

Unveiling the hidden diet of the Indian crested porcupine: A fecal pellet study from the Lesser Himalayan Region of Azad Jammu and Kashmir, Pakistan

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Abstract

The Indian crested porcupine creates conflicts with farmers by damaging crops and orchards within its range. Therefore, understanding the porcupine's diet and its composition is vital for knowing its ecological role, habitat adaptations, and foraging approaches. Diet analysis was conducted through micro-histological examination of 336 fecal pellet groups collected across three districts: 132 samples from Muzaffarabad (67 in summer, 65 in winter), 87 from Hattian Bala (47 in summer, 40 in winter), and 117 from Neelum (62 in summer, 55 in winter). The results indicated notable variation in dietary diversity across districts, with Hattian Bala exhibiting the highest number of dietary items, i.e., 34 species of plants, followed by Muzaffarabad, i.e., 30 species, and Neelum, i.e., 23 species. Cultivated crops and commercially important herbs, such as *Zea mays*, *Cannabis sativa*, *Solanum tuberosum*, and *Pisum sativum*, are grazed more in warmer months and utilized less in winter months.

Keywords: Fecal pellets, Himalayan region, Indian crested porcupine, micro-histological analysis

Introduction

The Indian crested porcupine (*Hystrix indica*) is one of Asia's largest rodents (Bhatt et al., 2024), ranging from 60 to 83 cm in length and weighing 11 to 18 kg. It is regarded as a significant economic pest of agriculture and forest areas. The porcupine is widespread throughout its habitat, and the population is sustainable. It has been recorded as Least Concern (Amori et al., 2021). The porcupine inhabits a broad range of territories (Nolan et al., 2022) in the subcontinent, including tropical and temperate scrublands, grasslands, and forests, mostly favoring rocky hillsides and burrows (Amori et al., 2021; Bhatt et al., 2024). Porcupines are herbivores, and their diet comprises vegetables, fruits, grains, crops, roots, tubers, bulbs, and bark (Sheraz et al., 2025). Crops of economic importance are badly damaged in irrigated plains and mountains (Safeer et al., 2018). Porcupines cause considerable harm to grasses that are being sown to increase grazing capacity on a long-term basis (Subedi et al., 2024).

Porcupines feed primarily as herbivores, preferring the bark of some tree species, roots, bulbs, and succulent tubers. Sometimes they prefer to eat ripe fruits. They routinely dig up the bulbs of *Eremurus aurantiacus*, *Melia azedarach*, *Morus alba*, and *Mangifera indica*. Trees with thick, rough bark are typically avoided. Researchers reported 30-70% damage to cropland and garden (Amori et al., 2021; Bhatt et al., 2024; Safeer et al., 2018; Sheraz et al., 2025).

The diet of the Indian crested porcupine plays a vital role in its ecological function and its interactions with both natural and human-altered environments (Sayyad et al., 2026). As an herbivore, this species consumes a variety of plant materials. This feeding behavior significantly influences the structure of vegetation and plant communities. However, porcupines also create conflicts (Altaf, 2016) with farmers by damaging crops and orchards within their range (Almasieh & Mohammadi, 2025; Franchini, 2023). Therefore, understanding the porcupine's diet and its composition is essential for determining its ecological role, habitat requirements, resource availability throughout the seasons, and foraging strategies. While most wildlife researchers have concentrated on mammal diversity (Ahmad et al., 2025; Khushbakhat et al., 2025), ecology (2025), and distribution (Hussain et al., 2025; Emiliano Mori et al., 2022; Nolan et al., 2022; Safeer et al., 2018), rather than the feeding ecology of species. Therefore, the present study of the porcupine diet is based on fecal pellet analysis in different seasons in the Lesser Himalayan region of Azad Jammu and Kashmir.

Materials and Methods

Study area

The Lesser Himalayas are sub-ranges of the Himalayas (Pant et al., 2025); they extend and pass through Afghanistan, Pakistan (Abbasi et al., 2012), India (Chhimwal et al., 2022), Nepal (Pant et al., 2025), China (Liu et al., 2023), and Bhutan (Dewan et al., 2024). The sub-range has an average elevation of 3,700 to 4,500 meters. The Neelum River, also known as the Kishanganga River, flows through Kashmir on the Indian subcontinent. It begins in the Ganderbal region of Indian-administered Kashmir, runs through the Neelum Valley into Azad Jammu and Kashmir (Jahangeer & Awan, 2024), where parts of its course run along the Line of Control, and merges with the Jhelum River at Muzaffarabad (Hussain et al., 2025). The Jhelum River is a large river in South Asia that flows through India and Pakistan (Ejaz & Rasheed, 2024). It is the westernmost of the five major rivers in the Punjab region. It begins in Indian-administered Jammu and Kashmir, flows into Azad Jammu and Kashmir, and then through Pakistan's state of Punjab (Altaf et al., 2021). The mountainous north, together with the whole Neelum Valley (Fatima et al., 2019; Jahangeer et al., 2025) and the valleys of the Jhelum Valley (Mughal et al., 2020), has cold temperate weather conditions, with a severe and lengthy winter that lasts from December to May and a calm and cool summer. Forest types include Montane Subtropical Semi-evergreen Forests, Subtropical Pine and Subtropical Scrub Forests, Montane Temperate Forest, Himalayan Dry and Himalayan Moist Temperate Forests, Alpine pastures, and Sub-alpine Forests (Altaf & Umair, 2022; Hayat et al., 2021; Rahman et al., 2021).

