Development of Seeded Zoysiagrass Cultivars with Improved Turf Quality and High Seed Yields

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Project Duration: 3 years
Total Funding: $89,317

Objectives:

1. Development of finer-textured germplasm/cultivar(s) of zoysiagrass with high seed yields that offer an economical alternative to fine textured vegetative types with the potential for rapid turf establishment.
2. Breed to improve characteristics such as turf quality, competitive ability and persistence under biotic and abiotic stresses.

Zoysiagrass (Zoysia spp.) is a warm season, perennial grass used on sports fields and home lawns that is increasing in popularity due the need for low inputs such as fertilizer, water and less frequent mowing. Most cultivars are vegetatively propagated by sprigging or solid sodding. Except for expensive solid sodding, other methods such as sprigging require a minimum of two years to establish and provide 90% cover (Patton et al, 2006). An alternative, relatively inexpensive, way is to propagate zoysiagrass is by seed. The cost for establishing one acre of fairway with a vegetative type zoysiagrass using sprigs is $3,000, strip sodding is $5,000 and solid sodding is $16,000 while the cost of establishment using seed is around $900.00 (Patton et al, 2006). Unfortunately the number of seeded varieties is limited with 'Zenith' being the most popular. This research project is focused on the development of new and improved cultivars.

Seed yield and ease of harvest are important traits looked for in the development of new seeded type zoysias. Diesburg (2000) reports that seed yields with zoysiagrass have been limited ranging from 100 to 600 pounds per acre as compared to yields for cool season grasses ranging from 700 to 1,600 pounds per acre. Stacking genes that maximize seed yield in the species is our target and is of utmost importance to the commercial success of newly released varieties while also maintaining good turf quality. Our goal is to develop a multi-clone synthetic variety which exhibits a texture that is finer than Zenith and seed yields that meet the production goals needed to make it profitable to produce. One of our breeding objectives is to minimize inbreeding depression by selecting parental clones with a broad genetic base (different pedigrees) but with approximately the same flowering time in order to enable cross pollination and to create commercially viable synthetic populations.

Since the initiation of the project in 2010, our breeding strategy has been the utilization of the classical plant breeding method known as phenotypic recurrent selection. Recurrent selection is a strategy that has proven to be useful with corn breeding at Iowa State in the development of the Stiff Stalk Synthetic (Lamkey, 1992). The method focuses on population improvement by increasing the frequency of quantitative genes that influence seed yield in the breeding populations. The approach involves alternating between Spaced Plant Nurseries (SPN) and isolation crossing blocks. As new progeny are generated and planted in the spaced plant nurseries, selection is for those advanced lines with improved seed yield from individuals with the finest texture. This strategy should allow for the gradual increase over multiple generations of desirable alleles in the fine textured population.

At the peak of the flowering season in the spring of 2013, we identified 32 lines from the 2011 Spaced Plant Nursery (SPN) comprising a 712 progeny population. The criteria for this second cycle of recurrent selection was a finer leaf texture combined with increased seedhead density observed over that of the original 15 parental lines evaluated during the first cycle of recurrent selection. These 32 lines were grouped into four isolation blocks based on flowering date and seedhead color. Samples were collected, vegetatively propagated and planted in isolation crossing blocks in the summer of 2013. They were grouped based on seed head color and flowering date with (1) nine of the 32 classified as red seedhead / early flowering , (2) seven as red seedhead / late flowering, (3) nine green seed heads / early flowering and...
Thirty-two lines were selected from the 2011 SPN and grouped into 4 isolation blocks and planted in 2013 based on flowering date and seed head color. Those plots came into flower and seed collected for the next round of germination in 2015 and spaced plant nursery development.

Along side the recurrent selection breeding strategy, we have initiated early generation testing of promising seed parents by grouping three sets of 3 parent synthetics in isolation blocks for evaluation of our progress toward the release of a commercial product. Seed was harvested and will be used to plant replicated trials in 2015.

Summary

- Thirty-two lines were selected from the 2011 SPN and grouped into 4 isolation blocks and planted in 2013 based on flowering date and seed head color. Those plots came into flower and seed collected for the next round of germination in 2015 and spaced plant nursery development.
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References:

