

# Turf Grass TRENDS



Issue #5

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## How to use National Turfgrass Evaluation Program results

by Kevin Morris, NTEP National Director

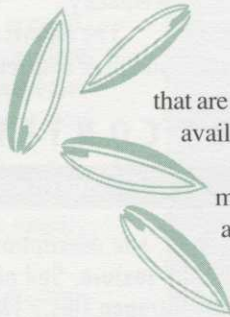
ONE OF THE MOST IMPORTANT decisions that turfgrass manager's must make is: which grass seed species and varieties to purchase and plant? A well-thought out and well-researched grass seed buying decision can dramatically improve the quality of a turf site, while reducing the time and expense of managing it. An ill-prepared buying decision can be a management disaster that haunts you, and those who follow you, for decades.

Unlike many decisions that a turfgrass manager must make, using incomplete and conflicting data, there is plenty of excellent, readily available hard information on which to base seed-buying decisions. The best source of this test data is the National Turfgrass Evaluation Program (NTEP).

### What is the National Turfgrass Evaluation Program?

NTEP IS A NON-PROFIT, cooperative effort between the U.S. Dept. of Agriculture's Beltsville Agricultural Research Center and the National Turfgrass Federation, Inc. Its goal is to coordinate and standardize the testing and evaluation of existing and promising new turfgrass varieties.

NTEP releases annual updates of the results of their ongoing evaluation programs for cool-season grasses: bluegrass, ryegrass, fine fescue, tall fescue, and bentgrass. These reports provide a wealth of information about many of the varieties of turfgrass



that are currently available and that may be available in the future.

The problem that confronts turf managers is that, unless you read the actual reports, the NTEP information seen in advertising is so heavily edited that it is difficult to decide whether one is buying a source of satisfaction or a source of trouble for years to come.

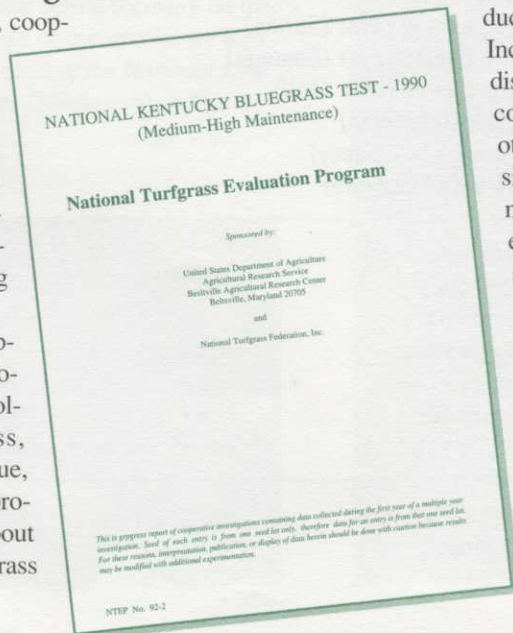
### How should turfgrass managers proceed?

THE INFORMATION THAT SEED-SELLERS do provide in advertising can be helpful in making a good seed buying decision, if you use that information as the first step in a process. Since the information is readily available, gather as much of it as you can on all the species and varieties that apply to your situation—and ones about which initially you have no interest. The broader and deeper the scope of information that you gather, the better. Make a list of seed-sellers and the species and varieties they offer. Also, keep in mind that, if no local seller is available, most seed-growers will sell direct.

Next, list the attributes that you want to introduce to the sites you manage.

Include color, leaf structure, disease and insect resistance, competitiveness and any other factor that may be desirable. Compare the information that you have gathered against this list of desirable attributes. Keep in mind, rarely will one variety have all of these attributes, so it may be necessary to use mixtures of two or more varieties or species—to obtain all of the characteristics that you need.

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## An overview of NTEP reports

**B**EFORE PLOWING INTO THE DATA provided by NTEP Progress Reports, turf managers should orient themselves to how the reports are generally organized.

This overview is based on the *National Kentucky Bluegrass Report-1990 (Medium-High Maintenance) 1991 Progress Report*. Reports on other species of turfgrass do vary somewhat, but all the reports are generally orga-

nized in the same way.

