Adaptation Period on Wheat Pasture for Positive Live Weight Gains: Fact or Fiction?

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Story In Brief

Grazing studies were conducted during two consecutive winter wheat grazing seasons (2004-05 and 2005-06) at the Oklahoma State University Wheat Pasture Research Barn to determine the pattern of steer BW change throughout the winter wheat grazing period. Thirty-four Angus steers (2004-05) and 28 Angus steers (2005-06) were managed in a single wheat pasture and weighed frequently throughout the grazing season. Grazing was initiated on Nov. 11 and 14 (2004 and 2005, respectively), with steers removed from wheat the following Apr. 26 of each season. Steer BW increased linearly ($P<.01$; $Y = 450.7 + 3.08x$) throughout the 166-d grazing season of 2004-05. Only the initial BW, which was measured prior to placement on wheat pasture, produced a residual that was significantly ($P<.01$) different from 0. During the 2005-06 wheat grazing season steer BW increased linearly ($P<.01$; $Y = 485.3 + 3.09x$) over the 163-d grazing season. The regression function for 2005-06 did not produce any residuals which were different from 0 ($P>.17$). These data indicate that, while brief periods during the grazing season can produce gains that appear to be greater or less than the overall trend in ADG, weight gains during the initial 2 to 3 wk of grazing on wheat pasture did not differ from the overall trend.

Key Words: Wheat Pasture, ADG, Adaptation, Steers, Weight Gain

Introduction

The idea that there is an initial period of 2 to 3 wk in which weight gains of growing cattle on wheat pasture are very low or even negative is heavily engrained in folklore. This potential adaptation period has been suggested in steers (Phillips et al., 2000; Appeddu et al., 2003; Phillips et al., 2004) as well as sheep (Brown et al., 2000) grazing winter wheat pasture. When monitoring short-term weight gain of animals, many factors come into play that can influence weight measurements. Paramount among these is amount of rumen fill (shrunk vs unshrunk weights, or a recent change in type and DM content of the diet). Also, when evaluating BW gains, it is important to realize that brief snapshots of an animal's performance may be less important than the overall trend for the entire production period. In the case of winter wheat pasture, a desirable length of grazing would be 100 d or more, depending on whether a grain crop is harvested or not. During the course of this production period there may be times when an animal is not as productive as other times. This can be due to environmental or forage availability and quality issues. Therefore, the objective of this study was to determine the overall trend of BW gains of steers on winter wheat pasture and determine if there was an adaptation period following turn-out onto winter wheat pasture.

Materials and Methods

Study Site. One continuous, clean-tilled winter wheat field (86 ac) at the Oklahoma State University Wheat Pasture Barn (located 3 mi W of Stillwater) was managed as two pastures during the 2004-05 and 2005-06 winter wheat grazing seasons. Wheat was planted to a single variety at the rate of 120 lb/ac on Sept 7, 2004 (variety Ok102) and Sept. 9, 2005 (variety 2174). Nitrogen fertilizer was applied just prior to planting each year (87 lb N/ac in 2004 and 106 lb N/ac in 2005). On Oct. 4, 2005 the entire pasture was sprayed to eliminate an Army Worm infestation. In each season, rainfall and temperatures were conducive to good stand establishment and fall forage production (Figure 1 and 2). Grazing was initiated on Nov. 11, 2004, and Nov. 14, 2005. In each year, pastures were managed in a graze-out manner, with steers removed from pastures on Apr. 26 of each year, resulting in 166- and 163-d grazing seasons in 2004-05 and 2005-06, respectively.

