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Survey of Ethnobotanical Plants Used by People Of Village Khanrotu (Rampur Bushhar), Shimla, Himachal Pradesh (India)

Kalyani Supriya

Department of Environmental Sciences, Himachal Pradesh University Shimla (H.P.), India

Abstract: ***Introduction:****The traditional knowledge of ethnobotany help in existence of local population and acquiring such knowledge can improve the modern living as well. Ethnobotany is made up of two words 'ethno' means study of people and 'botany' means study of plants. Himachal Pradesh is a small mountainous state in the North-West Himalayan region and is well known for its biological diversity. Many plant species are rare and it makes the floristic richness even more important besides having high flora and fauna. The state has high value of medicinal and herbal plants which plays an important role in the upliftment of the rural people. The present study was with the aim of enhancing the knowledge of the ethnobotanical aspects of rural people of Himachal Pradesh.* ***Material and Methods****:The study area lied in Rampur tehsil of Shimla district in Himachal Pradesh, India. The village Khanortu was the fourth ward of Taklech panchayat of Rampur tehsil. The study area was located between the co-ordinates 31º22'58"N and 77º42'55"E. It was at 133 km from the district headquarters, Shimla. For the collection of data, a semi-structured questionnaire was prepared and conferences/ interview**with respondents also conducted. Results: **The present investigation has revealed the usage of twenty three plant species for food (nineteen plants) and fodder (seven plants) purpose, three plants were recorded to be used for both purpose. These documented plants includes twenty angiosperms (87%), one gymnosperm (4.34%), one pteridophyta (4.34%) and one fungi (4.34%) belonging to 16 different families and 18 genera.* ***Conclusion****: The present study was helpful in understanding, how villagers of Khanrotu village used sustainably these plants and maintained this traditional knowledge as a heritage for future generation.*

Keywords: Ethanobotanical plants,rural people, traditional knowledge

1. Introduction

Since the time immemorial, humans have used the natural resources on such a frequent basis that it is impossible to even define their existence without it. Food, timber, medicine, fuel, cloth, shelter etc. were all natural products. Now we have reduced our dependency on nature to a great extent, still the rural, poor people and those who live in tribes are dependent on nature for food, fodder, medicine, and fuel. This dependency can be seen throughout the world, hence India is no different. India is an agriculture based country. According to Indian Economic survey (E.S) 2020-21, about 54.6% of the total workforce in the country is still engaged in agricultural and allied sector activities which accounts for approximately 17.8 per cent of the country's Gross Value Added (GVA) for the year 2019-20. It shows the unsustainability of the sector and hence the population relying on agriculture has to depend on other sources for their daily needs. The agriculture sector consist the poorest people in the country. Even the farmer himself couldn't get enough food, which makes him dependable on wild plants for survival. Majority of the interaction between humans and natural resources is in terms of food requirements, fodder requirements, timber, medicines and collection of fire material. There is no doubt that this knowledge is the reason human species made this far and this is not the only cause why this knowledge is important, it has not just historical or traditional aspect but there is environmental sustainability and resilience attached to it. The modern knowledge must be furnished in order to abreast itself with traditional knowledge on sustainability. The importance of this traditional knowledge for the protection of biodiversity and the achievement of sustainable development is slowly being recognized internationally. For example, Article 8 of the Convention on Biological Diversity urges us to "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity (Mazzocchi, 2006). It is hard to define traditional knowledge, but simply could be understood as; all that includes the daily practices of our decadents, their food habits, life style, social customs, religious believes family decorum, educational system, security codes, trading methods, agricultural tool, traveling mode etc. From the ancient time, plants have a great influence and importance in human life. Each plant species have something special that can be extracted from it. What can be extracted from a species and how it can be extract, all the answers lie with traditional knowledge which in modern scientific world we call "*Ethnobotany*". In order to gain information about the relation between the man and biodiversity there are many specialized fields. Ethnobotany is one of them. It can be defined as the study of regional plants and their uses through the traditional knowledge of local people (USFS). With respect to increasing the knowledge of traditional uses we can improve the efficiency of modern practices. Usually the traditional methods are well suitable or sustainable to the environment most of them do not possess any pollution or side-effects. Thus the traditional knowledge of ethnobotany can really help in existence of local population and acquiring such knowledge can improve the modern living as well. Ethnobotany is made up of two words 'ethno' means study of people and 'botany' means study of plants. Ethno is a Greek word from ethnology which is study of culture. It is a scientific study of relationship that exists between people and plants. Though then term ethnobotany was not coined until 1985 by the USA botanist John Williams Harshberger, the history begins long before that. In 77A.D. the Greek surgeon Dioscorides published "De Materia Medica". This

