THE FEED COMPOSITION OF ROE DEER (*CAPREOLUS CAPREOLUS*) ON PLAIN HABITATS

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ABSTRACT
In Europe and in our homeland the roe deer is the most widespread big game, estimated population in 2010 exceeded three hundred and fifty thousand (National Game Management Database, 2010). The aim of this research is to find out what kind of differences and resemblances can be found in feeding strategies at the examined plain habitats. The feed selection habit of one of the most important big game in our homeland has not been researched yet in detail in the counties Csongrád, Békés and Bács-Kiskun, where the roe deer population is numerous and excellent. The detailed knowledge of the related specific feeding strategies contributes not only to the better cognition of this kind but also provides a developed opportunity for the game managers to reach better game husbandry results.
Beyond the practical significance of the theme there are some other peculiarities to be cleared up in connection with the nourishment of roe deer. The practical and theoretical questions are what kind of feeding strategies would be typical and reasonable for the roe deer living on the plain at different seasons?

Keywords: roe deer, *Capreolus capreolus*, feed composition

INTRODUCTION

Gallery forest, wooded steppe and the scrubland are considered to be the ancient habitat of roe deer. They prefer leafy forests, forest edges and the bordering lawn or cultivated areas. On the enormous treeless plains they are not at all or only in limited numbers are found. The calmness offered by large scale field farming leads to area reservation of roe deer, this happened when they spread on the Great Hungarian Plain. It was also supported by the afforestation of the plain by forming forest belts and patches, namely the improvement of the habitat. The roe adapted to the agricultural environment very well. So in present days we separate the field and the forest roe ecotypes, which are different from each other in behaviour, social contacts and dietary habits (CSÁNYI, 1992).
Roe deer (*Capreolus capreolus*) has the largest population within the big game population in Hungary. Their nourishment was examined in several countries of Europe, and the abundance of available nourishing plants was highly emphasized (MÁTRAI et al., 1986; FEHÉR et al., 1988). The key factor of feed was not the quality but the accessibility. (TIXIER and DUNCAN, 1996; DUNCAN et al., 1998; TIXIER et al., 1997; 1998).

MATERIAL AND METHOD

The examinations were carried out at the hunting seasons between 2006 and 2009. For creating the database the samples were collected and registered from the dropped game in the hunting season of the doe (1st October–28th February) and of the roebuck (15th April–30th September). Altogether 436 roe deer (211 does and 225 roebucks) were examined and their data was registered (Table 1). In choosing the sample areas the main aspect was to find hunting territories on the Great Hungarian Plain which has different types of habitat, where

the quality of roe population ranked differently but they were not too far from each other. Besides it was very important that the professional hunters that helped during the collection of the samples should be reliable (Figure 1).

Figure 1.: The geographical location of the examined shoots
Source: National Game Management Database (2012)

Table 1. Summary table of the sampling locations, date and the quantity of samples

SAMPLES OF DOES DROPPED ON THE STUDIED AREAS				AGGREGATED DATA
Territory/Hunting season	**2006**	**2007**	**2008**	
Tiszaalpár	12	15	21	
Csongrád	14	16	15	
Nagyszénás	21	16	25	
Hódmezővásárhely	20	16	20	
Total	**67**	**63**	**81**	**211**
SAMPLES OF ROEBUCKS DROPPED ON THE STUDIED AREAS				
Territory/Hunting season	**2007**	**2008**	**2009**	
Tiszaalpár	18	16	25	
Csongrád	9	12	15	
Nagyszénás	22	17	25	
Hódmezővásárhely	23	21	22	
Total	**72**	**66**	**87**	**225**
Does and roebucks total	**139**	**129**	**168**	**436**

Source: National Game Management Database (2012)

The samples were taken from the hunting area Tiszaalpári Tisza Vadásztársaság (game management unit) (9,500 hectares, where the woody vegetation is floodplain forest, the forest cover of the area involved in the examination is more than 30%); the Bársony István Agricultural Secondary School of Csongrád (3,010 hectares of special function hunting area, the forest cover is 20%); the Petőfi Vadásztársaság (game management unit) of Nagyszénás (7,096 hectares, forest cover less than 1%) and the Szakszervezeti Vadásztársaság (game management unit) of Hódmezővásárhely (12,727 hectares, forest cover less than 1%). The estimated roe deer population of the territories involved in the examination is 1,800-2,000 animals.

