

MAINTENANCE OF LOESS GRASSLANDS PATCHES IN THE PANNONIC BORDER REGIONS: IMPORTANCE OF LANDSCAPE STRUCTURE

Dragica Purger¹, András Horváth², Sándor Bartha²

¹ Sombor 25000, Gakovački put 109/A, Serbia, or: Pécs 7624, Barackvirág utca 27, Hungary
Corresponding e-mail: purger.dragica@ddkvozig.hu
² Institute of Botany and Ecology HAS, H-7163 Vácraát, Alkotmány utca 2-4, Hungary
e-mail: ahorvath@botanika.hu, sanyib@botanika.hu



INTRODUCTION

Loess areas are parts of the forest steppe zone in Hungary, where the climax community was *Aceri tatarico-Quercetum pubescentis roboris*. Considerable part of these habitats originally was covered by species-rich loess steppe grasslands. It was recognised, that the regional and local variations in floristic composition of loess grasslands are caused mainly by differences in edaphic and climatic conditions. Despite the long tradition of investigating loess vegetation in Hungary, the loess flora and vegetation of particular areas is not properly surveyed yet. Due to historic destructions and alterations, the area of loess grasslands have been reduced considerable in Hungary, resulting in patterns of highly fragmented stands with varying sizes, shapes and isolation. We would like to know how the loess flora and vegetation persist in an agricultural landscape and consequently, which are the most important factors that should be taken into consideration in planning of conservation activities. We compared the pattern, quality, and extent of remaining loess grassland fragments in two regions 1, Baranya-Hills and 2, Mezőföld, situated in southern and central Hungary, on the edge of Carpathian basin (Map 1.). The two areas differ in their biogeographic position, land use history and present landscape contexts. The aims of our investigations were to compare the landscapes structures of these two regions and to evaluate the diversity and species composition of loess grasslands as a function of their areas, configurations and their connectivity to adjacent habitats.

STUDY AREA

Baranya-Hills (BH) region is situated at the southern and east-southern foothills of the Mecsek Mts, its area is ca. 1450 km², elevation varied between 130-250 m a.s.l. It is a colline region, for centuries famous for vine producing. There are a lot of small settlements, fragmented landscapes of diffused structure (Fig. 1-2). As a consequence of the periodical ethnic migrations, social and economic changes, landscape structure in this region is continuously changing. Mezőföld (MF) region covers ca. 4400 km². A number of isolated valley-systems wedged in the loess plateau (Fig. 3-4). The landscapes have more-less stable structure, loess valleys for centuries have been used as pastures. The soil of the two regions is brown forest soil of chernozem character, formed on loess. The climate is moderately warm (10 °C) and moderately moist (690 mm).



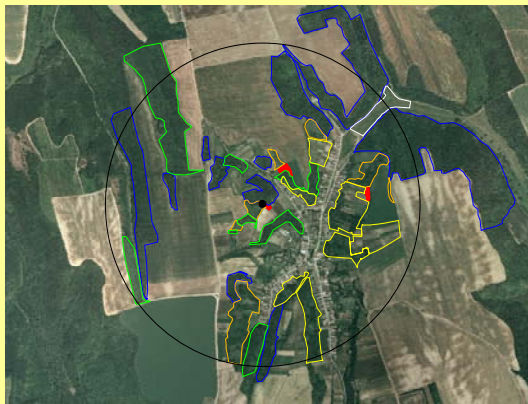
Map 1. Distribution of natural loess vegetation in Hungary (Study area is in Transdanubial part of the country)



Fig. 1-2. Dry grassland fragments, abandoned pastures covered with scrubs and set-aside (abandoned) fields are scattered in an agricultural landscapes of Baranya-Hills (Photo by D. Purger)



Fig. 3-4. Isolated loess valleys in Mezőföld in which great number of continental steppe plants persisted (Photo by A. Horváth)



Map 2. Satellite image show diffused structure of a typical landscape in Baranya-Hills with very small loess grassland (red) patches and abandoned fields (orange line). In a 1 km circle the most of area, except plough fields, is covered with Black-locust plantations (blue line) and scrubs (green) (drawn by D. Purger)



Fig 5. Fragmented landscape with small grasslands (abandoned fields) and Black-locust plantations near settlement (Photo by D. Purger)

RESULTS

The most of areas used as grasslands two hundred years ago, now are covered by Black-locust plantations or spontaneously invaded by this alien tree. Loess Oak forests remained on few localities, in extremely small areas. During the last fifty years a great part of grasslands was ceased and rapidly overgrown with scrub of Hawthorn (Fig. 2.) in both study regions. On the other hand, during the last decades loess grasslands have been formed on abandoned fields (set aside orchards, vineyards or plough fields) if the source of propagule is available.

