

Original Research Article
**An ethnobotanical survey of plants used by
communities around Jaunsar- Bawar region of
Uttarakhand, India**

ABSTRACT

The Jaunsar Bawar region of Uttarakhand, India, is well-known for its rich biodiversity and cultural history, which is inseparably, connected through traditional ecological knowledge (TEK) and ethnobotanical traditions. This work explores the ethnobotanical knowledge and practices amongst the primitive communities residing in the Jaunsar Bawar region, of 11 villages in three tehsils: Kalsi, Tyuni, and Chakrata of Uttarakhand state of India. With extensive field studies, literature review, surveys using standard questionnaire, semi structured interviews with local inhabitants including vaidyas, hakeems and forest government officials, the study tends to document the rich biodiversity of the region and comprehend relationship between human and plants. It document and explore the traditional usage of 64 plant species of different habit and form for medicine, timber, food, fodder, culinary, rituals and other purposes. Insights of the study aids in the documentation of primitive indigenous wisdom of plants use across generations and highlights the need for policies to support the preservation of traditional systems of knowledge while promoting local empowerment in natural resource management.

Keywords: Ethno botany, traditional ecological knowledge, floral diversity, Himalaya, Jaunsar Bawar.

1. INTRODUCTION

The forest has long been a major source of many resources and services required for human well-being in India and around the world (Bargali et al., 2022). According to the Census of India 2011, 67.99 % of the population of the Uttarakhand state reside in rural regions & depends entirely or in part on neighboring forests for their daily needs of major forest produce and NTFP species. John Harshberger described ethnobotany as the study of plants used by prehistoric and indigenous people in 1896. It is the study of the interaction between humans and plants, which includes the customs and knowledge of various societies regarding the use of plants for food, medicine, and other services (Panigrahi et al., 2021). Tribal societies have used indigenous knowledge acquired from their forefathers for ages in several aspects of their everyday life (Sahu, 2020). These indigenous and local populations' skills and experiences benefit the world at large and can serve as a helpful illustration for biodiversity policies (Gerique, 2006).

India is a land of diverse ethnic groups and abundant biological resources, making it a hotspot for ethnobotany (Singh et al., 2022). The Bhotia, Tharu, Jaunsari, and Buxa are just a few of the indigenous communities that call Uttarakhand state home and are distinguished by their unique flora varieties (Tewari et al., 2020). The Jaunsari tribe, who inhabit the state's northernmost portion Jaunsar Bawar region, is extremely knowledgeable about the indigenous flora and its traditional usage (Tomar and Dhyani, 2020). Because of this, the area has a high biodiversity and a long history of using plants and other natural resources (Pratap and Pratap, 2021). The majority of their livelihood comes from wild natural resources, which they are familiar with. The majority of the population works in agriculture and cattle raising. These individuals also make money by selling the wild produce to nearby markets when the weather is favorable. Wild edible plants make up the majority of the resources that the people who live in the district's communities use to generate income (Thakur and Dutt, 2020). Several workers have conducted ethnobotanical investigations of a central region of the western Himalaya (Bhatt et al., 2024; Gupta et al., 2023; Bargali et al., 2022; Londhe et al., 2020; Sahu, 2020). However, not much is known about the utilisation of plants other than their ethnomedicinal significance in the Jaunsar Bawar region. Hence, the sole objective of this exploration work was to summarise the anthropogenic approach to forest products by investigating the plants used for several purposes by the hill communities in their daily life; recorded the plant species of medicinal value, wild edibles, fibre yields, fodder, fuelwood; identified the taxa used in religious ceremonies and psychological practices of the local people; and documented the species used as vegetables, fruits, seeds, grains, condiments, oils, and beverages as wild edibles of the of Uttarakhand's Jaunsar Bawar region.

