Development of Large Patch Resistant and Cold Hardy Zoysiagrass Cultivars for the Transition Zone

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Objectives:

1. *Phase I (year 1): Perform pair wise crossing between Large Patch Resistance (LPR) experimental hybrids and germplasm accessions with cold hardy zoysiagrass parental lines (´Meyer´ and Meyer derivatives) in year 1 of the project.*
2. *Phase II (year 2 and 3) of the evaluation process will focus on field testing in the form of non–replicated spaced plant nurseries comprised of the newly generated progeny population that will be conducted concurrently at Manhattan, KS, West Lafayette, IN, and Dallas, TX. The objective of Phase II field testing is the selection of experimental lines that have comparable/superior cold tol–erance to Meyer as well as improved turfgrass quality.*
3. *Phase III (year 4–6) of the evaluation process will be in the form of replicated field trials where extensive testing will be performed on the selected entries in the field (Dallas, Manhattan, West Lafayette, and five other locations in the transition zone), as well as a disease nursery in which plots will be inoculated with Rhizoctonia solani (AG 2–2 LP) (Manhattan). This same set of advanced materials will undergo additional testing controlled environment testing to screen for LPR (KSU) and cold tolerance (KSU and Purdue).*

Zoysiagrass is a warm season grass species that provides an excellent playing surface for the sport of golfing with the added benefits of low nutrient and pesticide requirements making it an ideal turfgrass species for use in transition zone (Fry et al., 2008). ´Meyer´ (*Z. japonica*) has been the cultivar of choice since its release in 1951 (Grau and Radko, 1951), in part because it has excellent freezing tolerance. However, Meyer is relatively slow to spread and recover from divots, and is more coarse textured and less dense than *Z. matrella* cultivars (Fry and Dernoeden, 1987; Patton, 2009).

Researchers at Texas AgriLife Research–Dallas and Kansas State University have worked together since 2004 to develop and evaluate zoysiagrasses with higher quality than Meyer with adaptation to the transition zone. From this work, a number of advanced lines derived from paired crosses between *Z. matrella* and *Z. japonica*, have been identified with a level of hardiness equivalent to Meyer (Okeyo et al., 2011), but with finer texture and better density than Meyer.

Large patch disease, caused by *Rhizoctonia solani* (AG 2–2 LP), continues to be the primary pest problem on Meyer zoysiagrass fairways and tees in the transition zone (Kennelly, 2009). Most golf course superintendents apply two applications of fungicide annually to limit damage from large patch. The best fungicides for suppressing this disease cost ~$350/Acre. A course with 30 acres would then need to budget $21,000 annually to treat this disease alone. Incorporating large patch resistance, along with cold

Figure 1. Some of the 2500 seedlings from paired crosses of *Zoysia matrella* and *Z. japonica*. The progeny will have cold–tolerance similar to ´Meyer´ zoysiagrass, as well as the finer texture and better density than Meyer.

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hardiness and improved quality, into new transition zone zoysiagrasses would reduce fungicide requirements, increase sustainability, and reduce maintenance costs.

We are partnering with Dr. Jack Fry, Turfgrass Scientist with Kansas State University, Dr Aaron Patton, Extension Turfgrass Specialist with Purdue University and Dr. Megan Kennelly, Plant Pathologist with Kansas State University. These folks have extensive experience with testing turfgrasses adapted to the transition zone for cold hardiness and disease susceptibility.

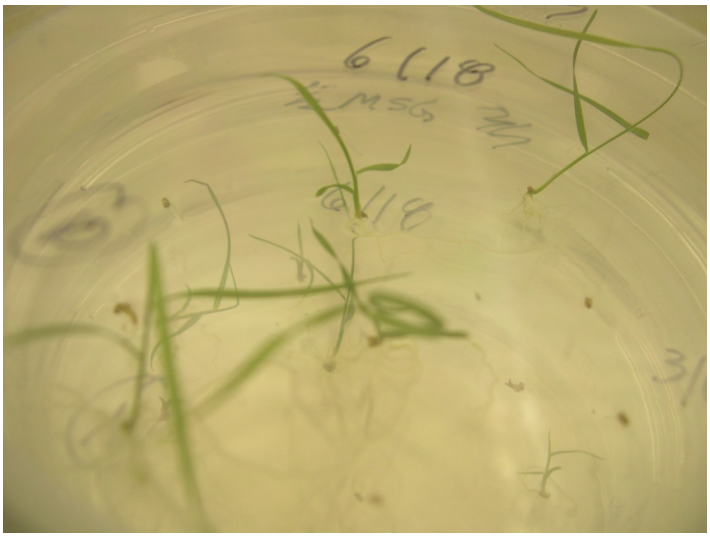
2500 Progeny were produced and distributed to our collaborators across three locations: 867 to Kansas State, 844 Purdue and 840 Dallas Center (Phase I completed).

Phase II was begun when three Spaced Plant Nurseries were planted this past summer: (1) West Lafayette, IN by Aaron Patton, (2) Manhattan, KS by Jack Fry and (3) Dallas, TX by A.D. Genovesi and Ambika Chandra

The plan of work for 2013 is to allow the spaced plant nursery to grow in for two years while taking timely notes before make selections in 2014. Advanced lines will be tested at eight locations in 2014, 2015 and 2016.

Figure 2. Field planting of promising progeny for cold–tolerant, fine textured zoysiagrasses. The progeny also will be tested for resistance to large patch.

Figure 3. Seedlings were germinated under sterile conditions in petri dishes. More than two thousand progeny were established for testing in Texas, Kansas, and Indiana.



Summary Points

- Phase I (year 1 completed): Pairwise crosses were made between large patch resistant germplasm and cold hardy zoysiagrasses adapted to the transition zone resulting in the production of 2500 progeny for further testing.
- Phase II (year 2 and 3 begun): Spaced Plant Nurseries were planted at three locations: 867 progeny at Manhattan, KS, 844 progeny at West Lafayette, IN, and 840 progeny at Dallas TX.
- The objective of Phase II field testing is the selection of experimental lines that have comparable/superior cold tolerance to Meyer as well as improved turfgrass quality. Attention will be paid to select for entries that exhibit no visible symptoms of large patch as a result of the natural incidence of the disease.

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