Forest Biodiversity and livelihood of tribal people in North Western Himalaya with special reference to Himachal Pradesh

Abstract: Forests are treasures gifted to mankind since times immemorial. In the Vedic era, the indigenous communities had a huge repository of knowledge pertaining to the utilization of plants and they relied on this vital comprehension for the welfare of society. This authentic knowledge of plants is vanishing among the people over the period of time due to growth and development in various human civilizations. Presently, the people living in close contact with nature aloof from the latest technologies, facilities and gadgets could practically experience the connect with the flora and fauna of the region. The tribal communities have been a part of forests for centuries, together possessing immense knowledge about the biodiversity of an area. They not only know the usage and importance of each item of forest produce including trees, herbs and shrubs but also are aware of the side effects of excess usage of a medicinal plant. Non-timber forest products are important component of subsistence and livelihood of tribal communities living in and near forests. This is of particular significance in the state of Himachal Pradesh having 27.73% of geographical area under forest cover and predominantly inhabited by tribal people. The tribes of Himachal Pradesh generally have their abode in the upper and middle level of the hills. Forest products particularly the NTFP's can provide a sustainable economic boost to millions of people, especially, tribals living in and around forests of north-western Himalayan ranges, by using existing forest resources.

Keywords: Biodiversity, Livelihood, Forest, Tribal people, North Western Himalaya

Introduction

The Himalayan region covers approximately 2,400 km and passes through eight countries which are Bangladesh, Bhutan, Afghanistan, China, Nepal, India, Pakistan, Myanmar (Chauhan *et al.*, 2023). It occupies about 18% of India's total geographical area. The north-western Himalayan region includes three Indian states viz., Jammu & Kashmir, Himachal Pradesh and Uttarakhand. It extends between $28^0$43'-$37^0$05' N latitude and $72^0$40'-$81^0$02' E longitude covering an area of 33 million hectares. The Himalayan ranges situated in this region exhibit a diverse climate,

vegetation and land use pattern. The North Western Himalaya is enriched with several unique and valuable biodiversity elements and is a rich repository of flora and fauna having a great diversity in the floristic pattern due to wide range of altitudinal variation. The state of Himachal Pradesh is situated in the Western Himalaya covering 5,550,890.60 ha land with altitude ranging from 350 m above mean sea level (msl) to 6816 m msl. The mountain ranges in the state include the Shiwaliks, Dhauladhar, Pirpanjal, Great Himalaya and the Zanskar. The climate varies from hot, sub- humid tropical in south-west to temperate cold-alpine and glacial in the northern and eastern high mountains. It is endowed with rich biodiversity representing the uniqueness of the region. Various studies have been carried out on ethno-botanical and ethno-medicinal aspects of floristic diversity in Himachal Pradesh (Uniyal and Chauhan, 1971; Uniyal and Chauhan, 1972; Chauhan, 1999; Samant *et al*., 2007; Sood and Thakur, 2004; Sood *et al*., 2011; Sood *et al.*, 2012; Kumar *et al.*, 2013; Kumar and Kumar, 2014; Thakur *et al.*, 2014; Kumar, 2016; Dogra *et al*., 2017; Kumar *et al*., 2018; Singhal and Kumar, 2018; Sharma, 2022).

Globally, it has been estimated that about 40% population depends directly on mountain resources for biodiversity, mineral resources, water, hydroelectricity, timber and recreation (Schild, 2008). Forests are the source of a range of ecosystem goods (food, fiber, fodder, medicine, fuels, timber and raw materials for industrial products) and services (purification of air and water, flood control, decomposition of wastes, soil fertility, pollination of crops and natural vegetation and aesthetics purposes). Forests constitute the major proportion of the land use in North Western Himalaya covering an area of about 1101, 2023 and 3486 thousand ha in Himachal Pradesh, Jammu & Kashmir and Uttarakhand respectively (Dar and Ahmad, 2016). The rural and tribal communities of North Western Himalayas closely interact with the forests to derive their economic livelihood and also for maintaining religious, cultural and spiritual identity. Forest resources have been identified as one of the key sources for sustenance and food security of tribal household (Bandey *et al.*, 2021). They have always played a significant role in survival and socioeconomic betterment of forest dwellers. The role of NTFP is particularly important in the Himalayan region, where a large proportion of the rural population depend on forests for meeting their basic needs (Joshi *et al*., 2018). The importance of commercial NTFPs for livelihood of rural and tribal people has been increasingly recognized in recent times. Agricultural production from tribal lands is not sufficient because it could just make the local populace capable of sustaining life but it couldn't be an adequate resource for their economic wellbeing. Hence the tribal communities largely depend on the collection of NTFPs. Tribal regions in Himalayas are sparsely inhabited in small settlements with high

dependence of local people on adjoining forests for obtaining fuelwood, fibre, fodder, food and medicine (Pandey *et al.*, 2013). It has been estimated that many village communities derive about 10-50% of their income from the sale of forest products. Although, NTFPs do not assure a high or regular income for forest people (Ndoye *et al*., 1998). The viewpoint of local communities considerably varies toward forest resources depending on the distance of forest as well as availability of resource and these resources serve as a buffer at the times of hardships (Neumann and Hirsch, 2000).