Cattle Management. Thirty-four Angus steers (initial BW 494 ± 80 lb) and 28 Angus steers (initial BW 502 ± 76 lb) originating from the OSU Range Cow Research herd were used for 2004-05 and 2005-06, respectively. In both years, steer calves were weaned approximately 30 d prior to turn-out onto wheat pasture. From weaning until turn-out steers had ad libitum access to prairie hay and were fed 2 lb/steer/d of a 40% CP (all-natural), Deccox® (Alpharma Inc., Fort Lee, NJ) -containing supplement. In 2004-05, 30 d prior to weaning steers were vaccinated for IBR, BVD, PI3, and BRSV, and administered a 7-way clostridial and pasturella vaccine. At weaning (Oct. 12, 2004), steers were given a booster for the respiratory vaccine and de-wormed with Dectomax® (Phizer Animal Health, Exton, PA). In 2005-06, steers were weaned Oct. 13, 2005 and mass medicated with Micotil® (Elanco Animal Health, Indianapolis, IN) on October 17 and 18, 2005. On Nov. 17, 2005, steers were vaccinated for IBR, BVD, PI3, BRSV and a 7-way clostridial and pasturella vaccine, as well as de-wormed with IVOMEC® Plus (Merial Ltd., Duluth, GA). In 2004-05, steers were implanted with Duralease™ Suspension Implant (Merial Ltd., Duluth, GA) at turn-out onto wheat pasture. At turn-out in 2005-06, steers were implanted with Synovex-S (Fort Dodge Animal Health, Fort Dodge, IA).

For 2004-05, steers were weighed on Nov. 11, 16, 19, 23, 30, Dec. 3, 10, 17, Jan. 11, Feb. 3, Mar. 7, 18, Apr. 4, 18, and 26. For 2005-06, steers were weighed on Nov. 14, 18, Dec. 1, 16, Jan. 13, Mar. 24, and Apr. 26. On weigh days, steers were gathered at 0800 and weighed following a 6-h period without feed or water. Initial weights (Nov. 11, 2004 and Nov. 14, 2005) for both years were taken at the OSU Range Cow Research Station following an overnight withholding of prairie hay, supplement, and water. After weighing, steers were allowed access to prairie hay prior to hauling approximately 15 mi to the OSU Wheat Pasture Barn. This was done to minimize the chance of bloat from turning hungry steers onto wheat pasture. Steers were allowed free-choice access to a high-Ca mineral supplement containing 1,620g/lb of monensin. Daily intake of the mineral supplement averaged .15 and .11 lb/steer during 2004-05 and 2005-06, respectively. One steer was removed from analysis of weight gains after being diagnosed with polioencephalomalacia on Nov. 19, 2004. Following treatment, he was placed back on wheat pasture and grazed through the end of the study. Initially, during 2004-05, the heifer mates to the steers grazed half of the wheat pasture. However, on Dec. 22, heifers were removed due to concerns of not having enough available forage to last the entire grazing season for both sets of cattle. Also, following first hollow stem (FHS) steers were restricted to half of the wheat pasture to better utilize the rapidly growing forage. This resulted in a weighted average stocking rate of 1.83 ac/steer for 2004-05. Stocking rate was held constant at 3.07 ac/steer for the 2005-06 grazing season.

Statistical Analysis. Regression analysis was performed on steer BW using the REG procedure of SAS using a model that included the effect of grazing days on steer BW. Each year was analyzed independently, using the average BW of all steers to determine the regression relationship. Residuals were calculated as the observed BW minus the predicted BW from the regression function. The PROBNORM function of SAS was used with the studentized residuals (residual divided by an estimate of its standard deviation) to determine the probability that the residuals were different from 0 (i.e. if P<.05 then the observed value was significantly different from the predicted value). Residuals significantly different from zero would indicate a weight or period of gain that would be different from the overall trend. Significant negative residuals early in the grazing period would indicate an adaptation period to wheat before positive weight gains occurred.

Results and Discussion

Rainfall amounts in the months before grazing were favorable for fall forage establishment and growth. Rainfall was well in excess of normal during Nov., Dec., and Jan. for 2004-05 (Figure 1), resulting in excessively muddy conditions which decreased grazing in areas of the pasture that were not well drained. On the other hand, the 2005-06 grazing season was characterized by one of the more significant short term droughts in Oklahoma history, with less than an inch of precipitation received in total from Nov. through Feb. Monthly average temperatures were near normal during the 2004-05 grazing season (Figure 2). However, high temperatures accompanied the drought conditions of 2005-06, with Jan. averaging 12°F higher than normal and Apr. averaging 7°F higher than normal.

