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PURPOSE

The purpose of *USGA Turfgrass and Environmental Research Online* is to effectively communicate the results of research projects funded under USGA's Turfgrass and Environmental Research Program to all who can benefit from such knowledge. Since 1983, the USGA has funded more than 350 projects at a cost of \$27 million. The private, non-profit research program provides funding opportunities to university faculty interested in working on environmental and turf management problems affecting golf courses. The outstanding playing conditions of today's golf courses are a direct result of ***using science to benefit golf.***

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Grasses for Overseeding Bermudagrass Fairways

Kevin N. Morris

SUMMARY

This study, jointly funded by the United States Golf Association, the Golf Course Superintendents Association of America, and the National Turfgrass Evaluation Program, is the second national trial of grasses used to overseed bermudagrass fairways. This trial was conducted from September 2004 through July 2006 and compares 31 cultivars, blends, and mixtures for overseeding when tested under actual golf course conditions. The study's findings include:

- Many perennial ryegrasses perform well in overseeding and often there is no statistical difference among the entries.
- *Poa trivialis* is slower to establish than perennial ryegrass, and it seems that when *Poa trivialis* is weakened due to heat or disease, it disappears quickly.
- Intermediate ryegrass cultivars are available now with quality closer to perennial ryegrass but with tendencies to transition earlier.
- Transition from the overseeding grass to bermudagrass in spring is rarely smooth and is affected greatly by weather patterns. In the cooler, more northern sites, grasses that are strong going into winter may not have as much bermudagrass returning in spring. When the overseeding grass dies, there may not be sufficient bermudagrass to provide adequate cover and quality.

For much of the southern half of the United States, overseeding bermudagrass fairways is a common practice used by golf courses to produce that beautiful green product that so many golfers desire, especially those escaping the winter blues of northern climates. Overseeding can add to a course's bottom line by increasing rounds, but overseeding also provides better tolerance of cart traffic, divoting, and weed invasion than dormant bermudagrass.

However, obtaining that perfect green "carpet" is not as easy as it may seem. With overseeding, golf course superintendents must manage a cool-season grass that loves milder temperatures

seeded into a warm-season grass base that loves hot days. Optimally, managing one grass without hurting the other, while keeping a high quality surface, is the challenge of many golf course superintendents. There are many factors that determine the success or failure of overseeding. One of the key factors is the type and/or cultivar of grass chosen. Golf course owners, managers and superintendents seek grasses that establish quickly, exhibit exceptional playability, are aesthetically pleasing, and require less inputs.

To address these issues, two research projects were developed and jointly sponsored by the Golf Course Superintendents Association of America (GCSAA), the United States Golf Association (USGA), and the National Turfgrass Evaluation Program (NTEP) to evaluate cultivars, blends, and mixtures for their use in overseeding bermudagrass fairways.

The first project evaluated 42 grasses, blends and mixtures, at ten golf courses from September 1999 through July 2001 (1). A second project was conducted from September 2004 through July 2006, evaluating 31 cultivars, mixes, and blends at twelve golf courses. This article summarizes the results of project two.



Research technician David McKissack collects data at Roanoke CC, in Roanoke, VA.

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Methods

Twelve golf courses were chosen to host the 'On-site Overseeding Trials' (Table 1). Because overseeding grasses provide a temporary playing surface for fall, winter, and spring and are reseeded each year, cultivars were seeded in two consecutive years (fall 2004 and fall 2005). Since speed, ease and uniformity of transition from the bermudagrass to the overseeded grass in fall and back to the bermudagrass in spring is one the biggest concerns when overseeding, entries were seeded in exactly the same location on each course for each of the two years. This allowed researchers to identify entries that persisted over time.

NTEP solicited entries for the trial from sponsoring companies. Trials were conducted with named cultivars and commercially available blends or mixtures. In addition, experimental entries that were to be commercialized in the

immediate future (i.e. before the end of the testing cycle) were also permitted. Various species used in overseeding, such as perennial ryegrass and *Poa trivialis* (rough bluegrass) were allowed. This led to the submission of many perennial ryegrass entries, as single cultivars or blends, but also single cultivars of *Poa trivialis*.

In addition, two cultivars of intermediate ryegrass and one mixture of perennial ryegrass and intermediate ryegrass were included in the trial. Intermediate ryegrasses are developed by crossing annual and perennial ryegrass, then selecting plants that have the best traits of both species. Plant breeders have worked to develop intermediate ryegrasses that provide a smooth spring transition back to bermudagrass but with finer leaf texture and darker green color.

