

Do Blends Provide Better Disease Resistance?

Imagine Kentucky bluegrass varieties 50 years ago. The variety 'Merion' was really the only one sold as seed that was available at the time. Today, consider the National Turfgrass Evaluation Program that includes 173 Kentucky bluegrass varieties measured over 31 locations across the United States. What a marvelous opportunity we have as turfgrass managers to select the most suitable grasses specific to our unique needs. In addition, we are learning more and more about turfgrass genetics and physiology to build better grasses. We have come a long way since then.

Over the past several years, we have been studying the true nature of blends of Kentucky bluegrass. The results we have found may surprise you. This research brings to question our reasons and theories regarding the use of blends and their potential application for the future.

Let us begin with a few simple questions.

1) How many turfgrass managers use blends of Kentucky bluegrass? Why do we use blends?

Actually, it is unlikely that many use monocultures of KBG. Almost all use blends. Blends are supposed to provide plasticity so a turf can withstand both biotic and abiotic environmental stresses. Because Kentucky bluegrass is apomictic, that is, it forms seed without fertilization, plants are virtually clones of one another, making them highly genetically uniform. Therefore, we use blends to encourage greater genetic diversity. The most important reason for blending has been for disease resistance. The general idea is to include a complement of varieties that encompass the diseases endemic to our areas. This is the old *don't put all your eggs in one basket* approach.

2) How many use blends of creeping bentgrass? Is this a good idea?

Few golf course superintendents, if any, use blends of bentgrass

(continued on page 18)



A scene from the University of Illinois Turfgrass Research Farm.

on their greens and fairways. But why not? Your first response may be: How are we going to manage a bentgrass blend? It is hard enough to learn about a single variety and then manage it properly over all the different environments that are present on a golf course. So, why not apply the same reasoning to Kentucky bluegrass? The diversity of Kentucky bluegrass is getting broader, especially for characteristics like color, texture, disease resistance and aggressiveness. Most of our reasons probably come back to the adage: *but we've always done it that way*. We have advanced too far in our technical knowledge to leave it there.

Let us review some of the results from our previous studies:

All seed is not created equally. Depending on the genetics of a variety, pollination efficiency, seed set and

storage conditions, there are inherent differences in seed before it ever leaves the bag. Some seed will not be viable, and this may be different between seed lots. Some years simply yield better than others.

Like the Sooners of Oklahoma, whoever gets there first—WINS. Seed of some varieties will germinate and grow faster than others. Once a plant gets a stronghold, it is difficult to compete with it. The same is true with overseeding. It is futile for a new little seed to compete with a plant that has an extensive root system, crown and rhizome carbohydrate stores, and vast aboveground photosynthetic mechanisms.

Over time, the most aggressive variety will continue to fill space until an equilibrium is reached. For example, once the most aggressive variety reaches a certain

Seed of some varieties will germinate and grow faster than others. Once a plant gets a stronghold, it is difficult to compete with it.

percentage, maybe 60 or 70% of the blend, it will remain at that percentage unless drastically disturbed.

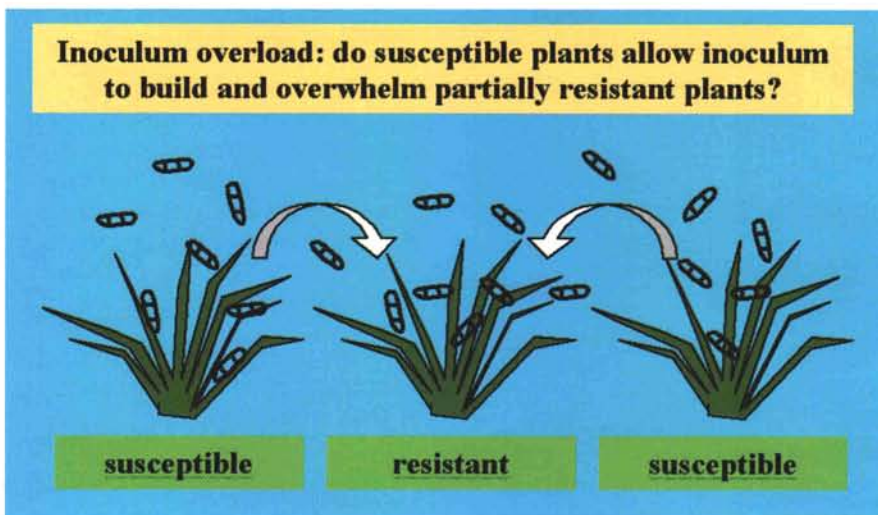
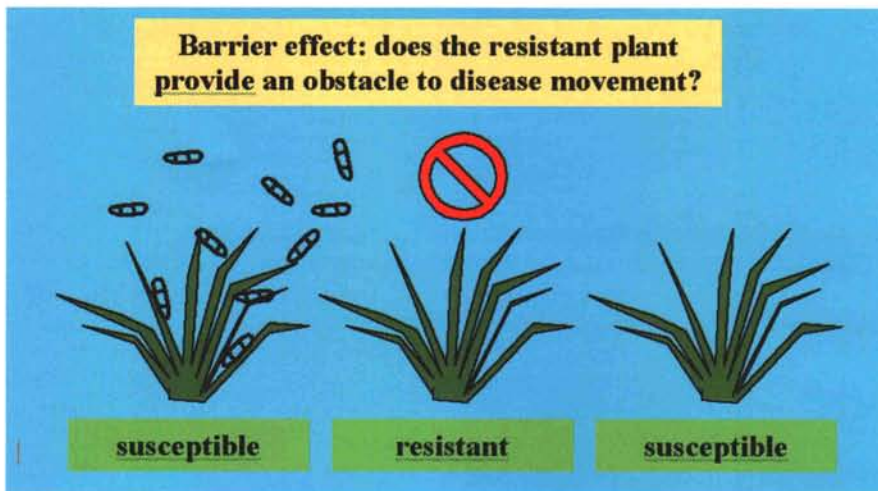
The bottom line: Why plant the weaker variety in the first place if it doesn't remain there to the end? This completely undermines the theory of blending where the diversity that is intended cannot possibly live up to its full potential.

