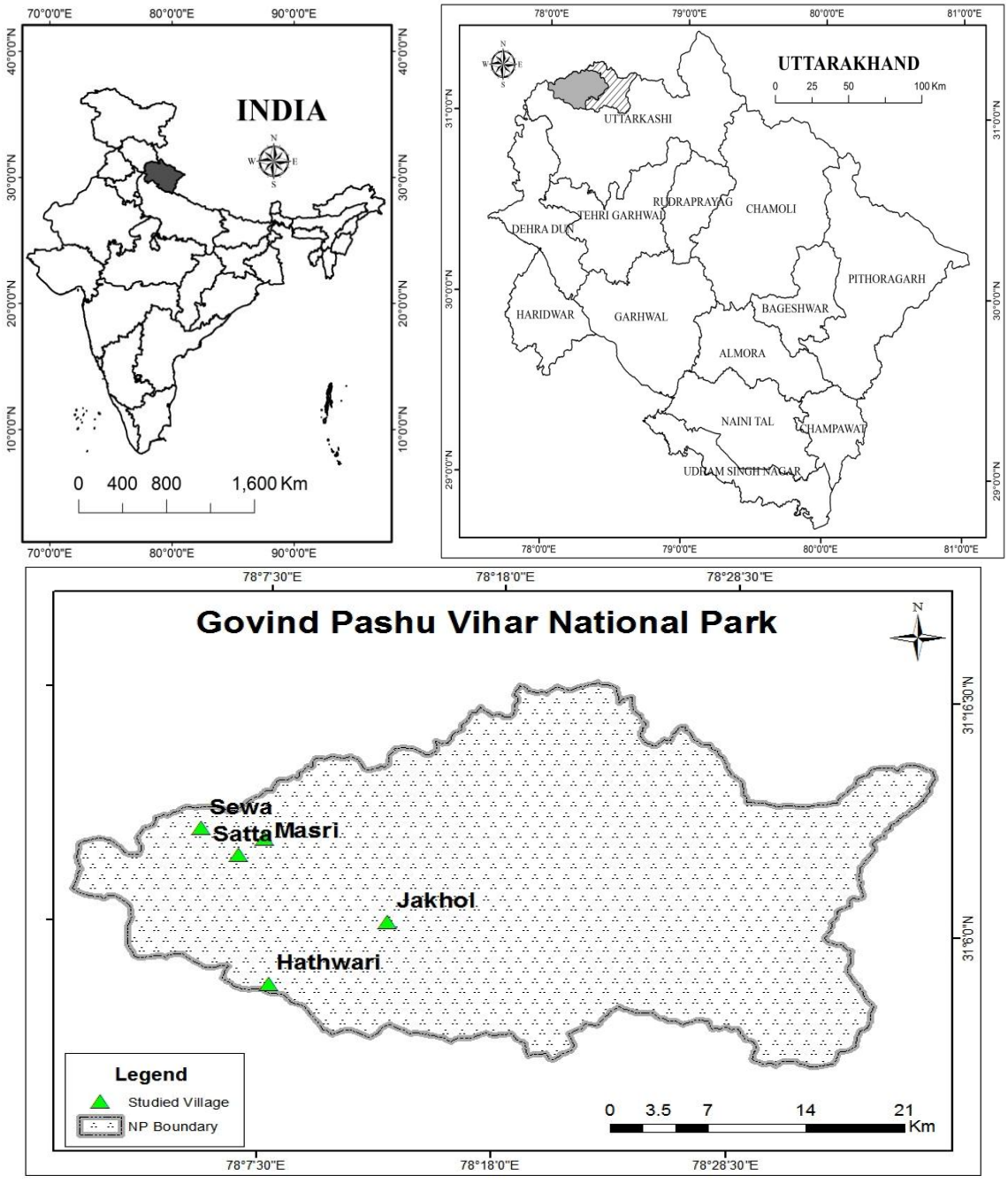

Fig. 1. Location of sampled villages

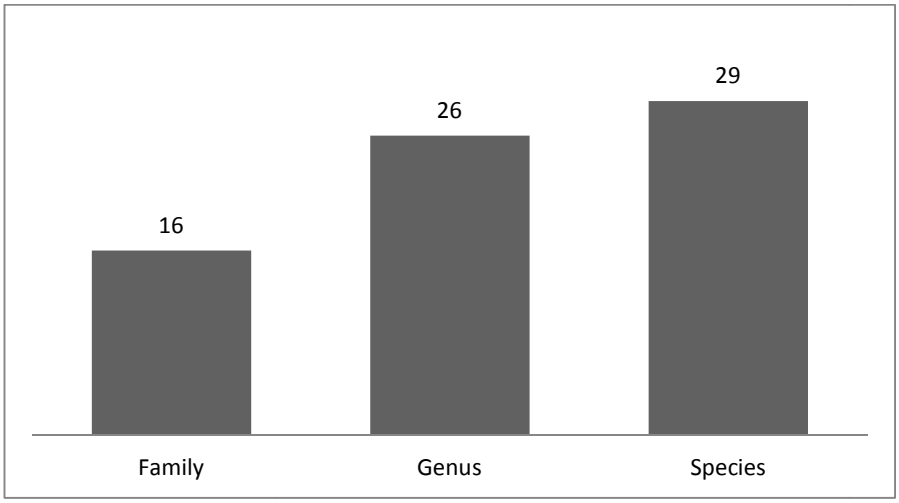

Fig. 2. Distribution of ethno-medicinal plants among taxonomic groups

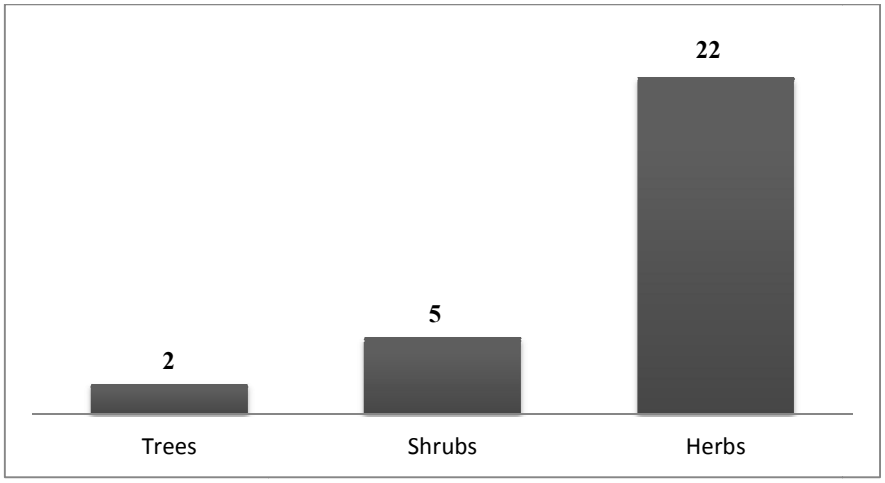

Fig. 3. Number of medicinal plants under different life forms in agroforestry land-use

Asteraceae (4), Rosaceae (4) and Polygonaceae (4) form the dominant families of medicinal importance each family represented by four species of medicinal importance used in traditional health care in the study area. However as the majority of the reported species belongs to herbaceous life among the biological spectrum Asteraceae (4) thus forms actual dominant family possessing the medicinal properties.

3.2 Plant Parts Used

The plant parts used for medical preparations were leaves, roots, whole plant, flowers, latex, stalk, seed oil (Fig. 4). The use of specific plant parts suggests that these parts have strongest medicinal properties but it needs biochemical analysis and pharmaceutical screening to validate the local information. The most commonly used parts of ethomedicinal plants, compiled with relevant literature were: leaves (43%), roots (25%), whole plant (12%), flowers and Latex (7%) Stalk, Climber and Seed Oil (2%).

3.3 Ailments Treated

These plants were used to treat a total of 17 diseases, ranging from simple to highly complicated (Fig. 5). The highest number of plants (7) was used for cuts and wounds, followed by fever (3) and two plants were used to treat diseases like cough and cold, Rheumatism, Gastrointestinal disorders. Most of the species 37.93% were found to be used to have a single therapeutic use in traditional Medicare.

