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Research Paper

Forage Selection by Royle's Pika (*Ochotona roylei*) in Jagran Forest Range, District Neelum, Azad Jammu and Kashmir, Pakistan

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Abstract

Lagomorphs show dietary flexibility in response to spatial and temporal variations in the food availability, which effect their ecology. The feeding ecology of Royle'e pika (*Ochotona roylei*), an herbivore endemic to Himalayan region, was the focus of this study during 2021-2022. The dietary responses of Royle's pika to seasonal variations were examined using 86 study plots in Jagran Forest Range (JFR), located in the northern region of Azad Jammu & Kashmir (AJK). Data were collected on monthly basis on the diet composition and temporal variations in food selection using focal scan sampling method. The diet of Royle's pika was preferably comprised of 40.69% flowers followed by mature leaves (15.41%), and roots (14.58%), as compared to fruits (3.74%), and whole plants (3.05%). Significant variability was recorded in diet composition across the study months ($H = 14.99$; $df = 7$; $p = 0.04$). Notably, Royle's pikas spent more time on feeding flowers during the summer (71.23%) and monsoon (78.93%). The average Shannon-Wiener Index of 3.365 indicated a high dietary diversity, reflecting the variety of plant species consumed, while a mean dietary evenness index of 0.94 suggests a balanced distribution across months. Seasonal shifts in diet were evident in autumn, when ground vegetation diminished, causing changes in food selection. Among the plants consumed, *Parnassia nubicola* had the highest selection ratio (31.81) in the pika's diet. The findings of this study highlight the adaptive strategies of Royle's pika in the Western Himalayan region of Kashmir that may contribute to a deeper understanding of the ecological dynamics of lagomorph under local environmental conditions.

Introduction

The forage selection by herbivores is shaped by the dynamics and complexity of factors such as forage availability, accessibility, quality, and abundance (Stephens & Krebs, 1986; McNaughton & Banyikwa, 1995). Herbivores have evolutionary adapted to feed on specific plants during certain phenophases that fulfill their nutritional requirement (Belovsky, 1978; Robbins, 1983; Stephens & Krebs, 1986; Belovsky & Schmitz, 1991). As individual grazers select forage from a complex dietary environment (Moore & Foley, 2005), so it is essential to define the foraging decisions of herbivores, which based on environmental complexity, physical and chemical traits of plants (Robbins, 1983). The optimal foraging theory highlighted that forage selection is associated with energy gained per unit cost, where cost is measured by time and distance covered to acquire food. However, later on greater attention was directed to the nutrient balancing and reducing intake of toxins from plants (Westoby, 1974; Pulliam, 1975). The optimum foraging theory generally indicates that herbivores maximize their foraging efficiency by consuming the more nutritious food while avoiding toxins or indigestible materials (Stephens & Krebs, 1986). Understanding how herbivores maximize foraging efficiency remains a key focus in ecology.

Pikas are small generalized herbivores that rely on a wide diversity of grasses and herbs (Smith et al., 1990). Their food preference decisions are often multifaceted and dynamic that influenced by accessibility, quality, and abundance (Bhattacharyya et al., 2013) as well as internal factors (e.g. energetics or nutritional needs) and external factors (e.g. predation risk, interspecific interactions etc.) (Lima & Dill, 1990). These constraints limit food availability and drive diet selectivity as herbivores balance trade-offs such as obtaining sufficient food with minimum predation risk, or selecting forage of varying nutritional value (Stephens & Krebs, 1986).

The distribution of pikas is directly linked to the availability of forage plants. They show two feeding behaviors: instant feeding in rainy season and collection of food for hay pile to use in winter (Koju et al., 2013). Their diet includes fresh grasses, fallen leaves, and mosses. They generally forage on standing and hoarded vegetation found near their talus habitats. During early summers, pikas primarily feed on standing vegetation and start hoarding food in hay piles during late summer (Dearing, 1997a). These hay piles are vital for winter survival as well as reproductive success in early spring (Huntly et al., 1986; Morrison, 2007). Unlike other pika species, Royel's pikas do not display significant hoarding behaviour (Kawamichi, 1968, 1971; Smith et al., 1990).

Diet selection in talus-dwelling pikas is explained by three distinct hypotheses. According to Millar and Zwickel (1972), pikas select their diet based on cues related to plant morphology and nutritional quality (Huntly et al., 1986; Hudson et al., 2008). According to Dearing (1996, 1997a, b), pikas selections are influenced by secondary metabolic components. According to Millar and Zwickel (1972) and Huntly et al. (1986), pikas should favor larger forage plant species for effective energy accumulation since they are central place foragers, returning to their position after each foraging session. Plant consumption can vary significantly based on their nutritional values. Forages with crude protein, minerals or moisture are preferred, while those with high fiber or phenolic contents are avoided due to low nutritional values and reduce digestibility. Royle's pika preferred forage with low fiber, tannin and lignin contents, larger leaf areas, high nitrogen and moisture contents (Bhattacharyya et al., 2013). Hay piles typically contain plants higher in calories, protein, lipids, and lower in fiber compared to un-selected plants (West, 1980). Alpine ecosystems, where nitrogen availability is strongly limited, highlights the importance of crude protein in forage selection by alpine herbivores (DeLuca et al., 2002). Pikas act as allogenic ecosystem engineers by forming hay piles that enhance soil development and fertility in low-productivity alpine and subalpine talus fields, which are often shallow, alkaline, and nitrogen-poor (Mattson, 1980).

Unlike many alpine species, pikas do not hibernate, relying instead on the hay piles to sustain them through winter. Their sensitivity to warm temperatures, snowpack variation and vegetation patterns makes them important indicator of climate change impacts on alpine ecosystems. In Pakistan and AJK, research on Royle's pikas has been limited to the distributional studies (Awan et al., 2004; Khan et al., 2012; Faiz & Abass, 2016). The Jagran Forest Range is one of the potential area of distribution of Royle's pika in AJK, however, detailed ecological studies are lacking. The present study aimed to evaluate of forage selection and diet composition of Royle's pika in the Jagran Forest Range, district Neelum, AJK.

Materials and Methods

Study Area

The present study was conducted in Jagran Forest Range, which is located in the Western Himalayan region in Neelum District, Azad Jammu and Kashmir (Figure 1). The study area lies between 73°39" E – 73°57" E, and 34°49" N – 34°31" N, with an elevation ranges from 1300 m to over 5000 m, covering an area of about 52026 ha (520.26 km^2). JFR is bordered to the west and north by Kaghan Valley of Khyber Pakhtunkhwa (KP), to the south by Machiara National Park in district Muzaffarabad and Bandi Forest Range in the Neelum district, and to the northeast by Keran Forest Range in Neelum district. The eastern border is lined with Indian-administered Jammu & Kashmir (GoAJK, 2020; Ali et al., 2023).

