Review on Agriculture and Rural Development 2023 vol. 12 (1-2) ISSN 2677-0792
DOI: 10.14232/rard.2023.1-2.121-126

THE FEED PREFERENCE OF ROE DEER IN DIFFERENT HABITATS

Tamás Barta[1], Szilárd Pinnyey[1], László István Beier[1*]

[1]University of Szeged, Faculty of Agriculture Institute of Animal Sciences and Wildlife Management, H-6800 Hódmezővásárhely, Andrássy u. 15.

[*]corresponding author: beier.laszlo.istvan@szte.hu

Abstract: The roe deer, widely distributed across Europe and our homeland, has a significant economic and hunting value. Our research aims to understand the diet and food choice of deer in the lowland (Great Hungarian Plain, Hódmezővásárhely) and mid-mountain (North Hungarian Mountains, Salgótarján) habitats. To determine their diet, we conducted a sample collection of roe deer and analysed their droppings using epidermal analysis. Descriptive statistics were employed to determine the proportions of ingested plants, revealing *Petroselium spp.* (6.5-8.3%) and *Beta spp.* leaves (4.3-9.1%) as the most commonly consumed plants in Hódmezővásárhely. In Salgótarján, the roe deer population consumed significant amounts of *Robinia pseudoacacia* (47.8%). These findings have implications for wildlife management and conservation, particularly in areas where roe deer are the predominant big game species, such as the Great Hungarian Plain, providing ample opportunities for hunting and economic benefits.

Keywords: roe deer, food selection, food preference, Great Hungarian Plain habitats, North Hungarian Mountains habitats, roe deer droppings

1. Introduction

Gallery forest, wooded steppe and the shrublands are considered to be the habitat of roe deer. They prefer deciduous forests, forest edges and bordering grasslands or cultivated areas. In the vast treeless plains, they occur in limited or no numbers. The tranquillity provided by large-scale arable farming increases the range occupation of roe deer, which is what happens when they spread to the lowlands. The spread of deer was also supported by the afforestation of the plain by forming forest belts and patches, the improvement of the habitat and the large-scale farming in the neighbourhood of the forest strips and forest patches meant adequate peace and an abundant source of food for the roe deer (Bakkay et al. 1978).

The composition of the roe deer's diet is determined by the vegetation in the habitat. The quality of the food is one of the most important factors, directly influencing population density and is a determinant of the body and antler weights and reproductive performance of not only juveniles but also adults (Csányi 1994, Gaillard et al. 1998, Majzinger 2004a; 2004b; 2006a; 2006b; 2013).

2. Materials and methods

The examinations were carried out between 1st February 2021. and 30th November 2021. For creating the database, the samples were collected from the dropped roe deer on the territory of *Návay Kornél Vadásztársaság (game management unit)* (Hódmezővásárhely) and *Szánas Vadásztársaság (game management unit)* (Salgótarján) Zatkó–Hadászó–Halamaház – Kék-Robur area.

The sample collection was carried out for a total of 10 months, and 222 homogenised samples of droppings were analysed. One of the main criteria for the selection of the sample sites was to study one field (lowland) and one mid-mountain (forest) habitat type (*Table 1*).

Table 1: Summary of the main data on the examined hunting areas and roe deer populations

	SZÁNAS VT. SALGÓTARJÁN	NÁVAY KORNÉL VT. HÓDMEZŐVÁSÁRHELY
Area code number	**55081**	**803560**
Classification of the area	**202**	**102**
Total land area (ha)	**3 496**	**18 927**
Quality of the roe deer population	**weak**	**excellent**
Significance of the roe deer population	**small**	**large**
Estimated size of roe deer population (individuals)	**70**	**1500**
Annual herd size (individuals)	**15**	**450**
Utilisation %	**21,4**	**30,0**
Deer density (head/100 ha)	**2,0**	**8,3**

To keep accurate records, the time and exact location of sample collection were recorded in the SAMPLE COLLECTION DATA SHEET, which we have edited. After the collection of samples, the droppings were properly wrapped and placed in the pre-counted plastic bag, which was stored in a freezer at -20°C until processing.

The faecal epidermal analysis was performed on the samples in the laboratory of SZTE-MGK (University of Szeged). The ingested food was determined by microbiological analysis as follows.

