TURFGRASS RESEARCH
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Development of Cold Hardy, Large Patch Resistant Zoysiagrass Cultivars for the Transition Zone

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Summary. A *Z. japonica* genotype TAES 5645 which exhibited resistance to large patch in preliminary studies conducted by our collaborators at Texas A&M University was used as a breeding parent there and crossed with 22 cold hardy zoysiagrasses, resulting in 985 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. This report focuses on the Manhattan, KS, results. 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%). The top-performing zoysiagrass progeny had little or no large patch present. Among this group of experimental zoysiagrasses, there appear to be promising progeny that have good winter hardiness, resistance to large patch, and improved turf quality characteristics but data collection is ongoing. Kansas data will be combined with data from other sites.

Rationale. Cold hardiness is the trait that helps 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 which could reduce fungicide requirements and maintenance costs are desired in the transition zone.

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

Study Description. In June 2015, 60 experimental progeny, previously screened from 985 entries for their quality and cold hardiness, were received from our turf breeder collaborators at Texas A&M University and planted in Manhattan, KS. One parent of each of the progeny (TAES 5645) has previously shown resistance to large patch infection in growth chamber experiments at Texas A&M University. The experimental progeny, plus controls, were laid out in a randomized complete block design with 6 by 6 ft plots in three replications. The plots were maintained under golf course fairway/tee conditions starting in summer 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. This report will focus on the Kansas results. In 2015, vigor was rated on a 1-9 scale, with 9 equaling maximum vigor. In May 2016, spring green up was rated on a 1-9 scale, with 9 being completely green. 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 on the other half of the plot on September 19; a similar inoculation was done in West Lafayette, IN, and Fayetteville, AR. At the other sites, disease will be assessed via visual rating if it naturally occurs in spring and fall.

Results. This report focuses on the results in Kansas. From 2015 to 2016, progeny showed a wide range of variability in turf quality characteristics including winter injury, spring green up (Figure 1), establishment rate, genetic color, leaf texture, turfgrass quality, and fall color. In fall 2016, Meyer (42% of plot area affected) had more large patch than all zoysiagrass progeny (0 to 23%) (Table 1 and Figure 2). The top performing zoysiagrass progeny had little or no large patch present. Among this group of experimental zoysiagrasses, there appear to be promising progeny that have good winter hardiness, resistance to large patch, and improved turf quality characteristics, but data collection is ongoing. Kansas data will be combined with data from other sites.

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Table 1. Large patch infestation in top-performing zoysiagrass progeny and standard cultivars in November 2016 in Manhattan, KS

Entry	Large patch (%)[†]
6099-447	0.0
6095-101	0.0
6101-26	0.0
6104-150	0.0
6099-359	0.0
6100-146	0.0
6102-62	0.3
Zorro	6.7
El Toro	1.7
Zeon	7.3
Chisholm	1.3
Meyer	41.7
LSD	15.8[‡]

[†]Large patch was rated as a percentage of the plot area affected on a 0 to 100% scale; n = 3.

[‡]To determine statistical differences among entries, subtract one entry's mean from another entry's mean. Statistical differences occur when this value is larger than the corresponding least significant difference (LSD) value ($P < 0.05$).

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Figure 1. Progeny showed a wide range of variability in spring green up on April 26, 2017, in Manhattan, KS.

Figure 2. Large patch symptoms in Meyer zoysiagrass (left) compared to an experimental progeny in November 2016 after inoculating in September in Manhattan, KS.

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