

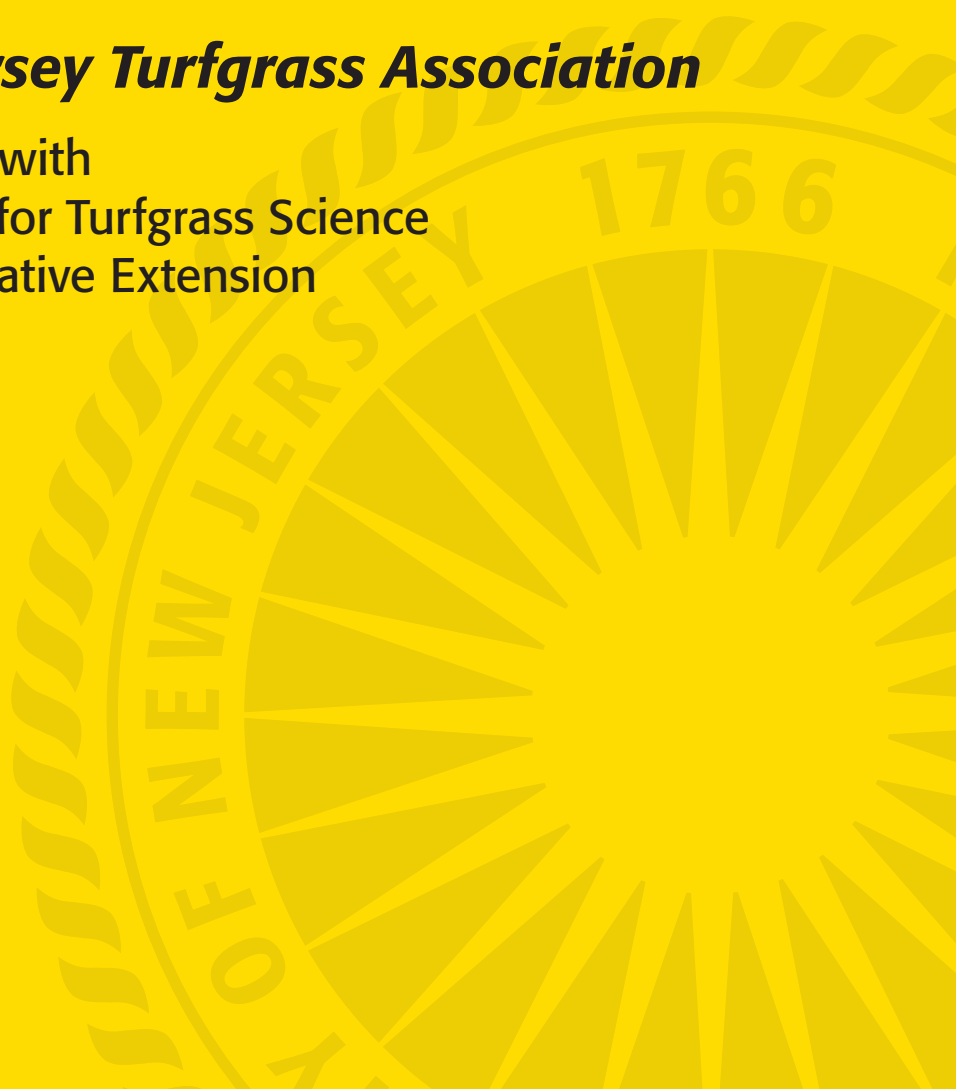
RUTGERS

New Jersey Agricultural
Experiment Station

20" 0 Turfgrass Proceedings

The New Jersey Turfgrass Association

In Cooperation with
Rutgers Center for Turfgrass Science
Rutgers Cooperative Extension



2010 RUTGERS TURFGRASS PROCEEDINGS

of the

GREEN EXPO Turf and Landscape Conference

December 7-9, 2010

Trump Taj Mahal

Atlantic City, New Jersey

The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, School of Environmental and Biological Sciences, Rutgers, The State University of New Jersey in cooperation with the New Jersey Turfgrass Association. The purpose of this document is to provide a forum for the dissemination of information and the exchange of ideas and knowledge. The proceedings provide turfgrass managers, research scientists, extension specialists, and industry personnel with opportunities to communicate with co-workers. Through this forum, these professionals also reach a more general audience, which includes the public.

