Intergeneric hybrid *Festuca rubra* × *Vulpia myuros* in the Czech Republic

Mezirodový hybrid *Festuca rubra* × *Vulpia myuros* nalezen v České republice

František K r a h u l e c[1] & Jaroslava N e s v a d b o v á[2]

[1]*Institute of Botany, Academy of Sciences of the Czech Republic, 252 43 Průhonice, Czech Republic, e-mail: krahulec@ibot.cas.cz;* [2]*West Bohemian Museum, Kopeckého sady 357/1, CZ-301 00 Plzeň, Czech Republic, e-mail: jnesvadbova@zcm.cz*

Krahulec F. & Nesvadbová J. (2007): Intergeneric hybrid *Festuca rubra* × *Vulpia myuros* in the Czech Republic. – Preslia 79: 63–68.

A hybrid between *Festuca rubra* and *Vulpia myuros* was found in SW Bohemia, Czech Republic in 1991. It is the first documented occurrence of a hybrid between *Festuca* and *Vulpia* in Central Europe. Its characteristic features, evident in the field, are sterility, sheath of upper leaf covering the culm up to panicle, the ratio of the lengths of lower and upper glume between 0.49 and 0.71, and intermediate awns. The occurrence of this hybrid at other localities in Central Europe is still possible in spite of the decrease of number of localities for *Vulpia* species.

K e y w o r d s : Czech Republic, *Festuca rubra*, *Festulpia*, hybridization, *Vulpia myuros*

Introduction

Hybrids between different genera are uncommon in Central Europe; some orchid hybrids are the best known examples. Within the *Poaceae*, *Festuca* hybridizes with *Lolium.* In Western Europe (Great Britain and the Netherlands), hybrids between *Festuca* and species of the genus *Vulpia* are documented in detail, both in the field and experimentally (Stace & Cotton 1974, Willis 1975, Barker & Stace 1982, 1984, 1986, Stace & Ainscough 1984, Ainscough et al. 1986, van der Meijden 1996, Stace 1997). However, there are no hybrids between *Festuca* and *Vulpia* reported from Central Europe. The first author, when working with material of *Festuca rubra* deposited in the herbarium of the West Bohemian Muzeum in Plzeň, found a specimen collected by the second author, which is evidently a hybrid between *Festuca* and *Vulpia*. Below is a detailed description of its morphology; further discoveries of such hybrids cannot be excluded in spite of the fact that *Vulpia myuros* is not common and *V. bromoides* is a rare species (Holub & Procházka 2000).

Festuca rubra L. × *Vulpia myuros* (L.) C. C. Gmelin

Description of the specimen

A photograph of the plant is presented in Fig. 1, leaf anatomy in Fig. 2 and detail of a spikelet in Fig. 3. Some quantitative characteristics of the inflorescence and spikelet parts are given in Table 1. They are compared with values for *Vulpia myuros* and *Festuca rubra* recorded in the literature (Hubbard 1992, Connert 2000).

A tussock perennial, tillers intravaginal, consisting of culms and sterile tillers. Leaves narrow (*Festuca*-like), anatomy closer to *F. rubra* (Fig. 2). Culms covered by leaf sheath

Table 1. – Values of certain morphological characters and their variation (expressed as standard deviation, s.d.) of the *Festulpia* specimen along with comparable values for *Festuca rubra* and *Vulpia myuros* (from Hubbard 1992, Connert 2000 and Edgar & Connor 2000); n – number of specimens examined.

Character	Spikelet length (mm)	Panicle length (cm)	No. of florets	Lower glume length (mm)	Upper glume length (mm)	Lower/upper glume ratio	Lemma length (mm)	Awn length (mm)
Festulpia								
Mean	8.64	12.55	2.83	2.48	4.17	0.50–0.64	4.81	3.17
s.d.	1.07	1.05	0.37	0.21	0.18		0.53	0.16
n	12	10	12	12	12	12	12	12
Festuca rubra	7–10	7–14	3–9	2.5–3.5	3.0–4.5		4.5–5.5 (–6.0)	0.5–3.0
Vulpia myuros	6–10	5–20	3–7	0.5–2.5	3–8		4.5–7.0	< 15

up to the panicle. Panicle relatively long, its branches uneven and short in lower part, in upper part short, with individual spikelets (*Vulpia*-like). Spikelets short, with (2–) 3 flowers. Flowers sterile, lacking a caryopsis. Glumes uneven, the upper on average 1.5 × longer than the lower. Awns usually 3 mm long. Stamens three, hidden between lemma and palea. Anthers 1.05–1.10 mm long.