Table 1. List of ethano-medicinal plants found in agroforestry landuse in study area

Family/Species	Local name	Part used	Ailment cured
Apiaceae			
Chaerophyllum acuminatum L.	Shan	Root	Fever, Intestinal infection
Asteraceae			
Anaphalis busa (Buch.-Ham.ex D.Don)DC.	Rangdu grass	Leaves	Cuts and Wounds
Artemisia nilagirica (CL.) Pamp.	Chamra/Panti	Leaves, Whole plant, Root	Gastrointestinal disorders, Intestinal infection, Respiratory, Intestinal worms, worms, Psychological disorder
Aster peduncularis Wall. ex Nees		Flower	Hiccups
Sonchus oleraceus var. asper L.arvensis	Dudi mori	Root	Cough and Cold, Head ache, Immunity
Cannabaceae			
Cannabis sativa L.	Bhang	Leaves	Insect bite
Fabaceae			
Parthenocissus semicordata (Wall.) Planch.	Laioda	Latex, Root, Stalk	Cataracts, Eye infection, Pimples
Trifolium repens L.	Amlodi	Leaves	Ear infection
Fagaceae			
Quercus semicarpifolia Sm.	Kharsu	Leaves	Cuts and Wounds
Gentianaceae			
Swertia chirayita (Roxb. ex Fleming) Karsten	Chirayata	Whole plant	Fever
Geraniaceae			
Geranium wallichianum D.Don.Ex.Sweet		Leaves	Urinary infection
Juglandaceae			
Juglans regia L.	Jungli Akhroot	Leaves, Root	Cuts and Wounds, Fever, Throat irritation, Tooth cleaning
Lamiaceae			
Mentha arvensis L.	Pudeena	Leaves, Whole plant	Rheumatism, Vomiting
Origanum vulgare L.	Van tulsi	Leaves	Rheumatism
Oxalidaceae			
Oxalis corniculata L.		Leaves	Ear infection
Polygonaceae			
Polygonum amplexicaule D. Don	Nenai	Root	Eye infection, Mouth ulcer, Tooth cleaning, Ear infection
Polygonum polystachyum Wallich ex Meisn.	Bout	Leaves	Cuts and Wounds, Fever
Rumax hastatus D.Don	Amloodi	Leaves	Cough and Cold, Cuts and Wounds, Head ache
Rumax nepalensis Spreng.	Chadi patri	Leaves	Colic

Family/Species	Local name	Part used	Ailment cured
Rosaceae			
Prinsepia utilis Royle.	Bekal	Seed Oil	Worms
Rosa macrophylla Lindl.	Tatolu	Root	Blood purifier
Rubus niveus Thumb.	Kala	Leaves, Root	Cuts and Wounds, Fever, Pimples
Spiraea canescens D.Don.	Chaklate	Root	Gastrointestinal disorders
Rubiaceae			
Galium aparine L.	Kushkusha	Leaves, Root, Whole plant	Cuts and Wounds, Eye infection, Gastrointestinal disorders, Pimples, Pus
Zanthoxylum armatum DC.	Timru	Latex	Tooth cleaning
Scrophulariaceae			
Verbascum thapsus L.		Root	Fever
Urticaceae			
Urtica dioica L.		Leaves	Galactogogue
Urtica parviflora Roxb.	Kali	Leaves, Latex	Abscess, Bleeding, Menstruation
Violaceae			
Viola canescens Wall. Ex Roxb	Benaksha	Whole Plant	Cuts and Wounds