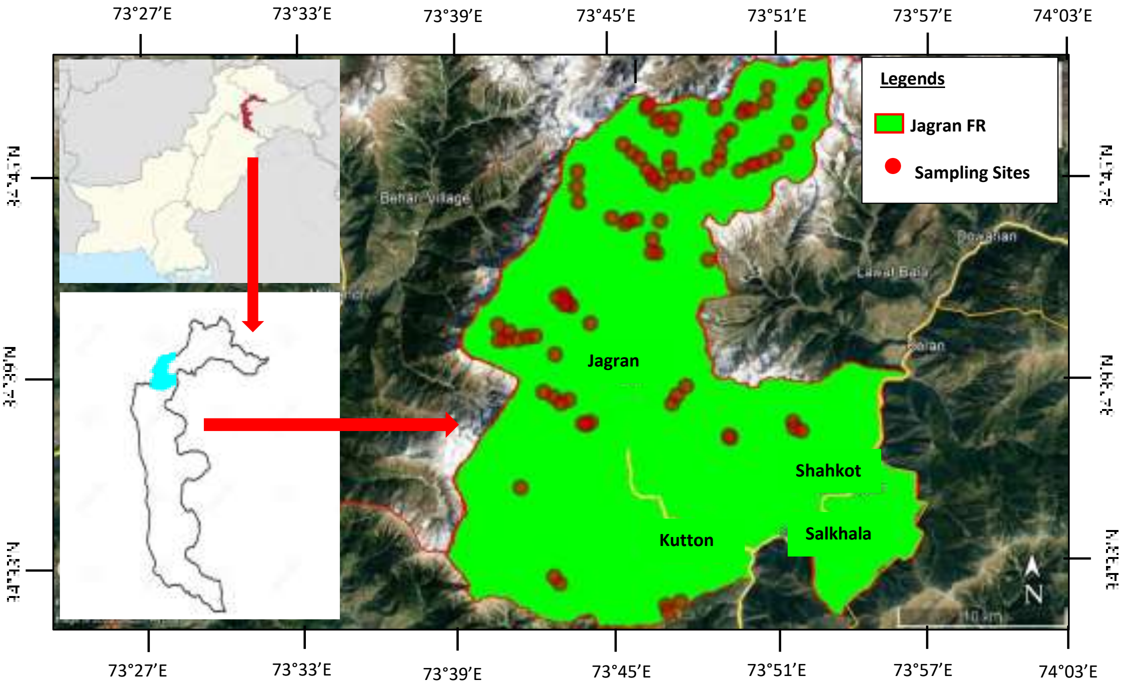

Figure 1: Location map of JFR along with the study sites in district Neelum, AJK.

JFR is characterized with harsh winters and heavy snowfall, with the high peaks remain snow-covered until June or even later. The area has beautiful landscape with green flora against the backdrop of towering, snow-capped peaks. Mean annual rainfall recorded as 1540 mm, while July receives maximum rainfall averaging 339.6 mm (WWF, 2008). Summers are very pleasant and cool. The area has very steep and rugged terrain, marked by deep valleys, with high ridges and steep slopes (WWF, 2008; Ashraf et al., 2016; GoAJK, 2020; Ali et al., 2023).

Data Collection

Pika foraging behavior was monitored for one year (June 2021 – May 2022) on a monthly basis, focusing on peak periods of surface activity, as outlined by Bhattacharyya et al. (2013). Observations were made across three seasons: summer (May – June), monsoon (July – August), and autumn (September – November). During this period, a total of 86 study sites were identified based on pika activity. At each site, a 50 m × 50 m permanent plot was used to record pika behaviour. Each permanent plot was located at least 200 m away from neighboring plots, with all plots having similar slopes (10° – 15°) and aspects. Pikas were observed using the focal scan sampling method (Grueter et al., 2009; Mekonnen et al., 2010; Bhattacharyya et al., 2013) during morning (06:00 – 10:00 h) and evening (15:00 – 18:00 h) hours. Observations were made with

10 × 40 mm Nikon binoculars from selected high vantage points that allowed the entire study plot to be visible (Altmann, 1974). The presence of an observer did not seem to affect the natural activities of Royle's pikas since they are considered synanthropic (Kawamichi, 1968).

At each activity scan data were collected by recording food items consumed (e.g., roots, stems, flowers, young leaves, mature leaves, fruits, or whole plant) and their corresponding plants species. Leaves (young and mature) are differentiated on the basis of colour, their position and shape etc. Reference plant specimens were collected for the consultation of plant taxonomists and their identification at the Herbarium of the Department of Botany, University of AJK, Muzaffarabad. Dietary composition was determined by computing the proportion of food items belonging to different species consumed by the pika. Daily food items consumed by the pika in each month were summed up to determine the monthly proportion of the diet attributed to each food category. The mean monthly proportions of diet were used to calculate seasonal diets as well as the overall diet for the study period. To assess dietary diversity, Shannon–Wiener index of diversity (H′) was calculated for each month (Krebs, 1999). Monthly dietary evenness was calculated using the evenness index (J) (Krebs, 1999). Values for J ranged from 0.0 to 1.0, where 1.0 indicates equal feeding records for each species in the diet (Krebs, 1999). Relative dietary preference for specific food species was assessed by calculating the Forage Selection Index (W) (Krebs, 1999). W is the comparison of the proportion of feeding observations of a plant species with the relative abundance of the concerned species as assessed from the study plots, which was determined using following formula:

$$\boldsymbol{Wi = \frac{Oi}{Pi}}$$

Wherein, O_i is the overall percentage of time spent feeding on species *i*, and P_i is the percentage of the stem density that species *i* contributes to the total stem density (relative cover of the species *i*) in pika habitat. $W_i > 1$ indicates preference and $W_i < 1$, avoidance.

Data Analysis

Analysis of Variance (ANOVA) was used to determine the significant difference in plants consumption across months and seasons, as well as to evaluate the proportions of different dietary plants in the diet of Royle’s pika. Pearson’s correlation analysis was carried out to examine the relationship between rainfall and the consumption of different food items and the monthly feeding time percentage of each diet category. Kruskal-Wallis test was applied to assess the significant difference in the time spent in feeding on various food items across seasons and months during the study period.

Results

Overall Diet

In the present study, a total of 7143 minutes (118.9 hours) of activity scan were recorded focusing on feeding behaviour. During this period, Royle's pika was observed consuming 75 plant species. Additionally, five hay-piles were also identified and examined during the study period (Figure 2-a). The overall diet of Royle's pika in the JFR predominantly comprised of herbaceous parts (Figure 2-b) that accounted for 93.33% of their diet, while shrub and other than leaves tree parts contributed only 6.67%. A significant preference for herbaceous parts over tree and shrub was recorded ($F = 21.47$; $df = 6.44$; $p<0.001$).

a).  b). 

