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Gastrointestinal nematode infection and performance of weaned stocker calves in response to anthelmintic control strategies

R.S. Walker[a,*], J.E. Miller[b], C.J. Monlezun[c], D. LaMay[a], C. Navarre[b], D. Ensley[d]

[a] Louisiana State University Agricultural Center, Hill Farm Research Station, 11959 Highway 9, Homer, LA 71040, United States
[b] Louisiana State University, School of Veterinary Medicine, 111 Dalrymple Bldg., Baton Rouge, LA 70803, United States
[c] Louisiana State University, Department of Experimental Statistics, 161 Martin D. Woodin Hall, Baton Rouge, LA 70803, United States
[d] Boehringer Ingelheim Vetmedica Inc., 2621 North Belt Hwy, St. Joseph, MO 64506, United States

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ABSTRACT

Gastrointestinal nematode (GIN) parasite control recommendations are in a state of flux because of the increase in anthelmintic resistant cattle parasites, such as *Cooperia* spp. In addition, *Cooperia* spp. infection is typically high in warm-season grass pastures and can affect growth performance of grazing stocker calves in the Gulf Coast Region. This study evaluated the effects of moxidectin pour-on, oxfendazole oral suspension, or a combination of the two given at separate times on infection and performance of weaned beef calves grazing summer forages. Steers ($n = 42$) and heifers ($n = 31$) were stratified by sex, d-11 fecal egg count (FEC), and d-1 shrunk body weight (BW) to one of 10 pastures with four anthelmintic treatments and one control. Treatments included: (1) oxfendazole given on d 0 and moxidectin on d 73 (O + M), (2) moxidectin given on d 0 and oxfendazole on d 73 (M + O), (3) moxidectin given on d 0 (M), (4) oxfendazole given on d 0 (O) and (5) no anthelmintic given (CON). Calves grazed for d-110 beginning May 27th. Response variables were FEC (collected on d-11, 14, 31, 45, 59, 73, 87 and 108), coprocultures (evaluated for d 87 and 108), final shrunk BW, shrunk BW gain, average daily gain (ADG), and full BW gain (collected on d 31, 59, 73, 87, and 108). Calves treated with either oxfendazole (O + M and O) or moxidectin (M + O and M) on d 0 had significantly lower ($P < 0.001$) FEC than the CON calves on d 14, 31 and 45. However, the M + O treated calves had significantly higher ($P < 0.001$) FEC than both oxfendazole treated groups. In addition, calves treated with a second dewormer on d 73 (O + M and M + O) had significantly lower ($P < 0.001$) FEC by d 87 than the CON or M treated calves. Shrunk BW gain and ADG were significantly greater ($P = 0.005$) for the O + M compared to the M treated and CON calves, but comparable with the M + O and O treated calves, respectively. Coprocultures sampled on d 87 and 108 for calves not receiving a second dewormer were predominantly *Cooperia* spp. and *Ostertagia* spp. On d 87, no larvae were recovered from the M + O treated calves, whereas the O + M treated calves had 94% *Cooperia* spp. and 3% *Ostertagia* spp. recovered. Providing a benzimidazole with a macrocyclic lactone given at two different periods may provide better GIN parasite control and improve animal gains for stocker calves grazing warm-season grass pastures.

1. Introduction

Gastrointestinal nematode (GIN) parasites are the most common internal parasites affecting cattle and can detrimentally affect profitability (Williams and Loyacano, 2001). Research over the last 20 years has provided data

* Corresponding author. Tel.: +1 318 927 2578; fax: +1 318 927 9505.
E-mail address: rswalker@agcenter.lsu.edu (R.S. Walker).

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reporting significant reductions of GIN parasites in cattle following a single treatment of a macrocyclic lactone or benzimidazole. This response to a macrocylic lactone treatment has been reported in growing weaned calves grazing summer (Ballweber et al., 1997; Sanson et al., 2003), winter (Ballweber et al., 1997), or both spring and summer pastures (Williams et al., 1997a). Improvements in growth performance of calves have been reported following anthelmintic treatment grazing both warm- and cool-season forages. Grazing warm season forages, Sanson et al. (2003) reported a 45%, 61%, and 184% increase in body weight (BW) gain following ivermectin treatment of yearling beef heifers over untreated heifers for three different years and deRouen et al. (2009) reported a 6.4 kg increase in BW gain for suckling spring-born calves treated with fenbendazole orally in late May over untreated calves. In addition, studies evaluating multiple treatments of an anthelmintic during the same grazing season have yielded success in reducing parasite egg counts and improving weight gain (Williams et al., 1990, 1997b; Stromberg et al., 1997).

Williams and Loyacano (2001) estimated that the cattle industry spends US $2.5 billion on pharmaceutical products for internal parasite control. However, parasite control recommendations are in a state of flux because of the increase in anthelmintic resistance in cattle parasites over the last 15 years, especially with *Cooperia* spp. (Gasbarre et al., 2009). This resistance in cattle parasites has been reported in the US (Gasbarre et al., 2009) and overseas such as UK (Stafford and Coles, 1999), New Zealand (Familton et al., 2001), and Brazil and Argentina (Anziani et al., 2001; Fiel et al., 2001). Resistance in *Cooperia* spp. and *Haemonchus placei* to the macrocyclic lactones moxidectin, doramectin, eprinomectin, and ivermectin has been identified (Gasbarre et al., 2009; Edmonds et al., 2010), and also the benzimidazoles albendazole (Soutello et al., 2007; Gasbarre et al., 2009), fenbendazole (Mejia et al., 2003), and oxfendazole (Vermunt et al., 1995).

The NAHMS Beef Cow/Calf survey in 2008 reported *Cooperia* spp. was the most prevalent parasite in cow/calf herds across the US, indicating a possible increase in resistance of *Cooperia* spp. to macrocyclic lactones. This anthelmintic resistance to *Cooperia* spp. in cattle treated with macrocyclic lactones could limit GIN parasite control options for grazing stocker cattle in the Gulf Coast Region during the summer. Alternative approaches need to be evaluated to reduce parasite loads in young grazing cattle and give producers more opportunity for a profitable return. Data evaluating the effect of a combination of a macrocyclic lactone and benzimidazole anthelmintic given separately at the beginning and during the middle of the grazing period on these resistant nematode parasites in cattle are limited. This study was designed to assess the effects of moxidectin, oxfendazole, or a combination thereof on nematode parasite control and performance of weaned fall-born calves turned out on warm-season summer pasture.

2. Materials and methods

This study was conducted at the Hill Farm Research Station, a unit of the Louisiana State University Agricultural Experiment Station. Use of all animals in this experiment was approved by the LSU AgCenter Animal Care and Use Committee.

2.1. Experimental design

Previously weaned fall-born Angus cross (no more than 25% Brahman) steers ($n = 42$) and heifers ($n = 31$) were used to evaluate the effect of two anthelmintics on GIN infection (based on fecal egg count, FEC) and animal performance (based on BW gain). Calves were put out on pasture to graze immediately following weaning (backgrounding period) for 45 d prior to the administration of anthelmintics (May 27th, d 0). The two anthelmintics used were oxfendazole (Synanthic® 22.5% oral suspension given at a dose of 4.5 mg/kg of BW, Boehringer Ingelheim Vetmedica Inc., St. Joseph, MO) and moxidectin (Cydectin®, pour-on given on the back mid-line at a dose of 0.5 mg/kg of BW, Boehringer Ingelheim Vetmedica Inc., St. Joseph, MO). Both anthelmintics gave rise to four treatments and one control: (1) oxfendazole given on d 0 followed by moxidectin given on d 73 (O + M), (2) moxidectin given on d 0 followed by oxfendazole given on d 73 (M + O), (3) moxidectin given on d 0 (M), (4) oxfendazole given on d 0 (O), and (5) no anthelmintic (CON) with provision for moxidectin salvage treatment on d 59. Ten pastures, each ranging in size from 1.6 to 2.4 ha, were randomly divided into five groups of two pastures each. Initial FECs from all calves were collected on May 16th (d-11) to determine initial GIN infection. Calves were stratified by sex, initial FEC, and d-1 shrunk (after withholding feed and water for 16 h) BW, and then assigned to the five groups of pastures so that initial shrunk body weights, initial FEC's, and number of male and female calves were approximately equal among the four treatments and control, as well as for the two pastures assigned to the same treatment. Each pasture group was randomly assigned to one of 10 additional pastures to allow calves from each pasture group to be managed in a two-pasture rotational summer grazing system. Stocking rates for the O + M, M + O, O, M, and CON groups were 2.0, 1.6, 2.0, 1.6 and 1.7 animals per ha, respectively. Pastures were either separated by barb wire fence or poly rope electric fence. There was no cross grazing of pastures by calves receiving a different treatment or the control. Calves grazed for d-110. Pastures consisted of sandy loam soils with forages consisting of predominantly Coastal and common bermudagrasss. Pastures were fertilized with 1.818 kg/0.41 ha of poultry litter in mid-June and no herbicide was applied for weed control.

2.2. Body weights

Response traits evaluated included average daily BW gain (ADG), shrunk BW gain, and full (non-shrunk) BW gain. Beginning and end BW were taken on two consecutive days after withholding feed and water for 16 h each day to determine initial (d-1 and 0) and final (d 109 and 110) shrunk BW, shrunk BW gain, and ADG. In addition, full BW gain was collected on d 31, 59, 73, 87, and 108. D 108 BW was collected immediately prior to withholding calves for 16 h