Influence of Pasture Supplementation on Fecal Particle Size of Yearling Horses and Calves Grazing Bermudagrass Pastures

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Summary

Fecal samples were collected from 12 yearling stock horses (770 lbs) and 24 yearling beef calves (650 lbs) to determine the distribution of fecal particle sizes attributable to livestock and pasture supplementation. After wet-sieving fecal samples collected from pasture supplemented and non-supplemented calves and horses, it was concluded that horses had a higher ($P < .01$) percent of their fecal particles retained by large and medium size mesh sieves than calves. Calves had a higher ($P < .01$) percentage of their fecal particles retained by the small sieves, as compared to horses. Although there was a numerical tendency for pasture supplement to increase the percent of particles retained by large sieves, there was not a significant effect on particle size due to supplementation.

Procedure

Fecal samples were collected, per rectum, from 24 yearling ½ Simmental x ¼ Hereford x ¼ Brahman calves (650 lbs) and 12 yearling stock horses (770 lbs). The calves and horses were on separate grazing trials of Coastal bermudagrass. Each grazing trial contained a pasture only treatment, replicated by sex, and a pasture-supplemental feed treatment, also replicated by sex. The treatments were: (1) n = 12 calves grazing Coastal bermudagrass pasture (CPAS); (2) n = 12 calves grazing Coastal bermudagrass pasture plus a 34.2 percent crude protein (CP) pasture supplement being fed on an ad libitum basis (CSUP); (3) n = 6 horses grazing Coastal bermudagrass pasture (HPAS); and (4) n = 6 horses grazing Coastal bermudagrass pastures plus a pasture supplement which provided 50 percent NRC (1978) requirements for energy and 60 percent of their NRC requirement for protein (HSUP). The HSUP and CSUP consumed 5 and 1.9 lbs of their respective supplements, daily.

Fecal samples from CPAS and CSUP were collected on August 12, 1986 while HPAS and HSUP samples were collected July 14, 1986. All samples were immediately frozen until wet-sieved. Each fecal sample was wet-sieved for 12 minutes, in duplicates, using a Fritsch wet-sieving apparatus. Sieves with mesh openings of 1.00, .400, .160, .100, .071, and 0.32 mm were used to analyze CPAS and CSUP. Fecal samples of HPAS and HSUP were wet-sieved in a similar manner with the exception of a 1.600 mm sieve being added to divide the large fraction of particles being retained by the 1.000 mm sieve. The 1.600 mm sieve was not used for CPAS and CSUP due to the extremely small quantity of particles that were large enough to be trapped by the 1.600 mm sieve. For analysis, the 1.600 and 1.000 mm sieves were combined and reported as the fraction retained on the 1.000 mm sieve. After wet-sieving, particles retained on individual sieves were washed from the mesh into a preweighed 100 ml beaker. Samples were then dried in a force-draft oven for 48 to 72 hours or until the sample was completely dry. Since mean particle size is strongly influenced by the sieve sizes used, data are reported for particles retained on each sieve as a percent of total particles retained.

The level of forage-on-offer and determination of CP and percent neutral detergent fiber (NDF) were obtained on the individual grazing trials in an identical manner. Forage-on-offer for HPAS, HSUP, CPAS, and CSUP were 205, 150, 185, and 180 lb dry matter forage/100 lbs liveweight, respectively. Although HSUP had less forage-on-offer, numerically, all levels of forages were in the range considered to be a low stocking rate and should not limit daily forage intake. The percent CP of forage which is similar to that selected by the animals in CPAS, CSUP, HPAS, and HSUP was approximately 20.9, 20.6, 17.0, and 17.5 percent, respectively, while percent NDF was approximately 70, 69, 76, and 75 percent. Forage quality samples were taken by hand picking portions of the sward representing selectivity by the animals.

Results and Discussion

Information obtained from the wet-sieving technique is reported for individual sieves as a percent of total fecal particles retained. A statistical analysis of the percent of total particles retained on each sieve is reported in Table 1. Excluding the .160 mm sieve, all significant differences ($P < .01$) are between livestock species. Calves tended to have a higher percent of their total fecal particles retained by the smaller sieves, while horses tended to have a higher percent retained by larger sieves. Significantly ($P < .01$) more particles were retained on the .160 mm sieve for HPAS than CPAS, CSUP, or HSUP suggesting that supplementation to grazing horses may slightly increase mean fecal particle size. There was no significant effect of protein supplementation to grazing calves, although there was a numerical tendency toward increasing particle size.

Fecal particle sizes were classified as large, medium, and small (Table 2). The large class is a combination of those particles retained on the 1.600 mm and 1.000 mm sieves. The medium class is formed by combining the .400 mm and .160 mm retained particles, while the small class is formed by combining the .100 mm, .071 mm, and .032 mm sieve particles. When fecal particles are classified and analyzed in this manner, significant differences are confined to species differences. The HPAS and HSUP had significantly more ($P < .01$) of their fecal particles in the medium and large classification, than CPAS and CSUP, while CSUP and CPAS had significantly more particles than HPAS and HSUP retained in the small classification.

Under the conditions of this trial, horses tended to have more large fecal particles than calves, and pasture supplementation had no significant effect on fecal particle size of calves or horses. Differences in fecal particle size between calves and horses was thought to be largely attributed to differences in regurgitation-rumination digestive processes. Although diet selection of ber-

TABLE 1. PERCENT OF FECAL PARTICLES FROM CALVES AND HORSES RETAINED ON EACH OF SIX DIFFERENT SIZED SIEVES

Treatment	Sieve Size (mm)					
	1.000	0.400	0.160	0.100	0.071	0.032
	Percent retained					
Calves						
Pasture Only	10.375 b*	17.131 b	30.210 b	20.0423 a	14.743 a	7.4993 a
Pasture + Supplement	14.093 b	17.156 b	26.117 b	19.1744 a	14.847 a	8.6130 a
Horses						
Pasture Only	18.720 a	21.813 a	34.742 a	15.6339 b	6.397 b	3.1811 b
Pasture + Supplement	21.252 a	23.776 a	29.709 b	14.5994 b	7.482 b	2.6937 b

*Numbers within the same column and followed by a different letter are statistically different ($P<.01$).

TABLE 2. PERCENT OF FECAL PARTICLES FROM CALVES AND HORSES RETAINED ON SIEVES GROUPED INTO THREE CATEGORIES

Treatments	Pasture Groups		
	Large[1]	Medium[2]	Small[3]
	Percent retained		
Calves			
Pasture Only	10.375 b*	47.341 b	42.284 a
Pasture + Supplement	14.093 b	43.273 b	42.634 a
Horses			
Pasture Only	18.720 a	56.555 a	24.725 b
Pasture + Supplement	21.252 a	53.486 a	25.262 b

[1]Large = particles from sieves sized 1.60 + 1.00 mm.
[2]Medium = particles from sieves sized .400 + .160 mm.
[3]Small = particles from sieves sized .100 + .071 + .032 mm.
*Numbers within the same column and followed by a different letter are statistically different ($P<.01$).

TABLE 3. AVERAGE DAILY GAIN (ADG) OF CALVES AND HORSES GRAZING BERMUDAGRASS PASTURES WITH OR WITHOUT SUPPLEMENTAL FEED

Treatments	ADG	ADC[1]	Increased Gain[2]	Supplement: Increased Gain
	lbs/hd		lbs	
Calves				
Pasture Only	1.03	—		
Pasture + Supplement	1.51	1.92	.48	4:1
Horses				
Pasture Only	1.03	—		
Pasture + Supplement	1.28	5.06	.25	20.2:1

[1]ADC = Average daily supplement consumption.
[2]Increased gain due to supplement.

mudagrass was not measured, this was thought to have a small, and possibly insignificant, impact on fecal particle size in this trial. In addition, since the rumination process resulted in greater quantities of small fecal particles, the efficiency of forage digestion by calves may exceed that of horses. Forage intake was not measured on these two groups of livestock; however, the liveweight gains on bermudagrass pastures (Table 3) showed performance on pasture only to be identical at 1.03 lbs/day and a sizable ADG advantage for calves receiving the protein supplement. The efficiency of converting supplemental protein to calf gain was greater than the efficiency of converting supplemental energy-protein to horse gain. Both groups of livestock had acceptable performance on the pasture or pasture supplement rations.