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Abstract

This study aims to evaluate effectiveness of two operational management systems for steer gains and fly control. The first strategy evaluated was pasture burn date of March (MAR) or April (APR). The second management strategy was free-choice mineral with spices (SPICE) or without spices (CON). Eight pastures (n = 281 steers; initial weight 572 ± 75 lb) were used in a 2 × 2 factorial treatment structure. Steers were weighed individually, randomly assigned to treatment, and grazed for 87 days. Weekly, 33% of steers were photographed to count flies and evaluated for hair coat score. Neither the date of pasture burning nor the mineral type impacted cattle gains for all treatments. Cattle consuming mineral with spices had less flies through a majority of the grazing period. Even though SPICE cattle had less flies, the spice treatment did not result in improvements in gain as during the weeks where spice cattle had less flies than control, both treatments were over the economic threshold for horn flies (200 flies per steer). Additional years on this project will be completed to determine the effects of pasture burn date and addition of spices in mineral.

Keywords

essential oils, spices, growth, ectoparasite

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2022 SEREC AGRICULTURAL RESEARCH

Stocker Steer Gains and Fly Numbers as Impacted by Burn Date and Type of Mineral on Tallgrass Native Range – Year 3

J.K. Farney and M. Frahm[1]

Summary

This study aims to evaluate effectiveness of two operational management systems for steer gains and fly control. The first strategy evaluated was pasture burn date of March (MAR) or April (APR). The second management strategy was free-choice mineral with spices (SPICE) or without spices (CON). Eight pastures (n = 281 steers; initial weight 572 ± 75 lb) were used in a 2 × 2 factorial treatment structure. Steers were weighed individually, randomly assigned to treatment, and grazed for 87 days. Weekly, 33% of steers were photographed to count flies and evaluated for hair coat score. Neither the date of pasture burning nor the mineral type impacted cattle gains for all treatments. Cattle consuming mineral with spices had less flies through a majority of the grazing period. Even though SPICE cattle had less flies, the spice treatment did not result in improvements in gain as during the weeks where spice cattle had less flies than control, both treatments were over the economic threshold for horn flies (200 flies per steer). Additional years on this project will be completed to determine the effects of pasture burn date and addition of spices in mineral.

Introduction

Essential oils/spices have been offered as a potential method to control insects in cattle (Showler, 2017; Massariol et al., 2009), alter rumen microbial population (Elcoso et al., 2019), and replace feed antibiotics, all of which may improve production responses in beef as well as dairy cattle. In feedlot studies, cattle consuming a blend of essential oils had similar average daily gain, final body weight, gain to feed ratios, and carcass characteristics as steers fed monensin with or without tylosin (Araujo et al., 2019). Grazing stocker cattle on cool-season annual grass pasture or summer pasture did not show improvements in gains when cattle received a cinnamon and garlic essential oil product by either free-choice or hand-feeding (Beck et al., 2017). However, other studies at Kansas State University have found that feeding supplements of spices in mineral have increased gain in growing cattle on grass (Farney, 2020a; Farney, 2020b).

Burning pasture in April results in about 20 pounds more gain in grazing cattle than burning a pasture in March (Owensby, 2010). Smoke management plans are important for the state of Kansas as high smoke production in April creates smoky conditions that

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drift to large metropolitan areas. If weight gains and plant population changes are not too different when burning in March instead of April, earlier burning would provide the opportunity to develop a smoke management plan that allows for an increased burning season to dilute a single month's smoke.

The overall objective of this study is to evaluate management practices that may impact stocker steer gains on a 90-day double-stocking grazing system in tallgrass native range. Specific objectives are to evaluate the time of burning, and the inclusion of spices in the mineral supplement, and to determine whether the effects of both treatments are additive.

Experimental Procedures

The study was conducted at the Bressner Research 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 × 2 factorial arrangement. The two management strategies were timing of pasture burning and free-choice mineral supplementation. Within each management strategy there were two treatments being evaluated, thus a total of four treatments were applied to the cattle at the unit. The pasture burning management strategies evaluated were burning in March or burning in April. The pastures for the March burn treatment were burned on March 3, 2021, while the April burned pastures were burned on April 11, 2021.

The free-choice mineral supplementation strategies consisted of two treatments: (1) free-choice complete mineral (CON) where 25% of magnesium (Nuplex Mg/K, Nutech Biosciences, Inc., Oneida, NY), copper, zinc, and manganese came from chelated organic sources (Nuplex Chelate-3 blend, Nutech Biosciences); and (2) the same base mineral with the addition of spices (SPICE). The spices included were powdered forms of oils from garlic and the product Solace (proprietary blend of four spices; Wildcat Feeds Inc., Topeka, KS). The mineral analysis is listed in Table 1. The minerals were formulated for a 4 ounce/head/day intake and were offered free choice. Every week, 125% of that week's formulated mineral consumption for each pasture was placed into feeders and weighed. Any remaining mineral from the previous week was also weighed.

