FEATURE ARTICLE I

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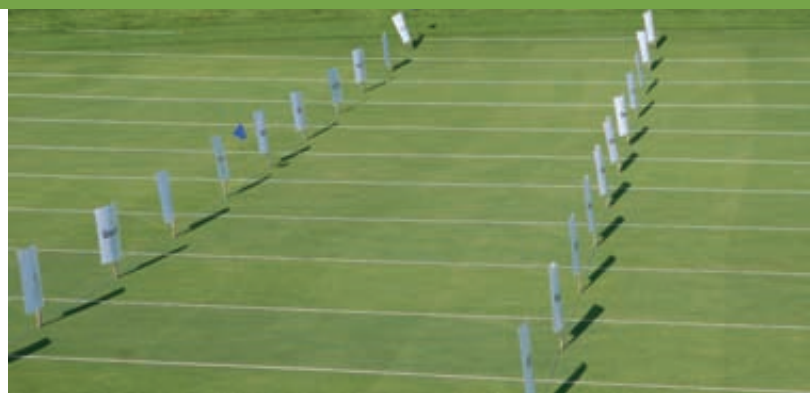

# Four Years of Testing Yields Interesting Results in Bentgrass Trials

*Compared to what was available 50 years ago, today's golf turf managers benefit from an arsenal of improved tools. There's no doubt that improvements have been made in management and irrigation equipment, as well as in chemicals for pest control and growth regulation. The most beneficial new tools available to golf turf managers, however, may be the grasses for golf courses. Turf breeders have worked wonders in selecting and creating seeded bentgrasses capable of providing the outstanding conditions demanded at the highest levels of golf.*

In October 2007, we completed the four-year National Turfgrass Evaluation Program (see http://www.ntep.org for results of the other sites in these trials or the results of other species trials) trials of bentgrasses (*Agrostis spp.*) maintained at fairway and putting green heights at the University of Illinois Landscape Horticulture Research Center in Urbana. The putting green trial contained 26 entries (Table 1) of creeping (*Agrostis stolonifera*) and velvet (*A. canina*) bentgrasses evaluated at 24 U.S. and Canadian locations, while the fairway trial had 28 entries (Table 5) of creeping and colonial (*A. capillaris*) bentgrasses evaluated at 22 U.S. and Canadian sites. The objective of our trials was to identify the best grasses for planting in Illinois.

Both trials were seeded in September 2003 at 0.5 pounds seed per 1,000 ft.$^2$ on native, silty-clay loam soils, irrigated as needed to maintain turf quality, and received four pounds of N per 1,000 ft.$^2$ per year. The fairway trial was maintained at ½ inch and the putting green trial at 1/8 inch. The putting green trial was topdressed with sand several times each growing season. Weeds, insects, and diseases were controlled as necessary to maintain turf quality.

In 2004, there were large amounts of *Poa annua* apparent in each trial as the grasses were greening up in the spring. Bruce Branham and Bill Sharp of the U. of I. devised a program of treating each trial plot with Velocity® (bispyribac-sodium, Valent U.S.A. Corp.) that spring, which did an outstanding job of controlling the annual interloper.

**Table 1**

**Entries and sponsors in 2003 NTEP putting green trial.**

| Entry No. | Cultivar | Species | Sponsor |
|---|---|---|---|
| *1 | LS-44 | creeping | Links Seed, LLC |
| *2 | Penn A-1 | creeping | Standard Entry |
| *3 | Benchmark DSR | creeping | Turf Merchants, Inc. |
| *4 | Penncross | creeping | Standard Entry |
| 5 | CY-2 | creeping | Snow Brand Seed Co. & Chiba-Prefecture Agr. Exp. Station |
| *6 | Alpha | creeping | Jacklin Seed by Simplot |
| *7 | T-1 | creeping | Jacklin Seed by Simplot |
| *8 | SR 7200 | velvet | Standard Entry |
| 9 | 13-M | creeping | Pennington Seed |
| *10 | Declaration | creeping | Lebanon Turf Products |
| *11 | Independence | creeping | Lebanon Turf Products |
| *12 | Legendary | velvet | Lebanon Turf Products |
| *13 | Authority | creeping | LESCO, Inc. |
| *14 | Bengal | creeping | Barenbrug USA |
| *15 | Kingpin | creeping | ProSeeds Marketing |
| *16 | Villa | velvet | DLF International Seeds |
| 17 | IS-AP 9 | creeping | DLF International Seeds |
| *18 | Venus | velvet | ProSeeds Marketing |
| *19 | Vesper | velvet | Standard Entry |
| *20 | Memorial | creeping | The Scotts Company |
| *21 | 007 | creeping | R. H. Hurley, LLC/Seed Research of Oregon |
| *22 | Greenwich | velvet | Turf-Seed, Inc. |
| *23 | Shark | creeping | Mountain View Seeds, Ltd. |
| *24 | MacKenzie | creeping | Seed Research of Oregon/Pickseed |
| *25 | Tyee | creeping | Seed Research of Oregon |
| *26 | Pennlinks II | creeping | Tee-2-Green Corp. |