Sample sites

From Muzaffarabad district, these villages (i.e. Tariqabad, Ranjata, Mera Tanoliyan, Khilla, Niazpura, Tamarcholi, Saran, Pirchanasi, Chehla, Shawai, Thangar, Dubgali, Batal, Talgran, Rajpayyan, Riyali, Bheri, Gali Khetar, Lower Sokar, Upper Sokar, Jing, Panjur, Sarlisacha, Panjurgali, Panjkot, Garangan, Mailsi, Bela, Gari Dopata, Moiyen, Palhot, Kaimanja, Hariala, Shalabagh, Langerpura, Kardala Chatar Klass, Danna, Kachili, Kot Tirhala, Rahimkot and Premkot) were selected for collection of data. From the Hattian Bala district, these, i.e. villages Chikar, Nagni, Sudhangali, Bela, Khanda, Nariyan, Kainar, Gujarbandi, Garmanda, Chakhama, Cham, Doba, Chhitriyan, Burzi, Sharian, Lamnian, Reshian, Daokhan were selected for the collection of data. From Neelum district, these (i.e. Kundalshahi, Kutton, Drig, Yaqubi, Sarsnagar, Dilpai, Gurial, Seri, Shal, Kensi, Shahkot, Salkhala, Haran, Donari, Raran, Keran, Nagdar, Kaarka,

Jabri, Lawat Pine, Aur Saydan, Lawat Bala, Kutton Gali, Sharda, Surgan, Samgham, Ghamot, Kel, Arangel, Kalalot, Lower Domel, Upper Domel, Jamgarh, Jandarseri, Sardari, Halamt, Taobot) were selected for collection of samples (Table 1 and Fig. 1).

Table 1. Sampling districts and sub-sites with coordinates and elevations.

Track	Locations	GPS Coordinates		Elevation (m)	Length (km)	Aspect
		N	E			
Muzaffarabad						
MT-1	Tariqabad, Ranjata, Mera Tanoliyan, Khilla	34°23'52"- 34°21'54"	73°31'27"- 73°34'21"	780-1090	7	W
MT-2	Niazpura, Tamarcholi, Saran, Pirchanasi	34°24'43"- 34°23'28"	73°34'34"- 73°22'52"	1250-3007	25	SW
MT-3	Chehla, Shawai, Thangar, Dubgali	34°23'04"- 34°26'05"	73°28'17"- 73°25'51"	675-1590	13	SE
MT-4	Batal, Talgran, Rajpayyan, Riyali	34°28'10"- 34°32'50"	73°30'13"- 73°27'58"	804-1577	28	SW
MT-5	Bheri, Gali Khetar, Lower Sokar, Upper Sokar,	34°31'08"- 34°34'07"	73°35'16"- 73°32'46"	1434-3237	15	S
MT-6	Jing, Panjur, Sarlisacha, Panjurgali	34°26'53"- 34°31'01"	73°38'32"- 73°38'59"	1009-2760	19	SE
MT-7	Panjkot, Garangan, Mailsi, Bela	34°20'44"- 34°17'39"	73°43'41"- 73°42'42"	1143-2875	9	NE
MT-8	Gari Dopata, Moiyen, Palhot, Kaimanja, Harijala	34°13'21"- 34°16'00"	73°38'01"- 73°44'16"	932-2293	12	SW
MT-9	Shalabagh, Langerpura, Kardala	34°19'32"- 34°21'33"	73°31'27"- 73°32'00"	822-1076	4	SW
MT-10	Chatar Klass, Danna, Kachili, Kot Tirhala, Rahimkot, Premkot	34°12'03"- 34°04'07"	73°29'51"- 73°38'07"	675-1780	16	NW
Hattian Bala						
HT-1	Chikar, Nagni, Sudhangali	34°08'58"- 34°04'54"	73°40'26"- 73°45'04"	1565-1897	31	NW
HT-2	Bela, Khanda, Nariyan, Kainar	34°10'28"- 34°12'31"	73°44'08"- 73°44'49"	1087-1680	14	SE
HT-3	Gujarbandi, Garmanda, Chakhama, Cham, Doba, Chhitriyan, Burzi	34°09'42"- 34°11'17"	73°50'02"- 73°58'54"	1300-3375	19	SW
HT-4	Sharian, Lamnian, Reshian, Daokhan	34°11'21"- 34°15'42"	73°47'07"- 73°48'21"	1255-2575	25	NE
Neelum						
NT-1	Kundalshahi, Kutton, Drig, Yaqubi, Sarsnagar	34°33'13"- 34°31'18"	73°49'58"- 73°44'29"	1476-2980	11	SE
NT-2	Dilpai, Gurial, Seri, Shal, Kensi	34°34'37"- 34°40'42"	73°47'37"- 73°45'35"	1603-2418	13	SW
NT-3	Shahkot, Salkhala, Haran, Donari, Raran	34°33'43"- 34°32'10"	73°52'57"- 73°54'21"	1409-2290	4	N
NT-4	Keran, Nagdar, Kaarka, Jabri	34°39'06"- 34°40'57"	73°56'54"- 73°49'57"	1517-2984	9	S
NT-5	Lawat Pine, Aur Saydan, Lawat Bala, Kutton Gali	34°41'25"- 34°42'00"	73°58'07"- 73°54'19"	1755-2740	7	S
NT-6	Sharda, Surgan, Samgham, Ghamot	34°47'39"- 34°54'42"	74°11'33"- 74°12'59"	1986-2810	11	SE
NT-7	Kel, Arangel, Kalalot, Lower Domel, Upper Domel	34°49'22"- 34°57'57"	74°21'08"- 74°28'46"	2077-2899	9	SW

