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## SIMILARITY BETWEEN PRONGHORN AND MULE DEER FECAL PELLETS

Mark K. Johnson<sup>1,2</sup> and James G. MacCracken<sup>1</sup>

**ABSTRACT.**— Botanical compositions and pH values for pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) fecal pellets from the Idaho National Engineering Laboratory Site were different. As there was no overlap between ranges of the herbivores' fecal pH values, the fecal pH technique is a valuable tool for distinguishing between fecal pellets of pronghorn and mule deer on the study area.

Pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) fecal pellets are similar in appearance. On some ranges fecal pH values of pronghorn and mule deer did not overlap and it was concluded that pH analysis of fecal groups was a legitimate method for distinguishing between the two herbivores for one study area (Howard, J. Wildl. Manage. 31(1):190-191). Differences in diet and physiology are possible explanations for differences in fecal pH's (Nagy and Gilbert, J. Wildl. Manage. 32(4):961-962).

The Idaho National Engineering Laboratory (INEL) Site occupies about 231,500 ha (894 mi<sup>2</sup>) of southcentral Idaho and contains a large number of pronghorn and a small population of mule deer of unknown size. We were studying pronghorn food habits using botanical analysis of feces and realized that some of our pronghorn samples might have been contaminated with those of mule deer. The purpose of this paper is to report our findings as to differences between pH values and botanical composition for mule deer and pronghorn fecal pellets from the INEL Site. This research was supported in part by the INEL Ecology Project, U.S. Department of Energy, under contract EY-76-S-07-1526 with Colorado State University.

Mule deer pellets were collected in three areas of the INEL Site where deer were lo-

cated. Although we did not observe deer depositing pellets which were collected, deer were observed on several occasions in the areas. To our knowledge, no pronghorn had been observed in the areas by any persons for at least several weeks. Since the pellets collected were fresh, we were convinced that they were from mule deer. From each area where deer pellets were collected, they were composited into one sample. From three other portions of the study area herbivore pellets were collected which usually bore closer resemblance to mule deer pellets than to pronghorn pellets. Since the identities of these pellets were unknown, they were called unknown Artiodactyl pellets and were analyzed separately. A composite sample was made for each area sampled. Pronghorn pellets were sampled from 24 areas of the INEL Site, and a composite sample was made for each area. Pronghorn pellets were collected in conjunction with an INEL pronghorn ecology study. All pellets used in this study were collected after pronghorn were observed depositing them. Mule deer and unknown Artiodactyl pellets were collected in October 1977. Pronghorn pellets were collected during January, February, and March 1976, July 1976, and July 1977.

Fifty pellets were selected from each composite sample and were ground together in a Wiley Mill over a 1.0 mm mesh sieve.

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The botanical composition of each mixture was determined by the method reported by Sparks and Malecheck (J. Range Manage. 21(4):264-265). Similarity in botanical compositions between samples was estimated using Kulczynski's formula (Oosting 1956. The study of plant communities., W. H. Freeman Co. p. 104). One hundred microscope slides were examined for each mixture. Ten different pellets were selected at random from pronghorn, mule deer, and unknown Artiodactyl samples for pH analysis. Each pellet was ground in a Wiley Mill over a 1.0 mm mesh sieve and was soaked in 50 ml of deionized water for one hr. The pH was determined with a Sargent-Welch DG recording titrator. Students' tests were used to compare mean pH values among the different classes of pellets.

Botanical compositions of pronghorn and unknown Artiodactyl pellets were about 65 percent similar (Table 1). Botanical composition of mule deer pellets were only about 25 percent similar to pronghorn or unknown Artiodactyl fecal pellets. *Artemisia*, *Astragalus*, and *Sphaeralcea*, plus *Atriplex*, made up more than 70 percent of the plant fragments in pronghorn pellets, and *Artemisia* and *Astragalus*, plus *Sphaeralcea*, made up more than 70 percent of the plant fragments in unknown Artiodactyl pellets.

*Kochia* and *Bromus*, plus *Leptodactylon*, made up more than 70 percent of the plant fragments in mule deer pellets. *Kochia* alone made up more than 50 percent of plant fragments in these pellets. *Kochia* and *Bromus* are common only along roadsides on the INEL Site, where deer had been observed feeding on these plants.