The samples were investigated in the laboratory of the University of Szeged Faculty of Agriculture where the processing of data was done continually. To examine the feed of roe

deer we used the shedded microfibre method (MÁTRAI ET AL., 1986). To identify the plants forming the feed we put a histological collection together from the photographed epidermis of the plants which can be found in the growing season on the area. The epidermis is the most resistant fibre containing part of the plant, the structure of which stays almost the same after digestion. The sampled plant parts should be damaged with nitric acid than dyed and fixed. According to the specific features we put an adverbial key together to simplify the identification of the species which constitute the feed. The definition of the feed combination was made according to the examination of unique samples.

According to the works of DUNCAN ET AL. (1998), BARANCEKOVÁ (2004), and MÁTRAI ET AL. (2010) we made the following classification of the main feed components:

1. Monocotyledonous plants

The plants in this group are preferred feed sources on all the habitats we have examined, for example: sedges (*Carex spp.*), the Bermuda grass (*Cynodon dactylon*), the quack grass (*Agropyron repens*) and the meadow fescue (*Festuca pratensis*).

2. Dicotyledonous plants

In this group are the naturally grown dicotyledonous plants like the narrow leaf vetch (*Vicia sativa L.*), the hairy vetch (*Vicia villosa Roth.*), the Hungarian vetch (*Vicia pannonica*) are the most important ones. In this group are the spotted ladysthumb (*Persicaria maculosa*), the white campion (*Melandrium album*), the black horehound (*Ballota nigra*), the spiked speedwell (*Veronica spicata*), the common buglos (*Anchusa officinalis*), the white goosefoot (*Chenopodium album*) and the orange mullein (*Verbascum phlomoides*).

3. Woody plants and their sprouts

The young sprouts of woody trees are important feed sources on all the examined territories. Extremely important are black elderberry (*Sambucus nigra*), the black locust (*Robinia pseudoacacia*), the dewberry (*Rubus caesius*). Also preferred are the sprouts and the crop of silver berry (*Elaeagnus angustifolia*), the privet hedge (*Ligustrum ovalifolium*), the common hackberry (*Celtis occidentalis*), the field maple (*Acer campestre*), the manna ash (*Fraxinus ornus*) the English oak (*Quercus robur*) and the sessile oak (*Quercus petraea*).

4. Monocotyledonous cultivated plants and their crop

We have examined this group separately because it is a common feed source which needs more attention. In this group we can find the green parts and the crops of cultivated plants like bread wheat (*Triticum aestivum*), the common barley (*Hordeum vulgare*), the cultivated rye (*Secale cereale*), the triticale (*Triticale*) and the maize (*Zea mays*).

5. Dicotyledonous cultivated plants

The most important plants in this group are the fabaceae, like the alfalfa (*Medicago sativa*), the clover (*Trifolium spp.*), the black hay (*Medicago lupulina*), the rapeseed (*Brassica napus*) and the sunflower (*Helianthus annuus*).

The statistical data was processed by the statistics programs: SPSS for Windows (14.0 Standard Version), PASW 18.0 and by Excel. We have used the following method for the data evaluation. For examining the differences in the seasonal feed compound we have used Pearson's Chi^2-probe (χ^2).

RESULTS

During the annual evaluation of the studied feed components on all the sample areas it can be stated that the feed selection and the proportion of feed components of doe and roebuck in Tiszaalpár, Csongrád, Nagyszénás and Hódmezővásárhely was very diverse in every hunting period. Examining the fall-winter feed component of doe on the sample areas we can say that the rate of different feed components in the studied years varied significantly ($p<0.05$) only on Nagyszénás habitat (Table 2.). The consumption of woody plants was high in every year

(8.29–46.74%) regardless to the forest cover. On the territories we have examined, the consumption of woody plants was lower than in MÁTRAI et al. (1986), and MÁTRAI and KABAI (1989) on the Gödöllő hills, where roe deer consumption of woody plants in 70-100% consisted of 1-3 species.

Table 2. Annual comparison of the feed components of doe on the examined territories*

	Tiszaalpár		Csongrád		Nagyszénás		Hódmezővásárhely	
	2007	2008	2007	2008	2007	2008	2007	2008
2006	χ^2=3.3 p=0.507	χ^2=3.4 p=0.487	χ^2=6.7 p=0.150	χ^2=2.8 p=0.590	χ^2=10.5 p=0.032	χ^2=0.6 p=0.960	χ^2=1.2 p=0.872	χ^2=1.7 p=0.778
2007	-	χ^2=0.9 p=0.913	-	χ^2=0.9 p=0.925	-	χ^2=28.3 p=0.000	-	χ^2=1.5 p=0.817

*: df=4, in all tests

In case of the roebuck the rate of feed components in the examined years did not differ significantly only on the Tiszaalpár habitat (Table 3).