NT-8	Jamgarh, Jandarseri, Sardari, Halamt, Taobut	34°48'40"- 34°43'43"	74°27'36"- 74°42'52"	2186-2256	32	S
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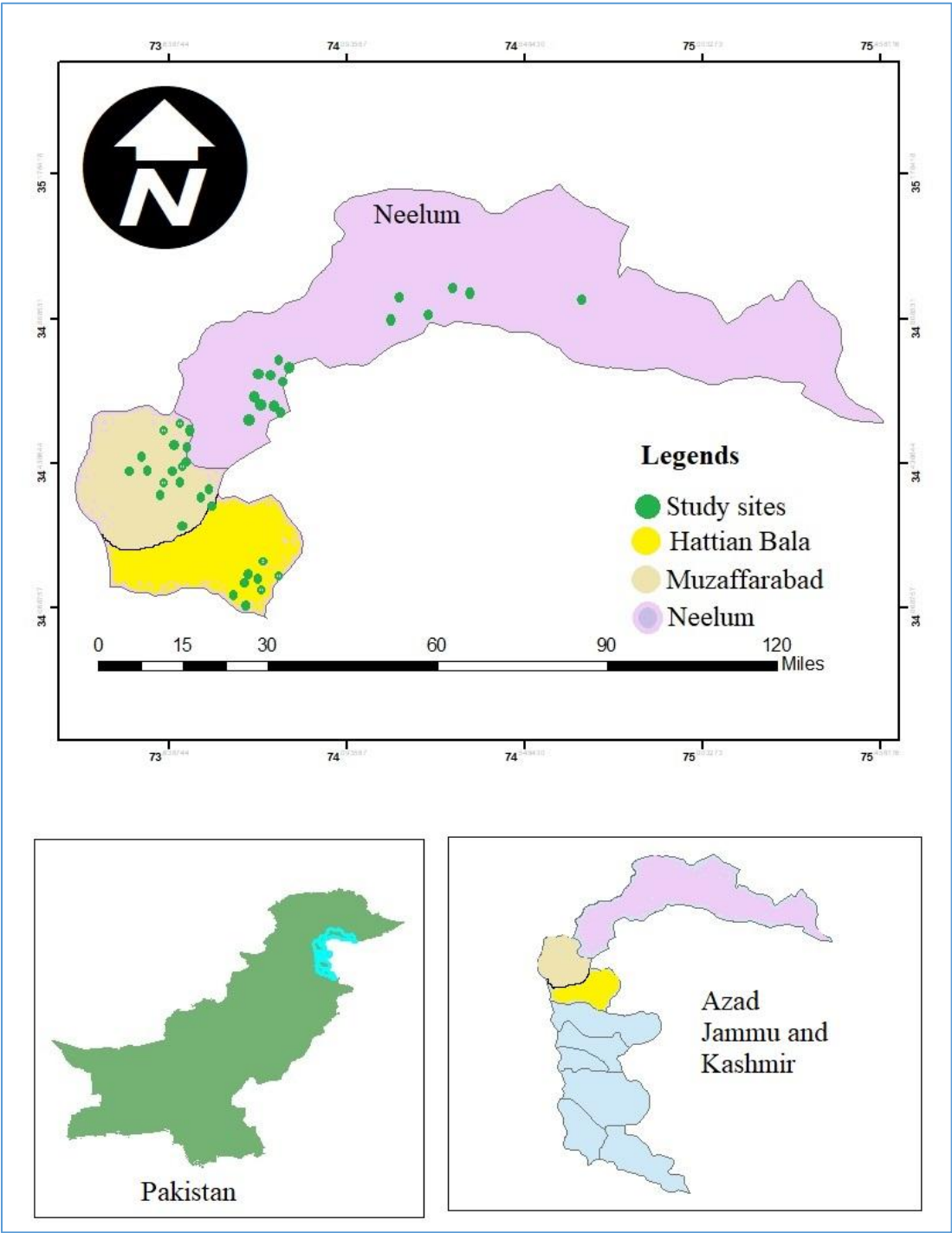


Figure 1. Map of the study area.

Sample Collection and Analysis

Samples were collected from 2018 to 2020; these samples were dried, powdered, and processed for microhistological examination, and specimens were identified by experts in the field.

Fecal Sample Collection

Fecal samples were collected in summer and winter from 42 plots in Muzaffarabad, 18 plots in Jhelum Valley, and 37 plots in Neelum. The samples were collected systematically along predetermined tracks. Species-specific fecal pellets were identified, placed in ziplock bags, and prepared for microhistological analysis.

Fecal Sample Analysis

Using microhistological techniques, we examined 336 fecal samples to determine the botanical composition of porcupine diets. Plant fragments in the fecal samples were identified to the species level based on epidermal cell features from reference slides of fresh plant material.

Slide Preparation

Fecal samples were crushed, strained, washed, and treated with a saturated solution of ethyl alcohol, glycerin, and distilled water. Samples were further processed with sodium hydroxide and alcohol treatments and finally mounted on slides with DPX mounting medium (Jnawali, 1995; Lasgaa et al., 2021; Mori et al., 2014).

Slide Interpretation and Diet Composition

Stomata, fibers, cells, and trichomes were key components identified on the source slides. The characteristics of plants found in fecal specimens were compared to those on the source slides to confirm their presence.

