Turfgrass Research 2019

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Evaluating Large Patch-Tolerant and Cold Hardy Zoysiagrass Germplasm in the Transition Zone

Mingying Xiang, Jack Fry, and Megan Kennelly[1]

Summary

More than 2,800 zoysiagrass progeny, all having a single parent in common that exhibited tolerance to large patch, were evaluated in several transition zone states for quality characteristics and large patch tolerance. From these evaluations conducted over several years, 10 progeny have been identified for further evaluation that have good quality and large patch tolerance that is superior to Meyer zoysiagrass.

Rationale

Cold hardiness is the trait that limits the long-term survival of zoysiagrass in the transition zone. Further, large patch disease caused by *Rhizoctonia solani* (AG 2-2 LP) has become the primary pest on zoysiagrass. Large patch disease is currently managed by fungicide applications in fall and/or spring. Improved cultivars with good cold hardiness and large patch resistance are desired in the transition zone, which could reduce fungicide requirements and maintenance costs.

Objectives

The objectives of this research were to identify high quality experimental zoysiagrass genotypes with cold tolerance equivalent to or better than Meyer, and better tolerance to large patch.

[1]Collaborators: Ambika Chandra and Dennis Genovesi, Texas A&M-Dallas; Aaron Patton, Purdue University; Mike Richardson, University of Arkansas.

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Study Description

In June 2015, 60 experimental progeny—previously screened from 2858 entries for their quality and cold hardiness—were received from our turf breeder collaborators at Texas A&M AgriLife Research and Extension Center at Dallas, TX, and planted in Manhattan, KS. One parent of each of the progeny (TAES 5645) has previously shown partial resistance to large patch infection in the preliminary experiments at Texas A&M. The experimental progeny, plus controls, were laid out in a randomized complete block design in 6 × 6 ft plots in three replications. The plots were maintained under golf course fairway/tee conditions starting in fall 2016. These progeny have also been planted and managed by university cooperators in West Lafayette, IN; Dallas, TX; Blacksburg, VA; Chicago, IL; Columbia, MO; Fayetteville, AR; Knoxville, TN; Raleigh, NC; and Stillwater, OK. In Manhattan, on September 12, 2016, after plots were fully established, one-half of each plot was inoculated by inserting the 8-10 gram oats grows with the large patch fungus under the thatch. Large patch severity was determined by visually rating the percentage of each half of the inoculated side that exhibited large patch disease symptom in November 2016, and May, September, and October 2017. A similar inoculation was done in Fayetteville, AR. Turf performance index (TPI) was used to evaluate the total times each progeny was in the top statistical group for each characteristic evaluated, which included percent green cover, monthly turfgrass quality, spring green up, winter kill, and large patch tolerance across all locations.

Results

A *Z. japonica* genotype, TAES 5645, that exhibited partial resistance to large patch in preliminary studies conducted by our collaborators at Texas A&M University, was used as a breeding parent and crossed with 22 cold hardy zoysiagrasses, resulting in 2858 progeny. These progeny were evaluated for cold hardiness and agronomic traits (establishment rate, overall quality, spring greenup, leaf texture, and genetic color) in Manhattan, KS; West Lafayette, IN; and Dallas, TX; from 2012 to 2014. From this work, 60 progeny were identified for further evaluation in larger plots. In fall 2016, Meyer (42% of plot area affected) had more large patch than all zoysiagrass progeny (0 to 23%) when evaluated in Manhattan, KS and Fayetteville, AR. In spring 2017, Meyer had 33% large patch, higher than most progeny. Among this group of experimental zoysiagrasses, progeny with good winter hardiness, tolerance to large patch, and improved turf quality were identified. In late 2018, 10 zoysiagrass lines were selected as top performers and will continue to be evaluated in 2019 for turf quality characteristics and large patch tolerance in Manhattan, KS; Dallas, TX; and West Lafayette, IN (Table 1). Discussions are underway for on-site evaluation of these top 10 hybrids at several golf courses in the transition zone.

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Table 1. Rank of the top 10 entries according to turfgrass performance index (TPI) in 2016 and 2017. The TPI is a parameter used to evaluate the total times each progeny was in the top statistical group for each characteristic evaluated, which included percent green cover, monthly turfgrass quality, spring green up, winter kill, and large patch tolerance.

Entry ID	2016 TPI* (54)	2017 TPI (57)	Sum TPI 2016 + 2017 (111)
6099-145	28	50	78
6119-179	39	38	77
6095-83	31	45	76
6095-73	36	32	68
6119-14	33	34	67
6126-71	33	34	67
6101-154	31	35	66
6101-32	28	35	63
6100-86	24	38	62
6100-186	27	34	61
Meyer	14	17	31

*For each year, the "total" amount represents the maximum possible times a progeny could have been in the statistical top group. For example, in 2016, if a progeny were in the top group for all parameters on all rating dates in all locations, it would have received a score of 54. Scores were calculated based on ratings across all locations.

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