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Effects of Sorting Steers by Body Weight into Calf-Fed, Summer Yearling, and Fall Yearling Feeding Systems[1]

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ABSTRACT

Two years of data (288 steers/yr) were used to determine if sorting cattle by BW into different production systems would decrease overweight carcasses (>431 kg) and hot carcass weight (HCW) variation. At receiving, steers were assigned randomly into sorted or unsorted groups (n = 144 steers/group). Within a group, steers were assigned to 1 of 3 feeding times: 1) calf-fed (entering the feedlot at receiving), 2) summer yearling (grazed during winter and entering the feedlot in May) and 3) fall yearling (grazed during winter and summer and entering the feedlot in September). Unsorted steers were assigned randomly to a feeding time. Sorted steers were assigned to a feeding time based on BW, with the heaviest one-third fed as calf-fed steers and the remaining steers grazing in the winter. After winter grazing, the heaviest one-half of the remaining sorted steers were fed as summer yearlings and the lightest one-half grazed summer grass and entered the feedlot in September. On feedlot entry, steers were assigned randomly to 6 pens/treatment. This experiment was analyzed as a completely randomized design with a 2 × 3 factorial arrangement of treatments and with pen as the experimental unit. By design, interactions ($P < 0.05$) were observed for initial feedlot BW and HCW. In addition, interactions ($P < 0.05$) were observed for G:F and percentage of overweight carcasses. Sorted fall yearlings had fewer overweight carcasses (6.40 vs. 35.42%). Regardless of whether they were sorted or unsorted, calf-fed steers and summer yearlings did not produce many overweight carcasses. Sorting into a production system decreased HCW variation and percentage of overweight carcasses.

Key words: carcass characteristic, feedlot cattle, sorting

INTRODUCTION

Ruminants have the ability to convert cellulose into energy and protein (Van Soest, 1994); therefore, they are able to graze in areas where cultivation or harvesting of forages is not feasible (Oltjen and Beckett, 1996). In terms of beef consumption, a constant supply of beef is critical, meaning cattle must be slaughtered throughout the year. To achieve a year-round beef supply, 2 major types of production systems are used: extensive and intensive (Griffin et al., 2007). Extensive systems use forage-based programs to grow cattle before they enter the feedlot. In extensive systems, cattle enter the feedlot after backgrounding. This can be after winter grazing or summer grazing. In intensive systems, cattle are placed in the feedlot directly after weaning and fed a high-concentrate diet until slaughter.

The cattle population is diverse in terms of BW and frame (Dolezal et al., 1993). This is important when choosing production systems to maximize profit. If large-framed cattle are placed in an extensive system, they may become overweight and receive discounts, thus decreasing profitability (Vieselmeyer, 1993). Furthermore, smaller framed cattle would be better suited to an extensive system, which allows the animal to grow. If smaller framed animals are placed directly into an intensive system, they risk becoming overconditioned at a less than ideal BW (Turgeon, 1984). If these smaller framed cattle are allowed to grow in an extensive system and then

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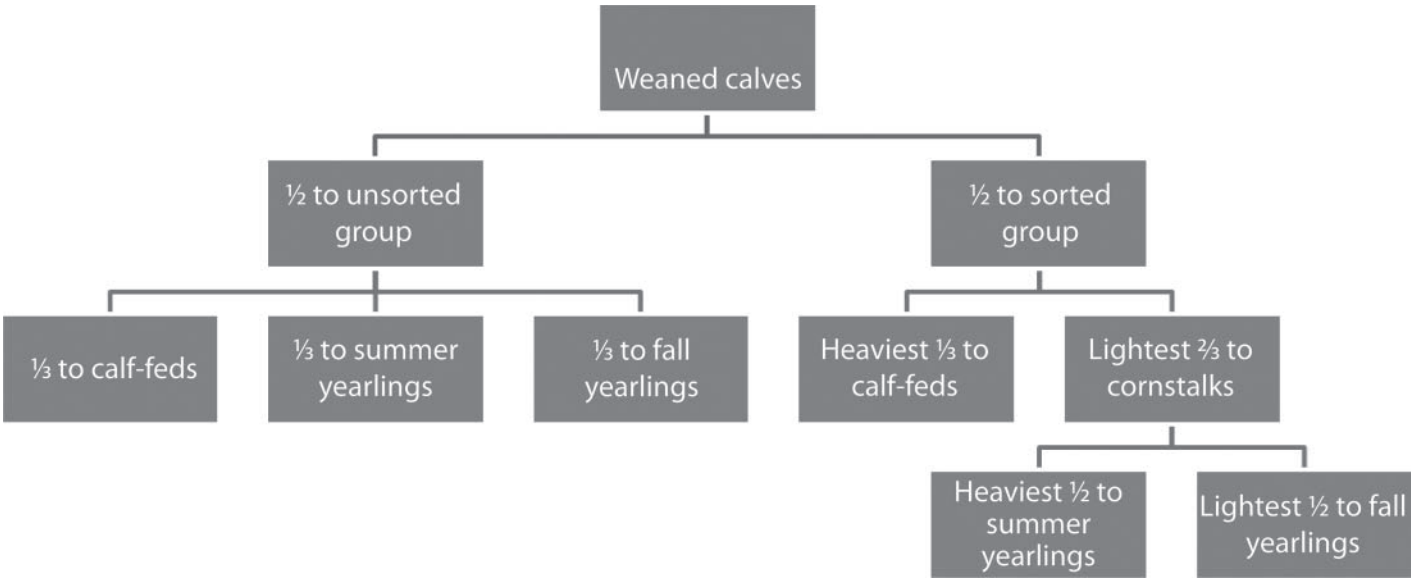

