

# **SPECIES DIVERSITY, TRADITIONAL ETHNOBOTANICAL USES OF FAMILY APIACEAE IN MUSK DEER NATIONAL PARK NEELUM VALLEY, AZAD JAMMU AND KASHMIR, PAKISTAN**

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## **ABSTRACT**

Apiaceae is one of the biggest plant families with high species diversity, having about 3700 species worldwide. This family has many potential uses such as food, fodder, shelter, Veterinary uses and medicinal plants. Current research was aimed to explore and document the diversity and traditional ethnobotanical uses of family Apiaceae from Musk Deer National Park. The samples were collected with random sampling method, while information on potential uses of different species was collected from interviews with local community. Current study reveals that 26 species belong to 12 genera from different habitats were collected having their ethnobotanical importance for the local inhabitants. Results depicted that Bupleurum was the dominant genus with 07plants species, followed by Pleurospermum and Chaerophyllum having 04 species each. Among plant use categories dual use categories was 50 % followed by single and multiple usage 42% and 08 % respectively. The current study will also be useful addition in ethnobotanical database, preservation of traditional culture and drug development through future ethno pharmacological research.

**INDEXTERMS-** Diversity, Ethnobotany, Apiaceae, Musk Deer National Park, Azad Kashmir, Pakistan

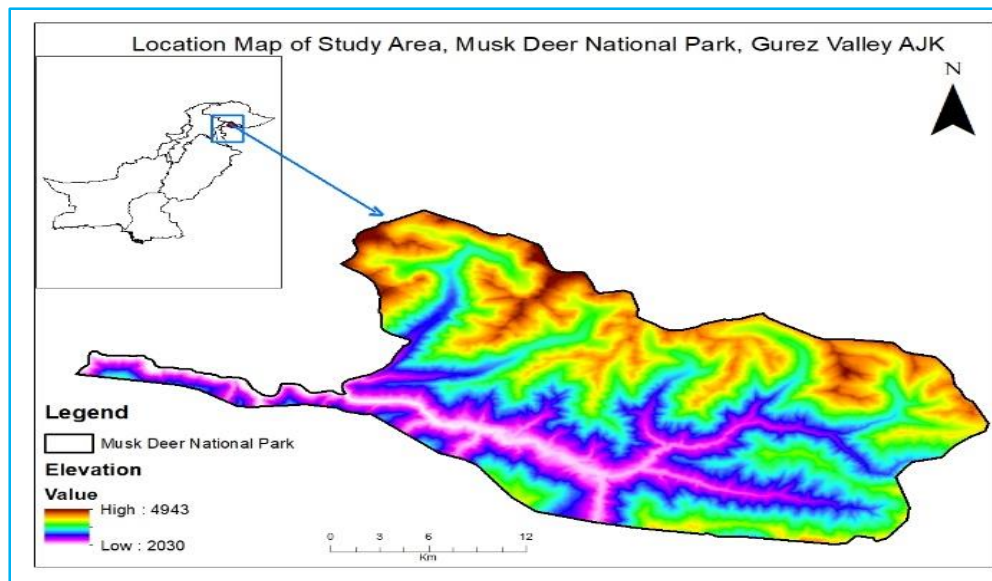
## **INTRODUCTION**

The Apiaceae is one of the largest plant families having 455 genera and 3700 species worldwide [1, 2]. About 56 genera and 167 species have been reported from Pakistan [3]. The Apiaceae is a cosmopolitan family distributed worldwide almost in all habitat, but it attains its greatest development in the temperate regions [3]. The family can be easily recognized by its inflorescence which is an umbel. Primarily Apiaceae consists of small

herbaceous plants though a few genera (e.g. *Heteromorpha*, *Steganotaenia*) are woody. Plants of this family usually possess a characteristic pungent or aromatic smell, its phytochemical composition indicates the presence of essential oil or oleoresin [4]. The members of this family are well known as aromatic, culinary herbs, spices, ethno veterinary medicine and with the significant higher proportion of medicinal plants, some of them have been used by humans since ancient times [5, 6, 7, 8].