2. METHODOLOGY

2.1 Study area: The study has been conducted in the hilly area of north Indian state of Uttarakhand's Gharwal division. Jaunsar Bawar tribe is mainly present in the districts of Uttarkashi and Dehradun in several villages (Chauhan, 2020), out of which 11 villages were chosen from tehsil Kalsi (4 villages) with elevation 780 m above mean sea level, tehsil Chakrata (5 villages) with elevation of 2,118m amsl and tehsil Tyuni (2 villages) with elevation of 947m amsl, as mentioned in Table: 1 below.

Table 1. Study area

SR	VILLAGE	GRAM PANCHAYAT	NO. OF HOUSEHOLD SURVEYED	COORDINATES
Teh. KALSI				
1	Vyas Nahri	Vyas Nahri	10	30.5225°N, 77.8403° E
2	Tilwari	Tilwari	10	30.4010°N, 77.8982° E
3	Hari pur	Haripur	10	30.5170°N, 77.8363° E
4	Kalsi	Kalsi	10	30.5179°N, 77.8439° E
Teh. CHAKRATA				
5	Sahiya	Sahiya	10	30.6115° N, 77.8753° E
6	Lakhamandal	Lakhamandal	10	30.7016° N, 77.8696° E
7	Rikhar	Rikhaad	10	30.6461° N, 77.8810° E
8	Birmau	Rikhaad	10	30.6587° N, 77.8953° E
9	Thana	Thana	10	30.6666° N, 77.8739° E
Teh. TYUNI				

10	Bhagawat	Meghatu	10	30.9483°N, 77.8467° E
11	Raygi	Raygi	10	30.6332°N, 77.6753° E

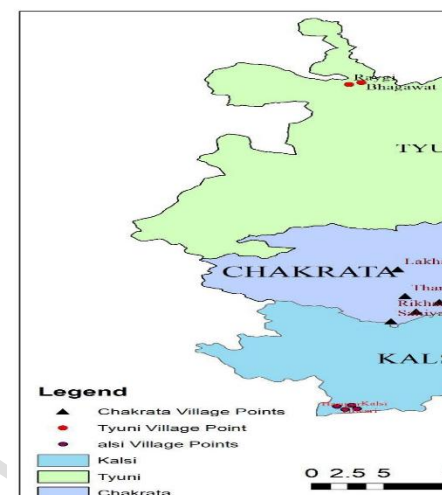
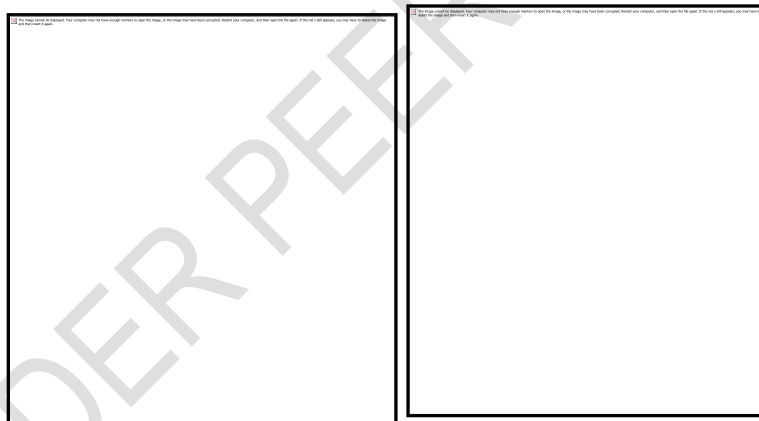


Fig.1. Study sites map

2.2 Selection of study sites: During first two months (Jan-Feb, 2023), field trips were done for a reconnaissance survey. Availability of local inhabitants was the basis of site selection (Assefa et al. 2021).

2.3 Data collection: The initial stages of data collection are secondary in nature. Information regarding access of local people would be collected from the development office.