After briefly explaining NTEP, the reports list the locations that submitted data and the code used to refer to each location, for example "KY1" means site number 1 in Kentucky.

The reports also provide a list of the cultivar entries and their respective sponsors.

### NTEP REPORT CONTENTS

General subject	Table	Specific subjects
<b>Test locations and practices</b>	A	Test locations for the year, site descriptions and management practices used. <i>Catagories:</i> Location, Soil texture, Soil pH, Soil Phosphorous lbs./acre), Soil Potassium (lbs./acre), Nitrogen (lbs./1M ft. <sup>2</sup> ), Sun or shade, Mowing height (inches), Irrigation practiced
	B	Locations & data collected by month
<b>Quality ratings</b>	1	Mean quality ratings of Kentucky Bluegrass cultivars at 17 locations in the United States and Canada. Quality is ranked from one to nine with nine representing ideal turf. This table also indicates which cultivars are currently commercially available.
	2	Mean quality ratings for each month
	3	Ranking of mean quality ratings
<b>Visual characteristics</b>	4	Spring green-up ratings
	5	Genetic color ratings
	6	Leaf texture ratings
	7	Winter color ratings
<b>Field growth performance</b>	8	Seedling vigor ratings
	9	Spring density ratings
	10	Summer density ratings
	11	Fall density ratings
	12	Percent living ground cover (Spring)
	13	Percent living ground cover (Summer)
	14	Percent living ground cover (Fall)
	15	Drought tolerance (wilting)
	16	Drought tolerance (dormancy)
	17	Drought tolerance (recovery)
<b>Disease resistance</b>	18	Leaf Spot ratings
	19	Stem Rust ratings
	20	Dollar Spot ratings
	21	Pythium Blight ratings
	22	Leaf Rust ratings
	23	Stripe Rust ratings
	24	Necrotic Ring Spot ratings
<b>Miscellaneous</b>	25	Sod strength ratings
	26	Poa Annua ratings



## Narrow the field

AS YOU COMPARE your list of desirable attributes against the list of available grass seed, narrow the field down to two or three promising species—with a group of 5–10 varieties for each species. Deciding whether to use a mixture of two or more species or to use one or more varieties within a species depends on what your goals are for the sites you manage. For example:

- IF YOU ARE SEEDING INTO DORMANT TURF for winter color, then your choices are usually limited to ryegrasses.
- IF YOU ARE SEEDING A BARE SITE or renovating an older site, then choosing two or more varieties within a species is often the best course of action, assuming uniform growing conditions at the site.
- WHERE VARIABLE GROWING CONDITIONS exist, a mixture of two or more species is often the best approach. Frequently, the use of more than one properly selected variety or species will broaden the genetic base of a turf stand, and improve its ability to withstand differing environmental conditions.

## Acquire the current NTEP Progress Reports

ONCE YOU HAVE PARED DOWN your initial list of possible species and varieties, contact NTEP and request copies of the current test results for those species. When the reports arrive take some time to orient yourself to how the information is provided. In short, get a feel for the forest before focusing on the individual trees. For the sake of this article, we have used the *1991 Progress Report of the National Kentucky Bluegrass Test -1990 (Medium-High Maintenance)*.

— continued on page 4

## Obtaining NTEP Progress Reports

National Turfgrass Evaluation Program progress reports can be obtained by writing: Kevin Morris, National Director, National Turfgrass Evaluation Program, BARC-West, Bldg. 001, Room 333, Beltsville, Maryland 20705

## LSD: How big a difference is big enough?

**S**eed producers or sellers spend substantial sums of money trying to influence turf managers to buy their particular variety of grass seed. For the past eight years or so, quoting comparative research test data has been one of the most popular features of ads for turfgrass seed—even if the data only show that one variety is two or three tenths of a point better than competing varieties. Seed-producers that participate in NTEP are allowed to use the data produced by it in their advertising, but is two or three tenths of a point a big enough difference on which to base a buying decision?