was a catalog of about 600 plants in the Mediterranean. It included how Greeks used the plants for various purposes. He also mentioned that how to extract the plant and was it poisonous or edible. In India the very first ethnobotanical study was done by Sir Watt, who published a dictionary of economic products of India with 3000 entries in vernacular with their uses. This is considered the first workshop on ethnobotany that was conducted in India (Sing *et al.*, 2018; Supriya*et al.*, 2022). To document the secret uses of plants, ethnobotany has become an important part of our world. Recent studies of tribal knowledge of plants are an imperative fact of ethno-botanical research; people healed themselves with traditional medicines and ancient remedies from time immemorial (Jain, 2018). Human beings have found remedies within their habitat, and have adopted different strategies depending upon the climate, phyto-geographic and faunal characteristics, as well as upon the peculiar culture and socio-structural typologies. Most of such information is passed on the following generations by traditional healers through oral communication and discipleship practice (Samuel *etal*., 2010). Moreover, the World Health Organization (WHO) has reported that about 80% of the world population relies on traditional medicine to cure ailments (Marshall, 1998) and about 84% of India depends on the traditional system of health care (Chopra *et al*., 2006). Today the field of ethnobotany requires a variety of skills; botanical training for identification and preservation of plant specimens, anthropological training to understand the cultural concepts around the perception of plants, linguistic training, at least enough to transcribe local terms and native morphology because the native healers are often reluctant to accurately share their knowledge with outsiders. Today, nearly 74% of pharmacologically active plant-derived components were discovered (Singh and Navneet, 2018). Currently, people of Asia and India are utilizing plants as part of their routine food and health management (Perumal, 2015). In 2003 at the 32nd session of UNESCO, the convention for safeguarding intangible cultural Heritage was adopted in Paris, in which it was stated for the first time that knowledge and practices concerning nature and the universe and part of our cultural heritage, means that ethnobotany, ethnobiology, folk medical and pharmaceutical knowledge and now recognized as being inextricable components of culture and therefore worthy of being protected and sustained (Pleroni*et al.*, 2005). In India literature relevant to ethno-botany can be traced in the Vedic literature, CharakaandShusrut, *ShurutaSamhita* appeared as the most important works. A very little work had been done until twenty years ago. Several workers have been investigated the ethno botany of northern, southern and central India. India has a rich diversity of flora and fauna due to an immense variety of climate and altitudinal zones coupled with varied ecological habitats (Bajpai and Mitra, 2002; Bhalla*et al.*, 2006; Bhatnagar *et al.*, 2007; Kochee*t al.*, 2008; Dubey *et al*., 2009). The present study was with the aim of enhancing the knowledge of the ethnobotanical aspects of rural people of Himachal Pradesh. Himachal Pradesh is a small mountainous state in the North-West Himalayan region and is well known for its biological diversity. Most common use of biodiversity in H.P is for timber, food, fuel, fodder and medicinal purposes. The geography of Himachal Pradesh varies from its low lying hills of about 300 m in Shivalik range which includes the districts like Solan, Sirmaur, Bilaspur, Una, Hamirpur and small part of Kangra district, up to 6900 m high mountains in Zanskar range in Kinnaur and Spiti. With the varying climatic conditions variety of plants and animals are found in the wilds of Himachal Pradesh. Many tribes in Kinnaur, Chamba, Lahul&Spiti uses plants for variety of reasons but the traditional food and medicinal uses are at the top. In this mountainous state there is vast floral a faunal diversity. As par the report published by HPSBB on Biodiversity status and initiatives in Himachal Pradesh,95% of the floral and faunal diversity is endemic to the state; remaining 5% is exotic species. Out of the 47000 plant species 3295 species are reported from Himachal Pradesh. Higher plants, ferns, mosses, lichens, 3120 angiosperms and 13 gymnosperms, 124 pteridophyta and 38 are orchids. The vegetation is a blend of ban-oak forest moist temperate deciduous forest Himalayan alpine pasture, Rhododendron forest. Lower hills have *Chir* and blue pine in majority while in higher altitudes *Fir* and *Spruce*. In foothills, dry deciduous forests with *Sal* as dominant species. In remote areas of the state many plants are used for medicinal purposes and nearly 60 species are endangered under IUCN red list. The present investigaton is focused to find out the plants and people relation in a village named Khanortu of Shimla district. Shimla district lies in the South-Eastern part of the state. There are 17 tehsils and the total number of inhabited villages is 2705 under the Shimla district. In Shimla district there is a Tehsil named Rampur Bushher and in its Taklech panchayat there is a village name Khanortu (Ward no. 4). The Khanrotu village is in sub temperate region of the district with elevation of nearly 1450 m. In the present study, relationship between the plants and the people was studied with the objective to find out the wild edible plants and fodder trees in study area.