The ethnobotanical surveys standard questionnaire to quantitative data on plants speaking with a significant of different ages; vaidyas, were mostly consulted. Information was documented name, usage, part used etc.



panchayat offices and block was conducted using a obtain ahugenumber of used by the tribes by number of their members hakeems and local healers (Kumar and Khan, 2023). on the basis of the local (Panda & Uniyal, 2023).

Semi-structured interview of the Kalsi Forest Department officials provided the information for the basis of field visits. During the course of the study, attempts were made to collect optimum data from January 2023 to May 2023 from maximum parts of the study area. The aim of this study was to explore and document the existing traditional wisdom of the tribe and to study the management strategies employed in the area in order to find the role of traditional knowledge in the floristic wealth conservation.

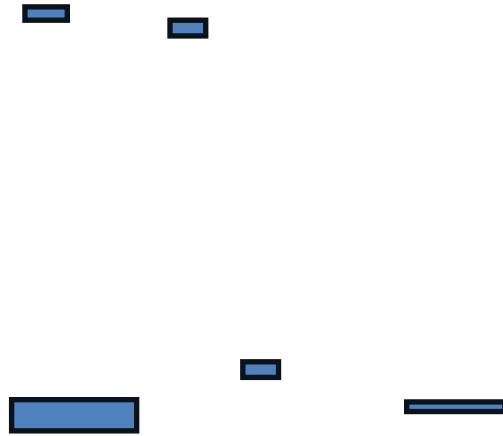


Fig.2. Interaction with the local inhabitants of Jaunsar Bawar region

3. RESULTS AND DISCUSSION

The results of the study are 110 respondents with 57.27% (Figure: 3) from 11 villages various plant species present

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based on responses from male and 42.72% females on their traditional usage of in the area.

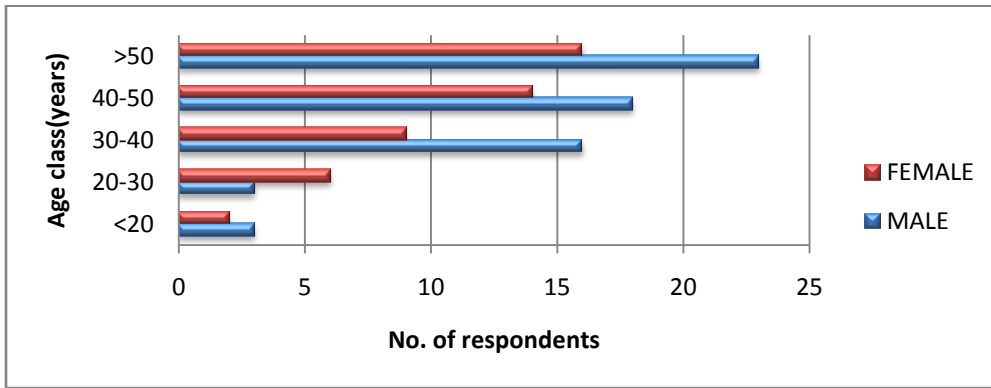


Fig.3. Number of respondents based on gender

3.1 Ethnobotanical knowledge- The present study compiles 64 ethnobotanical plant species belonging to 44 families and 59 genera varied in their usage and consumption by the local inhabitants (Table: 2). Out of the recorded 44 families, three dominant families are Rosaceae (13.6%), Fabaceae and Lamiaceae (6.8% each). The plant species fall under various habit and form within which trees (40.6%) covers the maximum number and climbers cover the minimum number of species (Figure: 4). The prominent usage categories are medicine (84.3%) for the properties such as anti-inflammatory, antiviral, antitumor, anti-malarial, analgesic etc.; timber (10.9%) for furniture and construction; food such as jams, pickles, spices etc.; recreation, cultural and sacred purpose (18.7%); fuelwood (6.2%) and fodder (4.6%) for domestic animals (Figure: 5). Within the documented data, the plant parts used by the tribe (Figure: 6) are leaves (28.1%), wood (20.3%), seeds (15.6%), bark (14.06%), flowers (7.8%), stems (4.6%) and rhizomes (3.1%). 9.3% of the total species is used as a whole plant.

