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Short communication

Evaluation of 3 bromegrass species as pasture: Herbage nutritive value, estimated grass dry matter intake and steer performance

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ABSTRACT

A 2 year grazing study was conducted to evaluate the effects of grazing meadow bromegrass (*Bromus riparius* Rehm.; cv. *Paddock*), smooth bromegrass (*B. inermis* Leyss.; cv. *Carlton*), and hybrid bromegrass (*B. riparius* × *B. inermis.;* cv. *AC Knowles*) on herbage nutritive value, dry matter (DM) intake and grazing beef steer performance. Each year, 36 crossbred beef steers (297 ± 6 kg BW) (15 month initial age) were randomly allocated to 1 of 3 replicated ($n=2$) paddocks of each bromegrass species in a "put and take" stocking system from May to July. Herbage samples were collected at start, middle, and end of each grazing period and analyzed for DM, crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), *in vitro* dry matter digestibility (IVDMD) and *in situ* rumen degradation kinetics. Herbage DM intake was estimated by combining fecal output with herbage *in vitro* dry matter digestibility. Fecal output was estimated using chromium sesquioxide (Cr_2O_3) as an external marker. Herbage CP (138 ± 4.2 g/kg), NDF (574 ± 5.3 g/kg), ADF (340 ± 5.3 g/kg), IVDMD (628 ± 3.5 g/kg), and effective degradation of herbage DM (35.87 ± 1.07% of DM) did not differ ($P > 0.05$) among the bromegrasses. In all 3 bromegrasses, CP and IVOMD decreased ($P < 0.05$) and NDF and ADF increased ($P < 0.05$) as the grazing season progressed. Over the 60 d grazing season, DM intake (10.0 ± 1.7 kg/d), ADG (1.0 ± 0.24 kg/d), and final BW (329.0 ± 9.2 kg) were similar ($P > 0.05$) among steers grazing either bromegrass pasture. The results of this study suggest that meadow bromegrass, smooth bromegrass and hybrid bromegrass are suitable species for grazing providing suitable nutritive value and steer performance for pasture in western Canada.

1. Introduction

Bromegrasses (*Bromus spp.*) are widely cultivated for pasture and hay in temperate areas of the world (Biligetu and Coulman, 2010). Smooth bromegrass (*Bromus inermis* Leyss.) is an upright growing, rhizomatous perennial grass that forms a dense sod in pastures. A native to temperate grasslands of Europe and Asia (Tzvelev, 1976; Miller, 1984), this species is extremely winter hardy and drought and heat tolerant. Since its introduction to North America in the 1880s, smooth bromegrass has been widely used as both hay and pasture species, but its slow regrowth makes it more suited to hay production (Smith et al., 1986; Ferdinandez and Coulman, 2001). Meadow bromegrass (*B. riparius* Rehm.), a bunch-type grass, shows increased regrowth compared to smooth bromegrass, and the basal nature of the leaves makes this species more suitable for pasture rather than hay

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production (Knowles et al., 1993; Lardner et al., 2003; Coulman, 2004; Biligetu and Coulman, 2010). More recently, the hybrid bromegrass cultivar (AC Knowles) was developed by hybridizing smooth and meadow bromegrass (*B. riparius* × *B. inermis*; Coulman, 2004). This species was selected to have characteristics that are intermediate to the two parental lines (Coulman, 2004; Biligetu and Coulman, 2010), with a lower acid detergent fiber than meadow bromegrass (Ferdinandez and Coulman, 2001), and has been shown to be suitable for hay and pasture production (Knowles and Baron, 1990; Lardner et al., 2000, 2013; Biligetu and Coulman, 2010). Regrowth traits are important for sustainable utilization of any pasture grass species and may also assist forage breeders in selecting superior lines with improved regrowth or persistence under grazing (Biligetu and Coulman, 2010). Hence, variation in regrowth of smooth, meadow, and hybrid bromegrass species has been evaluated (Knowles et al., 1993; Biligetu and Coulman, 2010); however, the majority of these 3 grass species as pasture herbage occurs in small-plot format that uses mechanical methods of defoliation, such as mowing or clipping. Mechanical treatments fail to impose grazing animal effects such as pulling, treading, manure and urine deposition and short stubble heights, which may cause different responses than frequent clipping (McCartney and Bittman, 1994). Limited information is available (Lardner et al., 2013) comparing these bromegrass species for herbage nutritive value and grazing animal performance as monoculture pasture. Therefore the objectives of this experiment were to determine the effects of grazing meadow bromegrass, smooth bromegrass and hybrid bromegrass as mid-summer pasture species on herbage nutritive value, rumen degradation kinetics, herbage dry matter intake and grazing steer performance.