This combination of characters indicates its hybrid origin: culm covered by leaf sheath (*Vulpia* like), architecture of inflorescence (combines both *Festuca* and *Vulpia*), uneven glumes (more *Vulpia* like), number of flowers (as in *Vulpia*), intermediate length of awns. The length of panicle is characteristic of hybrids with *V. myuros*, hybrids with *V. bromoides* have a short panicle.

Identity of the hybrid

Both native species of *Vulpia*, i.e. *V. myuros* and *V. bromoides,* occur in Bohemia and are known to hybridize with *Festuca rubra*. The sizes of both the hybrid of *F. rubra* with *V. bromoides* and *V. myuros* are published by Ainscough et al. (1986) and Stace (1997). The comparison with these values shows that the hybrid found in the SW part of the Czech Republic is a hybrid between *F. rubra* and *V. myuros*. The length of the panicle especially indicates the influence of *V. myuros*. This combination is also more probable because of the distribution of both species; *V. myuros* is a rare species in this area and *V. bromoides* is absent. *Festuca rubra* subsp. *rubra* is very probably the second parent, as it is the most common type in the region and in the vicinity of original locality. The possibility that other type could have been introduced (intentionally or unintentionally) directly to the locality cannot be excluded but since the population does not exist any longer and no other herbarium specimens are available collected, it cannot be proved.

Nomenclature

The name for the hybrid genus (nothogenus) is ×*Festulpia* Melderis ex Stace et R. Cotton. A binomial name for the hybrid between *Festuca rubra* and *Vulpia myuros* has not been suggested.

Fig. 1. – General view of the hybrid *Festuca rubra* × *Vulpia myuros*.

Fig. 2. – Cross-section of the leaf of the hybrid plant.

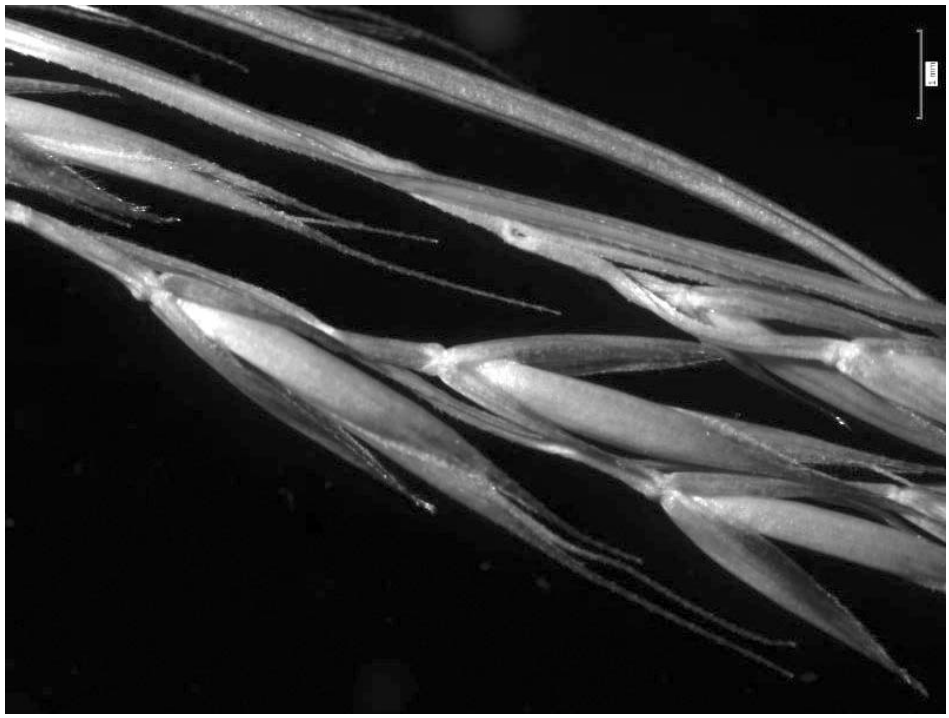

Fig. 3. – Details of the spikelets of the hybrid plant.

