



Diets of Hangul Deer *Cervus elaphus hanglu* (Cetartiodactyla: Cervidae) in Dachigam National Park, Kashmir, India

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This is in continuation of the work published by Bhat et al. (2009). Especially needed is information on the amounts of forage the deer require and kinds they prefer and the seasonality of their feeding habits. This paper reports the results of a study of seasonal diets of deer in Dachigam National Park (DNP) characterized by seasonality and high summer plant production. The study was conducted in an effort to expand on winter diets examined by Shah et al. (1983).

Material and Methods

The study was conducted at DNP which is situated 21km northeast of Srinagar approximately between 34°05'-34°12'N & 74°54'-75°09'E. Roughly rectangular, the park is 141km² in area (Fig. 1). It is approximately 24km in length and 6km in breadth ranging in altitude from 1700 to 4000 m. A more or less continuous range of mountains, except in the west where it has been artificially fenced, borders the National Park. The average climate of DNP is sub-Mediterranean. The Park is generally divided into lower (26km²) and upper Dachigam (115km²) by the beginning of fir forest.

The Hangul Deer remained restricted to lower Dachigam round the year due to the high level of disturbance in upper Dachigam. The collection of faecal pellets was, therefore possible only along eight transects (I-VIII) with total length of 24.5km in lower Dachigam (Fig. 1). One to five pellet groups per vegetation type along each transect were encountered in lower Dachigam. From each pellet group only 5 pellets were

collected and preserved for analysis (Sabnis 1981, 2004). During the present study 95 samples were collected and analyzed for knowing the dietary items of deer. Analysis was carried out following Satakopan (1971) and Sabnis (1981, 2004). The identification of the botanical composition of the diet was based on faecal analysis by micro histological techniques (100 fields for each sample). Five slides were made on each sampling occasion and twenty fields on each slide were examined. Epidermal identification requires reference slides of plant material, these were made and studied prior to faecal analysis. Percent occurrence of each species identified in each location (microscopic field using 100 power magnification) was recorded as:

$$\frac{\text{Number of fields with species A} \times 100}{\text{Number of fields with identified species}}$$

Results and Discussion

Results of the microhistological examination of hangul deer faeces collected from January 2005 to December 2006 are given in Tables 1-4. The results are supported by Zofia (1980), Shah et al. (1983), Bahamonde et al. (1986) and Bugalho et al. (2001). During the study 95 samples were analyzed for epidermal structures. The practical application of epidermal identification in biological sciences has been enumerated by several workers (Baugartsner & Martin 1939; Dusi 1949; Martin 1962; Stewart 1970; Stewart & Stewart 1970, 1971; Sabnis 1981). The main components of the spring diet were *Poa annua* (12%), *Hemerocallis fulva* (12%), *Hedera nepalensis* (10.7%), *Rosa* sp. (8%), *Berberis lyceum* (8%), *Bromus japonicus* (8%) and *Parrotiopsis jacquemontiana* (8%). Forbs accounted for 45.2% of the diet, shrubs 24%, grasses 20% and climbers 10.7% (Fig. 2). Major contributors to the summer diet were *Poa annua* (14.3%), *Salix alba* (14.3%), *Morus alba* (9.5%), *Carex* sp. (9.5%), *Solanum nigrum* (9.5%) and *Portulaca oleracea* (9.5%). As with the spring diet, forbs were the major contributors at 42.7%, followed by trees (38%), grasses (14.3%) and shrubs at 4.8% (Fig.3). In autumn, the major components of the diet included *Indigofera* sp. (22.2%), *Rosa* sp. (13.9%), *Jasminum humile* (11.1%), *Quercus ruber* (11.1%) and *Parrotiopsis jacquemontiana* (11.1%). Shrubs accounted for 75% of the diet, trees 19.4% and forbs 5.6% (Fig.4). The major dietary items in the winter were *Parrotiopsis jacquemontiana* (11.4%), *Quercus ruber* (10%), *Poa* sp. (8.6%), *Rosa* sp. (8.6%) and *Salix* sp. (8.6%). Trees accounted for 35.6%, shrubs 28.6%, forbs 21.3%, grasses 8.6% and climbers 5.8% (Fig.5).

Consumption of shrub and tree species by the deer increases during autumn and winter, perhaps as a strategy for complementing their diet when other forage is scarce. The variation in the diet intake of roe deer was mainly explained by the habitat in which they lived (Jackson 1980; Holisova et al. 1986; Tixier & Duncan 1996). According to Vavra et al. (1978) forbs were underestimated while shrubs overestimated by micro histological faecal analysis. Gallina and Chargoy (1987) found that shrub species had higher digestibility values throughout the year.

