Kansas Agricultural Experiment Station Research Reports

Volume 11
Issue 1 *Cattlemen's Day*

Article 13

2025

Effects on Stocker Steer Performance While Consuming Essential Oil or Ionophore Minerals

Tatiana M. Jones
Kansas State University

Jaymelynn K. Farney
Kansas State University, jkj@ksu.edu

Recommended Citation

Jones, Tatiana M. and Farney, Jaymelynn K. (2025) "Effects on Stocker Steer Performance While Consuming Essential Oil or Ionophore Minerals," *Kansas Agricultural Experiment Station Research Reports*: Vol. 11: Iss. 1. https://doi.org/10.4148/2378-5977.8672

Effects on Stocker Steer Performance While Consuming Essential Oil or Ionophore Minerals

Funding Source

We appreciate Hy-Plains Feed Yard LLC, Montezuma, KS, for supplying the cattle; Dale Lanham for maintaining the facility, and the Bressner Committee of producers and experts for support of the project. This research was supported, in part, by the intramural research program of the U.S. Department of Agriculture, National Institute of Food and Agriculture, Hatch-Multistate project 7000246.

K-STATE Research and Extension

CATTLEMEN'S DAY 2025

Effects on Stocker Steer Performance While Consuming Essential Oil or Ionophore Minerals

T.M. Jones and J.K. Farney

Abstract

This study evaluated an alternative to antibiotics for growth performance in grazing stocker steers. Steers (n = 281 head; 641 ± 10.3 lb) were assigned to one of two mineral treatments and grazed on tallgrass native range. Treatments consisted of the "positive" control of ionophore (lasalocid at 3.6 lb/ton) and essential oil (garlic oil at 3 lb/ton and essential oil blend at 6 lb/ton) in free-choice mineral. Steers were weighed at the beginning and end of the 92-day grazing period. Pasture biomass production and mineral intake were monitored weekly. There was no difference in total gains ($P = 0.92$) nor average daily gain ($P = 0.92$) between the two minerals fed to the steers. Mineral intake was the same for both treatments ($P = 0.58$) and was slightly higher than formulated intake (5.2 oz/head/day as compared to 4.0 oz/head/day). Available forage was not different between treatment pastures ($P = 0.67$). Overall, there was no difference between feeding ionophore or essential oils in mineral. The results of this study could provide operations that implement natural marketing systems an option to have cattle gains equivalent to traditional systems and may reduce cost of gain for a more profitable feeding system.

Introduction

Alternative methods to reduce the use of synthetic products in cattle production, as well as reduction in feeding antibiotics to cattle, have been a growing preference in consumer opinions. Essential oils/spices have been found to 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 types of essential oil within feedlot diets, with a greater majority reporting similar gains as control diets. Limited other studies have reported cattle gains while grazing pastures, thus clarifying the importance of evaluating essential oils on stocker cattle gains. In studies where growing cattle grazed tallgrass native range or bromegrass pastures, these calves gained on average, 0.10 lb/day more with an essential oil mineral than control minerals (range 0.08-0.25 lb/day depending on year and animal type; Farney et al., 2020; Farney et al., 2021; Farney et al., 2022; Farney et al., 2023; Farney et al., 2024).

Ionophores are antibiotics that alter rumen microbial populations to increase efficiency in cattle production systems. This treatment alters the ratio of volatile fatty acids to more propionate, which is more energy dense than acetate. In general, the gains

are greater when grazing a higher energy diet than grass alone. Studies have shown monensin and lasalocid have been proven to improve stocker cattle gains but including them in a mineral package has been less consistent (Brazle et al, 1990). Outside of one grazing study directly comparing essential oils to ionophore, there is limited information about the differences in performance between the two. Therefore, this study compared cattle performance and mineral intakes between essential oils and ionophores.