This publication includes lecture notes of papers presented at the 2010 GREEN EXPO Turf and Landscape Conference. Publication of these lectures provides a readily available source of information

covering a wide range of topics and includes technical and popular presentations of importance to the turfgrass industry.

This proceedings also includes research papers that contain original research findings and reviews of selected subjects in turfgrass science. These papers are presented primarily to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

Special thanks are given to those who have submitted papers for this proceedings, to the New Jersey Turfgrass Association for financial assistance, and to Barbara Fitzgerald, Anne Diglio, and Anne Jenkins for administrative and secretarial support.

Dr. Ann Brooks Gould, Editor
Dr. Bruce B. Clarke, Coordinator

PERFORMANCE OF PERENNIAL RYEGRASS CULTIVARS AND SELECTIONS IN NEW JERSEY TURF TRIALS

Eric D. Koch, Melissa M. Wilson, Ronald F. Bara, William K. Dickson, Dirk A. Smith,
Eugeniusz Szerszen, Stacy A. Bonos, and William A. Meyer¹

Perennial ryegrass (*Lolium perenne* L.) is a cool-season, bunch type grass that performs well in a wide variety of soil conditions but thrives in dark rich soils in regions with mild climates (USDA, 2002). Perennial ryegrass is an important turfgrass because of its ability to germinate quickly, creating an attractive leafy appearance in a short period of time. Due to this trait, it is often used in the southern United States for overseeding dormant lawns and athletic fields. Perennial ryegrass is economically important because it allows for athletic play year-round in areas where warm season turfgrasses undergo dormancy. This species is attractive for this purpose because it germinates quickly, provides a playing surface during cold weather, and dies off in the summer months. Perennial ryegrass can also be used as permanent grass in temperate climates. It is often found in mixtures with slower germinating grasses such as Kentucky bluegrass (*Poa pratensis* L.) and the fine fescues (*Festuca* spp.) to help prevent soil erosion during lawn establishment and to increase traffic tolerance of the turf stand. In mixtures, perennial ryegrass is extremely competitive and if a high percentage is used, the turf stand will eventually be dominated by this species (Murphy and Mohr, 2002).

In 1967, the first turf-type perennial ryegrass, 'Manhattan,' became commercially available followed with the release of 'Pennfine' in 1970. Today, many more cultivars have been developed. These cultivars are readily available to turf managers for use in sports fields as well as home lawns. New cultivars have been improved upon to have increased general stress tolerance, insect and disease resistance, improved mowing quality, dark green color, and more uniform leaf texture as well as higher shoot density (Murphy and Park, 2004). The development of improved

perennial ryegrass cultivars continues at the New Jersey Agricultural Experiment Station as well as at other research facilities.

The center of origin for perennial ryegrass includes Europe, North Africa, and parts of Asia. International collection trips are being made in an effort to acquire new sources of germplasm. Perennial ryegrass collections can contain new desirable traits that can then be used to breed the next generation of improved perennial ryegrass cultivars. All cultivars available on the market today contain dominant traits found from the center of origin of that specific species.

Perennial ryegrass is susceptible to an array of diseases and one of these diseases is crown rust (caused by the fungus *Puccinia coronata*). Crown rust has a very complex life cycle that uses two very different hosts to complete. Rust first appears as a yellow flecking on infected leaf blades followed by raised pustules that break through the epidermis of the blade to release spores. This disease becomes severe on grasses that are under stressful conditions such as nutrient, water, and light deficiencies (Smiley et al., 2005). Currently, breeding efforts are underway to improve resistance to the detrimental crown rust pathogen.

One of the more important aspects of improved perennial ryegrass cultivars can be the presence of symbiotic fungi known as endophytes that live intercellularly within the leaf, sheath, and stem tissues. The presence of this endophyte (*Neotyphodium* spp.) can convey biotic and abiotic stress tolerance in many perennial ryegrasses (van Zijll de Jong et al., 2008). It has been shown that damage from foliar

¹Graduate Assistant, Field Researcher IV, Principal Laboratory Technician, Turfgrass Research Farm Supervisor, Principal Laboratory Technician, Senior Greenhouse and Field Technician, Associate Professor, and Research Professor, respectively, New Jersey Agricultural Experiment Station, School of Environmental and Biological Sciences, Rutgers, The State University of New Jersey, New Brunswick, NJ 08901-8520.

feeding insects, such as billbugs, sod webworm, and chinch bugs, can be significantly reduced by using a ryegrass cultivars containing endophytes due to the release of toxins (Ahmad et al., 1986; Funk et al., 1994). Endophytes are an important tool for turfgrass breeders as a biological control agent as restrictions tighten on pesticide usage in the turfgrass setting. The endophyte is transferred via seed to offspring; seed, therefore, should be stored under cool dry conditions post-harvest. Turfgrass breeders and researchers are continuing to research the beneficial role of endophytes in turfgrasses.