2. Materials and methods

2.1. Site and herbage management

An experiment was conducted at the Western Beef Development Centre's Termuende Research Ranch, approximately 8 km east of Lanigan, Saskatchewan, CANADA (lat 51° 51′ N, long 105° 02′ W). The study site was at an elevation of 350 m, and topography was gently to moderately hummocky and the soils are a mixture of Oxbow Orthic Black and carbonated Oxbow with a loam texture (Saskatchewan Soil Survey, 1992). There were six, 0.8 ha paddocks which were established 3 years previously, with 2 paddocks each of meadow bromegrass (*B. riparius* Rehm. cv. *Paddock*), smooth bromegrass (*B. inermis* Leyss. cv. *Carlton*), and hybrid bromegrass (*B. riparius* × *B. inermis* cv. *AC Knowles*).

Prior to seeding, the areas were sprayed with glyphosate at 2.0 kg/ha of active ingredient to facilitate weed control. Seeding rates were 10 kg/ha for smooth bromegrass and 12 kg/ha for meadow bromegrass and hybrid bromegrass. Post-seeding weed control included spot spraying of 1.1 kg/ha of active ingredient propyzamide for control of foxtail barley (*Hordeum jubatum* L.) in the fall. In the spring, 9.9 g/ha of active ingredient thifensulfuron methyl and 4.9 g/ha of active ingredient tribenuron methyl was applied for control of broadleaf weeds. On these 6 paddocks, a 2-year study was conducted during the grazing seasons of 2003 and 2004. In spring, prior to grazing, all paddocks were fertilized uniformly with 79 kg N/ha and 23 kg P/ha via colter disc application according to soil test results.

Temperature and precipitation data were obtained from a meteorological station at the Termuende Research Ranch, 1 km east of the study site and from Environment Canada's Climate Data for Watrous East, Saskatchewan, Canada (long 51°48′N, lat 104°51′W, www.climate.weatheroffice.ec.gc.*ca*). Total precipitation at the study site for April, May, June, July, August and September was 19.1, 27.7, 41.8, 45.0, 25.2, 37.0 and 6.7, 56.2, 54.6, 29.1, 76.3, 22.7 mm for 2003 and 2004, respectively. The 30-year average for the Lanigan area is 15.0, 48.1, 62.8, 66.8, 47.8 and 39.5 mm for April, May, June, July, August and September, respectively. Total precipitation from April to September at the study site was 195.8 and 245.6 mm for 2003 and 2004, respectively. The 30-year average for the Lanigan area was 280 mm. Rainfall was below average in May through August in 2003, but similar in all months in 2004 except during July when rainfall was lower. Mean monthly temperatures for April, May, June, July, August and September were 4.7, 11.9, 16.0, 18.5, 20.0 and 10.4 °C in 2003 and 3.5, 7.4, 13.2, 17.1, 13.8 and 10.4 °C in 2004. The 30-year average temperature for April to September is 4.3, 11.6, 16.0, 18.5, 16.9 and 10.9 °C for the Lanigan area. The mean monthly temperatures were similar to the long-term average during April, July and September in both 2003 and 2004, but lower in May and August of 2004.

2.2. Animal and grazing management

Each year, 36 Angus × Charolais steers (15 ± 1 month and 297 ± 6 kg of live body weight (LBW)), were stratified by BW into 6 homogenous groups, tagged to allow individual identification and randomly assigned to 1 of 6 paddocks. Before starting each trial, all steers were vaccinated against bovine respiratory syncytial virus, infectious bovine rhinotracheitis, bovine viral diarrhea, and parainfluenza 3 (STARVAC 4 plus; Novartis Animal Health Inc.,) Mississauga, Ontario, *Pasteurella haemolytica* and *Histophilus somni* (Somnu-Star Ph®, Novartis, Mississauga, Ontario, Canada), and a *Clostridium* 8-way modified live vaccine (Covexin 8; Schering-Plough Animal Health, Guelph, Ontario, Canada).

As bromegrass is considered a mid-season species (Lardner et al., 2013), paddocks were grazed May through July when available herbage in spring was approximately 10 cm high (4–5 leaf stage). To maintain sward heights and a variable stocking rate (10 steers per ha) all paddocks were managed using a "put and take" grazing system with 3 randomly chosen "tester" steers per paddock (Mott and Lucas, 1952). In a put and take grazing system, a variable number of homogeneous animals are used so that extra animals are added when forage growth is fast and forage production is high and extra animals are removed when forage growth rate is slow and forage production is low. Daily animal performance is based on that of designated tester steers those that remain on experimental pastures for the entire trial (Mott and Lucas, 1952). Subsequently, additional steers were put and removed from pastures to maintain a uniform sward height of 7 cm. Tester steers remained on each paddock until plants were grazed to a