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

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Story in Brief

The objective of this study was to determine the effects of deworming and protein supplementation during late-summer on performance of fall-born heifers grazing native warm-season pastures. Forty Angus and Angus x Hereford heifers (average age = 270 d) were assigned to receive one of four treatment combinations: 1) no supplement, no anthelmintic; 2) supplement, no anthelmintic; 3) no supplement, anthelmintic; and 4) supplement, anthelmintic. The anthelmintic treatment (Ivermectin, 1% solution containing 10% clorsulon) was applied on July 25 and again on August 26. 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 July 29. Fecal egg counts were obtained from 5 heifers within each treatment combination at 28-d intervals. Fecal egg shedding was lower in anthelmintic treated heifers throughout the treatment period. Both protein supplementation and anthelmintic treatment resulted in improved weight gains during the treatment period and these effects were additive. However, more of the additional weight gain due to late-summer protein supplementation was lost during winter in supplemented compared to non-supplemented heifers. In contrast, additional weight gain due to summer deworming was maintained.

Key Words: Protein, Anthelmentic, Supplementation

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 parasites are a major cause of economic loss in ruminants throughout the world. *Ostertagia ostertagi* is the major contributor to the loss. Well-controlled studies have documented the pathophysiology of gastrointestinal parasite infection in the ruminant, more specifically, ruminant nutrition. 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

Forty Angus and Angus x Hereford fall-born heifers (initial weight = 616 ± 8 lb) were used in a 2x2 factorial design 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 vaccinated for clostridial diseases, IBR, BVD, PI_3 and BRSV. The heifers used in the experiment were not implanted at any time prior to or during the experiment. Similarly, these heifers had received no anthelmintic treatment prior to the experiment.

The heifers were gathered at 1800 on July 24, 2003 and fasted without access to water until being weighed at 0700 on July 25, 2003. These weights were arranged in order from heaviest to lightest. Groups of four heifers, in sequence of order, were then randomly assigned to one of four treatment combinations. Treatments included two levels of protein supplement (no supplement and supplement) and two levels of anthelmintic treatment (no anthelmintic treatment and anthelmintic treated).

Ivermectin, 1% solution containing 10% clorsulona, was injected subcutaneous at a dosage of 1 mL / 110 lb (50 kg) body weight in heifers assigned to anthelmintic treatments (n = 20) on July 25 and again on August 26, 2003. Heifers assigned to protein supplement treatments (n = 20) were individually fed 2.33 lb of cottonseed meal (41% CP, 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 CP. The supplementation period began on July 29 and continued through October 21 for a total of 84 d.

The heifers 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, heifers 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 from 5 heifers within each treatment combination on July 29 (d 4), August 26 (d 32), September 23 (d 60), and October 21 (d 88). 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.

In order to quantify total worm burden, two heifers from each treatment combination were harvested on October 23 or October 25, 2003. The abomasums were removed in total from the carcass, placed in 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 on April 24, 2004 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 Analysis of Variance (PROC GLM; SAS Inst., Inc., Cary, NC). The statistical model included supplement treatment, anthelmintic treatment and the supplement treatment x anthelmintic treatment interaction.

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 60 but increased substantially by d 88, which was 56 d after the last anthelmintic treatment. Differences among treatments regarding total worm burden were not detectable with this experimental design due to the high degree of variation among animals (high standard error; Table 1) and the small sample size.

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

	Treatment				SE
Supplement	-	+	-	+	
Anthelmintic	-	-	+	+	
No. samples per sampling date	5	5	5	5	
Sampling Date					
7/29[b]	56	42	3	3	11
8/26[b]	73	57	4	15	17
9/23[b]	134	81	1	9	29
10/21[a,b]	90	166	33	88	32
Abomasal Worm Burden (n=2)	672	572	306	468	163

[a]Significant effect of supplement (P<.05).
[b]Significant effect of anthelmintic (P<.05).

Heifers receiving protein supplement gained at a faster rate compared with the non-supplemented heifers 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 0.76 lb/d, with approximately 63% of the response being attributed to protein supplementation and 37% 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 2.1.

Because these heifers were maintained throughout the winter and early spring on low quality native range pasture with minimal hay and feed supplementation, almost no 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 heifers grazing native range

	Treatment				SE
Supplement	-	+	-	+	
Anthelmintic	-	-	+	+	
No. heifers	10	10	10	10	
Initial weight, lb	620	611	615	617	16
ADG, lb (7/29 to 8/26)[a]	1.40	2.13	1.49	2.08	.12
ADG, lb (8/26 to 9/23)[a,b]	1.16	1.51	1.44	1.92	.15
ADG, lb (9/23 to 10/21)[a,b]	.35	.73	.84	1.18	.16
ADG, lb (7/29 to 10/21)[a,b]	.97	1.46	1.26	1.73	.08
Winter/Spring ADG, lb (10/21 to 4/20)[a]	.13	-.14	.08	-.05	.07

[a]Significant effect of supplement (P<.05).
[b]Significant effect of anthelmintic (P<.05).

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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