In the tropics, the NTFPs are the important source of livelihood to rural communities particularly for their food, fodder, medicine and raw materials for house construction as well as firewood consumption (Martin, 1995). Rural people depend on a wide variety of plant and animal products for their use as well as marketing. In last few decades the role of non-timber forest products (NTFPs) for sustainable development and poverty alleviation has received worldwide attention. There exists a huge potential of utilizing traditional knowledge inherited by tribal communities about the wild plant resources and management for achieving sustainable production of NTFPs (Gangwar and Ramakrishnan, 1989, 1990; Phillips, 1993; Maikhuri *et al.*, 1994).The forest resources play a vital role in cottage industry, health security, food security, fodder/livestock security, agricultural support, bio-energy security, socio-cultural as well as socio economic security for local people in developing countries (Shit and Pati, 2012). The present study highlights the dependence of rural and tribal communities on forests and forest products in North Western Himalayan region.

Tribes of North Western Himalayas

Tribal people belong to economically backward areas which are inaccessible having unfavourable geo-climatic conditions. They have very limited access to public services which reflects in poor health and education facilities as well as low human development attainments in tribal areas. Depending on their specific location and agro-climatic conditions, they can be categorised as nomadic pastoralists and subsistence farmers. They are mainly dependent on livestock rearing, agriculture and trading of NTFPs for their socio-economic welfare. The Himalayan tribal communities have established a great harmony with the nature by developing a cordial relation with the biological resources and diverse geo-climatic conditions. The North Western Himalayas include the states of Jammu and Kashmir, Himachal Pradesh and Uttarakhand. The Gujjars and Bakarwals are the two unique ethnic groups in Indian-Administered Kashmir that rear flocks of sheep and goat between high and

low altitudes, migrating from one place to another in western Himalayas. Tribes of Uttarakhand include the Tharus, the Jaunsaries, the Buxas, the Bhotias and the Rajis presenting great cultural and ethnic diversity (Kundu and Pal, 2018). Tribes of Himachal Pradesh includes the Gaddis, the Gujjars, the Kinnara or Kinnauras, the Lauhalas and the Pangwalasand some other smaller tribe groups like the Bhot/Bodh, the Beda, the Jad/Lamba/ Khampa, and the Swangla. The Kinnara or Kinnauras tribe inhabit the border district of Kinnaur. The main sources of the income of Kinnauras are agriculture, horticulture and trade. The tribal inhabitants of Lahaul and Spiti district of Himachal Pradesh are known as Lahaulas. Their main sources of economy are agriculture, horticulture, animal husbandry, trade and several crafts. The people of Pangwal tribe inhabit the high-altitude regions of Chamba district in Himachal Pradesh. The main sources of their economy are village craft, agriculture and animal husbandry. Thus, majority of the Himalayan tribal population sustains itself through agriculture and animal husbandry. Poor road connectivity restricts access to basic public goods and services in tribal areas and creates high dependence of inhabitants on natural resources for livelihood.

Status and livelihood of Tribal people of North Western Himalayas

Globally, millions of people depend on forest resources for livelihood however dependency varies from place to place (Akhter *et al*., 2009). Tribal communities of North West Himalaya are closely associated with the forest as their livelihood is critically linked to the forest ecosystem. They are culturally as well as traditionally connected to the forests. Forests are extensively used for grazing, fuelwood collection, and numerous other subsistence needs by rural people. They have the potential to improve the living status of forest dwelling people, particularly tribal people, who are among the most disadvantaged groups. Forests produce a range of ecosystem goods and services which immensely contribute to the livelihood of the local people and generate employment as well as income.

Medicinal plants form an integral part of the life of most of the hill communities and inhabitants are known to collect these plants from natural habitat mainly for their own use or for trade (Samant *et al*., 2007). Majority of these are used in Ayurvedic, Unani and other Traditional systems of Medicines. In the Himalayan region, consumption of wild species as food has been reported high and round the year, particularly during the lean period (Sundriyal and Sundriyal, 2004). Forest dwellers collect wild edible plants very frequently. Wild edible plants are crucial not only for their role as a source of food and nutrition but are also an integral part of the culture and traditions of the Himalayan societies (Joshi *et al*., 2018).

Several valuable works have been carried out to describe useful aspects of plant diversity in North Western Himalaya (Table 1). The nutritive value of wild edible fruit *Hippophae rhamnoides* L. was highlighted by Dhyani *et al*. (2007). Kala (2007) reported 23 cultivated food crops and 15 wild edible fruit species as the most preferred species by local people in different localities of the Uttarakhand state. Kumar and Hamal (2009) recorded 50 edible plant species traditionally used by local inhabitants in Kishtwar High Altitude National Park, Jammu and Kashmir (Northwest Himalaya). Tiwari *et al*. (2010) recorded 55 plant species consumed as vegetables and as raw wild edibles by the local people in the hilly areas of Alaknanda Valley, Uttarakhand State. Wild edible fruit plants are not only the source of income for rural and tribal people but they also have traditionally occupied an important place in their health care, socio-cultural and spiritual life (Nisha and Rao, 2021). Most of the edible wild plants possess medicinal values. In addition to serving as source of nutrition, they also play important role in the treatment of several ailments. Many wild fruits such as *Punica granatum, Berberis asiatica, Solanum nigrum, Ficus auriculata* etc. are also known for their medicinal properties (Maikhuri *et al*., 1994). The local inhabitants of Kinnaur use the wild edible plants in raw or cooked form for maintaining their health, vitality and longevity. The different plant parts are consumed as a source of supplement of food, vegetables, spices, condiments, alcoholic beverages, according to their requirements and availability in nature. Further on the occasions of festivals, worships, weddings and other religious rituals special dishes and special drinks are traditionally prepared from the local plant-based resources. Thus, the locally available and commercially valuable natural resources support the health care as well as nutrition and can significantly contribute to rural well-being through proper planning (Rasul *et al.*, 2012).

