

## Evaluating Stocker Steer Gains on Tallgrass Native Range with Two Burn Dates and Spices in Mineral

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### Abstract

Two operational management strategies were evaluated in which two treatments were evaluated within each management strategy. The first operational management strategy evaluated was timing of burning native tallgrass pasture with burn dates in March or April. The second operational management strategy evaluated was free-choice mineral where steers received a complete balanced mineral with 25% of the magnesium, zinc, copper, and manganese coming from chelated organic sources or that same base mineral with the addition of spices. Eight pastures stocked with 281 head of stocker steers (initial weight  $644 \pm 63$  lb) were used. Steers were assigned to one of four treatments, weighed individually, grazed for 87 days in a double stock system, and then individually weighed at the end of the study. There was no interaction between the two management practices for average daily gain, total gain, and out weights ( $P > 0.17$ ). Average daily gain was increased by 0.35 lb/day ( $P = 0.03$ ) with an April pasture burn instead of March. There was no difference in average daily gain based on mineral supplement ( $P = 0.23$ ), even though numerically the cattle on spice mineral had a greater average daily gain. When evaluating final weights, cattle on April burned pastures tended ( $P = 0.09$ ) to weigh 20 lb more than those grazing pastures burned in March. Calves on the spice mineral tended ( $P = 0.10$ ) to weigh 19 lb more at the end of the study than steers on the control mineral. The two management practices were not additive, but taken individually implementing an April burn or offering the spice mineral could result in greater calf weight coming off pasture. Using 2019 prices, the spice mineral added \$2.71 per head to cost with an increase in \$26.65 in revenue.

### Introduction

Cattle producers are considering alternative methods to reduce the use of synthetic products in cattle production, and to reduce the feeding of antibiotics, in response to growing preferences from consumers. Essential oils/spices have been offered as a potential method to control insects in cattle (Showler, 2017), alter rumen microbial population (Elcoso et al., 2019), and replace feed antibiotics in feedlot diets (Araujo et al., 2019), all of which may increase cattle gains. There have been varying responses to cattle gains based on type of essential oil within feedlot diets, with a greater majority reporting similar gains as control diets. In a grazing study, no improvements in gains were observed when either hand-feeding or offering as free-choice a cinnamon and

garlic essential oil product (Beck et al., 2017). To our knowledge, there are limited data on cattle gains while grazing pastures, thus showing the importance of evaluating essential oils on stocker cattle gains is to be investigated.

Previous research from Kansas State University found that burning pasture in April results in about 20 lb more gain per grazing steer than burning a pasture in March (summarized by Owensby, 2010). The state of Kansas has been under scrutiny because high smoke production in April creates smoky conditions that drift to large metropolitan areas. Extending the burning season can reduce smoke load. If March burning produces gains and plant population changes that are not too different from the results when burning in April, it would provide the opportunity to develop a smoke management plan. Therefore, the overall objective of this study was to evaluate management practices that may impact stocker steer gains on a 90-day double stocking grazing system in tallgrass native range. Specific objectives include evaluating (1) timing of burning, (2) addition of spices in a complete free-choice mineral, and (3) determination if the effects are additive.

## Experimental Procedures

The study was conducted at the Bressner Research Range Unit in Yates Center, KS. The unit consists of eight pastures on 625 acres of tallgrass native prairie. Two management strategies were evaluated to determine effects on stocker steer gains in a  $2 \times 2$  factorial arrangement. The two management strategies were timing of pasture burning and free-choice mineral supplementation, with two different treatments to evaluate within each management strategy. Pasture burning times were March or April. The March burn treatment occurred on March 19, 2019, while the April burn treatment occurred April 15, 2019. Mineral treatments evaluated were: (1) free-choice complete mineral (control treatment) and (2) the same base mineral with the addition of spices (spice treatment; Table 1). The spices included were powdered forms of oils from garlic and the product Solace (proprietary blend of spices; Wildcat Feeds LLC, Topeka, KS). Minerals were formulated for a 4 oz/head/day intake and offered fresh weekly at 125% of calculated optimal pasture intake.

