

Benefits of × *Festulolium* varieties in European agriculture

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Abstract

Festulolium (× *Festulolium*) has been listed as a grass genus on the European list of Plant Varieties since 2004. DLF-Trifolium has made many trials with *Festulolium* varieties under different managements and climatic conditions across Europe. Results of these trials show the benefits of *Festulolium* and give a basis for recommendations on how to use varieties either as pure crops or in mixtures in various European regions.

Keywords: × *Festulolium*, yield, mixtures, feeding quality, persistence, variety

Introduction

Festulolium varieties have the potential to combine positive traits from both parental genera: fast development, high yield and high feeding quality from ryegrass (*Lolium*) and persistence and tolerance to stressful conditions (drought, frost) from fescue (*Festuca*). An extensive breeding programme in DLF-Trifolium has resulted in the successful registration of *Festulolium* varieties of various types. These varieties have been thoroughly tested under different managements and climatic conditions in field trials across Europe. The aim was to investigate yield, feeding quality, resistance to biotic and abiotic stress conditions and its utilization in grass-legume mixtures. All results were compared with top ryegrass or fescue varieties. This paper presents some of these results.

Materials and methods

Performance of *Festulolium* varieties under oceanic conditions was tested in two field trials established in autumn 2012 in Moerstraten, the Netherlands. Each trial included 18 entries in two replicates, plot size 10 m². Trials were harvested with a Haldrup F-55 in 2013 (4 cuts) and 2014 (5 cuts). Dry matter yield was calculated from moisture measured by a spectrometer (Corona Plus 45 NIR) on the machine. All yield results and scores were calculated by analysis of variance (ANOVA) using SAS/STAT® Software.

A long-term mixture trial was established in a flooded area near Odra river in Hladke Zivotice, Czech Republic in 1988. Mixtures were tested in plots of 100 m² (10×10 m) in two replicates. The trial was harvested with a Hege 212, with 3 cuts per year in each of 7 consecutive years. Composition of the original mixture was: *Festuca pratensis* 33%, *Poa palustris* 1%, *Dactylis glomerata* 9%, *Festuca rubra* 12%, *Agrostis gigantea* 3%, *Poa pratensis* 5%, *Lolium perenne* 17% and *Phleum pratense* 20%. In the tested mixture *F. pratensis* was replaced by the tall fescue-type *Festulolium* cv. Felina.

Festulolium krasanii cv. Fojtan was tested in comparison with *F. arundinacea* cv. Jordane and a mixture of two diploid and two tetraploid varieties of *L. perenne* at four different locations in Denmark in 2008 and 2009. Trials were cut 4–5 times per year and samples from each cut and location were analysed by near-infrared spectrometry.

Results and discussion

Ryegrass-type *Festulolium* cv. Perseus and two breeding lines were compared with *L. perenne*, *Lolium multiflorum* and *L. hybridum* in the Netherlands (Figure 1). The highest yields were harvested for all varieties in the first two cuts in the first harvest year. The yield decreased from the first to the second

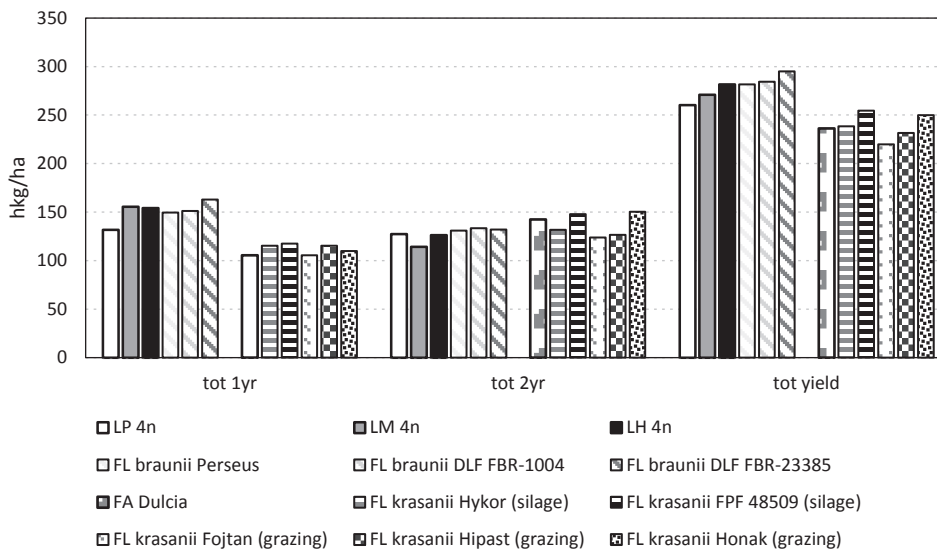


Figure 1. Yield comparison of Festulolium (FL) varieties, and original ryegrass (LP, LM, LH) and tall fescue (FA) species.

harvest year for *L. multiflorum* and, to a less extent, for *L. hybridum*, whereas the yield of *L. perenne* was similar in both harvest years. All Festulolium varieties of the ryegrass type yielded similar to *L. multiflorum* in the first harvest year and at the level of *L. perenne* in the second year. The total yield of these Festulolium varieties exceeded *L. hybridum* by 1-5%, *L. multiflorum* by 5-9%, and *L. perenne* by 9-13%.