Table 1: Forest Resources utilized by the tribal people of North Western Himalaya

Scientific Name	Family	Common Name/s	Region	Part/s used	Folk Uses	Reference/s
Abies spectabilis (D.Don.) Spach.	Pinaceae	Kolroi, Tosh	Himachal Pradesh (Kinnaur)	Leaves	Used for fever, asthma and bronchitis	Radha *et al.*, 2019;
Achillea millefolium L.	Asteraceae	Birnjasif, Gondana	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Leaves, Flowers, Whole plant	Used to cure toothache, high blood pressure, body pain, high fever and respiratory	Negi and Chauhan, 2009; Dutt *et al*., 2014; Radha *et al*.,

					infection. It is stimulative, diuretic and haemostatic	2019
Abrus precatorius L.	Fabaceae	Ratti, Gunchi	Himachal Pradesh (Sirmour)	Leaves	Used for healing wounds	Radha *et al*., 2019
Acalypha indica L.	Euphorbiaceae	Kuph	Uttarakhand	Leaves	Used to cure ear problems	Sharma *et al.*, 2011
Achyranthes aspera L.	Amaranthaceae	Chirchira	Uttarakhand	Leaves, Roots	Used for sperm viability, boils, dysentery and dog bite	Sharma *et al.*, 2011; Kumar *et al*., 2023
Achyranthes bidentata Blume	Amaranthaceae	Chirchita, Puthkanda	Himachal Pradesh (Chamba; Kinnaur)	Roots, Seeds, Leaves	The plant is astringent, diuretic and spasmolytic. It is also used for abdominal pain	Negi and Chauhan, 2009; Rani *et al.*, 2013
Aconitum heterophyllum Wall. ex Royle	Ranunculaceae	Atish	Himachal Pradesh (Pangi, Chamba; Chhota Bhangal; Kinnaur)	Root	Used for diarhhoea, stomachache, fever and vomiting	Uniyal *et al*., 2006; Negi and Chauhan, 2009; Dutt *et al*., 2014
Aconitum violaceum Jacq. ex Stapf.	Ranunculaceae	Mitha patis	Himachal Pradesh (Kinnaur)	Roots	Used to cure cough in children	Negi and Chauhan, 2009
Acorus calamus L.	Acoraceae	Bacch	Uttarakhand	Roots	Used for diarrhoea and rib pain	Kumar *et al*., 2023
Aegle marmelos (L.) Correa	Rutaceae	Bael patra	Himachal Pradesh (Kangra), Uttarakhand	Fruit	Fruits are edible and used to cure dysentery, cholera, indigestion and stomach ache	Sharma *et al.*, 2011; Supriya *et al.*, 2022; Kumar *et al*., 2023
Aesculus indica (Colebr. ex Cambess) Hook.	Hippocastanaceae	Jungli khanor	Himachal Pradesh (Chhota Bhangal; Kinnaur)	Fruits, Seeds	Fruits and seeds are edible. Fruits are used for curing excessive bleeding and pain during menses	Uniyal *et al*., 2006; Negi and Subramani, 2015
Ageratum conyzoides L.	Asteraceae	Fulnu	Himachal Pradesh (Kangra), Uttarakhand	Leaves	Used for healing wounds	Joshi and Pant, 2012; Supriya *et al.*, 2022
Ainsliaea aptera DC.	Asteraceae	Kandyari	Himachal Pradesh (Chhota Bhangal)	Roots	Prescribed for gastric problems	Uniyal *et al*., 2006
Ajuga bracteosa Wallich ex Benth	Lamiaceae	Neel-kanthi	Himachal Pradesh (Chhota Bhangal)	Leaves	Used for the treatment of mouth ulcer and breathing problems	Uniyal *et al*., 2006
Allium caesium Schrenk.	Amaryllidaceae	Dhum	Himachal Pradesh (Pangi, Chamba;	Leaves	Edible (used as chutney and also as condiment.)	Negi and Subramani, 2015; Prakash *et al.*,

			Kinnaur)			2020
Allium humile Kunth.	Amaryllidaceae	Pareeni	Himachal Pradesh (Pangi, Chamba)	Leaves	Good for digestion and also used as flavouring agent	Dutt *et al*., 2014; Prakash *et al.*, 2020
Allium semenovii Regel.	Amaryllidaceae	Shawan	Himachal Pradesh (Pangi, Chamba)	Whole Plant	Used as spice and vegetable	Dutt *et al*., 2014; Prakash *et al.*, 2020
Allium sativum L.	Amaryllidaceae	Lahasun	Himachal Pradesh (Kangra), Uttarakhand	Bulb	Used for curing diabetes, diarrhoea, gastrointestinal disorders, hypertension and strengthen immune system	Sharma *et al.*, 2011; Supriya *et al.*, 2022
Amaranthus spinosus L.	Amaranthaceae	Bhabri	Himachal Pradesh (Pangi, Chamba)	Stem, Leaves	Used as vegetable	Prakash *et al.*, 2020
Amaranthus viridis L.	Amaranthaceae	Jungali chaulayi	Himachal Pradesh (Sirmour)	Leaves, Roots	Used to cure skin infection	Radha *et al.*, 2019
Andrographis paniculata (Burm. f.) Nees	Acanthaceae	Kiryat, Kalmedh	Uttarakhand	Whole plant, Leaves	Used for curing dysentery, fever, worms and stomach complaints	Mathur and Joshi, 2013
Anemone rupicola Cambess	Ranunculaceae	Kakrya	Himachal Pradesh (Chhota Bhangal)	Leaves	Used for the treatment of ears with pus	Uniyal *et al*., 2006
Angelica glauca Edgew.	Apiaceae	Chaura	Himachal Pradesh (Chhota Bhangal; Chamba; Kinnaur)	Root, Umbels	Used for arthritis, cold, cough, fever and also as spice, snake repellent and carminative	Negi and Chauhan, 2009; Rani *et al.*, 2013; Dutt *et al*., 2014; Uniyal *et al*., 2006; Rana *et* al., 2019; Prakash *et al.*, 2020
Argemone mexicana L.	Papaveraceae	Satyanashi, Bharband	Himachal Pradesh (Kinnaur, Sirmour), Uttarakhand	Whole plant, Seeds	Used to cure malaria and digestive disorders	Sharma *et al.*, 2011; Radha *et al*., 2019
Arisaema flavum (Forssk.) Schott	Araceae	Jhamusha	Himachal Pradesh (Kinnaur)	Tubers, Fruits	Used for snakebite, stomach diseases and for preparation of wine.	Negi and Chauhan, 2009
Arnebia benthamii Wall ex G. Don	Boraginaceae	Ratanjot	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Roots	Used for the treatment of wounds, cuts, burns, toothache, ear-ache, eye	Negi and Chauhan, 2009; Dutt *et al*., 2014