The traditional ethnobotanical knowledges roots back to era when first man stated his life on earth and he used wild natural resources for life necessities. Ethnobotanical study provides comprehensive information about cultural uses of plants as ethnomedicines, to cure veterinary diseases folklore food phytonyms, fodder, fuel, aesthetic, rituals usage and shelter [9, 10, 11].

The study areas (Musk Deer National Park) is part of District Neelam which is one of the administrative units of state of Azad Jammu and Kashmir (AJK). AJK has diverse habitats, variable climatic conditions and appropriate fertile soil endowed with plant biodiversity out of which some are endemic to this region [12, 13]. MNDP covers area of an area of 528 Km<sup>2</sup> is present in North-East of Muzaffarabad with altitude of 1942 -4800 meters from sea level located at 34.731456°N, 74.786682°E and was gazetted as National Park in the Western Himalayan Range on September 24, 2007. It is bordered by Indian administrated Kashmir in the South, Astor and Deosai National Park (DNP) in the North-East, Muzaffarabad in the Southwest and Shounther Valley in the West (Fig: 1 Map of the study area).



**Figure 1: Map of the study area.**

The atmosphere is chilling winter with temp. 0–4°C and summer with 18–25°C and precipitation is 1650 mm per annum. Soil of the area is loamy appropriate for holding dampness which makes it useful woodland with thick vegetation [14] Forests, agriculture

and livestock are the main subsistence of the inhabitants. They use forest resources for instance fuel wood, timber, pasturelands, fodder, medicinal herbs and mushrooms on commercial basis. Medicinal plants and mushrooms particularly extracted in bulk are used for daily remedies as well as a source of income by selling them in the market.

An ethnobotanical expedition was conducted to document the traditional ethnobotanical uses of the member of Apiaceae in Musk Deer National Park (MDNP) of Neelum Valley, Azad Jammu and Kashmir (AJK) Pakistan. Musk Deer National Park has rich plant diversity and is hub of many endemic plant species while the study areas are not yet explored. The literature perusal and field survey analysis depicted that older indigenous people of AJK territory has more ethnobotanical knowledge of WIPs as compared to young generation because former have strong belief on traditional and cultural customs and prefer plant-based drugs which they deem safe and economic in use [15].

The current research was aimed to explore the diversity and traditional ethnobotanical uses of wild plants of family Apiaceae. On basis of ethnobotanical study, screening of potential medicinal plants for further phytochemical research and determine their potential for drug discovery to combat multi-drug resistant (MDR) bacteria and other microbes. The research will also assist in conservation of precious plants species of the area, because they provide current population status of the species and key threats for plants of the study area.

## **MATERIAL AND METHOD**

The current ethnobotanical research study was conducted during the year 2021 from different settlements around Musk Deer National Park, Neelum Valley of Azad Jammu and Kashmir, Pakistan. The area was selected to due to interesting reasons that (i) it is remote area located very far from main Muzaffarabad, the capital city of AJK, (ii) diverse ethnic and biocultural diversity and rich plant biodiversity. Furthermore, the native people have traditional biocultural, and customs primarily depend on wild plants for treatment of many diseases and other necessities of life.

### **Collection of ethnobotanical information**

Field trips were conducted in 11 villages of MDNP during May – August 2021 following Heinrich and coworker [16]. From each village, 10 household were randomly sampled with different socioeconomic background and age groups. These samples were comprised of herdsmen, plant collectors, hakims, social activists, traditional healers, and market dealers. The age range of these interviewed people range from 20 to 75 years. Similarly, questionnaire was provided to every informant in order to assemble the full knowledge of each informant with the sole purpose of obtaining the invaluable wealth of local knowledge, with special emphasis on medicinal plant uses [17]. Key informants with a sound traditional knowledge of useful wild plants were also sorted for detail interaction. Before starting the interviews and data collection, prior consent of each participant was taken and semi structured in depth interviews were conducted by using questionnaires [18].

After inquiring the demographic background of the respondents, information was collected on local name of plant species, traditional ethnobotanical uses as food, fodder, aesthetic, spices etc. Respondents with sound traditional knowledge of useful plants were sought—mostly elderly people who had lived and worked in the region for many years. The elder people have more accurate knowledge about the parts and recipes than the young which improves the effectiveness of medicinal plants [19]. Few informants of low age group were also interviewed with the purpose to know traditional knowledge flow from generation after generation.