Figure 1. Experimental design of sorting.

placed into the feedlot, they will produce larger carcasses without being excessively fat (Griffin et al., 2007).

Previous research has shown that calf-fed animals have greater G:F, more days on feed, and lighter hot carcass weights (**HCW**) compared with yearlings finished in the feedlot (Turgeon, 1984; Lewis et al., 1989; Griffin et al., 2007). In these studies, at the time of receiving, heavier cattle were sorted into calf-fed systems and lighter cattle were placed into yearling systems. Therefore, the objective of this study was to determine the effects of sorting or not sorting genetically similar cattle by BW into 3 different production systems (calf-fed steers, summer yearlings, and fall yearlings) and to determine feedlot performance and carcass characteristics.

MATERIALS AND METHODS

Experiments

This experiment was a 2-yr study that evaluated sorting steers into 3 different production systems: calf-fed steers, summer yearlings, and fall yearlings. In the first year, 288 English-cross steers (250 ± 37 kg) were purchased from Nebraska ranches and delivered directly to the University of Nebraska Research Feedlot at Mead. There were 224 steers from one ranch (255 ± 40 kg) and 64 steers from a second ranch (223 ± 19 kg). In the second year, 288 English-cross steers (242 ± 23 kg) were purchased from Nebraska sale barns and delivered to the University of Nebraska Research Feedlot. There were 167 steers in one purchase (243 ± 24 kg) and 121 in a second purchase (240 ± 21 kg). At the time of arrival, cattle were dewormed (Dectomax injectable, Pfizer, New York, NY), vaccinated with a killed vaccine for clostridial diseases (Ultrabac 7 with Somnus, Pfizer), vaccinated against respiratory disease (Bovishield Gold, Pfizer), and ear tagged. After processing, the steers were placed on bromegrass pastures and supplemented with hay and wet corn gluten feed [Sweet Bran (**SB**), Cargill, Blair, NE] as needed for 28 d. At the end of the receiving period, steers were limit fed a basal diet of 50% SB and 50% alfalfa hay (DM basis) for 5 d at 2% of BW. At the end of the limit-feeding period, steers were assigned randomly to either the sorted group (n = 144/yr) or the unsorted group (n = 144/yr). In the unsorted group, steers were assigned randomly to 1 of the 3 production systems. The sorted steers were sorted into the different production systems based on BW at different times of the year. The heaviest one-third of the cattle in the sorted group were placed into the calf-fed system. The remaining sorted cattle were allowed to graze cornstalks throughout the winter.

At the end of the wintering phase, the heaviest one-half of the remaining sorted steers were placed into the summer yearling production system and the lightest one-half were then placed into the fall yearling production system (Figure 1). Each year, there were 8 animals/pen, with 6 replications of sorted or unsorted pens per finishing period. This resulted in a total of 12 pens for each system treatment. The diets for the 3 different feeding periods were the same within a year (Table 1). Comparisons were made among the 3 different production systems.

Calf-Fed Steers

Calves were limit fed for 5 d and BW were taken on d 0 and 1. In this study, the unsorted calf-fed steers were assigned randomly to the calf-fed system and not assigned based on BW. In the sorted group, the heaviest one-third were placed into the calf-fed system. This was based on d 0 BW after being limit fed. Cattle were stratified by BW and then assigned randomly to pens. In yr 1 and 2, November 22, 2005, and November 14, 2006, respectively, were d 0. In yr 1, steers were initially implanted with Synovex S (Fort Dodge Animal

Health, Overland Park, KS) and reimplanted on d 71 with Revalor S (Intervet Inc., Millsboro, DE). In yr 2, steers were initially implanted with Synovex Choice (Fort Dodge Animal Health) and reimplanted with Synovex Choice (Fort Dodge Animal Health) on d 82. The calf-fed steers were fed for 167 and 196 d in yr 1 and 2, respectively. Steers were slaughtered on May 9, 2006, and on May 30, 2007, in yr 1 and 2, respectively.

Summer Yearlings

At trial initiation, steers were limit fed 50% SB and 50% alfalfa hay (DM basis) for 5 d at 2% of BW. After limit feeding, steer BW were collected. The unsorted group of summer yearlings was already assigned to treatment based on the random sort at the time of trial initiation. After BW were collected, steers were transported to cornstalks. Cattle grazed cornstalks over the winter months and were supplemented with 2.27 kg SB/animal per day (DM basis) to achieve a BW gain of 0.68 kg/d (Jordan, 2000). Steers grazed cornstalks for 153 and 156 d in yr 1 and 2, respectively. At the end of the cornstalk-grazing period, steers were limit fed 50% SB and 50% alfalfa hay (DM basis) for 5 consecutive days at 2% of BW. Limit-fed BW were collected on 2 consecutive days. Assignment of cattle to the sorted summer yearling system was determined based on the 2-d average BW, with the heaviest one-half of the sorted group being placed into the summer yearling system. Cattle were then allowed to graze bromegrass from April to May. Cattle grazed bromegrass for 35 and 48 d in yr 1 and 2, respectively. Steers assigned to the summer yearling system were then separated from the fall yearlings and limit fed 50% SB and 50% alfalfa hay (DM basis) for 5 d at 2% of BW. After limit feeding, BW were collected for 2 consecutive days. The d 1 BW were d 0 of the finishing period. Day 0 BW were used to assign cattle randomly to pens so that the pen average BW were similar within the sorted and unsorted groups. Body weights from d 0 and 1 were averaged to obtain the initial feedlot entry BW for the summer yearlings.

May 30, 2006, and June 6, 2007, were d 0 for the summer yearling finishing period in yr 1 and 2, respectively. In yr 1, cattle were implanted with Revalor S (Intervet Inc.). In yr 2, cattle were implanted with Synovex Choice (Fort Dodge Animal Health) on d 48. Steers in yr 1 were fed for 133 d and slaughtered on October 11, 2006. Steers in yr 2 were fed for 145 d and slaughtered on October 30, 2007.

Fall Yearlings

The unsorted fall yearlings were assigned based on the initial sort at the time of trial initiation. The sorted fall yearlings were determined based on BW at the end of the winter grazing period. The fall yearlings were limit-fed 50% SB and 50% alfalfa hay (DM basis) for 5 d at 2% of BW at the time of arrival. After limit feeding, BW was taken on 2 consecutive days and steers were placed onto cornstalks for the winter months and fed 2.27 kg SB. This was to achieve a BW gain of 0.68 kg/d (Jordan, 2000) while grazing cornstalks. At the end of the winter grazing period, cattle were then limit fed 50% SB and 50% alfalfa hay (DM basis) for 5 d at 2% of BW. After limit feeding, BW were collected on 2 consecutive days. Steers were then placed onto bromegrass to graze before being branded and implanted with Revalor G (Intervet Inc.). Steers were transported to the University of Nebraska Barta Brothers Ranch near Rose to graze Sandhills native range over the summer months. The summer grazing period on the bromegrass and Sandhills was considered 1 grazing period. The fall yearlings grazed pasture for 149 and 152 d for yr 1 and 2, respectively.

The fall yearlings were then transported back to the research feedlot near Mead, Nebraska, and limit fed 50% SB and 50% alfalfa hay (DM basis) for 5 d at 2% of BW. After limit feeding, steers were weighed for 2 consecutive days (d 0 and 1 of the finishing period). Cattle were assigned randomly to pens based on d 0 BW. Pen average BW within the sorted and unsorted groups were similar. Day 0 of the finishing period was September 21, 2006, and September 19, 2007, for yr 1 and 2, respectively. During yr 1, cattle were implanted with Revalor S (Intervet Inc.) on d 23, and in yr 2, cattle were implanted with Revalor S (Intervet Inc.) on d 28. The fall yearlings were fed for 116 and 132 d during yr 1 and 2, respectively. The fall yearlings in yr 1 were slaughtered on January 16, 2007, and on January 30, 2008, in yr 2.

For all treatments, final BW was determined using HCW and a standard dressing percentage of 63%. A standard dressing percentage was used because only the carcass has value. Furthermore, using HCW reduces the differences observed in the live performance caused by differences in gut fill from live animals. Steers were slaughtered at a commercial packing plant. On the day of slaughter, the carcasses were identified, and liver scores and HCW were collected. After a 48-h chill, 12th-rib backfat and LM area were measured. The USDA called marbling score was also recorded as it was scored by a USDA grader at the plant. The USDA YG was calculated using the following equation: YG = 2.5 + (6.35 × fat thickness, cm) +

Table 1. Diet composition for the finishing period for each year[1]

Ingredient	yr 1	yr 2
Dry-rolled corn	33.75	33.75
High-moisture corn	33.75	33.75
Wet distillers grains plus solubles	15.00	20.00
Alfalfa	7.50	7.50
Molasses	5.00	—
Supplement[2]	5.00	5.00

[1]Amounts of ingredients presented as percentage inclusion on a DM basis.

