

Botanical investigation of goats pastures on natural and replanted grasslands

Ferenc Stilling¹ – Péter Póti² – Ferenc Pajor² –
Sándor Hajnóczki^{1,2}

Hungarian University of Agriculture and Life Sciences,

¹Institute of Agronomy, Department of Botany, Gödöllő

²Institute of Animal Sciences, Gödöllő

stillingf@gmail.com

There are new challenges for global agriculture due to the changing circumstances in natural and economical world. Many professionals mentioned that our current agricultural methods not suitable to produce proper amount and quality foods. We have to change from the conventional farming to a sustainable agriculture to reach a well performing global agriculture what consist local viable agro systems. The organic farming as one type of sustainable agriculture, is a developing sector where the market and economical competition is growing. There is an opportunity to produce high quality food without additives in Hungary based on the climate, good quality soil as well traditional plant and animal species. The hungarian government set better balance between animal husbandry and arable farming as target and focusing on family farming and organic farming.

The most important local resources are the water source and the good quality feed production capacity (Horn et al., 2001; Szentes et al., 2007, 2009a, b, 2012). Our ruminant species were born and selected on grasslands so it is obvious to the best production place and best feed to them is the pasture (Vinceffy, 1993; Penksza et al., 2013, 2021; Magyar et al., 2017; Szabó et al., 2021) additionally the mandatory conditions of organic farming ask acces to open spaces or pasture. Easy to see that the grazing is stimulates metabolism, give better digestion and the herbaceous vegetation rich in vitamins and amino acids which have a beneficial effect on milk production (Csukás, 1952). By planting high diversity grasslands, these grasslands provide good quality forage in areas that are not well utilised by other forms of farming.

Grassland management systems play an important role both economically and in terms of nature conservation among extensive agricultural systems in Hungary because about one third of our protected animal and plant species and many endangered community connected to them. Approx. 11% of Hungary, about 1 million hectares of land is under grassland the majority of which can be used as pasture and a smaller part as meadow (meadow and pature mixed). Almost 70% of our grassland have low productivity and only the 5% have good productivity. The reason for this is that they have survived mainly in areas with unfavorable site conditions, where environmental conditions, especially poor soil conditions, are characteristic.

The areas are to study the species composition of grasslands grazed by goats in several parts of the

country to analyze and evaluate the effect of grazing goats on changes in the species composition of grasslands:

1. In Kaposzardahely where grazing is carried out on abandoned arable land. The area has been abandoned for 3 and 5 years and has a lawn that. In addition, a wet reed area was grazed.
2. In Kaposdada, where owner is keeping goats on "pristine grass", a natural grassland close to nature. The sample area is sloping, so the upper (LFH) and the lower third (LAH) of the slope were recorded, as well as the most intensively used terrain of the pasture, as a part of the paddock.
3. In Nagyréde, where the grassland created on abandoned arable land, on the control areas of the pasture not affected by the inoculation experiment. The coenological samples were taken in June.

Using Braun-Blanquet (1964) method using 2×2 m squares, but % cover of each species was recorded in 10-10 reeds with 3 quadrates. The species names follow the nomenclature of Király (2009).

The studied areas were evaluated on the basis of Borhidi's relative plant ecological indicators (Borhidi, 1995) according to NB (relative values of nitrogen demand) and WB (relative indicators of groundwater and soil moisture). The distribution of conservation value categories (TVK) was done according to Simon (2000), and the evaluation based on social behavior types (SZMT) was done according to the work of Borhidi (1995).

The results from 5 year abandoned Kaposzardahely and from the close-to-the-natural plots of Kaposdada were separated as results from Nagyréde (sown and control) on the basis of the examined goat pastures. The upper third of the slope (LFH) recordings of Kaposdada are closest to the Kaposzardahely recordings, including those that have been abandoned for 5 years. We could find legumes with high cover values, the *Trifolium repens*, in the plot abandoned 5 years ago.

There is a clear distinction between the upper third of the slope (LFH) from the Kaposdada recordings. The data from next to corral are closer to the quadrats in the lower third of the slope (LAH). The coverage of *Plantago lanceolata* and *Hieracium pilosella* are large in both of the quadrants, as a result of more intense trampling. Based on the DCA analysis of the sample plots, the relationship between the images is better illustrated. The data from Nagyréde shown that the plots been planted and the control lawns are separated. The re-sown area was richer in this case too.

