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

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Objectives:

1. *Develop seeded type zoysiagrass germplasm/cultivar(s) with high seed yields that offer an economical alternative to 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 most often propagated vegetatively by plugging, sprigging, stolonizing or sodding. Except for expensive sodding, other methods of vegetative propagation require a minimum of two years to establish and provide 90% cover of a turf stand (Patton et al, 2006). An alternative, relatively less expensive, means to propagate zoysiagrass is through seed. The cost to establish one acre of fairway with a vegetative type zoysiagrass using sprigging is $3,000, strip sodding is $5,000 and solid sodding is $16,000 while the cost of establishment using a seeded type would be around $900.00 (Patton et al, 2006).

Seed production capacity and ease of harvest are requisite for developing a seeded zoysia. Diesburg (2000) reports that in commercial production of seeded zoysiagrass yields have been limiting. Seed yields range from 100 to 600 pounds per acre for zoysia compared to expected yields of 700 to 1,600 pounds per acre for the cool season grasses. Genetics which maximize seed yield in the species will be of utmost importance to the commercial success of released varieties while maintaining genes for desirable turf traits. The goal of our ongoing USGA–funded project 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 a profit.

In order to achieve the objectives of the current project initiated in 2010, our strategy was to utilize the classical plant breeding method known as phenotypic

Figure 1. Seeded zoysia parental line with yellow and red seedheads selected in 2013.

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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). Recurrent selection focuses on population improvement by increasing the frequency of quantitative genes that influence seed yield in the breeding populations. With each cycle the mean of the population is shifted in the direction phenotypic selection is applied. The approach involves alternating between Spaced Plant Nurseries (SPN) and isolation (recombination) blocks. As new progeny are generated and planted in the spaced plant nurseries, selection is focused on improved seed yield from the finest textured seed parents. This strategy should allow for the gradual increase of the frequency of desirable alleles in the fine textured population.

We continue to concentrate our breeding efforts towards development of finer textured seeded types. As we made our selections from the 2011 SPN, our emphasis was to select plants with the following traits: finer texture, seedhead production (density and height), turf quality, flowering time, nicking between parental lines and seedhead color. During the spring of 2013 at the peak of flowering season, we identified 32 lines from the 712 member progeny population that had finer texture combined with increased seedhead density over that seen in the original 15 parental lines and the commercially available seeded cultivar, Zenith. These 32 lines were grouped into four isolation blocks based on flowering date and seedhead color. Vegetative specimens were collected, vegetatively propagated and planted in isolation crossing blocks in the summer of 2013. Nine of the 32 lines were selected to be planted together based on early flowering/ nicking and red seedhead color while another seven also with red seedheads but flowered too late to nick with the first nine populated two new isolation blocks. Likewise nine newly selected lines with green seed heads flowered early and so were grouped into another isolation block. Seven lines with green seed heads that flowered later were grouped together in a separate block to allow for recombination and another cycle of recurrent selection. In addition, we took what we considered to be our best parental lines from the 32 advanced lines and planted three sets of three clone synthetics in order to evaluate their commercial potential. Performance of these lines will be evaluated to select the ones that have superior turf quality, abiotic and biotic defensive traits. 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. In order to evaluate the commercial potential of the original 15 parental lines as well 28 out of the newly selected 32 lines, we have established a collaboration with Patten Seed Company (Newnan, GA). We feel this was a necessary and important collaboration because of their experience with seeded Zenith zoysiagrass production and marketing.

Summary Points

- Thirty–two lines were selected from the 2011 SPN and grouped into 4 isolation blocks and planted in 2013 based on flowering date and seedhead color.
- At the same time as a part of the recurrent selection breeding strategy, we have identified a subset of the 32 newly advanced lines to set up three synthetic populations to evaluate our progress toward the release of a commercial product.
- We have partnered with Patten Seeds Co. for the evaluation of our experimental lines and synthetic seed lots. The purpose of this collaboration is to evaluate the seed yield potential of elite lines in Newnan, GA. This involves a test for seed yields, harvestability, seed processing, and seed germination rates.

Figure 2. An Isolation Crossing Block set up to allow recombination of genes as a part of the recurrent selection breeding objective.

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