Tall fescue-type Festulolium varieties Hykor, Fojtan, Honak, Hipast and two breeding lines were compared with *F. arundinacea* cv. Dulcia in the Netherlands (Figure 1). Compared with the ryegrass trial, the yield was distributed more evenly over the growing season and yields were higher in the second year than in the first year. The individual Festulolium varieties of the tall fescue type reached dry matter yields that were 95% to 108% that of cv. Dulcia.

In a standard mixture for permanent meadows in the Czech Republic, replacement of *F. pratensis* (33% in the mixture) by *Festulolium krasanii* cv. Felina resulted in an increase in hay yield of 1-2 Mg per year from from the 2nd to the 7th harvest year (Figure 2).

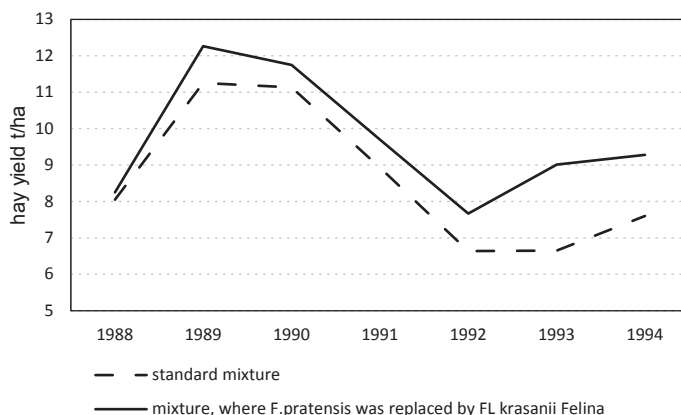


Figure 2. Replacing meadow fescue with Festulolium of tall fescue type in permanent mixture.

Table 1. Feeding quality of *Festulolium krasanii* (Fk) variety Fojtan compared to *Lolium perenne* (Lp) and *Festuca arundinacea* (Fa) (Nielsen K.A., 2008, 2009).¹

	% crude protein in DM	% sugar in DM	% NDF in DM	D-NDF	DOM	NELp20 MJ kg ⁻¹ DM
1 st year (2008)						
Lp	12.9	15.7	45.4	67.1	74.6	6.28
Fa Jordane	14.0	10.4	50.6	64.3	71.0	6.00
Fk Fojtan	14.5	10.5	49.6	66.5	72.6	6.16
2 nd year (2009)						
Lp	15.6	16.2	42.0	71.6	78.2	6.31
Fa Jordane	15.5	7.8	51.7	64.1	71.4	5.76
Fk Fojtan	15.9	7.5	51.3	65.7	72.5	5.87

¹ DM = dry matter; NDF = neutral detergent fibre; D-NDF = digestible NDF; DOM = digestible organic matter.

Trials in Denmark (Table 1) showed that the tall fescue-type *Festulolium* variety Fojtan has a digestibility of neutral detergent fibre and organic matter between that of its two parent components, tall fescue and perennial ryegrass. Likewise, the energy concentration NEL20, MJ kg⁻¹ dry matter, is higher than pure tall fescue but lower than perennial ryegrass.

Conclusions

Festulolium braunii = *L. multiflorum* × *F. pratensis* (4×) is currently the *Festulolium* species with the most registered varieties. Morphology, yield and feed quality is similar to Italian ryegrass (*L. multiflorum*) but persistence, winter hardiness and drought tolerance is better. Varieties from this group are suited for silage production as pure crop or in mixture with other grasses, clover or alfalfa.

Festulolium loliaceum = *L. perenne* × *F. pratensis* (2×, 4×) is similar to perennial ryegrass (*L. perenne*) or hybrid ryegrass (*L. boucheanum*). These types can replace perennial or hybrid ryegrass in different mixtures, resulting in higher yield and improved persistence.

Festulolium krasanii = *L. multiflorum* × *F. arundinacea* backcrossing into *F. arundinacea* (6×) varieties are similar to tall fescue (*F. arundinacea*) as far as yield and persistency is concerned, but late varieties like Fojtan have a better feeding quality.

References

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