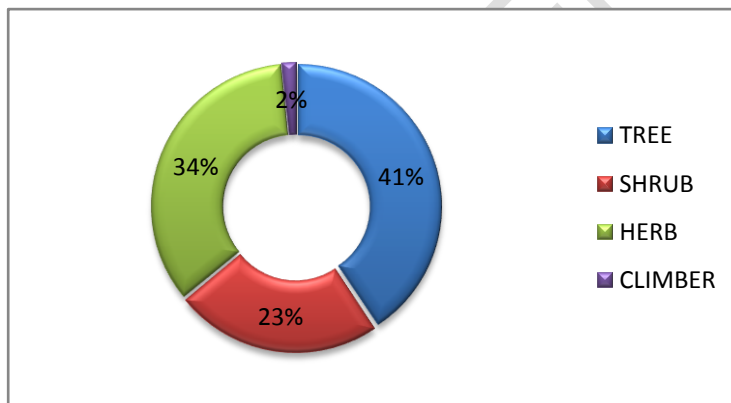


Fig.4. Habit ratio of species

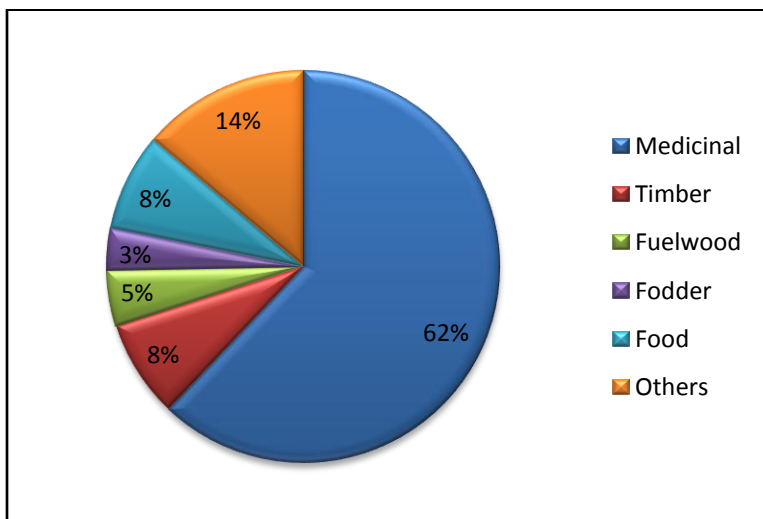


Fig.5. Category of usage

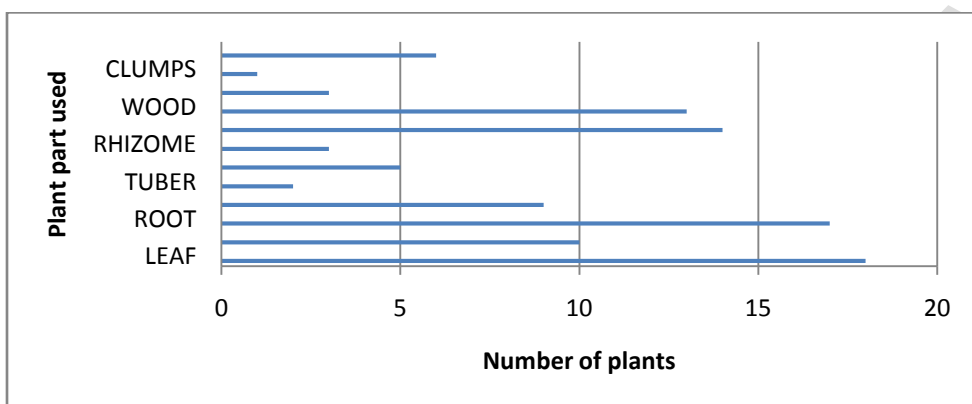


Fig.6. Number of plants used for its various parts

Table2. Plant species and their utility in Jaunsar Bawar

Sr	Botanical Name	Family	Habit	Vernacular Name	Uses	Plant Part (S)
1	<i>Abrus precatorious</i>	Fabaceae	Climber	Gunja	Headache, intestinal ulcer	Leaf, Seed, Root
2	<i>Acacia catechu</i>	Fabaceae	Tree	Khair	Diarrhoea, cough, fever	Leaf, Bark
3	<i>Acorus calamus</i>	Araceae	Herb	Bach	Stomach worms	Root
4	<i>Ageratum conyzoides</i>	Asteraceae	Herb	Ghaghra	Healing in cuts	Leaf

5	<i>Aloe vera</i>	Liliaceae	Herb	Gwarpatha	Treat burns, wounds, and skin diseases	Leaf
6	<i>Amomum subulatum</i>	Zingiberaceae	Herb	Siru	Digestive problems, spice	Seed
7	<i>Asparagus curillus</i>	Asperagaceae	Shrub	Sharanoi	Acne	Tuber
8	<i>Bauhinia variegata</i>	Fabaceae	Tree	Kachnar	Acne, lowers blood sugar level	Leaf
9	<i>Bistoraanplexicaulis</i>	Polygonaceae	Herb	Ninai	Ear ache, acne	Root
10	<i>Berberis spp.</i>	Berberidaceae	Shrub	Kashmoi	Eye tonic	Root
11	<i>Bergenia ciliata</i>	Saxifragaceae	Herb	Pattharchoor	Urinary troubles	Tuber
12	<i>Bombax ceiba</i>	Malvaceae	Tree	Semal	Combat fever and acne problems	Bark
13	<i>Cannabis sativa</i>	Cannabaceae	Herb	Bhang	Medicinal, recreational	Whole plant
14	<i>Cassia tora</i>	Fabaceae	Shrub	Panwar	Vermicide, malaria	Seed, Root, Leaf, Whole plant
15	<i>Cedrus deodara</i>	Pinaceae	Tree	Deodar	Itching in animals, furniture	Wood
