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Effects of multiple oral administrations of fenbendazole on growth and fecal nematodes infection of early-weaned beef calves grazing perennial, warm-season or annual, cool-season grasses

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ABSTRACT

Two experiments evaluated growth and total fecal egg count (FEC) of early-weaned calves receiving multiple or a single oral drench of fenbendazole while grazing warm- or cool-season grasses. On d 0, Brangus crossbred calves (n = 64 and 56 in Exp. 1 and 2, respectively) were allocated into bahiagrass or ryegrass pastures (6 to 8 pastures per forage system; 4 calves per pasture). Thereafter, 2 of 4 calves within each pasture (Exp. 1) or all calves in each pasture (Exp. 2) received oral administration of fenbendazole (5 mg/kg of BW) every 28 d from d 0 to 84 (MULT) or once on d 56 (CTRL). Overall ADG from d 0 to 84 increased ($P = 0.01$; Exp. 1) or tended to increase ($P = 0.11$; Exp. 2) for MULT versus CTRL calves. In Exp. 1, FEC on d 28 and 56 was less ($P \leq 0.05$) for MULT versus CTRL, but the reduction on FEC was greater for MULT calves grazing ryegrass versus bahiagrass ($P < 0.001$). Fenbendazole treatment on d 56 reduced FEC on d 84 versus 56, but FEC remained greater for CTRL calves grazing bahiagrass than all calves grazing ryegrass ($P \leq 0.03$; Exp. 1). In Exp. 2, FEC of MULT calves decreased on d 28 and 56 ($P \leq 0.10$) and achieved similar values in d 84 than CTRL calves ($P = 0.93$). Therefore, monthly oral administrations of fenbendazole improved ADG of early-weaned calves, regardless of forage system, compared with a single, strategic administration on d 56 after weaning.

Key words: beef calf, early weaning, fenbendazole, gastrointestinal parasite, ryegrass

INTRODUCTION

Although over US$ 2.5 billion has been spent on pharmaceutical products for cattle gastrointestinal (**GI**) parasite control (Williams and Loyacano, 2001), commercial beef cattle herds do not routinely perform parasite control in growing calves, which consequently limits growth due to a relatively high level of parasitism (Wikse et al., 2004). In early-weaned (70 to 90 d of age) calves, GI parasites are of particular concern, with untreated calves experiencing anemia and dramatic reductions in BW gain (Vendramini et al., 2006). Climatic conditions of the southern United States provide ideal conditions for GI nematode infection in grazing cattle (Myers, 1988). Early-weaned calves in this region have the opportunity to be reared on high-nutritive-value, winter-annual forages, such as ryegrass (Evers et al., 1997), or low-nutritive-value, warm-season forages, such as bahiagrass (Arthington and Kalmbacher, 2003). These pasture options influence the potential for GI nematode infection. The major mode of transmission of nematode parasites in cattle is through contamination of pasture forage. However, the use of annual forages in prepared seedbeds reduces pasture contamination of GI nematodes (Myers, 1988), which could decrease the need for frequent GI parasite treatments and further enhance early-weaned calf growth performance.

Greater BW gain has been reported among suckling calves receiving multiple internal parasite control treatments, compared with untreated calves, but not for early-weaned calves (Myers, 1988; Stromberg et al., 1997; Ballweber et al., 2000; Forbes et al., 2002; Hersom et al., 2011). Also, there is a lack of studies evaluating the potential interaction between GI parasite treatment and forage system on early-weaned calf performance. We hypothesized that multiple oral administrations of fenbendazole would improve growth performance compared with a single, strategically timed oral administration for early-weaned calves grazing perennial bahiagrass but not for early-weaned calves grazing annual ryegrass. Hence, 2 experiments were designed to evaluate the growth performance and fecal nematode infection of early-weaned calves receiving a single, strategically timed or monthly oral dose of fenbendazole while grazing ryegrass or bahiagrass pastures.

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MATERIALS AND METHODS

The 2 studies were conducted at the University of Florida, Institute of Food and Agricultural Sciences, Range Cattle Research and Education Center, Ona, Florida (27.4°N) from January to April 2013 (Exp. 1) and January to April 2014 (Exp. 2). Animals were cared for within the parameters of acceptable practices described by FASS (2010).

Exp. 1

On d −7, Brangus crossbred calves (n = 64; 32 steers and 32 heifers; 110 ± 18 kg; 93 ± 15 d of age) were weaned and then kept in a single drylot pen for 7 d with free-choice access to water, long-stem stargrass (*Cynodon nlemfuensis*) hay, and a commercial pellet-based concentrate (Preconditioning/Receiving Chow; Purina Mills, St. Louis, MO). On d 0, calves were stratified by sex, BW, and age and then randomly allocated into bahiagrass (*Paspalum notatum*; 0.4 ha each) or established ryegrass (*Lolium multiflorum*; 0.3 ha each) pastures using a fixed and continuous stocking rate (2 steers and 2 heifers per pasture; 8 pastures per forage system). Calves grazed on their respective pasture from d 0 to 84. Stocking rates were not adjusted based on forage availability of bahiagrass and ryegrass as our major goal was to prevent lack of forage during the entire study (Vendramini and Arthington, 2008). Also, on d 0 and within each pasture, one steer and one heifer were randomly assigned to receive a single (d 56 only; **CTRL**) or multiple (every 28 d from d 0 to 84; **MULT**) oral drench administrations of fenbendazole (Safe-guard, Merck Animal Health, Summit, NJ; 5 mg of fenbendazole/kg of BW). A group of calves untreated for GI parasites during the entire study was not included as one of our treatments because (1) young, lightweight, early-weaned calves without internal parasite treatment might experience severe anemia and reductions in growth performance (Vendramini et al., 2006) and (2) our objective was to evaluate the effect of increasing the number rather than eliminating oral administration of fenbendazole on calf growth performance.

Exp. 2

Experiment 2 consisted of the same treatments described in Exp. 1 but with minor changes to the number of pastures and calves, and fenbendazole treatment randomization into calves. Hence, Exp. 1 and 2 were analyzed separately. After 7 d of weaning, Brangus crossbred calves (n = 56; 28 steers and 28 heifers; 108 ± 15 kg of BW; 84 ± 15 d of age) were stratified by sex, BW, and age and then randomly allocated into 1 of 6 bahiagrass or 1 of 8 ryegrass pastures with 2 steers and 2 heifers per pasture (n = 14 pastures total). Thereafter, within each forage system, all calves within each pasture were randomly assigned to receive either the CTRL or MULT procedures of oral administration of fenbendazole (3 bahiagrass and 4 ryegrass pastures per fenbendazole treatment). Calves grazed on their respective pasture from d 0 to 84.

Diet and Data Collection (Exp. 1 and 2)

In Exp. 1 and 2, individual calf BW was obtained every 28 d from d 0 to 84, after 16 h of feed and water withdrawal. From d 0 to 84, calves were provided daily concentrate supplementation (80% soybean hulls and 20% cottonseed meal, as-fed basis; Table 1) at 1.0 or 2.0% of BW (DM basis) while grazing on ryegrass or bahiagrass pastures, respectively. Supplementation rates were selected based on previous studies from our group and according to differences in nutritive value of each forage system (Vendramini et al., 2006; Vendramini and Arthington, 2008). Supplemental amount offered was adjusted every 28 d using average BW of each pasture. Calves were offered free-choice access to water and commercial mineral, mineral mix (Cattle Select Essentials Range; Lakeland Animal Nutrition, Lakeland, FL; 63, 6.0, and 1.0% of NaCl, Ca, and P, and 50, 1,500, 210, 500, 40, and 3,000 mg/kg of Co, Cu, I, Mn, Se, and Zn) throughout the study.

Rectal fecal samples were collected at 28-d intervals, from d 0 to 84, for total fecal worm egg counts (**FEC**). In-

Table 1. Chemical composition of concentrate offered to calves from d 0 to 84

Item, DM basis	Concentrate[1]
DM, %	90.0
CP, %	20.0
ADF, %	28.0
NDF, %	39.0
TDN,[2] %	75.0
NE_m,[3] Mcal/kg	1.78
NE_g,[3] Mcal/kg	1.16
Ca, % of DM	0.17
Cu, mg/kg	8.0
Fe, mg/kg	196
K, %	0.12
Mg, %	0.03
Mn, mg/kg	32
Mo, mg/kg	0.65
Na, %	0.008
P, %	0.05
S, %	0.03
Zn, mg/kg	51

[1]Concentrate consisted of 80% soybean hulls and 20% cottonseed meal (as-fed basis). Samples of concentrate were collected every 28 d from d 0 to 84, pooled by month, and sent in duplicate to a commercial laboratory (Dairy One Laboratory, Ithaca, NY) for wet chemistry analysis of all nutrients.

[2]Calculated as described by Weiss et al. (1992).

[3]Calculated using the equations proposed by the NRC (2000).