Seasonal production of coloured brome (*Bromus coloratus* Steud) cv. Exceltas, a new high quality perennial temperate pasture grass

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Abstract

In response to the need to find better adapted and more persistent perennial grasses for pastures in temperate regions, the Tasmanian Institute of Agriculture (TIA) and the Tasmanian Department of Primary Industries, Parks and Environment (DPIPWE) developed a number of new pasture grass cultivars, including Exceltas, a cultivar of *Bromus coloratus* (coloured brome). This paper compares the seasonal herbage production and the persistence of Exceltas with nine commercial cultivars of *Lolium perenne* (perennial ryegrass) under dryland conditions at Cressy, Tasmania. Second year seasonal herbage production measurements showed Exceltas, at 8483 kg DM/ha, to be more productive than all the diploid *L. perenne* cultivars and all the tetraploids, except Bealey, which produced 8041 kg DM/ha. Plant frequency (%) of each line was used as a measure of persistence. Exceltas was the only cultivar whose frequency counts were not significantly reduced by the dry summer experienced in year 2 of the study. The results highlight the potential of *B. coloratus* cv. Exceltas for use as an alternative perennial grass for dryland temperate pastures receiving >650 mm of annual rainfall or pastures receiving summer rainfall or under irrigation.

Key Words

Bromus section *Ceratachloa*, perennial brome

Introduction

Bromus coloratus Steud, is one of the South American representatives of *Bromus* sect. *Ceratachloa*. This section contains a morphologically diverse group of mostly hexaploid grasses (Massa et al. 2004), which includes annual, biennial and perennial grasses native to South America, North America and is represented by one species in Africa (Massa et al. 2001). South American representatives of the section *Ceratachloa* native to the southern Andes of Argentina and Chile have been utilised in the development of a number of commercially important cultivars including *B. catharticus* cv. Matua (Rumball, 1974), *B. stamineus* cv. Grasslands Gala (Stewart, 1992) and *B. valdivianus* cv. Bareno.

Bromus coloratus cv. Exceltas was the first cultivar of the species to be commercially released. Exceltas was bred in Tasmania from germplasm collected in Chile (Hurst and Hall 2006). It is a highly palatable perennial grass selected for late inflorescence emergence, high tiller density and a more prostrate growth habit. Like other members of the section *Ceratachloa*, *B. coloratus* exhibits a low tolerance to soils which are poorly drained or prone to periods of waterlogging and is best suited to well drained soils of moderate to high fertility. This paper looks at the second year seasonal herbage production and persistence of Exceltas, comparing it with eight commercial cultivars of *Lolium*

perenne (perennial ryegrass) and one commercial cultivar of *Lolium multiflorum* x *L. boucheanum* (hybrid ryegrass).

Methods

Bromus coloratus cv. Exceltas, two commercial cultivars of tetraploid *L. perenne*; cvv. Banquet II and Bealey and one commercial cultivar of tetraploid *L. multiflorum* x *L. boucheanum* cv. Ohau, plus six commercial cultivars of diploid *L. perenne* cvv. Arrow, Avalon, Expo, Victoca, Wintas and Wintas II were sown as monocultures into the field at Cressy, Tasmania (Table 1). The site was sown on the 22 April 2010 using a randomised complete block design with 4 replications.

The site was sprayed twice prior to sowing with glyphosate (0.45 kg a.i/ha) + 100 mL/100 L Activator. All lines were direct drilled into 5 x 1.5 m plots using an Oyjord cone seeder. The sowing rates for Exceltas, diploid *L. perenne* and tetraploid *L. perenne* were 15, 20 and 25 kg/ha respectively. The experiment was fertilised with 18 and 51 kg/ha of phosphorous (P) and potassium (K) respectively prior to sowing, with a maintenance dressing of 8, 12, 14, 24 kg/ha respectively of nitrogen (N), P, K and sulphur applied in autumn 2011. The experiment received 50 kg/ha of N as Urea (46% N) in early spring 2011. Fenitrothion (0.5 kg a.i./ha) insecticide was applied annually to control the pasture pests *Oncopera intricata* (corbie) and *Aphodius* spp. (pasture cockchafers). Broadleaf weeds were controlled with dicamba (0.5 kg a.i./ha) + MCPA (0.2 kg a.i./ha), applied after the autumn break.