PROCEDURES

Two perennial ryegrass trials were established in 2008 and 2009. Both trials were seeded at Adelphia, NJ (Tables 1 and 2). Both Adelphia trials were hand sown with 0.88 oz of seed into 3 x 5 ft plots (3.7 lb seed/1000 ft²).

All trials were arranged in a randomized complete block design with three replications, and plots had a 6-inch unseeded border to limit contamination. A spring application of Dimension was used to control crabgrass on both trials in the month of April. The 2009 and 2008 trials (Tables 1 and 2) were also sprayed with Credit Extra for control of annual bluegrass (*Poa annua* L.). A second application of Credit Extra was applied to the 2008 trial (Table 1) in November. An application of Merit was made to the 2008 trial (Table 1) in July to control grub populations.

The annual rate of nitrogen (N) and mowing height for each trial is presented in Table 3. Single applications of fertilizer did not exceed 1.0 lb N/1000 ft². The amount and timing of nitrogen applied to the turf varied to encourage disease and other stresses. Trials were mowed regularly with reel mowers to maintain a 1.5-inch height of cut. Based on soil test results, the 2008 trial was limed in September to maintain a pH of 6.0 to 6.5. All trials were irrigated when necessary to avoid drought stress.

All trials were rated throughout the growing season for visual turf quality (i.e., overall appearance, turf color, uniformity, density, mowing quality, reduced rate of vertical growth, leaf texture, and freedom from insect and disease damage). Other ratings such as amount of residual reproductive stems and crown rust prevalence were rated when significant differences

were evident. All ratings were based on a 1 to 9 scale, with 9 representing the best turf characteristic. Plots were evaluated by a number of turfgrass specialists to reduce the impact of personal bias for particular characteristics. All data were summarized and subjected to an analysis of variance. Means were separated using Fisher's protected least significant difference (LSD) mean separation test.

RESULTS AND DISCUSSION

Results for all trials are presented in Tables 1 and 2. Entries in Table 1 are ranked according to the overall (multi-year) quality average. The trial presented in Table 2 is ranked by the average quality rating for 2010. A high quality average is generally indicative of better disease resistance, a darker bright green color, higher shoot density, uniformity, finer leaf texture, lower growth habit, improved mowing quality, and less damage due to insects.

Turf Quality

Perennial ryegrass has become a very popular species for home lawns, athletic fields, golf courses, and for overseeding purposes. Substantial improvements have been made to the overall turf quality of perennial ryegrass since the release of the first turf-type cultivars in the 1960s (Huff, 1997). Newer varieties and promising experimentals such as 04-10 LP, RKS, RHD Comp, Palmer IV, PPG-PR 123, and PPG-PR 109 possess a darker green color, a more uniform appearance, increased density, lower growth habit, cleaner mowing, and a better tolerance to disease and insects. Exacta, Cutter, Windstar, Caddieshack II, and Laquinta had lower ratings due to traits that do not fulfill the rating requirements.

Residual Reproductive Stems

A rating of "stemminess," or the amount of residual reproductive stems remaining in a plot after mowing, was taken in June 2010 on the 2009 perennial ryegrass trial (Table 2). Ratings were taken on a 1 to 9 scale with a 9 representing a plot with few residual reproductive stems. The lack of stemminess is an attractive trait as it allows for a more consistent and visibly appealing turfgrass stand. PST-Syn-2BRT, Zoom, Homerun, and Amazing GS all performed well for this trait while 2BSTAR, MJK comp, and PSG 4GM1 contained the most residual reproductive stems.