Trials were established on active play sites where golfers hit fairway golf shots and/or drove golf carts. Plots were carefully seeded either by hand or using a drop spreader. Since seeding rates

Location	Golf Course	Superintendent	Cooperator	University
Tucson, AZ	Heritage Highlands C.C.	David Herman	Dr. David Kopec	Arizona
Indian Wells, CA	Indian Wells Golf Club	David Hay	Dr. Robert Green Dr. Sowyma Mitra	California-Riverside Cal-Poly Pomona
Gainesville, FL	University of Florida	Todd Wilkinson	Dr. Grady Miller	Florida
Pensacola, FL	Osceola Golf Club	Eddie Daigle	Dr. Bryan Unruh	Florida
Atlanta, GA	Eagles Landing C.C.	Cecil Smith	Dr. Clint Waltz	Georgia
Starkville, MS	Mississippi State Univ.	Pat Sneed	Mr. Wayne Philley	Mississippi State
Las Cruces, NM	New Mexico State Univ.	Bruce Erhard	Dr. Bernd Leinauer	New Mexico State
Pinehurst, NC	Pinehurst C.C. #3	Bob Farren	Dr. Art Bruneau	North Carolina State
Oklahoma City, OK	John E. Kirkpatrick Five-Hole Demonstration GC	David Gerken	Dr. Dennis Martin	Oklahoma State
Myrtle Beach, SC	Blackmoor	Bob Zuercher	Dr. Bruce Martin	Clemson
Houston, TX	The Traditions Club	Sean Hogan	Dr. David Chalmers	Texas A&M
Roanoke, VA	Roanoke C.C.	Dan Wheeler	Dr. Michael Goatley	Virginia Tech

Table 1. Locations (cities, states), golf courses, superintendents, university cooperators, and universities participating in the fairway overseeding trial from September 2004 through July 2006.

Seeding Rate (lbs. per acre)												
Grass Type	Starkville MS	Atlanta GA	Roanoke VA	Gainesville FL	Tucson AZ	Myrtle Beach SC	Indian Wells CA	Oklahoma City OK	Las Cruces NM	Houston TX	Pensacola FL	Pinehurst NC
Perennial ryegrass - single cultivars or blends	300	450	450	450	600	300	600	450	450	450	450	450
<i>Poa trivialis</i> single cultivars	100	100	200	100	100	200	200	100	200	200	200	100
Mixtures of Perennial rye or Intermediate rye and <i>Poa trivialis</i>	250	400	250	400	400	250	400	250	400	400	400	250

Table 2. The choice of seeding rates were left up to participating golf course superintendents and varied by location and grass type.

vary widely from one region to another, each location was consulted concerning typical overseeding rates in their area. Consequently, three seeding rates for the ryegrasses (300, 450, and 600 lbs. per acre), two rates for *Poa trivialis* (100 and 200 lbs. per acre) and two rates for mixtures (250 and 400 lbs. per acre) were developed. The most appropriate rate for each grass type was then assigned to the locations (see Table 2).

The experimental plot size was large, 5' x 20', replicated three times. A large plot size allowed for a greater distribution of traffic and divoting. Host clubs provided the daily maintenance of the fairway site. An advisory committee consisting of representatives from GCSAA, USGA, NTEP, universities, and the turfgrass seed industry recommended establishment and maintenance procedures.

The researcher at the cooperating university was responsible for data collection. The following data was collected from each trial site:

1. Percent establishment rate (4-6 weeks after seeding).
2. Turfgrass quality (monthly during winter; minimum of three times during fall transition period; five to seven times during spring transition period)

3. Plot color, genetic color (twice - late fall/early winter and spring)

4. Rate or speed of transition from bermudagrass to overseeded grass in fall (minimum of three ratings)

5. Rate or speed of transition from overseeded grass to bermudagrass in spring (5 - 7 ratings)

6. Density and leaf texture - once each in spring

7. Environmental stress, traffic and divoting damage, disease and insect damage and other data deemed appropriate and feasible by the research cooperator.

Results and Discussion

Fall 2004 - Spring 2005

The trial contained thirty-one (31) entries, consisting of perennial ryegrass cultivars, perennial ryegrass blends, intermediate ryegrass and *Poa trivialis* (Table 3). These entries were seeded in September or October at the twelve golf course sites. Establishment was good; no problems were seen with any entries. Data collected from fall 2004 through spring 2005 was compiled, statisti-

