



Western Beef Development Centre

Division of PAMI

EVALUATING NEW PASTURE VARIETIES

By: Charlotte Ward and Dr. Bart Lardner, Scientist, WBDC

Introduction

Beef producers require forage varieties that are high yielding, of good nutritional quality and have relatively long persistence under grazed conditions. Small plot evaluation of forages uses mowing or clipping to simulate grazing events; however, these treatments lack 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). Thus, forage varieties need to be evaluated for livestock performance and stand persistence under grazed conditions before being commercially released. Extending the grazing season with perennial forages can also reduce the cost of keeping cattle compared to traditional over-wintering feeding systems (Highmoor 2005). This study compared six perennial forage varieties for steer performance, beef production per acre and forage quality over three grazing seasons.

Site Description

The study was conducted over three consecutive years (2004, 2005, 2006) at the Termuende Research Farm located near Lanigan, Saskatchewan. In 1999, three varieties, meadow brome grass (MBG) cv. *Paddock*, smooth brome grass (SBG) cv. *Carlton* and hybrid brome grass (HBG) cv. *AC Knowles* were established on a mixed Orthic Black soil. In 2003, crested wheatgrass (CWG) cv. *Goliath*, hybrid brome grass cv. *AC Knowles* and tall fescue (TF) cv. *Courtney* were established on an adjacent site. All varieties were compared to a long established stand of CWG (control pasture) of an unknown cultivar which was heavily invaded with smooth brome grass, quack grass and Kentucky bluegrass. All species were established in 2, 2-acre replicate paddocks. Grazing animals were restricted to paddocks using solar-powered electric fencing. Throughout the trial cattle were provided free choice mineral and water in portable stock troughs. Each spring prior to grazing, all paddocks were fertilized with nitrogen (70 lbs N/acre) and phosphorus (20 lbs P/acre) according to soil test recommendations.

Grazing Management

Each year cross-bred steers were randomly allocated to paddocks when available forage was approximately 8" high (4-5 leaf stage of growth). Cattle were removed from the pastures when the stubble height was approximately 3-4" high. Steers were weighed on consecutive days at the start and end of trial to determine average daily gain (ADG). Pastures were managed using the put-and-take grazing system (Mott and Lucas 1952) where animals were moved between paddocks to allow for similar available forage between replicates of the same species. Total beef production per acre (TBP) was calculated using ADG of the steers and the number of animal grazing days (AGD). In each paddock, forage samples were taken at the start and end of trial to determine crude protein (CP) and *in vitro* organic matter digestibility (IVOMD).

Results

In 2004, tall fescue was not grazed due to poor seedling establishment. Dependant on available forage, species were grazed from mid-June to mid-July. In 2004 and 2005 all pasture types were grazed only once, however in 2006 sufficient re-growth allowed for two grazing periods for most species. In 2004 and 2005, crested wheatgrass *Goliath* pastures were grazed from late-May to early-July while the control pastures were only grazed from late-May to mid-June. All other species were grazed from early-June to mid-July.

In 2006, CWG *Goliath* pastures were grazed from mid-May to early-June in period one. However, the control pastures were grazed considerably later (early-June to early-July). The bromegrass pastures were grazed from late-May to late-June while the TF pastures were utilized later, early-June to mid-July. In grazing period two in 2006, crested wheatgrass *Goliath* pastures were grazed late-July to Mid-August and bromegrass pastures were grazed mid-August to early September. Sufficient re-growth did not allow tall fescue and the control pastures to be grazed a second time.

Forage Quality

Crude protein and IVOMD values at early and late maturity for the pasture types are presented in Table 1.

Table 1. Forage quality of pasture types at Lanigan, SK (2004-2006)