16	<i>Celtis australis</i>	Cannabaceae	Tree	Kharik	Fever, cough, and diarrhea, furniture, agricultural tools religious ceremonies	Bark, Leaf, Fruit, Wood
17	<i>Cinnamomum tamala</i>	Lauraceae	Tree	Tej patta	Cold	Leaf
18	<i>Clerodendrum serratum</i>	Lamiaceae	Shrub	Bharangi	Cold, allergy, sinusitis	Flower

19	<i>Curcuma zeboaria</i>	Zingiberaceae	Herb	Kachoor	Infant stomach ache	Rhizome
20	<i>Cynodondactylon</i>	Poaceae	Herb	Doob	Dysentery, sacred purpose	Whole plant
21	<i>Diploknemabutyrcea</i>	Sapotaceae	Tree	Chironji	Diarrhea, dysentery, and skin disease, furniture and oil preparation	Seed, Wood
22	<i>Emblica officinalis</i>	Euphorbiaceae	Tree	Amla	Hair tonic	Fruit
23	<i>Ephedra gerardiana</i>	Ephedraceae	Small shrub	Somlata	Eye trouble	Leaf, Fruit, Root, Stem
24	<i>Ficus racemosa</i>	Moraceae	Tree	Fig	Digestion, edible fruits, sacred purposes	Flower, Wood
25	<i>Ficus religiosa</i>	Moraceae	Tree	Peepal	Burn	Bark
26	<i>Ficus palmate</i>	Moraceae	Tree	Bairu	Fuelwood and fodder for domestic animals	Leaf, Wood
27	<i>Grewia optiva</i>	Malvaceae	Tree	Bhimal	Rope making, fodder, edible fruits, firewood, religious purpose	Leaf, Bark, Wood, Fruit
28	<i>Hellenia speciosa</i>	Costaceae	Herb	Keol, Belori	Gonorrhoea	Rhizome
29	<i>Heracleum candicans</i>	Apiaceae	Herb	Padra	Eczema, skin diseases	Root, Fruit, Seed
30	<i>Himalayacalamusfal coneri</i>	Poaceae	Herb	Bans, Himalayan bamboo	Baskets, mats, furniture & other construction, young shoots edible.	Culms
31	<i>Jasminum humile</i>	Oleaceae	Shrub	Sungli, Shanjol	Ring worms, STDs, Skin diseases	Bark, Root, Flower, Leaf