Two hundred eighty-one steers ( $644 \pm 63$  lb) were weighed individually on April 26, 2019, and assigned to pasture randomly based on order through the chute (initial weights not different,  $P > 0.24$ ). Cattle were weighed at the end of the study on July 23, 2019, for a total of 87 days of grazing. Twenty-four head were not included in final data set because at one point during the study period they were found in the incorrect treatment pasture or in the neighbor's pasture. Therefore, only cattle that were known to stay within their respective treatment the entire 87 days were used for analysis.

## Results and Discussion

Average daily gain was not different when evaluating the four treatment combinations ( $P = 0.17$ ; Figure 1). An average daily gain advantage of 0.33 lb/day was observed for steers grazing pastures burned in April and this resulted in an average of 20 lb more weight coming off grass (Table 2). This is consistent with other studies conducted at Kansas State University (summarized by Owensby, 2010). There was no difference ( $P = 0.23$ ) in steer average daily gain based on type of mineral consumed, however, independent of pasture burning time, the calves on the spice mineral tended to average 19

lb more than those on the control mineral ( $P = 0.10$ ; Table 3). Even though the calves started at the same weight, these heavier final weights show positive managerial options with burning pasture in April and offering the spice mineral. In contrast to what was observed in an Arkansas and Oklahoma study with Beck et al. (2017), the spices used in this study tended to increase weight of steers as compared to control.

Based on 2019 prices, the spice mineral was \$200 more per ton than the control mineral. This added a total of \$2.71 per head to the feeding cost of steers. The added 19 pounds of calf weight, with August 2019 prices (\$135/cwt), resulted in \$26.65 more sale value per calf than calves on the control mineral. This was close to a 10-fold return on investment of the spice mineral.

## Implications

Burning pastures in April results in a greater calf gain than burning in March, while the addition of spices to a free-choice complete mineral shows promise as a cost-effective method to increase gains in stocker steers on tallgrass native range.

## Acknowledgments

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**Table 1. Analysis of supplemental free-choice minerals**

Item (on dry matter basis)	Control mineral	Spice mineral <sup>1</sup>
Crude protein	4.81	4.79
Calcium	18	18
Phosphorus	3	3
Salt	23	23
Magnesium <sup>2</sup>	3	3
Potassium	1	1
Iron	5,664	5,670
Copper <sup>3</sup>	1,153	1,153
Zinc <sup>3</sup>	3,470	3,470
Manganese <sup>3</sup>	1,816	1,818
Selenium	22	22
Iodine	333	333
Cobalt	13	13
Vitamin A	141,667	141,667
Vitamin D	14,167	14,167
Vitamin E	172	172

<sup>1</sup>Spice mineral was similar base as control mineral with addition of 3 lb/ton garlic oil and 6 lb/ton of Solace (Wildcat Feeds LLC, Topeka, KS) that replaced dried distillers grains and limestone in control mineral.

<sup>2</sup>Nuplex Mg/K (Nutech Biosciences Inc., Oneida, NY) composed 25% of the magnesium.

<sup>3</sup>Nuplex 3-chelate blend (Nutech Biosciences Inc.) composed 25% each of the copper, zinc, and manganese of the total trace mineral supply.

**Table 2. Average steer production responses based on burning pasture in March or April**

Item	March burn <sup>1</sup>	April burn <sup>2</sup>	Standard error	
			of means	<i>P</i> -value
Steer initial weight, lb	650	639	6.3	0.26
Steer average daily gain, lb/day	2.75	3.08	0.07	0.03
Total gain of steer, lb	239	268	6.1	0.03
Steer final weight, lb	890	910	6.6	0.09

<sup>1</sup>Four pastures were burned on March 19, 2019, with steers starting to graze April 26, 2019.