Crown Rust

A rating for crown rust was taken on the 2008 perennial ryegrass trial (Table 1) in September 2010 when rust pustules are typically ubiquitous and extremely visible on the turfgrass plant due to an orange/rust color. Ratings were taken on a 1 to 9 scale with 9 representing a perennial ryegrass plot minimally affected by the disease. Cultivars that showed promising resistance to crown rust include 04-10 LP, 06 O LP, and PST-2AG4-BS. Cultivars that contained large amounts of crown rust infections when ratings were taken were Exacta, PSG 4TPCUP, Affirmed, and Churchill.

SUMMARY

Turf type perennial ryegrass cultivars are some of the most versatile grasses available on the market today. High traffic tolerance, rapid establishment, and deep green color are extremely important traits that are raising the demand for perennial ryegrass in the turf grass seed industry. Although considerable improvements have been made to perennial ryegrasses, increased genetically stable resistance to diseases such as crown rust are still needed. In addition, increased heat and drought tolerance, cold hardiness, salinity tolerance, and the ability to survive under ice sheets for extended periods are also necessary.

ACKNOWLEDGMENTS

New Jersey Agricultural Experiment Station Publication No. E-12180-05-11. This work was conducted as a part of NJAES Project No. 12180, supported by New Agricultural Experiment Station, State and Hatch Act funds, the Rutgers Center for Turfgrass Science, and other grants and gifts from the United States Golf Association. Additional support was received by the New Jersey Turfgrass Association, the New Jersey Turfgrass Foundation, and the National Turfgrass Evaluation Program

REFERENCES

Ahmad, S., J. M. Johnson-Cicalese, W. K. Dickson, and C. R. Funk. 1986. Endophyte-enhanced resistance in perennial ryegrass to the bluegrass billbug, *Sphenophorus parvulus*. *Entomologia Experimentalis et Applicata* 41:3-10.

Funk, C. R., F. C. Belanger, and J. A. Murphy. 1994. Role of endophytes in grasses used for turf and soil conservation. Pages 201-209 *in*: C. W. Bacon and J. F. White Jr., eds., *Biotechnology of Endophytic Fungi of Grasses*. CRC Press, Boca Raton, FL.

Huff, D. R. 1997. RAPD characterization of heterogeneous perennial ryegrass cultivars. *Crop. Sci.* 37:557-564.

Murphy, J. A., and M. Mohr. 2002. Perennial ryegrass varieties for New Jersey. Rutgers Cooperative Extension, New Jersey Agricultural Experiment Station FS989.

Murphy, J. A., and B. S. Park. 2004. Perennial ryegrass varieties for New Jersey sports fields. Rutgers Cooperative Extension New Jersey Agricultural Experiment Station FS546.

Smiley, R. W., P. H. Dernoeden, and B. B. Clarke. 2005. *Compendium of Turfgrass Diseases*, 3rd. APS Press, St. Paul, MN.

USDA. Plant Fact Sheet, Perennial Ryegrass. United States Department of Agriculture Natural Resource Conservation Service. Feb. 2002.

van Zijll de Jong, E., M. P. Dobrowolski, N. R. Bannan, A. V. Stewart, K. F. Smith, G. C. Spangenberg, and J. W. Forster. 2008. Genetic Diversity of the Perennial Ryegrass Fungal Endophyte *Neotyphodium lolii*. *Crop Sci* 48:1487-1501.

Table 1. Performance of perennial ryegrass cultivars and selections in a turf trial established in August 2008 at Adelphia, NJ.