Statistical analysis

Relative Importance Value (RIV)

The relative frequency of every species of plant in fecal samples has been calculated and reported as the relative importance value (RIV) (Jnawali, 1995).

$$RIV_x = V_x + F_x / 2$$

V_x = Percentage volume of plant species x in fecal samples of the Indian crested porcupine

F_x = Percentage frequency of occurrence of plant species x in fecal samples of the Indian crested porcupine

Prominence Value (PV)

PV is collected by the following formula;

$$PV_x = M_x \times \sqrt{f_x}$$

Where M_x is the percentage cover of plant species x and f_x is the frequency of occurrence of plant species x in the sample quadrates (Koirala et al., 2000).

Diet selection value

Diet selection value (DSV) was documented using the given formula (Jnawali, 1995);

$$DSV_x = RIV/PV$$

Where, RIV_x is the RIV for species x ;

PV_x is the PV for species x ;

While PV represents the relative abundance of species of plants in Indian crested porcupine habitat, it is calculated as the mean percent cover of a species multiplied by the square root of that species' frequency of presence in the vegetation sample quadrats.

Diet Breadth

Diet breadth, showing variety in diet per fecal specimen, was obtained using Levin's measure of niche breadth (B) with the following formula (Krebs, 1999; Prins et al., 2006):

$$B = 1/\sum P_i^2$$

P_i = % of total sample belonging to species “ i ”

While “ i ”=1, 2,..... plant species

Indian crested porcupine faecal pellets were detected in the research region and matched with those from captive specimens to confirm the final identification.

Tests

ANOVA, Chi-square tests, and t-tests were used to assess the significance of variations in plant intake across different sites and seasons.

Results

Diet analysis was conducted through micro-histological examination of 336 fecal pellet groups collected across three districts: 132 samples from Muzaffarabad (67 in summer, 65 in winter), 87 from Jhelum Valley (47 in summer, 40 in winter), and 117 from Neelum (62 in summer, 55 in winter). It is noted that Indian crested porcupines consume both wild and cultivated plants in the study area. A total of 35 species of plants were noted, out of which *Pinus wallichiana*, *P. roxburgii*, *Picea smithiana*, *Olea europaea*, *Morus alba*, *Melia azedarach*, *Juglans regia*, *Ficus palmata*, *Diospyros lotus*, *Cedrus deodara*, *Aesculus indica*, and *Abies pindrow* are wild trees, although a few, such as *Olea europaea* and *Morus alba*, are also cultivated for fruit and/or timber. Wild shrubs include *Jasminum humile*, *Indigofera gerardiana*, *Daphne oleoides*, *Berberis lyceum*, *Artemisia*

maurensis, and *Agave sisalana*, while wild herbs include *Tulipa humilis*, *Polygonum amplexicaule*, *Mentha sylvestris*, *Euphorbia serrata*, *Euphorbia helioscopia*, *Bergenia ciliata*, *Arisaema jacquemontii*, *Ajuga bracteosa*, and *Aconitum chasmanthum*. Regarding the cultivated species, *Zea mays*, *Solanum tuberosum*, *Pisum sativum*, *Desmodium amplexicaulis*, *Cannabis sativa*, and *Agave sisalana* are grown for economic, food, or fiber uses, while *Impatiens balsamina* and *Tulipa humilis* are primarily attractive herbs. *Diospyros stewartii* is a wild tree of significant environmental value (Table 2).

The porcupine's diet at Muzaffarabad during the summer was dominated by herbs (38.71%) and trees (38.71%) each. Shrubs were the second-most-consumed plant (19.35%). Trees made up the majority of the Indian crested porcupine's winter diet (68.75%). *Diospyros lotus* ($RIV = 7.44 \pm 1.29$) (Table 2) and *Indigofera garerdiana* (6.69 ± 0.34) were the most prevalent plant species during the summer, whereas *Zea mays* ($DSV = 5.48$) was the favored plant species, followed by *Ajuga bracteosa*, *Impatiens balsamina*, *Indigofera garerdiana*, *Desmodium amplexicaulis*, and *Ariasema jacquemontii* (i.e., eaten in proportions higher than their availability) (Figure 2). During the winter period, *Melia azedarach* and *Diospyros lotus* were the most frequently consumed food species, with *Melia azedarach* as the preferred species, followed by *Picea smithiana*, *Pisum sativum*, *Indigofera garardiana*, and *Diospyros lotus*. The diet composition of the porcupine differed between summer and winter ($\chi^2 = 31.88$, $p = 0.012$).

