

FLORISTIC BIODIVERSITY OF FEEDING GROUND FOR DEERS (DAMA DAMA) BRED ON FARMS

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Abstract

The aim of the researches was to evaluate the biodiversity of plant life of feeding ground for deers bred for meat. The researches were conducted in 2011-2013. They were carried on the farm for deers, located near Krosno town. The phytosociological tests were based on the Braun-Blanquet method using six-note scale. In general there were 30 photos taken which were collectively elaborated. It was established that in the composition of feeding ground there were 62 plant species among which there were 11 species of trees and shrubs and 51 plants that contain phytoncides and they are very valuable for health and animal productivity.

Key words: deers, farmed deer breeding, plant life of feeding ground.

INTRODUCTION

The consumer behaviour to meat that has been observed in the recent years, indicates that the offer for animal quality and the treatment of meat as functional food has been enhanced. The high level of functional food is characteristic for the wild meat (Florek and Drozd, 2013; Kilar and Ruda, 2014; Kilar, 2013). In many countries the wild meat is considered as the up-scale product (Dzierżyńska-Cybulko and Fruzinski, 1997). The organization of farming production was caused by the demand for the wild meat over its supply. All these things were noticed in some countries in 1980s (Berg and Asher, 2003; Janiszewski and Daszkiewicz, 2010). The pioneers of farming production of deer meat came from New Zealand. Taking Europe into account, most deers bred on farms are in Germany, Ireland and Austria. The first deer farms in Poland came into existence in 1990s (Borys, 2004). Legally, deer farming was authorised in 2001 when red deers (*Cervus elaphus*), Fallow deers (*Dama Dama*) and Sika deers (*Cervus nippon*) were considered as the farm animals (Dz.U. 2001 nr 129 poz. 1438). In Poland in 2013 there were 522 farms where there were about 31000 animals kept (www.wetgiw.gov.pl). Deer farming is particularly aimed at international meat production.

Polish wild meat consumption is only about 0.08 kilograms per year (Borys, 2012). According to the researches (Kilar and Ruda, 2014; Radkowska, 2013; Radkowski and Barabasz-Krasny, 2008; Wolański, 2011), variety of floristic composition of feeding grounds is very important for animals as it gives them many primary nutrient. Also it has a very beneficial effect on their health and on the pro-health properties. A very important group of plants are herbs (Chabuz, 2012; Grzelak, 2013; Radkowska, 2013; Stokłosa, 2007).

All of alkaloids, anthocyanins, phenolic acids, phytosterols, flavonoids, glycosides, essential oils, mineral salts and many different active appetizing substances make the deer female more milky. Also all these substances make the nutrient availability grow and help the body detoxification (Budny, 2012; Grzelak, 2013; Radkowska, 2013). All these important substances are freely used by wild animals.

The feeding ground for deers is limited on account of the geographic location, topography and the farm area (Kilar and Ruda, 2014).

The aim of the researches was to evaluate the biodiversity of plant life of the feeding ground for deers bred for meat.

MATERIALS AND METHODS

The researches were conducted in 2011-2013.

They were carried on the farm for deers, located near Krosno town. The farm was found in 2006. It was made of one headquarters which was 7.0 hectare big. The clay soils area was formed as a gorge with the water course which was 340 meters high above sea level. Plant communities consisted of anthropocentric forest clearing and the rest apple orchard in *Dentario glandulosae-Fagetum*. A herd of deers consists of 50-60 animals among which there is about 40% of adult female deers.

The phytosociological tests were taken in May and October. The tests were based on the Braun-Blanquet method using six-note scale (Braun-Blanquet, 1964). Every time on the feeding ground there were 5 photos taken which covered the area of 50m². In general there were 30 photos taken which were collectively elaborated. The evaluation of the biodiversity of plant life of feeding ground included: species identification, apportionment of the plants from the economic point of view, belonging to the botanical families and to the phytosociological class. Also, this evaluation included the apportionment of the prophylactic properties and medicinal properties (Broda and Mowszowicz, 1996; Danysz and Buczek, 2008; Matuszkiewicz, 2009; Mirek, 2002).

The use value of plants was determined by the number of use value biased on the point method according to Filipek (Filipek, 1973).