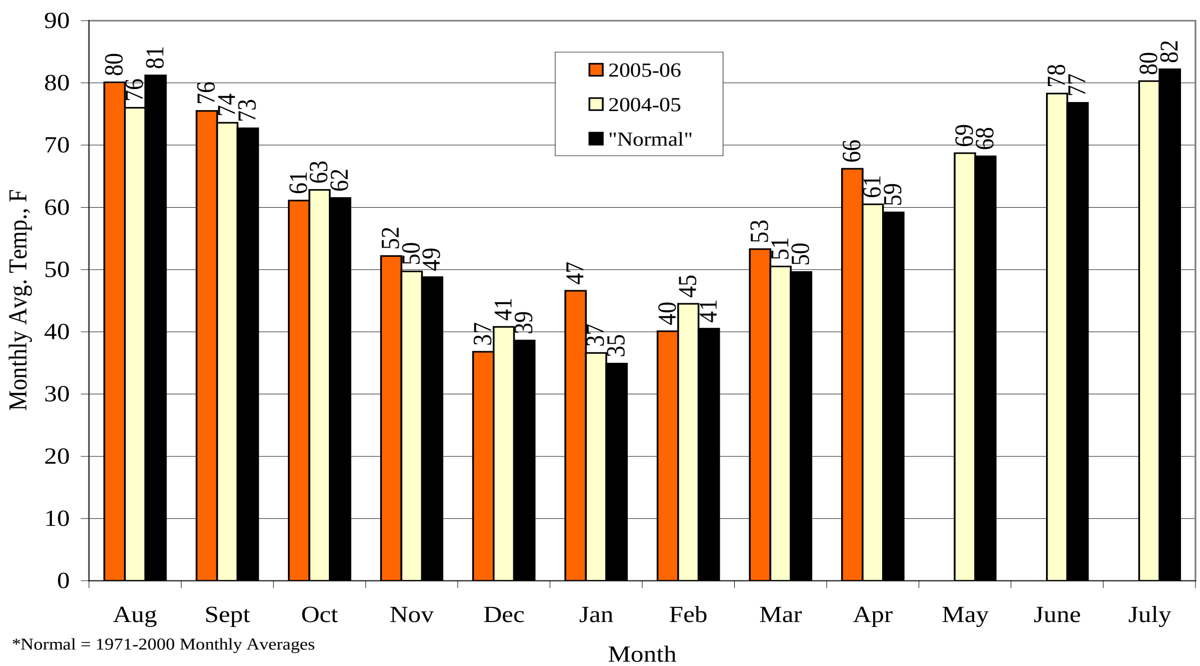

Figure 1. Monthly precipitation from August 2004 to April 2005 and "normal" monthly precipitation.

