SEEDS FOR SITES

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Never before in the history of turfgrass management, have so many choices of excellent grass cultivars been available. Over the past decade, enormous strides in breeding and development have been accomplished in tall fescue, perennial ryegrass, and other species. Turfgrasses today are head and shoulders above cultivars available only a few short years ago. Furthermore, with several long-term breeding programs about to bear fruit, the next few years will bring a host of superior Kentucky bluegrasses and fine fescues to the marketplace.

Trouble is, there are now so many turf varieties available that it's tough to know which to choose.

A good -- but not flawless -- way to choose the best variety is to select only newer varieties. Logic goes that if a variety has been recently released, it is probably superior to those it preceded.

The reasoning behind this logic is not perfect, because new turf varieties are being released by many different turf breeders, one or two of whom might be considered ethically challenged. Thus, not every new variety that hits the marketplace is a true advance. Some are actually a throw-back to earlier years.

This article encompasses several diverse issues in selecting the right turf variety for your site -- issues that extend from bluegrass and fine fescue classification, to turfgrass endophytes, to what frontiers remain in understanding turf species and their use.

CLASSIFYING THE KENTUCKY BLUEGRASSES

When you look at as many plots of Kentucky bluegrass as Rutger's breeder, Reed Funk does in the course of a year, you can't help but notice patterns. Funk is the father to the vast majority of bluegrass varieties presently on the market. Many of today's popular bluegrasses trace back to a plant he found growing on a golf course fairway, or a hybrid cross he made 20 years ago.

Over the years, Funk began noticing that the bluegrasses in the tens of thousands of turf plots at his New Jersey test site, fell into distinct patterns of performance. Some bluegrasses greened up early in the spring, while others took their good, sweet time. Some bluegrasses became stemmy during flowering season, others didn't. After years of observation, Funk and his colleagues classified bluegrasses into seven, distinct groups, based on their performance characteristics.

At first this may sound like a technique applicable only to scientists. But Funk's classification system has strong implications to practical varietal selection.

In the past, turf managers selected varieties somewhat arbitrarily. Depending on who you talked to, the best way to select compatible varieties varied. One philosophy was to pick varieties with the same leaf color. The reasoning was that if segregation occurred after planting, no one variety would "stick out" in off-color clumps.

Another line of reasoning was to choose varieties with similar aggressiveness. The idea was that if you combine a strong variety and a weak one, that the weak one would eventually vanish from the stand, nullifying the benefits of the blend.

Funk's classification system is based on performance. Does it make sense to mix together two varieties that perform exactly the same?

The main idea of mixing grasses is to extend their adaptation. Combining grasses with identical performance spectra would do little to broaden their adaptability.

Funk recommends combining 3 to 4 bluegrasses, each from a different performance group. That way, the broadest range of adaptation is attained.

Listed below are Funk's seven groupings of bluegrasses. Several example varieties are provided within each group.

Group: Aggressive types
Characteristics: High shoot density; spread into neighboring plots; tend to dominate mixtures and blends
Examples: BenSun, Limousine, Princeton 104, Touchdown

Group: Bellevue types
Characteristics: Medium good turf characteristics; excellent winter color with little or no purpling or browning
Examples: Banff, Classic, Georgetown, Trenton

Group: BVMG types (Baron types)
Characteristics: Medium good turf characteristics with excellent seed yield potential; some susceptibility to stripe smut
Examples: Baron, Kelly, Merit, Gnome

Group: Mid-Atlantic ecotypes
Characteristics: Medium-high density; deep, extensive rhizome system; excellent summer stress tolerance
Examples: Huntsville, Preakness, SR 2000, Wabash

Group: Midwest ecotypes
Characteristics: Erect growth habit; narrow leaves; early seed harvest; susceptible to leaf spot
Examples: Kenblue, Ginger, S-21, South Dakota certified

Group: North latitude compact types
Characteristics: Low compact growth habit; excellent leaf spot resistance; late greenup in spring
Examples: Able I, Apex, Blacksburg, Midnight

Group: Other types
Characteristics: These varieties defy classification; they possess characteristics of two or more groups
Examples: Aspen, Challenger, NuStar, Ram I

What we don't know about Kentucky bluegrass varieties, if you were to tally all the research man hours involved nationwide in evaluating Kentucky bluegrass varieties for their suitability as turf, the figure would be staggering. In spite of this immense scientific effort, there are some glaring holes in our knowledge. Newcomers to turfgrass management tend to stumble on these research shortcomings first, by asking what appears to be a "simple question."

Much of our ignorance stems from the fact that research plot trials are generally conducted for a maximum of five years. The entire National Turfgrass Evaluation Program is on a 4 to 5 year turnover cycle -- old tests are plowed to make way for new ones. Certain attributes, such as aggressiveness, persistence, and tolerance to close mowing can only be evaluated in long term studies.

