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Effects of an Extended-Release Anthelmintic on Performance of Grazing Beef Cattle

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ABSTRACT

Seventy-four crossbred beef steers (average body weight [BW] = 527 pounds) were used in a randomized complete block design to evaluate the use of a long-acting anthelmintic on performance and fecal egg count. Steers were sorted by BW into 16 3-acre pastures of annual ryegrass, and pasture was randomly assigned to one of two treatments: a single injection of an extended-release eprinomectin (EXT) or two injections (day 0 and day 64) of a typical dewormer used in stocker operations (doramectin [DOR]). Stocking rate was adjusted within each block to account for forage biomass differences. Steers were allowed to graze pastures for 114 days. No differences ($P = 0.36$) were noted for initial BW; however, at final BW, steers treated with EXT were heavier ($P = 0.04$) than steers treated with DOR. Moreover, steers treated with EXT had greater average daily gain (ADG) ($P = 0.05$) and overall greater gain per acre ($P = 0.04$) than steers treated with DOR. Total cost of gain was greater ($P = 0.04$) for cattle treated with EXT. No differences ($P = 0.67$) were noted regarding initial total fecal egg count, nor were differences noted for final total fecal egg count ($P = 0.31$). In this study, both products had similar effects on internal parasites; however, EXT resulted in greater performance, perhaps due to less stress of reworking cattle.

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INTRODUCTION

Stocker cattle production is an important economic industry in south Mississippi and in many parts of the United States. Stocker systems typically involve placing lightweight cattle on higher quality pastures for a period of time in an attempt to capture best net return (Reuter and Beck 2013). Stocker cattle production is an extensive operation in which cattle may be spread out over a vast geographic region, which can result in limited access to cattle.

Anthelmintics have also shown to improve grazing beef cattle performance (Stromberg et al. 1997). However, they too have limited days of efficacy, and to fully capture the benefit of the anthelmintic would involve reworking cattle, which can incur additional labor and possibly impact animal performance (Wallace et al. 2008). Therefore, the aim of this study was to examine the use of an extended-release anthelmintic agent on performance of grazing beef cattle, to quantify costs associated with reworking stocker cattle, and to determine if differences existed in fecal egg counts.

PROCEDURES

The Mississippi State University Institutional Animal Care and Use Committee approved all procedures used in this study.

Cattle and Pastures — Eighty head of crossbred beef steers were purchased from an order-buyer facility in Brookhaven, Mississippi, and transported approximately 104 miles to the White Sand Branch Research Unit, located 10 miles west of Poplarville, Mississippi. Upon arrival, cattle were offloaded and placed in a large (30-acre) dormant pasture with free-choice access to hay. Animals were maintained in that pasture for 16 days before the initiation of the study.

On 0-day of the study cattle were weighed and individually identified with ear tags. Cattle were stratified by BW and sorted into groups of similar BW. At weighing, a fecal grab sample was obtained to measure parasite load. Body weight was used as a blocking factor, with each block having an equal number of treatments (pastures). Each pasture was 3 acres in size and had been no-till seeded with annual ryegrass (*Lolium multiflorum*) at the rate of 35 pounds per acre in late October 2014. Thirty days before grazing, each pasture was fertilized with 60 pounds of nitrogen per acre of an ammonium nitrate/urea combination. Pasture samples were taken periodically (every 28 days) to determine forage quality (Table 1). Stocking rate was determined by the forage biomass measurements taken before the initiation of the study in conjunction with the BW obtained at sorting to ensure that all animals had similar quantities of forage available. Twelve pastures were stocked the most densely (five animals per pasture), two were stocked moderately (four animals per pasture), and two were stocked least densely (three animals per pasture) based upon forage biomass. There were equal numbers of animals per treatment. Within each block, pastures had been randomly assigned to treatment by use of a random number generator. Treatments were 1 milliliter of extended-release epinomectrin per 110 pounds of BW (EXT) or 1 milliliter of doramectrin per 110 pounds of BW (DOR). Cattle were then moved into their respective pastures. After 64 days on pasture, DOR cattle were brought back and re-treated with 1 milliliter of doramectin per 110 pounds of BW, while the cattle in the EXT treatment groups were left alone. After 114 days of grazing, all cattle were individually weighed, fecal samples were collected again, and the study was terminated.

Fecal samples — After collection, samples were kept cold at 40°F and shipped overnight to an analytical lab in Georgia for total parasite count.

Costs — Since one of the objectives was to quantify the costs of reworking cattle, all costs involved with the study were recorded and maintained, including time spent working cattle ($12 per hour in wages), a chute fee ($0.25 per animal), and medication costs ($1.07 per milliliter for EXT and $0.29 per milliliter for DOR). Additionally, seed, fertilizer, and other costs associated with site preparation were recorded.

Statistics — All data were analyzed as a mixed model using PROC MIXED of SAS (SAS 9.3). Pasture was the experimental unit, fixed effects included treatment, and random effects included block. Least square means were separated using the PDIFF option in SAS.