2. Material and Methods

2.1 Study Area

Himachal Pradesh situated between latitudes 30°22’40”N to 33°12'40"N latitude and 75°45’55”E to 79°04' 20"E longitude, which was wholly mountainous with altitude ranging from 350 to 6975 meters above mean sea level. Topographically, the state was divided into three zones: The Shiwalik or Outer Himalayas, Inner Himalayas or Mid-mountains and Greater Himalayas. The study has been conducted in the Inner or Mid Himalayan zone. The study area lied in Rampur tehsil of Shimla district in Himachal Pradesh, India. It lied in Dhauladhar range of Middle Himalayas running from Badrinath to Kashmir which was intercepted by Sutluj River nearby the study area. The village Khanortu was the fourth ward of Taklech panchayat of Rampur tehsil. The study area was located between the co-ordinates 31º22’58”N and 77º42’55”E. It was at 133 km from the district headquarters, Shimla. The study area was bounded by other villages like village like Theda in South-East, village Narain in South, village Rajpura in West, village Darshal in North-West, village Dheoti in North and Taklech in the East. The elevation of the village was somewhere around 1040 m from sea level.

Figure 1: Map of Study area (Source: google Earth)

Table 1: Statistical data related to the village (Census 2011)

Area of the village	210 ha
Household	39
Total population	187
Population (0-6 age)	23
Male population	95
Female population	92
Total Literate	130
Literate male	71
Literate female	59
Total worker	139
Cultivator	105
Other workers	14

The total population of the village was 210 according to the census 2011. From every household at least one person was in unorganized sector or was working as a daily wage worker. The economy of the house was additionally supported with agriculture and livestock. The study area was situated on the Northern aspect of the hill with a valley. On the southern aspect it is all jungle where villagers had their *ghasni* (grassland). The village Khanrotu was surrounded by hills and small rivers commonly called *khads*and *nallas.*

2.2 Collection of data

For the collection of data regarding the various specimens of plants, their local names, parts used, purposes and their ethnobotanical knowledge, extensive ethno-botanical survey of the village was conducted from April-September 2021. During the survey study area visit was conducted in such a way that the collection of data would be easy and reliable. The convenience non random sampling method was employed in order to identify key informants who had relevant knowledge about different plants and wild edible plants or grasses in the study area. During the survey, information gathered through participatory observations was also included in the results. For the interview purpose the age groups were fixed. It was decided to interview only people above the age of thirty years. This was done in order to keep the inaccuracy minimum and to gain some realistic information. Before the interview, the respondents were briefed about the purpose of the interview and the verbal consent was taken. During the survey, open ended semi-structured questionnaire was prepared for the interview During survey about twenty five respondents of different age groups were consulted for information collection. The elderly persons (man & women) of the village, local medicine man (*Baidiya*), ayurveda practitioners were interviewed via a meeting while collecting information. During the survey, questioning in the interviews and group discussions was carried out in native local language in order to minimize bias information and make it easy to understand and to administer for the interviewer and for interviewee as well.

3. Results and Discussion

During the survey it was recorded that 64% female and 36% males (Figure 2)were interviewed from five different age groups; three people (12%) were from (30-40 year) age group I (Figure 3). It was found that 24% people were from (40-50 year) age group II, 36% were from (50-60) age group III followed by 20% people from (60-70) age group IV and only 8% people were above 70 years age (group V). As per the survey findings it was observed that 12% of the respondents were illiterate, 8% respondents were studied up to fifth standard, majority of interviewees; 44% were studied up to eighth standard, 16% people were studied up to tenth standard, 12% of them were studied up to twelfth class and only 8% were graduated in study area (Figure 4). It was observed that the male interviewees had various professions like teacher; wage worker; painter & maximum female respondents were housewives who use to generate employment through selling dairy product like milk, ghee etc (Table 2). The employment status of the interviewees is given below in Table no. 2.During the survey and group discussions with local villagers it was found that information of ethnobotanical plants and their uses were confined to elder people (above 40 years of age). During the survey, it

