‘Emerald’ Zoysiagrass: Biotech techniques explain common observations

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‘Emerald’ zoysiagrass is a selection from the cross between *Zoysia japonica* and *Z. tenuifolia*. This selection combines the fine leaf texture of *Z. tenuifolia* with the cold tolerance and rate of growth of *Z. japonica*. ‘Meyer’ zoysiagrass is an example of a *Z. japonica* and, therefore, should have some genetic link to ‘Emerald’. It was released in 1955 as a joint effort between the USDA and the Georgia Experiment Station. ‘Emerald’ is a desirable lawn grass species in the Southeastern U. S. for its dark green color and fine leaf texture. According to one source, ‘Emerald’ will produce viable seed but is expensive and does not reproduce true-to-type. These are the likely reasons that ‘Emerald’ seed are not commercially available.

For the spring transitions of the years 2001 - 2005, homeowners and landscapers were frustrated with inconsistent green-up patterns of ‘Emerald’ zoysiagrass, especially in landscapes that have older established stands which have been amended with newer plantings of ‘Emerald’. Older areas within the lawns that were established to ‘Emerald’ transition sooner in the spring than some newer established areas. Observed time differences between transitions have been as much as 1- to 1.5-months between the green-up of the “early” and “late” grasses. This differential green-up is likely longer during spring weather conditions where cool temperatures and cloudy conditions persist, similar to spring 2005. The result is a patchy lawn and dissatisfied homeowners. By early summer, environmental conditions become favorable for warm-season turfgrass growth and it is difficult to see differences in these mixed lawns. This phenomenon has been observed in Atlanta, Augusta, and Birmingham, and Tuscaloosa, Alabama. This obviously begs the question, what is going on in these lawns?

The first year or two after planting the differences in green-up are usually attributed to either environmental, cultural, pests, or fertility factors. But because this phenomenon occurs year after year, it has become evident the difference in spring transition is due to something other than typical management practices. The issue then becomes whether the homeowner actually planted 'Emerald', either initially or subsequently. Adding to the complexity, it generally takes homeowners several years to detect the anomaly within their lawns which also gives them time to forget the source (either landscaper or retail outlet) of the plant material. By collecting samples from both "early" and "late" transitioning 'Emerald' zoysiagrass lawns, the characteristics and genetic makeup of these grasses could be observed and studied. Furthermore, by collecting samples from known sources of 'Emerald' and from retail outlets, grass sources that most closely resemble the older stands could be identified.

From 2002 to 2005, sixteen zoysiagrass samples in Georgia and Alabama were collected from different lawns, retail outlets, sod fields, and registered planting blocks. These grasses were allowed to grow in the greenhouse for observation of general characteristics and to supply plant material for DNA fingerprinting. The amplified fragment length polymorphism (AFLP) and polymerase chain reaction (PCR) techniques were used to determine the genetic diversity of the zoysiagrasses.

Genetic similarity between samples is shown in Figure 1 with genetic difference being the calculated by subtracting the similarity from 1.0. For example, grasses in clade 1 are 68% similar to grasses in clade 2, or 32% genetically different. This is considered significant enough to conclude these grasses are only distantly related.

The zoysiagrass samples could be grouped into two major groups or clades and one outlier (C14). Refer to Table 1 for collection location and observed green-up characteristics. Clade 1

and clade 2 were approximately 32% genetically different. The one outlier was most similar to clade 2 but 31% different. Interestingly, the "early" transitioning 'Emerald' zoysiagrasses were all within clade 1 while the "late" transitioning grasses were in clade 2. Because *Z. japonica* is a parent of 'Emerald', the sampled 'Meyer' zoysiagrass fell into clade 1 as would be expected.

Within clade 2, four of the five zoysiagrasses were from home lawns (C3, C4, C 10, and C11) and one was from a retailer (C6). Sample C11 was collected from a home lawn and the homeowner knew where it had been purchased, the same source as C6. These laboratory results and field observations suggest introducing a new planting of 'Emerald' into an existing stand can be risky when turfgrass uniformity is desired. Finding a source of 'Emerald' most similar to the standards is important, and from this screening, grass from the sod field where C1 was collected could be trusted. Also, any field planted from the registered plots (C15) could be trusted.

By using DNA fingerprinting techniques we were able to establish that genetic difference between 'Emerald' zoysiagrasses exists in the landscape and differences in observable characteristics could, therefore, be attributed to genetic differences. This work confirms that some turfgrass is being labeled, probably unintentionally, and sold to the consumer as 'Emerald' zoysiagrass, although the genetic link to all known 'Emerald' zoysiagrasses is distant (C6). Other retailers are carrying 'Emerald' (C5). Hence, educating the professional landscaper and retailer and then, identifying production fields with 'Emerald' may protect the consumer from having grass cultivar related variation within the landscape.

Specifying and planting certified turfgrass is one method of avoiding introducing a dissimilar 'Emerald' into an older 'Emerald' stand. Whether the homeowner is using a landscape professional or their lawn is a "do-it-yourself" project, inaccurate labeling of grasses / products may result in unsatisfactory lawns and reflects poorly on the entire turfgrass industry. This is why

using certified turfgrasses is important. Other than some assurance of varietal purity, certified turfgrasses are inspected for presence of noxious weeds and other grass varieties. As the turfgrass industry grows and new turfgrasses from other states or the world enter the market, assuring varietal purity through certification will become even more important.

Table 1. Key of suspected 'Emerald' zoysiagrasses and their spring green-up characteristics.

Gel Code	Collection Location	Green-up Characteristics
C1	Registered Sod Field	early
C2	Unknown 'Emerald' – sod field	early
C3	Unknown 'Emerald' – home lawn	late
C4	Unknown 'Emerald' – home lawn	late
C5	Unknown 'Emerald' – home lawn / retail	early
C6	'Emerald' – Retail	unknown
C7	BK-7 – Retail	unknown
C8	Meyer – Retail	unknown
C9	Unknown 'Emerald' – home lawn	early
C10	Unknown 'Emerald' – home lawn	late
C11	Unknown 'Emerald' – home lawn / retail	late
C12	Unknown 'Emerald' – home lawn	early
C13	Unknown 'Emerald' – home lawn	early
C14	Unknown 'Emerald' – home lawn	late
C15	Registered plots (GCIA)	early
C16	Known 'Emerald' - NTEP	early

Figure 1. Phylogenetic tree.