Table 1. Quality characteristics of annual ryegrass (*Lolium multiflorum*) grazed by beef cattle.[1]

Item[2]	Nutrient value
Day 0	
ADF (%)	23.4
CP (%)	25.6
NEm (Mcal/lb)	0.79
NEg (Mcal/lb)	0.53
Day 28	
ADF (%)	28.4
CP (%)	21.8
NEm (Mcal/lb)	0.71
NEg (Mcal/lb)	0.45
Day 56	
ADF (%)	31.2
CP (%)	17.6
NEm (Mcal/lb)	0.66
NEg (Mcal/lb)	0.40
Day 84	
ADF (%)	35.7
CP (%)	14.4
NEm (Mcal/lb)	0. 61
NEg (Mcal/lb)	0.37
Day 114	
ADF (%)	38.9
CP (%)	11.6
NEm (Mcal/lb)	0.57
NEg (Mcal/lb)	0.32

[1]Nutrient analysis conducted by Midwest Laboratories using wet chemistry methods.
[2]ADF = acid detergent fiber; CP = crude protein; NEm = net energy maintenance; and NEg = net energy for gain.

RESULTS

Performance data — Performance data are presented in Table 2. No differences were noted for initial BW (P = 0.36). However, at the end of the grazing study, differences were noted for final BW (P = 0.04), with cattle treated with EXT weighing about 19 more pounds. Additionally, greater ADG was noted for the EXT treatment group, as well (P = 0.05). On an acre basis, EXT cattle gained more weight per acre than DOR cattle (P = 0.05).

Economic data — Economic data are presented in Table 2. Despite the fact that DOR cattle had to be handled twice, it was more inexpensive to work DOR cattle than EXT (P = 0.01) due to the cost differences of the anthelmintic. Additionally, when factoring pasture preparation costs, the overall costs for EXT were greater than DOR (P =0.01). Despite the economic advantage DOR possessed, the greater gain associated with EXT resulted in a more favorable cost of gain compared with DOR (P= 0.04).

Parasite load — Data are presented in Table 3. Initial parasite load was similar for both treatment groups (P = 0.67) and was similar for both groups at the end of the grazing period (P = 0.32). Both treatments appeared to reduce fecal parasite load in a similar fashion (P = 0.13).

Table 2. Grazing performance and economic data of cattle treated with doramectrin (DOR) or extended-release epinomectrin (EXT).[1]

Item	DOR	EXT	SE[2]	P-value[3]
Initial body weight (lb)	526.7	528.2	18.0	0.36
Final body weight (lb)	788.9	807.9	20.9	0.04
Average daily gain (lb/day)	2.29	2.45	0.06	0.05
Gain (lb/A)	452.1	482.5	30.1	0.05
Cost to work cattle ($/hd[4])	7.96	8.29	0.14	0.009
Total cost per acre ($[5])	245.42	246.56	0.20	0.009
Cost of gain ($/lb)	0.55	0.51	0.01	0.04

[1]Extended-release epinomectrin administered at day 0 of the study; doramectin administered at day 0 and again at day 63.
[2]Standard error of treatment means.
[3]Probability value.
[4]Includes labor ($12 per hour) and medication costs.
[5]Includes labor, medication, and pasture preparation costs (seed and fertilizer).

Table 3. Fecal worm data of cattle treated with doramectrin (DOR) or extended-release epinomectrin (EXT).[1]

	DOR	EXT	SE[2]	P-value[3]
Initial fecal sample[4]	104.6	94.3	18.7	0.67
Final fecal sample[4]	20.8	9.7	7.3	0.32
Percent reduction	76.1	88.8	6.08	0.13

[1]Extended-release epinomectrin administered at day 0 of the study; doramectin administered at day 0 and again at day 63.
[2]Standard error of treatment means.
[3]Probability value.
[4]Log transformed data of fecal worm counts.

DISCUSSION

It is unclear why a performance difference existed in this study. Stacey et al. (1999) noted that the use of a slow-release ivermectin bolus resulted in greater ADG and performance compared to a pour-on treatment. However, it should be noted that there were also differences for parasite control, with the bolus having a greater reduction of parasites compared to the pour on. Stromberg et al. (1997) demonstrated the performance advantages associated with controlling the parasite load in beef heifers. Nonetheless, in this study, both treatments seemed to control internal parasites similarly. Therefore, parasite load cannot explain the performance differences noted in the study. Wallace et al. (2008) determined the costs of reworking cattle in the feedlot (reimplant) and noted that dry matter intake (DMI) was decreased for up to 10 days after reworking. Perhaps the stress of reworking cattle in the study caused a similar decrease in DMI. Using National Research Council guidelines (2000) to calculate DMI based upon forage quality samples and performance data, there is a 0.45-pound difference in calculated DMI between the two treatments. However, it is unclear if this is due to reworking cattle in DOR groups. Cattle fed diets greater in moisture (as would be the case for ryegrass pasture) have greater percent shrink than cattle fed dryer feedstuffs (Cravey et al. 1991). We hypothesize that the shrink the DOR group underwent due to reworking, coupled with a possible decrease in DMI after reworking, led to the differences in performance noted. However, Macoon et al. (2003) demonstrated the difficulties of obtaining DMI values for cattle grazing pastures. Therefore, it is unclear whether effects noted were due to DMI decrease.

IMPLICATIONS

Under the conditions of this study, both anthelmintic products had similar results with fecal parasite load. While treating cattle with an extended-release anthelmintic was more expensive, the animals exhibited greater performance, resulting in decreased cost of gain. Further work is warranted to see if these effects are consistent across various seasons in south Mississippi.

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