For the analysis of plants consumed by roe deers, we used the method of micro-weaving with the method developed by Stewart (1967), Fitzgerald and Waddington (1979), Davitt & Nelson (1980), Mátrai et al. (1986), Burucs et al. (1986) and Alipayo et al. (1992).

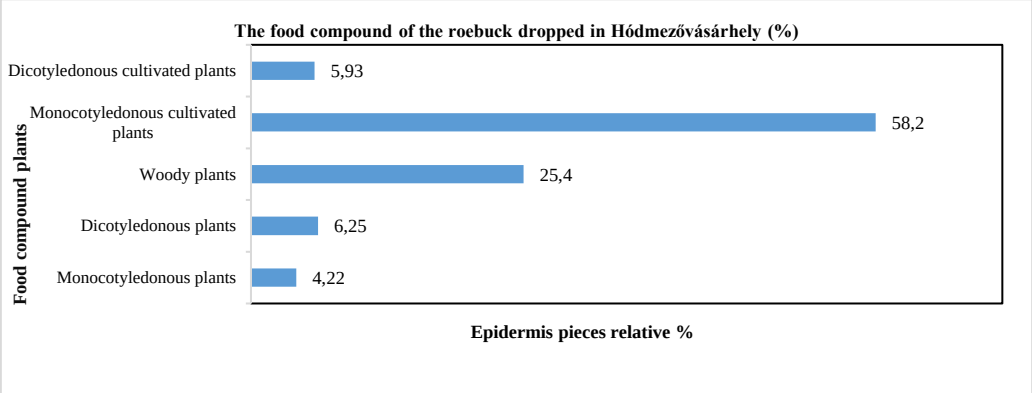
For the epidermal microarray analysis, samples were placed in a Petri dish. Before the analysis samples were homogenised by adding a little water after being drained. From the homogenized sample, subsamples were taken, two of each sample were prepared, and a 3-4 ml volume was placed in the test tubes. The plant parts were then fractured with 20% nitric acid for 90 seconds from the boiling point.

The detached epidermis was placed on a slide and spread with 1-2 drops of 87% glycerol and 1 drop of 0.2% toluidine blue solution according to the instructions of Mátrai & Katona (2004). The diet composition was determined by examining homogenized samples of several individuals of roe deers at 160-200 close magnification using a CETI-manufactured STEDDY-T type stereomicroscope. From each sample, 100 epidermal cells were identified in two replicates and the arithmetic mean of the counted values was taken. The consumption rate of the dietary components was calculated as the relative proportion of the total number of epidermis pieces analysed in each group.

3. Results

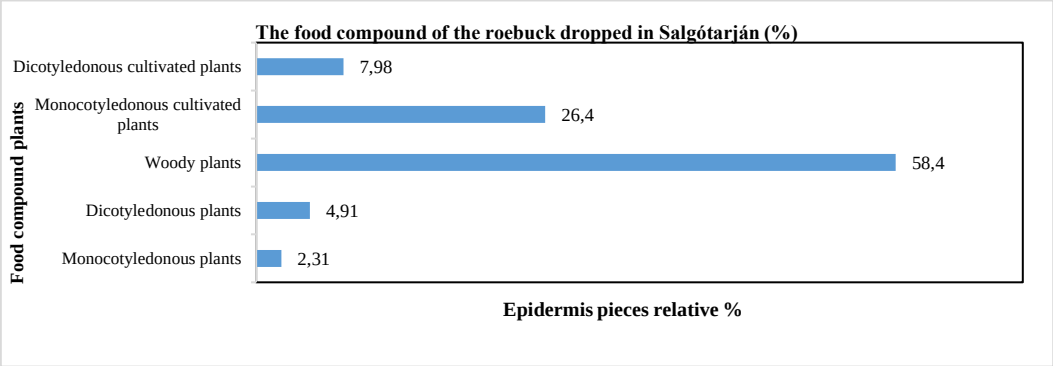
We found that the average proportion of monocotyledonous native plants in the diet was relatively low 4.22%, while slightly higher values (6.25%) were observed for dicotyledonous herbaceous plants. However, despite the low forest cover, the consumption of woody plants was high (25.4%). In Hódmezővásárhely, roe deer consumed monocotyledonous cultivated plants most frequently (58.2%). The importance of dicotyledonous cultivated plants was similar (5.93%) to that of dicotyledonous herbaceous plants (*Figure 1*).

