ENHANCED ESTABLISHMENT OF NATIVE WARM-SEASON FORAGE GRASSES USING SEEDLING TRANSPLANTS

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Abstract

To asses alternative establishment approaches for native warm-season forage grasses (NWSG) in southeastern USA, high-tunnel raised ≥ 6-week old seedlings of *Andropogon gerardii* (big bluestem), *Tripsacum dactyloides* (eastern gamagrass), *Sorghastrum nutans* (indiangrass) and *Panicum virgatum* (switchgrass), were transplanted into clean seedbeds in June, spaced 30 and 45 cm within and between rows, respectively. In the same summer, control plots were seeded ≤ 2 cm deep for comparison. As needed, tall-growing broadleaf weeds were controlled by chopping them down with hand hoes. In the first year, plants were allowed to grow undisturbed and early in the succeeding spring, dead standing biomass was mowed down. Sward heights were recorded at boot and full bloom stages. Plots were harvested by machine to determine dry matter yield per area, after which 7-day regrowth heights were recorded. No fertilizers were applied. Data were analyzed as a randomized complete block design for effects of planting method within species and that of species within planting methods in four replications. Generally, plants were healthier in transplanted than seeded plots which suffered more weed competition. Plant heights, at boot stage, were greater for the transplanted than seeded plots, except for indiangrass. Mean height at full bloom was shortest for seeded indiangrass (75 cm) and tallest for transplanted switchgrass and big bluestem (average, 180 cm). Except for switchgrass, regrowth was 5-, 11-, and 14-cm taller for transplanted indiangrass, gamagrass, and big bluestem, respectively, compared to seeded. Data indicate that, transplanting, under similar growing conditions may be a reliable strategy to successfully establish NWSG stands within a year. Strategies to further promote the growth of NWSGs while suppressing that of weeds during establishment are also needed.

Introduction

Establishing NWSG stands from seeds usually takes up to two years mainly due to a combination of factors such as inherently low proportions of seed germination and seedling emergence associated with seed dormancy and seed size limitations (Robocker, et al. 1953; Beckman, et al. 1993). Consequently, for seeded NWSG establishment, landowners are often pushed into costly high seed rates in hope of minimizing chances of having empty patches in the new stand. However, spatial differences in plant density and growth performance during early establishment still remain. This is partly so because at early stages, NWSGs usually exhibit preferential resource allocation to root growth at the expense of shoots (Holmes and Rice, 1996). This being an adaptation to drought, it enables emerging seedlings to develop deep and extensive root systems so they can exploit large soil volumes for moisture and nutrients.

When establishing NWSG stands from seeds, strategies to minimize such spatial differences in plant density and species composition include costly reseeding and use of post-emergence herbicides to control weeds in the first year. However, although most herbicides can effectively control important broadleaf weeds, they are generally unreliable against annual grasses such as *Digitaria sanguinalis* (crabgrass) and *Echinochloa spp* (barnyardgrass) which may impact forage yield and/quality.

Similarly, while early fall planting is an option that avoids competition from better adapted warm-season annual grasses, the NWSG seedlings soon succumb to severe cold temperatures before they attain significant growth and tiller initiation. Consequently, initial growth in the following growing season remains susceptible to weed competition unless additional control measures are imposed. Thus planting approaches that may give NWSG an early growing advantage over weeds and ensure spatial homogeneity in stand density and performance during early establishment stages are more likely to bring about faster improvement in summer forage production and associated ecosystem services.

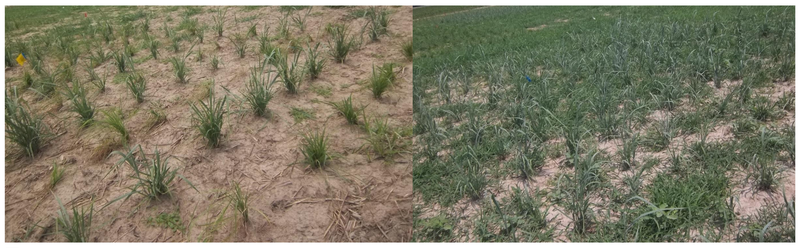
In this study, raising NWSG seedlings in high tunnels when outside temperatures are too low for germination and transplanting them into clean seedbeds before weed seedlings emerge was evaluated for four big bluestem (BB), gamagrass (GG), indiangrass (IG), and switchgrass (SG). This was to give the NWSG seedlings a growing advantage over weeds so they could maintain significant access to sunlight above the thick cover of their competitors. That would enable the NWSGs prepare better for compensatory growth in late summer when most annual grasses usually get lodged under their own seed weights.