Cultivar or Selection	-----Turf Quality ¹ -----			Crown Rust ² Sept. 2010 Avg.
	2009- 2010 Avg.	2009 Avg.	2010 Avg.	
1 04-10 LP	6.4	7.1	5.6	7.7
2 RHD Comp	6.3	6.3	6.2	6.0
3 RKS	6.1	6.6	5.5	7.0
4 Palmer IV	6.0	6.6	5.3	6.3
5 Soprano	5.9	6.4	5.3	7.0
6 RAD-PR61	5.8	6.6	5.1	4.7
7 RAD-PR54	5.8	6.3	5.3	5.7
8 Exacta II GLSR	5.8	6.1	5.4	7.0
9 GM3	5.8	6.2	5.3	5.3
10 Homerun	5.8	6.1	5.4	5.3
11 PST-Syn-2LOC	5.7	5.7	5.6	6.7
12 Zoom	5.6	6.0	5.2	7.0
13 PSG 4MSH7	5.6	6.0	5.1	5.0
14 GL 31	5.6	5.8	5.3	6.0
15 Derby Xtreme	5.6	5.7	5.4	6.3
16 PCG 4EAGGL11	5.5	5.9	5.1	5.3
17 ROB Comp	5.5	5.8	5.3	5.0
18 HP1	5.5	5.7	5.2	6.0
19 PST-Syn-2STP	5.5	5.6	5.4	5.3
20 GL3	5.5	6.0	4.9	5.7
21 06 O LP	5.5	5.8	5.1	7.3
22 PSG 4MSHG	5.4	5.8	5.1	4.7
23 PSG 4MSH83	5.4	5.5	5.3	5.7
24 IS-PR 314	5.4	6.0	4.8	6.7
25 Top Hat 2	5.4	5.7	5.0	4.3
26 Edge II	5.4	5.9	4.8	5.3
27 PSG 4MSH27	5.4	5.5	5.2	5.0
28 PSG 4MSH45	5.3	5.7	5.0	5.3
29 RLB Comp	5.3	5.8	4.8	5.7
30 PSG 4MSH14	5.3	5.6	5.1	5.0
31 PSG 4MSW17	5.3	5.4	5.2	5.0
32 SR 4600	5.3	5.9	4.7	6.7
33 Dasher 3	5.3	5.9	4.7	6.7
34 Amazing GS	5.3	5.6	5.0	6.0
35 Revenge GLX	5.3	5.5	5.1	4.0

(Continued)

Table 1 (continued).

Cultivar or Selection	-----Turf Quality ¹ -----			Crown Rust ² Sept. 2010 Avg.
	2009- 2010 Avg.	2009 Avg.	2010 Avg.	
36 PSG 4CAGL1	5.3	5.3	5.3	2.7
37 Defender	5.3	5.9	4.7	6.0
38 RAD-PR60	5.3	5.8	4.8	4.0
39 RAD-PR58	5.3	5.4	5.1	5.3
40 PST-2AG4-BS	5.3	5.4	5.1	7.3
41 PST-2MAGS	5.3	5.8	4.7	6.0
42 PSG 4CAGL9	5.3	5.7	4.8	4.7
43 PSG 4GM1	5.3	5.6	4.9	6.0
44 PSG 4MSH6	5.2	5.6	4.9	5.7
45 Transformer	5.2	5.6	4.9	6.3
46 PST-2COL	5.2	5.4	5.0	4.3
47 PSG 4MSH47	5.2	5.5	4.9	4.0
48 UNO	5.2	5.4	4.9	5.3
49 PSG 4MSH33	5.2	5.3	5.0	6.0
50 PSG 4MSH48	5.2	5.3	5.1	3.7
51 Keystone 2	5.2	5.5	4.8	5.3
52 Stellar GL	5.2	5.5	4.8	5.3
53 PST-2K9	5.2	5.3	5.0	5.7
54 Silver Dollar	5.1	5.4	4.9	3.7
55 Paragon GLR	5.1	5.2	5.0	5.0
56 PSG 4MSH36	5.1	5.3	4.9	4.3
57 Vail II	5.1	5.3	4.9	5.7
58 PSG 4MSH34	5.1	5.3	4.9	3.3
59 RAD-PR57	5.1	5.2	4.9	4.3
60 PSG 4DSL5	5.1	5.5	4.6	5.0
61 PST-2NJK	5.1	5.1	5.0	6.0
62 Palmer GLS	5.0	5.4	4.7	4.7
63 Integra II	5.0	5.3	4.8	4.0
64 HU1	5.0	5.0	5.1	4.7
65 PST-2TPR	5.0	5.0	5.0	5.0
66 Apple GL	5.0	5.3	4.7	5.3
67 PSG 4MSH16	5.0	5.1	4.9	4.3
68 Charismatic II GLSR	5.0	5.3	4.6	4.3
69 08-4 LP	5.0	5.3	4.7	4.7
70 SR 4220	5.0	5.2	4.7	4.3

(Continued)

Table 1 (continued).