When considering the NTEP data tables, there is a figure that needs special attention at the bottom of each numerical column—the LSD value. This LSD value, or least significant difference, is a tool for statistical analysis, which is used where one member of a group is compared to all the other members of that group. In the NTEP reports, it is used to determine if the difference in cultivars represented by the data is a real difference or just the illusion of one.

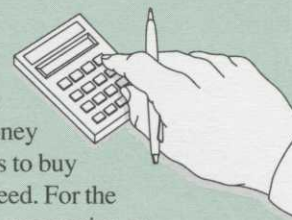
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**This LSD value, or least significant difference, is a tool for statistical analysis, which is used where one member of a group is compared to all the other members of that group.**

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When raw data, based on an “interpreted” standard, is produced by assigning a value to a characteristic, there is always a possibility of mistakes—especially since the assignment of perceived values is less precise than values that represent simple measurements. The LSD values for all of the tables are produced by a formula, and are given to clarify the margin of error created by this imprecision.

To determine if a statistically significant difference exists between two varieties, subtract the lesser value from the greater value and compare it to the LSD value. If the difference is greater than the LSD value, then the difference is significant—and indicates that the variety with the greater rating is a better variety. If the difference is less than the LSD value, then the difference is not significant—and falls within the realm of rating error. ■





## Format of NTEP "quality ratings" tables

TABLE 1

MEAN TURFGRASS QUALITY RATINGS OF KENTUCKY BLUEGRASS CULTIVARS GROWN  
UNDER HIGH MAINTENANCE AT SEVENTEEN LOCATIONS IN THE U.S. AND CANADA  
1991 DATA  
TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF

NAME	CO1	IA1	ID2	IL2	KY1	NJ1	OH1	OR2	RI1	UB1	VA1	WA1	MEAN
* MIDNIGHT	8.0	7.1	7.9	5.3	6.7	6.7	6.7	4.7	4.0	7.7	5.4	6.2	6.2
* UNIQUE (PST-C-76)	9.0	6.8	6.4	6.3	6.4	6.3	6.3	6.3	4.9	7.1	4.3	4.7	6.2
LSD value	1.2	0.8	1.1	1.3	1.0	1.0	1.1	1.1	1.4	0.5	0.9	1.2	0.3

This table is only a selection made by TGT from the actual NTEP chart (pp 6-8) which contains 125 varieties tested and 17 locations.

TABLE 2

MEAN TURFGRASS QUALITY RATINGS OF KENTUCKY BLUEGRASS FOR EACH MONTH  
GROWN UNDER HIGH MAINTENANCE AT SEVENTEEN LOCATIONS IN THE U.S. AND CANADA  
1991 DATA  
TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF: MONTHS

NAME	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
MIDNIGHT	5.3	5.7	5.2	5.2	6.4	6.4	6.3	6.3	6.3	6.6	5.9	5.0	6.2
* UNIQUE (PST-C-76)	6.3	6.7	6.3	5.6	6.2	6.3	6.4	6.3	6.4	6.5	5.5	5.2	6.2
LSD value	1.5	1.3	1.1	0.8	0.6	0.6	0.6	0.6	0.7	0.7	0.7	1.1	0.5

This table is only a selection made by TGT from the actual NTEP chart (pp 9-11) which contains 125 varieties tested and 17 locations.

TABLE 3

RANKING OF MEAN TURFGRASS QUALITY RATINGS OF KENTUCKY BLUEGRASS CULTIVARS  
UNDER HIGH MAINTENANCE AT SEVENTEEN LOCATIONS IN THE U.S. AND CANADA  
1991 DATA  
QUALITY RATINGS; 1=HIGHEST MEAN: STATE LOCATIONS REPORTING

NAME	CO1	IA1	ID2	IL2	KY1	NJ1	OH1	OR2	RI1	UB1	VA1	WA1	MEAN
MIDNIGHT	83.5	37.5	4.0	33.0	5.0	2.0	45.5	102.0	59.5	1.0	54.5	82.0	1.0
* UNIQUE (PST-C-76)	9.5	79.5	62.5	45.5	11.5	5.0	77.0	9.0	9.0	19.0	92.5	117.5	2.0

This table is only a selection made by TGT from the actual NTEP chart (pp 12-14) which contains 125 varieties tested and 17 locations.