					diseases and also as hair dye	
Artemisia absinthium L.	Asteraceae	Charmra	Himachal Pradesh (Chamba)	Leaves	Used for the treatment of wounds	Rani *et al.,* 2013
Artemisia brevifolia Wall.	Asteraceae	Nurcha, Sansei	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Flowering branches, Leaves	Good for asthma, worm expulsion, anaemia and diseases of brain	Negi and Chauhan, 2009; Dutt *et al*., 2014
Artemisia dracunculus Linn.	Asteraceae	Chamary	Himachal Pradesh (Kinnaur)	Flowers, Leaves	Used as appetizer, condiment, stomachic, stimulative, febrifuge and also for throat infection	Negi and Chauhan, 2009
Artemisia sieversiana Willd.	Asteraceae	Charmara	Himachal Pradesh (Chhota Bhangal)	Leaves	Used as abortifacient and also to cure pain and swelling of the wounds	Uniyal *et al*., 2006
Arundo domax L.	Poaceae	Rajal	Himachal Pradesh (Kinnaur)	Stem	Used for making walking sticks and also as support for climbing trees	Kumari and Saggoo, 2015
Asparagus racemosus Willd.	Asparagaceae	Saapaya	Himachal Pradesh (Chamba)	Roots	Used for stomach problems	Rani *et al.,* 2013
Avena fatua L.	Poaceae	Yukpa	Himachal Pradesh (Kinnaur)	Seeds	Used to cure stomach disorder and fever	Kumari and Saggoo, 2015
Bacopa monnieri (L.) Wettst.	Scrophulariaceae	Brahmi	Himachal Pradesh (Chamba)	Leaves	Used for nervous disorder and to enhance memory	Rani *et al.,* 2013
Bauhinia variegata L.	Fabaceae	Kachnar	Himachal Pradesh (Chamba; Kangra)	Bark, Flower buds	Used for wound healing, dysentery, haemorrhoids, snake poisoning, stomach problems, also used as vegetable	Rani *et al.,* 2013; Supriya *et al.,* 2022
Berberis aristata DC.	Berberidaceae	Kashmal	Himachal Pradesh (Chamba; Lahaul Spiti)	Roots, Fruits, Leaves, Flowers	Roots are used to cure eye infection, dysentery and piles. Fruits, leaves and flowers are edible	Singh and Chauhan, 2005; Rani *et al.,* 2013; Rana *et* al., 2019; Prakash *et al.,* 2020
Berberis asiatica Roxb. ex DC.	Berberidaceae	Chunchri, Kahamil, Kapacho	Himachal Pradesh (Chhota Bhangal;Pangi,	Roots, Fruits, Young	Roots are used for diabetes and jaundice. Fruits are edible and also used as laxative.	Uniyal *et al*., 2006; Negi and Chauhan, 2009; Dutt *et al*.,

			Chamba; Kinnaur)	shoots	Young shoots are used to drive away the evil spirits.	2014
Berberis lycium Royle	Berberidaceae	Kasmal	Himachal Pradesh (Chamba; Chhota Bhangal)	Roots, Stem, Fruits, Leaves, Flowers	Used to cure gum problems and eye infections. Fruits, leaves and flowers are edible	Uniyal *et al.*, 2006; Rani *et al.*, 2013; Prakash *et al.*, 2020
Bergenia ciliata (Haworth) Sternb.	Saxifragaceae	Sadpottar	Himachal Pradesh (Chhota Bhangal), Uttarakhand	Roots	Used for fever, dysentery and kidney stone	Uniyal *et al.*, 2006; Kumar *et al*., 2023
Bergenia ligulata (Wall.) Engl.	Saxifragaceae	Shaprotri	Himachal Pradesh (Chamba)	Leaves	Used for cold	Rani *et al.*, 2013
Bergenia stracheyi (Hook f. & Thomas.) Engl.	Saxifragaceae	Laoo-patra, Shamlot	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Rhizome	Used to cure indigestion, fever, burns and jaundice	Negi and Chauhan, 2009; Dutt *et al*., 2014
Betula utilis D. Don.	Betulaceae	Bhojpatra	Himachal Pradesh (Chamba, Kinnaur	Bark, Leaves	Used for the treatment of urinary tract infection, wounds and also as roofing material	Negi and Chauhan, 2009; Rani *et al.*, 2013; Dutt *et al*., 2014; Rana *et* al., 2019
Bunium persicum Boiss.	Apiaceae	Kalazira	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Seeds	Used for fever, cold, headache and also as spice and condiment.	Dutt *et al.*, 2014; Negi and Subramani, 2015; Prakash *et al.*, 2020
Cannabis sativa L.	Cannabaceae	Bhang	Himachal Pradesh (Chamba; Chhota Bhangal), Jammu and Kashmir	Leaves, Seeds	Used for Joint pain, fever, depression, cholera, paralysis, dandruff, tumours, ulcers and also, for religious purposes	Uniyal *et al*., 2006; Rani *et al.*, 2013; Dar *et al.*, 2020
Carica papaya L.	Caricaceae	Kharbuja	Himachal Pradesh (Kangra)	Fruit, Leaves, Stem bark	Used for the treatment of asthma, jaundice, bleeding piles, abortion, urinary tract infection, wounds and sore teeth	Supriya *et al.*, 2022
Castanea sativa Mil.	Fagaceae	Mitha	Himachal Pradesh (Kinnaur)	Fruits	Fruits are edible	Negi and Subramani, 2015

