Development of Seeded and Vegetatively Propagated Bermudagrass Varieties Improved in Turf Quality and Stress Tolerance

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Objectives:

1. Assemble, evaluate and maintain *Cynodon* germplasm with potential for contributing to the genetic improvement of the species for turf.
2. Develop and use simple sequence repeat markers.
3. Improve bermudagrass germplasm for seed production potential, turf performance traits, and stress tolerance.
4. Develop, evaluate and release seed- and vegetatively-propagated turf bermudagrass varieties.

Start Date: 2013
Project Duration: three years
Total Funding: $90,000

Bermudagrass is a major warm-season turfgrass that has been widely used on golf courses, sports fields, home lawns, and other landscapes in the United States. The major goal of the Oklahoma State University turf bermudagrass breeding program is to develop high quality, seeded and clonal cultivars with improved resistance to abiotic and biotic stresses. Research progress of the OSU turf bermudagrass breeding project in 2015 is summarized as follows.

Seed yield is a major trait targeted for improvement in common bermudagrass breeding programs because of the increased interest in seed-propagated cultivars. Understanding the nature of genetic variation for seed yield and its components in bermudagrass would aid development of seed-propagated bermudagrass cultivars. As part of Dr. Chengcheng Tan's Ph.D. research program, a field-based experiment was performed to estimate the genetic component of variation and narrow-sense heritability for seed yield and its two major components, inflorescence prolificacy and seed set percentage in common bermudagrass. Twenty-five half-sib families and their respective clonal parents were evaluated at two Oklahoma locations, Perkins and Stillwater. Half-sib families were different for seed yield, inflorescence prolificacy and seed set percentage, indicating the expression of additive genes in controlling these traits. Narrow-sense heritability estimates for seed yield was 0.18 based on variance component analysis among half-sib families and ranged from 0.26 to 0.68 based on parent-offspring regressions, indicating complex genetics control seed yield. Heritability estimates were moderate (0.30-0.55) for inflorescence prolificacy and moderate to relatively high (0.41-0.78) for seed set percentage. These results indicate that sufficient magnitudes of additive genetic variation for seed set percentage and inflorescence prolificacy will permit a positive response to selection.

A nursery of 98 cold hardy plants has been evaluated for turf performance, seed yield and related traits since 2011 as part of Ph.D. graduate student Yuanwen Guo's thesis project. More than 1,800 progeny plants were developed from equally mixed seed collected from the 98 plants grown in a selection nursery. The progeny plants transplanted in a nursery were visually evaluated for establishment rate, leaf texture, color, spring green up, seed head prolificacy in

2015 (Figure 1). Selected plants in the nursery will be evaluated for seed set and turf quality traits in 2016 and 2017. In the early summer of 2015, parental plants of 12 new polycrosses (to produce synthetic seed) were transplanted into separate nurseries (Figure 2). The parents were selected from four breeding populations based on relatively high seed yield and acceptable turf quality in previous years. Seed yields of the new crosses will be evaluated in 2016 and 2017.

Thirty-five official and four local entries in the 2013 NTEP bermudagrass trial were evaluated for sod tensile strength, sod handling quality and divot recovery characteristics during 2014 and 2015. This work was conducted by M.S. candidate Lakshmy Gopinath at Stillwater, OK. Bermudagrass sod harvested at 24 months after planting (MAP) generally had greater mean sod tensile strength (STS) and handling quality (SHQ) compared to sod harvested at only 14 MAP. Our experimental entries OKC 1131 and OKC 1302 had high STS and excellent SHQ on all harvest dates. A first-ever regression equation was developed that related bermudagrass STS (a quantitative measure of sod strength) to sod handling quality. We believe this relationship allows for decision making concerning the minimum STS necessary for satisfactory SHQ. Analysis of divot recovery data is not complete at this time. We anticipate the ability to characterize all entries for their divot recovery rate under spring, summer and fall growing conditions.

Summary Points

- A common bermudagrass experiment indicated low narrow-sense heritabilities of seed yield, but moderate and relatively high heritabilities of seed head prolificacy and seed set percentage.
- A common bermudagrass selection nursery was evaluated for phenotypic traits related to turf quality and seed yield.
- Twelve polycross plantings were field established to evaluate seed yield and selected traits related to turf performance.
- Sod tensile strength, handling quality and divot recovery were evaluated on 35 official and 4 local entries in the 2013 NTEP bermudagrass trial at Stillwater, OK.

Figure Captions

Figure 1. A field nursery of more 1,800 plants evaluated in establishment rate, turf quality, and seed yield related traits.

Figure 2. Twelve new polycross established to produce synthetic seed.