### How to identify the NTEP results that are relevant to your needs

1. Examine the table of "Locations Submitting Data"(NTEP, page 1) and mark the locations that most closely approximate the climate of your location.
2. Then look at "Locations, Site Descriptions and Management Practices" (NTEP, Table A, page 3), and, using your marked-up list of "Locations Submitting Data", choose the sites whose description and management practices most closely parallel your site's description and management practices as well.
3. Use this refined list of locations as the basic criteria for identifying the data that you should use to make your seed-buying decisions.

After this, to complete your seed selection process, you can use the Sample Turfgrass Seed Evaluation Form on page 7 as a guide. To develop your own seed evaluation data, use the blank form inserted into this issue.

### ■ Tables 1-3: Quality ratings Check these tables first

USE THE DATA CONTAINED in the three "Turfgrass Quality Ratings" tables (see above sample tables) to establish a short list of candidates from each location.

- **Entry #1:** Using Table 3, develop a short list of the best varieties for the selected locations. If you have a particular concern about quality during certain times of the year, check how the varieties performed monthly by referring to Table 2. Add or delete varieties from your list in Entry #1 accordingly.
- **Entry #2:** Using Table 1, enter the ratings values for each variety for each site.
- **Entry #3:** Combine the three lists into one, in descending order. (In the sample worksheet, applying the LSD to the top entry results in a list where the top ten entries are statistically the same and the four remaining entries are significantly less.)



## Format of NTEP "visual characteristics" tables

TABLE 4

SPRING GREENUP RATINGS OF KENTUCKY BLUEGRASS CULTIVARS  
GROWN UNDER HIGH MAINTENANCE  
1991 DATA  
SPRING GREENUP RATINGS 1-9; 9=COMPLETELY GREEN 1/

NAME	NJ1	NJ3	MEAN
GINGER	9.0	5.3	7.2
WASHINGTON	6.7	6.7	6.7
CARDIFF	6.3	7.0	6.7
CYTHIA	5.3	8.0	6.7
LSD value	1.2	1.5	0.9

This table is only a selection made by TGT  
from the actual NTEP chart (pp 15-16) which contains 125 varieties tested

TABLE 5

GENETIC COLOR RATINGS OF KENTUCKY BLUEGRASS CULTIVARS  
GROWN UNDER HIGH MAINTENANCE  
1991 DATA  
GENETIC COLOR RATINGS 1-9; 9=DARK GREEN 1/

NAME	CO1	NJ1	MEAN
MIDNIGHT	6.0	8.3	7.2
BA 74-114	5.3	8.0	7.0
OPAL	5.3	8.0	6.9
BA 77-279	5.0	7.7	6.9
LSD value	1.3	0.9	0.5

This table is only a selection made by TGT  
from the actual NTEP chart (pp 17-19) which contains 125 varieties tested

TABLE 6

LEAF TEXTURE RATINGS OF KENTUCKY BLUEGRASS CULTIVARS  
GROWN UNDER HIGH MAINTENANCE  
1991 DATA  
LEAF TEXTURE RATINGS 1-9; 9=VERY FINE

NAME	NJ3	MEAN
BARBLUE	7.0	7.0
EVB 13.863	7.0	7.0
LIMOUSINE	7.0	7.0
WW AG 508	7.0	7.0
LSD value	0.9	0.9

This table is only a selection made by TGT  
from the actual NTEP chart (pp 20-21) which contains 125 varieties tested

TABLE 7

WINTER COLOR RATINGS OF KENTUCKY BLUEGRASS CULTIVARS  
GROWN UNDER HIGH MAINTENANCE  
1991 DATA  
WINTER COLOR RATINGS 1-9; 9=COMPLETE COLOR RETENTION

