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Using microhistological techniques to predict botanical composition of horse diets on cool-season grass pasture

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Key words: horse, diet, pasture, grazing, microhistological

Introduction The horse industry is Kentucky's top agricultural cash crop at over 1 billion dollars annually (USDA, 2007); therefore, high quality pasture and efficient utilization is essential for animals to remain healthy and producers to remain economically viable. This research employed the use of microhistological analysis to analyze diet composition of Thoroughbred horses grazing cool-season grass pasture. Microhistological analysis is a popular method of diet determination based on microscopic recognition of generally unique and identifiable undigested cellular structures from the cuticle layer of plant leaves. These identifiable structures include: stomata and their density patterns, size of bulliform cells, shape and frequency of prickly hairs, cell wall construction, shape and thickness, and cuticle size. The objective of this research was to determine if the microhistological technique as described by Sparks and Malechek (1968) can accurately predict the diets of domesticated horses grazing cool-season pasture.

Materials and methods Extensive microscope training was required to become proficient at recognizing unique microscopic cellular characteristics and discerning individual species. Samples of tall fescue [*Lolium arundinaceum* (Schreb.) S.J. Darbyshire], bluegrass (*Poa pratensis* L.) and orchardgrass (*Dactylis glomerata* L.) were evaluated. After training and validation of the procedure, experiments were designed to test the accuracy of microhistological analysis for determining diet composition of horses grazing cool-season grasses.

Cool-season pasture grazing studies were conducted in October, 2006 and May, 2007 in Lexington, KY. Eight 0.25 ha paddocks with varying amounts of tall fescue were evaluated for percent botanical composition by using a 0.6 m² quadrat. Visual estimation, point quadrat analysis, and hand separation were used to determine botanical composition and dry matter availability. One Thoroughbred mare was placed in each paddock and allowed to graze freely for 6 days, and fecal samples were taken from paddocks on days 4-6. Fecal samples from day 5 were used for analysis to insure against contamination from pre-study herbage intake.

Results and discussion There was strong correlation ($r = 0.90$) between botanical composition in the paddock and diet composition of tall fescue component in grazing experiments; the same was true for orchardgrass measurements ($r = 0.80$). Intake of bluegrass as a proportion of available dry matter was higher in the fall than the spring. Figure 1 shows the regression of percent tall fescue available in paddocks against percent tall fescue present in feces. These data show that when tall fescue percentage in a paddock was higher, less tall fescue was consumed as a percent of what was available. Conversely, when tall fescue percentage in a paddock is low, it is consumed in a higher proportion. As tall fescue availability increased, the amount in the diet increased, only at a decreasing rate. The same trend occurred for orchardgrass.

Conclusions Microhistological analysis is a useful tool for determining diet composition of horses grazing cool-season grass pastures.

References

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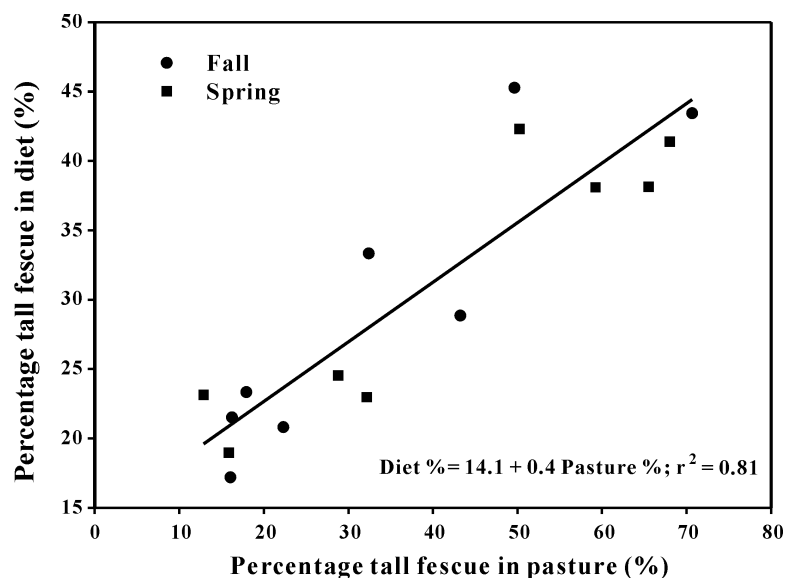


Figure 1 Regression plot of fecal tall fescue percentage and percent tall fescue available in paddocks from grazing experiments.