What Role for Turf Blends and Mixtures?

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One of the approaches often touted to reduce impact of disease problems is to provide some form of genetic diversity in what we plant. This doesn't denigrate the use of resistant varieties whenever we can. Rather, it is intended to reinforce it—to supplement it in whatever way we can—either to deal with problems we already know about, or to avoid setting ourselves up for future pitfalls down the road.

It's a strategy that makes sense. Certainly there are examples all around in the plant world where narrow genetic bases have set the stage for a previously unforeseen malady to emerge ferociously. The most classic example is the southern corn leaf blight epidemic of two decades ago. It took about 15 years following the conversion of virtually every corn field (other than sweet corn) to "Texas male sterile cytoplasm"—so that seed producers wouldn't have to detassel corn and ride herd over teenagers with other interests—for the fungus to build up its inoculum and for the epidemic to explode. Oat producers had a similar experience with "Victoria blight" in the 50's when a single gene for rust resistance was introduced into most varieties. Within two years after its widespread introduction, an indigenous soil-borne fungus that had never caused anybody a problem before suddenly found a crop to its liking. The turf story we know about is 'Toronto,' or C-15 bentgrass, and the bacterial blight disease that singularly attacked it. The latter problem was aided and abetted by the fact that C-15 was vegetatively propagated. Once in the nursery stock, of course, it was an easy task for a vascular pathogen like the bacterium to move about. Then all that was needed was some local spread and the right environment for destruction.

So the idea of diversifying the genetic base with blends of different varieties, or better yet, with mixtures of different species, has some appeal.

And we see sod producers now doing this with their Kentucky bluegrass blends, and occasionally with ryegrass mixtures. You can do the same thing with your fairways and roughs where appropriate, and maybe you're doing some of it.

But with a perennial (permanent) crop like turf, we have other considerations. This is especially true when we're dealing with amenity turf, because you have to put something out there that provides sufficient commonality of color, growth rate, dormancy, and other characteristics so that you don't produce an uneven, unattractive, or poor playing surface. And we don't really know what percentages or what combinations are needed.

About four years ago we initiated a growth room and greenhouse study that involved permutated blends (0, 10, 20, 40, 60, 80, and 100%) of two bluegrasses differing in susceptibility to "Helminthosporium" disease, e.g., 'Park' ("susceptible") and 'Adelphi' ("resistant"). We also mixed each of these similarly with 'Repell' perennial ryegrass, which is considered virtually immune to the two species used for these studies. For the sake of discussion, I'll burden you with the results of one trial which really serves to illustrate the overall results:

Table 1: *Effect of **Drechslera poae** and **Bipolaris sorokiniana** inoculations upon permeated Turfgrass blends of 'Park' and 'Adelphi' Kentucky bluegrass and in mixtures with 'Repell' Perennial ryegrass*

	Drechslera poae		Bipolaris sorokiniana	
Permutation/Combination	lesions*	total symptoms**	lesions*	total symptoms**
100% Park	2.8	4.3	2.5	3.4
90% Park, 10% Adelphi	2.5	4.0	2.5	3.6
80% Park, 20% Adelphi	2.1	3.1	2.0	3.1
60% Park, 40% Adelphi	2.9	4.3	2.0	4.3
40% Park, 60% Adelphi	2.8	3.9	1.4	3.9
20% Park, 80% Adelphi	2.0	3.3	1.0	3.8
10% Park, 90% Adelphi	2.5	3.0	1.5	3.3
100% Adelphi	2.0	3.0	1.0	3.5
100% Repell	0	0	0.2	0.3
90% Repell, 10% Park	0.5	0.5	0.2	0.6
80% Repell, 20% Park	0.5	0.6	0.2	0.4
60% Repell, 40% Park	0.9	1.6	0.5	1.0
40% Repell, 60% Park	2.0	2.3	0.5	0.8
20% Repell, 80% Park	2.1	2.8	0.8	1.3
10% Repell, 90% Park	1.4	1.8	1.9	2.3
100% Park	2.8	4.3	2.5	3.4
100% Repell	0	0	0.2	0.3
90% Repell, 10% Adelphi	0.2	0.4	0.2	0.4
80% Repell, 20% Adelphi	0.2	0.6	0.9	1.3
60% Repell, 40% Adelphi	1.0	1.9	1.0	1.9
40% Repell, 60% Adelphi	1.0	1.5	1.1	3.3
20% Repell, 80% Adelphi	1.3	1.3	0.5	2.8
10% Repell, 90% Adelphi	1.0	1.3	1.0	3.3
100% Adelphi	2.0	3.0	1.0	3.5
lsd (P = 0.05)	0.2	0.5	0.2	0.5

* Lesion rating: 0 = none; 1 = few; 2 = moderate; 3 = heavy
** Total symptom rating: 0 = none; 1 = trace of infection; 2 = estimated 1/4 of host tissue diseased; 3 = 1/2 of host tissue diseased; 4 = 3/4 of host tissue diseased; 5 = entire host tissue diseased.

So what is the interpretation of these results? There are several: (1) The bluegrass (alone) blends were okay in reducing leaf lesions caused by *Bipolaris* when 60% or more of the blend contained 'Adelphi.' But it didn't work so well with the more aggressive *Drechslera* fungus, and when crown

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effects with either pathogen became noticeable, no percentage helped. That probably occurred because in the greenhouse the resistance we see in the field doesn't come through; (2) By contrast, mixtures containing 60% or more ryegrass did a fine job on both foliar and crown symptoms, e.g., the genetic diversity was sufficiently great to do the job.

So the greater the diversity, the better off we're likely to be. Combinations with narrower bases probably are useful in many settings. I'd like to see a similar trial conducted in the field with more realistic conditions. In fact, that's what we intended when we started this study—we had fantasized that the O.J. Noer Turf Research Facility would be available a couple years before it occurred!

Blends and combinations are easier to establish when planting. But what about "drift," or shifts in percentages, that may occur a few years after planting? And how do we establish or re-establish satisfactory combinations via overseeding or other means in existing stands—especially if such a thing as "allelopathy" or related factors interfere? Good questions that should be the subject of more discussion—and research —for another day.

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