

# The ensilability of different varieties of *Festulolium*

Wyss U.<sup>1</sup> and Frick R.<sup>2</sup>

<sup>1</sup>Agroscope, Ruminant Research Unit, 1725 Posieux, Switzerland; <sup>2</sup>Agroscope, Grazing Systems Research Unit, 1260 Nyon, Switzerland

## Abstract

*Festulolium* varieties are hybrids of fescue (*Festuca*) and ryegrass (*Lolium*). This hybrid (Schedonorus) was developed to utilise the positive characteristics of the two species, namely, yield and persistence. In this study, *Festulolium* varieties were cultivated in small plots at Agroscope in Changins, Switzerland, from 2015 to 2017. For the ensilability test conducted in 2016, the forage of the first and second cuts of six *Festulolium* varieties, two fescue varieties (Préval and Paradisia) and two hybrid ryegrass varieties (Daboya and Dorcas) were harvested from three plots. The forage was wilted on the field to 28% dry matter (DM) for the first cut and 57% DM for the second cut and ensiled in laboratory silos. After storage for 90 days, the silages were opened, and the silage quality was analysed. The forage of the first cut had a higher crude protein and sugar content as well as a lower ADF/NDF content compared to that of the second cut. The *Festulolium* varieties had nearly the same chemical composition as the ryegrass varieties, but differences concerning the fibre, crude protein and sugar contents were detected relative to the fescue varieties. All the silages had only traces of butyric acid and showed good fermentation qualities. Because of the higher DM content of the forage of the second cut, lactic acid fermentation was limited, resulting in a smaller decrease in pH in all varieties.

**Keywords:** *Festulolium*, ryegrass, fescue, variety trials, silage quality

## Introduction

*Festulolium* varieties are hybrids of fescue (*Festuca*) and ryegrass (*Lolium*). Ryegrass varieties have wide adaptability, rapid establishment, a high response to high soil fertility and give high yields of highly digestible forage. However, ryegrasses can suffer from poor persistency and climatic stress in drought conditions. In comparison, fescues contribute more mid-summer growth and have greater drought tolerance. Nevertheless, fescues have relatively poor palatability and digestibility (Grogan *et al.*, 2018). The *Festulolium* hybrids were developed to combine the positive characteristics of the two species, namely, yield and persistence. Between 2015 and 2017, Agroscope in Changins, Switzerland, tested different varieties of *Festulolium*, fescue and ryegrass for their agronomic properties (Frick *et al.*, 2018). No silage additive was added. The aim of the investigation presented here was to compare the ensilability and silage qualities of the *Festulolium* varieties with those of the fescue and ryegrass varieties.

## Materials and methods

The forage of six *Festulolium* varieties (Felimare, Helus, Hopej, AberNiche, Bb 2540 and Fedoro), the fescue varieties Préval and Paradisia and the hybrid ryegrass varieties Daboya and Dorcas were sown in small plots in Changins, Switzerland, in 2015. The experimental design was a randomized complete block design with four blocks (replicates), but only the forage of three blocks was used for the silage trial. In 2016, the forage of the first cut, cutting date 9 May, and the second cut, cutting date 27 June, were wilted and ensiled in laboratory silos with a capacity of 1.5 L. The forage of the different plots' repetitions were ensiled separately. Three laboratory silos were used for each treatment. No silage additive was added. Before ensiling and after 90 days of storage, samples were taken, and the dry matter (DM) and nutrient content were analysed using near-infrared spectroscopy (NIRS) (Ampuero and Wyss, 2014). Additionally, the fermentation parameters (pH, acids and ethanol) in the silages were analysed. The data were analysed by one-way ANOVA with the three species *Festulolium*, ryegrass and fescue as variables.

## Results and discussion

In this study, the forage was wilted on the field to an average DM content of 28% for the first cut and 57% for the second cut (Table 1). There was a dry period from the first to the second cut, so the plants on the field already had a high DM content. The forage of the first cut had a higher crude protein and sugar content and a lower NDF and ADF content compared to that of the second cut. The *Festulolium* varieties had a similar chemical composition to the two ryegrass varieties. Compared to the varieties of *Festulolium* and ryegrass, the fescue varieties had a higher crude protein and NDF/ADF content and lower sugar content for the first cut and a higher crude protein and sugar content for the second cut. Unlike the first cut, the second cut of the fescue varieties had a lower NDF/ADF content compared to the *Festulolium* and ryegrass varieties.

The different fermentation parameters are indicated in Table 2. All the silages had only traces of butyric acid and showed good fermentation qualities. The higher DM content of the forage of the second cut, which was due to the weather conditions, probably meant that lactic acid fermentation was limited, resulting in a smaller decrease in pH. The *Festulolium* varieties showed similar fermentation qualities to those of the ryegrass varieties. The lactic acid fermentation in the two fescue varieties was more intense compared to that of the *Festulolium* and ryegrass varieties.