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 range. Treatments consisted of two minerals offered free choice to the steers. The positive-control mineral was a stocker mineral that contained 3.6 lb/ton of lasalocid (ionophore; Table 1; Bovatec 91; Zoetis, Kalamazoo, MI). The treatment mineral was the same base mineral with 3 lb/ton of garlic oil and 6 lb/ton of Solace (essential oil; Table 1; Wildcat Feeds LLC, Topeka, KS). There were four pastures of each mineral offered to the steers in AmeriAg mineral feeders (Burlington, NC). Mineral was offered weekly at 125% of the formulated intake, and the amount placed in feeders was weighed, as well as the amount remaining after consumption for the week. This was used to calculate average daily mineral intake for each week while on grass.

Two hundred eighty-one predominantly black-hided steers (641 ± 10.3 lbs) were weighed individually and randomly assigned to pasture based on order through the chute. The steers were weighed on April 30, 2024, and placed on pasture May 1, 2024. Steers grazed until removal from pasture on August 1, 2024.

Pasture biomass was determined weekly in the areas that the cattle grazed to determine the amount of available forage. To determine pasture biomass, three sections within each pasture were clipped to 1-in height in 1-ft × 1-ft squares. The samples were weighed, then dried in a 131°F forced air oven until completely dry. Then the weighed amounts were converted to dry matter/acre. The weekly biomass clippings were averaged by month to determine the total average available biomass by month. To determine forage accumulation there were exclusion cages in the pastures. At the end of grazing, the exclusion cages were clipped, weighed, dried, and calculated to determine dry matter/acre. The difference between the amount of forage in the exclusion cage and the pre-grazing biomass measurement is forage accumulation for the 92-day window of May 1, 2024, to August 2, 2024.

Results and Discussion

Cattle gains

There was no difference ($P = 0.92$; Table 1) in steer gains based on the two minerals offered. In studies by Farney et al. (2020, 2021, 2022, 2023, 2024) comparing the same essential oil blend used in this study to non-additive mineral, the authors found on average a 0.10 lb/day increase in average daily gain with essential oils. Initial weight of the steers was not significantly different, even though numerically those steers randomly assigned to essential oil treatment started out averaging about 20 lb heavier than ionophore steers. This was also observed at the final grazing weight where those steers were still at an actual numerical weight about 20 lb heavier. Thus, the gain difference was the same for the feeding period. In a grazing study by Beck et al. (2017), no improvements

in gains were observed when handfeeding or offering as free choice a cinnamon and garlic essential oil product as compared to ionophore.

Mineral consumption

There was no difference ($P = 0.58$; Table 2) in mineral consumption between the two minerals offered. The cattle consumed an average of 5.41 oz/head/day. Consumption of mineral averaged greater than formulated intake except in one week. Week four consumption of mineral dropped below 4 oz/head/day. This amount was different than what had been seen in previous studies where consumption decreased below formulated consumption amounts at the end of the grazing period, (Farney et al., 2020; Farney et al., 2021; Farney et al., 2022).

Forage production

There were no differences in available forage between the two treatments and both averaged 1,205 lb dry matter/acre. As summarized in Lyons et al. (1999), forage standing crop levels above 2,250 to 3,000 lb/acre do not limit intake by most livestock species. However, as standing crop levels decline from 2,250 to 1,000 lb/acre, a 15% decline in forage intake can be expected. The steers in this study gained an acceptable amount; however, due to some dry weather conditions during growing season, intake might have been restricted. Although available forage might have been limiting voluntary intake, forage accumulation over the grazing period was 3,895 lb dry matter/acre, and not different ($P = 0.89$) between treatments. Based on animal unit month calculations, the amount of forage available to the steers was sufficient to meet forage intake demands.

Implications

These data demonstrate that offering essential oil mineral *ad libitum* has similar effects to feeding ionophore mineral. In the case of natural and organic producers, this treatment could provide a feed supplement option that could help increase production rates, proficiency, and profitability.

Acknowledgments

We appreciate Hy-Plains Feed Yard LLC, Montezuma, KS, for supplying the cattle; Dale Lanham for maintaining the facility, and the Bressner Committee of producers and experts for support of the project. This research was supported, in part, by the intramural research program of the U.S. Department of Agriculture, National Institute of Food and Agriculture, Hatch-Multistate project 7000246.