### **Plants collection, Identification and Herbarium Deposition**

Collected Plants specimens were pressed, dried and poisoned using Mercuric Chloride ( $HgCl_3$ ) Methanol solution, dried again in dry blotter and were mounted on standard size herbarium sheet (17.5"x 11.5"). Plants were identified through available literature, Flora of Pakistan [20]. The botanical names and respective families were confirmed by angiosperm phylogeny group [21] and The Plant List (2010) <http://www.theplantlist.org>. The identified plant specimens were properly labelled, stamped and given voucher numbers after identification. Finally, they were deposited in the herbarium Department of Botany, Hazara University Mansehra, and Pakistan.

## **RESULTS and DISCUSSION**

The present ethnobotanical expedition was conducted in Musk Deer National Park Neelum Valley of Azad Jammu and Kashmir, Pakistan in year 2021. Traditional Ethnobotanical data generated was compiled in form a checklist of plants, inventory of traditional uses and biodiversity conservation status of plants species of family Apiaceae. The area is first time explored using quantitative ethnobotanical approach which resulted many novel data, as no such data is reported in previous literature. This is first document which describes the checklist of family Apiaceae and their ethnobotanical uses are presented in quantitative form which provides clues for future detailed phytochemical and ethnopharmacological research. It was found that indigenous communities of the area generally use plants and their byproducts for different necessities of life.

### **Diversity among the genera and Species of Family Apiaceae**

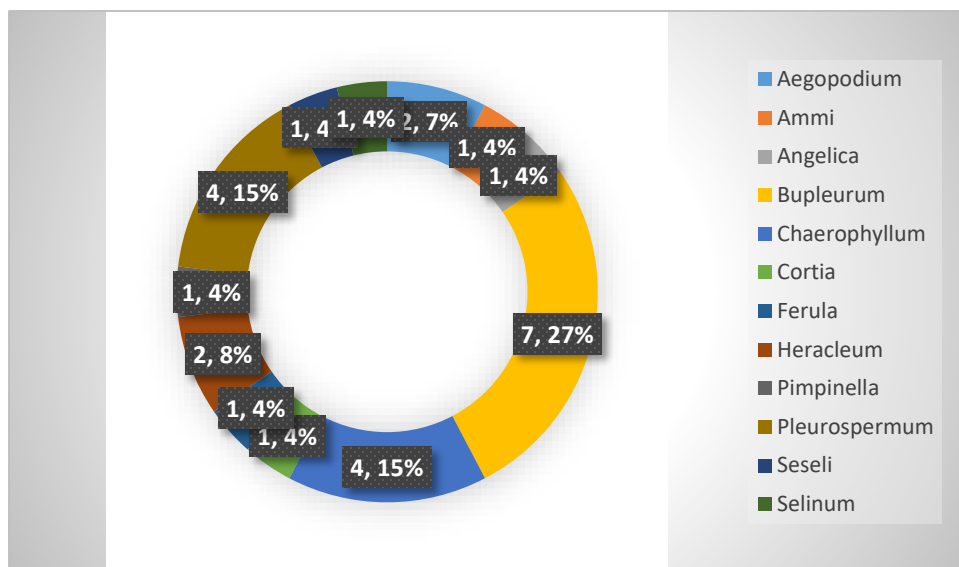
A total of 26 wild plants were collected, dried and prepared specimens were submitted in Herbarium, Department of Botany Hazara University Mansehra for future reference and study. The floristic profile of plants species belonging to family Apiaceae was prepared comprising of Family, Genus, species scientific name, habit, habitat and local name of each plant (Table 1).