Figure 2: a). Hay pile collected by Royle's pika observed during the study.
b). Royle's pika feeding on leaves of *Geranium pretense.*

Among the herbaceous parts, flowers contributed the largest proportion of diet (42.46%), followed by leaves (22.11%), roots (14.69%), and stems (7.60%), while whole plants were the least (2.61%) part of diet. Among shrubs and trees, leaves (3.23%) and flowers (2.91%) represented in minor proportion in the diet (Table 1). It was noticed that primroses were the most favored food group for Royle's pikas. The most consumed plant of this group was *Primula rosea* (6.71%), followed *Primula farinosa* (5.77%) and *Primula denticulata* (4.86%). Pikas predominantly selected flowers (6.71 ± 0.34%) of the herbaceous plants as a part of their diet over the other plant's parts (Table 1).

Table 1: Plants species with their parts consumed and percentage composition in Royle's pika diet in JFR, district Neelum, Azad Jammu & Kashmir during 2021-2022.

S. No.	Species	Habit	Parts Consumed	%age Composition
1.	*Abies pindrow*	Tree	Leaves	0.093
2.	*Achillea millefolium*	Herb	Leaves, flowers	1.314
3.	*Aconitum heterophyllum*	Herb	Leaves, stem, flowers	0.356
4.	*Adiantum venustum*	Herb	Leaves, stem, root	0.621
5.	*Ajuga integrifolia*	Herb	Whole plant	0.644

S. No.	Species	Habit	Parts Consumed	%age Composition
6.	*Alchemilla cashmiriana*	Herb	Leaves, flowers	1.224
7.	*Allium griffithianum*	Herb	Leaves, flowers	0.221
8.	*Anagallis arvensis*	Herb	Whole plant	0.577
9.	*Anaphalis nepalensis*	Herb	Leaves, flowers	0.902
10.	*Apluda mutica*	Herb	Leaves, flowers	2.092
11.	*Aquilegia fragrans*	Herb	Leaves, flowers	1.192
12.	*Arnebia benthamii*	Herb	Flowers	0.925
13.	*Artemisia annua*	Herb	Leaves, flowers, stem	0.354
14.	*Asplenium bulbiferum*	Herb	Stem, leaves,	0.896
15.	*Aster alpinus*	Herb	Whole plant	2.414
16.	*Aster himalaicus*	Herb	Whole plant	1.483
17.	*Bergenia ciliata*	Herb	Flowers, leaves,	0.386
18.	*Bistorta affinis*	Herb	Flowers	2.086
19.	*Cirsium arvense*	Herb	Leaves, flowers	1.401
20.	*Digitaria cruciata*	Herb	Leaves, flowers	0.992
21.	*Dryopteris ramosa*	Herb	Leaves	2.159
22.	*Dryopteris stewartia*	Herb	Leaves	1.155
23.	*Epilobium latifolium*	Herb	Stem, leaves	1.776
24.	*Fragaria nubicola*	Herb	Whole plant	1.448
25.	*Galium boreale*	Herb	Leaves, flowers	1.483
26.	*Gentiana alpina*	Herb	Flowers	0.925
27.	*Geranium pratense*	Herb	Leaves, stem	0.235
28.	*Gerbera gossypina*	Herb	Leaves	0.902
29.	*Geum montanum*	Herb	Leaves, flowers	1.717
30.	*Hachelia uncinata*	Herb	Leaves, roots	0.772
31.	*Iris hookeriana*	Herb	Leaves	1.213
32.	*Lagotis minor*	Herb	Whole plant	1.483
33.	*Ligularia amplexicaulis*	Herb	Leaves, flowers	1.79
34.	*Matricaria chamomilla*	Herb	Leaves, flowers	0.923
35.	*Mentha longifolia*	Herb	Leaves, stem, flowers	0.267
36.	*Morina longifolia*	Shrub	Leaves	0.502
37.	*Nepeta connata*	Herb	Flowers	0.96
38.	*Onosma bracteatum*	Herb	Leaves, flowers	0.772
39.	*Onychium japonicum*	Herb	Leaves, stem, root	1.517
40.	*Oxyria digyna*	Herb	Whole plant	0.864
41.	*Parnassia nubicola*	Herb	Leaves, flowers	2.704
42.	*Pedicularis punctata*	Herb	Leaves, flowers	0.833
43.	*Phleum alpinum*	Herb	Flowers	0.542
44.	*Plantago lanceolata*	Herb	Whole plant	1.668
45.	*Plectranthus rogosus*	Shrub	Leaves	0.354
46.	*Poa alpina*	Herb	Whole plant	1.253
47.	*Poa nemoralis*	Herb	Whole plant	1.483
48.	*Podophyllum emodi*	Herb	Leaves, flowers	0.357
49.	*Polygonum amplexicaulis*	Herb	Flowers, stem	1.517
50.	*Potentilla anserina*	Herb	Flowers	2.063
51.	*Primula denticulata*	Herb	Flowers	4.863
52.	*Primula farinosa*	Herb	Flowers	5.771
53.	*Primula rosea*	Herb	Flowers	6.714
54.	*Prunella vulgaris*	Herb	Leaves, flowers	3.284
55.	*Ranunculus pulchellus*	Herb	Leaves, stem, flowers	2.843
56.	*Rheum australe*	Herb	Flowers	0.511
57.	*Rhodiola heterodonta*	Herb	Whole plant	1.245
58.	*Rumex nepalensis*	Herb	Leaves, fruit	1.448

S. No.	Species	Habit	Parts Consumed	%age Composition
59.	*Sambucus wightiana*	Shrub	Flowers	0.513
60.	*Saussurea lappa*	Herb	Leaves, fruit	0.293
61.	*Sedum album*	Herb	Leaves, flowers	0.545
62.	*Sibbaldia cuneata*	Herb	Flowers	1.192
63.	*Skimmia laureola*	Shrub	Leaves	0.269
64.	*Solanum nigrum*	Herb	Whole plant	1.291
65.	*Solidago virgaurea*	Herb	Flowers, fruit	1.062
66.	*Sorghum nitidum*	Herb	Fruit	1.195
67.	*Swertia alata*	Herb	Leaves, fruit	1.192
68.	*Taraxacum campylodes*	Herb	Flowers	1.485
69.	*Themeda anathera*	Herb	Flowers, stem	2.094
70.	*Thymus linearis*	Herb	Root, stem, flowers	0.574
71.	*Tinospora cardifolia*	Herb	Flowers	1.645
72.	*Trifolium rapens*	Herb	Leaves, flowers	1.157
73.	*Viola pilosa*	Herb	Whole plant	1.738
74.	Lichen	Herb	Whole plant	0.435
75.	Moss	Herb	Whole plant	0.815

Monthly Variation in Diet Composition

Pikas consumed a variety of plant species as their diet in different months (Table 2). Flowers constituted the majority of pika's diet throughout the study period, except for October, November and April, when no flowers were available due to harsh climate. The proportion of flower in the diet ranged between 43.91% - 81.99%. The consumption of other food items showed considerable variation in different months. Young leaves 5.43 – 30.32%, mature leaves 0.05 – 39.77%, roots 0.99 – 39.34%, stems 2.74 – 15.47%, fruits 0.12 – 9.11% and whole plants 1.26 – 7.88% in monthly proportion of diet consumption. Kruskal – Wallis test revealed a significant difference in the time spent feeding on different items across different months ($H = 14.99$; $df = 7$; $p = 0.03$).