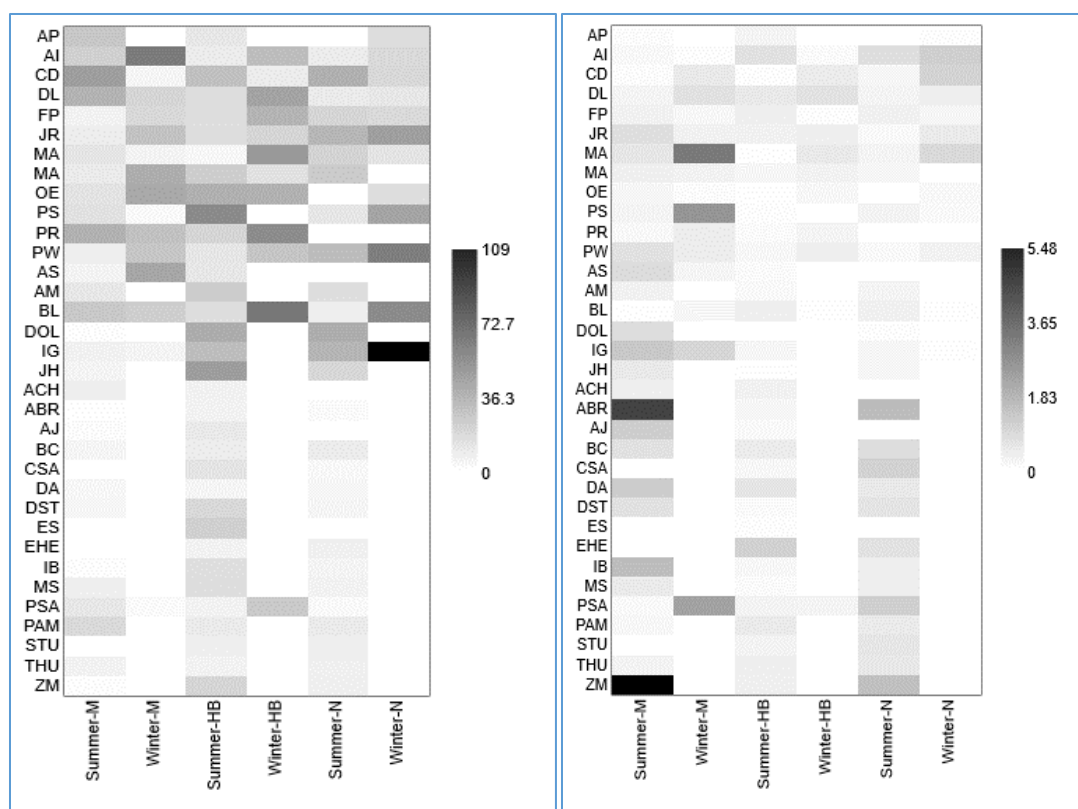


Figure 2. The figure on the left shows the PV (0 to 109), and the figure on the right shows the DSV (0 to 5.48) in the study area. Note. (M) i.e., Muzaffarabad district, (H) i.e., Hattian Bala district (Jhelum Valley), and (N) i.e., Neelum Valley or district, and codes are present in Table 2.

The Indian crested porcupine's food at Jhelum Valley (Hattian Bala) during the summer was primarily made up of herbs (44.4%), followed by trees (33.3%) and shrubs (16.67%). During the winter, trees made up the majority of the porcupine's diet (80.64%). *Diospyros lotus* and *Aesculus indica* were the most frequently found species throughout the summer, whereas *Euphorbia helioscopia*, *Aesculus indica*, *Desmodium amplexicaulis*, and *Diospyros lotus* were the most preferred species. During the winter season, *Diospyros lotus* and *Melia azedarach* were the governing plants, and the preferred species were *Melia azedarach*, *Cedrus deodara*, and *Pinus wallichiana* (Table 2). The chi-square test showed that the diet of the porcupine was significantly different ($\chi^2 = 27.19$, $p = 0.029$) between the two seasons in Jhelum Valley.

Herbs make up the majority of the Indian crested porcupine's diet at Neelum during the summer, followed by trees (32.14%), whereas during the winter, trees make up the majority of the porcupine's diet (75.18%). *Zea mays*, *Indigofera garerdiana*, *Bergenia ciliate*, and *Aesculus indica* were the most frequent plant species throughout the summer, while *Ajuga bracteosa*, *Zea*

mays, and *Pisum sativum* were the most preferred (i.e., eaten in proportions higher than their availability). During winter, more frequently used plant species were *Indigofera garerdiana* and *Cedrus deodara*, and preferred species were *Aesculus indica* followed by *Cedrus deodara* (DSV=0.92) and *Melia azedarach* (Figure 2). The diet composition of the porcupine differed between summer and winter ($\chi^2 = 47.129$, $p = 0.0116$).

Based on the seasonal availability and richness of plant species throughout the three sites, Jhelum Valley appears to be the most appealing environment for the Indian Crested Porcupine, especially during the winter when forage scarcity limits its range. Jhelum Valley typically has higher winter values for several preferred and nutritionally essential browsing and fodder plants, including *Diospyros lotus*, *Pinus roxburghii*, *Melia azedarach*, *Pinus wallichiana*, *Pisum sativum*, and *Juglans regia*. This indicates a diversified and abundant winter food base, providing both browse and additional herbaceous materials needed for Indian crested porcupine survival during times of low grass abundance. On the other hand, the city of Muzaffarabad, while providing moderate summer foraging plants such as *Melia azedarach*, *Diospyros lotus*, and *Indigofera garardiana* has comparatively lower winter availability. Conversely, Neelum Valley, despite having high wintertime availability of particular species of trees like *Aesculus indica*, *Cedrus deodara*, *Juglans regia*, and *Pinus wallichiana*, lacks sufficient understory and herbaceous diversity during the winter.