Table 3. Annual comparison of the feed components of roebuck on the examined territories *

	Tiszaalpár		Csongrád		Nagyszénás		Hódmezővásárhely	
	2008	2009	2008	2009	2008	2009	2008	2009
2007	χ^2=2.1 p=0.705	χ^2=6.4 p=0.171	χ^2=23.9 p=0.000	χ^2=15.7 p=0.003	χ^2=11.7 p=0.019	χ^2=9.4 p=0.052	χ^2=14.3 p=0.006	χ^2=19.3 p=0.001
2008	-	χ^2=2.5 p=0.634	-	χ^2=113.6 p=0.000	-	χ^2=33.5 p=0.000	-	χ^2=0.6 p=0.957

*: df=4, in all tests

From the results it can be stated that the diversity of the feed compound of doe on the examined territories is confirmed, the statistical difference in Tiszaalpár (between p=0.000 and p=0.021), in Csongrád (between p=0.000 and p=0.001) and in Nagyszénás (between p=0.000 and p=0.001), while it cannot be stated in the habitats of Csongrád and Hódmezővásárhely (in 2006 p=0.126; in 2007 p=0.767 and in 2008 p=0.676) (Table 4).

Table 4. Annual comparison of the feed components of doe on the examined territories *

	2006			2007			2008		
	Csong.	Nagysz.	Hmv.	Csong.	Nagysz.	Hmv.	Csong.	Nagysz.	Hmv.
Tiszaalpár	χ^2=31.6 p=0.000	χ^2=198.4 p=0.000	χ^2=35.2 p=0.000	χ^2=23.1 p=0.000	χ^2=60.3 p=0.000	χ^2=19.5 p=0.001	χ^2=14.7 p=0.005	χ^2=111.1 p=0.000	χ^2=11.5 p=0.021
Csongrád	-	χ^2=74.6 p=0.000	χ^2=7.2 p=0.126	-	χ^2=19.8 p=0.001	χ^2=1.8 p=0.767	-	χ^2=41.7 p=0.000	χ^2=2.3 p=0.676
Nagyszénás	-	-	χ^2=20.2 p=0.000	-	-	χ^2=18.2 p=0.001	-	-	χ^2=20.4 p=0.000

*: df=4, in all tests

In case of roebuck it is confirmed that the feed components vary on different habitats but in 2009 in Csongrád and Nagyszénás differences were not detected statistically. The feed preferences of the roe deer population on the examined territories differ in the hunting seasons of doe and roebuck according to the ecological conditions, agricultural cultivation and the rate of afforestation – was not confirmed on every occasion (Table 5).

Table 5. Annual comparison of the feed components of roebuck on the examined territories *

	2007			2008			2009		
	Csong.	Nagysz.	Hmv.	Csong.	Nagysz-	Hmv.	Csong.	Nagysz.	Hmv.
Tiszaalpár	χ^2=11.9 p=0.018	χ^2 =55.4 p=0.000	χ^2=41.2 p=0.000	χ^2=13.2 p=0.010	χ^2=63.7 p=0.000	χ^2=76.8 p=0.000	χ^2=23.5 p=0.000	χ^2=30.9 p=0.000	χ^2=78.8 p=0.000
Csongrád	-	χ^2=35.2 p=0.000	χ^2=35.6 p=0.000	-	χ^2=58.8 p=0.000	χ^2=253.8 p=0.000	-	χ^2=9.4 p=0.051	χ^2=47.4 p=0.000
Nagyszénás	-	-	χ^2=95.6 p=0.000	-	-	χ^2=123.8 p=0.000	-	-	χ^2=97.3 p=0.000

*: df=4, in all tests

On the studied plain habitats the consumption of the following woody plants was typical (2.40–12.26) the black locust (*Robina pseudoaccacia),* the elder (*Sambucus nigra)* (3.12–19.93%) MÁTRAI (2000) high consumption 60-90% of conifers (*Pinus spp.)*, cherries' (*Prunus spp.),* mulberry (*Rubus spp.),* the honey locust (*Gleditsia triacathos)* apples and grapes was detected. TIXIER et al. (1998) found the same dominant species in the winter feed only in smaller quantities (1–3) and smaller rate (22–50%).

According to the researches of MÁTRAI (2000) on temporary habitats the presence of the main feed components was even higher. Besides the conifers the maple (*Acer campestre)*, the oak and the ash (*Fraxinus spp.)*, the alfalfa (*Medicago sativa),* the carrot (*Beta spp.),* the honey locust (*Gleditsia triacathos),* the silver berry *(Elaeangus angustifolia)* were also present.