32	<i>Juglans regia</i>	Juglandaceae	Tree	Akhrot	Fruit, furniture, oil for skincare	Fruit, Wood
33	<i>Mallotus philippensis</i>	Euphorbeaceae	Tree	Kamil, Kamlu	Itching, Stomach ache	Seed, Leaf
34	<i>Mentha arvensis</i>	Lamiaceae	Herb	Pudeena	Dysentery, Culinary purposes	Leaf
35	<i>Murrayakoenigii</i>	Rutaceae	Tree	Gandheli	Stomach worms in infants, Culinary purposes	Leaf
36	<i>Musa spp.</i>	Musaceae	Herb	Banana	Used in festivals and ceremonies, fruit is consumed directly, mats, baskets etc.	Leaf, Flower, Fruit
37	<i>Myrica esculenta</i>	Myricaceae	Tree	Kaphal	Fruit for pickle, jam and chutneys, timber, fuelwood	Fruit, Wood
38	<i>Ocimum sanctum</i>	Lamiaceae	Shrub	Tulsi	Fever, Cough, Cold	Whole plant
39	<i>Prinsepia utilis</i>	Rosaceae	Shrub	Bhekkoi	Boils	Root
40	<i>Picrorhizakurroa</i>	Plantaginaceae	Herb	Kutki	Fever, digestion, cultural, flovaouring agent	Root, Rhizome, Whole plant
41	<i>Pinus roxburghii</i>	Pinaceae	Tree	Chir	Bark used as cast for cattle fracture	Bark
42	<i>Podophyllum hexandrum</i>	Podophyllaceae	Herb	Bankakri	Hoof diseases	Root
43	<i>Populus ciliate</i>	Salicaceae	Tree	Neeru	Timber, fuelwood, bark and leaves for fever and pain	Bark, Leaf, Wood
44	<i>Punica granatum</i>	Lythraceae	Shrub	Damoi, Anar	Gastric	Fruit

45	<i>Prunus armeniaca</i>	Rosaceae	Tree	Chula	Headache	Seed
46	<i>Prunus persica</i>	Rosaceae	Tree	Aadu	Seed coat for acne	Seed
47	<i>Pyrus pashia</i>	Rosaceae	Tree	Kainth	Cough, fever, fuelwood, timber, jams and pickles	Fruit, Wood
48	<i>Quercus leucotrichophora</i>	Fagaceae	Tree	Banj oak	Scorpion bite, fodder	Leaf
49	<i>Rauwolfia serpentine</i>	Apocynaceae	Shrub	Sarpgandha	Powder of roots used for hypertention	Root
50	<i>Rhododendron arboretum</i>	Ericaceae	Tree	Burans	Dysentery, blood coolant	Flower
51	<i>Rubus ellipticus</i>	Rosaceae	Shrub	Aakhe, Ishav	Edible fruit	Fruit
52	<i>Rubus niveus</i>	Rosaceae	Shrub	Kali achoi, Heesar	Wounds	Root
53	<i>Sapindus mukorossi</i>	Sapindaceae	Tree	Reethachilka	Hair tonic	Seed
54	<i>Siegesbeckia orientalis</i>	Asteraceae	Herb	Dudhla	Snake bite	Root
55	<i>Terminalia bellirica</i>	Combretaceae	Tree	Baheda	Piles, urinary disorders, liver problems	Bark, Fruit, Seed
56	<i>Terminalia chebula</i>	Combretaceae	Tree	Harad	Constipation, diarrhea, and indigestion	Fruit
57	<i>Tinospora cordifolia</i>	Menispermaceae	Shrub	Giloy, guduchi	Jaundice, diabetes	Stem
58	<i>Toona ciliata</i>	Meliaceae	Tree	Tun, Toon, Tooni	Hair oil to cure baldness, fodder	Bark
59	<i>Trianthem portulaca strum</i>	Aizoaceae	Herb	Panchphuli	Fever, skin diseases, leafy vegetable	Leaf