This method has ten-point scale. 9-10 points mean a very good value, 7-8 points- just good value, 4-6 points- average value, 1-3 points- low values, 0 points – worthless. If we have from 1 to 3 points in this method, it means that the plants are poisonous. A comparison of floristic composition of the feeding ground and the feeding ground composition for wild deers was made (Krupka, 1990).

RESULTS AND DISCUSSIONS

During the time from the spring to the late autumn, the staple food for deers bred on farms is the plant resources of the feeding pond.

During the winter, animals are fed with supplementary food because from the floristic resources animals can only get some shoots of the trees or shrubs (Janiszewski and Daszkiewicz, 2010). A big floristic biodiversity of feeding ground has the natural behaviour and

it has a beneficial effect on the animal productivity and their health (Kilar and Ruda, 2014; Radkowska, 2013; Stokłosa, 2007).

Table 1. Biodiversity and characteristics of plant life of feeding ground for deers bred on farms

Details	The number of species	%
Total, including	62	100.00
• grass	11	17.74
• fabacea	3	4.84
• carex	1	1.61
• herbs and weeds	36	58.07
• trees and shrubs	11	17.74
The degree of coverage		
• above 75%	0	0.00
• 50-75%	0	0.00
• 25-50%	6	9.68
• 5-25%	18	29.03
• to 5%	23	37.10
• to 5%	15	24.19
Species having value in use for animals:		
• Lwu 9-10	5	8.06
• Lwu 7-8	3	4.84
• Lwu 4-6	8	12.90
• Lwu 3-1	10	16.13
• Lwu 0	34	54.85
• Lwu -1 do -3	2	3.22
Hytoncides including:		
• species with the strong prophylactic and medicinal properties	51	82.26
• species with the moderate and weak prophylactic and medicinal properties	27	43.55
	24	38.71

It was established that in the composition of feeding ground there were 62 vascular plant species (Table 1). All these plants were belonging to 27 botanical families and to 15 phytosociological classes (Table 3).

From the economic point of view, the apportionment of plant life of feeding ground was composed of: 58.07 % of herbs and weeds, 17.74% of grass, 17.74% of trees and shrubs, 4.48% of *Fabacea*, 1.61% of *Carex* (Table 1). Within the botanical families, the grass family was the biggest (11 species).

The *Betulaceae*, *Caryophyllaceae*, *Poligonaceae*, *Primulaceae* and *Rosaceae* families consisted of 4 kinds of plants. The *Brassicaceae*, *Fabaceae* and *Plantaginaceae* families consisted of 3 kinds of plants. The *Asteraceae*, *Boraginaceae*, *Lamiaceae* and *Ranunculaceae* families consisted of 2 kinds of plants. All the *Adoxaceae*, *Balsaminaceae*, *Compositae*, *Cyperaceae*, *Fagaceae*, *Gentianaceae*, *Marchantiaceae*, *Oxalidaceae*, *Rhamnaceae*, *Rubiaceae*, *Salicaceae*, *Scrophulariaceae*, *Umbelliferae*, *Urticaceae* families consisted of 1 kind of plants (Table 2).

Taking into account the phytosociological classes, the biggest number of taxa was in *Molinio-Arrhena Theretea*, *Quercu-Fagetea* and *Stellarietea Mediale* families (Table 3).

Table 2. The number of botanical plants of the feeding ground for deers bred on farm

	Family	The number of plants	Structure
1.	<i>Adoxaceae</i>	1	1.61
2.	<i>Asteraceae</i>	2	3.23
3.	<i>Balsaminaceae</i>	1	1.61
4.	<i>Betulaceae</i>	4	6.46
5.	<i>Boraginaceae</i>	2	3.23
6.	<i>Brassicaceae</i>	3	4.84
7.	<i>Caryophyllaceae</i>	4	6.46
8.	<i>Compositae</i>	1	1.61
9.	<i>Cyperaceae</i>	1	1.61
10.	<i>Fabaceae</i>	3	4.84
11.	<i>Fagaceae</i>	1	1.61
12.	<i>Gentianaceae</i>	1	1.61
13.	<i>Lamiaceae</i>	2	3.23
14.	<i>Marchantiaceae</i>	1	1.61
15.	<i>Oxalidaceae</i>	1	1.61
16.	<i>Plantaginaceae</i>	3	4.84
17.	<i>Poaceae</i>	11	17.74
18.	<i>Poligonaceae</i>	4	6.45
19.	<i>Primulaceae</i>	4	6.45
20.	<i>Ranunculaceae</i>	2	3.23
21.	<i>Rhamnaceae</i>	1	1.61
22.	<i>Rosaceae</i>	4	6.45
23.	<i>Rubiaceae</i>	1	1.61
24.	<i>Salicaceae</i>	1	1.61
25.	<i>Scrophulariaceae</i>	1	1.61
26.	<i>Umbelliferae</i>	1	1.61
27.	<i>Urticaceae</i>	1	1.61

