*Original Research Article*

# An ethnobotanical survey of plants used by communities aroundJaunsar- 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 th (Bargali et al., 2022). According to the Census of India 2011, 67.99 % of the population of the Uttarakhand state reside regions &depends entirely or in parton neighboring forests for their daily needs of major forest produce and NTFP speci Harshberger described ethnobotany as the study of plants used by prehistoric and indigenous people in 1896. It is the stud interaction between humans and plants, which includes the customs and knowledge of various societies regarding the use of p 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).

**Comment [G1]:** The abstract seems okay. However, revisit your abstract. There are a lot of grammatical errors.

**Comment [G2]:** The primitive here is a big word. Are you sure they are primitive or indigenous?

**Comment [G3]:** Documents and explores

**Comment [G4]:** Habit or habitat?

**Comment [G5]:** Ethnobotany.. Do not separate it.

**Comment [G6]:** The flow of information in your introduction is good. However, several grammatical errors will confuse the readers. Re-read everything and edit the grammatical errors. There are more in the second paragraph.

**Comment [G7]:** (2011)

**Comment [G8]:** And - use the word

**Comment [G9]:** Before you use an acronym, you need to spell it out first. After, you can use the abbreviation.

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 Jaunsur 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'sJaunsar Bawar region.

## 2. METHODOLOGY

**2.1 Study area:** The study has been conducted in the hilly area of north Indian state of Uttrakhand'sGharwal 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 |

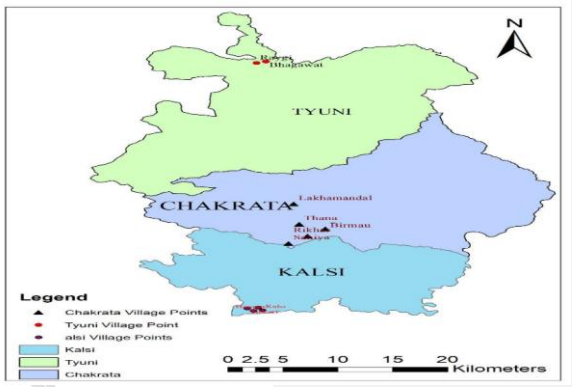



**Fig.1. Study sites map**

**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 oflocal people would be collected from the panchayat offices and block development office.

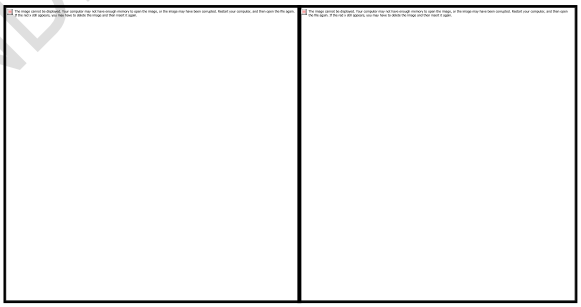
The ethnobotanical surveys was conducted using a standard questionnaire to obtain ahugenumber of quantitative data on plants used by thetribes by speaking with a significant number of their members ofdifferentages; vaidyas, hakeems and local healers were mostly consulted (Kumar and Khan, 2023). Information was documented on the basis of the local name, usage, part used etc. (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.

**Comment [G10]:** I have a lot of questions about your methods.
1.How could you obtain quantitative data using a standard questionnaire, which is usually used for qualitative studies?
2.What statistical measures did you use IF you used quantitative data to make your results accurate?
3.Since you interviewed local inhabitants, are they really from "primitive" communities or just indigenous or local? Be careful in your word selections.
Your data collection needs to have a major revision. It is very confusing and it lacks details.

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

## 3. RESULTS AND DISCUSSION

.The results of the study are based on responses from 110 respondents with 57.27% male and 42.72% females (Figure: 3) from 11 villages on their traditional usage of various plant species present in the area.



**Comment [G11]:** This is not results and discussion. This is just presenting the data with no supporting literature. There is no analysis and all of your objectives were not met.

You need to work on the following:
- Major grammatical errors
- Organization of thoughts is bad
- Presentation of data
- Figures, tables, and plates should be in proper format too
- Analysis
- Supporting literature

You need to have a MAJOR REVISION ON ALMOST EVERYTHING! You can do it!