was observed that the younger generation was ignorant about the vast edible resources available in their surroundings. It was interesting to know that the male respondents held substantial knowledge of edible plants as compared to the females. However females had good knowledge of the fodder plants. The reason could be the fact that female use to do more household and dairy works than males. The general uses of documented plants of the study area have been given in Table no. 4, 5, 6, 7 and 8. In the study area, wild plants were being used for many purposes like food, fodder, medicinal plants, timber and basket making, resins and soap or detergents but the wild edible and fodder plants held a special position as it was supplementary part of their life. The present investigation has revealed the usage of twenty three plant species for food (nineteen plants) and fodder (seven plants) purpose, three plants were recorded to be used for both purpose. These documented plants includes twenty angiosperms (87%), one gymnosperm (4.34%), one pteridophyta (4.34%) and one fungi (4.34%) belonging to 16 different families and 18 genera. According to the findings plants found in the study area were from Fabaceae, Moraceae, Cannabaceae, Ericaceae, Myricacea, Berbaridaceae, Rosaceae, Rutaceae, Urticacea, Polypodiaceae, Morchellaceae, Malvaceae, Fagceae, Pinaceae, Convoluvlaceae, and Cruciferae family (Table no. 4, 5, 6 , 7 and 8). The Fabaceae and Moraceae were highest repeating families with three species each followed by Cannabaceae and Fagaceae with two species each. The highest repeating genus was *Ficus*and *Quercus*with two species each. As enumeration of the ethnobotanical data has been done for various aspects included scientific name, local name, common name, family, phenology, collection period, plant part used, traditional or other uses of the plants collected during the survey, plants were recorded in different life forms(Table no. 4, 5, 6 , 7 and 8). The edible trees have been listed in Table no. 4, shrubs category enlisted in Table no. 5, edible herbs enlisted in Table no. 6, edible fungi in Table no. 7 and fodder trees have been listed separately in Table no. 8.

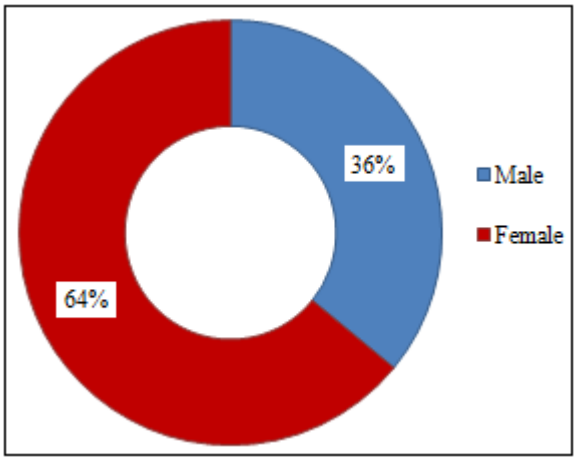

Figure 2: Diagrammatic representation showing gender distribution of respondents in study area.

Figure 3: Diagrammatic representation showing age group distribution of respondents in study area

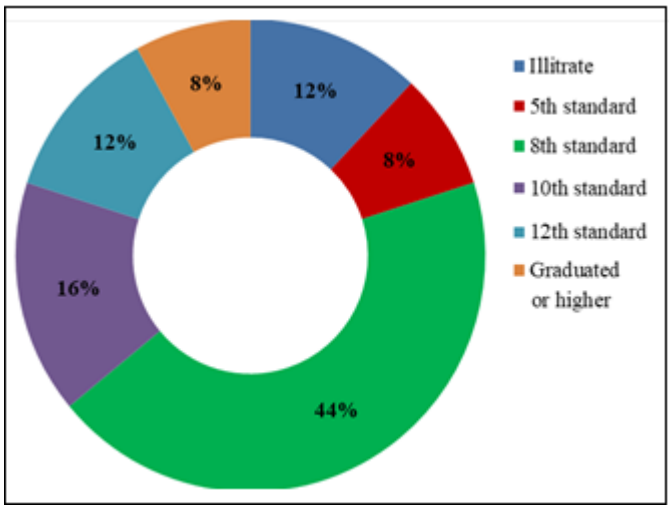

Figure 4: Diagrammatic representation of educational status of respondents in study area.