[2]Supplement contained 30 g/ton of monensin (Elanco Animal Health, Greenfield, IN) and 90 mg/animal daily of tylosin (Elanco Animal Health).

Table 2. Simple effects of sorting (sorted vs. unsorted) and production system (calf-fed steers, summer yearlings, and fall yearlings) on feedlot performance

	Sorted			Unsorted			*P*-value	
Item	Calf-fed	Summer	Fall	Calf-fed	Summer	Fall	System	System × sorting[1]
Initial BW,[2] kg	294[d]	360[c]	394[b]	261[e]	358[c]	420[a]		<0.01
Initial BW SD, kg	22	15	24	26	33	43		—
ADG, kg/d	1.61[b]	1.85[ab]	1.88[ab]	1.60[b]	1.86[ab]	1.94[a]	<0.01	0.09
DMI, kg/d	9.45[d]	11.49[c]	12.29[b]	9.12[d]	11.37[c]	13.15[a]		<0.01
G:F	0.170[b]	0.161[b]	0.153[c]	0.179[a]	0.164[b]	0.147[c]		0.02

[a–e]Means within a row with different superscripts are statistically different.

[1]*P*-value for production system × sorting interaction.

[2]Initial BW = steer BW at feedlot entry.

(0.0017 × HCW, kg) + (0.2 × KPH, %) − (2.06 × LM area, cm^2) (Boggs and Merkel, 1993).

Statistical Analysis

Data from this study were first analyzed as a completely randomized design with a 2 × 2 × 3 factorial arrangement of treatments using the MIXED procedure of SAS (SAS Institute Inc., Cary, NC). Feedlot pen was the experimental unit. The model included feeding period, sorted versus unsorted, year, feeding period by sorted versus unsorted, feeding period by year, sorted versus unsorted by year, and feeding period by sorted versus unsorted by year. There were no significant interactions with year; therefore, data from both years were pooled and analyzed as a completely randomized design with a 2 × 3 factorial arrangement of treatments using the MIXED procedure of SAS. Year was included as a random effect in the model. Least squares means were separated using the least significant difference method when a significant ($P < 0.05$) treatment *F*-test was detected. If there was not a significant interaction, main effects were reported. If there was a significant interaction, the simple effects were reported.

RESULTS AND DISCUSSION

Feedlot Performance

The initial BW at the time of receiving was not different between the sorted and unsorted groups within a