The food value of feeding grounds depends on the hydrological conditions, soil conditions and the land use intensity (Wasilewski, 2012). During the time when the researches were conducted, the ceiling of the stocking density factor was not higher than 0.70 DJP per hectare. Which means that the feeding ground was extensively used what is good for biodiversity of plant protection (Chabuz, 2012; Radkowski and Barabasz-Krasny, 2008).

The phytosociological imagery analysis shows that among the plants which are part of the feeding ground, dominated plants are: *Pyrus communis* L., *Cerasus avium* (L) Moench, *Poa annua* L., *Trifolium repens* L., *Cardamine impatiens* L., and *Malus sylvestris* Mill.

The degree of the plant cover is from 25% to 50%. The researches have shown that a very low share of the plants in the plant life of feeding ground had: *Carpinus betulus* L., *Salix caprea* L., *Elymus europaeus* L., *Poa trivialis* L., *Oxalis stricta* L., *Impatiens parviflora* DC., *Myosotis silvatica* (Ehrh.) Hoffm., *Marchantia polymorpha* L., *Primula elatior* (L.) Hill., *Rumex crispus* L., *Holosteum umbellatum* L.,

Silene vulgaris (Moench) Garcke., *Heracleum sphondylium* L.

Table 3. The number of phytosociological plants of the feeding ground for deer's bred on farms

Phytosociological class	The number of species	%
<i>Agropyretea Intermedio-Repentis</i>	1	1.61
<i>Artemisieteae Vilgaris</i>	4	6.45
<i>Betulo-Adenostyletea</i>	3	4.84
<i>Cakiletea Maritimae</i>	1	1.61
<i>Epilobieteae Angustifolii</i>	5	8.06
<i>Festuco Brometea</i>	2	3.23
<i>Koelerio glaucae-Corynephoretea canescentis</i>	2	3.23
<i>Magnoliopsida</i>	1	1.61
<i>Molinio-Arrhena Theretea</i>	19	30.65
<i>Montio-Cardaminetea</i>	2	3.23
<i>Nardo-Callunetea</i>	1	1.61
<i>Quercu-Fagetea</i>	10	16.13
<i>Rhamno-Prunetea</i>	1	1.61
<i>Stellarieteae Mediale</i>	9	14.52
<i>Vaccino-Piceetea</i>	1	1.61

The research results show that the use value was low- only 2.65 points. The use value was higher for typical forage plants – 4.65 points. The small use value of plant life of the feeding ground is caused by the presence of 34 kinds of plants, which have no use value.

Among all the plants of the feeding ground there were two kinds of poisonous plants (*Ranunculus sceleratus* L., *Cardamine pratensis* L.). According to Table 1, there was only 8.06% of plants that had a very good value and 4.84% of plants that had just a good value. Among plants with a very good value were: *Dactylis glomerata* L., *Lolium perenne* L., *Trifolium repens* L., *Trifolium pratense* L., *Trifolium hybridum* L. But the plants that had just a good value were: *Agropyron repens* (L.) P.B., *Poa trivialis* L., *Alchemilla pastoralis* Bus.

Even though there was a low use value, the plant life of feeding ground was distinguished on account of the big number of phytoncides (Table 1). All kinds of plants according to their prophylactic and medicinal properties are shown in the Table 4.

The plants such as: *Cerasus avium* (L) Moench, *Salix caprea* L., *Carpinus betulus* L., *Taraxacum officinale* Web., *Cardamine amara* L., *Veronica chamaedrys* L., *Primula elatior* (L.) Grufb., *Mentha aquatica* L., *Heracleum sphondylium* L. have pro-health properties, antiparastic properties and they have a positive impact on the digestion process.