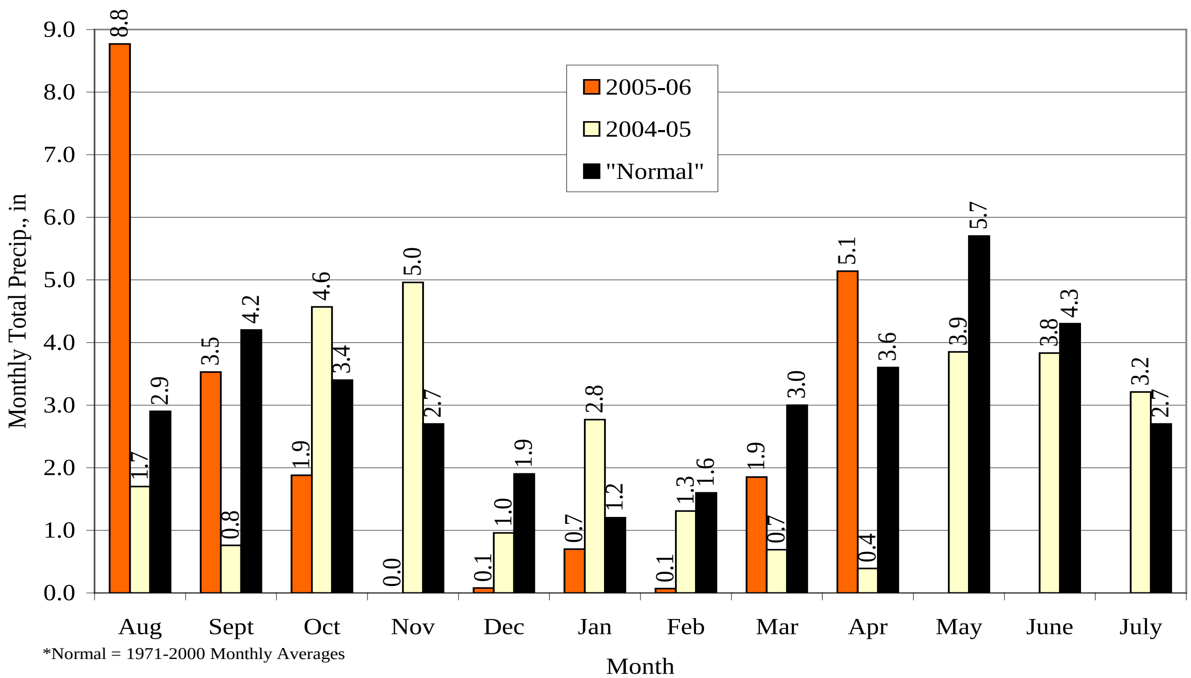

Figure 2. Monthly average temperature from August 2004 to April 2005 and "normal" monthly average temperature.

Steer BW Gain. Steer BW change during 2004-05 is shown in Figure 3. Steer BW increased linearly ($P<.01$; $Y = 450.7 + 3.08x$) throughout 2004-05. The significant, linear ($P<.01$) slope of the regression function indicates steers gained 3.08 lb/d during the 166-d grazing season. The weigh dates and observed weights are presented in Table 1, along with the predicted BW, residuals and P-values. The only residual that was significantly ($P<.01$) different from 0 was from the initial weight, with a residual of 43.2 lb. This weight was taken prior to arrival at the OSU Wheat Pasture Barn, and could be the result of using a different scale at the OSU Range Cow Research Station, as well as a different time period without access to feed and water (overnight vs. 6-h). Reuter and Horn (2000) found that the only residual (-24.8 lb) significantly different from 0 came on d 20 of wheat pasture grazing. They indicated this as evidence of a very transient adaptation period to wheat pasture where positive BW gains were not achieved. Intermediate weights from d 0 to 20 were not taken.