On the studied plain habitats the examined doe liked the monocotyledonous plants because they were found in large quantities (40.15–74.14%) which were very important in the winter period, like in the studies of MÁTRAI (2000) where she stated that on field habitats the feed selection of roe deer only differed in the consumed plants and not in their distribution. She stated that the dominant feed components were the parsley (*Petoselium spp.)*, the carrot leaf (*Beta spp.),* the flowering plants (*Medicago spp. and Trifolium spp.),* the wheat (*Triticum spp.)* and the barley (*Hordeum spp.).*

While studying the feed selection of roe deer on Moravian agricultural habitats HOLISOVA et al (1982) received the same results in fall and winter periods, where the main feed components were the winter cereals and the corn, but she also underlined the importance of mulberry (*Rubus spp.),* privet (*Ligustrum vulgare),* ash (*Fraxinus excelsior)* (47–68%).

Examining the feed components of roebuck we can state that the rate of the monocotyledonous plants was low (2.32–29.06%), mostly were consumed the quitch grass (*Agropyron repens),* Bermuda grass (*Cynodon dactylon)*, the sedge *(Carex spp.).* In the case of dycotiledonous plants we have found the same results (2.00–24.75%), the common bugloss (*Anchusa officinalis)*, the hairy vetch (*Vicia villosa),* the black horehound (*Ballota nigra)*, the goosefoot (*Chenopodium album),* the mullein (*Verbascum phlomoides),* the hawkweed ox-tongue (*Picris hieracioides)*, the common gypsy-weed (*Veronica officinalis)* were consumed.

CONCLUSIONS

The consumption of woody plants was dominant from spring till fall (24.86–52.80%), there were no significant differences between the years, mostly eaten plants were the black locust (*Robinia pseudoacacia)* and the elder (*Sambucus nigra),* these results correspond to the results of STRANDGAARD (1972) on agricultural habitats of Kaløn (38–74%). According to the examinations made by SZMIDT (1975) the common beech (*Fagus sylvatica)* was the most preferred woody plant. The most disliked plants in the winter period were the pine (*Pinus*

sylvestris) and the elder (*Sambucus nigra)*. The common beech was a favored species according to numerous writers (WAGENKNECHT, 1969) or at least it was consumed periodically (KLÖTZLI, 1965).
The elder was consumed less according to PIELOWSKI (1970), but also there were researchers who stated that it was a frequently consumed plant together with the pine (KURT, 1970).
KURT (1970) says that in spring and summer 62% of the consumed nourishment is of leaves and sprouts of woody plants and in winter period this rate can be even 80%, which cover not only the energy needs but also the water needs of roe deer, states SZCZERBINSKI (1964). In summer period this plant group provides 50% of the feed consumed and it is very important in digestion regulation (BUBENIK, 1959).
The monocotyledonous crops were also preferred by roebuck, the common wheat (*Triticum aestivum)*, the barley (*Hordeum vulgare)*, the rye (*Secale cereale)* were also consumed as we have found them in large quantities in the samples (12.63–49.28%).
The rate of dicotyledonous crops was between 4.03–15.94%, mostly the Fabaceae were consumed like: alfalfa (*Medicago sativa),* the white clover (*Trifolium repens),* the red clover (*Trifolium pratense),* and in spring the rape (*Brassica napus).*
But in spring and summer there was a great diversity in the samples in the same growing season the consumption of 17–21 plant species – mostly dicotyledonous plants, the leaves and sprouts of woody plants and cultivated crops were dominant. On all territories there were 1–3 mostly preferred woody plants (acacia, elder, narrow-leaved willow, hackberry) which is almost similar to the result published by TIXIER and DUNCAN (1996), where the authors raised the attention to the fact that there is great diversity in the feed of roe deer on identical habitats. Their opinion is that plant species which can be found on the habitat significantly affect the feed selection of roe deer. According to their results roe deer consumed 305 types of plants in the growing season the most preferred plants were the leaves and sprouts of woody plants.
We can state that after examining the main feed components, the feed selection of roe deer in the same year but on different territories was very diverse thanks to the conditions of the regions and their various feed supply. In the periods when there is less feed, according to the results on different plain habitats we can say that the dominant plant species consumed by roe deer are similar. The feeding strategy was the same on all habitats: roe deer consumed those plants which were in abundance. They did not leave the forest or the agricultural areas to find easily digestible, nutritious perennial plants. According to the latest researches of MÁTRAI (2006) roe deer must save energy in the winter, because of its smaller size needs more energy per body weight than the red deer. The search and consumption of easily digestible feed was not typical on the examined plain habitats because these plants are not available all year long. In the periods of feed shortage the consumption of easily accessible plants was dominant.

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