Cultivar or Selection	-----Turf Quality ¹ -----			Crown Rust ² Sept. 2010 Avg.
	2009- 2010 Avg.	2009 Avg.	2010 Avg.	
71 Phenom	5.0	5.2	4.7	4.7
72 Buena Vista GLSR	5.0	5.1	4.8	4.7
73 Hawkeye 2	5.0	4.9	5.0	2.7
74 Applaud II	4.9	5.2	4.6	3.7
75 PST-2R9R	4.9	4.9	4.9	4.7
76 SR 4550	4.9	5.1	4.7	4.3
77 PSG 4MSH31	4.9	5.0	4.8	6.0
78 PSG 4MSH12	4.9	5.0	4.8	4.0
79 04-8 LP	4.9	5.4	4.4	4.3
80 08-25 LP	4.9	5.3	4.5	5.3
81 RAD-PR62	4.9	5.3	4.5	3.7
82 RAD-PR59	4.9	5.1	4.6	5.7
83 1G Squared	4.9	5.0	4.7	5.7
84 PSG 4 PLK	4.9	4.9	4.8	3.7
85 PST-2AG\$	4.9	4.8	4.9	4.7
86 Repell GLS	4.8	4.9	4.7	4.3
87 PST-Syn-2SHR8	4.8	4.9	4.8	5.3
88 05 E PR	4.8	5.0	4.6	3.3
89 PST-2USD	4.8	4.5	5.1	5.0
90 Calypso 3	4.8	5.0	4.6	4.7
91 08-27 LP	4.8	4.9	4.7	5.0
92 PSG 4FSL1	4.8	5.1	4.4	4.3
93 Panther GLS	4.8	4.7	4.8	4.0
94 PST-bulk-2DARB	4.8	4.6	5.0	6.3
95 Harrier	4.8	5.3	4.2	6.3
96 RAD-PR56	4.8	5.2	4.3	3.3
97 PST-2TQL	4.8	4.8	4.7	5.3
98 Applaud	4.7	5.1	4.3	4.0
99 08-16 LP	4.7	4.9	4.5	4.3
100 07-13 PR	4.7	5.2	4.2	3.3
101 07-4 PR	4.7	5.2	4.1	4.0
102 PSG 4LCKP	4.7	5.0	4.3	4.3
103 Headstart 2	4.7	5.0	4.3	5.3
104 PST-2RH0	4.6	4.6	4.7	3.3
105 Wind Dance	4.6	4.6	4.6	4.0

(Continued)

Table 1 (continued).

Cultivar or Selection	-----Turf Quality ¹ -----			Crown Rust ² Sept. 2010 Avg.
	2009- 2010 Avg.	2009 Avg.	2010 Avg.	
106 SR 4420	4.6	4.9	4.3	4.3
107 Accent II	4.6	4.6	4.5	3.7
108 PST-2TSE	4.6	4.3	4.8	6.7
109 Wind Dance II	4.6	5.0	4.1	5.3
110 PST-2H2O	4.6	4.3	4.8	6.7
111 08-26 LP	4.5	5.1	4.0	2.3
112 Dart	4.5	4.7	4.4	4.0
113 PST-Syn-2MIN8	4.5	4.5	4.6	5.3
114 Jet	4.5	4.5	4.6	3.3
115 Pleasure Supreme	4.5	4.8	4.1	4.3
116 Top Gun II	4.5	4.5	4.5	2.7
117 Plateau	4.5	4.2	4.7	5.0
118 Gator 3	4.4	4.5	4.3	4.0
119 07-12 PR	4.4	4.7	4.0	2.7
120 08-3 LP	4.3	4.6	4.1	3.7
121 PSG 4HSL7	4.3	4.5	4.1	3.3
122 PST-2R57S	4.3	4.4	4.2	5.0
123 Penguin 2	4.3	4.1	4.4	2.7
124 08-5 LP	4.2	4.3	4.2	4.3
125 07-7 PR	4.2	4.3	4.1	4.3
126 PSG 4STDSP	4.2	4.3	4.1	3.7
127 STR 4TPCS	4.2	3.8	4.6	4.7
128 APR 1472	4.2	4.0	4.4	4.0
129 Hawkeye	4.2	4.1	4.2	4.3
130 SR 4682	4.2	4.2	4.1	2.3
131 PSG 4PSL8	4.2	4.0	4.3	3.0
132 PST-2SNS	4.1	4.0	4.3	6.0
133 PSG 4TPCSP	4.1	4.0	4.2	3.7
134 07-6 PR	4.1	4.5	3.7	4.3
135 Secretariat II GLSR	4.1	4.0	4.2	3.3
136 APR 1915	4.1	3.9	4.2	2.7
137 07-5 PR	4.1	4.0	4.2	6.0
138 Integra	4.1	4.2	3.9	3.3
139 PST-2NKR	4.1	3.9	4.2	4.0
140 Prelude GLS	4.0	4.0	3.9	3.0

(Continued)

Table 1 (continued).