The grazing area was dominated by plants of moderately oligotrophic production sites. It showed a very similar pattern to species relative nitrogen requirements. Plants of nutrient-rich habitats were primarily found in more demanding areas or in nutrient-rich plots. These species occur in quadrats in the upper third of the slope in Kaposdada. The most disturbed habitat spots will be found in areas close to the corral according to Simon Nature Conservation rate. These species occur in quadrants in the upper third of the slope. Although the amount of disturbance tolerant species was lower in the upper third of the slope, the proportion of weeds was higher. In the lower third and in areas close to the paddock, the coverage of disturbance tolerant plants will be greater.

The distribution of species by type of social behavior is similar to the one drawn by nature conservation categories. Between areas abandoned 3 years ago and 5 years ago, previously abandoned plots have less disturbance-indicating species (DT), so the pasture is becoming closer to natural state. On the Kaposdada recordings show the most disturbed habitat areas near the corral. These species occur in quadrants in the upper third of the slope. Although the amount of disturbance tolerant species was lower in the upper third of the slope, the proportion of weeds (W) was higher in the Kaposdada sample plots. In the lower third and in areas close to the paddock, the coverage of disturbance tolerant plants will be greater.

The most heavily used areas close to the corral, both in the Kaposdada and Nagyréde test areas, were most distinguished among the vegetation of the sample plots. Here vegetation is degraded by many weeds and disturbance-resistant species. During the Kaposszerdahely recordings, the vegetation of the grassland used for 5 years as grassland is already approaching that of the natural grassland, which

confirms that the grazing of the goats also helped the regeneration and maintenance of the grassland. Goats were also suitable for maintaining the natural vegetation of the natural grassland. Life form spectrum of species appeared as a good indicator. The amount of species with stolon and rosette became more significant in the intensively used spaces.

The heavily used part of the slope in Kaposdada, the younger pasture in Kaposszerdahely and in Nagyréde, are close to grasslands were created on abandoned arable land among the studied grasslands. These trends are similar to those of other publications (Kiss et al., 2008, 2011). The vegetation of young fallow is often rich in degradation and weed species in other studies (Albert et al., 2014; Csecserits et al., 2011; Kelemen et al., 2010; Török et al., 2011; Valkó et al., 2010; Fülöp et al., 2020, 2021; Bódis et al., 2021; Penksza et al., 2008, 2010, 2020, 2021). Based on the relative ecological values of the species, the slopes of Kaposdada are the closest to the natural ones, among them the pastures formed in the lower third of the pasture. During the Kaposszerdahely recordings, the vegetation of the grassland used for pasture for 5 years is closer to nature, so grazing with goats does not prevent it, but rather facilitates it (Deák and Valkó, 2013; Valkó and Deák, 2013; Bajor et al., 2016). According to the data of the examined areas, grazing by goats had a positive role in maintaining the vegetation. Life form spectrum of species in the areas appeared as a good indicator. The amount of species with stolon and rosette became more significant in the intensively used spaces, which shows similar data to several publications (Török et al., 2016, 2018; Kiss et al., 2008; Kiss and Penksza, 2018;).