According to the Prominence Value (PV) and Diet Selection Value (DSV), Indian crested porcupine foraging revealed significant seasonal and site-specific differences. In the summer months at Muzaffarabad, high Prominence Value for *Cedrus deodara*, *Pinus roxburghii*, *Diospyros lotus*, *Abies pindrow*, *Berberis lyceum*, and *Aesculus indica* indicate that these species were highly available and potentially preferred, but their usually low Diet Selection Value indicates minimal or less frequent utilization. In contrast, species such as *Ajuga bracteosa*, *Zea mays*, *Indigofera garardiana*, *Pisum sativum*, and *Agave sisalana* recorded comparatively low Prominence Value but very high Diet Selection Value, demonstrating significant presence. In the wintertime at Muzaffarabad, extremely high Prominence Value for *Aesculus indica*, *Olea europaea*, *Agave sisalana*, *Melia azedarach*, and *Juglans regia* indicates the prominence of all these species in the landscape, whereas substantially high Diet Selection Value for *Melia azedarach*, *Picea smithiana*, *Pisum sativum*, and *Cedrus deodara* shows that the Indian crested porcupine was primarily grazing on a few winter-adapted plant species, regardless of how

common they were. In summer at Hattian Bala, the greatest Prominence Value were observed for *Picea smithiana*, *Jasminum humile*, *Daphne oleoides*, *Olea europaea*, *Indigofera gerardiana*, and *Cedrus deodara*, highlighting Jhelum Valley/Hattian Bala as the most forage-rich site. Meanwhile, Diet Selection Value of Indian crested porcupine remained low for many of these plant species, indicating decreased selectivity due to abundant food, while comparatively higher Diet Selection Value for *Aesculus indica*, *Diospyros lotus*, *Bergenia ciliata*, and *Polygonum amplexicaule* demonstrates a thriving preference. In winter at Hattian Bala, exceptionally elevated Prominence values for *Berberis lyceum*, *Pinus roxburghii*, *Melia azedarach*, *Olea europaea*, and *Diospyros lotus* demonstrate increased accessibility to plant species, while moderate to significant Diet Selection Value for *Diospyros lotus*, *Melia azedarach*, *Pinus wallichiana*, and *Pisum sativum* illustrate how important they are as sources of food during the winter months. In the summer months at Neelum, high Prominence Value for *Daphne oleoides*, *Indigofera gerardiana*, *Pinus wallichiana*, *Juglans regia*, and *Cedrus deodara* coincided with usually low to moderate Diet Selection Value of the Indian crested porcupine, showing opportunistic feeding. However, plant types like *Ajuga bracteosa*, *Cannabis sativa*, *Zea mays*, and *Pisum sativum* demonstrated significantly higher Diet Selection Value despite low Prominence Value, pointing to dominant attraction. In the winter months at Neelum, *Indigofera gerardiana*, *Pinus wallichiana*, *Juglans regia*, *Berberis lyceum*, and *Picea smithiana* have very high Prominence Value, indicating that these genera are prominent wintertime sources, even though the relatively low Diet Selection Value indicates dependence on access instead of effective choosing (Figure 2).

Diet diversity per fecal sample (i.e., Diet Breadth) of the Indian crested porcupine varied in all three districts, i.e. Muzaffarabad, Hattian Bala, and Neelum, more diversity was found in district Jhelum Valley, with the presence of (34) dietary items in the diet, followed by Muzaffarabad (30) and Neelum(23). In Muzaffarabad, the composition of *Diospyros lotus* (B=17.66), *Indigofera garerdiana* (B=16.92), and *Bergenia ciliata* (B=14.24) was high in summer, while *Melia azedarach* and *Morus alba* were more available during the winter season. In Jhelum Valley diet variety of *Diospyros lotus* was relatively high in both seasons compared to other plant species. At district Neelum composition of *Zea mayz* was higher than other species during the summer while *Aesculus indica* was frequently found during winter season as compared to other species

(Fig. 3). Diet variety differed significantly across different seasons ($t = 19.443$; $df = 1$; $p = 0.03$), while non-significant across various study sites ($F = 23.912$; $df = 2, 12$; $p = 0.001$).

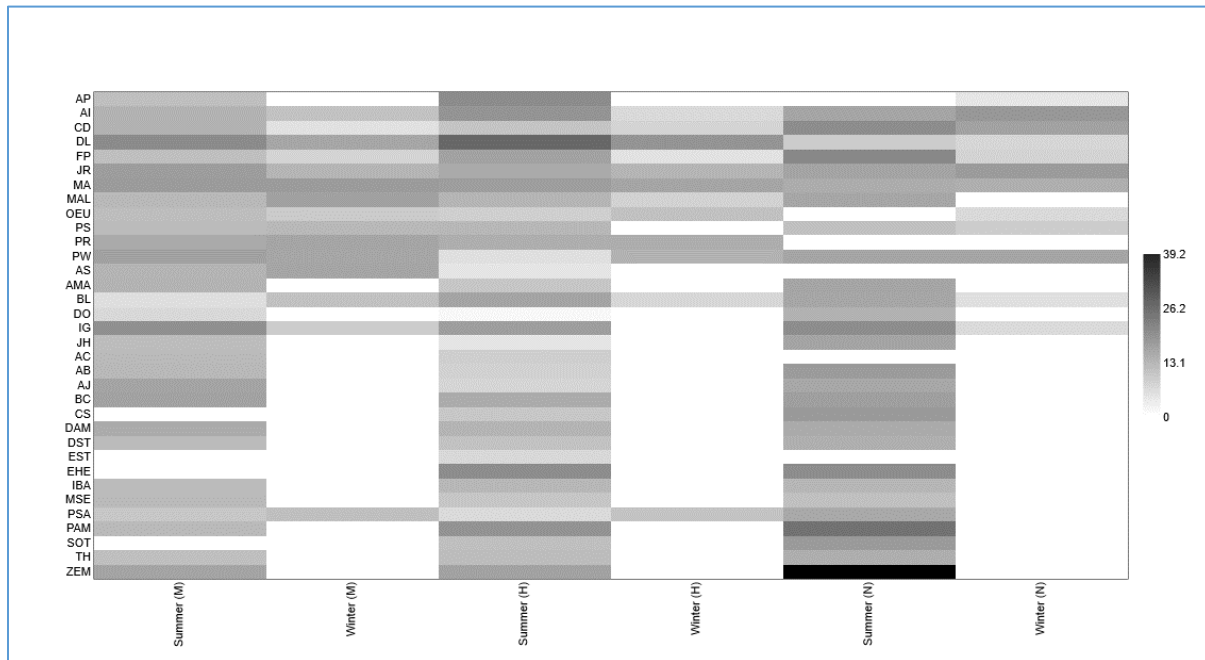


Figure 3. Diet Breadth (Diet diversity per fecal sample): **Note.** (M) i.e., Muzaffarabad district, (H) i.e., Hattian Bala district (Jhelum Valley), and (N) i.e., Neelum Valley or district, and codes are present in Table 2.