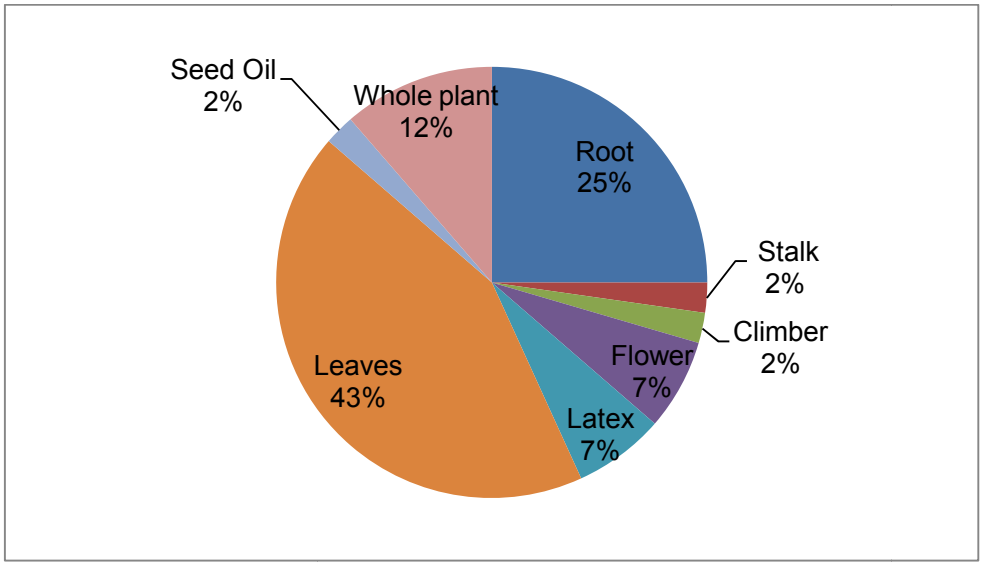

Fig. 4. Percentage of plant parts used in traditional medicines

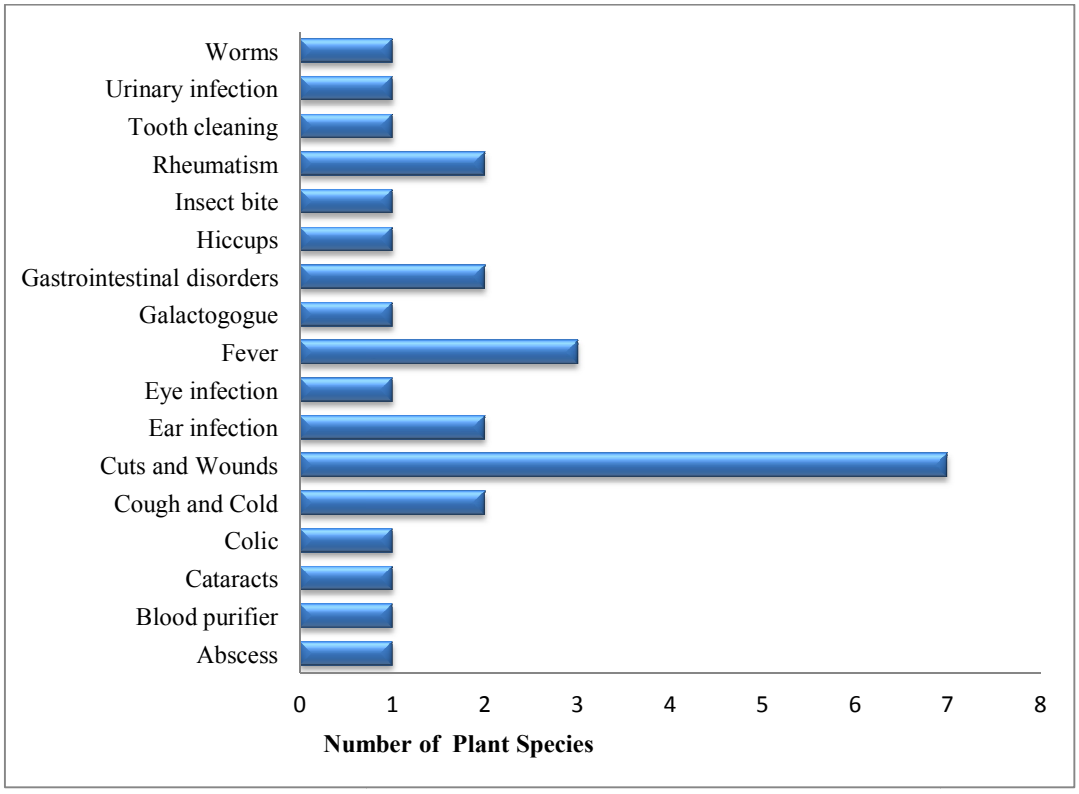

Fig. 5. Number of plants used to cure different diseases

4. DISCUSSION

The Indian Himalayan Region is very well known for the medicinal plants wealth, these medicinal plants are used for curing various diseases/ ailments by the inhabitants of remote areas [22]. The importance of medicinal plants is increasingly being recognized in the Himalayan region [23,24] and particularly from ecological, social, and economic perspectives [7,8]. A great

deal of traditional knowledge about the use of various plant species is still intact with the indigenous people inhabiting Himalaya due to less accessibility of terrain and comparatively slow rate of development [25-27]. The use of medicinal plants in the traditional healthcare is an age old practice in the Himalayan region and the source of these medicinal plants species collected by the local people include kitchen gardens, agriculture fields and nearby forests [17,27]. In traditional farming systems of Uttarakhand hills, the agroforestry and forestry based wild plant resources supplement healthcare needs of local population and have a huge potential in supporting biodiversity conservation. Medicinal plants thus grown in the traditional agroforestry systems bear ecological as well as social values [28]. It has been reported that 15-17% of plant species found in different home gardens possess medicinal value and use in traditional medicare [29,30]. Medicinal plants accounted for about 27% of total plant species in the homegardens in Amazon [28], 56% in northern Catalonia (*Iberian Peninsula*) [31].

A number of workers have explored the utility of Himalayan flora on their ethno-medicinal use [32,33,17,34,35,27]. However the data on diversity of medicinal in traditional agroforestry is scanty particularly for the Himalayan region that stores large number of medicinal resources in wild. The present attempt has been designed to explore the diversity of ethno-medicinal Plants in the agroforestry. In this purview we documented 29 medicinal plants belonging to 16 families and 26 genera which included 2 trees, 5 shrubs, 22 herbs. The present findings are in conformity with the findings of Bhat et al. [33], Samant and Pal [36], Subramani et al. [37]. However, the present study may have reported less number of species in terms of species possessing medicinal properties but are well documented as far as agroforestry land use is concerned and also similar trend was observed by Negi et al. [17] in Govind Wildlife Sanctuary and documented 33 plant species belonging to 32 genera and 28 families used traditionally to cure 28 diseases.

