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

Dennis Genovesi and Ambika Chandra
Texas A & M AgriLife Research - Dallas

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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 projected 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

Figure 1. Late red *Zoysia* three clone synthetic planted in August of 2013 shown here in mid July 2014 where parents A, B and C are planted in that order with 6 reps in a 6' x 9' block.

Figure 2 The late red *Zoysia* three clone synthetic shown in Figure 1 after harvest with sickle bar mower.

(4) seven lines with green seed heads / late flowering. Each of the four sets comprised a separate isolation block for recombination and the third cycle of recurrent selection. In addition, we took what we considered to be our best parental lines from the 32 advanced lines and propagated them for planting three clone synthetics in order to evaluate their commercial potential. Three synthetics were planted with (1) early flowering / red seed head, (2) late flowering / red head and (3) late flowering / yellow seed head. The isolation blocks were allowed to grow in during 2013-2014. In July of 2014 seed was collected / harvested from each of the nurseries (see Figures 1, 2 and 3). Seedheads and peduncles have been stored until pure seed lots can be separated/thrashed and scarified. In 2015 seed lots from each isolation block will be germinated to produce four separate spaced plant nurseries. The three experimental synthetics will be used to plant field trials at the Research Center - Dallas as well as with as many cooperators as the quantity of seed will allow.

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.
- 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.

References:

Diesburg, K. L. 2000. Expanded germplasm collections set the stage for increased zoysiagrass breeding for turf use. Diversity 16(1):49-50.

Patton, A. J., Reicher, Z. J., Zuk, A. J., Fry, J. D., Richardson, M. D., and Williams, D. W. 2006. A guide to establishing seeded zoysiagrass in the transition zone. Online. Applied Turfgrass Science doi:10.1094/ATS-2006-1004-01-MG.

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Figure 3. Late red *Zoysia* synthetic flowering in May of 2014. Some seed heads have exerted 11" above the ground.

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