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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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 analysed using low cytometry. After deforestation and shrubcutting, 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 identificable taxa. The results have confirmed the presence of the species, but we also have new occurences 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.

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* (Adler et al., 1994; Horánszky et al., 1971; Májovszký, 1962; Patzke, 1968; Soó, 1973; Stace et al., 1992; Săvulescu, 1972; Schwarzová, 1967; Armonien et al., 2010). These taxa can be identified easily based on their characteristic tissue structure and molecular genetic analyses (Bednarska et al., 2017; Galli et al., 2001, 2006; Šmarda et al., 2007; Šmarda, 2008; Šmarda and Kočí, 2003; Pawlus, 1985). Pawlus (1985) 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. (2007) added *F. pseudovaginata* Penksza and *F. glaucina* Stohr. to it.

The species which were determinate in the original natural vegetation (Borhidi et al., 2012) were expected to appear on the new bare soil patches. So we wanted to aswer 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?

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.

Based on our results, we confirmed the appearance of *Festuca vaginata, F. psudovaginata, 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.

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

(Penksza, 2003), and is endemic in the Carpathian Basin (Penksza et al., 2019). Examinations are being continued in order to clear hardly identificable taxa. Our survey have confirmed the occurrence of the species so far, and we discovered new occurences too.

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