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Selecting Native Grasses for Improved Survival under a Changing Global Climate

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In “The Changing Climate of South Texas 1900-2100”, Jim Norwine describes the likely climate scenario for south Texas in the year 2100. “South Texas will warm on average through the century. Because it will be hotter, even if annual rainfall remains roughly constant or increases a bit, the region will become drier due to increased evapotranspiration rates. Our infamous variability will probably increase as the climate mutates into one of more prolonged droughts and more extreme rainfall events/periods. Imagine Corpus Christi moved to Laredo by the year 2100”.

The rate of global warming and other associated climate changes such as increased evapotanspiration rates and drier moisture balances, which are anticipated over the next century, are expected to have significant impacts on south Texas vegetative communities.
To be prepared for these changing conditions, the USDA-NRCS E. “Kika” de la Garza Plant Materials Center (PMC) in Kingsville, Texas, has been evaluating methods for improving heat and drought tolerance in native grasses.

Switchgrass (*Panicum virgatum*) is a tall, perennial, native grass that produces abundant forage and has promising potential as a biofuel plant. However, one short coming of switchgrass is its panicoid seedling morphology. This morphology can result in the subcoleoptile internode elongating to elevate the coleoptile to the soil surface. This surface elongation can hinder or eliminate the development of its long-term adventitious root system. This trait has been implicated as a major limitation to successful switchgrass establishment under drought conditions. However, Tischler & Voight (1993) developed a selection method to overcome this problem.

The PMC began to evaluate and develop a more drought tolerant switchgrass in 2005. It began by establishing a 100 plant evaluation block from a composite collection from the King Ranch that had 6 day or earlier germination. We then used the Tischler & Voight protocol to establish a 150 plant low crown evaluation plot set-up as 6 blocks of 25 randomized plants from 8 maternal lines of the King Ranch Composite, 4 South Texas Accessions and *Alamo* LC-3. From this, we culled plants leaving 70 low crown plants representing 8 lines of the King Ranch composite collection.

Seed harvested from these 70 plants in 2010 and 2011 was compared to *Alamo* switchgrass for low crown development. *Alamo* only had 11% low crown seedlings whereas the PMC harvest of 2010 had 70% and the 2011 harvest had 72%. A seed germination test was conducted comparing *Alamo* to the PMC 2010 seed harvest. This test revealed that *Alamo* had a 7% germination rate within 4 days while the PMC 2010 harvest had a 26% rate.

Peter Setimela established in 1999 a rapid screening technique for heat tolerance in sorghum. We have adapted this protocol for evaluating heat tolerance in big sacaton (*Sporobolus wrightii*). We also have developed a screening technique for evaluating drought tolerance. This screening technique resulted in the mortality of 73% of the big sacaton plants leaving 27% of the plants for establishing a promising "drought hardy" seed increase block.

These measures appear to improve native grass seedlings for drought and heat tolerance. Although we have significantly more testing to confirm these improvements, we believe these measures will help us cope with the rapidly changing climate scenario expected for South Texas.

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