*Commercially available in the U.S. in 2007.

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The 5' by 5' plots of each grass were replicated three times, and the plots were evaluated for quality monthly during the growing season using a 1-9 scale, where 1 = dead turf, 9 = perfect turf, and 5 = minimally acceptable turf quality for the intended use. Spring green up and genetic color were evaluated once each year, also using a 1-9 scale where 1 = light colored turf and 9 = dark green turf.

## Putting Green Trial

*Turf Quality* – In Table 2, the means of 7 monthly evaluations per year, over four years were statistically separated using Fisher's Protected LSD. After 4 years of evaluations, Declaration, IS-AP 9, 007, MacKenzie, Shark, and Tyee were in the top statistical group; with the exception of IS-AP 9, all are commercially available. Overall, the quality of these creepers is the best we've ever seen in a long-term putting green trial in Urbana. Note that while the velvet bentgrasses in trial held up better than any we've previously evaluated, as a group, none of the velvets performed in the top groups. It's also interesting to note that Penn A-1, a top performer in our 1998 – 2001 On-Site Putting Green Trial, held at North Shore Country Club on a USGA sand based rootzone, did not perform as well in Urbana on native soil.

To go a step further, I like to look at monthly performance of the grasses in our cultivar trials. I prefer grasses that perform acceptably through the entire growing season, rather than grasses that do well in spring and autumn, when growing conditions are good for cool-season turfgrasses, but perform poorly during the dog days of summer. Table 3 presents the number of times at monthly evaluations that the quality performance of a cultivar was above the mean rating for that month. Six cultivars, Independence, IS-AP 9, Kingpin, Shark, T-1, and Tyee performed above the mean at an impressive 26 or 27 of the 28 evaluations.


*Spring Green Up and Genetic Color* – The bentgrasses in the trial did not show great differences in the rate of spring green up (Table 4); 14 of the 26 cultivars were in the top-performing group after 4 years of evaluations. Moreover, none of the top performers were velvet bentgrasses. The genetic color of 'Alpha' was alone as the darkest cultivar over 4 annual evaluations. As with the spring green up evaluations, the velvet bentgrasses were lighter colored and generally more yellow-green than the blue-green creepers.

## Fairway Trial

*Turf Quality* – After 4 years of monthly evaluations, 13-M, Alpha, Authority, Bengal, Crystal BlueLinks, Declaration, Kingpin, LS-44, Penneagle II, Runner, Shark, SR 1150, and T-1 were all in the top statistical group (Table 6) as separated by Fisher's Protected LSD. All of these grasses are creepers; none of the top performers in the fairway trial were colonial bentgrasses.

**Table 2**

**Quality performance of 26 bentgrasses in 2003 NTEP putting green trial**

**2004 – 2007**

| Entry No. | Cultivar | Mean Quality |
|---|---|---|
| 1 | LS-44 | 5.7 d-h |
| 2 | Penn A-1 | 5.1 c-f |
| 3 | Benchmark DSR | 5.2 c-g |
| 4 | Penncross | 3.8 ab |
| 5 | CY-2 | 5.9 e-i |
| 6 | Alpha | 5.6 d-h |
| 7 | T-1 | 6.1 g-i |
| 8 | SR 7200 | 3.6 a |
| 9 | 13-M | 5.6 d-h |
| 10 | Declaration | 6.4 h-k |
| 11 | Independence | 6.2 h-j |
| 12 | Legendary | 4.6 bc |
| 13 | Authority | 6.1 g-i |
| 14 | Bengal | 6.0 f-i |
| 15 | Kingpin | 6.2 h-j |
| 16 | Villa | 5.0 c-e |
| 17 | IS-AP 9 | 6.7 i-k |
| 18 | Venus | 4.9 cd |
| 19 | Vesper | 4.8 b-d |
| 20 | Memorial | 6.0 f-i |
| 21 | 007 | 6.8 i-k |
| 22 | Greenwich | 4.9 c-e |
| 23 | Shark | 6.8 i-k |
| 24 | MacKenzie | 7.1 jk |
| 25 | Tyee | 7.2 k |
| 26 | Pennlinks II | 5.1 c-f |
| LSD 0.05 | 1.0 | |