Centella asiatica (L.) Urb	Apiaceae	Brahmi, Manduki	Uttarakhand	Leaves, Stem	Used for urinary problems, nervous disorders and skin diseases	Mathur and Joshi, 2013
Chaerophyllum villosum Wall. ex DC.	Apiaceae	Tila	Himachal Pradesh (Pangi, Chamba)	Tuber, Roots	Used to cure stomach disorders. Roots are edible	Dutt *et al.,* 2014; Prakash *et al.,* 2020
Cirsium wallichii DC.	Asteraceae	Bursa	Himachal Pradesh (Chhota Bhangal)	Root	Used for gastric problems	Uniyal *et al*., 2006
Codonopsis ovata Benth.	Campanulaceae	Katari	Himachal Pradesh (Pangi, Chamba)	Leaves	Good for eye diseases	Dutt *et al.,* 2014
Convolvulus arvensis Linn.	Convolvulaceae	Dhechigmendo	Himachal Pradesh (Lahaul Spiti)	Leaves, Flowers	Used to cure kidney pain	Singh and Chauhan, 2005
Corylus jacquemontii Decne.	Corylaceae	Thangi/ Thangoli	Himachal Pradesh (Chamba)	Seeds	Used for muscular pain	Rani *et al.,* 2013
Cotoneaster microphyllus Lindl.	Rosaceae	Kadhor	Himachal Pradesh (Chamba)	Fruits	Used to treat skin diseases	Rani *et al.,* 2013
Crataegus oxyacantha L.	Rosaceae	Pinyath	Himachal Pradesh (Chamba)	Fruits	Fruits are used for curing anaemia	Rani *et al.,* 2013
Curcuma longa L.	Zingiberaceae	Haldar	Himachal Pradesh (Kangra), Uttarakhand	Rhizome	Used to cure skin disorders, Indigestion, injury, heart problems, gastrointestinal and respiratory diseases	Supriya *et al.,* 2022; Kumar *et al*., 2023
Cymbopogon distans (Steud.) Wats.	Poaceae	Kurcha	Himachal Pradesh (Kinnaur)	Leaves	Used for joint pain and inflammation	Kumari and Saggoo, 2015
Cynodon dactylon (L.) Persoon	Poaceae	Drub	Himachal Pradesh (Chhota Bhangal)	Aerial parts	Used to cure nasal bleeding	Uniyal *et al*., 2006
Dactylorhiza hatagirea D. Don	Orchidaceae	Hathpanja, Salampanja	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Tubers	Used for diabetes, diarrhoea, dysentery, fracture and to check nose-bleeding	Negi and Chauhan, 2009; Dutt *et al.,* 2014
Datura stramonium Wall.	Solanaceae	Datura	Himachal Pradesh (Chamba)	Seeds	Used to cure pimples (Acne)	Rani *et al.,* 2013
Delphinium brunonianum Royle	Ranunculaceae	Loskar, Nirbisha	Himachal Pradesh (Kinnaur)	Leaves, Flowers	Used to cure dysentery and fever	Negi and Chauhan, 2009
Delphinium denudatum	Ranunculaceae	Losar	Himachal Pradesh	Roots	Used against toothache	Negi and Chauhan,

Wall. ex Hook. & Thoms.			(Kinnaur)			2009
Desmodium elegans DC.	Fabaceae	Kathi	Himachal Pradesh (Chamba)	Roots, Leaves	Used to treat cholera. Leaves are used as fodder	Rani *et al.,* 2013
Dioscorea deltoidea Wall. ex Griseb.	Dioscoreaceae	Shingli-Mingli	Himachal Pradesh (Kinnaur)	Rhizome	Used for gastric complaints and also for washing wool and hair	Negi and Chauhan, 2009
Diplazium esculentum (Retz.) Sw.	Woodsiaceae	Kasror	Himachal Pradesh (Chamba)	Whole plant	Used for muscular pain	Rani *et al.,* 2013
Eleusine indica (L.) Gaertn.	Poaceae	Kangli	Himachal Pradesh (Kinnaur)	Whole plant	Used for curing dysentery, constipation and for making mats and ropes	Kumari and Saggoo, 2015
Ephedra gerardiana Wall. ex Stapf	Ephedraceae	Somlata	Himachal Pradesh (Kinnaur), Uttarakhand	Shoots	Used to treat asthma, hay fever and rashes	Negi and Chauhan, 2009
Eucalyptus gigantea Dehnh.	Myrtaceae	Safeda	Himachal Pradesh (Kangra)	Leaves, Bark	Used to cure bronchitis, throat infection, also as antiseptic, anti-inflammatory and insect repellent	Supriya *et al.,* 2022
Fagopyrum esculentum Moench	Polygonaceae	Ogala	Himachal Pradesh (Kinnaur)	Seeds, Roots	Seeds are edible. Root is used against rheumatic pain, lung diseases and typhoid	Negi and Chauhan, 2009
Ferula jaeschkeana Vatke	Apiaceae	Kurash, Jangli Hing	Himachal Pradesh (Pangi, Chamba, Kinnaur)	Rhizome	Used to heal wounds, cuts, boils and burns	Negi and Chauhan, 2009; Dutt *et al.,* 2014
Fragaria nubicola Lindley ex Lacaita	Rosaceae	Aakhe, Kida-bhumla	Himachal Pradesh (Chhota Bhangal)	Aerial parts	Aerial parts are used for fever.	Uniyal *et al*., 2006;
Grewia optiva Drummond ex Burret	Tiliaceae	Dhaman	Himachal Pradesh (Chhota Bhangal)	Leaves	Used for joint pain	Uniyal *et al*., 2006
Heracleum lanatum Michx	Apiaceae	Poral	Himachal Pradesh (Kinnaur)	Flowers, Leaves	Used to cure headache	Negi and Chauhan, 2009
Hippophae salicifolia D.Don	Elaeagnaceae	Charma	Himachal Pradesh (Pangi, Chamba)	Fruits	Fruits are edible and used for making jam and juice	Prakash *et al.,* 2020
Hypericum oblongifolium Hook.	Hypericaceae	Phiunli	Himachal Pradesh (Chamba;	Roots, Leaves,	Used to cure diarrhoea, skin allergy and animal diseases	Rani *et al.,* 2013; Radha *et al.,* 2019