References

Araujo. R.C., D.R. Daley, S.R. Goodall, S. Jalali, O.A. Guimarães Bisneto, A.M. Budde, J.J. Wagner, and T.E. Engle. 2019. Effects of a microencapsulated blend of essential oils supplemented alone or in combination with monensin on performance and carcass characteristics of growing and finishing beef steers. Applied Animal Science 35(2):177-184. doi.org/10.15232/aas.2018-01822

Beck, P.A., M.S. Gadberry, C.B. Stewart, H C. Gray, T.J. Wistuba, M.D. Cravey, and S.A. Gunter. 2017. Effects of a blended garlic and cinnamon essential oil extract with and without monensin sodium on the performance of grazing steers. The Professional Animal Scientist 33(2): 176–185. doi:10.15232/pas.2016-01572

Brazle, F.K., G. Kuhl, , D.L Harmon, W.M. Larson, and K.S. Lusby. 1990. The effect of antibiotics and ionophores on the gain of stocker cattle grazing native grass pasture. The Professional Animal Scientist 6(3):19–23. doi:10.15232/s1080-7446(15)32268-3

Elcoso, G., B. Zweifel, and A. Bach. 2019. Effects of a blend of essential oils on milk yield and feed efficiency of lactating dairy cows. Applied Animal Science 35(3):304–311. doi:10.15232/aas.2018-01825

Farney, J. K., K. Rash, H. Gillespie, E. Black, and N. Collins. 2024. Stocker steer gains and fly numbers as impacted by burn date and type of mineral on tallgrass native range – Year 5. Kansas Agricultural Experiment Station Research Reports 10(2). doi: 10.4148/2378-5977.8574

Farney, J.K., H. Allen, and L. Muniz. 2023. Stocker steer gains and fly numbers as impacted by burn date and type of mineral on tallgrass native range – Year 4, Kansas Agricultural Experiment Station Research Reports 9(2). doi: 10.4148/2378-5977.8434

Farney, J.K. and M. Frahm. 2022. Stocker steer gains and fly numbers as impacted by burn date and type of mineral on tallgrass native range – Year 3. Kansas Agricultural Experiment Station Research Reports 8(3). doi: 10.4148/2378-5977.8289

Farney, J.K., and M.E. Reeb. 2021. Stocker steer gains and fly numbers as impacted by burn date and type of mineral on tallgrass native range. Kansas Agricultural Experiment Station Research Reports 7(2). doi:10.4148/2378-5977.8043

Farney, J.K. 2020. Evaluating stocker steer gains on tallgrass native range with two burn dates and spices in mineral, Kansas Agricultural Experiment Station Research Reports 6(2). doi: 10.4148/2378-5977.7885

Lyons, R. K., R. Machen, and T.D.A. Forbes. 1999. Understanding forage intake in range animals. Texas Agricultural Extension Services L-5152:1–6.

Table 1. Mineral composition

Item (dry matter basis)	Ionophore	Essential oil
Crude protein, %	5.48	5.50
Calcium, %	16.11	16.17
Phosphorus, %	3.44	3.44
Salt, %	22.53	22.53
Magnesium, %	2.48	2.48
Potassium, %	0.88	0.88
Iron, ppm	5529	5529
Copper, ppm	1153	1153
Zinc, ppm	3471	3471
Manganese, ppm	1818	1818
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

Table 2. Effects of mineral types on growth performance, average daily gain, average daily mineral intake, and pasture biomass

Item	Ionophore[1]	Essential oil[2]	SEM[3]	*P*-value
Initial weight, lb	629	653	10	0.16
Final weight, lb	833	856	9	0.12
Total gain, lb	204	203	8.8	0.92
Average daily gain, lb/day	2.15	2.13	0.09	0.92
Pasture biomass, lb dry matter/acre	1180	1229	79	0.67
Average mineral intake, oz/head/day	5.18	5.63	0.54	0.58

[1]Ionophore mineral (Bovatec 91 included at 18 lb/ton to provide 3.6 lb/ton lasalocid; Zoetis, Kalamazoo, MI).
[2]Essential oil mineral (3 lb/ton garlic oil and 6 lb/ton Solace; Wildcat Feeds LLC, Topeka, KS).
[3]Standard error of means.