**Table 3**

**Turf quality performance above the mean for 26 bentgrasses in 2003 NTEP putting green trial**

**2004 – 2007**

| Entry No. | Cultivar | April | May | June | July | August | September | October | Total |
|---|---|---|---|---|---|---|---|---|---|
| 17 | IS-AP 9 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 27 |
| 7 | T-1 | 4 | 2 | 4 | 4 | 4 | 4 | 4 | 26 |
| 11 | Independence | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 26 |
| 15 | Kingpin | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 26 |
| 23 | Shark | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 26 |
| 25 | Tyee | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 26 |
| 1 | LS-44 | 4 | 3 | 3 | 4 | 4 | 3 | 4 | 25 |
| 5 | CY-2 | 3 | 4 | 3 | 4 | 4 | 3 | 4 | 25 |
| 10 | Declaration | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 25 |
| 21 | 007 | 4 | 4 | 4 | 4 | 4 | 2 | 3 | 25 |
| 13 | Authority | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 24 |
| 24 | MacKenzie | 3 | 2 | 4 | 4 | 4 | 3 | 4 | 24 |
| 14 | Bengal | 2 | 2 | 3 | 4 | 4 | 4 | 4 | 23 |
| 6 | Alpha | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 21 |
| 20 | Memorial | 2 | 1 | 2 | 3 | 4 | 3 | 4 | 19 |
| 9 | 13-M | 3 | 1 | 2 | 3 | 4 | 2 | 1 | 16 |
| 3 | Benchmark DSR | 2 | 2 | 2 | 0 | 4 | 1 | 2 | 13 |
| 2 | Penn A-1 | 1 | 1 | 1 | 3 | 2 | 2 | 2 | 12 |
| 16 | Villa | 1 | 2 | 1 | 0 | 0 | 0 | 1 | 5 |
| 26 | Pennlinks II | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 4 |
| 4 | Penncross | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| 18 | Venus | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 2 |
| 22 | Greenwich | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 2 |
| 8 | SR 7200 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 12 | Legendary | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 19 | Vesper | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |

## Table 4

### Spring green up and genetic color means for 26 bentgrasses in 2003 NTEP putting green height bentgrass trial 2004 – 2007.

| Entry No. | Cultivar | Spring Green Up | Genetic Color |
|---|---|---|---|
| 1 | LS-44 | 5.3 e-h | 6.5 ij |
| 2 | Penn A-1 | 5.2 d-h | 6.3 h-j |
| 3 | Benchmark DSR | 5.1 c-h | 6.2 h-j |
| 4 | Penncross | 4.5 ab | 5.7 d-g |
| 5 | CY-2 | 4.1 a | 6.0 g-i |
| 6 | Alpha | 5.4 h | 7.3 k |
| 7 | T-1 | 5.4 gh | 6.6 j |
| 8 | SR 7200 | 4.7 b-d | 5.2 a-c |
| 9 | 13-M | 5.3 f-h | 5.9 f-h |
| 10 | Declaration | 5.1 c-h | 6.1 g-i |
| 11 | Independence | 4.9 b-g | 5.4 b-e |
| 12 | Legendary | 4.5 ab | 4.9 ab |
| 13 | Authority | 5.2 e-h | 6.1 g-i |
| 14 | Bengal | 5.4 gh | 6.3 h-j |
| 15 | Kingpin | 5.2 d-h | 5.7 d-g |
| 16 | Villa | 4.8 b-e | 5.2 a-c |
| 17 | IS-AP 9 | 4.6 a-c | 5.9 f-h |
| 18 | Venus | 4.4 ab | 4.8 a |
| 19 | Vesper | 4.9 b-g | 5.5 c-f |
| 20 | Memorial | 5.3 gh | 6.2 g-j |
| 21 | 7 | 4.9 b-h | 5.3 b-d |
| 22 | Greenwich | 4.6 a-c | 5.1 a-c |
| 23 | Shark | 4.8 b-f | 5.9 e-h |
| 24 | MacKenzie | 4.9 b-g | 5.9 f-h |
| 25 | Tyee | 5.2 d-h | 6.2 h-j |
| 26 | Pennlinks II | 5.3 f-h | 6.0 f-h |
| **LSD 0.05** | **0.5** | **0.5** | |