Table 2: Occupation status of the respondents in study area

Sr. no	Occupation of the respondents	Respondents	
		Number	Percentage (%)
1	Teacher	1	4
2	Wage worker	6	24
3	Electrician	1	4
4	Painter	1	4
5	Mistri	2	8
6	Housewives	11	44
7	Vaidya/Medicinal Practitioner	2	8
8	Mid-day meal worker	1	4
Total		25	100

Wild Edible Plants

During the investigation, nineteen (82.6%) wild edible plants were documented that were being consumed by villagers throughout the year. These plants comprised the pteridophyte and the fungi as well. These wild edible plants were from fifteen families like Fabaceae, Moraceae, Cannabaceae, Ericaceae, Myricaceae, Berbaridaceae, Rosaceae, Rutaceae, Fabaceae, Convoluvlaceae, Cruciferae, Urticacea, Dryopteridaceae, Morchellaceae, Pinaceae and eighteen genera like *Bahunia, Ficus, Myrica, Morus, Pinus, Pyrus, Rhododendron, Berberis, Murraya, Rubus, Canabis, Ipomoea, Lathyrusa, Nasturtiumm, Pteridium, Urtica, Vicia, and Morchella* .It was observed thatout of total wild edible plants, eight (42%) were edible tree species like *Bahuniaveriegata, Ficuspalmeta, Ficusroxburghii, Myricaesculanta, Morusserata, Pinusroxburghii, Pyruspashia and Rhododendron arboreum*belonging to 6 families named Fabaceae, Moraceae, Myricaceae, Pinaceae, Rosaceae, and Ericaceae. It was recorded that among the edible trees Moraceae was the highest reoccurring family (three plants). According to the survey data collected on wild edible plant of the study area have been summarized based on their life form in Table no. 4 .

Table 3: Number of edible species and their life form.

Sr.no.	Plant life form	Number of species	Percentage of species (%)
1	Edible Herbs	7	36.8
2	Edible Shrubs	3	15.7
3	Edible Trees	8	42.3
4	Edible Fungi	1	5.2
	Total	19	100

Table 4: List of plants used for edible purpose (Edible trees) distributed in study area

Sr. No.	Scientific name	Local name	Common name	Family of the plant	Phenology	Collection period	Plant part Used	Other uses
1	*Bauhinia variegata*	Grayed	Orchid tree / Mountain ebony	Fabaceae	Flowering in March - May, fruiting in August to September	Spring season	Young floral buds are edible	Dried buds used in dysentery, piles and expelling worms. Roots are antidote to snake bite.
2	*Ficus Palmeta*	Phedu	Wild fig	Moraceae	Flowering is in June to September and seed ripens in August.	Summer season	Fruit is edible	The latex of the plant is used to take out spines lodged deeply in the flesh, also it is a fuel wood
3	*Ficus Roxburghii*	Triyamad	Elephant ear fig	Moraceae	Flowering in March – April, fruiting in June and July	Summer season	Fruits are edible	Roasted fruit is used in the treatment of diarrhea and dysentery. Very good fodder plant
4	*Myrica Esculanta*	Kaphad	Box berry	Myricaceae	Flowering occurred in Feb to April, fruiting is in the month of may	Summer season	Fruits are edible	Bark of the stem or root is used to treat dental caries
5	*Morushimlayana*	Kimu	Himalyanmulbay	Moraceae	Flowers in April to May, and ripen in June to July	Winters season	Ripened fruits are eaten	Extr. of the bark is applied to cuts and wounds
6	*Pinusroxburghii*	Chir pine	Chir pine	Pinaceae	Flowering occur in March and ripening of seeds in April –May	Spring season	Seeds are eaten raw.	Fuel wood, resin is use in many industries. Leaf extr. kill stomach worms.
7	*Pyruspashia*	Shegul	Himalayan pear	Rosaceae	Flowering begins in Februry to April, fruiting occurs in November-December	Spring season	Ripened fruits are eaten in raw form	Rootstock is used for grafting pear. Walking sticks are made of it. A good fuel.
8	*Rhododendron arboreum*	Burash	Rhodo-dendron tree	Ericaceae	Flowering occur in February- march	Spring season	Flowers are edible	The extr. of the bark is used in the treatment of coughs, diarrhea and dysentery