Discussion

Fecal pellet analysis in the Lesser Himalayan region supports the hypothesis that *H. indica* is mostly a vegetarian species because, unlike Mori et al. (2021), we found no insects in the fecal pellet analysis. We found just 34 plant species in the diet, compared to 17 and 18 species in Italy and Tunisia, respectively (Ettiss et al. 2020, Santini 1980). This high diet diversity is most likely due to the large number and quantity of accessible plant species in our research location. The Indian Crested Porcupine ate 31 plant species, with *Zea mays* being the most common, followed by *Rumex obtusifolius* and *Melia azedarach* (Khan et al., 2022). While Sheraz et al. (2025) noted 20 species from Potohar region and Bounaceur et al. (2024) noted micro-histological study of faecal pellets revealed that this strict herbivore consumed only 10 species of plants.

The seasonal fluctuation in food consumption by Indian crested porcupines is obvious, indicating the accessibility and palatability of various plant types. On average, Indian crested porcupines consume a greater proportion of *Melia azedarach*, *Juglans regia*, and *Diospyros lotus* during

wintertime, whereas *Olea europaea*, *Indigofera gerardiana*, *Daphne oleoides*, *Cedrus deodara*, *Berberis lyceum*, and *Abies pindrow* are more typically consumed in the summer. Cultivated crops and commercially important herbs, such as *Zea mays*, *Cannabis sativa*, *Solanum tuberosum*, and *Pisum sativum*, are preferentially grazed in the summertime and used less in the wintertime.

Bruno and Riccardi (1995) found that grass flowers were most abundant in the summer, fruits in October and November, storage organs in the winter, and herbs in the spring. Lovari et al. (2017) report a slightly different seasonal diet, with roots and rhizomes predominating in the spring and herbs in the summer. In Tunisia, the crested porcupine compensates for the scarcity of cultivated plants during the winter season by consuming more *Stipa* spp. (Ettiss et al., 2020), implying that the dietary content is sensitive to both accessibility and edible features. Sheraz et al. (2025) noted that *Hystrix indica* likes agricultural and cultivated plants in the months of winter, and jujube, millet, and Indian rosewood in months of summer. Hofmann (1989) documented that understanding food preferences is difficult. While Lovari et al. (2017) noted that this species consumed a high rate of plant species available in abundance, Belovsky (1978) stated that this species specializes when resources are abundant and generalizes when they are scarce. E Mori et al. (2017) noted that this species travels long distances in search of food.

Conclusion

The micro-histological examination of fecal pellets supports our first prediction that the crested porcupine would mostly graze on cultivated plants while they are seasonally available. Cultivated crops and commercially important herbs, such as *Zea mays*, *Cannabis sativa*, *Solanum tuberosum*, and *Pisum sativum*, are grazed more in warmer months and utilized less in winter months. In this mountainous environment, *H. indica* was a strict herbivore capable of exploiting numerous plant species, demonstrating opportunistic feeding behavior in proportion to food resource availability but selective when resources were more diversified and abundant, refuting our second hypothesis. Such behavior, which deserves further investigation, could explain why the crested porcupine is still widely poached in the Lesser Himalayan region. The current study represents a preliminary contribution to understanding the dietary patterns of crested porcupines in the Lesser Himalayan region. More research on the trophic ecology of porcupines in various areas and habitats is required to tailor conservation initiatives to local limitations.

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Table 2. Mean relative importance values (RIV±SE) of food plants in the fecal samples of the Indian crested Porcupine at District Muzaffarabad, Hattian bala (Jhelum valley) and Neelum valley, Azad Jammu and Kashmir.