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Table 1. Species composition of spring diet of Hangul Deer (N = 25)

Plant species	Percent occurrence	Nature of plant	Part used
<i>Portulaca oleracea</i>	5.3	F	Aerial
<i>Solanum nigrum</i>	5.3	F	Aerial
<i>Fagopyrum esculentum</i>	4	F	Aerial
<i>Ophioglossum sp.</i>	4	F	Aerial
<i>Capsila bursa pastoris</i>	6.6	F	Aerial
<i>Rumex sp.</i>	8	F	Aerial
<i>Hemerocallis fulva</i>	12	F	Aerial
<i>Poa annua</i>	12	G	Aerial
<i>Bromus japonicus</i>	8	G	Aerial
<i>Rosa sp.</i>	8	S	Leaf
<i>Berberis lycium</i>	8	S	Leaf
<i>Parrotiopsis jacquemontiana</i>	8	S	Leaf
<i>Hedera sp.</i>	10.7	C	Leaf

Table 2. Species composition of summer diet of Hangul Deer (N = 20)

Plant species	Percent occurrence	Nature of plant	Part used
<i>Hemerocallis fulva</i>	7.1	F	Aerial
<i>Carex sp.</i>	9.5	F	Aerial
<i>Arctium lappa</i>	7.1	F	Aerial
<i>Solanum nigrum</i>	9.5	F	Aerial
<i>Portulaca oleracea</i>	9.5	F	Aerial
<i>Poa annua</i>	14.3	G	Aerial
<i>Berberis lycium</i>	4.8	S	Leaf
<i>Robinia pseudoaccacia</i>	7.1	T	Leaf
<i>Morus alba</i>	9.5	T	Leaf
<i>Aesculus indica</i>	7.1	T	Leaf
<i>Salix alba</i>	14.3	T	Leaf

Table 3. Species composition of autumn diet of Hangul Deer (N = 20)

Plant species	Percent occurrence	Nature of Plant	Part used
<i>Polygonum sp.</i>	5.6	F	Aerial
<i>Indigofera sp.</i>	22.2	S	Leaf
<i>Rosa sp.</i>	13.9	S	Leaf
<i>Jasminum humile</i>	11.1	S	Leaf
<i>Prunus prostata</i>	5.6	S	Leaf
<i>Prunus tomentosa</i>	2.8	S	Leaf
<i>Rubus sp.</i>	8.3	S	Leaf
<i>Parrotiopsis jacquemontiana</i>	11.1	S	Leaf
<i>Quercus rober</i>	11.1	T	Leaf
<i>Populus sp.</i>	8.3	T	Leaf

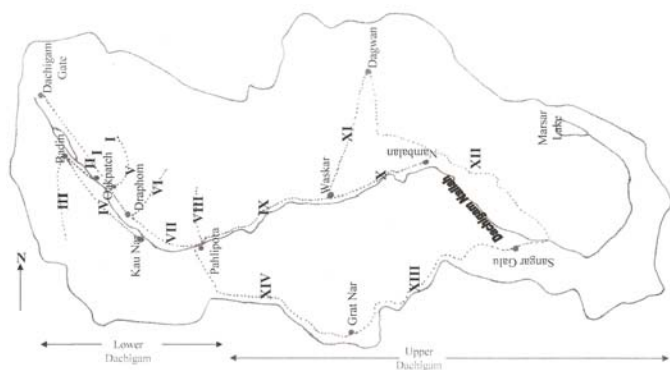


Figure1. Dachigam National Park

Table 4. Species composition of winter diet of Hangul Deer (N = 30)

Plant species	Percent occurrence	Nature of plant	Part used
<i>Centaurea iberica</i>	2.9	F	Aerial
<i>Rumex nepalensis</i>	4.2	F	Aerial
<i>Anthriscus sp.</i>	2.9	F	Aerial
<i>Artemisia sp.</i>	2.9	F	Aerial
<i>Capsila bursa pastoris</i>	4.2	F	Aerial
<i>Fragaria nubicola</i>	4.2	F	Aerial
<i>Poa sp.</i>	8.6	G	Aerial
<i>Parrotiopsis jacquemontiana</i>	11.4	S	Leaf
<i>Jasminum humile</i>	5.7	S	Leaf
<i>Berberis lycium</i>	2.9	S	Leaf
<i>Rosa sp.</i>	8.6	S	Leaf
<i>Robinia pseudoaccacia</i>	1.4	T	Leaf
<i>Quercus rober</i>	10.0	T	Leaf
<i>Celtis australis</i>	5.7	T	Leaf
<i>Salix sp.</i>	8.6	T	Leaf
<i>Pinus wallichiana</i>	4.2	T	Leaf
<i>Populus alba</i>	5.7	T	Leaf
<i>Hedera nepalensis</i>	5.8	C	Leaf

