Paper ID: 563
Theme: 2. Grassland Production and Utilization
Sub-Theme: 2.6. Interdependence of grassland and arable lands for sustainable cereal, forage and livestock production

The production potential of *Festuca* spp., *Lolium* spp. and Festulolium hybrids in the southern Cape of South Africa

Janke van der Colf[1]*, Philip R Botha[2]
[1]Western Cape Department of Agriculture, George, South Africa
[2]Western Cape Department of Agriculture, Outeniqua Research Farm, George, South Africa
Corresponding author e-mail: JankeVdC@elsenburg.com

Keywords: Dry matter production, Fescue, Festulolium, Hybrid, Ryegrass

Introduction

Researchers are continuously searching for species that can improve the productivity and sustainability of pasture systems under adverse environmental conditions such as drought and extreme temperatures. Plant breeders have bred hybrids between ryegrass (*Lolium* spp.) and Fescue (*Festuca* spp.) in an attempt to combine the high forage quality of the former with the stress tolerance of the latter (Kopecky *et al*., 2008; Akgun *et al*., 2008). The resultant hybrids are commonly referred to as Festulolium spp. These species include Festulolium pabulare which is a cross between Tall Fescue (*F. arundinacea*) and Italian ryegrass (*L. multiflorum* var. italicum), and Festulolium braunii, which is a cross between Meadow Fescue (*F. pratensis*) and Italian ryegrass. All hybrids are back-crossed with their fescue or ryegrass parent species to obtain festucoid and loloid varieties, respectively. There is currently limited scientific data describing the production potential of such Festulolium varieties compared to that of ryegrass and fescue under irrigation in the Southern Cape of South Africa. The aim of this study was to determine the dry matter production potential of Festuca spp., Lolium spp. and Festulolium spp. in the southern Cape of South Africa.

Materials and Methods

The production potential of 13 Festulolium, seven fescue, two annual ryegrass and two perennial ryegrass cultivars were compared in a small plot trial on the Outeniqua Research Farm in South Africa in terms of total seasonal and annual dry matter (DM) production over a two year period. The trial design was a randomised complete block design in the form of an irrigated small plot cutting trial. Treatments were cut to a height of 50 mm approximately every 28 days or when the majority of treatments were ready for harvest to determine DM production and growth rate. An appropriate analysis of variance (AOV) was be performed, normality of residuals tested (Shapiro and Wilk, 1965) and Student's t-LSD (Ott, 1993) was calculated at a 5% significance level to compare treatment means.

Results and Discussion

The total seasonal and annual dry matter production (t DM ha^{-1}) of *Festuca* spp., *Lolium* spp. and Festulolium hybrids during year 1 and year 2 is shown in Table 1.

Table 1: The mean total seasonal and annual dry matter production (t DM ha^{-1}) of Festuca spp., Lolium spp. and Festulolium hybrids (LSD (0.05) compares within column. ^{abc}Means with no superscript did not differ significantly).

Species	Year 1					Year 2				
	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
Tall Fescue	2.41^{cd}	4.97^{cd}	3.85^{ab}	3.44^{a}	14.7^{bc}	1.06^{cd}	4.49^{a}	4.54^{a}	3.20^{a}	13.3^{a}
Meadow Fescue	2.19^{de}	5.12^{bcd}	3.57^{abc}	2.76^{c}	13.6^{c}	0.93^{cd}	3.59^{bc}	3.14^{b}	2.19^{bc}	9.84^{bc}
Italian ryegrass	3.91^{a}	5.62^{ab}	3.21^{cd}	3.25^{ab}	16.0^{a}	1.44^{a}	4.31^{ab}	2.82^{b}	2.18^{bc}	10.7^{bc}
Perennial ryegrass	3.51^{ab}	5.74^{a}	3.89^{ab}	3.05^{abc}	16.2^{a}	1.35^{ab}	3.36^{c}	3.05^{b}	1.83^{c}	9.58^{c}
Festulolium pabulare loloid	3.22^{ab}	5.44^{abc}	2.97^{d}	2.87^{bc}	14.4^{bc}	1.18^{abc}	3.63^{bc}	3.19^{b}	1.93^{bc}	9.92^{bc}
Festulolium pabulare festucoid	1.44^{e}	4.85^{d}	4.13^{a}	3.27^{ab}	13.7^{c}	0.87^{d}	3.86^{abc}	4.08^{a}	3.10^{a}	11.9^{ab}
Festulolium braunii loloid	3.14^{bc}	5.33^{abcd}	3.43^{bcd}	3.24^{ab}	15.3^{ab}	1.15^{bc}	3.67^{bc}	2.94^{b}	2.30^{b}	10.1^{bc}
LSD (0.05)	0.762	0.510	0.582	0.437	1.07	0.275	0.754	0.592	0.379	2.234