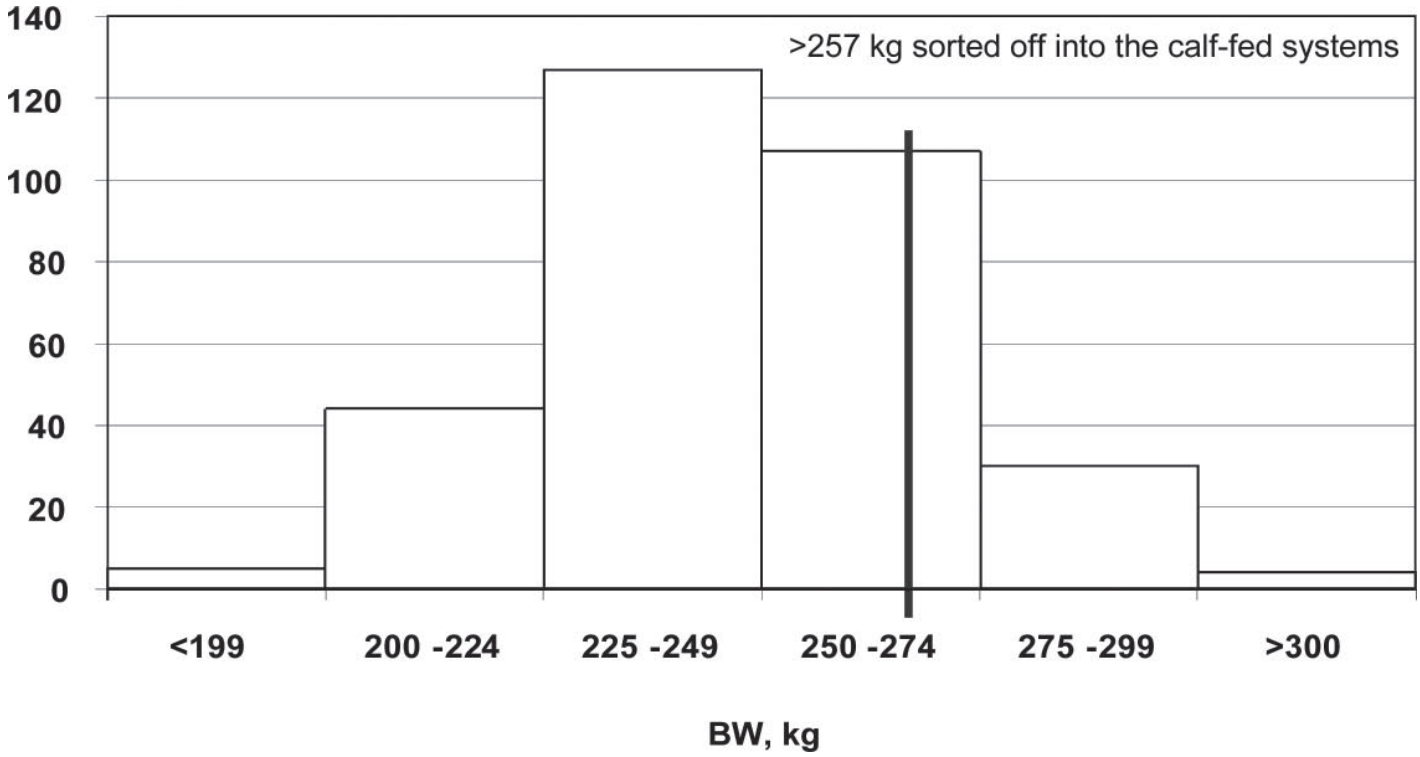

Figure 2. The BW distribution for steers at the time of arrival to the research feedlot for yr 2.

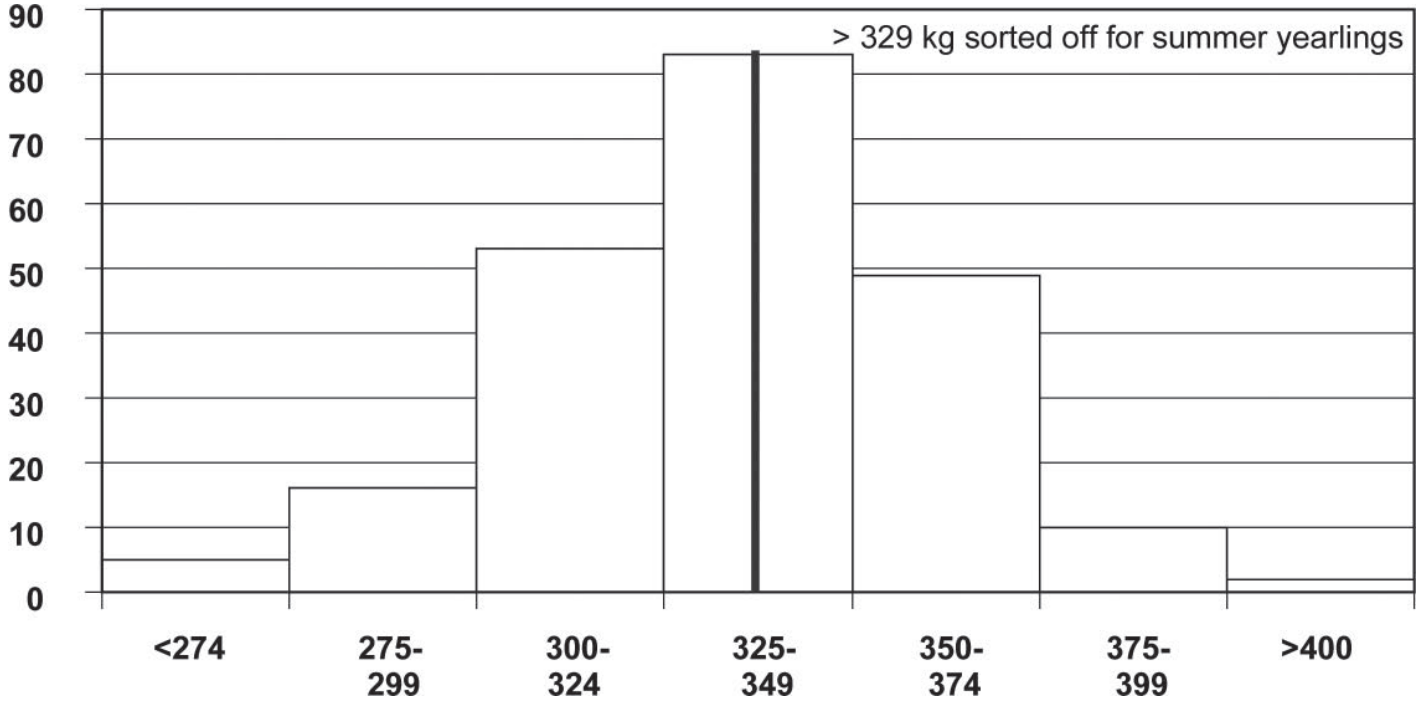

Figure 3. Body weight distribution for steers after grazing cornstalks over the winter months for yr 2.