Figure 1: Aggregated data on the dietary components of the roe deer in Hódmezővásárhely (n=192)



In the Salgótarján hunting area (where the forest cover is above 62%), the roe deer's dietary composition shows that they consumed almost the same proportion of monocotyledonous (2.31%) and dicotyledonous (4.91%) plants in each month. When examining the role of woody plants, high values were obtained (58.4%). Among the woody plants, *Robinia pseudoacacia*, *Sambucus nigra* and *Rubus fruticosus* were the most consumed species in Salgótarján (*Figure 2*).

Figure 2: Aggregated data on the dietary components of roe deer tested in Salgótarján (n=30)



The roe deer studied in Salgótarján was very fond of monocotyledonous crops, as a high number (26.4%) of the samples contained such autumn-sown cereals, which are a very important food for roe deer during the winter. The prevalence of biennial cultivated crops was 7.98% and the most commonly consumed crop in this group was alfalfa. The average proportion of monocotyledonous native plants in the diet was low (2.31%), with the main species consuming *Agropyron repens* and *Cynodon dactylon*. A higher proportion (4.91%) was found in biennial native plants, mainly *Anchusa officinalis*, *Vicia villosa*, *Ballota nigra*, *Chenopodium album*, *Verbascum phlomoides*, *Picris hieracioides* and *Veronica officinalis* were the most commonly consumed plants.

4. Discussion

Mátrai (2000; 2006) showed that the dominant food items in the agricultural area he studied were parsley, carrot leaves, butterflies and cereals, winter wheat and winter barley. In his opinion, the roe deer had no difficulty in feeding on wide-leaved, tasty, easily digestible plants with green bracts in winter, which bordered the fields with weeds and a wide variety of plants. Latham et al (1999) found, that roe deer ate predominantly forbs (herbaceous plants other than

graminoids) in summer, and a mixture of forbs, heaths and tree and shrub browse in winter. According to Kałuziński (1982), roe deer consume parts of trees and bushes including grasses and herb layer plants during the spring and summer only. Barta et al. (2020), in their study of spring and summer diets of roe deer in Hódmezővásárhely, found that the average proportion of monocotyledonous native plants in the diet was low (6.84-8.18%), with the main species consumed being *Agropyron repens*, *Cynodon dactylon* and *Carex spp*. Similarly low values were observed for biennial native plants (1.90-7.11%). The most commonly consumed plants were mainly *Anchusa officinalis*, *Vicia villosa*, *Chenopodium album*, *Verbascum phlomoides*, *Picris hieracioides*, *Veronica officinalis* and *Ballota nigra*. Obidziński et al. (2013) analyzed the diet of roe deer. They stated that the diet was dominated by plants of high nutritive value. According to Mátrai (2006), roe deer must conserve their energy in winter because, being a small species, their metabolism is more intensive than that of, for example, red deer. Ossi et al., (2020) say that roe deers tend to modulate their use of feeders according to winter severity and the availability of natural food resources. Pápay et al. (2020) also found that woody species were browsed by ungulates in relation to their abundance. "It has been shown that roe deer can avoid less preferred food plants based on olfactory- and perhaps visual cues, without even tasting the plant" says Bergman et al. (2005) in their study of roe deers's feeding patterns on pine, willow and birch. According to Faragó (1993), cereals provided the main green vegetable food during the winter, and therefore this habitat type was chosen by almost 50% of the roe deer in February. In grassland habitats, the winter diet of roe deer consists of dry grasses, herbs, lichen, and green shoots of trees, which are low in quality ingredients (Beuković et al., 2022). In the lowland habitat studied, deer also favoured monocotyledonous crops, as a relatively high proportion of these samples contained autumn-sown cereals, which are a very important food for roe deer during the autumn-winter period, similar to the results of Mátrai (2000), where his findings showed that roe deer dietary choice in the field habitat differed only in the crops consumed and not in their distribution. Roe deer have been classified as a typical concentrate selector, browsing on highly digestible plant parts (Lechner-Doll et al., 2008).