Keywords: grazing, abandoned area, *Festuca species*, biomass

REFERENCES

- Albert, Á. J.-Kelemen, A.-Valkó, O.-Migléc, T.-Csecserits, A.-Rédei, T.-Deák, B.-Tóthmérész, B.-Török, P. (2014): Trait-based analysis of spontaneous grassland recovery in sandy old-fields. *Applied Vegetation Science* 17: 214-224.
- Bajor, Z.-Zimmermann, Z.-Szabó, G.-Fehér, Zs.-Járdi, I.-Lampert, R.-Kerény-Nagy, V.-Penksza, P.-L. Szabó, Zs.-Székely, Zs.-Wichmann, B.-Penksza, K. (2016): Effect of conservation management practices on sand grassland vegetation in Budapest. Hungary. *Applied Ecology and Environmental Research*, 14 (3): 233-247.
- Bódis, J.-Fülöp, B.-Lábadi, V.-Mészáros, A.-Pacsai, B.-Svajda, P.-Valkó, O.-Kelemen, A. (2021): One year of conservation management is not sufficient for increasing the conservation value of abandoned fen meadows. *Tuexenia* 41: 381-394.
- Borhidi, A. (1995): Social behaviour types, the naturalness and relative ecological indicator values of the higher plants in the Hungarian flora. *Acta Bot. Hung.* 39: 97-181.
- Braun-Blanquet, J. (1964): *Pflanzensoziologie* II. Wien
- Csecserits, A.-Czucz, B.-Halassy, M.-Kröel-Dulay, G.-Rédei, T.-Szabó, R.-Szitár, K.-Török, K. (2011): Regeneration of sandy old-fields in the forest steppe region of Hungary. *Plant Biosystems* 145: 715-729.
- Csukás Z. (1952): *Takarmányozás*. Budapest, Mezőgazd. Kiadó
- Deák B.-Valkó O. (2013): Az ökológiai szempontú gyeptelepítéshez és a gyep fenntartásához szükséges szakmai ismeretek összefoglalása. In: Török P. (szerk.) *Gyeptelepítés elmélete és gyakorlata az ökológiai szemléletű gazdálkodásban*. Budapest: Ökológiai Mezőgazdasági Kutatóintézet, pp. 77-82.
- Fülöp B.-Pacsai B.-Bódis J. (2020): Az esetleges természetvédelmi kezelések szerepe a botanikai értékek megőrzésében – Esettanulmány a Balaton partjáról. *Gyepgazdálkodási Közlemények* 18: 15-23.
- Fülöp, B.-Pacsai, B.-Bódis, J. (2021): Minor Treatments Can Play a Significant Role in Preserving Natural Habitats and Protected Species on the Shore of a Central European Lake. *AGRONOMY* 11(8): p. 1540, 12 p.
- Horn P.-Dér F.-Nagy J. (2001): A szarvastenyésztés lehetőségei, különös tekintettel gyephasznosításra. *Gyepgazdálkodásunk helyzete és kilátásai*. pp. 212-215.
- Kelemen A.-Török P.-Deák B.-Valkó O.-Lukács B. A.-Lengyel Sz.-Tóthmérész B. (2010): Spontán gyepregeneráció extenzíven kezelt lucernásokban. *Tájékológiai Lapok* 8: 33-44.
- Király G. (szerk.) (2009): *Új magyar fűvészkönyv*. Magyarország hajtásos növényei. Határozókulcsok. Aggteleki Nemzeti Park Igazgatóság, Jósvafő. 616 old.