F - Forbs; G - Grasses; S - Shrubs; T - Trees; C - Climbers; N - Number of samples

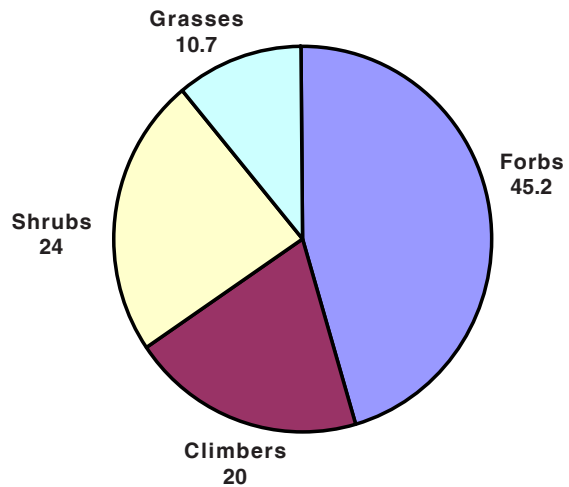


Figure 2. Percentage composition of spring diet of Hangul Deer

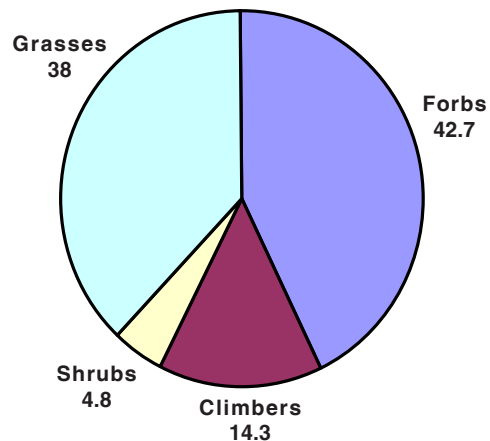


Figure 3. Percentage composition of summer diet of Hangul Deer

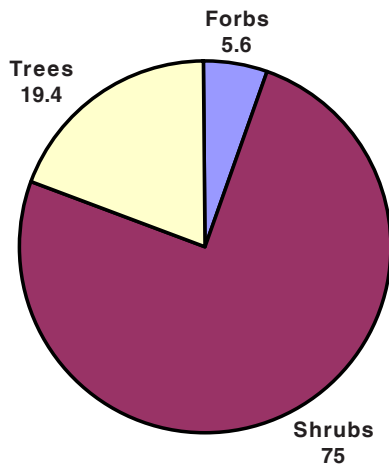


Figure 4. Percentage composition of autumn diet of Hangul Deer

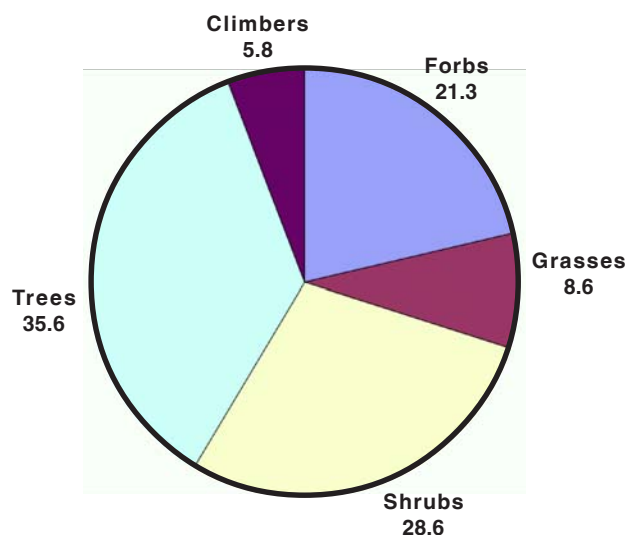


Figure 5. Percentage composition of winter diet of Hangul Deer

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