The researches have shown that in the composition of feeding ground there was no plant life of small shrubs and ferns, forkbeards

and horsetails. There were only some shoots of trees and shrubs noticeable – about 17.75%. The presence of green dicotyledonous plants was about 63.0%. It was three times as much as the presence of these plants in the feeding ground for wild deers (Table 5).

According to the accurate observations of animals that have been done, the poorer floristic feeding ground did not cause any clinical disorders of the animal health and behaviour.

Table 4. The tapes of plants with the prophylactic properties and medicinal properties

Details	Kinds of plants
Plants with the strong prophylactic and medicinal properties	<i>Cardamine impatiens</i> L., <i>Glechoma hederacea</i> L., <i>Primula elatior</i> (L.) Hill., <i>Heracleum sphondylium</i> L., <i>Ranunculus sceleratus</i> L., <i>Salix caprea</i> L., <i>Centaureum erythraea</i> Rafn., <i>Betula pendula</i> Roth., <i>Sambucus nigra</i> L., <i>Plantago media</i> L., <i>Taraxacum officinale</i> Web., <i>Plantago maior</i> L., <i>Ranunculus repens</i> L., <i>Alchemilla pastoralis</i> Bus., <i>Cardamine pratensis</i> L., <i>Achillea millefolium</i> L., <i>Mentha aquatica</i> L., <i>Cardamine amara</i> L., <i>Veronica chamaedrys</i> L., <i>Polygala vulgaris</i> L., <i>Carpinus betulus</i> L., <i>Primula elatior</i> (L.) Grufb., <i>Lysimachia nemorum</i> L., <i>Fagus sylvatica</i> L., <i>Frangula alnus</i> Mill., <i>Veronica arvensis</i> L., <i>Anagallis arvensis</i> L.
Plants with the moderate and weak prophylactic and medicinal properties	<i>Poa annua</i> L., <i>Impatiens parviflora</i> DC., <i>Calamagrostis arundinacea</i> (L.) Roth., <i>Bromus erectus</i> Huds., <i>Poa annua</i> L., <i>Dactylis glomerata</i> L., <i>Alopecurus geniculatus</i> L., <i>Festuca rubra</i> L., <i>Lolium perenne</i> L., <i>Poa trivialis</i> L., <i>Elymus europaeus</i> L.,

Table 5. The comparison of the feeding ground for wild deers and deers bred on farm

Details	Wild deers %	Deers bred on farm %
Shoots of trees and shrubs	33.10	17.75
Small shrubs	24.40	0.00
Grass, sedges, sieve plants	19.80	19.35
Green dicotyledonous plants	20.20	62.90
Ferns, forkbeards, horsetails	2.50	0.00

CONCLUSIONS

Even if the deer farming is very well organised, the freedom to choose both the feeding ground and the floristic biodiversity is limited. The plant life of feeding ground was composed of 62 kinds of vascular plant species, among which there were 11 kinds of trees and shrubs. Even if there was a big floristic biodiversity of feeding ground there were no small shrubs, ferns, forkbeards and horsetails that are very important for the typical wild deer food.

The deficiency of these plants could be replaced to same extend with a big number of phytoncides (51 species) that have a beneficial effect on the animal health and animal-productivity.