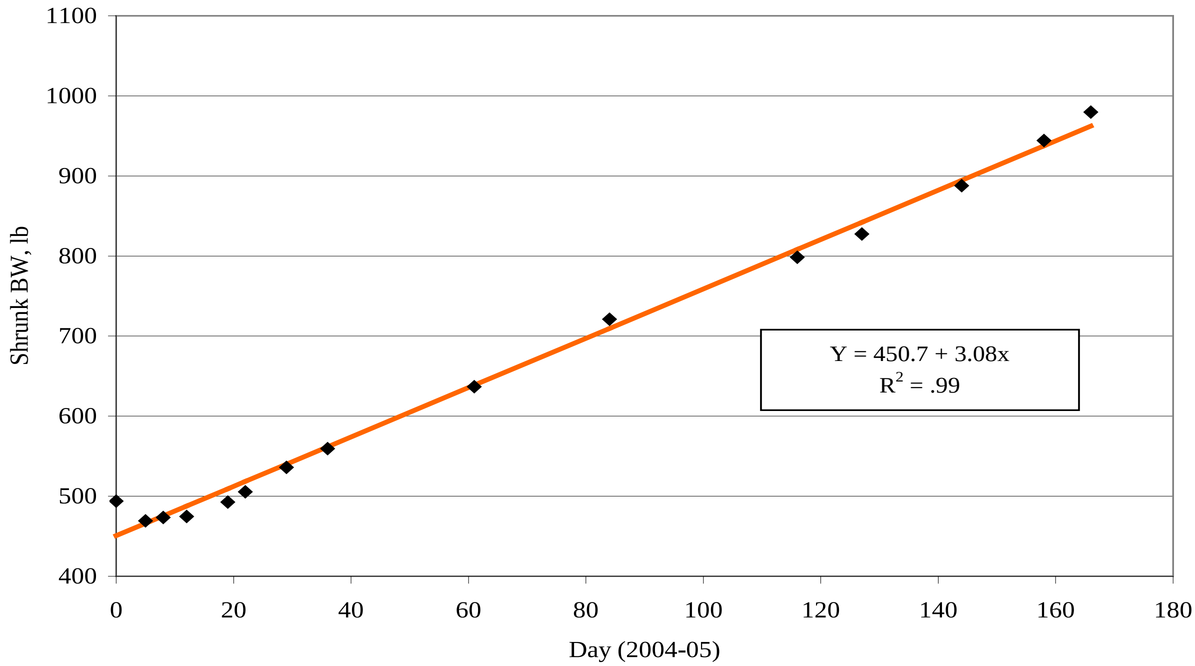

Figure 3. Steer BW vs days on wheat pasture during the 2004-05 winter wheat grazing season. Initial BW of 494 lb was taken prior to placement on wheat pasture.

Table 1. Observed and predicted steer BW and residuals during the 2004-05 winter wheat grazing season.

Date	Day	Observed BW, lb	Predicted BW, lb[b]	Residual, lb[c]	P-value[d]
Nov. 11	0	494[a]	451	43.2	< .01
Nov. 16	5	469	466	3.2	.84
Nov. 19	8	473	475	- 1.9	.88
Nov. 23	12	475	488	- 13.0	.40
Nov. 30	19	493	509	- 16.5	.28
Dec. 3	22	506	518	- 12.9	.41
Dec. 10	29	536	540	- 4.1	.79
Dec. 17	36	560	562	- 2.1	.92
Jan. 11	61	637	639	- 1.9	.91
Feb. 3	84	721	710	11.5	.46
Mar. 7	116	798	808	- 9.9	.50

Mar. 18	127	828	842	- 14.6	.34
Apr. 4	144	888	894	- 6.6	.65
Apr. 18	158	944	938	6.6	.65
Apr. 26	166	980	962	17.4	.20

[a]Weight prior to placement on wheat pasture

[b]Predicted steer BW based on regression function from Figure 3 (Y = 450.7 + 3.08x)

[c]Observed minus predicted

[d]Probability of a greater t-statistic for the residual

Steer BW change during 2005-06 is shown in Figure 4. As was observed for 2004-05, steer BW increased linearly (P<.01; Y = 485.3 + 3.09x). Also, the linear (P<.01) slope of the regression function for 2005-06 indicates an ADG of 3.09 lb for the 163-d grazing season, nearly identical to the previous year. Weigh dates and observed weights, with the predicted weights and corresponding residuals and P-values from 2005-06 are presented in Table 2. No residuals from 2005-06 were significantly (P>.17) different from 0. However, as with the previous year, the residual for the initial BW was large (second largest residual). Because steers were handled and weighted in the same manner as the previous year, the same explanation can be applied to the initial observation in this year.

