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Animal finishing-phase response to modified intensive-early stocking on shortgrass rangeland[1]

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ABSTRACT

A comparison of animal performance and carcass traits was made from 2002 to 2008 following the finishing phase of a continuous season-long stocking (SLS) system and a modified intensive-early stocking system with late-season grazing (IES 1.6× + 1) on shortgrass native rangeland of western Kansas. The continuous season-long stocked system placed animals at a density of 1.37 ha per steer from May through October, or 2.63 animal unit months/ha, whereas the intensive-early stocked system with late-season grazing (3.33 animal unit months/ha) stocked pastures at 0.85 ha per steer from May through the middle of July, moved the heaviest animals mid-July to the feedlot, and then stocked pastures at 1.37 ha per steer until October. Animals moved from pasture to the feedlot in July and October from the modified IES 1.6× + 1 stocking system were approximately 27.3 kg per steer lighter than the continuous SLS animals entering the feedlot from pasture in October. This greater BW entering the feedlot carried over into greater HCW at the end of the feeding period for the continuous SLS animals. Average daily gain, total individual BW gain, and feed efficiency were similar among groups at the end of the feedlot finishing phase. Marbling score was greatest for the continuous SLS animals, but fat thickness over the 12th rib was similar among groups. Differences between groups during the feedlot finishing phase appeared to be related more to size of animals when removed from pasture and duration on pasture more than any other factors.

Key words: beef production, carcass trait, feed efficiency, modified intensive-early stocking, season-long continuous stocking

INTRODUCTION

Beef production on western Kansas rangelands is primarily dominated by mature beef cow/calf systems, whereas beef production in eastern Kansas is primarily beef cow/calf systems and young stocker animal systems. Intensive-early stocking (**IES**), stocking young animals at greater densities for the first half of the growing season (typically 75–90 d) and then removing the animals for the last half of the growing season, is now a common practice in eastern Kansas (Owensby et al., 2008). Modifications to IES, which stock at greater densities early in the season and remove only a portion of the animals for the last half of the season, thereby leaving some animals on pasture for late-season grazing, have been used successfully in eastern and western Kansas to increase beef production on a land-area basis (Owensby et al., 2008; Harmoney and Jaeger, 2011). In eastern Kansas, a 16% annual increase in stocking rate from the use of the modified IES system (**IES 2× + 1**, twice the normal stocking density for the first half of the growing season and one times the normal stocking density for the last half of the grazing season) in a rotation with continuous stocking and traditional IES resulted in 30% greater animal production on a land-area basis without any negative effect on the pasture system vegetation (Owensby et al., 2008). The modified IES system with late-season grazing (**IES 1.6× + 1**, 1.6 times the normal stocking density during the first half of the growing season and one times the normal stocking density for the last half of the growing season) on shortgrass native rangeland of western Kansas increased stocking rates by 23% and increased pasture beef

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production by 25% compared with continuous season-long stocking without altering vegetation characteristics (Harmoney and Jaeger, 2011).

In the western Kansas research, the continuous system placed animals on pasture at a 1× rate from May through October, whereas the IES system with late-season grazing stocked pastures at a 1.6× rate from May through the middle of July and then stocked pastures at a 1× rate for the remainder of the grazing season by moving the heaviest animals from pasture to the feedlot mid-July each year. Average daily gains and total animal BW gain was slightly greater for the continuous system during the first half of the grazing season but was equal for animals stocked during the last half of the season. Total-season individual-animal BW gain and ADG were similar between the continuous season-long stocked and the IES system animals that were on pasture the entire grazing season. Total BW gain on a land-area basis was greater for the modified IES system with late-season grazing and with greater animal densities. Early removal of the heaviest animals at the July midpoint of the grazing season was intended to result in a more uniform animal group ready for feedlot placement and to add flexibility with another time period of marketing animals.