Table 2: Monthly variation in composition of various food items in Royle's pika diet at JFR, district Neelum, Azad Jammu & Kashmir during 2021-2022.

Months	Percentage of Diet						
	Young leaves	Mature leaves	Root	Stem	Flower	Fruit	Whole plant
June 2021	5.76	1.09	3.95	6.55	70.65	9.11	2.89
July 2021	5.43	0.05	2.48	2.74	81.99	5.32	1.99
August 2021	11.66	2.98	0.99	2.89	75.27	4.34	1.87
September 2021	23.56	12.45	6.12	3.44	43.91	7.54	2.98
October 2021	18.99	35.87	21.67	15.47	-	0.12	7.88
November 2021	7.98	39.77	39.34	11.65	-	-	1.26
April 2022	30.32	23.19	30.05	15.01	-	-	1.43
May 2022	12.09	7.89	12.03	6.7	53.66	3.51	4.12
Mean	**14.474**	**15.411**	**14.579**	**8.056**	**40.685**	**3.742**	**3.052**

Primula rosea was the most consumed species at an average consumption of 5.65, while minimum (1.67%) consumption of recorded in May as compared to maximum (9.76%) in July. *Primula farinosa* the second largest contributor (mean = 5.48), consumed a minimum (2.03%) in September and maximum (7.87%) in July. *Poa alpina* (0.12 – 0.88%) and *Aster alpinus* (0.23 – 0.98%) were the plants that scored the lowest values of consumption in Royle's pika diet during the entire study period (Table 3). *Bergenia ciliata*, *Plectranthus rogosus*, *Skimmia laureola* and *Thymus linearis* were the plants that were consistently consumed throughout the study period (Table 3).

Table 3: Monthly variation in percentage composition of food species in Royle's pika diet at JFR, district Neelum, Azad Jammu & Kashmir during 2021-2022.

Species Name	Monthly %age diet composition								Mean
	June 2021	July 2021	August 2021	September 2021	October 2021	November 2021	April 2022	May 2022	
Abies pindrow	-	0.19	-	-	5.87	6.26	-	-	4.106
Achillea millefolium	1.56	1.87	1.99	0.11	-	-	-	4.76	2.058
Aconitum heterophyllum	-	0.55	0.44	0.19	6.92	10.55	6.32	3.93	4.128
Adiantum venustum	0.09	2.76	2.98	1.56	4.12	9.03	6.92	-	3.923
Ajuga integrifolia	0.12	0.98	0.45	2.65	4.91	-	5.33	2.01	2.35
Alchemilla cashmiriana	0.54	1.56	1.98	-	-	-	-	2.89	1.742
Allium griffithianum	0.56	1.98	0.56	3.12	-	-	-	-	1.555
Anagallis arvensis	0.62	1.09	0.33	-	-	-	-	-	0.68
Anaphalis nepalensis	0.87	0.34	0.12	-	-	-	3.12	1.02	1.094
Apluda mutica	0.11	0.45	0.09	3.81	-	-	-	-	1.115
Aquilegia fragrans	0.89	0.88	0.32	-	-	-	-	-	0.696
Arnebia benthamii	0.45	1.45	0.91	2.33	-	-	0.43	-	1.114
Artemisia annua	1.98	0.37	0.22	2.01	-	-	-	-	1.145
Asplenium bulbiferum	1.09	2.67	0.45	-	-	-	-	2.91	1.78
Aster alpinus	-	0.23	0.98	-	-	-	-	-	0.605
Aster himalaicus	0.09	0.56	0.11	1.99	7.39	-	4.01	2.76	2.416
Bergenia ciliata	0.03	0.45	0.45	2.01	5.22	8.44	2.93	1.99	2.69
Bistorta affinis	2.98	1.67	2.55	3.55	-	-	-	1.89	2.528
Cirsium arvense	0.33	1.77	1.09	2.9	-	-	-	-	1.522
Digitaria cruciata	0.43	1.98	0.02	-	-	-	-	2.99	1.355
Dryopteris ramosa	0.11	0.45	0.92	3.89	5.32	9.49	5.03	-	3.601
Dryopteris stewartii	2.11	0.98	2.09	2.66	4.07	-	-	1.01	2.153
Epilobium latifolium	0.32	0.49	0.23	3.09	-	-	5.12	3.92	2.195
Fragaria nubicola	3.92	4.88	2.89	-	-	-	6.66	-	4.587
Galium boreale	1.99	2.55	0.99	2.09	-	-	-	2.99	2.122
Gentiana alpina	-	1.03	2.01	1.9	-	-	-	-	1.646
Geranium pratense	0.76	2.99	1.03	-	-	-	3.23	3.1	2.222
Gerbera gossypina	2.98	2.11	1.99	-	-	-	2.73	-	2.452
Geum montanum	0.98	0.76	0.99	-	-	-	-	-	0.91