Seedlings were counted in two quadrats (0.25 m^2) per replicate, 4 weeks after sowing. Frequency assessments were made in April 2011 and April 2012 after the autumn break. Two square quadrats of steel mesh with 100 cells (each 0.1 x 0.1 m) were placed in fixed positions on the ground at each assessment time. For each plot, cells containing a portion of a live plant crown of the sown species were recorded and the total number of cells containing a live crown was used to estimate frequency of occurrence. The mean of the two quadrats was used as the percent-frequency count. Seasonal herbage production assessments were made in year 2. Dry matter production was assessed by cutting one 0.25 m^2 quadrat per replicate and oven drying the samples at 100^oC for 24 hours. Seasonal cuts were only taken from the internal 3 x 1 m area of each plot to eliminate any edge effect. The site was "crash" grazed with sheep after each seasonal herbage production assessment. Plots were then mechanically mown to approximately 2 cm to ensure even plant height after grazing and the herbage removed from the experimental area. Five assessments were made throughout the year to determine seasonal herbage production - the end of summer, at the end of autumn, the end of winter, the end of spring and midsummer.

Table 1. Cressy site details.

Attribute	
Latitude	41° 43' 57.76" S
Longitude	147° 03' 58.80" E
Elevation (m)	147
Long term mean annual rainfall (mm)	628
mean maximum temperature (°C)	17.2
mean minimum temperature (°C)	5.1

Soil texture	Deep sand
pH (water)	5.8
Colwell P (mg/kg)	81
Colwell k (mg/kg)	334

Results

Sown in April 2010, the site experienced above average rainfall in the year of establishment with 717 mm of rainfall, 14% above the long term average (Table 2). This resulted in the uniform establishment of all *L. perenne* cultivars. Exceltas seedling density was significantly lower than the *L. perenne* cultivars; however, 236 plants/m^2 resulted in a uniform sward (Table 3).

Table 2. Cressy monthly rainfall (mm).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	total
2010	7.4	73	74.2	57.2	42	73.4	42.4	68.8	55.4	57.4	80.4	87.4	717
2011	70.7	43.4	118.6	48.5	23.4	98.6	31.4	65	35.4	37.8	69.4	16	655.2
2012	21	24.2	27.4										

Seasonal herbage assessment commenced at the end of summer 2011 on March 16th after the plants had become well established (Table 4). There were no significant differences between the cultivars for this harvest. Autumn dry matter assessment was taken on May 17th. Exceltas produced 1126 kg DM/ha, significantly less than the top five cultivars of *L. perenne*. The tetraploid cultivars of *L. perenne*, Banquet II and Ohau were the highest yielding cultivars with 1905 and 1823 kg DM/ha respectively. The winter assessment was made on August 30th. Exceltas produced significantly more dry matter than all the *L. perenne* cultivars, producing 1810 kg DM/ha. There was no significant difference between the top eight *L. perenne* cultivars at this harvest. Bealey produced 1416 kg DM/ha which was the highest yielding *L. perenne*. Spring production was measured on November 11th and Exceltas produced significantly more dry matter than six of the nine *L. perenne* cultivars with 3136 kg DM/ha. The diploid Victoca was the most productive *L. perenne* cultivar followed by tetraploids Expo and Bealey with 3585, 2594 and 2593 kg DM/ha respectively. Dry conditions resulted in low dry matter production for the early summer period. This is reflected in the assessment cut taken on January 9th 2012. For this period Exceltas was significantly more productive than the *L. perenne* cultivars, producing 1420 kg DM/ha. The most productive *L. perenne* cultivar was the tetraploid Bealey, significantly better than the next cultivar Banquet II with 1069 and 685 kgDM/ha respectively. The total annual production of Exceltas was 8483 kg DM/ha, which was significantly higher than all but the tetraploid *L. perenne* cultivar Bealey with an annual production of 8041 kg DM/ha.