Study Objectives

- To compare early summer transplanted versus seeded BB, GG, IG, and SG stands based on plant vigor and weed competition in the first year.
- To compare early summer transplanting versus seed drilling of BB, GG, IG, and SG based on second year plant heights and apparent spatial uniformity in growth performance.

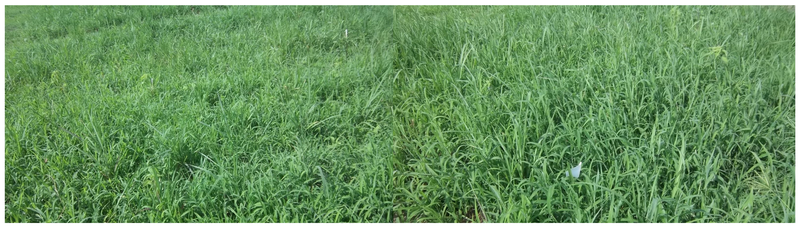
Materials and Methods

- Seedlings were raised in high tunnel for at least 6 weeks ready for transplanting in early June.
- After a heavy rainfall, the 35-40d old seedlings were transplanted into freshly prepared fields.
- Throughout the study there was not any fertilizer applied or irrigation.

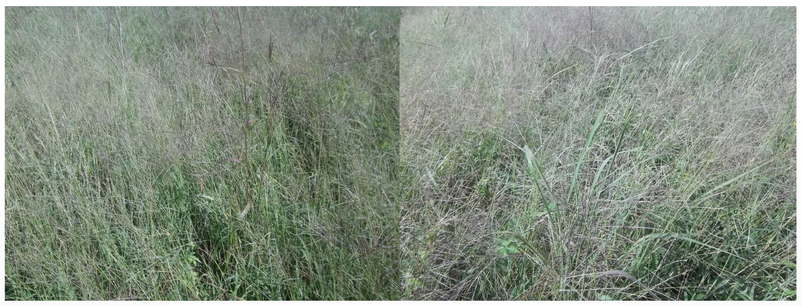


- Immediately after planting and later on as necessary, improper seedling placement and incomplete root coverage by the planter were manually corrected.
- Transplanted seedlings experienced no rainfall, for about three weeks, but were not irrigated
- Within a month after planting, any noticed dead seedlings were replaced with healthy ones.

- For each species, similar representative plots were seeded ≤ 2 cm deep for comparison.
- Plots showing great spatial variations in seedling emergence were re-seeded in mid summer



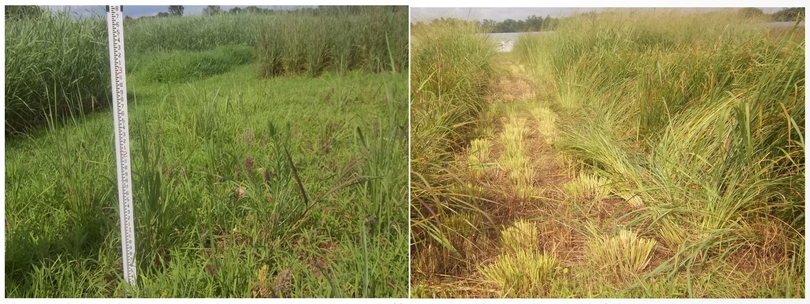
- Tall-growing non-grass weeds, mostly *Amaranthus hybridus* (pigweed), *Conyza canadensis* (horseweed), *Datura stramonium* (Jimsonweed), and *Solanum carolinense* (Horsenettle) were manually controlled by chopping with hand hoes to keep them from flowering.



- In their first year, plants in all plots were allowed uninterrupted growth to flowering.
- Later in the summer, NWSGs enjoyed more sunlight as weeds lodged under their seed weights.

Results

Spring growth in seeded plots reflected weed competition but not in transplanted ones.



Stand establishment and weed suppression differed greatly by the seed-filling stage in July

Conclusions

- ✓ Seeding produced week and generally short stands with greater proportion of weeds while transplanting resulted with tall healthy clumps ready for haying by the next summer.
- ✓ Transplanting the NWSGs significantly minimized their spatial variations in plant density and growth performance.
- ✓ With no irrigation or any fertilizers applied, transplanted NWSGs are more likely to outcompete weeds by the second growing season unlike their seeded counterparts.

References

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