The average ( $\pm$ SE) pH value for mule deer pellets ( $9.12 \pm 0.03$ ; range, 9.05-9.22) was significantly higher ( $p < 0.05$ ) than averages for pronghorn ( $8.60 \pm 0.04$ ; range, 8.52-8.72) and unknown Artiodactyl ( $8.53 \pm 0.06$ ; range, 8.38-8.70) pellets, which were similar. The range in pH values from the latter two herbivore classes overlapped, but neither overlapped with the range of pH values from mule deer pellets.

The range in pH values for pronghorn pellets was very narrow, regardless of area or collection date, and range in pH values for mule deer pellets was narrow regardless of area. The major food of pronghorn was *Artemisia* for all collection dates, but *Ceratoides* made up more than 65 percent of three composite samples. The pH values for these samples were not the highest or the lowest values determined for pronghorn samples. In New Mexico narrow ranges in pH values were found for pronghorn and mule deer pellets collected for a whole

TABLE 1. Mean percent ( $\pm$ SE) relative particle densities of plant fragments recovered from pronghorn, mule deer, and unidentified Artiodactyl fecal pellets from the Idaho National Engineering Laboratory Site.

Taxa <sup>1</sup>	No. of Composites Examined =	Pronghorn	Unidentified Artiodactyl	Mule Deer
		24	3	3
<i>Artemisia</i>		45.8 $\pm$ 1.5	48.9 $\pm$ 10.6	18.8 $\pm$ 9.3
<i>Astragalus</i>		8.5 $\pm$ 3.2	14.8 $\pm$ 6.6	2.5 $\pm$ 1.1
<i>Sphaeralcea</i>		4.6 $\pm$ 2.0	12.2 $\pm$ 7.3	3.0 $\pm$ 4.7
<i>Atriplex</i>		9.4 $\pm$ 4.5		0.7 $\pm$ 0.6
<i>Ceratoides</i>		15.0 $\pm$ 10.0	0.4 $\pm$ 0.4	
<i>Kochia</i>				57.8 $\pm$ 22.2
<i>Opuntia</i>		4.2 $\pm$ 1.8	5.3 $\pm$ 3.7	
<i>Salsola</i>			6.9 $\pm$ 5.1	0.3 $\pm$ 0.3
<i>Leptodactylon</i>			1.0 $\pm$ 0.9	3.8 $\pm$ 4.7
<i>Erigeron</i>		2.7 $\pm$ 1.5	1.6 $\pm$ 1.0	
<i>Bromus</i>		0.4 $\pm$ 0.2		10.7 $\pm$ 5.6

<sup>1</sup>Other taxa in herbivore fecal pellets identified in trace (<2 percent) amounts were *Sitanion*, *Koeleria*, *Sporobolus*, *Vulpia*, *Carex*, *Eriogonum*, *Crepis*, *Descurainia*, *Achillea*, *Lygodesmia*, *Chrysothamnus*, *Erysimum*, *Phlox*, *Balsamorhiza*, *Sarcobatus*, *Convolvulus*, *Castilleja*, *Chenopodium*, *Stipa*, *Aristida*, *Agropyron*, *Oryzopsis*, *Salix*, moss, unclassified grasses, unclassified forbs and arthropods.

year, and there was no overlap in the ranges of pH values found for each species (Howard, J. Wildl. Manage. 31(1):190-191). Evidence suggests that seasonal differences in diets have an insignificant influence on fecal pH's. Differences in fecal pH's between species are probably due to physiological differences rather than dietary differences. Under average circumstances fecal pH's of pronghorn and mule deer probably remain within narrow ranges.

The similarity in pH values and botanical compositions of unknown Artiodactyl pellets with those of pronghorn suggests that the

unknown fecal pellets were deposited by pronghorn. We conclude that visual examination of Artiodactyl pellets is inadequate for identifying the animal of their origin. However, fecal pH values of pronghorn and mule deer on the INEL Site appear to be different. Since mule deer pellets that we collected were from a few areas and represented a limited portion of the year, we recommend further study to corroborate our findings before the fecal pH technique is employed in practical application on the INEL Site.