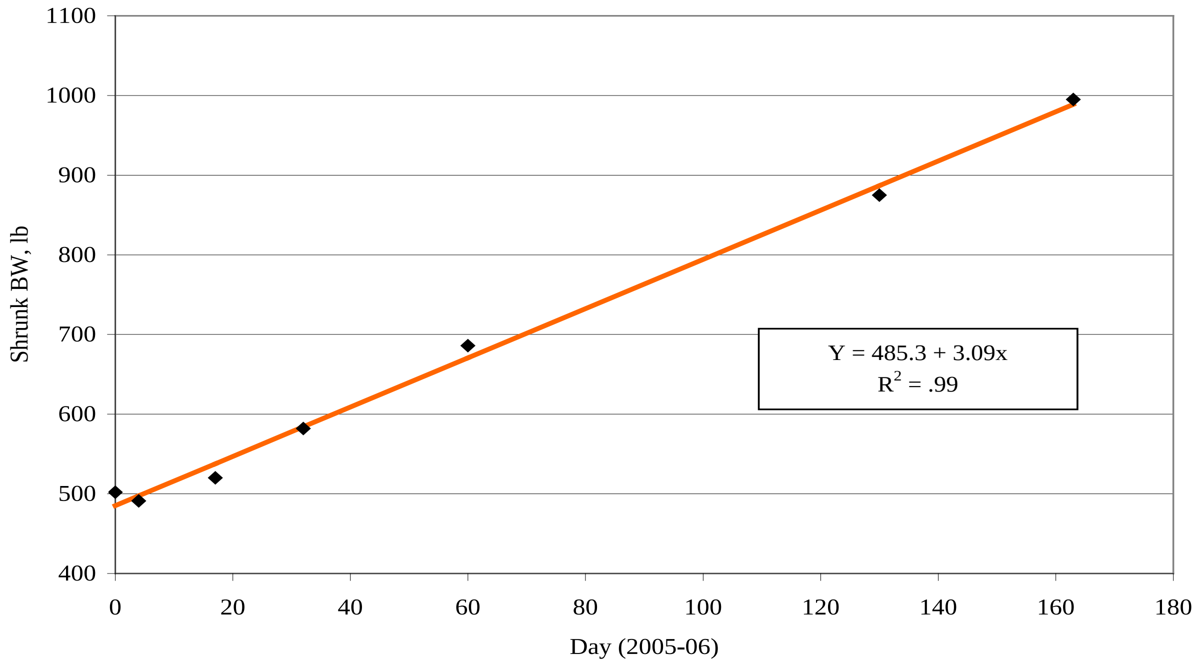

Figure 4. Steer BW vs days on wheat pasture during the 2005-06 winter wheat grazing season. Initial BW of 502 lb was taken prior to placement on wheat pasture.

Table 2. Observed and predicted steer BW and residuals during the 2005-06 winter wheat grazing season.

Date	Day	Observed BW, lb	Predicted BW, lb[b]	Residual, lb[c]	P-value[d]
Nov. 14	0	502[a]	485	16.7	.18
Nov. 18	4	491	498	- 6.6	.60
Dec. 1	17	520	538	- 17.8	.17
Dec. 16	32	582	584	- 2.1	.87
Jan. 13	60	686	671	15.4	.25
Mar. 24	130	875	887	- 11.8	.31
Apr. 26	163	995	989	6.2	.51

[a]Weight prior to placement on wheat pasture

[b]Predicted steer BW based on regression function from Figure 3 (Y = 485.3 + 3.09x)

[c]Observed minus predicted

[d]Probability of a greater t-statistic for the residual

Summary

These data indicate that there is not an adaptation period for steers grazing winter wheat pasture. When evaluated as part of the BW gains during the entire winter wheat grazing season, there was little evidence (first weight of 2004-05 was significantly different) of a departure from the highly significant linear function that represented BW gain throughout the grazing season. It appears much of the explanation for an adaptation period to wheat pasture is the result of a failure to account for the overall trend during the entire production period, with an over-emphasis on a brief snapshot in time following turn-out. With surprising consistency, our data indicates that in each of the two consecutive years, which had totally different climates, steers were gaining in excess of 3 lb/d throughout the course of a 160-d grazing season.

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