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REFERENCES

- Berg D.K., Asher G., 2003. New developments reproductive technologies in deer. *Theriogenology*, 59(1): 189-205.
- Borys B., Bogdaszewska Z., Bogdaszewski M., 2012. Dynamiczny wzrost fermowej hodowli danieli i jeleni w Polsce. *Wiadomości Zootechniczne*, R.L.(2012), 1: 33-44.
- Braun-Blanquet J., 1964. *Pflanzensoziologie, Grundzüge der Vegetationskunde*. 3. Aufl. Springer, Wien-New York.
- Broda B., Mowszowicz J., 1996. *Przewodnik do oznaczania roślin leczniczych, trujących i użytkowych*. Wydawnictwo Lekarskie PZWL, Warszawa.
- Budny A., Kupczyński R., Sobolewski S., Korczyński M., Zawadzki W., 2012. Samolecznictwo i ziołolecznictwo w profilaktyce i leczeniu zwierząt gospodarskich. *Acta Scientiarum Polonorum, Medicina Veterinaria*, 11(1): 5-24.
- Chabuz W., Grzywaczewska G., Rysiak A., Cios S., Podolak G., Litwińczuk Z., 2012. Wpływ wypasu lokalnych ras bydła na różnorodność biologiczną łąk i pastwisk Polesia Lubelskiego. *Roczniki Naukowe Polskiego Towarzystwa Zootechnicznego*, 8(4) : 81-90.
- Danysz A., Buczek W., 2008. *Kompilacja farmakologii o farmakoterapii*. Wyd. Urban i Partner, Wrocław-Warszawa.
- Dzierżyńska-Cybulko B., Fruziński B., 1997. Dzikizna jako źródło żywności. Państwowe Wydawnictwo Rolne i Leśne, Poznań.
- Filipek J., 1973. Projekt klasyfikacji roślin łąkowych i pastwiskowych na podstawie liczb wartości użytkowej. *Postępy Nauk Rolniczych*, 4: 59-68.
- Florek M., Drozd L., 2013. Związki bioaktywne w mięsie jeleniowatych. *Medycyna Weterynaryjna*, 69(9): 535-539.
- Grzelak M., Gawel E., Barszczewski J., 2013. Wpływ występowania ziół i chwastów na zróżnicowaniu wartości gospodarczej runi łąk. *Progress in Plant Protection*, 53(1): 182-185.
- Janiszewski P., Daszkiewicz T., 2010. *Zwierzęta łowne*. Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego w Olsztynie.
- Kilar J., Ruda M., 2014. The nutritional value of organic meat from the loin of deer and fallow deer. 6th International Conference on the "Quality and Safety in Food Production Chain", Wrocław, 26-27 June: 72.
- Kilar J., Ruda M., 2014. Dobrostan pokarmowy jeleni w ekologicznym chowie fermowym. Materiały konferencyjne LXXIX Zjazdu Naukowego PTZ „Systemy produkcji zwierzęcej w

- XXI wieku”. Siedlce, 259
15. Kilar M., Kilar J., Ruda M., Różański H., 2013. Deer meat as a functional food. I Międzynarodowa Konferencja “Ziołolecznictwo, Biokosmetyki i Żywność funkcjonalna”, Krosno 18-19 kwietnia, 131.
 16. Krupka J., 1990. Łowiectwo. Państwowe Wydawnictwo Rolnicze i Leśne, Warszawa.
 17. Matuszkiewicz W., 2009. Przewodnik do oznaczania zbiorowisk roślinnych Polski. Wydawnictwo Naukowe PWN, Warszawa.
 18. Mirek Z., Piekoś-Mirkowa H., Zajac M., 2002. Flowering plants and pteridophytes of Poland: a checklist. W. Szafer Institute of Botany Polish Academy of Sciences, Kraków, 442.
 19. Radkowska J., 2013. Wykorzystanie ziół i fitogenicznych dodatków paszowych w żywieniu zwierząt gospodarskich. Wiadomości Zootechniczne, R. LP, 4:117-124.
 20. Radkowski A., Barabasz-Krasny B., 2008. Zbiorowiska roślinne pastwisk gromadzkich na Pogórzu Bocheńskim. Łąkarstwo w Polsce, 11: 161-170.
 21. Stokłosa A., Stępnik K., Barabasz-Krasny B., 2007. Rośliny lecznicze terenów odłogowanych Pogórza Przemyskiego. Annales UMCS Lublin-Polonia, sect. E, vol. LXII(1), 163-173.
 22. Wasilewski Z., 2012. Evaluation of botanical composition and quality of grazed sward in three habitat groups. Journal of Research and Applications in Agricultural Engineering, 57(4): 172-176.
 23. Wolański P., Trąba Cz., Rogut K., 2011. Różnorodność florystyczna oraz walory krajobrazowe łąk, pastwisk i szuwarów na pogórzu Przemyskim. Zeszyty Problemowe Postępu Nauk Rolniczych, z. 568: 157-169.
 24. Ustawa o organizacji hodowli i rozrodzie zwierząt gospodarskich (Dz.U. 2001 nr 129 poz. 1438).
 25. www.wetgiv.gov.pl data dostępu 15.02.2015