- Kiss T.-Penksza K. (2018): A legeltetés hosszú távú hatása kiskunsági füves pusztákon. *Természetvédelmi Közlemények* 24: 104-113.
- Kiss T.-Penksza K.-Tasi J.-Szentés S. (2008): Juh- és marhalegelő cönológia és gyepgazdálkodási vizsgálata kiskunsági területeken. *Gyepgazdálkodási Közlemények* 6: 39-45.
- Kiss, T.-Lévai, P.-Ferencz, Á.-Szentés, Sz.-Hufnagel, L.-Nagy, A.-Balogh, Á.-Pintér, O.-Saláta, D.-Házi, J.-Tóth, A.-Wichmann, B.-Penksza, K. (2011): Change of composition and diversity of species and grassland management between different grazing intensity – in Pannonian dry and wet grasslands. *Applied Ecology and Environmental Research* 9(3): 197-230.
- Magyar, V.-Penksza, K.-Szentés, Sz. (2017): Comparative investigations of biomass composition in differently managed grasslands of the Balaton Uplands National Park, Hungary. *Gyepgazdálkodási Közlemények* 15(1): 49-56.
- Penksza K.-Tasi J.-Szentés Sz.-Centeri Cs. (2008): Természetvédelmi célú botanikai, takarmányozástani és talajtani vizsgálatok a Tapolcai és Káli-medence szürkemarha és bivaly legelőin. *Gyepgazdálkodási Közlemények* 5(1): 49-62.
- Penksza K.-Szentés Sz.-Loksa G.-Dannhauser C.-Házi J. (2010): A legeltetés hatása a gyepre és természetvédelmi vonatkozásai a Tapolcai- és Káli-medencében. *Természetvédelmi Közlemények* 16: 25-49.
- Penksza K.-Házi J.-Tóth A.-Wichmann B.-Pajor F.-Gyuricza Cs.-Póti P.-Szentés Sz. (2013): Eltérő hasznosítású szürkemarha legelő szezonális táplálóanyag tartalom alakulás, fajdiverzitás változása és ennek hatása a biomaszra mennyiségére és összetételére nedves pannon gyepben. *Növénytermelés* 62(1): 73-94.
- Penksza, K.-Csík, A.-Filep, A. F.-Saláta, D.-Pápay, G.-Kovács, L.-Varga, K.-Pauk, J.-Lantos, Cs.-Lisztes-Szabó, Zs. (2020): Possibilities of Speciation in the Central Sandy Steppe, Woody Steppe Area of the Carpathian Basin through the Example of *Festuca* Taxa. *Forests* 11 : 12 pp. 1325-1327.
- Penksza, K.-Saláta, D.-Pápay, G.-Péter, N.-Bajor, Z.-Lisztes-Szabó, Zs.-Fűrész, A.-Fuchs, M.-Michéli, E. (2021): Do Sandy Grasslands along the Danube in the Carpathian Basin Preserve the Memory of Forest-Steppes? *Forests* 12 : 2 p. 114, 15
- Simon T. (2000): A magyar edényes flóra határozója. Tankönyvkiadó. Budapest
- Szabó, G.-Magyar, V.-Szentés, Sz.-Penksza, K. (2021): Comparative phytosociological study of long-term on Tihany Peninsula of the Balaton Uplands National Park, Hungary. *Gyepgazdálkodási Közlemények* 20: 37-38.
- Szentés Sz.-Penksza K.-Tasi J. (2007): Gyepgazdálkodási vizsgálatok a Dunántúli középhegység néhány természetes gyepében. *AWETH* 3: 127-149. ISSN: 1786-8440
- Szentés Sz.-Wichmann B.-Házi J.-Tasi J.-Penksza K. (2009a): Vegetáció és gyep produkció havi változása badacsonytördemici szürkemarha legelőkön és kaszálón. *Tájökológiai Lapok* 7(2): 319-328.
- Szentés Sz.-Tasi J.-Házi J.-Penksza K. (2009b): A legeltetés hatásának gyepgazdálkodási és természetvédelmi vizsgálata Tapolcai- és Káli-medencei lőlelelőn a 2008. évi gyepgazdálkodási idényben. *Gyepgazdálkodási Közlemények*, 7: 65-72.
- Szentés, Sz.-Nagy, A.-Sutyinszki, Zs.-Házi, J.-Penksza, K. (2012): The change of wet grasslands in extreme climate-rainfall along the River Ipoly (Hungary) *Növénytermelés* 61: 271-274.
- Török, P.-Kelemen, A.-Valkó, O.-Deák, B.-Lukács, B.-Tóthmérész, B. (2011): Lucerne dominated fields recover native grass diversity without intensive management actions. *Journal of Applied Ecology* 48: 257-264.
- Török, P.-Valkó, O.-Deák, B.-Kelemen, A.-Tóth, E.-Tóthmérész, B. (2016): Managing for composition or species diversity? – Pastoral and year-round grazing systems in alkali grasslands. *Agriculture, Ecosystems & Environment*. doi: 10.1016/j.agee.2016.01.010
- Török, P.-Penksza, K.-Tóth, E.-Kelemen, A.-Sonkoly, J.-Tóthmérész, B. (2018): Vegetation type and grazing intensity jointly shape grazing on grassland biodiversity. *Ecology and Evolution* 8: 10326-10335. doi/full/10.1002/ece3.4508
- Valkó O.-Deák B. (2013): Az ökológiai gyepgazdálkodás alapelvei – Természetvédelmi és gazdasági szempontok összehangolása. In: Török P. (szerk.) *Gyeptelepítés elmélete és gyakorlata az ökológiai szemléletű gazdálkodásban*. Budapest: Ökológiai Mezőgazdasági Kutatóintézet, pp. 11-14.
- Valkó O.-Vida E.-Kelemen A.-Török P.-Deák B.-Miglécz T.-Lengyel Sz.-Tóthmérész B. (2010): Gyeprekonstrukció napraforgó- és gabonatóblák helyén alacsony diverzitású magkeverék vetésével. *Tájökológiai Lapok* 8: 53-64.
- Vinczeffly I. (1993): *Legelő- és gyepgazdálkodás*. Mezőgazda Kiadó, Budapest