Another problem relates to practical research plot management. Most university turf plots are used for a myriad of purposes, such as recording data for extension publications, training students, and hosting annual turf field days. From a practical standpoint, it would be counterproductive to maintain a set of plots that was half dead or full of weeds. Trouble is, many of the important selection traits -- such as how low can you mow bluegrass and still have it survive? -- would leave a set of plots devastated for other purposes.

Listed below are some of the areas we know little about in regard to varietal performance.

Variety trait	Reasons why we know little about it
Aggressiveness	Aggressiveness of a variety is actually a combination of several

characteristics, most notably shoot density and spreading ability. It is approximated by rating "turf density." Aggressively spreading varieties begin creeping into neighboring plots as a plot test matures after 5 to 8 years. By this time, however, the trial is usually terminated and the aggressiveness data never recorded.

Patch diseases

It's only been within the past few years that plant pathologists have agreed on the identification of the patch diseases and devised effective means for inoculating them. Fungal races (natural variation among fungi of the same species) tend to confound research results, making one pathologist's findings appear to conflict with another's.

Salt tolerance

Although salty soils are prevalent in many areas of the country, there are no ongoing variety trials to evaluate salt tolerance. Some researchers have attempted to assess salt tolerance in the greenhouse, but the application of greenhouse data to real world situations is questionable. In field testing, practical considerations limit research. Applying a topdressing of salt to a field study effectively renders the soil useless for other purposes, and makes the researcher generally unpopular with other users of the site. The underwhelming conclusions from the few successful salt-tolerance studies have been that attractive varieties under no-salt conditions also tend to be the attractive varieties under salty conditions.

Wear tolerance

The Europeans with their rugby and soccer fields put much greater emphasis on wear tolerance than we Americans. For a turf variety to be sold in Europe, it has to pass grueling wear tolerance tests. Not so in America. However, wear machines (an offset drum-type turf torture device for research plots), once unheard of in this country, are now starting to make inroads. Perhaps some day we'll have reliable wear data as a routine part of turf variety testing.

Winterhardiness

Occasionally you might see winter-hardiness or winter injury data recorded for warm-season grass trials but rarely for the cool-season grasses. That's because it is fairly uncommon for cool-season grasses to uniformly winterkill in the United States. If winterkill does occur, it's usually blotchy in appearance and useless to the evaluating scientist. Moreover, a half-dead trial from winterkill is quite an embarrassment to the researcher, since the dead areas quickly regrow to weeds, and the trial is usually given up for lost.

CHOOSING THE RIGHT FINE FESCUE

Picking a good fine fescue variety for a turf planting is more difficult than just selecting a good variety. You have to pick the right species too!

Fine fescue has some distinct advantages in turf management:

Advantages

- Lower fertility requirement
- Superior shade tolerance
- Extremely winter hardy
- Good winter/spring growth and color
- Quick germination
- May contain endophyte
- Fine, delicate texture

Disadvantages

- Summer dormancy

- Do not persist on wet soils
- Light green color
- Generally intolerant of close mowing

Botanists recognize five basic species of fine fescue, all with differing performance levels. Species that do well in New England, for example, may do poorly in Michigan. This adds to the confusion of whether or not to plant fine fescue.

In the past, turf managers had the choice of just chewings or strong creeping red fescue. It wasn't until later that slender creeping, hard, and sheep fescue became available. Hard and sheep fescue finally won the recognition they deserved when all five species of fine fescue were entered in the National Turfgrass Evaluation Programs trial. In many midwestern environments, sheep and hard fescue varieties outperform chewing and creeping red, particularly under heat and drought conditions. Here is how researchers at Colorado State University classified the drought tolerance differences among the fine fescues:

Drought tolerance	*Incidence of drought*	*Species*
Excellent	Frequent, severe	Sheep
Good	Occasional, long term	Hard
Medium	Frequent, moderate	Chewing, Creeping
Poor	Infrequent, short duration	Slender

The five fine fescue species differ markedly in turf performance. Listed below are some defining characteristics of the five species and how they differ from one another:

Chewings fescue

- Bunch type
- Extensive tillering
- Excellent shade tolerance
- Lower fertility requirement
- Tolerant to low pH
- Improved density, disease resistance, seed yield
- Use in overseeding

Creeping red fescue

- Good uniformity and quality
- Larger seed, better seedling vigor
- Aggressive rhizome system
- Improved disease resistance
- Improved seed yield
- Some use in overseeding
- Best mixer

Slender creeping fescue

- Short, slender rhizomes
- Fine, dense, compact growth
- Resistant to heavy metals

Hard fescue

- Extensive root system
- Good shoot density
- Bunch grass
- Grey-green leaves
- Improved low growth, disease resistance
- Selected for low maintenance

Sheep fescue

- Ornamental blue appearance
- Very fine texture
- Tufted growth habit
- Bunch grass with some creeping ability
- Best when unmowed; may get patchy when mowed
- Very tolerant of low pH
- Varieties do not presently have an endophyte
- Subcategories: Blue fescue, fine-leaved sheep

ENDOPHYTES IN TURFGRASS VARIETIES

Endophytes are a special class of fungus that live their lives wholly within the body of a plant. The name "endophyte" can be broken into its two root parts: "endo," meaning inside, and "phyte," meaning plant.