	CP ^z (%)		IVOMD (%)	
	Early Maturity	Late Maturity	Early Maturity	Late Maturity
<i>Meadow bromegrass (Paddock)</i>				
2004	17.8	9.2	70.2	59.3
2005	17.5	12.1	67.4	61.9
2006 (P1) ^y	20.4	8.4	67.9	55.4
(P2)	9.5	9.6	56.5	54.9
<i>Smooth bromegrass (Carlton)</i>				
2004	19.6	7.8	70.5	57.4
2005	20.5	10.5	66.7	54.7
2006 (P1)	19.2	12.7	64.8	54.5
(P2)	11.7	10.3	58.5	58.2
<i>Hybrid bromegrass (1999) (AC Knowles)</i>				
2004	18.6	8.9	69.7	56.8
2005	22.2	9.1	68.7	56.9
2006 (P1)	19.8	10.7	67.2	54.4
(P2)	11.6	11.0	56.4	54.5
<i>Hybrid bromegrass (2003) (AC Knowles)</i>				
2004	15.5	8.0	68.3	57.5
2005	22.2	10.0	68.7	56.7
2006 (P1)	20.8	10.0	68.1	55.6
(P2)	10.9	11.0	59.0	57.4
<i>Crested wheatgrass (Goliath)</i>				
2004	18.0	9.0	71.7	54.5
2005	21.6	12.3	68.9	53.1
2006 (P1)	19.1	12.2	66.0	52.6
(P2)	11.0	8.5	57.1	51.3
<i>Tall fescue (Courtney)</i>				
2005	22.2	11.5	73.2	60.0
2006 (P1)	17.7	9.1	65.1	53.3
<i>Control pasture</i>				
2005	12.9	13.2	57.6	54.0
2006 (P1)	17.1	7.8	64.0	55.5

^zCP=crude protein; IVOMD=in vitro organic matter digestibility

^yP1=grazing period 1; P2=grazing period 2



As expected, forage quality was very high early in the grazing season but declined as the pasture matured later in the year. Over three years of the study all bromegrasses showed greater digestibility at late maturity compared to *Goliath* CWG or the control pastures. Tall fescue was also shown to provide good forage quality, as this species had high digestibility even with advancing maturity of the pasture. Crude protein values were similar among all species with the exception of the control pastures where levels were lowest (7.8%) late in the season.

Animal Production

Animal performance is presented in Table 2. Average daily gain of grazing steers was similar among all species in 2004 and 2005. The high ADG of steers grazing the control pastures was due to the very short duration of the grazing period (13 days). In the first grazing period in 2006, ADG of steers was greater than gains in the second grazing period. This may be due to the decreased forage quality and quantity observed in the second grazing period.

Table 2. Steer performance grazing pasture species

	MBG ^z	SBG	HBG (1999)	HBG (2003)	CWG	TF	Control
Average daily gain (lb/day)							
2004	3.04	2.60	2.88	2.88	3.11	-	-
2005	2.63	2.64	3.24	3.24	3.35	3.08	3.55
2006 (P1) ^y	2.71	2.42	3.08	2.64	3.21	1.91	3.07
(P2)	1.63	1.85	1.43	2.50	1.44	-	-
Mean	2.17	2.14	2.26	2.57	2.33	1.91	3.07
Animal grazing days^x (days/acre)							
2004	66	66	66	50	50	-	-
2005	95	89	102	94	93	93	32
2006 (P1)	112	79	103	95	87	152	60
(P2)	10	20	20	32	34	-	-
Total	122	99	123	127	121	152	60
Total beef production (lb/acre)							
2004	201	171	190	145	156	-	-
2005	252	243	277	170	313	285	112
2006 (P1)	303	188	314	250	281	293	184
(P2)	18	41	32	89	58	-	-
Total	321	229	346	339	339	293	184

zMBG=meadow bromegrass; SBG=smooth bromegrass, HBG(1999)=hybrid bromegrass (established 1999); CWG=crested wheatgrass; TF=tall fescue; HBG(2003)=hybrid bromegrass (established 2003); Control=long established stand of crested wheatgrass

yP1=grazing period 1; P2=grazing period 2

xAGD=animal grazing days (1000 lb animal)

Animal grazing days were lower in 2004 and 2005 compared to 2006 due to the two grazing periods obtained in the last year of the study. The control pastures had the fewest AGD which resulted in the lowest TBP of the pasture types compared in this study. *Paddock* meadow bromegrass and *AC Knowles* HBG had greater AGD and TBP in 2005 and 2006 compared to *Carlton* SBG, suggesting that MBG and HBG may be better suited to grazing than SBG in this region. Despite a greater number of AGD for *Courtney* TF in 2006, TBP for TF was lower compared to MBG and HBG resulting from a lower ADG of steers grazing tall fescue.

Conclusions

The results of this study suggest that CWG *Goliath* has excellent forage quality in the spring, provides high TBP and is well suited to spring grazing. Both meadow and hybrid bromegrasses evaluated in this study showed good forage quality and superior beef production compared to tall fescue or the control pastures when used for summer grazing. Finally, the two years of data collected for tall fescue shows that the grass appears to have excellent forage quality and provide high TBP; however, this species may have limited regrowth potential and no opportunity for a second grazing period under dryland conditions.

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