			Sirmour)	Flowers		
Ipomoea carnea Jacq.	Convolvulaceae	Basunth	Himachal Pradesh (Kangra)	Leaves	Used for wound healing and possess antibacterial and anti-inflammatory activity	Supriya *et al.*, 2022
Juniperus macropoda Boiss.	Cupressaceae	Theleru	Himachal Pradesh (Kinnaur)	Berries	Used for cough, colic, diarrhoea, indigestion, pectoral affections and impotency	Negi and Chauhan, 2009
Jurinea dolomiaea Boiss	Asteraceae	Guggal dhoop	Himachal Pradesh (Pangi, Chamba)	Roots	Used for skin eruptions and cuts	Dutt *et al.*, 2014
Justicia adhatoda L.	Acanthaceae	Safed basunth	Himachal Pradesh (Kangra, Sirmour), Uttarakhand	Leaves	Used for dysentery, fever, cough, cold, bronchitis and asthma	Mathur and Joshi, 2013; Radha *et al.*, 2019; Supriya *et al.*, 2022
Mallotus philippensis (Lam.) Muell.-Arg.	Euphorbiaceae	Rohini	Uttarakhand	Fruits	Fruits are used as anthelmintic	Sharma *et al.*, 2011
*Malus baccata (*L.) Borkh. R	Rosaceae	Khontli	Himachal Pradesh (Kinnaur)	Fruits	Fruits are edible	Negi and Subramani, 2015
Malva parviflora L.	Malvaceae	Nasochal	Himachal Pradesh (Chhota Bhangal)	Aerial parts	Used for abortion	Uniyal *et al*., 2006
Melica persica Kunth.	Poaceae	Karvo	Himachal Pradesh (Kinnaur)	Whole plant	Used in religious ceremonies	Kumari and Saggoo, 2015
Mentha longifolia (Linn.) Hudson	Lamiaceae	Pudina	Himachal Pradesh (Kinnaur; Lahaul Spiti), Jammu & Kashmir	Leaves, Shoots	Used as antiseptic, carminative, stimulant and also for curing stomach disorder, wounds, body pain and vomiting	Singh and Chauhan, 2005; Negi and Chauhan, 2009; Dar *et al.*, 2020
Mirabilis jalapa L.	Nyctaginaceae	Raat ki rani	Himachal Pradesh (Chamba)	Roots	Used to cure cough and cold	Rani *et al.*, 2013
Morus alba L.	Moraceae	Toot	Himachal Pradesh (Kangra)	Fruits	Used to cure sore throat, fever, lower blood pressure and improve eyesight	Supriya *et al.*, 2022
Murraya koenigii Spreng.	Rutaceae	Kadhi patta	Himachal Pradesh (Chamba;	Leaves, Branches	Used for blood purification, vomiting, kidney pain, hair	Sharma *et al.*, 2011; Rani *et al.*, 2013;