How Diseases Affect Blends

At the University of Illinois, we are currently studying the effects of several diseases on Kentucky bluegrass blends. Our studies include *Bipolaris* leaf spot, powdery mildew, pink snow mold, *Drechslera* leaf spot, *Pythium* blight and leaf rusts. The reason we are studying so many diseases is to not make assumptions that all diseases are alike. Each disease has specific mechanisms for attacking plants. In turn, each plant has specific ways to provide resistance. The epidemiology, or process by which diseases are spread, is highly variable among diseases. For instance, the dollar spot fungus spreads by mycelial threadlike structures that move short distances leaf-to-leaf and longer distances by mechanical or foot traffic. On the other hand, most leaf spots move by conidia that are spread by wind, splashing rain and traffic.

Our current research identifying the effects of *Bipolaris* leaf spot on

(continued on page 20)



blends of Kentucky bluegrass shows a linear or *additive effect*. That is, adding more of the resistant variety gives a corresponding level of disease resistance. No more or no less. **The bottom line:** for this particular disease, if you include 30% of a resistant variety in a blend, you get 30% resistance. The other 70%, if susceptible, will get disease.

Our research on powdery mildew was a bit more variable. However, we can hypothesize that with more disease pressure, powdery mildew would affect blends in more of an *inoculum overload* manner. **The bottom line:** if you add susceptible varieties to a blend, they will undermine the resistant varieties that are included.

This illustrates why the only acceptable blend is one in which the *barrier effect* is actively protecting plants. This means that when a susceptible plant gets infected, the surrounding resistant plants will impede the spread of disease. For most turfgrass diseases, this is not realistic. Turfgrass plants are crowded too close together. Frequent mowing, cart and foot traffic, daily irrigation and wind movement completely undermine resistant barriers to disease progress. It is more likely that both the additive and inoculum overload concepts are present. **The bottom line:** if you include a resistant variety at 30% of the blend, then you'll get either 30% resistance or less. So, for disease resistance, blends are simply not an effective means for minimizing disease.

We have so many varieties to choose from and plenty of resources to help us select the best varieties. If you look at most trials, few actually evaluate blends of grasses. Instead, they are planted as monocultures and then we piece together (by supposition) what varieties we should include in a blend. We've come a long way since 'Merion' and the other old standbys. If you are looking for a quality stand of grass, just like what is expected with a monoculture of creeping bentgrass, why not choose the best single variety of Kentucky bluegrass for your purposes.

There are some great varieties of Kentucky bluegrass on the market right now with many choices that fit your specific locations and needs. If you decide to choose a monoculture, there are many resources at your disposal:

- The proof is in the pudding: Look at your neighbor's grass. Ask how it is managed; ask what problems they've had; look at its quality; and ask the name of the variety.
- Take a look at university or other demonstration and research plots. You can see firsthand how varieties perform in your area.
- Use regional and national trials like the National Turfgrass Evaluation Program (www.ntep.org). You can ask for a specific analysis that factors in the regions closest to your conditions. Never expect a grass that is rated high nationally to perform as

This illustrates why the only acceptable blend is one in which the barrier effect is actively protecting plants. This means that when a susceptible plant gets infected, the surrounding resistant plants will impede the spread of disease. For most turfgrass diseases, this is not realistic.

well in your location. I hope to never hear anyone say, "I want a blend of the top five nationally."

- Ask your local extension person or turfgrass specialist to recommend a variety specific to your needs. You may actually need to find different grasses for each situation.

In relation to diseases in particular, be sure to concentrate on diseases that are common to your area. If you don't commonly see copper spot or bacterial wilt, don't worry about those diseases. Concentrate on diseases like summer patch, brown patch and leaf spots that are endemic to your area. If the grass is deficient in one particular disease, make sure it is an easy one to control. For instance, you wouldn't want a variety that is susceptible to Pythium blight. Not only can it be costly to control, the disease can have devastating effects. Diseases like leaf rust are easy to control on mowed turfgrass and usually don't kill the plants. If this is the only weakness in your variety, your job as a turf manager will be that much easier.