Table 5: List of plants used for edible purpose (edible shrubs) distributed in study area

Sr. No.	Scientific name	Local name	Common name	Family	Collection period	Phenology	Plant part Used	Other uses
1	*Berberis Lycium*	Kamashadi	Indian barberry	Berbaridaceae	Summer season	Flowering in March and April, fruit ripening occur in May and June	Fruits are edible	Plant is a good source of dye and tannin.
2	*Murraya Koenigii*	Kari patta	Curry leaf	Rutaceae	Summer season	Flowering occur in April-May and peak fruiting in July August	Used as a flavoring agent	Leaves stops vomiting, bark and roots are used in bites of poisonous animals.
3	*Rubus Ellipticus*	Hinsar	Yellow himalayan rasp- berrey	Rosaceae	Summer season	Flowering occurs in march and ripening of fruits in May and June	Fruit is edible.	Fruit is used for wine preparation and roots are used for stomach pain

Table 6: List of plants used for edible purpose (Edible herbs) distributed in study area

Sr. No	Scientific name	Local name	Common name	Family	Collection period	Phenology	Plant part Used	Other uses
1	*Canabis sativa*	Bhang	Hemp, marijuana	Cannabaceae	Summer to rainy	Flowers in autumn	Leaves and seeds are edible	It's A medicinal plant, and Hamp seed oil is also produced.
2	*Ipomoea batatas*	Kacchaaalu	Sweet potato	Convolvulaceae	Winter season	It flowers rarely in summer months	Tuber is edible	Only edible uses.
3	*Lathyrusaphaca*	Chaptidaicho dki	yellow pea	Fabaceae	Spring season	Flowering in Feb- April, fruiting in April to May	The leaves with immature flowers at the top of the plant are edible.	Used to feed the livestock
4	*Nasturtium officinale*	Bholku	Watercress	Crucifereae	Summer season	Flowering occurs in April to July, ripens in July to October	Leaves are used for the preparation of green vegetable	Used to treat Swollen breathing passages and coughs.
5	*Diplaziumesculentum*	Lingada	Fiddlehead	Dryopteridaceae	Summer and Rainy season		Whole body above the ground is edible.	It is used for pickle.
6	*Urticadioca*	Chiunshee	Common nettle	Urticaceae	Summer season	Flowering in May to September Fruiting in September – October.	Leaves are used as vegetable	Treat painful muscles and joints, eczema, arthritis, gout, and anemia.
7	*Vicia sativa*	Shiviyan	common vetch	Fabaceae	Spring season	Flowering in Feb-March fruiting in March onward	Seeds with pod or without pod are edible.	Also feed to livestock

Table 7: List of plants used for edible purpose (wild edible fungus) distributed in study area

Sr. No	Scientific name	Local name	Common name	Family	Collection period	Plant part Used	Other uses
1	Morchellaesculenta	Gucchi	Himalayan wild mushroom	Morchellaceae	Rainy season	Whole body above ground	It is used as body tonic and for stomach problems

Collection period

In the study area it was observed that eleven (57%)of the wild edible plants were being collected in summer season. These plants were *Berbarisaristata, Diplaziumaesculantum, Ipomoea batatas, Rubusellipticus, Murrayakoengii, Myricaesculanta, Ficusroxburghii, Narturtiumofficinale, canabis sativa, Urticadioca* and *Ficuspalmata*. In spring season five (26%) plants were available like *Bahuniavereagata, Lathyrusaphaca, Rhododendron arboreum, Pinusroxburghii,* and *Pyruspashia*. It was recorded that only three (16%) plants were being found in rainy season; *Morcehellaesculanta, Diplaziumesculantum, Canabis sativa.* And only two (11%) plants; *Morusserata*and *Ipomoea batatas* were recorded to be harvested in winters. On the basis of seasonal availability and collection period the distribution of wild edible plants was given in Figure no. 5.