Cultivar or Selection	-----Turf Quality ¹ -----			Crown Rust ² Sept. 2010 Avg.
	2009- 2010 Avg.	2009 Avg.	2010 Avg.	
141 PSG 4AZSLT	3.9	4.0	3.8	2.7
142 Calypso II	3.9	3.8	3.9	3.3
143 PSG 4STDUP	3.8	3.7	4.0	4.7
144 08-17 LP	3.8	3.8	3.8	3.0
145 Racer 2	3.8	3.8	3.8	2.3
146 Churchill	3.6	3.5	3.7	2.3
147 Charismatic	3.6	3.4	3.8	2.7
148 Fiesta 4	3.5	3.4	3.6	4.0
149 Affirmed	3.5	3.4	3.6	2.3
150 Shining Star II	3.5	3.5	3.5	3.3
151 Sonata	3.6	3.4	3.8	5.0
152 Goalkeeper II	3.5	3.4	3.7	3.0
153 08-12 LP	3.6	3.3	3.8	4.0
154 Shining Star	3.5	3.3	3.6	4.0
155 La Quinta	3.5	3.3	3.6	2.7
156 Caddieshack II	3.5	3.2	3.9	2.7
157 PSG 4TPCUP	3.4	3.1	3.7	2.3
158 Wind Star	3.4	3.0	3.8	3.0
159 Cutter	3.2	3.0	3.4	3.7
160 Exacta	3.3	3.0	3.6	2.3
LSD at 5% =	0.5	0.7	0.6	1.5

¹9 = best turf quality²9 = least disease

Table 2. Performance of perennial ryegrass cultivars and selections in a turf trial established in August 2009 at Adelphia, NJ.

Cultivar or Selection	Turf Quality ¹ 2010 Avg.	Stemminess ² June 2010 Avg.
1 PPG-PR 123	6.6	7.7
2 PPG-PR 109	6.5	7.7
3 PPG-PR 112	6.3	7.3
4 PPG-PR 114	6.2	6.7
5 PPG-PR 111	6.1	7.7
6 Amazing GS	6.1	8.0
7 PPG-PR 115	5.9	8.0
8 PR 909	5.9	6.7
9 RAD-PR65	5.9	7.7
10 Palmer V	5.9	6.7
11 2MAGS	5.8	5.7
12 PPG-PR 121	5.8	7.3
13 PSG 4MSH	5.8	7.7
14 RAD-PR58	5.7	7.0
15 PPG-PR 107	5.7	6.7
16 Pennant II	5.7	7.7
17 2USD-07	5.7	5.7
18 2AG4	5.7	7.7
19 RAD-PR66	5.7	7.7
20 PPG-PR 105	5.6	6.7
21 ESP comp	5.6	5.0
22 RAD-PR55R	5.6	7.3
23 Fiesta 4	5.6	6.3
24 PPG-PR 106	5.6	6.3
25 Exacta II	5.5	7.3
26 Buena Vista	5.5	7.0
27 SAM comp	5.5	6.3
28 APR 2037	5.5	8.0
29 HU1	5.5	5.3
30 PST-Syn-2BRT	5.5	8.3
31 SCPR1	5.5	7.0
32 Homerun	5.5	8.0
33 PST-Syn-2CIT	5.5	7.0
34 Zoom	5.5	8.0
35 PSG 4GM1	5.5	4.0

(Continued)

Table 2 (continued).