Conclusion

In summary, the findings of this study shed light on the intricate relationship between the availability of plant food and the dietary preferences of roe deer. The composition of vegetation in a specific habitat plays a crucial role in shaping the food choices of these herbivores. The diet of roe deer primarily consists of a diverse range of forage components, including various plant species, such as *Petroselium spp*., leaves from *Beta spp*., *Medicago spp*., and *Trifolium spp*. Additionally, cereals like *Triticum spp*. and *Hordeum spp*. are also included in their diet. In the Salgótarján habitat, woody plants, particularly *Robinia pseudoacacia* and *Sambucus nigra*, play a significant role in the deer's diet, especially during the period from spring to autumn. These woody plants account for 58.4% of the deer's overall consumption. Interestingly, certain woody plant species like *Pinus sylvestris* and *Sambucus nigra* are less preferred by the deer. Moreover, the leaves and shoots of woody plants are essential components of the roe deer's diet, contributing to 62% of their food intake during spring and summer, and even up to 80% during winter. These plant parts not only provide the necessary energy for the deer but also fulfil their water requirements. During the summer, this particular group of plants constitutes 50% of the deer's diet and aids in digestion regulation.

The significance of understanding the composition of vegetation in a given area cannot be overstated when considering the dietary preferences and nutritional needs of roe deer. The availability of plant foods in the habitat significantly influences the food choices of these herbivores, even within a specific habitat. Therefore, researchers, wildlife managers, and conservationists must consider the specific plant species and their abundance in a particular area to ensure the well-being and conservation of roe deer populations. This study provides

valuable insights into the dietary ecology of roe deer and highlights the need for further research to explore the specific nutritional requirements and feeding behaviours of these animals in different habitats. Understanding the complex interplay between plant food availability, dietary preferences, and nutritional needs of roe deer is essential for effective habitat management, conservation strategies, and maintaining the overall ecological balance of their ecosystems.

In conclusion, this study emphasizes the importance of considering the composition of vegetation in a given area when assessing the dietary preferences and nutritional needs of roe deer. By gaining a comprehensive understanding of the availability of plant food and its influence on the food choices of these herbivores, we can better manage their habitats and ensure their long-term survival in the face of changing environmental conditions.

Acknowledgements

The chemical materials and stereomicroscope used for the sample collection and analysis were provided by the Institute of Animal Science and Wildlife Management, Faculty of Agriculture, University of Szeged.

References

Alipayo D., Valdez R., Holecheck J.L., Cardenas M. (1992): Evaluation of microbiological analysis for determining ruminant diet botanical composition. Journal of Range Management, 45: 148-152.

Bakkay L., Bán, I., Fodor T. (1978): A magyarországi őzállomány értékelése. Nimród Fórum: 5-9.

Bergman M., Iason G., Hester A. (2005): Feeding patterns by roe deer and rabbits on pine, willow and birch in relation to spatial arrangement. Oikos, 109(3): 513-520. https://doi.org/10.1111/j.0030-1299.2005.13794.x

Beuković D., Obranović I., Vukadinović M., Popović Z., Polovinski-Horvatović M., Lavadinović V., Beuković M. (2022). The quality of roe deer (capreolus capreolus) diet in the winter and spring periods is based on rumen contents. Contemporary Agriculture, 71(1-2): 137-140. https://doi.org/10.2478/contagri-2022-0019

Burucs P., Fehér Z., Mátrai, K. (1986): Összefüggés az őz (Capreolus capreolus) táplálékának és ürülékének növényi összetétele között. Vadbiológia, 1: 129-142.

Csányi S. (1994): Populációdinamika és állományhasznosítás. 255-311. p. In: Kőhalmy, T. (szerk.). Vadászati enciklopédia. Mezőgazda Kiadó, Budapest.

Davitt B.B., Nelson J.R. (1980): A Method of Preparing Plant Epidermal Tissue for Use in Fecal Analysis. Circ. 0628, College of Agriculture Research Center, Washington State University, 4 p.

Faragó S. (1993): Vadon élő állatfajok fennmaradásának lehetőségei mezőgazdasági környezetben Magyarországon. WWF-füzetek, 4: 24.