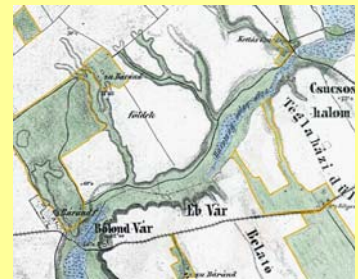
Distribution of plant species frequencies on regional scale in BH region as well as coenological relevés data set shows J - shaped species frequency distribution pattern: very few species occurred in all relevés. Infrequent species prevailed. The great dissimilarity between plots suggest that the size of the community pool depends mainly on local processes, e.g. on local management history and anthropogenic influences (indicated by the presences of many weeds)! At regional scale, these disturbances increase species richness, but locally they might cause selection, stochastic occurrence and extinction of species. We assume that the difference in size between the CSP and LSP, depends also on the habitat diversity and patch connectivity.

In the Baranya-Hills region weak correlation was found between patch area and local species richness ($P < 0,05$). Probably, because some relatively small isolated fragments still preserve relative great part of species pool, v.c. a larger patches of degraded grasslands contain relatively small number of species. In the Mezőföld strong correlation ($P < 0,01$) was found between species number (from 40 to 200 plants!) and area (1 to 40 ha). Varied types of grassland vegetation grow in loess valleys on slopes with different exposition. A type of xero-mesophilous forest-steppe grasslands association is *Euphorbia pannonicae* - *Brachypodium pinnati* Horváth 2002, which doesn't found in Baranya-Hills.

Generally, the relative floristic richness of the loess grasslands in the Baranya-Hills region can be explained by its geographic position. There are grasslands situated on the margin of steppe zone, connected with the regions with richer forest-steppe vegetation, and in the proximity are the Mecsek and Villány Mts, which can serve as propagule sources for species of xeric forests.

There are some plant species differential for Baranya-Hills (e.g. *Astragalus glycyphyllos*, *Helleborus odoros*, *Euphorbia esula*, *Anchusa italica*, *A. barbellieri*, *Bupleurum affine*, *Trifolium ochroleucum*, *Cirsium boujartii*). On the other hand, in Mezőföld region occur a number of plants which have not been registered in BH (e.g. *Euphorbia pannonica*, *Stipa* spp., *Jurinea mollis*, *Serratula radiata*, *Inula oculus-chrysi*, *Vinca herbacea*, *Nepeta parviflora*, *Crambe tatarica*, *Phlomis tuberosa*, *Astragalus dasyanthus*, *Oxytropis pilosa*). Loess grassland specialists and rare specialists (e.g. *Ajuga laxmanni*, *Taraxacum serotinum*, *Inula germanica*, *Linum hirsutum*) are rather scarce locally and regionally in both region.

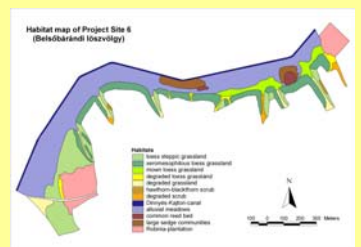
Due to flora gradient in Mezőföld region can be found greater proportion of Continental, Pontic- and Pontic-Pannonian plants. In the Baranya-Hills there are a greater proportion of Pontic-Submediterranean, Submediterranean and Pannonian-Balkan species.



Map 3: Landscape in Mezőföld on the 200 years old map



Map 4: Satellite image show that present context of the same loess valley is similar with historical structure of landscape in Mezőföld.



Map 5. Habitat map of loess valley near Belsőbáránd (Mezőföld) (Drawn by A. Horváth)

CONCLUSION

Our results show that history affects landscape structures and dynamics producing significant differences between the investigated regions. We conclude that the spatiotemporal patterns of agricultural landscape matrix has important role in dynamics and maintenance of loess grassland fragments. Therefore, nature conservation should consider the stability of the entire landscapes.

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QUESTIONS

- Does landscape history affect the present pattern of diversity and the present differentiation of vegetation?
- Do the general characteristics of the regional species pools of loess grasslands differ between the two regions?
- Are the preferences of plant species similar between regions?

METHODS

In the Baranya-hills 25 and in the Mezőföld regions 36 semi natural loess grassland patches were investigated. Vegetation maps of the study areas were made by Arc-view program, on the base of satellite images, as well as upon field work. Changes in the landscape structure were surveyed by analysing series of historical maps. The actual vegetation maps are compared with the vegetation patterns 200 years ago (sheets of the second military maps). Coenological relevés (4 m² and 400 m²) were recorded, and floristic lists were made. Nested sampling was used (—a larger sampling area contains all smaller areas). The species-pool approach (e.g. Pártel *et al.* 1996) and landscape ecological research methods were used. The regional species pool (RSP) is determined as a set of steppe-, forest steppe-, and forest species and some coenologically indifferent species which are able to grow potentially in loess grasslands. To filter a regional flora we used information about the coenological preference of species from phytocoenological surveys (Soó 1968, 1980, Borhidi 1993). We have determined community pool (CSP) for loess grasslands in the investigated areas as cumulative number of species present in the 25 and the 36 stands sampled. Local species pool (LSP) was considered as the set of species occurring in the landscape 1 km around the centre of plot. Regionally common and locally abundant (core) species — are those, present in at least 60% of plots, while scarce (satellite) species occur in up to 20% of plots.

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