During year 1, the total annual DM production of Italian and perennial ryegrass was similar (P>0.05) to that of *Festulolium braunii* loloid, but higher (P<0.05) than the rest. During year 2, the total annual DM production of Tall Fescue was similar (P>0.05) to that of *Festulolium pabulare* festucoid, but higher (P<0.05) than the rest. The seasonal production pattern of *Festulolium pabulare* loloid was similar to that of Italian ryegrass during both years, notably the higher (P<0.05) winter and lower (P<0.05) summer production than Tall Fescue and *Festulolium pabulare* festucoid. *Festulolium pabulare* festucoid had a similar seasonal production pattern and total annual production to Tall Fescue, with lower (P<0.05) winter and higher (P<0.05) summer and autumn production than Italian ryegrass and *Festulolium pabulare* loloid. *Festulolium braunii* loloid showed intermediate production patterns between that of Italian ryegrass and Meadow Fescue. All species showed a decline in total annual production from year 1 to year 2. This is in agreement with findings that perennial grass species such as Tall Fescue and perennial ryegrass show a decline in production after year 1 in the region (Botha *et al.*, 2008).

Conclusion

Loloid hybrids tended to follow a similar production pattern to ryegrasses, with higher winter production than Tall Fescue, but lower persistence over years. If the aim, within a fodder flow programme, is thus annual seasonal production in the first year, annual ryegrass, perennial ryegrass and *Festulolium braunii* loloid is the recommended selection. Festucoid hybrids tended to have production patterns that more closely represented that of Tall Fescue, achieving higher summer yields and better persistence than ryegrasses and loloid types over years. As result if the species is to be included as part of a perennial pasture system, Tall Fescue and *Festulolium pabulare* festucoid is recommended. Further research on the nutritive value and palatability of Festulolium hybrids relative to fescue and ryegrass is required to evaluate their future role in pasture systems.

References

Akgun, I., M. Tosun and S. Sengul. 2008. Comparison of agronomic characters of Festulolium, *Festuca pratensis* huds. And *Lolium multiflorum* lam. Genotypes under high elevation conditions in turkey. *Bangladesh Journal of Botany*. 37:1-6.

Botha, P. R., H. S. Gerber and L. B. Zulu. 2008. Die seisoenale droëmateriaalproduksie van Kropaargras, Swenkgras en verskillende meer- en eenjarige raaigrasspesies. *Proceedings if Outeniqua Research Farm Information Day 2008*. Western Cape Department of Agriculture. pp. 12-22.

Kopecky, D., A. J. Lukaszewski and J. Dolezel. 2008. Cytogenics of Festulolium (*Festuca* x *Lolium* hybrids). *Cytogenetics and Genome Research*. 120**:**370-383.

Shapiro S. S. and M. B. Wilk. 1965. An Analysis of Variance Test for Normality (complete samples). *Biometrika* 52: 591-611**.**

Ott, R. L. 1993. *An Introduction to Statistical methods and data analysis*. Belmont, California: Duxbury Press: pp 807-837, pp 1-1051.