Fitzgerald A.E., Waddington D.C. (1979): Comparison of two methods of faecal analysis of herbivore diet. J. Wildl. Managm., 43: 468-473.

Gaillard J.M., Liberg O., Andersen R., Hewison A.J.M., Cederlund G. (1998): Population dynamics of roe deer. The European roe deer: the biology of success (eds Andersen R., Duncan P.)

Kałuziński J. (1982): Composition of the food of roe deer living in fields and the effects of their feeding on plant production. Acta Theriologica, 27: 457-470. https://doi.org/10.4098/at.arch.82-40

Latham J., Staines B., Gorman M. (1999): Comparative feeding ecology of red (Cervus elaphus) and roe deer (Capreolus capreolus) in Scottish plantation forests. Journal of Zoology, 247(3): 409-418. https://doi.org/10.1111/j.1469-7998.1999.tb01003.x

Lechner-Doll M., Lason K., Lang D., Behrend A. (2008): Evolutionary aspects of dietary selection and digestion in the European roe deer (Capreolus capreolus) with special reference to seasonality. Zoosystematics and Evolution, 77(2): 223-227. https://doi.org/10.1002/mmnz.20010770208

Majzinger I. (2013): Az európai őz (*Capreolus capreolus*) szaporodásbiológiája, valamint a szaporulat és a szaporulati veszteségek alakulásának újabb hazai eredményei. Magyar Állatorvosok Lapja, 8: 473-480.

Majzinger I.(2006a): Az őz (*Capreolus capreolus*, L.) szaporodási teljesítményének vizsgálata különböző típusú mezei élőhelyeken Doktori (PhD) értekezés, Természetvédelmi Állattani és Vadgazdálkodási Tanszék, Debreceni Egyetem, Agrártudományi Centrum, Mezőgazdaságtudományi Kar, Debrecen, 151 pp.

Majzinger I. (2006b): Az őzbakok agancssúlyának vizsgálata a kor függvényében. Agrár- és Vidékfejlesztési Szemle, 1: 43-49.

Majzinger I. (2004b): Az őz felnevelt szaporulatának vizsgálata. Vadbiológia, 11: 41-54.

Majzinger I. (2004a): Examination of reproductive performance of Roe Deer (*Capreolus capreolus*) in Hungary. Journal of Agricultural Sciences, Debrecen, 15: 33-38.
Mátrai K. (1986): Az őz és a szarvas téli tápláléka. Nimród Fórum: 22-24.
Mátrai K. (2000): Az őz téli tápláléka: élőhelytől függő azonosságok és különbségek. Vadbiológia, 7: 47-53.
Mátrai K. (2006): Növényevő nagyvadfajok táplálkozási sajátosságai, a vadgazda tennivalói. In: Hivatásos vadászok kézikönyve. 208-219 p. Dénes Natur Műhely Kiadó.
Mártai K., Katona K. (2004): Mikroszövettani határozókulcs növényevők táplálékvizsgálatához. CD. Szerzői kiadás.
Mátrai K., Koltay A., Tóth S., Vizi Gy. (1986): Az őz téli tápláléka és az élőhely növényzete közötti összefüggés. Vadbiológia, 1: 97-108.
Obidziński A., Kiełtyk P., Borkowski J., Bolibok L., Remuszko K. (2013): Autumn-winter diet overlap of fallow, red, and roe deer in forest ecosystems, southern poland. Open Life Sciences, 8(1): 8-17. https://doi.org/10.2478/s11535-012-0108-2
Ossi F., Ranc N., Moorcroft P., Bonanni P., Cagnacci F. (2020): Ecological and behavioral drivers of supplemental feeding use by roe deer capreolus capreolus in a peri-urban context. Animals, 10(11): 2088. https://doi.org/10.3390/ani10112088
Stewart D.R.M. (1967): Analysis of plant epidermis in faeces: a technique for studying the food preferences of grazing herbivores. J. Appl. Ecol., 4: 83-111.
Szczerbinski W. (1964): Zagadnienie pokarmu dla grubej i dorodnej zwierzyny roslino- i wszysikozernej w srodowiskach lesnych i polnych. Zach. Por. low., 5(2): 9-14.