Table 3. Establishment counts and frequency counts after the first and second summers.

Cultivar	Species	Establishment (plants/m^2)	2011 frequency (%)	2012 frequency (%)
Exceltas	*B. coloratus* (H)*	236	84	75
Banquet II	*L. perenne* (T)*	469	83	52

Bealey	*L. perenne* (T)	454	86	67
Ohau	*L. perenne* (T)	406	83	51
Arrow	*L. perenne* (D)*	464	85	41
Avalon	*L. perenne* (D)	593	85	43
Expo	*L. perenne* (D)	512	85	56
Victoca	*L. perenne* (D)	500	90	66
Wintas	*L. perenne* (D)	510	85	40
Wintas II	*L. perenne* (D)	479	89	64
LSD (P=0.05)		82.8	NS	15.6
LSD (P=0.05), Time x Line=12.1				
* (H) Hexaploid, (T) Tetraploid, (D) Diploid				

Table 4. Seasonal herbage production of *B. coloratus* cv. Exceltas and nine *L. perenne* cultivars.

Cultivar	Species	Late summer	Autumn	Winter	Spring	Early summer	Annual total
Exceltas	*B. coloratus* (H)*	983	1126	1818	3136	1420	8483
Banquet II	*L. perenne* (T)*	1282	1905	1258	1995	685	7125
Bealey	*L. perenne* (T)	1289	1674	1416	2593	1069	8041
Ohau	*L. perenne* (T)	1220	1823	1250	2240	569	7102
Arrow	*L. perenne* (D)*	1229	1700	1346	1814	436	6525
Avalon	*L. perenne* (D)	1069	1470	1344	2115	266	6264
Expo	*L. perenne* (D)	1170	1522	1361	2594	550	7197
Victoca	*L. perenne* (D)	1202	1302	1323	3585	535	7947
Wintas	*L. perenne* (D)	1002	1179	1061	1873	302	5417
Wintas II	*L. perenne* (D)	834	1456	1300	2340	313	6243
LSD (P=0.05)		ns	380	236	777	289	458
* (H) Hexaploid, (T) Tetraploid, (D) Diploid							

Frequency measurements after the first summer showed no significant differences between species or cultivars, with all maintaining a strong sward with plant frequency >82%. Rainfall for the period was 91% above the long term summer average with the site receiving 201.5 mm. Rainfall for the second summer was 42% below the long term average with the site receiving 61.2 mm over the 3-month period. The dry summer conditions reduced plant densities. This was reflected in the lower frequency percentage measurements for all cultivars (Table 3). Wintas, Arrow and Avalon had the greatest reduction in frequency falling to 40, 41 and 43% respectively. The frequency of Exceltas fell by 9 units, but the decline was not significant. With a frequency after the second summer of 75%, Exceltas was significantly higher than all *L. perenne* cultivars, with the exception of the tetraploid *L. perenne* cv. Bealey and the diploid *L. perenne* cv. Victoca, with frequency percentages of 67 and 66% respectively.

Conclusion

Under the conditions of this study and for the measurements taken, Exceltas was equally or more productive than the nine cultivars of *L. perenne*. This study has highlighted the potential for using Exceltas to improve the availability of herbage through the winter and early summer periods, times when high quality feed is in short supply. The results have showed that Exceltas has the potential to be an excellent alternative perennial grass for dryland temperate pastures receiving >650 mm or pastures receiving summer rainfall or under irrigation. The higher frequency of Exceltas after the first and second summers indicated it was better adapted than *L. perenne* to the prevailing climatic and site conditions during this study.

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