			Kangra), Uttarakhand		growth, boils, burns, diarrhoea, dysentery, joint pain and gum problems	Supriya *et al.*, 2022; Kumar *et al*., 2023
Origanum vulgare Linn	Lamiaceae	Maruwa	Himachal Pradesh (Pangi, Chamba)	Leaves	Used for curing chickenpox and fever	Dutt *et al.*, 2014
Oxyriadigyna (Linn.) Hill	Polygonaceae	Chucha	Himachal Pradesh (Kinnaur)	Leaves	Used for stomach disorder and also as pickles	Negi and Chauhan, 2009
Parthenocissus semicordata (Wall.) Planchon	Vitaceae	Amru bail	Himachal Pradesh (Chhota Bhangal)	Aerial parts, Root	Used against leucorrhoea, wounds and boils	Uniyal *et al*., 2006
Phytolacca acinose Roxb.	Phytolaccaceae	Ranshag, Ashlu	Himachal Pradesh (Chamba)	Leaves	Used to cure acne disease	Rani *et al.*, 2013
Picrorhiza kurroa Royle ex Benth	Scrophulariaceae	Karru	Himachal Pradesh (Chamba; Chhota Bhangal; Kinnaur), Jammu & Kashmir	Leaves, Roots, Rhizome	Used for cold, cough, fever, joint pain, stomach disorders, digestive problems and as blood purifier	Uniyal *et al*., 2006; Negi and Chauhan, 2009; Rani *et al.*, 2013; Dutt *et al.*, 2014; Dar *et al.*, 2020
Pinus gerardiana Wall. ex D.Don	Pinaceae	Neoza, Ree, Chilgoza	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Nuts (Kernel)	Used in socio-religious beliefs; Kernels are edible and also used as carminative and expectorant	Negi and Chauhan, 2009; Dutt *et al.*, 2014; Negi and Subramani, 2015
Polygonatum cirrhifolium (Wall.) Royle	Liliaceae	Sobnyam	Himachal Pradesh (Kinnaur)	Leaves	Used as tonic and vegetable	Negi and Chauhan, 2009
Polygonatum verticillatum (L.) All	Liliaceae	Salam mishri	Himachal Pradesh (Chhota Bhangal)	Roots	Used to cure spermatorrhaea and piles	Uniyal *et al*., 2006
Prunus armeniaca L.	Rosaceae	Chuli	Himachal Pradesh (Kinnaur)	Fruits, Kernels	Fruits are edible and kernel oil is used for curing rheumatic pain	Negi and Chauhan, 2009; Negi and Subramani, 2015
Prunus cerasoides D.Don	Rosaceae	Pajja	Himachal Pradesh (Chhota Bhangal)	Stem bark	Used for joint pain	Uniyal *et al*., 2006
Prunus cornuta Wall.	Rosaceae	Jammu	Himachal Pradesh (Chamba)	Fruits	Used to cure anemia	Rani *et al.*, 2013
Pyrus pashia Buch.-	Rosaceae	Kainth	Himachal Pradesh	Fruits	Used for the treatment of	Supriya *et al.*, 2022

Ham. ex D.Don			(Kangra)		throat infection, mouth boils, respiratory, cardiovascular and gastrointestinal ailments	
Pteridium aquilinum (L.) Kuhn	Dennstaedtiaceae	Kinus	Himachal Pradesh (Chamba)	Roots	Used to cure abdominal edema	Rani *et al.,* 2013
Rheum australe D. Don.	Polygonaceae	Chukeri ke todhi	Himachal Pradesh (Chhota Bhangal; Pangi, Chamba; Kinnaur)	Leaves, Tubers	It is edible and also used for fracture, cold, cough and piles	Uniyal *et al*., 2006; Negi and Chauhan, 2009; Dutt *et al*., 2014
Rheum moorcroftianum Royle	Polygonaceae	Pawan	Himachal Pradesh (Pangi, Chamba)	Roots	Good for digestion problems	Dutt *et al.,* 2014
Rhododendron arboreum Smith	Ericaceae	Brah	Himachal Pradesh (Chhota Bhangal, Sirmour)	Flowers	Used for cold, fever, cough and nasal bleeding	Uniyal *et al*., 2006; Radha *et al.,* 2019
Rubia manjith Roxb. ex Fleming	Rubiaceae	Manjith	Himachal Pradesh (Kinnaur)	Leaves	Used to heal cuts	Negi and Chauhan, 2009
Rubus ellipticus Sm.	Rosaceae	Akhan	Himachal Pradesh (Chamba)	Fruits	Used for indigestion	Rani *et al.,* 2013
Rubus niveus Thunb.	Rosaceae	Khiradi	Himachal Pradesh (Chhota Bhangal)	Roots	Used to cure menstrual disorder	Uniyal *et al*., 2006
Rumex hastatus D.Don	Polygonaceae	Almoru	Himachal Pradesh (Chhota Bhangal)	Leaves	Used to stop nasal bleeding	Uniyal *et al*., 2006
Rumex nepalensis Sprengel	Polygonaceae	Albar	Himachal Pradesh (Chhota Bhangal), Jammu & Kashmir	Leaves, Roots	Used to cure wounds, headache, stomach and abdominal pain	Uniyal *et al*., 2006; Dar *et al.*, 2020
Salix alba L.	Salicaceae	Chirand	Himachal Pradesh (Chamba)	Seeds	Used to cure scabies, eczema, joint pain and also used against dandruff	Rani *et al.,* 2013
Saussurea lappa (Decne) Sch. Bip.	Asteraceae	Kuth	Himachal Pradesh (Kinnaur)	Roots	Used for nausea and indigestion	Negi and Chauhan, 2009
Saussurea costus (Falc.) Lipsch.	Asteraceae	Kuth	Himachal Pradesh (Chhota Bhangal), Jammu & Kashmir	Roots, Leaves	Used to cure joint pain	Uniyal *et al*., 2006; Dar *et al.*, 2020