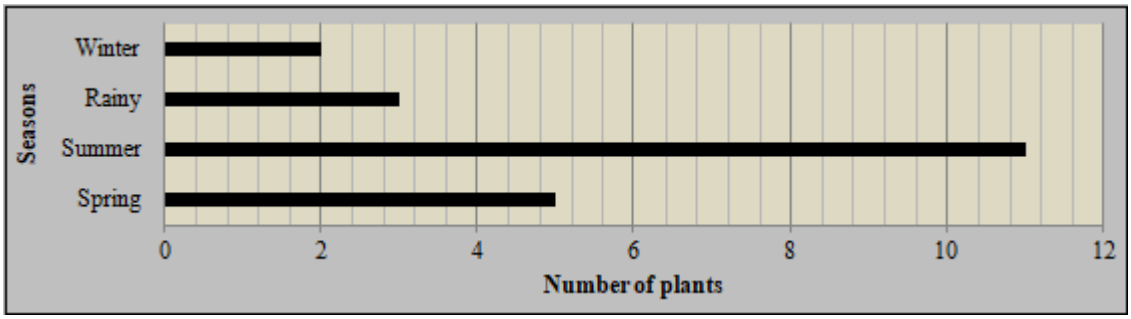

Figure 5: Diagrammatic representation showing Seasonal availability and collection period of edible plants

Plant part used

During the investigation it was found that different plant parts were being used by the respondents. On the basis of plant part used recorded in the survey edible plants were categorized in to six categories; edible fruits, edible leaves, edible seeds, flowers, roots/tubers and whole body part above ground. Majority of the species, around seven (37%), had recorded its fruits as edible part, these species were *Rubuselipticus, Berbariseristat, Pyruspashia, Morushimalyana, Myricaesculanta, Ficusroxburghii* and *Ficus palmate*. It was recorded that respondents informed that that flowers of two plants (10.5%); *Rhododendron arboreum*and *Bahuniaverigata* to be edible. It was recorded that plant leaves of five species (26.3%) named as; *Urticadioca, Nasturtium officinale, Lathyrusaphaca, Canabis sativa* and *Murrayakoenigii*were reported to be edible. The seeds of two plants (10.5%); *Vicia sativa* and *Pinusroxburghii* were edible and the whole body of two species (10.5%); *Morchellaesculanta* and *Diplaziumesculantum* was being consumed by the villagers. Other than that the tuber of *Ipomeabatatas* (5.2%) was recorded to be edible. Here distribution of plants based on plant part used for food was given in the Figure no. 6.

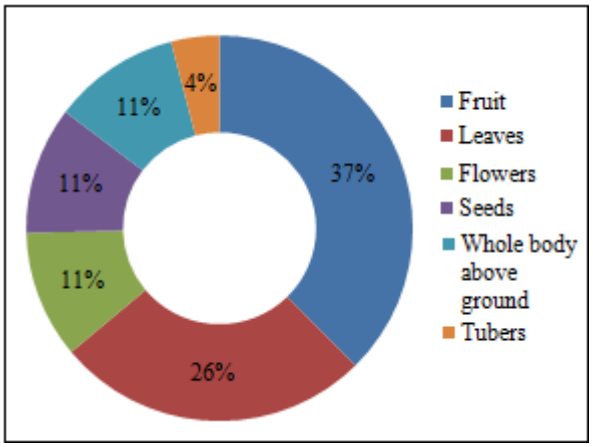

Figure 6: Diagrammatic representation showing plant part used for food instudy area.

Fodder trees

Being agriculture based economy in the village (Khanrotu), livestock was an important part. The cow and goat were the major part of it. Out of total 39 households 32 had cows and 6 households had both cow and goat and had dog as pet animals also. It was kind of necessary for shepherds to have dogs as protector. Dairy product was being sold out and was a good source of income. For the better nutritional health of cow, wild fodder plants were very important component in their diet. The local people use to fed Grasses to cows mostly on cut and carry basis and this was the case with the fodder trees as well. The local people of study area cut the branches of fodder trees which was locally called "*jodi*" and fed it to the animal. The animal breeds that villagers favoured were "*jersey*" or "*Himachali Pahari*" cow or hybrid. Usually the hybrids were very much favoured as they were well adapted to hilly terrains and also had high milk production. At the present time, the trend of goat or sheep farming had declined drastically. There were 6 household reported with goat in the village. "*Chigu"* was the breed that they use to rear and the number of livestock varied household to household. In study area, it was observed that villagers follow the feeding pattern which includes grass feeding 4-6 times per day depending upon season and cow milking stage. This regular routine was supplemented with fodder tree feeding locally called '*Jodi*". This '*Jodi*' was not reported to be given on daily basis. During the survey respondents told that '*Jodi*' feeding depends upon availability and accessibility hence was given twice or thrice in a week. For this purpose the villagers had fixed their fodder trees and cutting someone else's trees was not acceptable. These trees were usually confined or in surrounding with their agricultural land or "*Ghasnies*" (grassland). Other than fodder, perishable food items like fruits and cereals were being feed to the livestock. Cow feed from the market was given extensively to the livestock. Other additional feed which was quite rare locally called "*khalni*" (remains of apricot seed after the extraction of oil) and considered as a tonic for cows and was given with market feed in a hot water mixture.