NAME	NJ3	OR9	MEAN
SR 2000	4.3	8.0	6.2
BLACKSBURG	4.0	8.0	6.0
BARBLUE	4.7	7.0	5.8
GEORGETOWN	4.7	7.0	5.8
LSD value	1.0	1.6	0.9

This table is only a selection made by TGT  
from the actual NTEP chart (pp 22-23) which contains 125 varieties tested

### ■ Tables 4–7: Visual characteristics Reducing the list of possible varieties

THE GROUP OF TABLES that deal with "Visual Characteristics" can be used to further adjust your list. The tables for spring green-up, genetic color, leaf texture, and winter color can be used to more closely reflect the characteristics you want for your sites.

- **Entry #4:** Using Tables 4 and 5, enter values from each table for each variety.
- **Entry #5:** Average the spring and genetic color ratings and list in descending order.

### ■ Tables 8–17: Field performance Refining the list

USE THE TABLES on "Field Performance" characteristics to develop a list of variety choices. These characteristics include seedling vigor, density (spring, summer and fall), percent living cover (spring, summer and fall), and drought tolerance (wilting, dormancy and recovery).

- **Entry #6:** Develop an alphabetical list of the selected varieties with their assigned ratings for seedling vigor and summer density.
- **Entry #7:** Average the seedling vigor and summer density ratings and list in descending order.

– continued on page 6

## Format of NTEP "field performance" tables

TABLE 8

SEEDLING VIGOR RATINGS OF KENTUCKY BLUEGRASS CULTIVARS  
GROWN UNDER HIGH MAINTENANCE  
1991 DATA  
SEEDLING VIGOR RATINGS 1-9; 9=MAXIMUM VIGOR

NAME	CO1	NJ1	MEAN
BANFF	6.3	8.3	7.7
FREEDOM	6.7	8.3	7.6
KENBLUE	6.7	8.0	7.4
PSU-151	6.0	8.0	7.3
LSD value	1.9	1.2	0.7

This table is only a selection made by TGT  
from the actual NTEP chart (pp 24-26) which contains 125 varieties tested.

TABLE 9

SPRING DENSITY RATINGS OF KENTUCKY BLUEGRASS CULTIVARS  
GROWN UNDER HIGH MAINTENANCE  
1991 DATA  
DENSITY RATINGS 1-9; 9=MAXIMUM DENSITY

NAME	NJ3	ON1	MEAN
SILVIA	7.0	4.3	5.7
BARSWEEP	7.5	3.3	5.4
SUFFOLK	6.7	3.7	5.2
ALPINE	6.7	3.7	5.2
LSD value	1.4	1.5	1.0

This table is only a selection made by TGT  
from the actual NTEP chart (pp 27-28) which contains 125 varieties tested.



## Format of NTEP "disease resistance" tables

TABLE 18

LEAF SPOT RATINGS OF KENTUCKY BLUEGRASS  
CULTIVARS GROWN UNDER HIGH MAINTENANCE  
1991 DATA  
LEAF SPOT RATINGS 1-9; 9=NO DISEASE

NAME	OR9	MEAN
BLACKSBURG	8.3	8.3
J-335	8.3	8.3
LSD value	1.5	1.5

This table is only a selection made by TGT  
from the actual NTEP chart (pp 45-46) which contains 125 varieties tested

TABLE 20

DOLLAR SPOT RATINGS OF KENTUCKY BLUEGRASS  
CULTIVARS GROWN UNDER HIGH MAINTENANCE  
1991 DATA  
DOLLAR SPOT RATINGS 1-9; 9=NO DISEASE

NAME	RI1	MEAN
MINSTREL	8.7	8.7
BA 73-366	8.3	8.3
LSD value	0.9	0.9

This table is only a selection made by TGT  
from the actual NTEP chart (pp 49-50) which contains 125 varieties tested

TABLE 19: STEM RUST RATINGS; TABLE 21: PYTHIUM BLIGHT RATINGS,  
TABLE 22: LEAF RUST; TABLE 23: STRIPE RUST; TABLE 24: NECROTIC RING SPOT

### ■ Tables 18–24: Disease resistance Providing a third measurement

USE THE TABLES ON Specific Diseases to develop information aimed at your supplemental management needs. The diseases covered include Leaf Spot, Rust (stem, leaf and stripe), Dollar Spot, Pythium, and Necrotic Ring Spot.