Neither the eastern nor western Kansas research of modified IES reported on the feedlot finishing-phase characteristics of animals when removed from pasture (Owensby et al., 2008; Harmoney and Jaeger, 2011). Animal diets and stocking before placement in the feedlot may or may not affect feedlot and finishing performance (Hancock et al., 1987; Owensby et al., 1995; Drouillard and Kuhl, 1999). The objective of this research was to quantify whether animal performance through the finishing phase differs because of the pasture phase of the continuous season-long stocking (**SLS**) system and modified 1.6× + 1 IES system, and the different time of animal removal in the 1.6× + 1 system. Poor feedlot performance by animals from the IES 1.6× + 1 system would reduce the appeal of using this system, even though animals had positive pasture-phase performance.

MATERIALS AND METHODS

Research Site

The pasture and feedlot research sites were located at the Kansas State University Agricultural Research Center near Hays, Kansas (38°51′29.8759N, 99°20′06.9770W, elevation 611 m above sea level). Specifics of the pasture resource and the experimental design and analysis of the pasture phase have previously been published for this 7-yr experiment (Harmoney and Jaeger, 2011). Procedures for this experiment were approved by the Kansas State University Institutional Animal Care and Use Committee. Four pasture replicates were used for each stocking system. All pastures were stocked with Angus and Angus × Hereford steers. The continuous season-long-stocked system placed 10 animals at a density of 1.37 ha per steer (1×, the sustainable stocking density for a 5-mo stocker grazing season) from May through October, or 2.63 animal unit months per hectare, whereas the IES system with late-season grazing (3.33 animal unit months/ha) stocked pastures with 16 animals at 0.85 ha per steer (1.6×) from May through the middle of July and then stocked pastures with 10 steers at 1.37 ha per steer (1×) for the remainder of the grazing season by moving the heaviest 6 animals to the feedlot mid-July each year. All animals placed on pasture in May were moved from pasture to the feedlot in either July or October. Animals were implanted with Synovex-S (200 mg of progesterone and 20 mg of estradiol; Zoetis, Florham Park, NJ) and were vaccinated for *Clostridium*, infectious bovine rhinotracheitis, and bovine viral diarrhea before being placed on pasture. Animals were withheld from feed and water for 6 to 12 h and weighed once at the time of placement on pasture, at mid-July on pasture, at removal from pastures, and at slaughter. Animals from both systems within a year, when removed in July (the heaviest animals from IES 1.6× + 1) or October (the remainder from IES 1.6× + 1 and the continuous SLS), were implanted with the same implant [either Synovex Choice (100 mg of trenbolone acetate and 14 mg of estradiol benzoate) or Synovex Plus (200 mg of trenbolone acetate and 28 mg of estradiol benzoate); Zoetis, depending on year] at the time of removal from pasture and placement in the feedlot. Animals from 2 replications of the same treatment on pasture were placed into the same feedlot pen during the finishing phase. However, the heaviest animals removed in July from all 4 replicates of the 1.6× + 1 system were placed in a single feedlot pen during the finishing phase to match as similar as possible the animal numbers in each pen and the bunk and pen space allocated for the October-removed animals. Steers removed from pasture in October from the continuous SLS and 1.6× + 1 treatments were allowed 36 cm per steer of linear group bunk space and 51.5 m^2 per steer pen area in the feedlot, and July-removed steers from the 1.6× + 1 treatment were allowed 30 cm per steer of linear group bunk space and 42.8 m^2 per steer pen area. Feedlot pens used a compacted soil surface.

Feeding and Slaughter

When placed in the feedlot, animals were transitioned from a diet composed of mostly sorghum silage to a finishing diet composed of mostly finely rolled milo and at least a 10% sorghum silage roughage content. The same feed ingredients at full feed were used during the 2-wk transition to a high-grain diet. The initial 70% sorghum silage roughage on a DM basis was reduced by 5% each day to reach a target 10 to 15% roughage through the remainder of the feeding phase. Animals from both stocking systems, whether placed in the feedlot in July or October, were fed the same