Disappearing Forbs in Microhistological Analysis of Diets

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Abstract

Most forage plants in animal diets can be identified by microhistological analysis. However, the epidermis of some forb species apparently does not survive the slide making process. These fragile species can probably be identified by the difficulty encountered in finding identifiable fragments on reference slides.

Reports of the diets of grazing herbivores have become common in the literature. One of the standard procedures for determining diets is described by Sparks and Malecheck (1968). They conclude, for mixtures of the species which they used, that there was a 1:1 ratio of estimated dry weight percentage:actual dry weight percentage and also of the percent particles counted:actual dry weight percentage. However, they warned that the 1:1 ratio might not be valid for some species. Dearden et al. (1975) gave correction factors for 7 species which did not show the 1:1 ratio.

Vavra et al. (1978) and McInnis et al. (1983) have indicated that some differences seen in diet estimates between esophageal, rumen, and fecal samples were due to differential digestion of epidermal material. Marshall and Squires (1979) reported differential losses of isolated epidermis during the grinding process. Common snowberry (*Symphoricarpos albus* (L.) Blake) was partially destroyed during sample preparation even without digestion (Vavra and Holechek 1980).

This paper compares the actual percent weight with estimated percentages of forb fragments on reference slides for 6 forb species.

Methods

Reference material was collected, dried at 60° C, and ground in a Wiley Mill to pass a 40-mesh screen. Hertwig's and Hoyer's media were used for clearing and mounting (Ward 1970). Reference slides were made with 3 to 6 species of known weight on each slide to check method and observer accuracy of cattle diet determination (Samuel and Howard 1982). Reference slides were not identified as such to the 2 identifiers in 1975 and 1977 and were read along with the diet slides. In 1976 the identifiers knew which were reference slides. Slides were scanned back and forth with a phase contrast microscope at 125×. A total of 25 (in 1976) or 50 (in 1975 and 1977) fragments were identified per slide.

Results and Discussion

Table 1 gives data from selected species of forbs which were included on the reference slides. On these slides there was only one forb per mixture and all identifiable forb fragments were counted. Grasses and sedges made up the remainder of the mixture. Data were combined across years and identifiers. Fringed sagewort (*Artemisia frigida* Willd.), rush skeletonplant (*Lygodesmia juncea* (Pursh) D. Don) and scarlet globemallow (*Sphaeralcea coccinia* (Pursh) Rydb.) had estimated values reasonably close to the actual weights. Nebraska lupine (*Lupinus plattensis* Wats.) was seen at levels about half of what would be expected from the amount in the slide mixture. Dalmation toadflax (*Linaria dalmatica* (L.) Mill.) and wavyleaf thistle (*Cirsium undulatum* (Nutt.) Spreng.) almost disappeared.

Table 1. Actual and estimated percentages of forbs from hand-compounded slides.

Species	Actual % weight	% Fragments seen	Total fragments identified
Fringed sagewort	10	5	400
	20	18	250
Rush skeletonplant	25	27	150
Scarlet globemallow	10	7	350
	33	29	300
Nebraska lupine	10	6	450
	33	15	300
Dalmatian toadflax	20	0	100
	34	3	200
Wavyleaf thistle	25	4	100
	34	2	300

Species which are not readily seen may have an epidermis which does not separate readily from lower cell layers, does not survive the grinding of slide preparation, or is altered during digestion. Species with epidermis which is not easily discernable could probably be identified from the reference slides. When reference slides are prepared in a standardized manner, identifiable fragments are readily seen on the slides. Species which require an unusual amount of scanning on the reference slides to find identifiable fragments should be put into compunded mixtures for quantification of the visibility of the species. Procedures developed by Dearden et al. (1975) and Vavra and Holecheck (1980) can be used to develop correction factors for underestimated species.

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