The distribution and habitat conditions

The hybrid was found in SW part of the Czech Republic (SW Bohemia): Sušice, Dolní Dvorce: grassland slope N of the Račí potok stream, 350 m NW of the village of Dolní Dvorce, 49°10'25" N, 13°32'8" E, 13 Juni 1991. The composition of vegetation is documented by the following relevé (rel. 05/10 by J. Nesvadbová, 11-degree cover scale of Domin-Hadač, cf. Kopecký 1961); 580 m a.s.l., S exposure, slope 30°, 25 m^2, cover of herb layer (E_1) 60%: *Thymus pulegioides* 4, *Viscaria vulgaris* 4, *Hieracium pilosella* 3, *Festuca ovina* 3, *Carex umbrosa* 3, *C. caryophyllea* 2, *C. muricata* agg. 2, *Juniperus communis* 2, *Arrhenatherum elatius* 2, *Jasione montana* 2, *Campanula rotundifolia* 2, *C. patula* 2, *Ranunculus bulbosus* 2, *Plantago lanceolata* 2, *Festuca rubra* 2, *Luzula campestris* 2, *Dianthus deltoides* 1, *Viola canina* 1, *Polygala vulgaris* 1, *Orchis morio* 1, *Achillea millefolium* 1, *Rumex acetosella* 1, *Pimpinella saxifraga* 1, *Hypericum perforatum* 1, *Briza media* 1, *Carlina acaulis* 1, *Knautia arvensis* 1, *Centaurea scabiosa* 1, *Veronica chamaedrys* 1, *V. verna* 1, *Ononis repens* 1, *Poa pratensis* 1, *Leucanthemum ircutianum* 1, *Potentilla erecta* 1, *Holcus mollis* 1, *Taraxacum* sect. *Ruderalia* 1, *Ranunculus acris* 1, *Erophila verna* 1, *Trisetum flavescens* 1, *Dactylis glomerata* 1, *Picea abies* (planted) 2, *Betula pendula* 1, *Corylus avellana* 1, *Crataegus* sp. 1. – Remark: The hybrid between *Festuca* and *Vulpia* was not identified, it is hidden among *Festuca rubra*. Its abundance in the relevé is unknown.

The community belongs to the order *Nardetalia*, *Violion caninae* alliance, association *Campanulo rotundifoliae-Dianthetum deltoidis* Balátová-Tuláčková 1980 (syn. *Thymo pulegioidis-Festucetum ovinae* Oberdorfer et Görs in Görs 1968). It is an acidiphilous grassland, with open canopy and soil surface (cover of herb layer 60%), in which the annuals *Erophila verna* and *Veronica verna* grow as well as some rather rare species such as *Orchis morio*. *Vulpia myuros* was not detected at that time, but it could easily have been overlooked when young or, as an annual, it may not have been present at that time.

In 2006, the slope was not covered with grassland. It was forested at the beginning of the 1990s and at present is covered with a young spruce plantation. Its margins are fertilized by the run off from adjacent fields. Species of poor grassland occur only rarely there, e.g. *Dianthus deltoides* and *Jasione montana*. But the sward is closed with no open ground.

Both *Vulpia* species occurring in Central Europe belong to rare and endangered species: *V. bromoides* is classified as CI (critically endangered) and *V. myuros* as CIII (endangered) in the Czech Republic (Holub & Procházka 2000). In S Bohemia, *V. bromoides* has not been recorded for more than 30 years (Chán 1999), *V. myuros* is still present in the region (Hadinec & Lustyk 2006). A similar situation to that in the Czech Republic occurs close by in Austria (Adler et al. 1992). In Germany, *V. myuros* is more common than *V. bromoides* (Jäger & Werner 2002), but not so rare as in the Czech Republic or Austria. In spite of the relative rarity of both *Vulpia* species, further records of hybrids between them and members of the *F. rubra* agg. cannot be excluded, especially because *V. myuros* has recently appeared from time to time in different ruderal habitats. The main reason for the absence or rarity of hybrids is a shortage of more permanent habitats, which disappeared with the change in agriculture practices and the nitrogen pollution of the whole of Central Europe. In permanent habitats, with open ground, both species met more regularly in the past. Short-term ruderal habitats are less suitable for hybrid establishment.

In Europe, hybrids between *Festuca rubra* and different species of *Vulpia* are only known from Great Britain (Stace 1997 – *V. bromoides, V. myuros, V. fasciculata*) and the Netherlands (van der Meijden 1996 – *V. bromoides, V. myuros*).

Acknowledgements

Clive Stace is acknowledged for valuable suggestions, Tony Dixon for improving our English and Jiří Machač for taking the photographs. The work was supported by a grant from the Czech Grant Agency no. 206/04/0786 and institutional long-term research plan AV0Z60050516 from the Academy of Sciences of the Czech Republic.