Endophytes were first recognized about 10 years ago in New Zealand by pasture researchers working on a livestock disease known as Fescue Foot or Ryegrass Staggers. It had long been believed that something in tall fescue was contributing to this cattle disease, since cattle rapidly recover when removed from a fescue ration. Researchers discovered that a fungus known as Acremonium lives within the veins of infected plants.

The remarkable thing about endophytes is that they cause no apparent disease symptoms to the host. There is a mutually beneficial relationship between the grass plant and the fungus. The grass provides the fungus with nutrients and energy from its photosynthesis, and the fungus produces protection chemicals for the grass. These protection chemicals are toxic to grazing animals. But they're also toxic to grazing insects. Sod webworm, bluegrass billbug, Argentine stem weevil, Southern armyworm, and chinch bugs are killed when ingesting infected plants. The endophyte gives the grass biological insect control, without the need for commercial pesticides.

Among the turf species, only the ryegrasses and fescues contain an endophyte. And not all varieties are created equal. Some ryegrasses, for example, have 100% endophyte infection, while others have zero.

When selecting good turf varieties for your planting, choose varieties with enhanced endophyte levels. By incorporating a high endophyte grass into your mixture, your turf may require fewer applications of pesticides throughout its lifetime.

Listed below are questions I've been asked over the years about endophytes. The answers will help clear up misunderstandings about the role of endophytes in turfgrass management.

QUESTION: Do endophytes harm the grass plant?
ANSWER: In turf, research has found that endophytes cause no injury or disease to the stand. Certain species of endophytes are known to produce a seed production disease known as "choke," but this disease affects only seedheads and does not affect mowed turf.
QUESTION: Are the toxins in endophyte-infected grass poisonous to children or pets?
ANSWER: The level of toxins in endophyte-infected grass is so low that it is harmless to children and pets -- even to dogs and cats who occasionally graze. With livestock, a steady diet of infected grass is required to manifest symptoms. The symptoms leave as soon as the diet is changed. Walking barefooted on infected turf is harmless.
QUESTION: Do fungicides applied to the turf kill the endophyte?
ANSWER: Generally not. It takes regular, heavy doses of fungicide to diminish endophyte populations in turf. These regular fungicide applications occur only on golf course putting greens, and bentgrass -- the principal putting green grass -- doesn't contain an endophyte.
QUESTION: Can I inoculate my existing turf with endophyte?
ANSWER: There is no commercial method for inoculating existing turf with endophyte. This can only be done on a laboratory basis, plant by plant. Plant breeders will generally do this during the breeding of new varieties. The best way to impart the benefits of endophytes in existing turf is to overseed with endophyte-containing varieties. Eventually the endophyte varieties will dominate the existing turf through competition.
QUESTION: Do all turfgrasses contain endophyte?
ANSWER: No. Turf species and varieties vary widely in endophyte level. Kentucky bluegrass and creeping bentgrass never contain endophyte. Fescue and ryegrass may or may not contain it, depending upon variety.

For example, APM and Advent perennial ryegrass contain high levels of endophyte. Bonsai tall fescue contains no endophyte.

QUESTION: How should I handle my seed to ensure viable endophyte?

ANSWER: Endophytes are a living organism; care must be taken to ensure their viability when handling seed. Always buy fresh seed. Store seed for 9 to 12 months or less. If possible, store the seed under cool, dry conditions. If stored under 5 degrees C, endophyte will remain viable for 18 months.

QUESTION: Will I see the beneficial effects of endophyte on my turf right away?

ANSWER: Probably not. Endophytes can be thought of as an insurance policy. They protect the stand from future damage by insects. You will not notice the beneficial effects unless you have a side-by-side comparison with uninfected turf.

QUESTION: What are the best applications for grasses high in endophyte?

ANSWER: Logically, the best use of high endophyte grasses is on turf sites facing restricted use of pesticides. The natural pesticide in high endophyte grasses will decrease the need for commercial products. All turf, however, will benefit from the presence of endophyte, including golf courses, athletic fields, lawns, parks, highways, and cemeteries.