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POSSIBILITIES OF SPECIATION FOLLOWING ANTHROPOGENOUS ENVIRONMENTAL CHANGES IN THE CENTRAL SANDY AREA OF THE CARPATHIAN BASIN THROUGH THE EXAMPLE OF *FESTUCA TAXA*

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Abstract: Our goal is to check and revise the dominant *Festuca* species of vegetation types formed under extraordinary conditions through morphotaxonomic and ploidy analyses. To accomplish this, we had to add examinations of dominant species in grasslands further from the Danube in the Carpathian Basin and East Central Europe. Individuals of examined taxa were analysed using 26 parameters of the inflorescences. Ploidy was analyzed using low cytometry. After deforestation and shrub cutting, bare soil patches of areas exposed to anthropogenous effects had provided an opportunity new vegetation to form. As a result of this work, new species *Festuca pseudovaginata* had been discovered here, which is endemic in the Carpathian Basin. Survey continues in order to clear other hardly identifiable taxa. The results have confirmed the presence of the species, but we also have new occurrences discovered. We verified *F. vaginata* and *F. pseudovaginata* from open sandy areas. In closing grasslands *F. javorkae* and *F. wagneri* appears. In Slovakia we found *F. wagneri* and *F. pseudovaginata* as new species in the country's flora. We could add new appearance data of *F. javorkae*, and describe *F. brevipila* as a new taxon of the Hungarian flora. Furthermore, a possibly new species also appeared during our research, on which we found distinctive morphological features, but to describe it as new species it needs further ITS analyses.

Keywords: *Festuca vaginata*, *Festuca psammophila* series, sandy vegetation

INTRODUCTION

Those taxa of *Festuca* species in the Carpathian Basin which have bowed base and stem leaves are identified and mentioned by various authors as belonging to the aggregation of *Festuca ovina* [1-9]. These taxa can be identified easily based on their characteristic tissue structure and molecular genetic analyses [10-16]. Pawlus [17] separated a new series within the *Festuca* genus. This is the *psammophila* series, which includes *F. polesica* Zapal, *F. vaginata* W. K., *F. psammophila* Host. *F. pallens*. Subsequently, Šmarda et al. [17] added *F. pseudovaginata* Penksza and *F. glaucina* Stohr. to it. The species which were determinate in the original natural vegetation Borhidi et al. [18] were expected to appear on the new bare soil patches. So we wanted to answer the question: on new surfaces formed by human interventions, is there a possibility to form new vegetation units and species, or will the natural vegetation and its main species appear?

MATERIALS AND METHODS

The *Festuca* individuals collected in the Carpathian Basin were put through morphological and ploidy examination. Meanwhile, we made coenological records in every type of sandy grasslands along the Danube from Austria to Romania. Furthermore, we set up a collection of living plants, which ensures individuals growing in the same conditions to molecular surveys. We also modelled the appearance, composition and dominant species of new vegetation on bare soil surfaces. The area has been being managed since 2006. The study area lies on the Pest plain near the left bank of the Danube. For data analysis and presenting the results, PAST (Paleontological Statistics Version 3.06) Hammer [19] and Hammer et al. [20] statistical software was used.

RESULTS AND DISCUSSION

Based on our results, we confirmed the appearance of *Festuca vaginata*, *F. pseudovaginata*, *F. javorkae*, *F. wagneri* in the natural grasslands, and discovered new occurrences of *F. brevibila* and *F. javorkae* in the area. In Slovakia, *F. wagneri* appeared as a new species of the flora of the country. *Festuca pseudovaginata* habits only the Pannon region, we found endemic and natural stands of it, but on secondary habitats it was confirmed as a completely new species. Furthermore, taxa of disturbed vegetations are being examined. These habitats are potential hotspots of speciation.

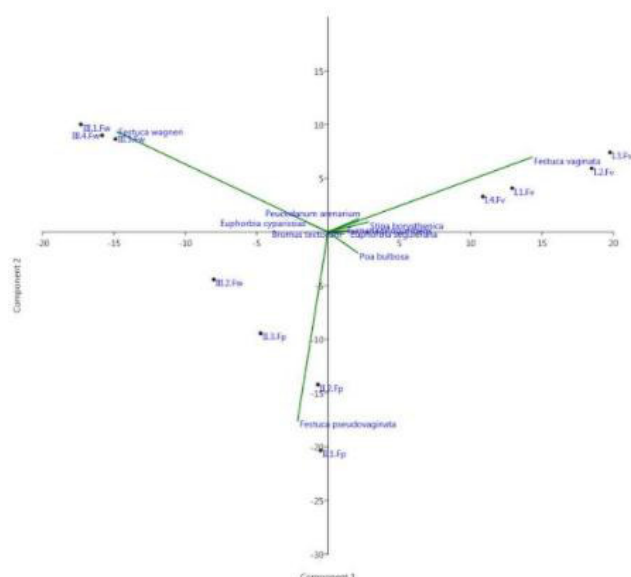


Figure (1) PCA analysis of the vegetation types in the central sandy part of the Carpathian Basin (*Festuca vaginata* vegetation types: **I.1.Fv**: Little Hungarian Plain, **I.2.Fv**: northern part of Kiskunság, **I.3.Fv**: southern part of Kiskunság, **I.4.Fv** southernmost part. *Festuca pseudovaginata* **II.1.Fp**: degraded type dominated by weeds, **II.2.Fp**: *erdős terület*, **II.3.Fp**: természetes gyepek. *Festuca wagneri* **III.1.Fw**: Csallóköz, **III.2.Fw**: Northern part of Kiskunság, **III.3.Fw**: Southern part of Kiskunság, **III.4.Fw**: in the southernmost part)

CONCLUSIONS AND RECOMMENDATIONS

In earlier literature, *Festuca vaginata* was treated as the only dominant grass taxon of the open calcareous sandy grasslands. This was debated by Pócs [21] when finding *F. wagneri* in Hungary for the first time, however, he treated it as a forest-steppe species. There was no consensus on the coenological affiliation of *F. wagneri*, although its taxonomy was clarified by Penksza and Engloner [22] when describing it as a separate species. Since older specimens lose their epidermal hairs and their sclerenchyma becomes annular, a greenish grass taxon was identified as *F. wagneri* in samples of *F. vaginata* grasslands, until Penksza [23] described it as a new species named *F. pseudovaginata*, which also forms an association new to science. Later it was confirmed that the soil parameters of this association differ greatly from the others Bajor et al. [24], i.e., Ca and Mg content. However, in the present survey soil profile was made for the first time, and its analysis confirmed what environmental backdrop *F. pseudovaginata* indicates. This species has evolved on forest soils. The soil profile showed 1,5 m deep forest soil, and the amount of organic matter was higher.

On bare soil surfaces of areas exposed to anthropogenous effects, two species of the genus *Festuca* have become dominant. One of them, *Festuca pseudovaginata* was described as a new species Szabó et al. [25], and is endemic in the Carpathian Basin Penksza et al. [16] (Figure 1). Examinations are being continued in order to clear hardly identifiable taxa. Our survey has confirmed the occurrence of the species so far, and we discovered new occurrences too.

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