The present study revealed that herbs constitute the abundant strata used in the local recipes of disease administration and are in agreement with the findings of Singh [35] and Bhat et al. [33]. This is perhaps because herbs constitute the abundant strata and it is believed that the more abundant a plant is the more medicinal virtues it may possess [38]. The present study also revealed the leaves as dominant part consumed for medicinal property. These observations correlates well with studies conducted elsewhere [4,35,27].

Medicinal plants being invariable component of agroforestry [39] the use of agroforestry technologies can be expedited to mitigate biodiversity loss [40] and can supplement the healthcare needs of local populace living the remote pockets of Himalaya. In this context a detailed ethano-botanical survey should be conducted in the Himalayan region that would be helpful in conservation of these medicinal plants in long term.

5. CONCLUSION

The findings of present study revealed that Govind Pashuvihar Wildlife sanctuary is very rich in commercially and pharmaceutically important ethno-medicinal plant species. The people inhabiting the remote pockets of this sanctuary have centuries-old knowledge regarding the uses of the plants, and the locals use these species in a traditional way for curing a wide spectrum of diseases. However these medicinal resources are facing threat due to anthropogenic pressure and land-use changes. In order to save these medicinal plants the focus of the conservation should be on bringing these plant species into cultivation, agroforestry seems to be viable option where these medicinal plants can be cultivated as understory crops to increase farm income viz-a-viz conserve these important plant resources by evading pressure from wild habitat. Thus medicinal plants can be integrated as component in the agroforestry that would not only increase the remuneration to the farmers but could be expedited as tool for conservation of medicinal plants.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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