Table 1. The DM and nutrient content of the first and second cuts of the different varieties at ensiling (values in g kg<sup>-1</sup> DM).<sup>1</sup>

	First cut					Second cut				
	DM %	Protein g kg <sup>-1</sup>	ADF g kg <sup>-1</sup>	NDF g kg <sup>-1</sup>	Sugar g kg <sup>-1</sup>	DM %	Protein g kg <sup>-1</sup>	ADF g kg <sup>-1</sup>	NDF g kg <sup>-1</sup>	Sugar g kg <sup>-1</sup>
Felimare	28.8	87	220	407	177	57.8	84	336	568	102
Helus	28.0	90	232	418	175	59.3	73	367	620	93
Hopej	28.0	84	240	452	171	55.5	67	346	598	105
AberNiche	31.1	86	213	403	182	58.0	71	336	576	113
Bb 2540	31.0	91	252	454	157	58.8	71	352	598	101
Fedoro	29.3	92	244	443	169	56.1	70	349	594	107
Ø <i>Festulolium</i>	29.4	88	233	430	172	57.6	73	348	592	103
SE	0.36	1.7	3.3	5.1	1.7	0.61	2.8	3.0	6.6	1.4
Daboya	29.7	90	241	441	172	56.1	80	326	552	106
Dorcas	28.9	82	233	440	176	56.1	81	342	584	100
Ø Ryegrass	29.3	86	237	440	174	56.1	80	334	568	104
SE	0.63	3.0	5.7	8.9	2.9	1.06	4.8	5.3	11.4	2.4
Préval	25.4	115	303	531	112	58.2	119	331	527	89
Paradisía	25.1	131	296	523	107	54.4	132	315	502	89
Ø Fescue	25.2	123	299	527	109	56.3	126	323	514	89
SE	0.63	3.0	5.7	8.9	2.9	1.06	4.8	5.3	11.4	2.4
P-value	***	***	***	***	***	ns	***	**	***	***

<sup>1</sup> DM = dry matter; Protein: crude protein; ADF = acid detergent fibre; NDF = neutral detergent fibre; Sugar = ethanol water soluble carbohydrates; SE = standard error; ns = not significant; \*\*  $P < 0.01$ ; \*\*\*  $P < 0.001$  refers to the effect of species.

Table 2. The fermentation parameters of the silages of the first and second cuts of the different varieties (values in g kg<sup>-1</sup> DM).<sup>1</sup>

	First cut					Second cut				
	pH	LA g kg <sup>-1</sup>	AA g kg <sup>-1</sup>	BA g kg <sup>-1</sup>	Et g kg <sup>-1</sup>	pH	LA g kg <sup>-1</sup>	AA g kg <sup>-1</sup>	BA g kg <sup>-1</sup>	Et g kg <sup>-1</sup>
Felimare	4.4	67	17	1	7	5.9	3	1	<1	22
Helus	4.4	65	18	1	9	6.0	2	1	<1	15
Hopej	4.6	57	20	1	11	5.7	8	2	<1	18
AberNiche	4.8	54	13	1	13	5.8	4	1	<1	7
Bb 2540	4.4	50	15	1	9	5.8	3	1	<1	15
Fedoro	4.5	58	12	2	16	5.8	7	1	<1	17
Ø Festulolium	4.5	58	16	1	11	5.8	4	1	<1	16
SE	0.04	2.1	1.0	0.5	1.1	0.04	0.7	0.1	0.03	1.8
Daboya	4.4	48	14	1	8	5.6	6	2	<1	10
Dorcas	4.4	52	17	1	9	5.7	6	2	1	14
Ø Ryegrass	4.4	50	16	1	9	5.7	6	2	<1	12
SE	0.06	3.6	1.7	0.9	1.8	0.06	1.2	0.3	0.05	3.1
Préval	4.5	65	10	2	13	5.7	6	2	1	1
Paradisla	4.6	65	11	6	13	5.6	10	3	1	2
Ø Fescue	4.5	65	10	4	13	5.7	8	2	1	1
SE	0.06	3.6	1.7	0.9	1.8	0.06	1.2	0.3	0.05	3.1
P-value	ns	*	*	*	*	*	*	*	***	**

<sup>1</sup> LA = lactic acid; AA = acetic acid; BA = butyric acid; Et: ethanol; SE = standard error; ns = not significant; \*  $P < 0.05$ ; \*\*  $P < 0.01$ ; \*\*\*  $P < 0.001$  refers to the effect of species.

## Conclusion

The six investigated *Festulolium* varieties showed similar chemical compositions to those of the hybrid ryegrass varieties. Compared to these two species, differences concerning the fibre, crude protein and sugar contents were found in the fescue varieties. In general, the *Festulolium* varieties were easy to ensile and the silages were of good quality.

## References

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