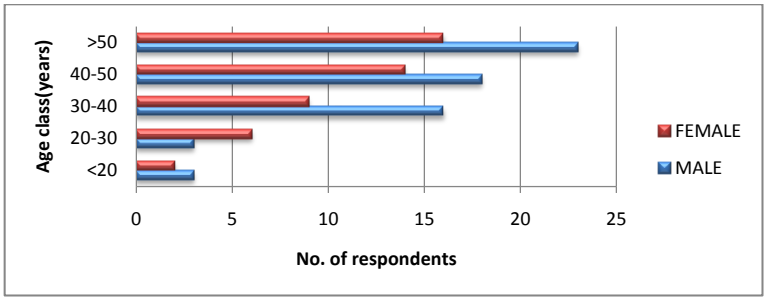



**Fig.3. Number of respondents based on gender**

**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.

**Comment [G12]:** How were you able to identify these 64 plant species? Mention it in your data collection section.

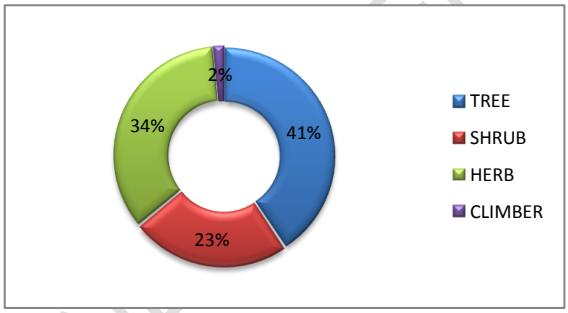



**Fig.4. Habit ratio of species**

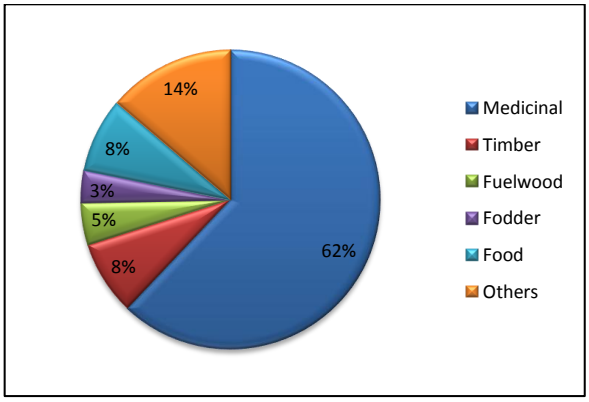



**Fig.5. Category of usage**

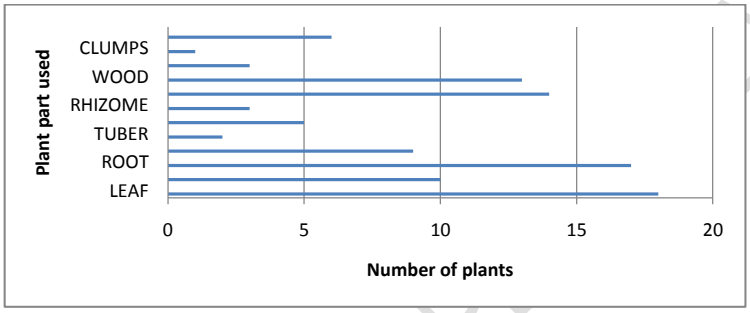



**Fig.6. Number of plants used for its various parts**

**Table2. Plant species and their utility in Jaunsar Bawar**

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

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

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

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

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 60 | *Tribulus terrestris* | Zygophyllaceae | Herb | Gokhru | Uterine tonic, vegetable and cultural use | Fruit, Root, Whole plant |
| 61 | *Urtica ardens* | Urticaceae | Herb | Kushka | Skin diseases | Root |
| 62 | *Viola pilosa* | Violaceae | Herb | Vanafsa | Fever, Cold | Flower |
| 63 | *Withaniasomnifera* | Solanaceae | Shrub | Ashwagandha | Stress, anxiety, inflammation, flavoring agent and cultural use | Root, whole plant |
| 64 | *Zanthoxylum armatum* | 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.<br><br>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

Comment [G13]: I get what you are trying to convey in your conclusion but the organization of your sentences needs to be improved.

- 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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