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Effect of sugar beet–pulp concentration during grain adaptation and in finishing diets with different corn processing methods on performance and carcass characteristics[1]

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ABSTRACT

Two experiments evaluated the use of wet beet pulp (BP) in feedlot diets. In Exp. 1, feeding 0, 10, or 20% wet BP (DM basis) in either dry-rolled corn or steam-flaked corn finishing diets was evaluated using 432 steers (BW = 314 ± 25 kg) in a randomized block design with a 2 × 3 factorial treatment structure (n = 6 replications per treatment). No corn processing × BP interaction was detected (P > 0.05) for finishing performance and carcass data. Final BW, DMI, and ADG decreased linearly (P < 0.01) with increasing concentration of BP; however, G:F was not different (P = 0.49) among BP concentrations. In Exp. 2, steers (n = 232; BW = 326 ± 14.5 kg) were used in a randomized block design to determine the effect of adapting steers to finishing diets using BP (n = 6 replications per treatment). Alfalfa-hay inclusion decreased as dry-rolled corn increased in the control treatment. Beet-pulp adaptation diets included a low-BP treatment or a high-BP treatment in which both BP and alfalfa were decreased as dry-rolled corn increased. After the 22-d adaptation period, steers were fed a common diet until slaughter. Gain and G:F were not different (P > 0.19) among treatments during grain adaptation. However, steers adapted using the high-BP and low-BP treatments tended (P = 0.07) to have greater ADG compared with the control throughout the entire finishing period. In summary, there was no BP × corn processing interaction. Replacing up to 50% of alfalfa with BP during grain adaptation is a suitable alternative.

Key words: beet pulp, corn processing, feedlot cattle, grain adaptation

INTRODUCTION

Interest in using alternative feed sources has intensified because of the increase in grain prices. One feed resource that has been evaluated as a possible corn replacement is beet pulp. Wet beet pulp (24% DM, 9.5% CP, and 44% NDF) is a by-product that is produced during the extraction of sugar from sugar beets (Bauer et al., 2007). Although the availability of beet pulp may be limited by region, some feedlots are in close proximity and able to incorporate beet pulp into their beef-cattle diets. The fiber fraction of sugar-beet pulp is highly digestible and has been shown to be a very effective corn-silage substitute in growing diets (Rush et al., 1992; Park et al., 2000). Results from finishing research with beet pulp replacing corn (dry rolled or high moisture) indicate

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beet pulp decreases finishing performance (Weichenthal et al., 1993; Park et al., 2001; Bauer et al., 2007). Data are limited on how corn processing methods interact with the feeding of beet pulp. Therefore, a feeding experiment was conducted to determine the effects of feeding different concentrations of beet pulp in combination with dry-rolled corn or steam-flaked corn.

Adaptation of cattle to high-concentrate diets is an important period that may influence feedlot performance and health (Brown et al., 2006) for the entire finishing period. The low energy density and bulky nature of forages make them difficult to store, process, mix, and deliver to cattle in comparison to grain. Strategies that reduce or eliminate the use of forages to adapt cattle to finishing diets could potentially reduce the forage needs of a feedlot by 35 to 40%, which may result in decreased cost of gain and logistics within the feedlot (MacDonald and Luebbe, 2012). Limited research has evaluated the use of beet pulp as a forage replacement in grain adaption programs. Therefore, a second experiment was conducted to compare grain adaption programs using beet pulp to traditional grain adaption with alfalfa hay on finishing performance and carcass merit.

MATERIALS AND METHODS

All procedures involving animal care and management were approved by the University of Nebraska's Institutional Animal Care and Use Committee.