year ($P > 0.16$). In yr 1, the sorted group averaged 273 kg compared with 269 kg for the unsorted group. In yr 2, the sorted group had an average BW of 249 kg and the unsorted average was 248 kg. The design of the study was to assign the steers randomly into the sorted and unsorted groups, thereby making the 2 groups similar. There was a significant interaction between the feeding periods and sorted versus unsorted treatments ($P < 0.01$) for initial feedlot BW (Table 2). The sorted calf-fed steers were 33 kg heavier than the unsorted calf-fed steers. This was because the heaviest steers in the sorted group were placed in the calf-fed system. The unsorted group was assigned randomly into the calf-fed system. There was no difference between the sorted and unsorted summer yearlings with the initial feedlot BW of 360 and 358 kg, respectively ($P > 0.30$). The fall yearlings were different between the sorted and unsorted groups ($P < 0.01$). The unsorted group was significantly heavier, by 27 kg. This was due to sorting the heaviest steers as calf-fed steers and summer yearlings in the sorted group.

Steers that were in the sorted fall yearlings were the lightest one-half after grazing cornstalks. In the unsorted group, steers were assigned randomly to the group, so some of the larger steers that would normally be placed into a calf-fed system were placed into the fall yearling system. At the time of arrival in the fall, steer BW were normally distributed (Figure 2). By removing the heaviest one-third, the distribution was skewed to the right, but it returned to a normal distribution after the cattle grazed cornstalks over the winter months (Figure 3). The initial feedlot BW was according to the study design and showed that the objective was achieved.

The SD was also calculated from the initial feedlot BW. In all 3 feeding periods, the sorted steers had a numerically lower value. The SD for the sorted calf-fed steers was 22 kg, compared with 26 kg for the unsorted calf-fed steers. The SD for the sorted summer yearlings was 15 kg, whereas the SD for the unsorted summer yearlings was 33 kg. In the fall yearlings, the SD for the sorted group was 24 kg, compared with 43 kg for the unsorted group.

The system × sorted versus unsorted interaction was not significant ($P = 0.80$) for ADG; therefore, only the main effects of sorting and system are discussed. The calf-fed steers had the lowest ADG (1.62 kg/d), followed by the summer yearlings (1.86 kg/d). The fall yearlings had the highest ADG (1.91 kg/d), which was not different from that of the summer yearlings ($P > 0.47$). Previous research (Griffin et al., 2007) has shown that calf-fed steers have a lower ADG compared with fall yearlings, and the summer yearlings would be expected to be intermediate. A significant interaction between the feeding periods and sorted versus unsorted ($P < 0.01$) treatments was observed for daily DMI. There was no difference between the sorted and unsorted groups of calf-fed steers and summer yearlings; however, there was a difference between the sorted and unsorted fall yearlings. The unsorted fall yearlings consumed 0.86 kg more daily than the sorted fall yearlings. This is likely related to the BW of the cattle within each group. When daily DMI was compared on a percentage of BW, only small numerical differences were observed. The sorted calf-fed steers had a daily DMI of 2.15% of BW, and the unsorted calf-fed steers had a DMI of 2.22%. In the summer yearlings, the sorted group was at 2.34% of BW, compared

Table 3. Simple effects of sorting (sorted vs. unsorted) and production system (calf-fed steers, summer yearlings, and fall yearlings) on carcass characteristics

	Sorted			Unsorted			*P*-value	
Item	Calf-fed	Summer	Fall	Calf-fed	Summer	Fall	System	System × sorting[1]
HCW,[2] kg	368[d]	389[c]	397[b]	351[e]	388[c]	417[a]		<0.01
HCW SD,[3] kg	26	19	28	30	30	40		—
Fat, cm	1.39	1.44	1.20	1.32	1.35	1.26	0.03	0.32
LM area, cm^2	86.6[a]	82.4[b]	86.6[a]	83.8[b]	81.5[b]	89.1[a]		0.03
Marbling[4]	572	515	565	565	514	588	<0.01	0.09
Carcasses >431 kg, %	3.27[c]	2.08[c]	6.40[bc]	1.04[c]	10.42[b]	35.42[a]		<0.01
Carcasses >454 kg, %	1.19[b]	0.00[b]	1.04[b]	0.00[b]	2.08[b]	17.71[a]		<0.01

[a–e]Means within a row with different superscript are statistically different.

[1]*P*-value for sorting by production systems interaction.

[2]HCW = hot carcass weight.

[3]HCW SD = hot carcass weight SD.

[4]Marbling = USDA marbling score (400 = Slight, 500 = Small[00], etc.).

with 2.33% for the unsorted group. The sorted fall yearlings had a daily DMI of 2.40% of BW, compared with 2.43% for unsorted steers.