Saussurea obvallata (DC.) Edgew.	Asteraceae	Bhramkamal	Himachal Pradesh (Kinnaur)	Whole plant	Used for magico-religious purposes	Negi and Chauhan, 2009
Selinum tenuifolium Wall. ex Clarke.	Apiaceae	Bhootkeshi, Matoshal	Himachal Pradesh (Chhota Bhangal; Pangi, Chamba)	Roots, Umbels.	Used to cure knee pain and swelling after delivery of women	Uniyal *et al.*, 2006; Dutt *et al.*, 2014
Setaria etalica (L.) P. Beauv.	Poaceae	Yarka cha	Himachal Pradesh (Kinnaur)	Seeds	Used to cure fever, headache and to increase lactation of cattle	Kumari and Saggoo, 2015
Sinopodophyllum hexandrum (Royle)	Podophyllaceae	Bankakri	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Roots, Fruits	Used to cure cancer, cough, headache, cuts, wounds, fever, ulcer and abdominal pain	Negi and Chauhan, 2009; Dutt *et al.*, 2014
Stellaria monosperma Buch.-Ham. ex D.Don	Caryophyllaceae	Kokuwa	Himachal Pradesh (Chamba)	Leaves	Used for skin diseases	Rani *et al.*, 2013
Swertia chirata C.B. Clarke	Gentianaceae	Charayta	Himachal Pradesh (Chamba; Chhota Bhangal)	Leaves	Used for skin irritation	Uniyal *et al.*, 2006; Rani *et al.*, 2013
Taxus baccata Thunb.	Taxaceae	Barhami	Himachal Pradesh (Chamba)	Leaves, Bark	Used to cure cancer	Rani *et al.*, 2013
Terminalia arjuna Wight & Arn.	Combretaceae	Arjun	Uttarakhand	Bark	Used against pneumonia and asthma	Sharma *et al.*, 2011; Joshi and Pant, 2012
Terminalia chebula Retz.	Combretaceae	Harad	Himachal Pradesh (Kangra)	Fruits	Used for cough, gastrointestinal disorders and possesses antibacterial, antiviral, chemo- preventive and radio protecting activity	Supriya *et al.*, 2022
Thalictrum foliolosum DC.	Ranunculaceae	Barmot	Himachal Pradesh (Chhota Bhangal)	Roots	Used to cure stomach pain and gastric trouble	Uniyal *et al*., 2006
Thymus linearis Benth.	Lamiaceae	Ban ajwain, Sanauni, Tumro	Himachal Pradesh (Pangi, Chamba; Kinnaur)	Flower, leaves	Used as anti-spasmodic, antiseptic, as condiment and to cure stomach disorder, cough, cold and high fever	Negi and Chauhan, 2009; Dutt *et al.*, 2014; Prakash *et al.*, 2020
Tinospora cordifolia Miers	Menispermaceae	Gloe	Himachal Pradesh (Kangra, Chamba), Uttarakhand	Stem, Whole plant	Used against skin diseases, jaundice, constipation, pneumonia, fever, cold, anaemia, inflammation,	Rani *et al.*, 2013; Supriya *et al.*, 2022; Kumar *et al*., 2023

					digestive problems and enhances immune system	
Trillium govanianum (D.Don.)	Trilliaceae	Nagchatri	Himachal Pradesh (Chamba)	Roots	Used to cure arthritis, menstrual and reproductive disorders	Rani *et al.,* 2013; Rana *et* al., 2019
Urtica dioica L.	Urticaceae	Ain	Himachal Pradesh (Chamba)	Leaves	Used for skin diseases and also as vegetable	Rani *et al.,* 2013; Prakash *et al.,* 2020
Valeriana jatamansi D.Don	Valerianaceae	Mushkbala	Himachal Pradesh (Chamba)	Roots	Used to cure stomach ache, and also as incense (‘dhoop’)	Rani *et al.,* 2013
Verbascum thapsus Linn.	Sambucaceae	Botiy-chi	Himachal Pradesh (Kinnaur; Lahaul Spiti)	Whole plant, Leaves, Flowers	Used to ward off evil spirits. Leaves and flowers are used to cure vomiting	Singh and Chauhan, 2005; Negi and Chauhan, 2009
Viburnum mullaha Buch.-Ham. ex D.Don	Caprifoliaceae	Tilhanj	Himachal Pradesh (Chamba)	Roots Fruits	Roots used to cure cold and cough. Fruits are edible	Rani *et al.,* 2013; Rana *et* al., 2019
Viola canescens Wall.	Violaceae	Banaksha	Himachal Pradesh (Chamba)	Flower	Used for cold and cough	Rani *et al.,* 2013
Viola pilosa Blume	Violaceae	Vanaksa	Himachal Pradesh (Chhota Bhangal)	Flowers	Used to cure fever, cough and cold	Uniyal *et al*., 2006
Vitex negundo L.	Lamiaceae	Bana	Himachal Pradesh (Chamba; Kangra; Sirmour)	Leaves, Stem	Used for cold, cough, fever, ulcer, joint pain, boils, toothache, sprain and inflammation	Rani *et al.*,2013; Radha *et al.,* 2019; Supriya *et al.,* 2022
Withania somnifera (L.) Dunal	Solanaceae	Ashwagandha	Uttarakhand	Fruits, Roots	Used as immune enhancer, stress resistant and also for joint pain	Kumar *et al*., 2023
Zanthoxylum armatum DC.	Rutaceae	Trimiria	Himachal Pradesh (Chamba; Kangra; Sirmour)	Stem, Bark, Seeds, Fruits	Used to cure toothache, gum problems, fever and cardiovascular disorders	Rani *et al.*,2013; Radha *et al.,* 2019; Supriya *et al.,* 2022

Conclusion

Livelihood-based extraction of forest resources is a common practice in every state of India, particularly, in the hilly states of Himalayan region. Himalayais enriched with the wealth of natural resources, but due to the high population density there is higher rate of extraction of these valuable resources. Forests constitute the major share in the land use of North Western Himalayan region. The tribal people of North West Himalaya are dependent on forests and various forest produce for sustaining life. These products include fruits, vegetables, pulses and cereals for nutrition, fodder for domestic animals, wood for fuel, timber for construction purposes, medicinal plants for healthcare management and plant fibres for making cloth. However, due to the excessive use, these forests have come under heavy pressure for meeting the demand of ever-increasing populations. Therefore, appropriate strategies for sustainable extraction of these forest resources are required so that they can be conserved for future generations. Scientific documentation of diversity, distribution and economic importance of different species can play significant role in the conservation and sustainable use of such plant resources.

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