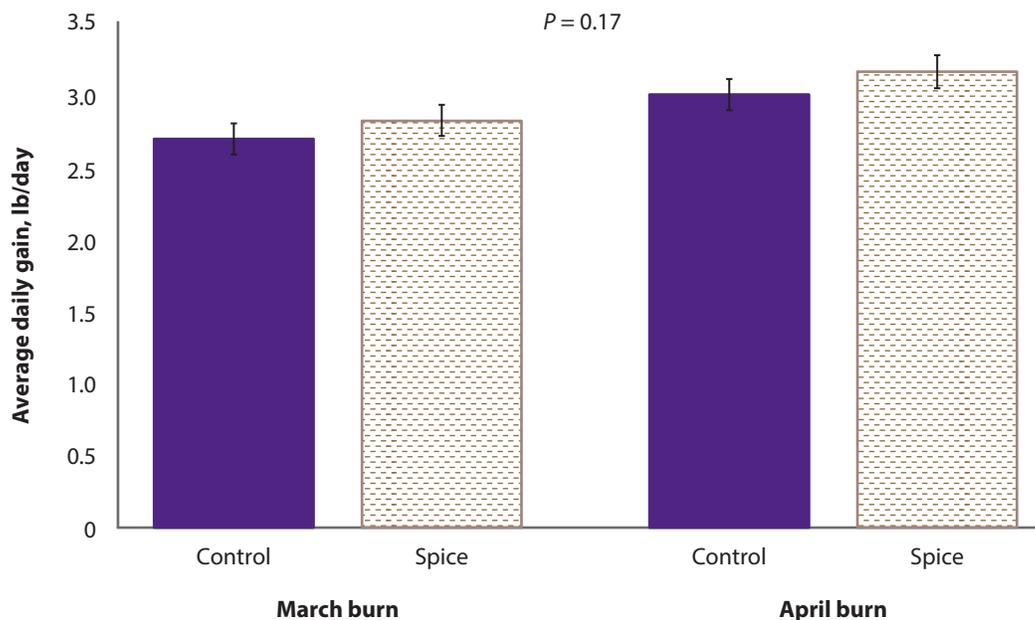
<sup>2</sup>Four pastures were burned on April 15, 2019, with steers starting to graze April 26, 2019.

**Table 3. Average steer production responses based on type of mineral offered**

Item	Control mineral <sup>1</sup>	Spice mineral <sup>2</sup>	Standard error of means	P-value
Steer initial weight, lb	641	649	6.2	0.45
Steer average daily gain, lb/day	2.85	2.99	0.07	0.23
Total gain of steer, lb	248	260	6.2	0.23
Steer final weight, lb	890	909	6.6	0.10

<sup>1</sup>Control mineral was a complete free-choice mineral formulated for a 4 oz/head/day intake (Wildcat Feeds LLC, Topeka, KS). Chelated mineral sources were included at 25% of the total mineral supply for magnesium (Nuplex Mg/K; Nutech Biosciences Inc., Oneida, NY), copper, zinc, and manganese (Nuplex 3-chelate blend; Nutech Biosciences).

<sup>2</sup>Spice mineral was a complete free-choice mineral formulated for a 4 ounce/head/day intake (Wildcat Feeds LLC, Topeka, KS) with the spices in powdered form of garlic oil (3 lb/ton) and Solace (proprietary blend of spices; 18 lb/ton; Wildcat Feeds LLC). Chelated mineral sources were included at 25% of the total mineral supply for magnesium (Nuplex Mg/K; Nutech Biosciences Inc.), copper, zinc, and manganese (Nuplex 3-chelate blend; Nutech Biosciences).



**Figure 1. Average daily gain based on each burn time (March or April) and whether cattle were on control mineral or mineral with spices.**

<sup>1</sup>Control mineral (solid bars) was a complete free-choice mineral formulated for a 4 oz/head/day intake (Wildcat Feeds LLC, Topeka, KS). Chelated mineral sources were included at 25% of the total mineral supply for magnesium (Nuplex Mg/K; Nutech Biosciences Inc., Oneida, NY), copper, zinc, and manganese (Nuplex 3-chelate blend; Nutech Biosciences).

<sup>2</sup>Spice mineral (striped bars) was a complete free-choice mineral formulated for a 4 oz/head/day intake (Wildcat Feeds LLC, Topeka, KS) with the spices in powdered form of garlic oil (3 lb/ton) and Solace (proprietary blend of spices; 18 lb/ton; Wildcat Feeds LLC). Chelated mineral sources were included at 25% of the total mineral supply for magnesium (Nuplex Mg/K; Nutech Biosciences Inc.), copper, zinc, and manganese (Nuplex 3-chelate blend; Nutech Biosciences).