Effects of Strategic Supplementation on Return to Management and Performance of Yearling Cattle

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Summary with Implications

A three-year experiment evaluated the effects of two supplementation strategies on yearling cattle performance and producer returns to management. Yearling cattle grazed on crested wheatgrass pastures and were supplemented either throughout the entire grazing season, only during the latter part of the grazing season, or not supplemented at all. The supplemented yearlings received 3.5 lb of dried distillers grains with solubles 6 days/week. On average non-supplemented yearlings had an average daily gain of 1.51 lb/d and providing supplement increased average daily gain by 0.5 lb/d. Yearlings supplemented during the latter part of the season had similar performance to yearlings supplemented the entire season, with decreased supplementation costs. Providing supplement through the entire grazing season returned $14.96/animal and providing supplement during the latter part of the grazing season returned $32.21/animal more than the non-supplemented group. Strategic supplementation as grass quality declines is a management tool to increase gain of yearlings and financial return to management.

Introduction

Cool season grasses, such as crested wheatgrass decline in crude protein throughout the grazing season (*2023 Nebraska Beef Cattle Report*, pp. 29–31). As available forage quality decreases, animal gains can also decrease. Previous research has suggested that supplementing yearlings on pasture with high protein feeds, such as dry distillers grains with solubles (DDGS) can increase yearling performance compared to not providing supplement. Strategically supplementing with a high protein feed source, as forage quality decreases, could provide opportunities for producers to increase performance and profitability of yearlings grazing cool season grasses in the summer. With strategic supplementation, a producer would feed less overall, and therefore save money on feed and labor costs compared to providing supplementation over the whole season. Thus, strategic supplementation could be used as a cost-effective way to increase animal performance and return to management. The purpose of this experiment was to evaluate the effect of DDGS supplementation during the whole summer grazing season or the second half of the grazing season on performance and return to management of yearlings grazing crested wheatgrass pastures against no supplement control.

Table 1. Description of animal type, and supplementation strategies across three experimental years[1] for yearlings[2] grazing crested wheatgrass pastures.

	Year 1	Year 2	Year 3
Yearling Description			
Initial Wt[3]	733 ± 34	582 ± 42	774 ± 96
Sex	Steers	Heifers	Steers
Days of Supplementation per Treatment[4]			
CONT	0	0	0
FULL	125	99	111
HALF	70	55	56
Pounds of Supplement Fed per Treatment			
CONT	0	0	0
FULL	375	297	333
HALF	210	165	168

[1] Experimental years were 2019 (year 1), 2020 (year 2), and 2021 (year 3)

[2] All yearlings were received from a single source cooperator under their management strategy, which included vaccinations and implants prior to their arrival at High Plains Agriculture Laboratory.

[3] Initial weights are recorded as a raw mean with standard deviations.

[4] Treatments across all experimental years were CONT (no supplement was fed), FULL (3 lb of supplement was fed everyday through the grazing period), STRAT (3 lb of supplement was fed everyday beginning at the assumed midway point through the grazing period).

Procedure

A three-year (2019–2021) grazing experiment was conducted at the High Plains Agriculture Laboratory, near Sidney, Nebraska. This experiment investigated the effects of changing forage quality and strategic supplementation of DDGS on yearling performance and return to management among a variety of economic conditions. Three treatments were developed to evaluate two supplementation strategies against no supplementation. The control treatment (CONT) received no supplement, the full treatment (FULL) received 3.5 lbs (dry matter) of DDGS 6 days a week throughout the grazing period, and the strategic treatment (STRAT) received 3.5 lbs (dry matter) of DDGS 6 days a week only during the latter part of the grazing period. The FULL treatment received supplement for an average of 112 days, while the STRAT treatment received supplement for an average of 60 days, which was 54% of the grazing period. The supplement was fed in bunks placed directly in their pastures. Yearlings were stocked at approximately 10.5 acres per head on pastures containing primarily crested wheatgrass. Twelve total pastures were used in years 1 and 2 (n=4 per treatment), while nine pastures were used

Table 2. Average yearling performance across experimental years for each treatment.

	CONT	FULL	STRAT	SEM	*P*-value
Initial Wt, lb	701	695	699	17.6	0.98
Final Wt, lb	873[b]	924[a]	916[a]	14.8	0.05
ADG, lb/d	1.51[b]	2.04[a]	1.95[a]	0.066	< 0.01

[a, b] Means within a row with different superscripts differ ($P < 0.05$)

Table 3. Average yearling performance across treatments for each experimental year.

	Year 1	Year 2	Year 3	SEM[1]	*P*-value
Initial Wt, lb	750[a]	579[b]	766[a]	19.2	< 0.01
Final Wt, lb	1021[a]	750[c]	941[b]	16.2	< 0.01
ADG, lb/d	2.19[a]	1.74[b]	1.60[b]	0.072	< 0.01

[1] SEM, standard error of the mean is reported as the largest value of the three years.