Species Name	Monthly %age diet composition								Mean
	June 2021	July 2021	August 2021	September 2021	October 2021	November 2021	April 2022	May 2022	
Hachelia uncinata	0.45	0.56	0.56	1.8	-	-	-	-	0.842
Iris hookeriana	0.88	0.45	0.23	3.02	8.22	-	0.45	-	2.208
Lagotis minor	1.59	0.54	0.91	-	-	-	-	4.92	1.99
Ligularia amplexicaulis	2.11	0.11	0.89	-	-	-	6.45	3.02	2.516
Matricaria chamomilla	0.45	0.04	0.11	-	-	-	-	2.45	0.762
Mentha longifolia	1.67	0.44	0.07	3.78	-	-	0.98	-	1.388
Morina longifolia	0.13	0.12	0.59	-	-	-	-	1.78	0.655
Nepeta connata	0.91	0.73	1.89	-	-	-	0.45	-	0.995
Onosma bracteatum	2.55	2.92	2.87	0.02	-	-	0.93	-	1.858
Onychium japonicum	0.82	0.63	0.32	1.99	2.09	-	0.23	-	1.013
Oxyria digyna	0.85	0.55	0.89	2.13	-	-	-	-	1.105
Parnassia nubicola	1.87	0.83	0.67	-	-	-	0.34	2.91	1.324
Pedicularis punctata	0.28	0.56	0.47	-	-	-	0.99	3.56	1.172
Phleum alpinum	0.33	0.12	0.39	2.34	-	-	2.01	1.99	1.196
Plantago lanceolata	0.98	0.76	0.88	3.99	5.33	-	-	2.98	2.486
Plectranthus rogosus	0.12	0.66	1.02	4.23	7.91	21.92	4.18	2.45	5.311
Poa alpina	-	0.12	0.88	-	-	-	-	-	0.5
Poa nemoralis	0.52	0.98	1.02	1.9	-	-	-	2.99	1.482
Podophyllum emodi	0.65	0.82	2.88	3.09	-	-	0.12	-	1.512
Polygonum amplexicaulis	4.92	5.01	2.99	-	-	-	1.02	2.91	3.37
Potentilla anserina	0.72	2.98	3.92	1.98	-	-	-	-	2.4
Primula denticulata	3.39	4.98	3.89	-	-	-	3.91	-	4.042
Primula farinosa	7.12	7.87	4.92	2.03	-	-	-	-	5.485
Primula rosea	9.54	9.76	5.29	1.99	-	-	-	1.67	5.65
Prunella vulgaris	1.78	1.98	1.45	2.33	-	-	-	-	1.885
Ranunculus pulchellus	0.87	0.12	1.98	-	-	-	1.3	4.21	1.696
Rheum australe	3.23	0.67	0.67	1.9	6.23	9.42	-	1.77	3.413
Rhodiola heterodonta	0.87	0.32	0.97	-	-	-	-	-	0.72
Rumex nepalensis	1.89	0.76	1.83	2.03	3.55	-	3.94	-	2.333
Sambucus wightiana	1.65	2.98	1.76	1.09	-	-	-	1.02	1.7
Saussurea lappa	2.56	3.11	0.98	2.09	5.66	-	2.93	-	2.888
Sedum album	1.03	1.09	0.65	-	-	-	-	-	0.923
Sibbaldia cuneata	1.87	0.11	1.76	-	-	-	-	-	1.246
Skimmia laureola	2.92	0.76	0.65	2.8	4.88	12.91	4.78	3.02	4.09
Solanum nigrum	0.88	0.98	1.77	-	-	-	-	1.66	1.322
Solidago virgaurea	0.53	1.89	2.9	-	-	-	-	4.88	2.55
Sorghum nitidum	1.45	0.43	1.66	2.09	-	-	3.84	1.89	1.893
Swertia alata	0.42	0.12	1.66	-	-	-	-	-	0.733
Taraxacum campylodes	0.59	0.11	1.93	-	-	-	-	2.07	1.175
Themeda anathera	0.76	0.09	0.23	1.56	4.97	-	3.98	3.01	2.086
Thymus linearis	0.79	0.56	2.46	1.37	7.34	11.98	1.32	2.34	3.52
Tinospora cardifolia	1.46	0.12	0.45	-	-	-	-	-	0.676
Trifolium rapens	0.68	0.01	1.59	2.9	-	-	1.03	-	1.242
Viola pilosa	3.12	0.12	1.93	-	-	-	-	-	1.723
Lichen	1.89	0.11	1.09	3.71	-	-	2.99	2.33	2.02
Moss	-	0.98	1.9	1.98	-	-	-	-	1.62

Seasonal Variation in Diet Composition

Royle's pika showed distinct seasonal shift in their diet preference. They consumed comparatively higher proportion of flowers during the summer and monsoon seasons (71.23% and 78.93%, respectively), while no flower consumption took place in autumn season. In autumn, their diet shifted to mature (37.88%) and young leaves (11.97%) as compared to other seasons. Roots were also consumed in highest proportion (36.12%) during autumn season, while fruits accounted for 10.11% of the summer season, followed by monsoon (4.87%) and autumn (0.16%). Whole plants contributed higher proportion (3.32) in the summer diet as compared to monsoon and autumn seasons, where their intake was minimal (Table 4). Kruskal – Wallis test showed no significant difference in the time spent feeding on different food items across the seasons ($H = 0.29$; $df = 7$; $p = 0.07$).

Table 4: Seasonal variation in composition of food items in Royle's pika diet at JFR, district Neelum, Azad Jammu & Kashmir during 2021-2022.

Months	Percentage of Diet						
	Young leaves	Mature leaves	Root	Stem	Flower	Fruit	Whole plant
Summer	3.21	2.23	4.58	5.32	71.23	10.11	3.32
Monsoon	4.73	2.31	3.72	3.43	78.93	4.87	2.01
Autumn	11.97	37.88	36.12	12.69	-	0.16	1.18
Mean	**6.64**	**14.14**	**14.81**	**7.15**	**75.08**	**5.05**	**2.17**

Fragaria nubicola (5.29%) was the most consumed species in the summer diet followed by *Ligularia amplexicaulis* (3.86%), while *Apluda mutica* (0.11%) and *Solanum nigrum* (0.12%) were the lowest consumed species. During monsoon, *Primula rosea* (7.52%) and *Primula farinosa* (6.39%) were the highly consumed plant species. Whereas, the lowest consumption was recorded for *Matricaria chamomilla* (0.07%) and *Abies pindrow* (0.19%) during the monsoon season. For autumn, *Skimmia laureola* (5.76%) and *Iris hookeriana* (5.62%) were the most consumed species, while lowest consumption was recorded on *Onosma bracteatum* (0.02%) and *Achillea millefolium* (0.11%) (Table 5).

Table 5: Seasonal variation in composition of food species in Royle's pika diet at JFR, district Neelum, Azad Jammu & Kashmir during 2021-2022.

Species Name	%age diet composition in seasons			Mean
	Summer	Monsoon	Autumn	
Abies pindrow	-	0.19	2.92	1.555
Achillea millefolium	3.16	1.93	0.11	1.733