Cultivar or Selection	Turf Quality ¹ 2010 Avg.	Stemminess ² June 2010 Avg.
36 Soprano	5.4	6.3
37 2H20	5.4	7.7
38 HP1	5.4	6.0
39 PST-Syn-2MAG8	5.4	7.0
40 PPG-PR 113	5.4	4.3
41 Pleasure Supreme	5.4	7.3
42 2NKM-07	5.4	7.0
43 RAD-PR60	5.4	8.0
44 Hawkeye 2	5.4	7.0
45 PPG-PR 110	5.3	7.3
46 2R57S	5.3	5.7
47 Accent II	5.3	7.7
48 Top Gun II	5.3	8.0
49 PPG-PR 108	5.3	7.3
50 2DR9	5.3	5.0
51 2NJK	5.3	6.7
52 Repell GLS	5.2	5.7
53 SCPR2	5.2	6.7
54 RAD-PR53R	5.2	6.7
55 Harrier	5.2	5.3
56 PPG-PR 103	5.2	6.3
57 PPG-PR 122	5.2	4.7
58 IG Squared	5.2	6.7
59 Gray Fox	5.2	7.0
60 Silver Dollar	5.2	6.7
61 PST-Syn-2RLB	5.2	6.0
62 RAE comp	5.1	7.3
63 SR 4600	5.1	6.3
64 Charismatic II	5.1	6.0
65 RKS	5.1	7.7
66 PSG CKPN1	5.1	6.3
67 Headstart 2	5.1	7.3
68 Panther GLS	5.1	6.7
69 2LGS	5.1	5.7
70 2TQL-07	5.1	7.0
71 RAD-PR46R	5.1	7.3
72 PPG-PR 102	5.0	5.7
73 Gray Goose	5.0	6.7
74 Secretariat II	5.0	7.3
75 2TPR	5.0	7.7

(Continued)

Table 2 (continued).

Cultivar or Selection	Turf Quality ¹ 2010 Avg.	Stemminess ² June 2010 Avg.
76 Hawkeye	4.9	7.0
77 PSG 4SLUP2	4.9	6.3
78 PPG-PR 104	4.9	5.7
79 Line Drive GLS	4.9	7.0
80 Applaud II	4.9	7.3
81 Protégé	4.9	6.0
82 204D	4.9	6.7
83 SR 4420	4.9	6.3
84 Revenge GLX	4.8	6.3
85 Brightstar SLT	4.8	5.3
86 PST-Syn-2MIN	4.8	5.3
87 SR 4550	4.8	6.7
88 PPG-PR 118	4.8	6.7
89 Overdrive	4.7	7.3
90 Quicksilver	4.7	7.3
91 PSG PNCK1	4.7	4.7
92 SR 4220	4.7	7.3
93 Penguin 2	4.7	6.0
94 PSG 4SLTC	4.7	7.3
95 Wind Dance 2	4.6	7.7
96 Phenom	4.6	6.7
97 Monterey 3	4.6	7.3
98 MJK comp	4.6	4.0
99 RAD-PR49R	4.6	6.0
100 Calypso III	4.6	7.3
101 PPG-PR 117	4.6	7.3
102 Prelude GLS	4.5	6.0
103 Integra II	4.5	5.3
104 Apple GL	4.5	7.0
105 RAD-PR47R	4.5	6.3
106 SCPR3	4.4	7.3
107 Citation Fore	4.4	5.7
108 KSA comp	4.4	4.0
109 PPG-PR 119	4.4	5.7
110 PST-Syn-2BSTAR	4.4	3.3
111 PSG 4TPSP1	4.4	5.3
112 SR 4682	4.3	7.0
113 PSG 4TPSP2	4.2	7.0
114 PSG TPUP24	4.2	6.7
115 Exacta	4.2	6.3

(Continued)

Table 2 (continued).

Cultivar or Selection	Turf Quality ¹ 2010 Avg.	Stemminess ² June 2010 Avg.
116 Charismatic	4.2	7.0
117 APR 1915	4.1	7.3
118 Affirmed	4.1	7.0
119 STR 4TPCS	4.1	5.7
120 PPG-PR 101	4.0	7.0
121 Racer 2	4.0	6.7
122 PSG 4SLUP3	3.9	5.7
123 Churchill	3.9	6.3
124 Shining Star II	3.9	5.7
125 Calypso II	3.8	7.3
126 PPG-PR 120	3.7	7.3
127 Shining Star	3.7	6.0
128 Goal Keeper II	3.6	7.0
129 Caddieshack II	3.6	6.7
130 Laquinta	3.3	6.3
LSD at 5% =	0.8	1.3

¹9 = best turf quality

²9 = least amount of reproductive stems in turf stand

Table 3. Yearly nitrogen (N) applied and mowing height (Ht) on perennial ryegrass tests established at Adelphia, NJ.

	2009		2010	
	N ¹	Ht ²	N	Ht
Table 1 (2008).....	2.0	1.5	1.75	1.5
Table 2 (2009).....			2.00	1.5

¹Annual N applied (lb/1000 ft²)

²Mowing height in inches