## Table 5.

### Entries and sponsors in 2003 NTEP fairway trial

| Entry No. | Cultivar | Species | Sponsor |
|---|---|---|---|
| *1 | LS-44 | creeping | Links Seed, LLC |
| *2 | L-93 | creeping | Standard Entry |
| *3 | Bardot | colonial | Standard Entry |
| *4 | Penncross | creeping | Standard Entry |
| 5 | EWTR | colonial | Landmark Seed Co. |
| *6 | Alpha | creeping | Jacklin Seed by Simplot |
| *7 | T-1 | creeping | Jacklin Seed by Simplot |
| *8 | Princeville | creeping | LESCO, Inc. |
| 9 | 13-M | creeping | Pennington Seed |
| *10 | Declaration | creeping | Lebanon Turf Products |
| *11 | Independence | creeping | Lebanon Turf Products |
| *12 | Tiger II | colonial | Standard Entry |
| *13 | Authority | creeping | LESCO, Inc. |
| *14 | Bengal | creeping | Barenbrug USA |
| *15 | Kingpin | creeping | ProSeeds Marketing |
| *16 | Greentime | colonial | DLF International Seeds |
| *17 | Runner | creeping | DLF International Seeds |
| *18 | Shark | creeping | Mountain View Seeds, Ltd. |
| *19 | SR 7150 | colonial | Seed Research of Oregon |
| *20 | MacKenzie | creeping | Seed Research of Oregon/Pickseed |
| *21 | SR 1119 | creeping | Seed Research of Oregon |
| *22 | SR 1150 | creeping | Seed Research of Oregon |
| *23 | Pennlinks II | creeping | Tee-2-Green Corp. |
| *24 | Penneagle II | creeping | Tee-2-Green Corp. |
| *25 | Crystal BlueLinks | creeping | Tee-2-Green Corp. |
| 26 | PST-9NBC | colonial | Pure-Seed Testing, Inc. |
| 27 | PST-9VN | colonial | Pure-Seed Testing, Inc. |
| *28 | Seaside | creeping | Standard Entry |

*Commercially available in the U.S. in 2008.




When examining monthly quality performance based on the number of times a cultivar performs above the mean, the top group shrinks. In at least 26 monthly evaluations, only 13-M, Crystal BlueLinks, Declaration, Penneagle II, and T-1 performed above the mean (Table 7). Again, none of these grasses are colonial bentgrasses.

*Spring Green Up and Genetic Color* – Spring green up was similar throughout the 4 years of evaluation and there were no statistically significant differences among cultivars (Table 8). There were significant differences however, among genetic color ratings. Two creepers, T-1 and Kingpin, were darker green than the other cultivars in the trial. In fact, T-1 is a unique dark blue-green that stands out and will create an interesting contrast to other turfgrasses on your course. Also, the colonial bentgrasses tended to be more olive-green than the blue-green creepers.

## Recommendations and Future Activities

I often find it difficult to recommend cultivars for putting surfaces given the differences in management expertise, budgets, number of rounds per year, rootzones, and microclimates. In most cases, if you know that you're going to re-grass greens in the future, I would select several of the top performers in this trial and grow them for a couple of years on a practice green to evaluate performance under your specific environmental and management conditions. That stated, the two grasses that really performed well over the last two-and-a-half years of the putting green test were MacKenzie and Tyee. These two varieties stood out as probably the best putting green grasses we've grown over the past 20 years at our Urbana site. Unfortunately, I'm not aware of courses where either of these grasses has been tested under "real-world" conditions, so proceed cautiously if you're considering planting these types.

