The Professional Animal Scientist 29 (2013):535–545

Comparison of grazing oat and pea crop residue versus feeding grass–legume hay on beef-cow performance, reproductive efficiency, and system cost[1]

A. D. Krause,* H. A. Lardner,*† J. J. McKinnon,* S. Hendrick,‡ K. Larson,† and D. Damiran*†
*Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 5B5 Canada; †Western Beef Development Centre, Humboldt, Saskatchewan, S0K 2A0 Canada; and ‡Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, S7N 5B4 Canada

ABSTRACT

Spring-calving nonlactating pregnant Angus (Bos taurus) cows (yr 1, $n = 90$, $BW = 637.6 \pm 5.8$ kg; yr 2, $n = 78$, $BW = 671.2 \pm 8.1$ kg; yr 3, $n = 68$, $BW = 669.4 \pm 6.6$ kg) were managed in 1 of 3 replicated ($n = 3$) wintering systems: (i) grazing oat residue [OATG; TDN = 58.6, CP = 6.7 (% DM)] piles in field paddocks; (ii) grazing pea residue [PEAG; TDN = 50.9, CP = 11.1 (% DM)] piles in field paddocks; and (iii) drylot (DLPF) pen feeding grass–legume round bales [TDN = 54.5, CP = 10.4 (% DM)] in bale feeders. The study was conducted over 3 production cycles, and cows were allocated crop residue and bales on a 3-d basis to manage utilization and feed waste. Forage utilization was less ($P < 0.05$) in PEAG ($33.4 \pm 4.3\%$) and OATG ($44.9 \pm 5.9\%$) systems than in the DLPF ($90.0 \pm 1.63\%$) wintering system. Dry matter intake of cows varied ($P < 0.05$) among systems; cows consuming PEAG or OATG had less ($P < 0.01$) DMI compared with DLPF cows. Nutrient (CP, TDN) intake was greatest ($P < 0.05$) for DLPF cows and least for cows in the PEAG system. Cows grazing PEAG residue lost BW (11 kg) from d 1 to 20; however, BW change during the entire trial period (63 d) was positive (4 kg) for PEAG cows but less ($P = 0.01$) than OATG (27 kg) or DLPF (66 kg) cows. Calf birth weight was least ($P = 0.03$) for OATG cows than DLPF cows, 39 vs. 42 kg, respectively. On average, total costs for the OATG and PEAG winter feeding strategies were \$0.77 and \$0.59 cow/d less than the DLPF (\$2.13 cow/d) system, respectively. Grazing crop residue for part of the winter feeding program of a cow has cost advantages over pen-feeding hay; however, environmental conditions (snowfall, temperature) dictate forage accessibility. Therefore, producers with access to crop residues should consider using this feed in a chaff-straw based ration along with adequate supplementation to ensure the nutritional needs of the cow are being met.

Key words: beef cow, oat residue, pea residue, reproductive efficiency, system cost

INTRODUCTION

Winter feeding costs are a major contributor to the overall cost of production for cow-calf producers (Rasby and Rush, 1996; Kaliel and Kotowich, 2002). Traditionally, these costs are due to feeding cows in drylot pens over the winter period, which includes costs for harvesting, handling, and transporting feed and removal of manure (Hitz and Russell, 1998; Johnson and Wand, 1999; Volesky et al., 2002). Feed is provided to pregnant cows during the winter months in western Canada usually as hay in round bales (Saskatchewan Ministry of Agriculture, 2011). Cost per tonne

[1] This research was supported in part by grants from the Saskatchewan Agriculture Development Fund, Saskatchewan Cattle Marketing Deductions Fund, and Western Beef Development Centre.
[2] Corresponding author: blardner.wbdc@pami.ca

to cut and bale hay averages between CAN$38.50 and CAN$44 per tonne (Saskatchewan Ministry of Agriculture, 2011), whereas the 10-yr average market value of hay is CAN$80 per tonne. Maximizing profitability within a cow-calf operation requires that a least-cost winter feeding system be in place; however, current literature is limited for winter feeding systems for beef cows.

The beef industry has suffered financially during recent years, which has renewed interest in finding alternative winter feeding strategies for beef cows. Grazing nonlactating pregnant beef cows on annual crop residues or stockpiled forages or bale or swath grazing during the winter months are options to potentially reduce the costs of wintering beef cows (Meyer et al., 2009; Kelln et al., 2011; Van De Kerckhove et al., 2011). One study reported that cows grazing either stockpiled tall fescue–alfalfa, smooth bromegrass–red clover, or corn residues may have BW gain and BCS similar or greater than cows wintered on sun-cured hay in drylot pens (Hitz and Russell, 1998). Some studies have also suggested that swath grazing (when a cereal crop is cut at soft dough stage and left in field to be grazed fall or winter) can reduce cow costs per day (McCartney et al., 2004; Karn et al., 2005). Lately there has been renewed interest in using annual crop residues (straw and chaff) in beef-cow diets because of their potential to reduce winter feed costs (McCartney et al., 2006). Crop residues are the materials left after a crop has been harvested and include straw, leaves, unthreshed heads, glumes, hulls, and kernels (AAFRD, 2008). Because crop residues are a low-quality feed, they are only suitable as a large portion of the diet for mature beef cows. The current study was conducted to determine the effects of field grazing either oat or pea residues in field paddocks or drylot pen-feeding grass–legume hay on beef-cow performance, reproductive efficiency, estimated DMI, and winter system costs.

MATERIALS AND METHODS

Site and Crop Management

A 3-yr winter grazing study was conducted at the Western Beef Development Centre's Termuende Research Ranch near Lanigan, Saskatchewan, Canada (51°51′N, 105°02′W). Each year, 16-ha fields were seeded with pea (*Pisum sativum* L. 'Performance 40–10,' 67.2 kg/ha) and oat (*Avena sativa* L. 'Baler,' 71.7 kg/ha) on May 28, 2009 (yr 1), July 13, 2010 (yr 2), and May 30, 2011 (yr 3). The oat crop also received 9.1 kg/ha of actual nitrogen (N; urea) fertilizer at seeding. Weed control was managed preemergence in both crops using glyphosate [*N*-(phosphonomethyl) glycine] at 2.6 L/ha (Roundup, Monsanto Inc., Winnipeg, Manitoba, Canada), which was applied June 5, 2009, July 17, 2010, and June 7, 2011. After emergence a mixture of fluroxypyr + 2, 4-D (Attain A, Dow AgroSciences, Calgary, Alberta, Canada), thifensulfuron methyl + tribenuron methyl (Refine SG, E.I. DuPont Canada, Mississauga, Ontario, Canada), and nonylphenoxy polyethoxyethanol (Ag-Surf, Viterra Inc., Regina, Saskatchewan, Canada) at 1.3 L/ha was applied to the oat crop, and a mixture of imazamox + imazethapyr (Odyssey, BASF Canada Inc., Mississauga, Ontario, Canada) and naphthalene (Merge, BASF Canada Inc.) at 1.2 L/ha was applied to the pea crop on July 3, 2009, August 6, 2010, and July 12, 2011, at first instance. Only in yr 2 on September 28, 2010, both crops were desiccated with glyphosate (Roundup, Monsanto Inc.) at 2.5 L/ha.

In yr 1, the oat and pea crops were swathed September 18, 2009, and November 3, 2009, respectively, and combined September 23, 2009, and November 5, 2009, respectively. In yr 2, both crops were swathed and combined October 15, 2010, and October 16, 2010, respectively. In yr 3, both crops were swathed and combined September 28, 2011, and October 1, 2011, respectively. Oat and pea residues (straw + chaff) were collected in piles and deposited in the field using a whole-buncher (AJ Manufacturing, Calgary, Alberta, Canada) attached to the combine. Average pile weights for oat and pea residue were 14.6 and 19.3 kg of DM (yr 1), 17.3 and 13.7 kg of DM (yr 2), and 20.3 and 24.1 kg of DM (yr 3), respectively. Prior to grazing each 16-ha field was further subdivided into three 5.3-ha paddocks using high-tensile electric fence.

Grazing Animal Management

The 3-yr study was conducted from November 20, 2009, to January 21, 2010 (yr 1; 62 d), November 10, 2010, to November 30, 2010 (yr 2; 20 d), and October 18, 2011, to December 20, 2011 (yr 3; 62 d). Nonlactating pregnant Angus (*Bos taurus*) cows (yr 1, n = 90, BW = 637.6 ± 5.8 kg, BCS = 2.7 ± 0.2, cow age = 5 ± 0.3 yr, rib fat = 5.1 ± 0.8 mm, day of gestation = 108 ± 15 d; yr 2, n = 78, BW = 671.2 ± 8.1 kg, BCS = 2.8 ± 0.6, cow age = 6 ± 0.2 yr, rib fat = 5.2 ± 0.4 mm, day of gestation 89 ± 8 d; yr 3, n = 68, BW = 669.4 ± 6.6 kg, BSC = 3.0 ± 0.2, cow age = 7 ± 0.4 yr, rib fat thickness = 4.7 ± 0.6 mm, day of gestation 93 ± 10 d) were used in this study. Each year, cows were stratified based on BW, age, and pregnancy status and were randomly allocated to 1 of 3 replicated (n = 3) wintering systems. Each year all cows were exposed to fertility-tested bulls that passed a breeding soundness evaluation on July 1 for a 63-d breeding season. Pregnancy was diagnosed via rectal palpation at the end of the breeding season and before the study starts to eliminate any open cows. The strategy was to use the same cows for the entire 3-yr study, unless culled for injury or failure to conceive, in which case the animal was not replaced. Each treatment (n = 3) had 3 replicates (n = 3; 3 paddocks and pens for grazing and feeding treatment, respectively), and each replicate group consisted either of 10 (yr 1), 8 to 9 (yr 2), or 7 to 8 (yr 3) cows per replicate.