Exp. 1 Beet-Pulp Inclusion and Corn Processing Method

A total of 432 yearling British × Continental steers (initial BW = 314 ± 25 kg) were used in an experiment conducted at the University of Nebraska–Lincoln Panhandle Research and Extension Center feedlot located near Scottsbluff, Nebraska. A randomized block design was used with a 2 × 3 factorial treatment structure with 3 BW blocks (n = 144 steers in each of the light, medium, and heavy BW block). Steers were assigned randomly to 36 pens (12 steers per pen) with pen serving as the experimental unit. The first factor was corn processing method, which consisted of either steam-flaked corn (**SFC**) or dry-rolled corn (**DRC**), and the second factor was concentration of wet-beet-pulp inclusion (0, 10, or 20% DM basis). Two weeks before the start of the experiment, steers were vaccinated with an infectious bovine rhinotracheitis, parainfluenza-3, bovine viral diarrhea virus, bovine respiratory syncytial virus modified live virus vaccine (Bovi-Shield Gold; Pfizer Animal Health, New York City, NY), vaccinated with a *Clostridium chauvoei*, *C. septicum*, *C. novyi*, *C. sordelli*, *C. perfringens* types C and D bacterin toxoid (Vision 7; Merck Animal Health, De Soto, KS), and treated with Ivomec (Ivomec; Merial, Duluth, GA) for internal and external parasite control. Steers were limit fed (2% of BW) a 50% ground alfalfa hay, 50% distillers grains (DM basis) diet for 5 d before the initiation of the experiment in an effort to reduce variation in gut fill at time of weighing (Klopfenstein, 2011). Steers were individually weighed using a hydraulic squeeze chute with load cells mounted on the chute (Silencer, Moly Manufacturing Inc., Lorraine, KS: scale readability ± 0.45 kg) for 2 consecutive days (d 0 and 1) after the limit-feeding period to obtain an initial BW (Stock et al., 1983). On d 0, steers were implanted with Component TE-IS (Elanco Animal Health, Greenfield, IN) and were vaccinated with *Haemophilus somnus* (Somubac; Pfizer Animal Health). Steers were stratified by BW within respective BW block. Steers were housed in uncovered, soil-floor pens (7.3 × 54.9 m). Steers were reimplanted with Component TE-S (Elanco Animal Health) 72 d after initial implant. Six dietary treatments (6 replications per treatment) were assigned randomly to pens within BW block. Steers were individually weighed once at the end of the experiment, and a 4% pencil shrink was applied for calculation of final live BW. Carcass adjusted performance was calculated using HCW adjusted to a common DP of 63%.

Feed bunks were assessed at approximately 0600 h and managed so that trace (≤0.2 kg) amounts of feed were left in the bunk each morning at time of feeding. Feed was delivered with a truck mounted mixer and delivery unit (Roto-Mix model 274, Roto-Mix, Dodge City, KS; scale readability ± 0.91 kg) each morning at 0800 h. Steers were adapted to finishing diets over a 21-d period with a series of 4 diets containing 39, 29, 19, and 9% alfalfa hay (DM basis) for 3, 4, 7, and 7 d, respectively, with corn grain replacing alfalfa hay. Concentration of wet distillers grains with solubles (20%; **WDGS**; Bridgeport Ethanol LLC, Bridgeport, NE), corn silage (15%), and liquid supplement (6%) were included at the same concentration in the adaptation diets as the finishing diets (DM basis; Table 1). Beet pulp (Western Sugar Cooperative, Scottsbluff, NE) was included in both the DRC- and SFC-based diets at 0, 10, or 20% (DM basis), respectively, replacing corn. The beet pulp (22.4% DM, 10.1% CP, 46.3% NDF) used in the current experiment was delivered as needed from November 2010 until February 2011 and was stockpiled in a concrete bunker silo through the remainder of the experiment. Urea was included in both DRC and SFC diets at 0.30 and 0.40% of diet DM, respectively, to meet or exceed degradable intake protein requirements (NRC, 1996). The liquid supplement was formulated to provide 33 mg/kg monensin (Elanco Animal Health) and 8.7 mg/kg tylosin (Elanco Animal Health) in the diet. Ingredient and diet samples were collected weekly and dried in a 60°C forced-air oven for 48 h to determine DM of the samples (AOAC International, 1997; Method 930.15). Composited ingredient samples were sent to a commercial laboratory (Servi-Tech Laboratories, Hastings, NE) and analyzed for CP (AOAC International, 2000; Method 990.03), NDF (ANKOM, 2006), ether extract (AOAC International, 2006; Method 2003.6), Ca, P, S (Mills and Jones, 1996), and total starch (AOAC