Gain Measures

Two hundred eighty-one steers (572 ± 75 lb) were weighed individually on April 19, 2021, and assigned to pasture randomly based on order through the chute. Cattle were weighed at the end of the study on July 16, 2021, for a total of 87 days of grazing. Two steers were not weighed on the final weigh date so only 279 head were included in the analyses. Data collected included initial and final weights, and then average daily gain and total gain were calculated.

Fly Counts and Hair Coat Score

Weekly, 33% of the steers in each pasture were photographed with a Nikon digital camera with a 300 mm zoom lens, with the photographer's back to the sun. The steers were photographed with their entire side filling the viewfinder. Then photos were processed with ImageJ and flies counted (Figure 1). Additionally, hair coat score was recorded from the photos with a score of 1–5, where a 1 was a 100% slick haired

animal; 2 had 25% of body with long hair; 3 had 50% of body covered in long hair; 4 had 75% of body covered in long hair; and 5 was 100% long haired. Data collected included number of flies and hair coat scores for each week.

Results and Discussion

Performance of Steers

In contrast to previous years (Farney et al., 2020; Farney and Reeb, 2021) there was no effect of burn date or mineral type on average daily gain, total gain, or final weight (Table 2). Burn date probably did not impact gains as 2021 had a cooler than average spring and the grasses were slow to begin growing. In fact, the day of turnout, there was a light misting of snow on the pastures.

Fly Counts

Flies increased through the summer until week 8 where there was a reduction in fly numbers until week 11 when there was an increase in the number of flies (Figure 2). During the 2021, grazing season, steers on the SPICE mineral had less flies than CON, especially during weeks 4–7, and 9–12 (Figure 3). In contrast to previous years, SPICE mineral intake was more consistent in 2021 and was closer to 4 ounce/head/day for which it was formulated. This level of intake may be why in 2021 the spice mineral reduced fly populations, whereas in other years there was no difference in fly numbers (Farney et al., 2020; Farney and Reeb, 2021).

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Table 1. Analysis of minerals

Item (on dry matter basis)	Control mineral	Spice mineral[1]
Crude protein, %	5.69	5.50
Calcium, %	16.67	16.17
Phosphorus, %	3.33	3.44
Salt, %	22.54	22.53
Magnesium, %[2]	2.51	2.48
Potassium, %	0.89	0.88
Iron, ppm	5,546	5,529
Copper, ppm[3]	1,153	1,153
Zinc, ppm[3]	3,471	3,471
Manganese, ppm[3]	1,817	1,818
Selenium, ppm	22	22
Iodine, ppm	333	333
Cobalt, ppm	13	13
Vitamin A, IU	141,667	141,667
Vitamin D, IU	14,167	14,167
Vitamin E, IU	172	172

[1]Spice mineral with similar base as control mineral with the addition of 3 pounds per ton garlic oil and 18 pounds per ton of Solace (Wildcat Feeds Inc., Topeka, KS) that replaced dried distillers grains and limestone in control mineral.
[2]Nuplex Mg/K (Nutech Biosciences Inc., Oneida, NY) contributed 25% of the magnesium in the minerals.
[3]Nuplex 3-chelate blend (Nutech Biosciences Inc., Oneida, NY) contributed 25% of the copper, zinc, and manganese of the total trace mineral supplied in the minerals.

Table 2. Performance measures and fly counts based on mineral and burn dates

	March		April			*P*-value		
Item	Control	Spice	Control	Spice	SEM	Burn	Mineral	Burn × mineral
In wt., lb	571	572	570	580	9.2	0.75	0.63	0.50
Out wt., lb	725	751	741	726	12.1	0.69	0.68	0.16
Gain, lb	152	177	168	145	11.5	0.51	0.93	0.11
ADG, lb/d	1.78	2.06	1.95	1.70	0.13	0.51	0.93	0.11
Fly counts, n	72	51	63	49	1	0.04	<0.001	0.23
Score coat score	3.35	3.36	3.39	3.84	0.03	0.35	0.92	0.68

SEM = standard error of the mean.

Figure 1. Illustration of the photos taken and fly count method. A. Original photo taken with Nikon camera with 300 mm zoom lens. B. Same image in ImageJ with flies highlighted in yellow.