[a, b, c] Means within a row with different superscripts differ ($P < 0.05$)

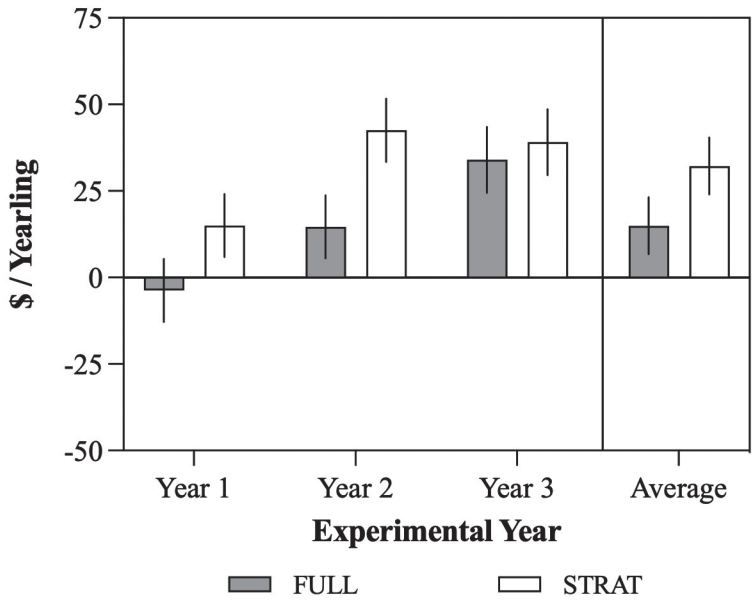

Figure 1. Experimental year differences in return to management for treatments across ten years of average economics (cattle and DDGS prices). Return to management for FULL and STRAT is subtracted from average return to management for CONT to display differences in choosing to supplement or not.

in year 3 (n=3 per treatment). Pasture was the experimental unit. Initial body weights, yearling sex and grazing length varied throughout the experiment due to calf and grass availability (Table 1). On average, yearlings grazed for 112 days from late May through early September. To determine initial and final body weights and average daily gain (ADG), the yearlings were weighed in the morning for two consecutive days at the onset and the end of the trial.

Economic Analysis

To simulate return to management in the treatments among a variety of marketing conditions, a partial budgeting approach was taken using economic data from the previous decade. Average live cattle prices and DDGS prices for Nebraska were obtained from 2012 through 2021. Recorded cattle performance was applied to the market prices. Although the experiment was only conducted for three years (2019, 2020, and 2021), variation of the cattle market is independent of the observed cattle performance. The potential change in yearling value was calculated using the three years of cattle weight information and applying it to the ten years of collected cattle market information. Yearling values were calculated based on the average weight from each treatment group and the corresponding price per cwt. The cost of supplementation in each treatment was calculated by multiplying the price of DDGS in each economic year by the amount of supplement fed to a yearling in the FULL and STRAT treatments during each experimental year. To determine the return to management in each treatment scenario, the cost of supplement for each year was subtracted from the change in yearling value. Then the change in cattle value for the CONT treatment was subtracted from the change in yearling value for FULL and STRAT to evaluate the return to management of supplementation (i.e. the return to the labor of providing the supplement). Additionally, value of gain was calculated by dividing the difference in initial and final value by the increase in weight.

Applying the three years of biological data to the ten years of economic data, allows for evaluation of potential differences for each treatment among a variety of market conditions. It is widely accepted that cattle markets typically follow a ten-year cycle of variation. By simulating potential marketing scenarios in this manner, the inherent variability of market prices for both DDGS and live cattle is accounted for.

Results

There were no significant interactions ($P > 0.53$) between experimental year and treatment. There was an effect ($P < 0.01$) of treatment (Table 2) and year (Table 3) on ADG. Across all years, supplementation increased ($P < 0.01$) gains by 0.5 lb/d and final body weight over the control but strategy did not differ ($P \geq 0.31$) in ADG or final body weight. This suggests that delaying supplementation to latter half of the grazing period will result in as much improvement in performance as supplementing all season and require less total supplement and labor.

Across 10 economic years, the average DDGS price was $161.99/ton. Utilizing 10 years of economic data, within the three experimental years, return to management was $14.96/yearling more for FULL and $32.21/yearling more for STRAT than CONT yearlings (Figure 1). These results suggest that on average supplementation will increase return and that the STRAT will increase return to management more than the FULL treatment. However, within year, a significant increase ($P < 0.01$) in return to management over the CONT was