For fairways, the grasses 13-M, Crystal BlueLinks, Declaration, Penneagle II, and T-1 all performed well. Again, without some real world applications to evaluate, I would proceed slowly by trying to test grasses at your sites before undertaking a major re-grassing. On a side note, I have seen

T-1 planted in the tee boxes at Red Tail Run, a newer course in Decatur. The turf managers at the site are pleased with its performance due to its color, density, and re-growth.

In September, we'll be planting a new fairway trial in Urbana and a putting green trial in Glenview, at North Shore Country Club. If trends continue, these next trials will bring us some more outstanding grasses capable of providing the conditions demanded at the highest levels of golf. **-OC**

**Table 6**

**Quality performance of 28 bentgrasses in 2003 NTEP fairway trial**

**2004 – 2007**

| Entry No. | Cultivar | Mean Quality |
|---|---|---|
| 1 | LS-44 | 6.3 h-j |
| 2 | L-93 | 5.9 f-i |
| 3 | Bardot | 4.1 a-c |
| 4 | Penncross | 5.5 fg |
| 5 | EWTR | 4.6 cd |
| 6 | Alpha | 6.4 h-j |
| 7 | T-1 | 6.5 ij |
| 8 | Princeville | 5.9 f-h |
| 9 | 13-M | 6.3 h-j |
| 10 | Declaration | 6.5 j |
| 11 | Independence | 5.8 f-h |
| 12 | Tiger II | 4.7 cd |
| 13 | Authority | 6.2 h-j |
| 14 | Bengal | 5.9 f-j |
| 15 | Kingpin | 6.0 g-j |
| 16 | Greentime | 4.8 de |
| 17 | Runner | 6.3 h-j |
| 18 | Shark | 6.2 h-j |
| 19 | SR 7150 | 4.1 a-c |
| 20 | MacKenzie | 5.8 f-h |
| 21 | SR 1119 | 5.8 f-h |
| 22 | SR 1150 | 6.0 g-j |
| 23 | Pennlinks II | 5.3 ef |
| 24 | Penneagle II | 6.3 h-j |
| 25 | Crystal BlueLinks | 6.4 h-j |
| 26 | PST-9NBC | 4.4 b |
| 27 | PST-9VN | 3.8 ab |
| 28 | Seaside | 3.6 a |
| LSD 0.05 | 0.6 | |

**Table 7**

**Turf quality performance above the mean for 28 bentgrasses in 2003 NTEP fairway trial**

**2004 – 2007**

| Entry No. | Cultivar | April | May | June | July | August | September | October | Total |
|---|---|---|---|---|---|---|---|---|---|
| 25 | Crystal BlueLinks | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 28 |
| 7 | T-1 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 26 |
| 9 | 13-M | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 26 |
| 10 | Declaration | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 26 |
| 24 | Penneagle II | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 26 |
| 1 | LS-44 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 25 |
| 6 | Alpha | 4 | 3 | 4 | 4 | 2 | 4 | 4 | 25 |
| 17 | Runner | 3 | 4 | 4 | 4 | 2 | 4 | 4 | 25 |
| 13 | Authority | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 24 |
| 14 | Bengal | 3 | 2 | 4 | 4 | 3 | 4 | 3 | 23 |
| 22 | SR 1150 | 3 | 4 | 4 | 3 | 2 | 4 | 3 | 23 |
| 2 | L-93 | 4 | 2 | 3 | 3 | 2 | 4 | 4 | 22 |
| 11 | Independence | 3 | 2 | 4 | 4 | 3 | 3 | 3 | 22 |
| 18 | Shark | 3 | 4 | 4 | 3 | 4 | 2 | 2 | 22 |
| 15 | Kingpin | 2 | 3 | 4 | 2 | 3 | 3 | 4 | 21 |
| 21 | SR 1119 | 2 | 1 | 3 | 3 | 3 | 4 | 4 | 20 |
| 8 | Princeville | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 18 |
| 20 | MacKenzie | 2 | 1 | 3 | 2 | 4 | 2 | 4 | 18 |
| 23 | Pennlinks II | 1 | 1 | 1 | 2 | 3 | 2 | 4 | 14 |
| 4 | Penncross | 2 | 2 | 1 | 2 | 1 | 3 | 1 | 12 |
| 16 | Greentime | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 5 |
| 12 | Tiger II | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 4 |
| 26 | PST-9NBC | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 4 |
| 5 | EWTR | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| 3 | Bardot | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 27 | PST-9VN | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 19 | SR 7150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | Seaside | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |