Effects of Late-Summer Protein Supplementation and Deworming on Performance of Beef Calves Grazing Native Range

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Story in Brief

The objective of this study was to determine the effects of late-summer (July through October) deworming and protein supplementation on performance of fall-born steers and heifers grazing native warm-season pastures. One hundred six Angus and Angus x Hereford calves (average age = 270 d) were used in a 2x2 factorial design experiment with two levels of protein supplementation (non-supplemented and supplemented) and two levels of anthelmintic treatment (non-treated and treated). The anthelmintic treatment (Ivermectin, 1% solution containing 10% clorsulon) was applied on July 25, 2003, pretrial d 4 and July 27, 2004, trial d 1 and repeated August 26, 2003 (d 28) and August 24, 2004 (d 28). Protein supplemented heifers received the equivalent of 1 lb per head per day of cottonseed meal (41% CP, as fed basis) for 84 d beginning on d 1. Fecal egg shedding was lower in anthelmintic treated calves throughout the treatment periods. Abomasal worm counts were higher in non-dewormed calves compared to dewormed calves. Protein supplementation and anthelmintic treatment resulted in improved weight gains during the supplementation period and these effects were additive.

Key words: Protein, Anthelmentic, Supplementation, Grazing, Beef Cattle

Introduction

Native range protein concentration falls below the requirements for growing cattle during summer and fall. Consequently, oilseed based protein supplements have been shown to consistently and efficiently improve performance of stocker cattle grazing native warm-season pastures during the late-summer and autumn months (McCollumn et al., 1985; Fleck et al., 1986; Lusby et al, 1994). Gastrointestinal helminth parasites are a major cause of production losses in young grazing ruminants and *Ostertagia ostertagi* is a major contributor to these losses. Previous reports have demonstrated increased summer weight gains when growing cattle were treated with an anthelmintic during mid- and late-summer (Purvis et al., 1996; Smith and Claywell, 1996).

This study was designed to determine the effects of summer protein supplementation and anthelmintic treatment alone or in combination.

Materials and Methods

One hundred six Angus and Angus x Hereford fall-born calves (initial weight = 624 ± 56 lb) were used in a 2x2 factorial design replicated over 2 years (2003 and 2004) to determine the effects of late-summer protein supplementation and anthelmintic treatment (deworming) on weight gain, fecal egg shedding and worm burden. The study was conducted at the Range Cow Research Center located 15 miles west of Stillwater, Oklahoma. Heifers were weaned from their dams during May or June (average age at weaning = 210 d) and administered a 7-way clostridia bacterin and 4-way viral vaccine containing infectious bovine rhinotracheitis virus, bovine viral diarrhea virus types 1 and 2, parainfluenze three virus, and bovine respiratory syncytial virus. Calves used in the experiment were not implanted at any time prior to or during the experiment. No anthelmintic treatments administered prior to the experiment.

Treatments included two levels of protein supplement (no supplement and supplement) and two levels of anthelmintic treatment (non-treated and treated).

Ivermectin, 1% solution containing 10% clorsulon, was injected subcutaneous at a dosage of 1 mL / 110 lb (50 kg) body weight in calves randomly assigned to anthelmintic treatments (n = 55) on pretrial d-4 and repeated on trial d 28 (July 25 and August 26, 2003) and trial d 1 and repeated on trial d 28 (July 27 and August 24, 2005). Calves randomly assigned to protein supplement treatments (n=55) were individually fed 2.33 lb of cottonseed meal (41% crude protein, as fed basis) on Monday, Wednesday, and Friday each wk using an individual supplementation barn. This feeding rate was equivalent to 1 lb per head per day of supplement. The supplementation period began on experiment d 1 and continued for 84 d.

The calves grazed as a contemporary group from the time they were weaned through the end of this experiment. The pastures contained primarily native grass species including big bluestem, Indian grass, switch grass, and little bluestem, as well as limited bermudagrass forage. Abundant forage was available at all times throughout the experiment.

Weights were recorded at 28-d intervals. Prior to each weight, calves were gathered from pasture and penned in a dry lot without access to feed or water for 16 h. Rectal grab samples of feces were collected on trial d 1, d 28, d 56, d 84 from calves randomly selected from each treatment group on d 1. Fecal samples were delivered to the laboratory and processed using the Modified Wisconsin Sugar technique. Strongyle egg counts were reported in eggs/gm of feces.

Abomasal worm burdens were quantified in a total of 30 calves. The abomasums were removed in total from the carcass on post trial days 2 and 4, placed in calf identification number labeled buckets with a small amount of water and taken to the laboratory and processed according to the procedure described by Downey. Results were reported as total worm burden and include the following species; Ostertagia ostertagi, adult and immature, Haemonchus sp., and Trichostrongylus sp.

After the treatment period, heifers were managed as a contemporary group and grazed abundant native range pastures through the winter and early spring months. Hay was only fed when extreme weather conditions existed and approximately 1 lb per head per day of 38% protein supplement was fed. Weights were recorded on the remaining heifers in April each year in order to determine if previous summer/fall treatment had an impact on weight change through out the winter.

Individual animal was considered the experimental unit because animals assigned to supplement treatments were fed individually and because animals assigned to anthelmintic treatment were treated individually. Data were analyzed using least squares (PROC GLM; SAS Inst., Inc., Cary, NC). The initial statistical model included the effects of year, gender, supplement treatment, anthelmintic treatment and all appropriate interactions.

Results

Fecal egg counts were initially low and gradually increased over time in animals that were not treated with the anthelmintic (Table 1). Furthermore, dewormed animals had substantially lower fecal egg counts throughout the experiment compared with animals that were not dewormed. Fecal egg counts in dewormed cattle remained low through d 54 but increased substantially by d 84.

Table 1. Effect of late-summer protein supplement and anthelmintic treatment on fecal egg counts of beef calves grazing native range

	Treatment				SE
Supplement	-	+	-	+	
Anthelmintic	-	-	+	+	
No. cattle	12	14	13	12/11	
d 1[a] July	43.1	52.9	40.8	26.8	17.6
d 28[a] August	66.6	113.9	6.9	8.3	19.7
d 56[a] September	135.2	102.9	3.3	5.6	17.5
d 84[a] October	111.3	142	18.9	50.4	19.2
No. Abomasal Worm Burden samples	7	7	8	8	
Abomasal Worm Counts	1352.3	1010.1	261.7	252.6	284.3

[a] Significant effect of anthelmintic (P<.01).

Calves receiving protein supplement gained at a faster rate compared with the non-supplemented calves in each of the three study periods (Table 2). Anthelmintic treatment did not influence weight gain during the first period of the study (August) although deworming did increase performance in each of the last two periods (September and October). No supplement by anthelmintic treatment interaction was detected, suggesting that the effects of protein supplement and deworming were additive. Overall, the combination of anthelmintic treatment and protein supplementation increased average daily weight gain by 0.73 lb/d, with approximately 74% of the response being attributed to protein supplementation and 26% of the response being attributed to deworming.

Supplement conversion, expressed as lb of supplement per lb of added weight gain, was similar among treated and non-treated heifers averaging 2.01.

Because these heifers were maintained throughout the winter and early spring on low quality native range pasture with minimal hay and feed supplementation, little weight was gained throughout the winter and early spring. Heifers that had previously been supplemented with protein had a slight weight loss (-0.1 lb/d) whereas heifers that had not been fed the protein supplement had a slight weight gain (0.1 lb/d; Table 2). Previous anthelmintic treatment had no influence on winter weight change.

Table 2. Effect of late-summer protein supplement and anthelmintic treatment on performance of beef calves grazing native range

	Treatment				SE
Supplement	-	+	-	+	
Anthelmintic	-	-	+	+	
No. calves	27	27	27	27	
Initial weight, lb	625.7	622	624.7	618.7	11.2
ADG, lb d 28[a]	1.49	1.93	1.53	2.11	.10
ADG, lb d 56[a,b]	.89	1.29	1.05	1.57	.08
ADG, lb d 84[a,b]	.32	.87	.69	1015	.09

ADG, lb d 1 to d 84[a,b]	.90	1.36	1.09	1.63	.05
Winter/Spring ADG, lb[a]	.13	-.14	.08	-.05	.07

[a] Significant effect of supplement (P<.01).

[b] Significant effect of anthelmintic (P<.01).

Implications

Protein supplementation during late-summer and anthelmintic treatment increases performance of growing cattle grazing native range in Central Oklahoma. The effects of protein supplementation and deworming are additive. However, some, although not all, of the additional weight gain due to supplementation was lost during the winter when heifers received a maintenance diet. Added weight gain that was attributed to deworming heifers the previous summer was not lost during the winter.

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