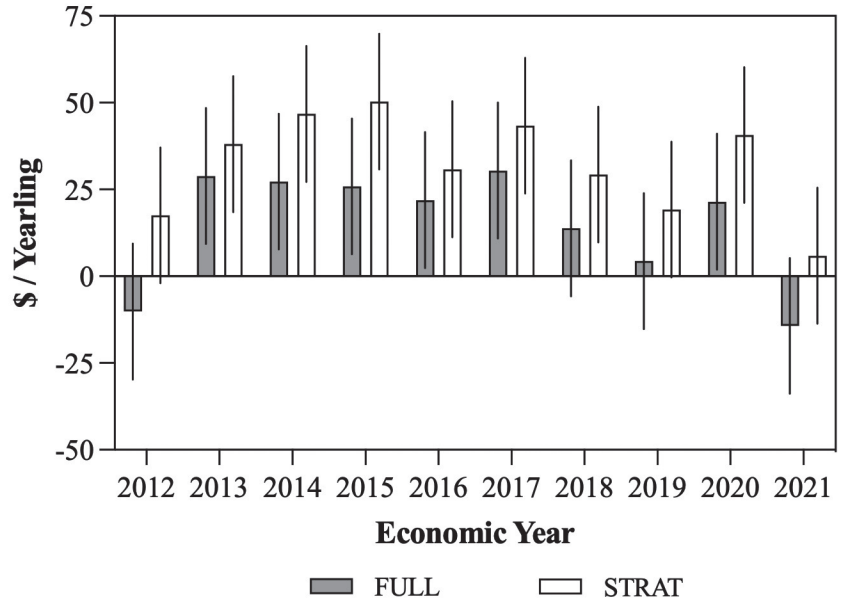

Figure 2. Economic year (2012–2021) differences in return to management for treatments. Return to management for FULL and STRAT is subtracted from average return to management for CONT to display differences in choosing to supplement or not.

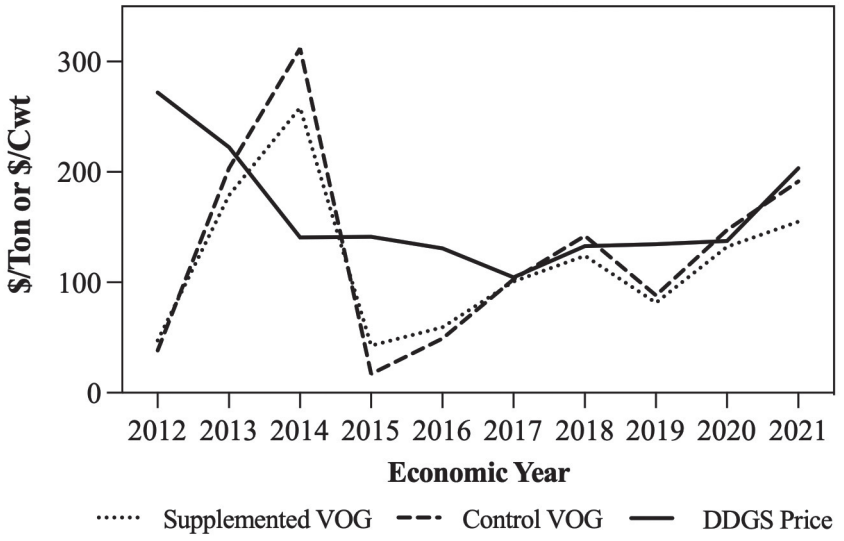

Figure 3. Economic year (2012–2021) prices of DDGS ($/ton) compared to calculated value of gain (VOG, $/cwt). Supplemented VOG displays the average between the full and strategic treatments.

observed only in experimental year 3 for FULL and experimental year 2 and 3 for STRAT. There did not appear to be an advantage to supplementation in year 1 due to the high rate of gain in that year, resulting in the supplemented cattle being over 1,000 lbs when they were sold.

The return to management for the supplemented treatments across three experimental years within each economic year (2012–2021) are shown in Figure 2. There were no economic year by treatment interactions (P = 0.99), meaning the treatments displayed the same trend in each year. When averaging the return between the FULL and STRAT treatments, there was an economic year effect (P < 0.01) and a supplementation effect (P < 0.01). In 7 of the 10 years evaluated, supplementing would have increased return, regardless of the strategy used. In 2012, the price of DDGS were too high in combination with an overall low value of gain (Figure 3). In 2019, there was an overall lower value of gain relative to the price of DDGS. In 2021, there were increased prices of DDGS combined with a higher value of gain for not supplementing (CONT). These scenarios resulted in a reduction in return for those supplementation strategies observed in Figure 2. Looking at 2015 and 2016, there was a relatively low value of gain compared to higher prices in DDGS. However, the value of gain for not supplementing (CONT) was lower than the value of gain for supplementing (Figure 3), resulting in greater return for those strategies (Figure 2).

Conclusion

Forage quality of cool season pasture declines throughout the summer grazing season which can reduce the rate of gain in yearlings. Providing high protein supplementation to yearlings on cool-season pasture will increase final body weights and ADG compared to not providing supplement. This experiment has demonstrated that strategically supplementing as forage quality declines will provide similar performance to supplementing throughout the entire grazing season while reducing cost. Overall, strategic supplementation as grass quality declines throughout the grazing season is a practical management tool to benefit performance for yearlings and return to management.

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