- **Entry #8:** Make an alphabetical list of selected varieties—with their assigned ratings for Leaf Spot, Dollar Spot and Pythium Blight resistance—or whichever diseases are important for your particular needs.
- **Entry #9:** Average the Leaf Spot, Dollar Spot and Pythium Blight ratings and list in descending order.

### ■ Look at all three average ratings

- **Entry #10:** When you look at all three of the averages for color, seedling & density and disease resistance, a picture begins to appear.
- **Entry #11:** Average the color, density and disease resistance ratings and list in descending order.

This final list assumes that the three areas of evaluation—color, density and disease resistance—are equal in value to you as a turfgrass manager.

- **Entry #12:** If you value disease resistance more than color and density (i.e., by a factor of two), then the resulting list will be more oriented to the best disease resistant varieties. If color is twice as important as the other two, then the final list will be more oriented toward varieties with good color. How the final list of varieties appears is a function of how much importance that you assign to each category.

### ■ Compare the first list with the final list

- **Entry #13:** If you compare the first list, based on site quality ratings, with the final list, based on color, density and disease resistance, the difference is quite striking.

In the sample worksheet, a variety like Cynthia has risen from near the top to the top, Midnight has risen from near the bottom to tie for the top, while Barmax has plunged to the bottom. When you apply the LSD for the final list to the top entry in that list, you end up with a list of thirteen varieties that are not statistically different from each other and one variety that is different.

### Making the buying decision has become more logical

THIS RATHER INVOLVED PROCESS does not make your seed-buying decisions easier, rather it makes them more informed. The questions of who to buy the seed from and in what form to buy the seed (i.e. multiple, single variety purchases or mixtures of different species or varieties) are still a function of who is selling the selected varieties in your area, can they mix and bag custom blends, and will they accept or purchase (for sale or blending) varieties that they do not normally stock.

### Cost is not, and should not, be a factor in the seed-buying decision!

THE COST DIFFERENCE between a common variety of bluegrass and a named variety usually is usually no more than \$1.00 to \$1.50 per 1,000 ft.<sup>2</sup>. And in the case of Tall Fescues and Ryegrasses the cost difference can be as little as \$.10 to \$.20 per 1,000 ft.<sup>2</sup>. A decision to use one variety over another based on cost is at best short-sighted and at worst a management nightmare. Considered and informed seed-buying decisions always pay off in lowered management input and cost—and increased customer satisfaction. ■

*Background for entries 1–3: Our sample sites are in southeastern Pennsylvania. The use is for renovating full sun lawns with histories of disease problems. The selected reporting sites are: New Jersey 1 (NJ1), Ohio 1 (OH1), and Maryland (UB1).*

*Background for entries 4–5: Since most of the sites in this sample evaluation are residential, the desired characteristics are early spring green-up and good genetic color. Leaf texture and winter color are not as important.*

*Background for entries 6–7: Continuing the previous example, good seedling establishment and overall summer performance are important in a residential situation.*

*Background for entries 8–9: Continuing the previous example, Leaf Spot, Dollar Spot and Pythium Blight are diseases that have proven to be a problem at this site and resistance to these diseases is very important.*





**SAMPLE TURFGRASS SEED EVALUATION WORKSHEET**

**PRELIMINARY SELECTION: Quality Ratings**

**#1:** Compile short list using quality ratings (Table 3) for the selected sites:

	<b>New Jersey</b>	<b>Ohio</b>	<b>Maryland</b>
1.	Midnight	Plantini	Midnight
2.	Barblue	Barmax	Glade
3.	Blacksburg	Ram-1	Cynthia
4.	Unique	Suffolk	Minstrel
5.	Preakness	Monopoly	Cardiff