**Table 1: Floristic Inventory of Family Apiaceae from Musk Deer National Park  
Neelum Vally, Azad Jammu and Kashmir, Pakistan**

Botanical Name of Species	Local Name	Habit	Habitat
<i>Aegopodium alpestre</i> Ledeb.	Not Known	Annual Herb	Mixed forests or grassy places
<i>Aegopodium burttii</i> Nasir	Not Known	Annual Herb	Mostly at dry area but some time also found in shady places
<i>Ammi visnaga</i> (L.) Lam.	Not Known	Biennial Herb	Grasslands , dry mountain slope
<i>Angelica glauca</i> Edgeworth	Choorra	Perennial Herb	Along water courses
<i>Bupleurum canaliculatum</i> Diels	Methi jar	Perennial Herb	Dry places
<i>Bupleurum hoffmeisteri</i> Klotzsch	Methi jar	Perennial Herb	Dry sunny slope
<i>Bupleurum kohistanicum</i> Nasir	Methi jar	Perennial Herb	Dry slope
<i>Bupleurum longicaule</i> Wall. ex DC.	Methi jar	Perennial Herb	Semi Dry area, grassy places on mountain slope
<i>Bupleurum tenuissimum</i> L.	Methi jar	Perennial Herb	Semi Dry area on mountain slope
<i>Bupleurum clarkeum</i> (Wolff). E. Nasir	Methi jar	Perennial Herb	Semi Dry area, grassy places on mountain slope
<i>Bupleurum marginatum</i> Wall. ex DC.	Methi jar	Perennial Herb	Alpine forests, mountain slopes, grasslands, river banks
<i>Chaerophyllum capnoides</i> (Decne.) Benth. ex C.B. Clarke	Kangoo	Annual Herb	Dry rocky area
<i>Chaerophyllum reflexum</i> Aitch.	Dudkai	Annual Herb	Open dry places
<i>Chaerophyllum reflexum</i> var. <i>acuminatum</i> (Lindl.) Hedge & Lammond	Dudkai	Annual Herb	Open moist places
<i>Chaerophyllum villosum</i> Wall. ex DC.	Dudkai	Annual Herb	Open moist places
<i>Cortia depressa</i> (D.Don) C. Norman	Not Known	Perennial Herb	Mostly at dry area but some time also found in shady places
<i>Ferula jaeschkeana</i> Vatke	Not Known	Perennial Herb	Moist grassy field with sand gravel
<i>Heracleum canescens</i> Lindl.	Palhar	Perennial Herb	Near water stream
<i>Heracleum cachemiricum</i> C.B. Clarke	Moorchar	Perennial Herb	Dry places
<i>Pimpinella diversifolia</i> DC.	Not Known	Perennial Herb	Dry area, sometime also found in shady places and grassland
<i>Pleurospermum candollei</i> Benth.ex C.B. Clarke	Not Known	Perennial Herb	Dry places
<i>Pleurospermum brunonis</i> Benth.ex C.B. Clarke	Not Known	Perennial Herb	Dry rocky area
<i>Pleurospermum stellatum</i> Benth. var. <i>Lindleyanum</i> C.B. Clarke	Not Known	Perennial Herb	Dry area, Alpine Grass Land.
<i>Pleurospermum govanianum</i> (DC.) C.B. Clarke		Perennial Herb	Found both in dry and shady moist places.
<i>Seseli libanotis</i> (L.) W.D.J. Koch		Perennial Herb	Slightly moist places
<i>Selinum wallichianum</i> (DC.) Raizada & H.O. Saxena		Perennial Herb	Forests, montane scrub, grassy slopes

The results depicted that highest number of plants was seen for Genus *Bupleurum* (07 species), followed by *Chaerophyllum* & *Pleurospermum* (04 species each) and

Aegopodium and Heracleum (02 speccies each) reaming genera having 01 species each (Fig. 2).