Entry No.	Name	Species or Composition	Sponsor
1	Charger	perennial ryegrass	Standard entry
2	Winterplay	<i>Poa trivialis</i>	Standard entry
3	ProSelect	40% Jet, 40% Sonata, 20% Integra perennial ryegrass blend	Pennington Seed Company
4	Marvelgreen Supreme	40% Palmer IV, 40% Prelude IV, 40% Sunkissed p.r. blend	ProSeed Marketing, Inc.
5	ALS2	perennial ryegrass	LESCO, Inc.
6	PRS2	perennial ryegrass	LESCO, Inc.
7	Overseeding Eagle Blend	33% Greenville, 33% ProSport, 34% Pacesetter p.r. blend	LESCO, Inc.
8	Futura 2500	30% Blazer 4 perennial ryegrass, 30% Sunshine II perennial ryegrass, 40% Pick Lh A-00 intermediate ryegrass	Pickseed West, Inc.
9	Pick SD	perennial ryegrass	Pickseed West, Inc.
10	Playmate	50% Headstart 2, 50% Pick HS-01-09 p.r. blend	TurfOne
11	BMX 020383	perennial ryegrass	Lewis Seed Company
12	RAD-OS3	intermediate ryegrass	Lewis Seed Company
13	RAM-100	<i>Poa trivialis</i>	Lewis Seed Company
14	IS-OS	perennial ryegrass	DLF International Seeds
15	Top Hat	perennial ryegrass	Standard entry
16	IS-IR3	intermediate ryegrass	DLF International Seeds
17	Champion GQ	34% SR 4550, 33% SR 4420, 33% SR 4220 p.r. blend	Seed Research of Oregon
18	Magnum Gold	34% Peregrine, 33% Hawkeye, 33% Penguin p.r. blend	Seed Research of Oregon
19	Flash II	perennial ryegrass	Mountain View Seed Ltd.
20	MTV-124	perennial ryegrass	Mountain View Seed Ltd.
21	OS	perennial ryegrass	Mountain View Seed Ltd.
22	STP	perennial ryegrass	Mountain View Seed Ltd.
23	PR 17	perennial ryegrass	Mountain View Seed Ltd.
24	Starlite	<i>Poa trivialis</i>	Mountain View Seed Ltd.
25	CRR	perennial ryegrass	Novel AG
26	League Master	40% Ringer, 20% Omega 2, 20% 04-BRE, 20% 04-BEN p.r. blend	Oregro Seeds
27	OSC110	perennial ryegrass	Olsen Seed Company
28	OSC108	perennial ryegrass	Olsen Seed Company
29	Covet	perennial ryegrass	Olsen Seed Company
30	OSC116	perennial ryegrass	Olsen Seed Company
31	Colt	<i>Poa trivialis</i>	Standard entry

Table 3. Entry numbers, species or composition of blend of mixture, and company sponsors of 31 perennial ryegrass, *Poa trivialis*, and intermediate ryegrass cultivars, as well as perennial ryegrass blends and mixtures of perennial ryegrass and intermediate ryegrasses participating in the fairway overseeding trial from September 2004 through July 2006.

cally analyzed, and reported. This data can be found on the NTEP web site (www.ntep.org/onsite/ost.htm).

Following are general observations concerning the trials evaluated in fall 2004 - spring 2005:

1. The *Poa trivialis* varieties were slower to establish and develop into a dense stand than the perennial ryegrasses. They also exhibited lighter green color than the perennial ryegrasses. The four *Poa trivialis* entries had the lowest turfgrass quality ratings at most locations.

2. The perennial ryegrasses overall provided the best turfgrass quality. However, at most locations, there was little statistical difference among the entries. This result is similar to what we have seen in previous overseeding trials.

3. The two intermediate ryegrass entries differed somewhat in their appearance and overall

performance. The entry 'IS-IR3' performed better than 'RAD-OS3' at some locations, statistically equal to many perennial ryegrass entries. However, this performance was not consistent as the intermediate ryegrasses finished in the bottom for turfgrass quality at several other locations.

4. The transition in spring from overseeding grass to actively growing bermudagrass did not reveal large differences in entry performances. In some cases, the *Poa trivialis* entries were poorer in this respect, resulting in reduced overseeding cover when the bermudagrass is not growing enough to provide adequate ground cover. At other locations, there was virtually no difference among any entries.

Fall 2005 - Spring 2006

The same thirty-one (31) entries seeded in

fall 2004 were seeded again in September or October 2005 at the twelve golf course sites. The same physical location on the golf course was used with the following two exceptions: An error occurred after seeding at the Myrtle Beach site resulting in contamination of the entire trial. Therefore, no data was collected from this site during the 2005-2006. Another area at the Eagles Landing Club (Stockbridge, GA) was used in 2005 due to drainage problems at the previous site.

