

Root and vigor response of big bluestem to summer grazing strategies

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Keywords: Animal Unit Month (AUM), root mass-density, organic reserves

Introduction Warm-season grasses e.g., big bluestem (*Andropogon gerardii* Vitman) are great potential sources of summer forage in eastern Nebraska. Frequent, intensive defoliation can reduce root mass and limit root distribution. Quantifying root structure response to multiple defoliation events in a grazing situation is critical to develop management plans for these types of grasses. This experiment aimed to quantify the cumulative effects of timing and frequency of grazing on root structure and organic reserve estimates in big bluestem pastures.

Materials and methods A pasture experiment was conducted in 1999, 2000, and 2001 using a 2 x 2 x 2 factorial with 4 replications, and the following factors and levels: (i) May grazing (M) or May deferred (NM), (ii) June grazing at a late vegetative stage (Jv) or June grazing at an early elongation stage (Je), and (iii) late-summer grazing in early August and early September (AS) or late summer grazing in September only (S). These factors and levels resulted in 8 grazing-date treatments applied to 0.05-ha paddocks using yearling steers (*Bos taurus*) (227 kg) at a cumulative recommended stocking rate of 9.9 AUM/ha (1 AUM=310 kg forage dry matter/month). Following three years of grazing, organic reserves were estimated by measuring etiolated tiller growth within 1.0 m² quadrats (Reece *et al.* 1997). Five soil cores (6.6 x 120 cm) were extracted from each paddock and divided into 30 cm segments. Root material was manually washed and separated from soil material, and then dried and weighed. The proportion of root mass to core segment volume was calculated to estimate root-mass density.

Results Timing of grazing and rest-period interval seemed to have a much larger effect than did frequency of grazing on organic reserve estimates and root-mass density in the upper 30 cm of the soil profile. However grazing in May and early June, did not appear to affect root structure or level of organic reserves. Etiolated tiller weight in paddocks grazed at either level in May, the elongation stage in June (Je) and in early August and early September (AS) was 48% lower ($P < 0.1$) than all other grazing-date combinations (Figure 1). Similarly, this grazing-date combination resulted in a 30% reduction ($P < 0.1$) in root-mass density compared to the other grazing strategies (Figure 2). It appears that having less than 40 days rest between the late June and early August grazing periods was inadequate for optimum recovery of big bluestem plants.

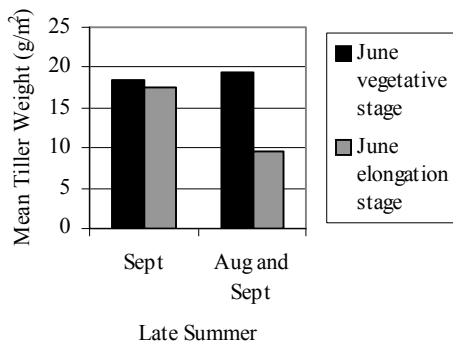


Figure 1 Mean tiller weight of etiolated big bluestem tillers for June and late summer levels of grazing following 3 years of grazing

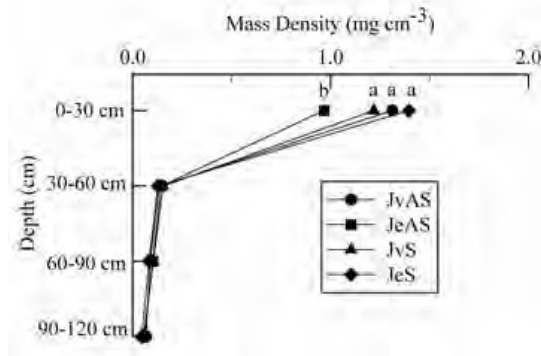


Figure 2 Mean root-mass density of big bluestem for June and late summer levels of grazing averaged over both levels of May following 3 years of grazing

Conclusions Grazing big bluestem pasture at the elongation stage in June and early August reduces root density and organic reserves of big bluestem. Management strategies for big bluestem pasture should include early season rest periods of 20-30 days and >40 days of rest between defoliation events in late summer to avoid reductions in root-density and plant persistence.

References

Reece, P. E., J. T. Nichols, J. E. Brummer & R. K. Engel. (1997). Technical Note: Field measurement of etiolated tiller growth of rhizomatous grasses. *Journal of Range Management*, 50, 175-177.