60	<i>Tribulus terrestris</i>	Zygophyllaceae	Herb	Gokhru	Uterine tonic, vegetable and cultural use	Fruit, Root, Whole plant
61	<i>Urtica ardens</i>	Urticaceae	Herb	Kushka	Skin diseases	Root
62	<i>Viola pilosa</i>	Violaceae	Herb	Vanafsa	Fever, Cold	Flower
63	<i>Withaniasomnifera</i>	Solanaceae	Shrub	Ashwagandha	Stress, anxiety, inflammation, flavoring agent and cultural use	Root, whole plant
64	<i>Zanthoxylum armatum</i>	Rutaceae	Shrub	Timru, Timbur	Stem used as toothbrush, toothache	Stem, seed

Some of the traditional plant use methods being observed and explored through interaction with the inhabitants of upper age class in the area are listed in Table: 3 below:

Table3. Traditional methods of plant usage in study area

Plant common name	Method of usage
Aadu	The shell or seed coat of the seeds is grinded as fine paste to be used as scrub and face mask as pimple and acne cure.
Baheda	The fruit is roasted and grinded, powder so formed is consumed with honey to treat cough.
Bicchughas	Flowers and leaves of the plant are cooked as vegetable for the pregnant women due to high nutrition. The soup is consumed to remove kidney stones.
Burans	The leaves are grinded in fine paste and inhaled to relieve cough.
Brahmi	The boiled leaves are applied on forehead to cure headache.
Chulu	The oil extracted from the seeds is believed to be hot in nature thus massaged on pregnant women body.
Deodar	Itching and skin infections of domestic animals like cows are treated with its wood oil.
Gandheli	The extract of the leaves are given to young children to kill stomach worms.
Golda	The roots are crushed and applied on the snake bite.
Kashmoi	The roots are dried and consumed empty stomach to control blood sugar level.

	Extracted juice also cures red eyes and other eye infections.
Shilpada	Kidney and gall bladder stones are cured by the juice of boiled roots.
Timru	Leaves are dried and kept for years and used to cure toothache.

Future research avenues provide researchers with several opportunities to study local plant and animal species. Socioeconomic factors can be calculated for services. Ecotourism has the ability to boost the economic incentives for conservation operations while also benefiting local communities in the area. Policies that encourage local empowerment in natural resource management while simultaneously protecting traditional knowledge systems must be created. Additionally, because the study area is isolated and its narrow, curving roadways are prone to calamities like landslides, researchers can develop tactics to deal with issues like language barriers, as two-fourths of the respondents speak only Jaunsari natively. In order to prevent any detrimental effects on the local population, cultural awareness must be ensured.

4. CONCLUSION

- Plant usage could change over certain period of time without affecting knowledge but generating changes in long run. Due to a lack of contemporary facilities, the Jaunsar Bawar region still has access to traditional knowledge, which is primarily used for daily needs. Noteworthy findings stand out from this work reveals that residents in the more remote hamlet know and consume more plants than people in the more accessible villages. The knowledge about incorporation of cultural norms and customs into conservation methods for producing more inclusive and successful conservation outcomes needs to be developed. Threats can be identified and conservation measures can be developed with the support of continuous research and monitoring of the region's plant diversity.

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