Ploidy level variability of some Central European fescues (*Festuca* subg. *Festuca*, Poaceae)

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Abstract: Using flow cytometry, ploidy levels for 205 living samples of various European species of *Festuca* L. subg. *Festuca* were determined. We used successfully flow cytometry also for ploidy level estimation of other 28 additional, ½–2-year-old herbarium specimens. About 23 taxa and two spontaneous hybrids originating from natural populations from Austria, the Czech Republic, France, Hungary, Germany, Italy, Poland, Romania and Slovakia were studied. The following ploidy levels were documented: *F. alpestris* $2n = 2x$; *F. amethystina* $2n = 4x$; *F. billyi* $2n = 6x$; *F. brevipila* $2n = 6x$; *F. carnuntina* $2n = 6x$; *F. cinerea* $2n = 4x$; *F. degenii* $2n = 4x$; *F. duernsteinensis* $2n = 4x$; *F. duvalii* $2n = 4x$; *F. gracilior* $2n = 2x$; *F. lemanii* $2n = 6x$; *F. ovina* subsp. *guestfalica* $2n = 4x$; cf. *F. ovina* × *F. pallens* $2n = 2x$; *F. pallens* $2n = 2x$, $3x$, $4x$; *F. psammophila* $2n = 2x$; *F. pseudodalmatica* $2n = 4x$; *F. pseudovina* $2n = 2x$; *F. rupicola* $2n = 6x$; *F. stricta* $2n = 6x$; *F. vaginata* subsp. *dominii* $2n = 2x$; *F. vaginata* subsp. *vaginata* $2n = 2x$; *F. vaginata* × *F. valesiaca* $2n = 2x$; *F. valesiaca* $2n = 2x$; *F. versicolor* subsp. *versicolor* $2n = 2x$; *F. wagneri* $2n = 4x$.

Key words: dry material, flow cytometry, karyology, polyploidy.

Introduction

Including about 360 species (Watson & Dallwitz, 1999), *Festuca* L. is one of the largest genera within the Poaceae family. Clayton & Renvoize (1986) divided the genus into the nine subgenera, with the most species-rich group being *Festuca* subg. *Festuca*. One center of diversity of this subgenus is located in the mountains and uplands of central and southern Europe. Within the subgenus, two sections, sect. *Festuca* and sect. *Variae* Hack., are recognized by Tzvelev (1971). Further division in smaller species groups and aggregates vary in the concepts of different authors.

In subgen. *Festuca*, there is a remarkable morphological similarity among the taxa included, caused to a great extent by the morphological variability of particular characters. Based on morphological characters alone, interpretation of many taxa is very problematic and sometimes nearly impossible. As already proved in the 1920s, ploidy level variability is very important for taxon delimitation (Litardière, 1923; Lewitsky & Kuzmina, 1927). Soon it was shown that the most problematic species groups of the genus represent more or less miscellaneous polyploid complexes, and ploidy level became one of the basic classification and description criteria. Without knowledge of ploidy level, almost no systematic and taxonomic study can be done in this group at present.

This raises the question of what method to use for ploidy level determination. The widely used acetoorcein method and similar techniques are very time-consuming and do not allow determination of a large amount of samples. Recently, flow cytometry has become the method of choice for rapid and accurate determination of ploidy level and DNA content in fresh plant tissues (Doležel, 1997). In *Festuca*, flow cytometry was first used by Huff & Palazzo (1998) and Arumuganathan et al. (1999) and was successfully applied in *Festuca* sect. *Variae* by Wallossek (1999).

The base chromosome number of *Festuca* species is $x = 7$, diploids ($2x$) possess 14 chromosomes, triploids ($3x$) 21, tetraploids ($4x$) 28 and hexaploids ($6x$) 42 chromosomes; sometimes accessory chromosomes (B-chromosomes) have also been reported (Mizianty & Pawlus, 1984; Fuente et al., 2001; Šmarda & Kočí, 2003).

The aim of this work was to determine the ploidy levels of Central European species of *Festuca* subg. *Fes-*