Souhrn

V roce 1991 sbírala J. Nesvadbová nedaleko Dolních Dvorců u Sušice rostlinu, která byla určena jako hybrid mezi *Festuca rubra* a *Vulpia myuros* (nothogenus ×*Festulpia*). To je v souladu se skutečností, že *V. bromoides* je v jihočeské části Předšumaví nezvěstná po více než 30 let (údaje ze západočeské části chybějí), zatímco *V. myuros* se v Předšumaví stále vyskytuje, i když nepatří k hojným druhům. Tento hybrid je sterilní a je možno jej identifikovat zejména podle horního stébelného listu, jehož čepel při bázi dosahuje až těsně pod latu, a také podle sterility. Dosud známý pouze z Nizozemí a Velké Británie, jeho další výskyt však nelze vyloučit zejména tam, kde se *V. myuros* vyskytuje pravidelně v nezapojených trávnících spolu s *F. rubra*.

References

Adler W., Oswald K., Fischer R. et al. (1994): Exkursionsflora von Österreich. – Ulmer Verlag, Stuttgart und Wien. [1180 pp.]

Ainscough M. M., Barker C. M. & Stace C. A. (1986): Natural hybrids between *Festuca* and species of *Vulpia* section *Vulpia*. – Watsonia 16: 143–151.

Barker C. M. & Stace C. A. (1982): Hybridization in the genera *Vulpia* and *Festuca*: the production of articficial F1 plants. – Nordic J. Bot. 2: 435–444.

Barker C. M. & Stace C. A. (1984): Hybridization in the genera *Vulpia* and *Festuca* (*Poaceae*): the the characteristics of artificial hybrids. – Nord. J. Bot. 4: 289-302.

Barker C. M. & Stace C. A. (1986): Hybridization in the genera *Vulpia* and *Festuca*: meiotic behaviour of artificial hybrids. – Nordic J. Bot. 6: 1–10.

Chán V. (ed.) (1999): Komentovaný červený seznam květeny jižní části Čech [Annotated red list of of the South Bohemian Flora]. – Příroda 16: 1–284.

Connert H. J. (2000): Pareys Gräserbuch. Die Gräser Deutschlands erkennen und Bestimmen. – Parey Buchverlag, Berin. [592 pp.]

Edgar E. & Connor H. E. (2000): Flora of New Zealand. Vol. 5. Grasses. – Manaaki Whenua Press, Lincoln. [650 pp.]

Hadinec J. & Lustyk P. (eds.) (2006): Additamenta ad floram Reipublicae Bohemicae V. – Zpr. Čes. Bot. Společ. 41: 173–257.

Holub J. & Procházka F. (2000): Red list of vascular plants of the Czech Republic – 2000. – Preslia 72: 187–230.

Hubbard C. E. (1992): Grasses. Ed. 3. – Penguin Books, London. [476 pp.]

Jäger E. J. & Werner K. (2002): Exkursionsflora von Deutschland. Gefässpflanzen: Kritischer Band. Ed. 9. – Spektrum, Akademischer Verlag, Heidelberg & Berlin. [948 pp.]

Kopecký K. (1961): Fytocenologický a fytoekologický rozbor porostů *Phalaris arundinacea* L. na náplavech střední Berounky [Phytosociological and ecological analysis of *Phalaris arundinacea* stands on deposits of the middle section of the Brounka river]. – Rozpr. Čs. Akad. Věd, Praha, ser. math.-nat., 71/6: 1–105.

Stace C. (1997): New Flora of the British isles. Ed. 2. – Cambridge Univ. Press. [1130 pp.]

Stace C. A. & Ainscough M. M. (1984): Continuing addition to the gene-pool of the *Festuca rubra* aggregate (*Poaceae*: *Poeae*). – Pl. Syst. Evol. 147: 227–236.

Stace C. A. & Cotton R. (1974): Hybrids between *Festuca rubra* L. sensu lato and *Vulpia membranacea* (L.) Dumort. – Watsonia 10: 119–138.

van der Meijden R. (1996): Heukel's Flora van Nederland. Ed. 22. – Wolters-Noordhoff, Groningen.

Willis A. J. (1975): *Festuca* L. × *Vulpia* C. C. Gmel. = × *Festulpia* Melderis ex Stace & Cotton. – In: Stace C. A. (ed.), Hybridization and the flora of the British Isles, p. 552–554, Academic Press, London.

Received 6 September 2006
Revision received 12 October 2006
Accepted 15 October 2006