**Figure 2: Species distribution pattern of each Genus of family Apiaceae from Musk Deer National park Neelum Valley of Azad Jammu and Kashmir, Pakistan**

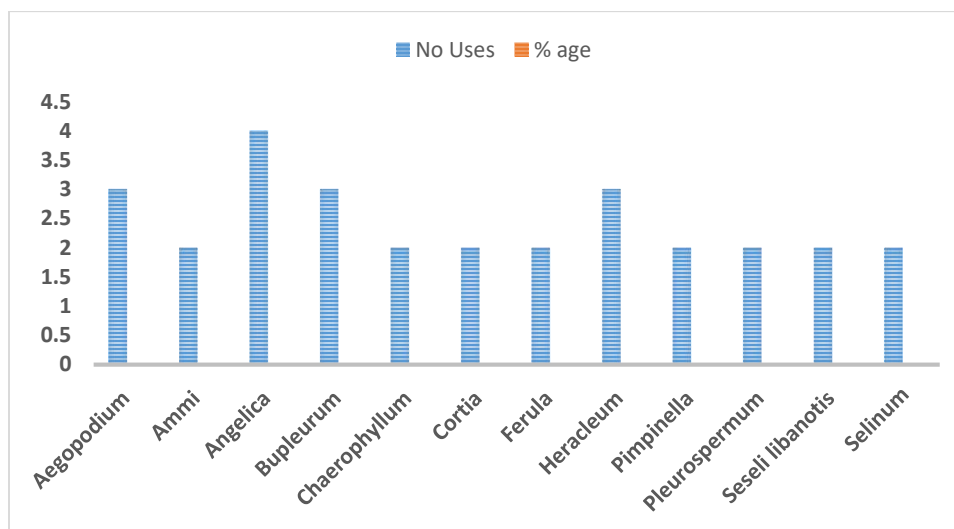
**Table 2: Genus wise Inventory of wild indigenous plants of Family Apiacea from Musk Deer National Park Neelum Valley, Azad Jammu and Kashmir, Pakistan**

S.No	Genera	S.No	Botanical Name of Species	Total No of Species
1	Aegopodium	1	Aegopodium alpestre Ledeb.	2
		2	Aegopodium burttii Nasir	
2	Ammi	3	Ammi visnaga (L.) Lam.	1
3	Angelica	4	Angelica glauca Edgeworth	1
4	Bupleurum	5	Bupleurum canaliculatum Diels	7
		6	Bupleurum hoffmeisteri Klotzsch	
		7	Bupleurum kohistanicum Nasir	
		8	Bupleurum longicaule Wall. ex DC.	
		9	Bupleurum tenuissimum L.	
		10	Bupleurum clarkeum (Wolff). E. Nasir	
		11	Bupleurum marginatum Wall. ex DC.	
5	Chaerophyllum	12	Chaerophyllum capnoides (Decne.) Benth. ex C.B.Clarke	4
		13	Chaerophyllum reflexum Aitch.	
		14	Chaerophyllum reflexum var. acuminatum (Lindl.) Hedge & Lammond	
		15	Chaerophyllum villosum Wall. ex DC.	
6	Cortia	16	Cortia depressa ( D.Don) C. Norman	
7	Ferula	17	Ferula jaeschkeana Vatke	1

8	Heracleum	18	Heracleum canescens Lindl.	2
		19	Heracleum cachemicum C.B. Clarke	
9	Pimpinella	20	Pimpinella diversifolia DC.	1
10	Pleurospermum	21	Pleurospermum candollei Benth.ex C.B.Clarke	4
		22	Pleurospermum brunonis Benth.ex C.B.Clarke	
		23	Pleurospermum stellatum Benth. var. Lindleyanum C.B. Clarke	
		24	Pleurospermum govanianum (DC.) C.B. Clarke	
11	Seseli	25	Seseli libanotis (L.) W.D.J. Koch	1
12	Selinum	26	Selinum wallichianum (DC.) Raizada & H.O. Saxena	1

### Traditional Ethnobotanical Data

Traditional ethnobotanical data of wild plants was prepared in form of inventory which comprised of botanical name, part used, mode of use and traditional recipe or uses (Table 3). The results indicated that Genus *Angelica* showed highest percentage (4%) followed by *Aegopodium*, *Bupleurum* and *Heracleum* (3 % each) whereas remaining genera having contribution 2 % and below Fig.3.