Species Name	%age diet composition in seasons			Mean
	Summer	Monsoon	Autumn	
Aconitum heterophyllum	1.66	0.49	0.13	0.76
Adiantum venustum	1.15	2.87	1.98	2
Ajuga integrifolia	0.48	0.71	3.78	1.656
Alchemilla cashmiriana	0.71	1.77	-	1.24
Allium griffithianum	0.56	1.27	3.12	1.65
Anagallis arvensis	0.62	0.71	-	0.665
Anaphalis nepalensis	1.67	0.23	-	0.95
Apluda mutica	0.11	0.27	3.81	1.396
Aquilegia fragrans	0.89	0.6	-	0.745
Arnebia benthamii	0.44	1.18	2.33	1.316
Artemisia annua	1.98	0.29	2.01	1.426
Asplenium bulbiferum	2	1.56	-	1.78
Aster alpinus	-	0.6	-	0.6
Aster himalaicus	0.28	0.33	4.69	1.766
Bergenia ciliata	1.65	0.45	0.49	0.863
Bistorta affinis	1.45	2.11	3.55	2.37
Cirsium arvense	0.33	1.43	2.9	1.553
Digitaria cruciata	1.71	1	-	1.355
Dryopteris ramosa	2.57	0.68	2.55	1.933
Dryopteris stewartia	1.56	1.53	0.33	1.14
Epilobium latifolium	3.12	0.36	3.09	2.19
Fragaria nubicola	5.29	3.88	-	4.585
Galium boreale	2.49	1.77	2.09	2.116
Gentiana alpina	-	1.52	1.9	1.71
Geranium pratense	0.36	2.01	-	1.185
Gerbera gossypina	0.85	2.05	-	1.45
Geum montanum	0.98	0.87	-	0.925
Hachelia uncinata	0.45	0.56	1.8	0.936
Iris hookeriana	0.66	0.34	5.62	2.206
Lagotis minor	1.25	0.72	-	0.985
Ligularia amplexicaulis	3.86	0.5	-	2.18
Matricaria chamomilla	1.45	0.07	-	0.76
Mentha longifolia	1.32	0.25	3.78	1.783
Morina longifolia	0.95	0.35	-	0.65
Nepeta connata	0.68	1.31	-	0.995
Onosma bracteatum	1.74	2.89	0.02	1.55
Onychium japonicum	0.55	0.47	2.04	1.02
Oxyria digyna	0.85	0.72	2.13	1.233
Parnassia nubicola	1.71	0.75	-	1.23
Pedicularis punctata	1.61	0.51	-	1.06
Phleum alpinum	1.44	0.25	2.34	1.343
Plantago lanceolata	1.98	0.82	0.44	1.08
Plectranthus rogosus	2.25	0.84	3.99	2.36
Poa alpina	-	0.5	-	0.5
Poa nemoralis	0.71	1	1.9	1.203
Podophyllum emodi	0.33	1.85	3.09	1.756
Polygonum amplexicaulis	2.95	4	-	3.475
Potentilla anserina	0.72	3.45	1.98	2.05
Primula denticulata	3.65	4.43	-	4.04
Primula farinosa	2.77	6.39	2.03	3.73
Primula rosea	2.62	7.52	1.99	4.043
Prunella vulgaris	1.78	1.71	2.33	1.94
Ranunculus pulchellus	1.21	1.05	-	1.13

Species Name	%age diet composition in seasons			Mean
	Summer	Monsoon	Autumn	
Rheum australe	2.5	0.67	1.55	1.573
Rhodiola heterodonta	0.87	0.64	-	0.755
Rumex nepalensis	0.91	1.29	2.79	1.663
Sambucus wightiana	0.13	2.37	1.09	1.196
Saussurea lappa	0.74	2.04	0.87	1.216
Sedum album	1.03	0.87	-	0.95
Sibbaldia cuneata	1.87	0.93	-	1.4
Skimmia laureola	1.57	0.7	5.76	2.676
Solanum nigrum	0.12	1.37	-	0.745
Solidago virgaurea	0.75	2.39	-	1.57
Sorghum nitidum	1.39	1.04	1.43	1.286
Swertia alata	0.42	0.89	-	0.655
Taraxacum campylodes	1.33	1.02	-	1.175
Themeda anathera	1.54	0.16	1.89	1.196
Thymus linearis	1.44	1.51	1.77	1.573
Tinospora cardifolia	1.46	0.28	-	0.87
Trifolium rapens	0.85	0.8	2.9	1.516
Viola pilosa	1.12	1.02	-	1.07
Lichen	2.4	0.66	0.71	1.256
Moss	-	1.44	1.98	1.71

Dietary Diversity

The mean monthly Shannon – Wiener index (H′) for food species diversity was recorded at 3.36, with a range of 2.11 to 3.98 (Table 6). Dietary diversity peaked in August 2021 and reached its lowest point in November 2021. Overall, the diet of Royle’s pikas exhibited high diversity and significant variation throughout the study duration. The mean monthly dietary evenness index (J = 0.94) indicates a well-balanced distribution of dietary items, ranging from 0.87 in July to 0.99 in October (Table 6).

Table 6: Plant species diversity and evenness indices in food of pikas during different months of the years 2021-2022.

Months	Shannon-Wiener Index (*H'*)	Evenness Index (*J*)
June 2021	3.79	0.89
July 2021	3.75	0.87
August 2021	3.98	0.92
September 2021	3.65	0.97
October 2021	2.85	0.99
November 2021	2.11	0.96
April 2022	3.25	0.92
May 2022	3.54	0.98
Mean	**3.365**	**0.94**

Food Selection and Preference

Data revealed that *Parnassia nubicola* has the highest selection ratio (W = 31.81) among all plant species consumed by Royle's pika (Table 7). This was followed by *Ajuga integrifolia* (W = 17.88) and *Primula rosea* (W = 14.59), while *Mentha longifolia* and *Morina longifolia* showed least selection ratio of 0.17 and 0.21 respectively.

Rainfall and Diet

Generally, pikas fed during the clear or cloudy weather and rarely come out during heavy rainfall, one observation of feeding in raining was recorded at alpine pastures of Batakanali Behk (3641 m). Rainfall pattern significantly effects the feeding ecology of Royle's pikas. The consumption of herbaceous leaves was significantly negatively correlated with rainfall patterns ($r = -0.78$, $p<0.001$). In contrast, the consumption of roots showed no significant correlation ($r = -0.12$, $p = 0.34$) with rainfall. Similarly, the rainfall patterns have no significant correlation with the consumption of stems ($r = 0.29$, $p = 0.22$), flowers ($r = 0.35$, $p = 0.27$), and fruits ($r = 0.44$, $p = 0.29$). The consumption of whole plant by Royle's pika showed a strong negative but significant correlation with rainfall patterns ($r = -0.65$, $p = 0.03$).

Table 7: Forage Selection Index (W) of Royle's pika based on stem densities for plant species consumed in JFR during 2021-2022.