Sr.	Plant Species					Muzaffarabad		Hattian Bala Valley		Neelum Valley	
	Scientific Name	Code	English Name	Family	Type	Summer	Winter	Summer	Winter	Summer	Winter
1	<i>Abies pindrow</i>	AP	West Himalayan fir	Pinaceae	Tree	1.91±1.02	0	2.39±0.55	0	0	9.09±1.07
2	<i>Aesculus indica</i>	AI	Indian horse-chestnut	Sapindaceae	Tree	2.92±0.59	3.62±0.69	5.15±1.13	2.79±0.76	5.68±0.67	16.21±0.56
3	<i>Cedrus deodara</i>	CD	Himalayan deodar	Pinaceae	Tree	3.53±0.74	1.79±1.29	1.32±0.65	3.56±0.95	5.80±0.59	15.04±1.33
4	<i>Diospyros lotus</i>	DL	Date-plum	Ebenaceae	Tree	7.44±1.29	11.39±0.92	6.81±0.87	23.51±1.12	2.09±0.31	3.71± 1.46
5	<i>Ficus palmate</i>	FP	Punjab fig	Moraceae	Tree	1.58±0.81	2.51±0.90	5.06±1.29	1.72±1.03	5.27±0.74	2.99± 0.72
6	<i>Juglans regia</i>	JR	Persian walnut	Juglandaceae	Tree	5.51±0.36	7.39±0.97	4.33±1.45	6.42±0.63	3.57±0.34	17.94±1.32
7	<i>Melia azedarach</i>	MA	Indian lilac	Meliaceae	Tree	5.58±1.02	13.42±1.01	4.87±0.97	19.76±1.68	4.32±0.73	9.09±1.07
8	<i>Morus alba</i>	MA	Common mulberry	Moraceae	Tree	2.98±0.67	9.42±0.75	4.10±1.21	3.30±0.57	3.86±0.57	0
9	<i>Olea europaea</i>	OE	Wild olive	Oleaceae	Tree	2.31±1.073	2.75±0.76	1.55±1.02	5.08±0.70	0	1.98± 0.67
10	<i>Picea smithiana</i>	PS	West Himalayan spruce	Pinaceae	Tree	2.96±1.00	5.46±0.47	2.96±0.99	0	2.55±0.78	4.62± 1.68
11	<i>Pinus roxburgii</i>	PR	Indian pine	Pinaceae	Tree	4.16±1.14	10.38±0.62	1.73±0.56	11.18±0.76	0	0
12	<i>Pinus wallichiana</i>	PW	Himalayan pine	Pinaceae	Tree	4.74±0.94	9.51±0.64	1.59±1.41	9.34±0.60	3.01±0.34	14.53±1.57
13	<i>Agave sisalana</i>	AS	Sisal	Asparagaceae	Herb	3.67±1.033	7.58±0.49	1.05±0.87	0	0	0
14	<i>Artimisia maurensis</i>	AM	Maui wormwood	Asteraceae	Herb	2.94±0.68	0	2.76±1.00	0	3.25±0.40	0
15	<i>Berberis lyceum</i>	BL	Indian barberry	Berberidaceae	Shrub	0.69±0.45	3.57±0.58	5.04±1.38	2.41±0.90	2.40±0.38	1.52± 1.06
16	<i>Daphne oleoides</i>	DOL	Olive daphne	Thymelaeaceae	Shrub	0.83±0.52	0	0.06±0.00	0	2.09±0.346	0
17	<i>Indigofera garerdiana</i>	IG	Himalayan indigo	Fabaceae	Shrub	6.69±0.34	3.72±0.68	5.03±1.03	0	5.97±0.60	2.90±1.05
18	<i>Jasminum humila</i>	JH	Yellow jasmine	Oleaceae	Shrub	2.05±0.82	0	1.07±1.25	0	2.86±0.25	0
19	<i>Aconitum chasmathum</i>	ACH	Kashmir Monkshood	Ranunculaceae	Herb	2.74±0.69	0	1.57±0.90	0	0	0
20	<i>Ajuga bracteosa</i>	ABR	Himalayan bugle	Lamiaceae	Herb	2.72±0.62	0	1.05±0.82	0	2.62±0.37	0
21	<i>Ariasema jacquemontii</i>	AJ	Himalayan Cobra Lily	Araceae	Herb	4.38±2.03	0	1.00±0.81	0	1.77±0.45	0
22	<i>Bergenia ciliate</i>	BC	Hairy Bergenia	Saxifragaceae	Herb	2.58±0.74	0	3.19±0.86	0	5.95±0.74	0
23	<i>Cannabis sativa</i>	CSA	Marijuana	Cannabaceae	Herb	0	0	1.78±0.73	0	2.45±0.30	0
24	<i>Desmodium amplexicaulis</i>	DA	Tick-trefoil	Fabaceae	Herb	3.353±1.03	0	2.16±0.54	0	1.67±0.40	0
25	<i>Dryspyros sterwartii</i>	DST	Himalayan persimmon	Ebenaceae	Tree	2.21±0.68	0	1.48±0.58	0	2.33±0.55	0
26	<i>Euphorbia serrata</i>	ES	Saw-leaf spurge	Euphorbiaceae	Herb	0	0	5.04±0.97	0	0	0
27	<i>Euphorbia helioscopia</i>	EHE	Sun spurge	Euphorbiaceae	Herb	0	0	5.04±0.97	0	3.76±0.46	0
28	<i>Impatiens balsamina</i>	IB	Garden balsam	Balsaminaceae	Herb	1.58±0.56	0	2.12±0.90	0	1.72±0.65	0
29	<i>Mentha sylvestris</i>	MS	Wild mint	Lamiaceae	Herb	3.04±0.79	0	1.48±0.87	0	1.94±0.58	0
30	<i>Pisum sativum</i>	PSA	Garden pea	Fabaceae	Herb	1.20±0.59	0.58±0.47	1.32±1.20	5.40±0.86	2.18±0.58	0
31	<i>Polygonum amplexicaule</i>	PAM	Clasping-leaved knotweed	Polygonaceae	Herb	2.53±0.65	0	3.78±0.70	0	3.66±0.37	0
32	<i>Solanum tuberasum</i>	STU	Potato	Solanaceae	Herb	0	0	1.75±0.45	0	4.00±0.55	0

33	<i>Tulipa humilis</i>	THU	Dwarf tulip	Liliaceae	Herb	1.28±0.67	0	1.89±0.66	0	2.89±0.61	0
34	<i>Zea mays</i>	ZM	Corn	Poaceae	Herb	4.74±0.53	0	5.74±1.64	0	8.86	0
35	Unidentified					2.51±0.36	1.26±0.35	5.15±0.46	2.41±0.46	1.46±0.51	3.86±0.67