

Study on the changes of vegetation composition of the wood pasture near Cserépfalu, Hungary

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The wood-pastures were important elements of the landscape, moreover had appreciable act in the agriculture. This type of management belongs to the 'agroforestry' systems which are really ancient agricultural land uses, but nowadays endangered woody habitats in Hungary. The aim of our study was to collect, data about the appearance and traceability of different factors on the vegetation at different parts of a wood pasture.

The wood-pastures as semi-natural habitats were optimal for the livestock in balance with nature even the artificial origin (Joffre et al., 1999). As woody-grassland systems they working well but the under- or overgrazing could affect shift from the state of balance (Nótári, 2006; Vandenberghe et al., 2007; Jávör et al., 1999). The composition of species could change like the spreading of less preferred species (Paulsamy et al., 1987) or the decreasing of values (Fuls, 1992) as the results of over-grazing, on the other hand without the grazing the spreading of shrub species is considerable (Jávör et al., 1999).

The grazing has important act in the maintenance of diversity and achieving the clearing of pastures in the case of wood-pastures (Luoto et al., 2003; Pykälä et al., 2005). The grazing of herbivores is proven changes the primary production (Noy-Meir et al., 1989), spatial heterogeneity (Adler and Hauenroth, 2000; Peco et al., 2006), structure (Sala, 1988), composition (Kahmen et al., 2002) and diversity (Pykälä et al., 2005; Fuhlendorf and Smeins, 1999; Cipriotti and Aguiar, 2005; Catorci et al., 2011a, b; Rois-Díaz et al., 1999; Sala et al., 1996) of grasslands.

The type of grazing is shown by the vegetation and the yield of grasslands (Naveh and Whittaker, 1979; Milchunas et al., 1988), moreover the grazing as management type has major act in the keeping the diversity of grassland species and in the landscape level processes (Luoto et al., 2003; Enyedi et al., 2008).

The examination of wood-pastures is a really important task for the future. With regard for the complexity of plant-animal-environment system, the aim of our study was to collect, data about the appearance and traceability of different factors on the vegetation at different parts of the wood pasture.

The research area is located in the North Hungarian Mountains, in the Bükk-hillfoot of Eger Micro region, near to Cserépfalu settlement (Marosi and Somogyi, 1990; Dövényi, 2010). The wood-pasture has two geographically well-segregated part – we have examined the coenological conditions of

the northern area called Hidegkút-lapos and Cinegés. From the view of management clearing from shrubs were carried out from 2005 to 2007. From 2007 approximately 60-70 Hungarian grey cattle were grazed on the wood-pasture in every year between April and November but the strating of grazing could spin out to May-June and the grazing could finish in October in dependence from the weather.

To reach the aims three different habitat of these area were designated for research:

'A' – nighting place of livestock – *Agrostio-Festucetum rubrae*

'B' – exposed drier area – *Agrostio-Festucetum rupicolae*

'C' – lower and more humid area – *Agrostio-Festucetum rupicolae*

We prepared coenological records from 2012 to 2019 in the main vegetation period based the method of Braun-Blanquet (1964), with 2×2 metres quadrat sizes and the coverage estimated in % for each present species. The sources of data from 2011 are Saláta et al. 2011 and 2012. The name of species are given based on the nomenclature of Király (2009).

To evaluate the state of the vegetation we applied the distribution of nature conservational categories (TVK) of Simon (1992) and the social behaviour types of Borhidi (1993, 1995) and Horváth et al. (1995) for the plant species. The 'ecological ordering' and evaluation of species was done by lifeform types of Raunkiær (1934) and Pignatti (2005) (Chiarucci and Bonini, 2005; Buide et al., 1998). All species had got the specific category of social behaviour types (Borhidi, 1993, 1995). Within the nature conservational values (Simon, 1992).

We summarized the life forms categories into four groups:

- I. perennial species
- II. therophytes
- III. chamaephytes
- IV. phanerophytes

The survey of diversity has done with the application of the two most frequented diversity indexes (Shannon-Wiener and Simpson) (Ricotta et al., 2002) and the diversity application of the Chang Bioscience web page (www.changbioscience.com/genetics/shannon.html). The results are represented on diagrams. For additional evaluation we ordered the data with the hierarchical cluster and ordering modules of the SYN-TAX 2000 software package (Podani, 1997, 2001). During the hierarchical cluster analysis the UPGMA (Unweighted Pair Group

Method with Arithmetic Mean) method were used with Euclidean middle distance, without ordering and considered with two decimals.

Based on the results of hierarchical cluster analysis the records of the 'A' area from different years are forming clads with each other's and separated from the records of the 'B' and 'C' areas.

Based on the results of ordination the states represented by the records have been done in the T5 time are grouped and separated so the year effect has role in the composition of vegetation. As curiosity we highlight the distance between the different vegetation stages of different years: the distance is smaller between the composition. These results are support the hypothesis like the year effect may has prior act in the evaluation of the vegetation's conditions.

As the results of the diversity assessment the highest diversity has seen in the case of area 'A' and 'C'.

A lot of research has shown that grazing favors plant biodiversity (Fischer and Wipf, 2002; Proulx and Mazumder, 1998; Pykälä et al., 2005; Losvik, 1999) and increased diversity (Bakker, 1989; Kampmann et al., 2007), in the woody-shrub-grassland mosaic, causes higher species richness (Saláta, 2012).

During the process of social behaviour types all species had got the the specific category but the figure contains only the 3 main – from the view of this grassland – ones because of the better interpretability. The dominance were owned by the stress tolerant species where the narrow ecologically stress tolerant species had higher number and coverage. The ratio of ruderal species was between 10 and 42%. Within this group the ratio of non-native aggressive competitors was the highest before the ratio of natural competitors.

If the simplification used latter is applied to the nature conservational values we can narrow the types to the species of natural condition and degraded

condition. The ratio of natural species is between 50 and 95%. Within this group the associative species owned the highest rate before the rate of pioneer and accompanying species. The ratio of these species was high, 87-95% in the case of area 'B'.

During the taxonomic examinations, the genus *Festuca* proved to be difficult. This genus is very important in economic means. 5 members of it were found on the area: the wide-leafed species *estuca pratensis* and *Festuca arundinaceae*. *Festuca ovina*, which is a characteristic narrow-leafed species of the natural vegetation type of the area; *Festuca rubra*, which has transitional leaf characteristics but is a natural habitant *Festuca rupicola*, *Festuca valesiaca* and the disturbance tolerant *Festuca pseudovina*.

To summarize the life forms the rate of perennials was dominant in all three areas. From the aspect of nature conservation the change of phanerophytes rate is interesting – after the higher rates in 2013-2019, the presence. Our results show that the composition of the sampling area didn't change significantly due to the grazing, but the relatively extraordinary summer weather and the year effect had a huge impact on (the composition).

Further researches are needed to understand how wood-pastures are reacting to grazing and how the year effect on the composition appears.

To evaluate the state of the vegetation we applied the distribution of nature conservational categories (TVK) of Simon (1992) and the social behaviour types of Borhidi (1993, 1995) and for the plant species. The 'ecological ordering' and evaluation of species was done by lifeform types of Raunkiaer and Pignatti. The grazing as management type has major act in the keeping the diversity of grassland species – also as in our case –, but the weather and the year effect has a large impact on the diversity too. This survey was supported by the OTKA H-12423.

Keywords: *Gray Hungarian cattle, Festuca, grazing, wood-pastures*

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