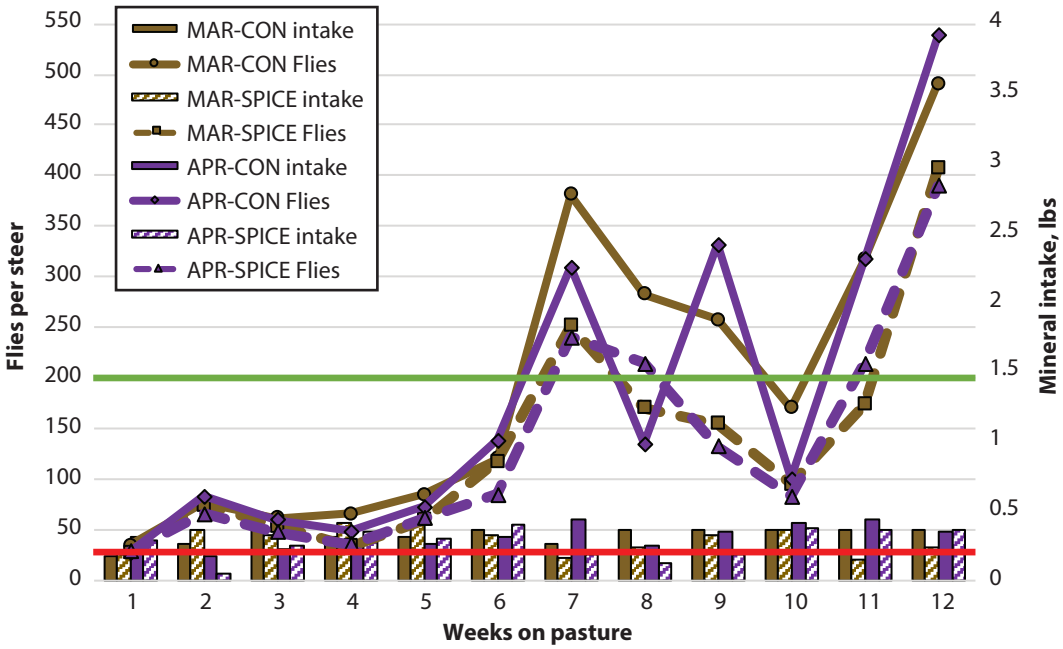

Figure 2. Average number of flies per steer per week and average weekly intake of mineral by treatments.

Average number of flies per steer per week ($P = 0.02$) are represented in the line chart while weekly average mineral intake is the bar charts. The green line at 200 indicates economic threshold for horn flies. The red line at 0.25 indicates the formulated mineral intake of 4 oz/head/day.

MAR-CON: Fly numbers are represented in brown solid line with circle markers. Mineral intake is represented by solid brown bars.

MAR-SPICE: Fly numbers are in dashed brown line with square markers. Mineral intake is represented by brown striped bars.

APR-CON: Fly numbers are in solid purple line with diamond markers. Mineral intake is represented by solid purple bars.

APR-SPICE: Fly numbers are in dashed purple line with triangle marker. Mineral intake is represented by purple striped bars.

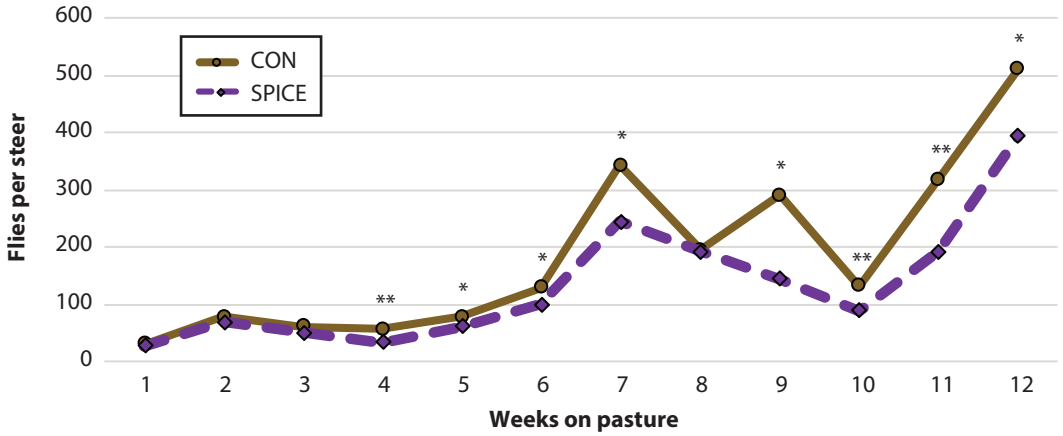

Figure 3. Average number of flies per steer per week by mineral treatments.
Average number of flies per steer per week ($P = 0.01$) are represented in the line chart.
CON: control mineral is represented by the solid brown line with circle markers.
SPICE: spice mineral is the same base mineral as control with 3 pounds/ton of garlic oil and 18 pounds/ton of Solus (Wildcat Feeds LLC).
* indicates for that week $P < 0.01$.
** indicates for that week $P < 0.10$.