**Figure 3: Genus wise tradition ethnobotanical uses**

**Table 3. Traditional ethnobotanical uses of wild plant species of family Apiaceae recorded from Musk Deer National Park Neelum Valley, Azad Jammu and Kashmir, Pakistan**

S. No	Species Name	Parts Used	Traditional Enthobotanical uses
1	<i>Aegopodium alpestre</i> Ledeb.	Stem, leaf	Arial plant parts are used as fodder for domestic livestock
2	<i>Aegopodium burtii</i> Nasir	Stem, leaf	It is used as fodder for domestic goats and animals.
3	<i>Ammi visnaga</i> (L.) Lam.	Fruit, leaf, stem	Colic and gastrointestinal cramps, kidney stone, cough and whooping cough, asthma, bronchitis, hypertension, cardiac arrhythmias, mild angina, congestive heart failure, diuretic and relieving liver and gall bladder disorder. Wound healing, inflammation condition, poisonous bite, painful menstruation
4	<i>Angelica glauca</i> Edgeworth	Root	Dried root powder used with water to cure gastrointestinal disorder and respiratory track infection. Roots of the plants are cooked and with the addition of molasses are given to cure indigestion cause by the cold. It increases internal temperature and relieve the pain. It is also used to cure dyspnea.
5	<i>Bupleurum canaliculatum</i> Diels	Root, stem, leaf	Its roots are eaten due to its fragrance. Whole plant is used as fodder for domestic animals
6	<i>Bupleurum hoffmeisteri</i> Klotzsch	Root, stem, leaf	Its roots are eaten due to its fragrance. Whole plant is used as fodder for domestic animals
7	<i>Bupleurum kohistanicum</i> Nasir	Root, stem, leaf	Its roots are eaten due to its fragrance. Whole plant is used as fodder for domestic animals
8	<i>Bupleurum longicaule</i> Wall. ex DC.	Root	Liver trouble and as a diaphoretic, it is also effective in thoracic and abdominal inflammation and fever. Useful in flatulence and indigestion. It is used in malaria and other fevers
9	<i>Bupleurum tenuissimum</i> L.	Root, stem, leaf	Its roots are eaten due to its fragrance. Whole plant is used as fodder for domestic animals
10	<i>Bupleurum clarkeum</i> (Wolff). E. Nasir	Root, stem, leaf	Its roots are eaten due to its fragrance. Whole plant is used as fodder for domestic animals
11	<i>Bupleurum marginatum</i> Wall. ex DC.	Root, stem, leaf	Its roots are eaten due to its fragrance. Whole plant is used as fodder for domestic animals
12	<i>Chaerophyllum capnoides</i> (Decne.) Benth. ex C.B. Clarke	Root, Stem, leaf	Root is edible and eaten as fresh. It is used as fodder for domestic animals
13	<i>Chaerophyllum reflexum</i> Aitch.	Root, stem	Root is edible and eaten as fresh. It is used as fodder for domestic animals



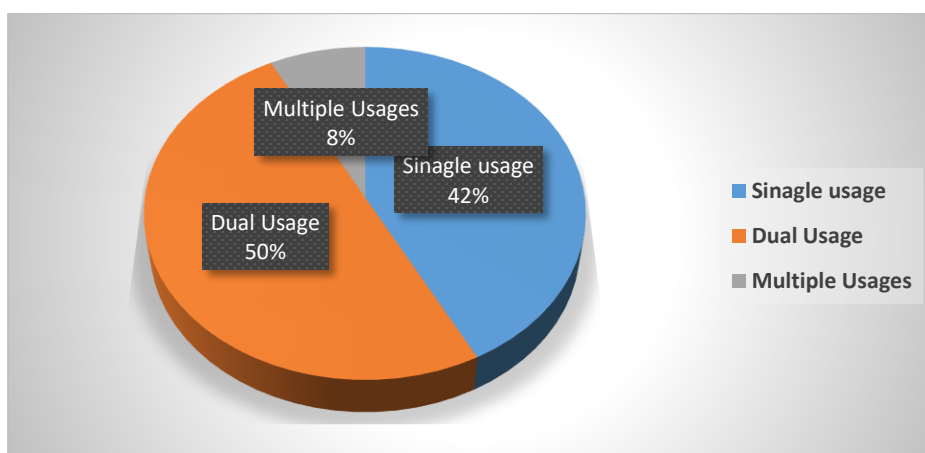
14	Chaerophyllum reflexum var. acuminatum (Lindl.) Hedge & Lammond	Root, Stem	Root is edible and eaten as fresh. It is used as fodder for domestic animals
15	Chaerophyllum villosum Wall. ex DC.	Seed, stem, leaf	Seed are used to cure kidney and urinary disorder. Areal part of plant are used as fodder for livestock
16	Cortia depressa ( D.Don) C. Norman	Flower, leaves	Used to cure Fever, rheumatism, sedative and stomachache. Aerial plant parts also used as fodder
17	Ferula jaeschkeana Vatke	Gum, latex, leaf, Rhizome	Used to relieve asthma, cough, rheumatic diseases, skin wounds and as stomach tonic. Rhizome to heal wounds, boils, burns, cuts and other skin problems. Dried leaves used as fodder for livestock
18	Heracleum canescens Lindl.	Root	Root powder is applied to heal wound. Root paste is used for skin problems. It is also used as fodder for domestic livestock
19	Heracleum cachemiricum C.B. Clarke	Root	Dried root powder used with water to cure gastrointestinal disorder and respiratory tract infection. Roots of the plants are cooked and with the addition of molasses are given to cure indigestion cause by the cold. It increases internal temperature and relieve the pain. It is also used to cure dyspnea
20	Pimpinella diversifolia DC.	Fruit, leaf	Fruit used to cure Cough and cold, Gas trouble, indigestion. dried leaves are grinded along with salt and powder is taken orally with water
21	Pleurospermum candollei Benth.ex C.B.Clarke	Fruit	Fruit used against Dyspepsia, flatulence, renal pain, stomach. It is also used as fodder
22	Pleurospermum brunonis Benth.ex C.B.Clarke	Whole plant	It is used as fodder
23	Pleurospermum stellatum Benth. var. Lindleyanum C.B. Clarke	Leaf, seed	The plant material is burnt on fire and the ash of plant mixed with butter and applied on tongue to cure stomatitis
24	Pleurospermum govanianum (DC.) C.B. Clarke	Stem, leaf	It is used as fodder for domestic livestock
25	Seseli libanotis (L.) W.D.J. Koch	Root	Root power is used to cure Rheumatic disorder
26	Selinum wallichianum (D C.) Raizada & H.O. Saxena	Stem, leaf	Decoction is used for Cold and cough. Also used as fodder for domestic livestock

### Summary of ethnobotanical investigation

To summarize ethnobotanical data, on the basis of single or more recipe uses, all 26 plants species were categorized into four types. The data is presented in four types with 42% plants were being used in single recipes, 50% were used in dual usages and 08% plants had been reported having multiple usages. A pictorial form data is shown in pie

chart shape (Fig 4).Local people of the area primarily are dependent on wild resources for life necessities and it is coincided with past works cited in the literature, where it is proved that rural people majorly use wild plants for coping daily life needs [ 26,27].

The present study revealed that 11 species (42%) had single ethnobotanical use, 13 species (50%) had dual use and four species (8%) had multiple uses. The plants have been used in different categories such as food, medicines, fruits, vegetables, Veterinary medicine and fodder (Table ...) Similar ethnobotanical studies were conducted on the plants of District Kotli and District Bhimber of Azad Jammu and Kashmir and Khyber Pakhtunkhwa province of Pakistan [22,23,24,25].



**Figure 4:Graphical presentation of plants on the basis of their usage from study area of Musk Deer National Park Neelum Valley, Azad Jammu & Kashmir, Pakistan**

## CONCLUSION

The centuries old traditional ethnobotanical knowledge of wild plant is in danger of being lost. Therefore it is required to conserve it. The present research was focused to explore the various ethnobotanical uses of plants from unexplored areas of Musk Deer National Park Neelum Valley, Azad Jammu and Kashmir, Pakistan. This research was carried out by interviewing the local peoples through a questionnaire method using structured and semi-structured procedure. Local peoples use wild plants species of family Apiaceae to cure different diseases and other purposes like veterinary uses, food and fodder. So, this study will be useful those for the local peoples and researchers in different fields such as ethno pharmacology and conservationists for future work.

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