

DIFFERENTIAL SPECIES RESPONSE OF NATIVE WARM-SEASON GRASSES TO DEFOLIATION INTENSITY

IN PURE STANDS AND BINARY MIXTURES

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Abstract

To assess differential responses of native warm-season grasses [*Andropogon gerardii* Vitman (big bluestem), *Tripsacum dactyloides* L. (eastern gamagrass), *Sorghastrum nutans* L. (indiangrass) and *Panicum virgatum* L. (switchgrass)] to defoliation in pure and mixed binary-species stands, a field experiment was conducted at Virginia State University Research and Demonstration farm in Chesterfield County, near Ettrick, VA. For two consecutive years, strips (1.5 x 6 m) in the stands were harvested once, twice, or thrice a year at 20-cm stub-heights. In mid-June of the third year, three random second-year bunches of each species were separately clipped from the strips into paper-bags. For each bunch, the respective oven-dry (65 °C for 4 days) clipped biomass weight (g) was recorded. After the final harvest in late October, species crown diameters (cm) in respective strips for both stands were recorded. Data were analyzed as a Randomized Complete Block Design for effects of stand composition and harvest regimes on species performance. While pure stand biomass was greater for switchgrass than indiangrass, big bluestem, and gamagrass, in that order, performance in the mixtures differed notably between harvest intensities. Switchgrass outperformed gamagrass and big bluestem in the one-cut strips, while the reverse was true in the three-cut ones. Gamagrass also remained vegetative longer than switchgrass, indiangrass and big bluestem. Data indicate that, in mixed stands, species contributions to biomass and potential changes in composition can be manipulated through strategic defoliation management. Information on how fertility management might influence species response to defoliation in mixed stands is needed..

Introduction

Maintaining desirable species composition and performance in mixed native warm-season grass (NWSG) stands is usually challenging due to differential species response to management practices. For example, differences in species tolerance to defoliation are often reflected in their recovery growth rates following a common harvesting event. Considering high costs of establishing NWSG stands due to low seed germination and seedling emergence associated with seed dormancy and seed size limitations (Beckman, et al. 1993). Producers need strategies for ensuring desirable stand survival and performance. Although transplanting offers enhanced establishment option (Temu et al 2016), inappropriate defoliation management could result in undesirable subsequent species composition when one species recovers from the stress sooner than the other.

In this study, three harvesting one, two, or three times/year were compared based on their effects on subsequent growth performance of big bluestem (BB), gamagrass (GG), indiangrass (IG), and switchgrass (SG) plants in two-species mixtures. Species response to defoliation was based on clump biomass and crown diameter during recovery. The experiment was in a randomized complete block design.



In this big Bluestem-indiangrass mixed stand, indiangrass barely matched its competitor. Frequently harvesting may twist the balance in favor of indiangrass whose bunches tend to spread relatively faster

Materials and Methods

- Two-species mixtures of BB, GG, IG, and SG were established in alternating rows within 6 x 7 m plots and managed for two years.
- During the third year, three harvest frequencies (1, 2, or 3 cuts/year) were imposed in parallel 1.5 m wide strips on each plot
- Harvesting started in late-May for the 3-cuts and mid-June for 2-cuts
- The end-of-season harvest for all treatments was in early November
- Harvesting was done with a wintersteiger plots harvester equipped with a weighing system. In each mixture, species performance based on clump size were monitored.



Results and Discussion



A bunch of indiangrass clearly outcompeted by switchgrass in the unharvested two-species mixed stand. Notice the even smaller indiangrass bunch between the switchgrass rows on the right.



A bunch of gamagrass heavily shaded under tall-growing switchgrass in a strip harvested only once/year

Gamagrass outcompeted switchgrass in strips harvested at least twice/year

Results and Discussion...



Indiangrass was clearly suppressed in the switchgrass-indiangrass mixtures harvested only once a year.

In a similar stand, below, indiangrass appeared more competitive in the harvested strips.



Conclusions

- Defoliation management of newly established NWSG in mixed stands should pay attention to likely changes in subsequent species composition.
- Species differences in their tolerance to defoliation greatly influenced by their relative elevation of growing points.
- Gamagrass does relatively better in frequently harvested mixtures compared its tall-growing counterparts.
- Managers need to establish strategic defoliation regimes and be mindful of subsequent specific performance response

References

Beckman, J. J., Moser, L. E., Kubik, K., & Waller, S. S. 1993. Big bluestem and switchgrass establishment as influenced by seed priming. *Agronomy Journal*, 85(2), 199-202.

Temu, V.W., Kering, M.K, and Rutto, L.K. 2016 Effects of Planting Method on Enhanced Stand Establishment and Subsequent Performance of Forage Native Warm-Season Grasses. *Journal of Plant Studies*; Vol. 5, No. 1; 2016