A significant interaction was observed for G:F ($P < 0.05$). The unsorted calf-fed steers were the most efficient, at 0.179 kg of BW gain/kg of intake, which was higher than that of the sorted calf-fed steers (0.170 kg of BW gain/kg of intake), sorted summer yearlings (0.161 kg of BW gain/kg of intake), and unsorted summer yearlings (0.164 kg of BW gain/kg of intake). The sorted and unsorted fall yearlings were the least efficient, at 0.153 and 0.147 kg of BW gain/kg of intake, respectively. The unsorted calf-fed steers were the most efficient even though they were the lightest steers that entered the feedlot. As stated above, there was no difference in ADG or DMI for the sorted and unsorted calf-fed steers. These data suggest that the lighter steers that enter the feedlot as calf-fed steers will be more efficient compared with the heavier steers that enter the feedlot as calf-fed steers. Overall, G:F was similar for sorted and unsorted (0.163 vs. 0.161 kg of BW gain/kg of intake) steers across the 3 feeding systems.

There was a difference between years in days on feed for the different feeding periods. During yr 2, the steers in all 3 systems were fed more days compared with yr 1. This was due to the steers in yr 2 having a lighter average BW at receiving, which carried through the rest of the trial. The steers in yr 2 were marketed at BW similar to steers in yr 1, which required the steers in yr 2 to be fed longer in the feedlot to make up that difference.

Carcass Characteristics

Carcass weight followed the same pattern as initial feedlot BW (Table 3). There was an interaction between feeding period and sorted versus unsorted ($P < 0.01$). The unsorted calf-fed steers had the lowest HCW, at 351 kg. The sorted calf-fed steers had a HCW of 366 kg, which was different from that of the unsorted calf-fed steers. This was similar to the relationship of initial feedlot BW. For the summer yearlings, there was no difference between the sorted and unsorted groups, at 389 and 388 kg, respectively. There was a difference in HCW between the sorted and unsorted fall yearling groups. The sorted group was 22 kg lighter than the unsorted fall yearlings. Again, this followed the same pattern as the initial feedlot BW. This interaction was expected because of the design of the study. The heaviest steers in the sorted group were sorted into the calf-fed system and the lightest steers were placed into the fall yearling system.

These results were similar to previous research showing that fall yearlings had heavier carcasses compared with calf-fed steers (Jordan, 2000; Sainz and Vernazza Paganini, 2004; Griffin et al., 2007). Griffin et al. (2007) compared calf-fed steers and yearlings over 8 yr. They concluded that the yearling steers had an additional 90 kg of final BW. This was calculated by adding the difference of initial and final BW. In the comparison by Griffin et al. (2007), the calf-fed steers were heavier at receiving, whereas the yearlings were lighter. The final BW was 38 kg more for the yearlings compared with the calf-fed steers. The initial BW of calf-fed steers was 52 kg heavier than that for yearlings, thus resulting in a total of 90 kg more net final BW that was sold (BW gained). In this study, the sorted yearlings had an additional 108 kg of BW that was sold (BW gained) based on initial and final BW compared with the sorted calf-fed steers. The sorted steers from this study would be similar to the steers used in the study by Griffin et al. (2007), with the heavier steers finished as

calf-fed steers and the lighter steers finished as fall yearlings. In our study, the unsorted yearlings had an additional 46 kg of HCW, for a total of 112 kg greater net final BW (gained) compared with that of the calf-fed steers. This indicates that finishing steers as yearlings will allow more BW to be gained and some extra BW to be sold.

The SD of the HCW was similar to that of the initial feedlot BW, with all 3 sorted groups having numerically lower values compared with the unsorted groups. The sorted calf-fed steers had a 4-kg lower SD compared with that of the unsorted calf-fed steers. The sorted summer yearlings had an 11-kg lower SD. The sorted fall yearlings had a 12-kg lower SD than that of the unsorted fall yearlings.

Carcass weights are important because most packing plants discount carcasses that are heavier than 431 kg and carcasses that are heavier than 454 kg (Feuz, 2002; USDA, 2008). There was a significant interaction between the feeding periods and sorted versus unsorted for percentage of carcasses of greater than 431 kg. The unsorted fall yearlings had the highest percentage, at 35.42% greater than 431 kg, followed by the unsorted summer yearlings, at 10.42%. This was expected because the unsorted summer and fall yearlings were never sorted by BW and contained some of the larger steers at receiving. The unsorted fall yearlings also had the greatest HCW average at the end of the finishing period. The sorted fall yearlings exhibited 6.40% overweight carcasses, which was not nearly as great as for unsorted fall yearlings and unsorted summer yearlings. There were no differences between the sorted summer yearlings, unsorted calf-fed steers, and sorted calf-fed steers, which exhibited approximately 2% overweight carcasses.

An interaction was observed between feeding period and sorted versus unsorted ($P < 0.01$) for carcasses of greater than 454 kg. The percentage of unsorted fall yearlings was significantly higher (17.71%) than the percentage of other groups, which ranged from 0 to 2.08%. These data show that sorting steers into the different feeding systems decreased the number of overweight carcasses.