**#2:** Enter rating values for each variety at each site (Table 1):

<b>New Jersey</b>	<b>Rate</b>	<b>Ohio</b>	<b>Rate</b>	<b>Maryland</b>	<b>Rate</b>
Midnight	6.7	Plantini	7.8	Midnight	7.7
Barblue	6.5	Barmax	7.5	Glade	7.6
Blacksburg	6.4	Ram-1	7.3	Cynthia	7.5
Unique	6.3	Suffolk	7.3	Minstrel	7.5
Preakness	6.3	Monopoly	7.3	Cardiff	7.4
LSD	1.0	LSD	1.1	LSD	0.5

**#3:** Combine the short lists into one, in descending order of their ratings:

<b>Variety</b>	<b>Rating</b>
Plantini	7.8
Glade	7.6
Barmax	7.5
Cynthia	7.5
Minstrel	7.5
Cardiff	7.4
Ram-1	7.3
Suffolk	7.3
Monopoly	7.3
Midnight	7.2*
Barblue	6.5
Blacksburg	6.4
Unique	6.3
Preakness	6.3
LSD	0.9*

\* average

**REFINING SELECTIONS: Visual Characteristics**

**#4:** Using Tables 4 through 7, list alphabetically and enter values:

<b>Variety</b>	<b>Spring</b>	<b>Genetic *</b>
Barblue	6.7	5.8
Barmax	2.7	5.0
Blacksburg	5.3	7.9
Cardiff	6.3	7.0
Cynthia	6.3	6.9
Glade	3.3	7.0
Midnight	3.3	8.2
Minstrel	6.0	7.7
Monopoly	4.0	5.0
Plantini	4.3	6.9
Preakness	5.7	7.0
Ram-1	5.0	7.2
Suffolk	4.7	5.5
Unique	4.0	7.2
LSD	1.2	0.8*

\* average

**#5:** Combine the values, and list in descending order of average spring and genetic color ratings:

<b>Variety</b>	<b>Color (average)</b>
Minstrel	6.9
Cardiff	6.7
Blacksburg	6.6
Preakness	6.4
Barblue	6.3
Cynthia	6.1
Ram-1	6.1
Midnight	5.8
Unique	5.6
Plantini	5.6
Glade	5.2
Suffolk	5.1
Monopoly	4.5
Barmax	3.9
LSD	1.0*

\* average

**FIELD PERFORMANCE**

**#6:** Using Tables 8-11, enter ratings for seedling vigor and summer density and list alphabetically:

<b>Variety</b>	<b>Seedling</b>	<b>Summer Density</b>
Barblue	7.0	5.7
Barmax	8.7	7.7
Blacksburg	3.7	5.0
Cardiff	7.0	6.0
Cynthia	7.7	7.0
Glade	7.7	6.7
Midnight	7.3	6.3
Minstrel	6.7	7.7
Monopoly	8.3	6.7
Plantini	8.3	7.7
Preakness	7.3	6.7
Ram-1	6.7	7.0
Suffolk	8.7	7.3
Unique	6.0	6.0
LSD Value	1.2	1.2

**#7:** List the same varieties by descending order of the average seedling vigor and summer density:

<b>Variety</b>	<b>Seedling &amp; Density*</b>
Barmax	8.2
Plantini	8.0
Suffolk	8.0
Monopoly	7.5
Cynthia	7.4
Glade	7.2
Preakness	7.0
Ram-1	6.9
Midnight	6.8
Minstrel	6.7
Cardiff	6.5
Barblue	6.4
Unique	6.0
Blacksburg	4.4
LSD	1.2*

\* average

DISEASE RESISTANCE

#8: Using Tables 3 and 4, list alphabetically and enter values:

Variety	Leaf Spot	Dollar Spot	Pythium
Barblue	5.3	5.0	5.0
Barmax	5.3	2.3	6.7
Blacksburg	8.3	2.0	6.3
Cardiff	6.3	5.3	5.0
Cynthia	6.3	7.0	6.0
Glade	3.0	7.7	5.0
Midnight	5.7	8.0	8.0
Minstrel	7.0	4.3	3.3
Monopoly	4.3	6.3	4.0
Plantini	4.7	4.0	5.3
Preakness	5.0	7.7	4.7
Ram-1	4.3	8.0	7.0
Suffolk	4.3	8.7	5.3
Unique	6.3	6.0	4.7
LSD	1.5	1.4	1.9

#9: Using the information in #8, calculate average ratings (by adding the three values for each variety and then dividing by three) and then list in descending order:

Variety	Disease Resistance *
Midnight	7.3
Ram-1	6.8
Cynthia	6.1
Suffolk	6.1
Preakness	5.8
Unique	5.7
Blacksburg	5.6
Cardiff	5.6
Glade	5.3
Barblue	5.1
Minstrel	4.9
Monopoly	4.9
Barmax	4.8
Plantini	4.7
LSD	1.6*

\* average

CONCLUSIONS

#10: Enter averages for color (from #5), density (from #6) and disease resistance (from #9):

Variety	Color	Variety	Density	Variety	Disease
Minstrel	6.9	Barmax	8.2	Midnight	7.3
Cardiff	6.7	Plantini	8.0	Ram-1	6.8
Blacksburg	6.6	Suffolk	8.0	Cynthia	6.1
Preakness	6.3	Monopoly	7.5	Suffolk	6.1
Barblue	6.1	Cynthia	7.4	Preakness	5.8
Cynthia	6.1	Glade	7.2	Unique	5.7
Ram-1	5.8	Preakness	7.0	Blacksburg	5.6
Midnight	5.6	Ram-1	6.9	Cardiff	5.6
Unique	5.6	Midnight	6.8	Glade	5.3
Plantini	5.2	Minstrel	6.7	Barblue	5.1
Glade	5.1	Cardiff	6.5	Minstrel	4.9
Suffolk	4.5	Barblue	6.4	Monopoly	4.9
Monopoly	3.9	Unique	6.0	Barmax	4.8
Barmax	3.9	Blacksburg	4.4	Plantini	4.7
LSD	1.0	LSD	1.2	LSD	1.6

#11: Using the information in #10, average together values for color, density and disease resistance, and then list in descending order:

Variety	Rating*
Cynthia	6.6
Midnight	6.6
Ram-1	6.5
Suffolk	6.5
Blacksburg	6.3
Minstrel	6.2
Cardiff	6.0
Plantini	6.0
Glade	6.0
Barblue	5.9
Preakness	5.7
Unique	5.6
Monopoly	5.5
Barmax	4.5
LSD	1.3*

\*average

#12: If color, density and disease resistance are not of equal value to you, weight the values to reflect your priorities; for example, if disease resistance is twice as important to you, double its value, and average the results. Then list in descending order:

Midnight	6.8
Ram-1	6.6
Cynthia	6.4
Preakness	6.2
Suffolk	6.2
Cardiff	6.1
Minstrel	5.9
Unique	5.8
Barblue	5.7
Plantini	5.7
Glade	5.7
Blacksburg	5.6
Barmax	5.4
Monopoly	5.3
LSD	1.4

OPTIONAL COMPARISON

#13: To see the difference between your initial selections and your final selections, list values from #3 and #11 in descending order:

First compiled list		Final compiled list	
Variety	Rating	Variety	Rating*
Plantini	7.8	Cynthia	6.6
Glade	7.6	Midnight	6.6
Barmax	7.5	Ram-1	6.5
Cynthia	7.5	Suffolk	6.5
Minstrel	7.5	Blacksburg	6.3
Cardiff	7.4	Minstrel	6.2
Ram-1	7.3	Cardiff	6.0
Suffolk	7.3	Plantini	6.0
Monopoly	7.3	Glade	6.0
Midnight	7.2*	Barblue	5.9
Barblue	6.5	Preakness	5.7
Blacksburg	6.4	Unique	5.6
Unique	6.3	Monopoly	5.5
Preakness	6.3	Barmax	4.5
LSD	0.9*	LSD	1.3*

\* average