Species	Family	Habit	Stem Density	%age in diet	W
Abies pindrow	Pinaceae	Tree	0.011	0.093	8.454
Achillea millefolium	Asteraceae	Herb	1.211	1.314	1.085
Aconitum heterophyllum	Ranunculaceae	Herb	0.105	0.356	3.39
Adiantum venustum	Pteridaceae	Herb	0.43	0.621	1.444
Ajuga integrifolia	Lamiaceae	Herb	0.036	0.644	17.888
Alchemilla cashmiriana	Rosaceae	Herb	0.671	1.224	1.824
Allium griffithianum	Amaryllidaceae	Herb	0.828	0.221	0.267
Anagallis arvensis	Primulaceae	Herb	0.162	0.577	3.562
Anaphalis nepalensis	Asteraceae	Herb	0.495	0.902	1.822
Apluda mutica	Poaceae	Herb	1.046	2.092	2
Aquilegia fragrans	Ranunculaceae	Herb	2.062	1.192	0.578
Arnebia benthamii	Boraginaceae	Herb	0.725	0.925	1.276
Artemisia annua	Asteraceae	Herb	0.439	0.354	0.806
Asplenium bulbiferum	Aspleniaceae	Herb	0.633	0.896	1.415
Aster alpinus	Asteraceae	Herb	0.773	2.414	3.122
Aster himalaicus	Asteraceae	Herb	0.919	1.483	1.614
Bergenia ciliata	Saxifragaceae	Herb	1.266	0.386	0.305
Bistorta affinis	Polygonaceae	Herb	1.975	2.086	1.056
Cirsium arvense	Asteraceae	Herb	0.46	1.401	3.045
Digitaria cruciata	Poaceae	Herb	0.396	0.992	2.505
Dryopteris ramosa	Dryopteridaceae	Herb	1.508	2.159	1.432
Dryopteris stewartii	Dryopteridaceae	Herb	1.957	1.155	0.59
Epilobium latifolium	Onagraceae	Herb	0.685	1.776	2.593
Fragaria nubicola	Rosaceae	Herb	0.449	1.448	3.225
Galium boreale	Rubiaceae	Herb	0.205	1.483	7.234

Species	Family	Habit	Stem Density	%age in diet	W
Gentiana alpina	Gentianaceae	Herb	1.065	0.925	0.868
Geranium pratense	Geraniaceae	Herb	0.278	0.235	0.845
Gerbera gossypina	Asteraceae	Herb	0.543	0.902	1.661
Geum montanum	Rosaceae	Herb	0.652	1.717	2.633
Hachelia uncinata	Boraginaceae	Herb	1.241	0.772	0.622
Iris hookeriana	Iridaceae	Herb	0.246	1.213	4.931
Lagotis minor	Plantaginaceae	Herb	0.155	1.483	9.567
Ligularia amplexicaulis	Asteraceae	Herb	0.685	1.79	2.613
Matricaria chamomilla	Asteraceae	Herb	0.2	0.923	4.615
Mentha longifolia	Lamiaceae	Herb	1.539	0.267	0.173
Morina longifolia	Caprifoliaceae	Shrub	2.449	0.502	0.205
Nepeta connata	Lamiaceae	Herb	0.495	0.96	1.939
Onosma bracteatum	Boraginaceae	Herb	0.692	0.772	1.115
Onychium japonicum	Pteridaceae	Herb	0.979	1.517	1.549
Oxyria digyna	Polygonaceae	Herb	0.542	0.864	1.594
Parnassia nubicola	Celastraceae	Herb	0.085	2.704	31.812
Pedicularis punctata	Scrophulariaceae	Herb	0.495	0.833	1.683
Phleum alpinum	Poaceae	Herb	0.403	0.542	1.345
Plantago lanceolata	Plantaginaceae	Herb	0.279	1.668	5.978
Plectranthus rogosus	Lamiaceae	Shrub	0.773	0.354	0.458
Poa alpina	Poaceae	Herb	4.443	1.253	0.282
Poa nemoralis	Poaceae	Herb	5.257	1.483	0.282
Podophyllum emodi	Berberidaceae	Herb	0.465	0.357	0.767
Polygonum amplexicaulis	Polygonaceae	Herb	0.154	1.517	9.851
Potentilla anserina	Rosaceae	Herb	0.42	2.063	4.912
Primula denticulata	Primulaceae	Herb	0.83	4.863	5.859
Primula farinosa	Primulaceae	Herb	0.422	5.771	13.675
Primula rosea	Primulaceae	Herb	0.46	6.714	14.595
Prunella vulgaris	Lamiaceae	Herb	0.246	3.284	13.349
Ranunculus pulchellus	Ranunculaceae	Herb	0.201	2.843	14.144
Rheum australe	Polygonaceae	Herb	0.898	0.511	0.569
Rhodiola heterodonta	Crassulaceae	Herb	0.46	1.245	2.706
Rumex nepalensis	Polygonaceae	Herb	0.169	1.448	8.568
Sambucus wightiana	Caprifoliaceae	Shrub	0.341	0.513	1.504
Saussurea lappa	Asteraceae	Herb	0.106	0.293	2.764
Sedum album	Crassulaceae	Herb	0.685	0.545	0.795
Sibbaldia cuneata	Rosaceae	Herb	0.598	1.192	1.993
Skimmia laureola	Rutaceae	Shrub	0.474	0.269	0.567
Solanum nigrum	Solanaceae	Herb	0.095	1.291	13.589
Solidago virgaurea	Asteraceae	Herb	0.581	1.062	1.827
Sorghum nitidum	Poaceae	Herb	0.754	1.195	1.585
Swertia alata	Gentianaceae	Herb	1.098	1.192	1.085
Taraxacum campylodes	Asteraceae	Herb	0.598	1.485	2.483
Themeda anathera	Poaceae	Herb	0.722	2.094	2.9
Thymus linearis	Lamiaceae	Herb	0.314	0.574	1.828
Tinospora cardifolia	Menispermaceae	Herb	0.336	1.645	4.895
Trifolium rapens	Febaceae	Herb	0.671	1.157	1.724
Viola pilosa	Violaceae	Herb	0.422	1.738	4.118
Lichen	-	Herb	0.422	0.435	1.031
Moss	-	Herb	1.252	0.815	0.651

Discussion

Forage Selection by Royle's Pika (*Ochotona roylei*)

In herbivores, the foraging decisions are shaped by various constraints, including food availability, access, energy contents and nutritional needs (Stephens & Krebs, 1986) as well as predation risk (Lima & Dill, 1990). These competing pressures highlight the necessity for diet selection in herbivores. The Himalayan talus-dwelling pikas are often seen as opportunistic herbivores with minimal discrimination among forage classes (Krivosheyev, 1971; Khlebnikova, 1976; Yudin et al., 1976; Revin & Boeskorov, 1990). These pikas typically feed on or store plants abundantly available in their habitats (Cherniavski, 1984; Voronov & Basarukin, 1992). However, Travina et al. (2000) observed some level of forage preference in Asian pika species. In *Ochotona hyperborea*, forage selection was influenced by the site and local vegetation composition (Gliwicz et al., 2006). While earlier studies on the American pika (*Ochotona princeps*) suggested low selectivity in food plants. However, more recent research indicates different findings (Millar & Zwickel, 1972; Dearing, 1996; Roach et al., 2001). Current study also demonstrates that Royle's pika is not too much selective in selection of foraging plants. It is a generalist herbivore, feeding on a wide diversity of herbs and grasses (Koju, 2014). In the present study, 75 plant species were found in Royle's pika diet, of which 93.33% were herbs and grasses, while the shrubs and trees constitute the negligible amount in pika's diet. Contrary to our findings, a recent study also indicated the consumption of shrubs and trees in the post-monsoon diets of pikas (Bhattacharyya et al., 2019). In other words, pikas were found to feed on nearly all the ground vegetation inside the study plots. Many other herbivores like primates also feed according to vegetation availability and distribution. It also indicates that special plant species or families are not under the preferences of diet by pikas. These findings are supported by Chalise (1999), Koju and Chalise (2013), Koju (2014), and Bhattacharyya et al. (2013).