The other carcass characteristics evaluated were the LM area, 12th-rib backfat thickness, and USDA called marbling. For the LM area, there was a significant interaction ($P < 0.01$). The sorted calf-fed steers had a larger LM area than the unsorted calf-fed steers. The LM area for the sorted calf-fed steers was similar to that of the fall yearlings, which was not different between the sorted and unsorted groups. The sorted and unsorted summer yearlings were not different from the unsorted calf-fed steers.

There was not a significant interaction between feeding period and sorted versus unsorted steers for fat thickness; however, there was a difference between feeding periods. There was no difference between calf-fed steers and summer yearlings. The fat thickness of calf-fed steers averaged 1.36 cm and that of summer yearlings averaged 1.38 cm. Both of these groups had greater fat thickness than the fall yearlings, which averaged 1.23 cm. This indicates that the calf-fed steers and summer yearlings were finished to a similar fat thickness and that the fall yearlings required more days on feed to be at a similar fat thickness. If the fall yearlings had been fed longer, the number of overweight carcasses would have increased. Marbling scores (400 = Slight^{00}, 500 = Small^{00}, etc.) were called by a USDA grader at the plant where the steers were slaughtered. No interaction was observed for marbling score; however, there was a difference in feeding period. The calf-fed steers and fall yearlings had similar marbling, with an average score of 569 and 577, respectively. Krehbiel et al. (2000), Sainz and Vernazza Paganini (2004), and Griffin et al. (2007) also showed that calf-fed steers and fall yearlings had similar USDA called marbling scores. The scores of calf-fed steers and fall yearlings were higher than those of summer yearlings, with an average score of 515. The steers finished during the summer months did not grade as well as those finished during the winter-spring or fall.

Grazing Periods

Even though steers were managed as 1 group during winter and summer grazing, performance for the winter and summer grazing periods was retrospectively evaluated using the pen assignment at feedlot entry as the experimental unit. Average daily gains from the winter and summer grazing periods were calculated for the summer and fall yearlings (Table 4). There was a difference in ADG for steers that grazed cornstalks in yr 1 and 2. In yr 1, steers had less ADG compared with steers in yr 2 (0.52 vs. 0.58 kg/d). These BW gains were somewhat less than those reported by Jordan (2000), who had a rate of BW gain of 0.77 kg/d by supplementing steers with 2.27 kg SB/animal per day. The differences in BW gain between the 2 studies could have been due to the quality of corn residue grazed or the winter weather. The summer yearlings then grazed bromegrass for 35 and 48 d in yr 1 and 2, respectively. In yr 1, the summer yearlings had an ADG of 0.61 kg/d. In yr 2, the ADG was 0.07 kg/d. The fall yearlings also followed the same pattern. The fall yearlings for yr 1 had an ADG of 0.81 kg/d compared with 0.31 kg/d for yr 2. Folmer et al. (2008) had a summer ADG for long yearlings of 0.79 kg/d. Year 1 in the current study was similar, but yr 2 had a much smaller ADG on grass. The poor ADG in yr 2 resulted in the steers in the summer and fall yearling systems being fed longer in the feedlot. Reasons for the poor pasture BW gains in yr 2 are not apparent. Shain et al. (2005) indicated that maximizing grazing BW gain had the greatest effect on reducing the slaughter breakeven cost. The current study also emphasizes the need for good pasture management and BW gain to keep production costs minimal.

Table 4. Grazing BW gains during the backgrounding phase of the systems for both years based on feeding period

	yr 1		yr 2	
Item	Summer[1]	Fall[2]	Summer[1]	Fall[2]
Initial BW,[3] kg	271	246	246	240
Grass BW,[4] kg	352	323	340	327
Feedlot BW,[5] kg	374	443	345	372
Winter ADG, kg/d	0.53	0.51	0.60	0.56
Summer ADG, kg/d	0.61	0.81	0.07	0.31

[1]Steers that were finished in the summer yearling system.

[2]Steers that were finished in the fall yearling system.

[3]Initial BW at the time of receiving in the fall.

[4]BW at the end of cornstalk grazing in the spring and beginning of summer grazing.

[5]BW at the end of summer grazing and the beginning of the finishing period.

IMPLICATIONS

Results from this study indicate that sorting steers into different feeding periods based on BW will decrease variation in initial feedlot BW and HCW when steers are slaughtered. Sorting steers into different feeding periods based on BW reduced the number of overweight carcasses among summer and fall yearlings. These data also show that lighter calf-fed steers were more efficient than heavier calf-fed steers, but sorted and unsorted steers over the 3 systems had equal G:F. The data also show that calf-fed steers were more efficient compared with fall yearlings; however, fall yearlings had greater ADG compared with calf-fed steers, with summer yearlings being intermediate for G:F and ADG. It has been recommended that steers be sorted into different feeding periods based on BW. These data support that recommendation because sorting steers by BW decreased the SD for HCW and the percentage of overweight carcasses without affecting the performance of the steers.

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