Table 8: Diagrammatic representation showing plants used for fodder purpose in the study area

Sr. No.	Botanical name	Local name	Common name	Family of the plant	Phenology	Collection period	Other Usage
1	*Bauhinia variegate*	Grayed	Orchid tree	Fabaceae	Flowering in March - May, fruiting in August to September	Spring to autumn season	Dried buds used in dysentery, piles and expelling worms. Roots are antidote to snake bite.
2	*Ficus palmate*	Phedu	Wild fig	Moraceae	Flowering is in June to September and seed ripens in August.	Summer and rainy season	The latex of the plant is used to take out spines lodged deeply in the flesh, also it is a

							fuel wood
3	*Celtisaustralis*	Khidak	Nettle tree	Canabaceae	Flowering and leafing occur in Feb- march, fruiting occur in April may	Spring to autumn	It is a very good fodder plant other than that it's a fuel wood as well.
4	*Grewiaoptiva*	Beul	Beul	Malvaceae	Flowering occurs in April to May, fruit ripens in October November.	Spring to Autumn	A multi-purpose tree providing leaf fodder, fiber, and fuel wood
5	*Ficusroxburghii*	Triyemad	Elephant fig	Moraceae	Flowering in march – April, fruiting in June and July	Spring to Autumn season	Roasted fruit is used in the treatment of diarrhea and dysentery.
6	*Quercus Leucotrichophora*	Ban	Ban oak	Fagaceae	Flowers in April to May and fruiting in December.	Evergreen	A very good fuel wood
7	*Quercus Glauca*	Bani	Ring cupped oak	Fagaceae	Flowers in April to May and fruiting in December.	Throughout the year	A very good fuel wood.

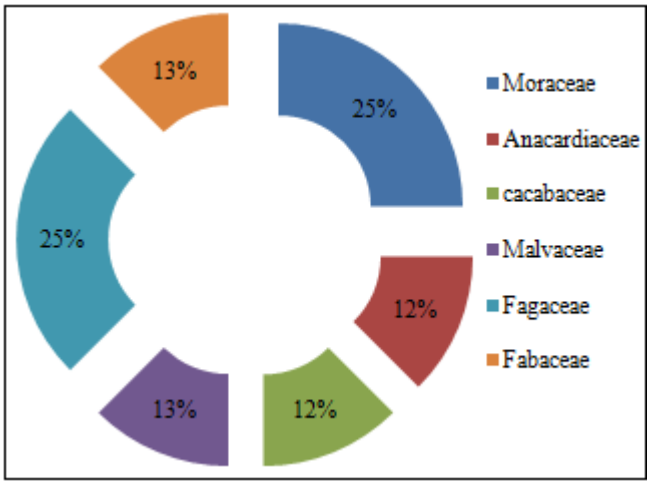

Figure 7: Diagrammatic representation of family wise distribution of fodder tree species

During the investigations, it was observed that not all household does the feeding through cut and carry methods, many household followed on field or pasture feeding of cows. In case of goat and sheep on site pasture feeding was done, no cut and carry method was applied for them unless it's rainy season. During the field survey seven fodder tree species were recorded. These plants were; *Bahuniavariegata, Celtisaustralis, Ficuspalmata, Ficusroxburghii, Grewiaoptiva, Quercusleucotricophora Quercusglauca*. Survey showed two species; *Quercusleucotricophora, Quercusglauca* were from Fagaceae family and two;*Ficuspalmeta* and Ficusroxburghii were from Moraceae. *Ouercus*and *Ficus* species were given widely to the livestock. However *Grewiaoptiva* was considered the best fodder species to the animals. A list of fodder plants species has been given in Table 8.

4. Conclusion

The present study was helpful in understanding, how villagers of Khanrotu village used sustainably these plants and maintained this traditional knowledge as a heritage for future generation. They used this knowledge in a way without putting plants in the danger of extinction and harnessed natural resources from the environment. Therefore, present efforts through this study were made to enhance the traditional knowledge so that the natural resources such as wild food sources and fodders could be used sustainably in the modern era.

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