A progress report containing 2005-2006 data and management information on this project can be found on the NTEP web site at <http://www.ntep.org/onsite/ost.htm>. Following are some observations concerning the second year of this trial:

At most locations, the perennial ryegrass entries or blends of perennial ryegrasses were the best performers. Often, there was little or no sta-

tistical difference among the perennial ryegrasses for overall quality, as well as fall and spring transition.

The fewest differences in overall turfgrass quality among entries were seen at Las Cruces, NM. The greatest spread in overall turfgrass quality was recorded at the Pinehurst, NC location. The Bryan, TX location showed greater entry differences this year than in 2004-2005.

The intermediate ryegrasses were the top performers at the Roanoke, VA site only. Also, the *Poa trivialis* entries as a group performed better at this location than at any other location. This is the northernmost location for this trial and is the most likely explanation for the strong showing of those two species. At many locations, *Poa trivialis* entries established significantly slower than the perennial ryegrasses, taking until 30-40 days after seeding to establish the same percentage ground cover as the perennial ryegrasses. This difference



Dr. Bernd Leinauer (center), Jose Maak (left), and Kevin Morris (right) check species composition of overseeded plots on the New Mexico State University Golf Course in Las Cruces.



The mountains provide a spectacular backdrop for the fairway overseeding trials at Indian Wells Country Club in Indian Wells, CA.

was most evident at Gainesville, FL as the *Poa trivialis* entries provided only 70-75% ground cover by the end of winter, compared to 85-90% cover for the perennial ryegrasses.

Again, the intermediate ryegrass entries generally had lower quality ratings than the perennial ryegrasses. The intermediate ryegrasses do not have the density and dark green color of the best perennial ryegrasses. However, the two entries did perform statistically equal for turfgrass quality at several locations. The higher ranking entry, 'IS-IR3', finished in the top statistical grouping for turfgrass quality at eight of the eleven locations.

Summary

After two years of this study and the previous study, we can draw the following conclusions about overseeding:

Many perennial ryegrasses perform well in overseeding and often there is no statistical difference among the entries. We have seen this same trend in other overseeding trials.

Poa trivialis' usefulness in overseeding of fairways is questionable. It is slower to establish than perennial ryegrass, and it seems that when *Poa trivialis* is weakened due to heat or disease, it disappears quickly. This leaves insufficient green

bermuda for acceptable quality. *Poa trivialis* also is lighter green in color than most perennial ryegrasses. However, if the goal is little or no physical disturbance of the bermudagrass prior to overseeding, the small seed size of *Poa trivialis* allows it to sift through the bermudagrass canopy to make soil contact. The result is a better stand of *Poa trivialis* compared to perennial ryegrass.

Weather patterns and management greatly influence overseeding success. Variable weather patterns turn a successful overseeding formula from the past into a disaster in the present. For instance, weather can affect establishment rate or transition speed and timing. This is where good management by the superintendent is crucial. The ability and authority to adjust management schemes as needed is critical for success.

The intermediate ryegrasses may be useful in fairway overseeding. Cultivars are available now with quality closer to perennial ryegrass, but with earlier transition tendencies.

Transitioning from a turf stand dominated by overseeding grass to a stand of growing bermudagrass in spring is the most difficult and arduous task a superintendent faces during the overseeding period. This transition from the overseeding grass to bermudagrass in spring is rarely smooth and is affected greatly by weather patterns. In the cooler, more northern sites, grasses that are strong going into winter may not have as much bermudagrass returning in spring. When the overseeding grass dies, there may not be sufficient bermudagrass to provide adequate cover and quality.

A balance exists between quality and cover of each species in fall and spring. The higher the quality of the overseeding early in fall, the more overseeding present in spring, along with reduced bermudagrass cover. The result is a more difficult spring transition. The lower the quality of overseeding in fall, the less overseeding present in spring, often leading to a better spring transition. Use of a weaker cultivar or species may make for a better spring transition. However, if heat and humidity come early, these weaker grasses may transition out sooner than expected.

The practice of overseeding bermudagrass

fairways continues throughout the southern U.S., however, not without associated risks. An overseeding grass that is too strong through the winter may lead to slower bermudagrass recovery in spring. Also, weather patterns can be quite variable from one season to the next, therefore, overseeding results can be drastically different over time. Management practices including pre-plant preparation, maintenance practices during the winter season, and management of spring transition can significantly affect the quality of overseeding.

Golf course superintendents walk a tightrope in balancing the golfers demand for quality and the grasses' response to management and climatic conditions. Golf courses that prescribe to fairway overseeding need to have clear goals and objectives for the practice, as well as realistic expectations of the outcome. Success in overseeding needs to be carefully defined, considering expectations of the clientele tempered with a healthy dose of reality.

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