The number of plant species consumed by Royle's pika in JFR was comparatively higher than the previous findings of Koju (2014), who reported 58 plant species in pika diet in Langtang National Park, Nepal; Shrestha et al. (1999), that reported 33 plant species in pika diet in Nepal; Koju et al. (2013) reported 43 plant species at Gosainkunda area of Nepal; and Bhattacharyya et al. (2013), which reported 17 plants species in pika diet at Uttarakhand, India. These difference in number of species consumed could be due to the geographic location of Azad Kashmir, which is in western range of Himalayas, while the Nepal and Uttarakhand are located in central Himalayas, so there might be variations in the diversity of ground vegetation of both areas, which results in these variations in the diet composition of Royle's pika in these areas. Secondly, it might be due to least human interference. Despite of many anthropogenic activities in adjacent areas, JFR still harbors areas where true wilderness exists and ground vegetation is relatively undisturbed. JFR is remote, having no proper road tract and thus is inaccessible for most of the visitors.

Flowers were the most consumed food item in pika diet during the present study. Similar results were recorded in previous studies by Koju and Chalise (2013a), Koju (2014), and Bhattacharyya et al. (2019) for Royle's pika, and by Dearing (1996), and Gliwicz et al. (2006) for American pika. As flowers are highly nutritious yet they often contain toxins as a self-defense to reduce consumption (Higginson, 2015). Remarkably, pikas have evolved to evade these protections by holding onto toxins for use. Studies show that these toxins improve the fitness of pikas (Higginson, 2015). Moreover, pikas also use these toxins as preservatives, to keep their hay plants fresh for long time during winter. Secondly, pikas are also attracted towards colors and fragrance of flowers. Flower consumption was found higher across the summer and monsoon months of the study period, except for the month of April, as there were no flowers due to harsh climatic conditions. Due to this reason, the highest consumption in overall diet, in mean monthly diet, and in mean seasonal diet, was recorded for the different flowering herbaceous plants, like *Primula* spp., *Fragaria nubicola*, *Ligularia amplexicaulis* etc. It might be due to the fact that they are widely distributed in alpine and subalpine regions, and have diversity in colours. It resulted that *Primula rosea* alone made up 6.71% of the total diet of Royle's pika at JFR. *Primula* spp. and *Fragaria nubicola* were also recorded in the study of Koju (2014), but its percentage consumption in pika diet was not as much higher as in current study. Due to unavailability of flowers during the autumn season, pikas shifted to feed upon roots, dried grasses or bark of shrubs and trees, whatever is available. It also enhances the consumption of roots, plants and shrubs, and mature coniferous leaves during the autumn season. Koju and Chalise (2014) reported similar feeding pattern on dried plant parts and grass roots during the winter months. Similarly, the extended snow-free period and high precipitation during the summer and monsoon in the study area enabled the growth of large patches of lichen and moss on the talus rocks. These were consumed by Royle's pika in winter. These findings supported the findings of Adhikari et al. (2012).

Talus-dwelling pikas are known to store vegetation to survive the winter in hay piles (Dearing, 1996). Simpson (2009) and Henry et al. (2012) recorded that the lack of hay piles in American pika populations residing at low elevations (0–300 m) enables year-round foraging during the prolonged snow-free period. Present study indicated that Royle's pikas are very less active in hay pile formation, as only five hay piles were observed in JFR. The findings are supported by Koju and Chalise (2014), and Koju (2014) in Langtang National Park, Nepal, where they noticed that pikas were not active in storing hay piles. They reported seven hay piles during their study with dry vegetation of *Juncus thomosnii*, *Fragaria* sp., *Argmone* sp., *Artimisia vulgare*, *Ligularia ampllexicaulis*, *Poa* sp., and *Rumex nepalensis*. Roberts (1997) concluded that rather forming hey-pile, Royle's pikas make tunnels beneath the snow to reach both plant food and their various food stores in winter. Moreover, during winter and early spring, they gnaw the bark off low bushes and twigs when green food is scantily available.

With the start of June until August, JFR receives a heavy rainfall period along with the melting of glaciers on high mountains that allows to flourish the great variety of flowering and non-flowering plants. The colours and fragrance of these plants are of great attraction for pikas and in many ecosystems, pikas are thought to be responsible for the pollination of different plants (Higginson, 2015). This opinion reflected in our findings, that a high dietary diversity for pika was recorded in the months of June, July and August, than other months of the study period. Moreover, the forage selection index was also found higher for *Parnassia nubicola, Ajuga integrifolia* and *Primula rosea*, which are flowering plants widely distributed in alpine and subalpine pastures. Moreover, Huntly et al. (1986) reported that pika's strategies for selecting the plants for diet may base on plant morphology (feed on plants having larger leaves to achieve an energy-efficient foraging strategy). Contrarily, Dearing (1996; 1997a, b) concluded that plant chemical defense hinders pikas to select plants having low secondary metabolite contents, and low fiber and lignin contents (low NDF, ADF and ADL values). Similar to our findings, Bhattacharyya et al. (2019) described Royle's pika in Uttarakhand, India, which prefers plants with larger leaves and low secondary metabolites and fibers. In both field and multiple-choice feeding studies, Hudson et al. (2008) found that collared pikas also preferred bigger leaves in their winter diet.

Conclusion

This study in the Jagran Forest Range of District Neelum demonstrates that Royle's pikas exhibit significant seasonal variations in their dietary preferences, particularly a notable reliance on flowers during the summer and monsoon months. The high dietary diversity and evenness indicate that pikas adapt their feeding strategies in response to the availability of different plant species. Preferred plant species include *Fragaria nubicola*, *Ligularia amplexicaulis*, *Primula denticulata*, *Achillea millefolium,* and *Epilobium latifolium* during summer; *Primula rosea*, *Primula farinosa*, *Primula denticulata*, *Polygonum amplexicaulis,* and *Fragaria nubicola* during monsoon; and *Skimmia laureola*, *Iris hookeriana*, *Aster himalaicus*, *Plectranthus rogosus,* and *Apluda mutica* during autumn.

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