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# 1997 RUTGERS TURFGRASS PROCEEDINGS

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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, Cook College, Rutgers University 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. Articles appearing in these proceedings are divided into two sections.

The first section (white pages) includes lecture notes of papers presented at the 1997 New Jersey Turfgrass Expo. Publication of the New Jersey Turfgrass Expo Notes provides a readily

available source of information covering a wide range of topics. The Expo Notes include technical and popular presentations of importance to the turfgrass industry.

The second section (green pages) includes technical research papers containing original research findings and reviews covering selected subjects in turfgrass science. The primary objective of these papers is 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 those individuals who have provided support to the Rutgers Turf Research Program at Cook College - Rutgers, The State University of New Jersey.

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

# PERFORMANCE OF TALL FESCUE CULTIVARS AND SELECTIONS IN NEW JERSEY TURF TRIALS

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Tall fescue (*Festuca arundinacea* Schreb.) is a cool-season grass that was originally introduced into the United States from Europe in the 1800s as a forage grass. It is well adapted to a wide range of soil and climatic conditions. The first tall fescue cultivars, Alta and Kentucky 31, were introduced in the early 1940s and were considered dual purpose (forage/turf). These cultivars had a vigorous, erect growth habit and good drought resistance. The higher mowing height requirements limited their functional use to lower maintenance utility turfs.

Since its inception in 1972, the focus of the tall fescue breeding program at Rutgers University has been to produce turf type cultivars that are lower growing, form an attractive, dense, and persistent turf with finer, darker green leaves, and possess improved pest resistance and stress tolerance. Tall fescue has become the predominant cool-season perennial forage grass grown in the United States, which is due in part to the introduction of cultivars such as Rebel and Rebel II from the Rutgers breeding program.

Tall fescue is a popular species for use in athletic fields, parks, and roadsides. It has a deep, extensive root system and, compared to most other cool-season turfgrasses, performs well under conditions of drought stress and wear. Tall fescue maintains an adequate turf cover even when infrequently mowed or under low fertility. It is, therefore, an excellent choice for roadside plantings or for erosion control. It is important to mention, however, that drought tolerance (i.e., good root extension) in tall fescue is only fully realized when adequate soil conditions ex-

ist. For example, shallow soils limit root growth and may cause tall fescue to perform similarly to many other cool-season turfgrasses. Improvements in leaf texture, density, color, and growth habit have made it feasible to use tall fescue successfully in mixes with 5 or 10% Kentucky bluegrass (by weight) without having the tall fescue plants stand out in the turf. These physical characteristics have been greatly improved during the past few decades; however, work is still needed for improved resistance to diseases such as Pythium blight and brown patch.

## PROCEDURES

Four tall fescue evaluation tests were established between 1993 and 1996 at the Rutgers Plant Science Research Station at Adelphia, New Jersey. In 1996, a tall fescue test was also established at the Turfgrass Research Facility at North Brunswick, New Jersey. All tests (Tables 2 to 5), except the 1993 test at Adelphia (Table 1), were hand sown in August or September using 0.88 oz of seed per 3 X 5 ft. plot. The 1993 Adelphia test was seeded in October with 1.8 oz per plot. Each entry was replicated a minimum of three times, and the plots were randomized in a complete block design.

The nitrogen fertility and mowing height history of each test is presented in Table 6. Tests were mowed during periods of active plant growth, and mowing was timed to avoid excessive accumulation of clippings. In general, reel mowers were used, and clippings were not collected. All tests were limed as needed to maintain a soil pH between 6.0 and 6.5. Broadleaf

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weeds were controlled with spring and fall applications of 2,4-D + Dicamba. Annual grassy weeds were controlled with a preemergent application of Dacthal.

Depending on test objectives, tests were maintained at different fertility levels and mowing heights. During the establishment phase and early years of certain tests, a high maintenance regime (high nitrogen fertility, irrigation to avoid drought stress, and a 1.5 inch height of cut) was followed to permit rapid evaluation for insect and disease resistance. For example, high levels of nitrogen were often used to encourage the development of brown patch and Pythium blight, two important diseases of tall fescue. As tests matured, nitrogen inputs were decreased, mowing height increased, and the turf was no longer irrigated so that entries could be evaluated under a lower maintenance situation.

All tests were visually rated for turf quality (the overall appearance of a turf) regularly throughout the growing season. Turf quality includes factors such as color, density, leaf texture, growth habit, and freedom from damage due to diseases or insects. Ratings were based on a 1 to 9 scale, where 9 represented the most desirable turf quality and the least pest damage. Whenever possible, turf was evaluated separately for characteristics such as resistance to brown patch, tolerance to heat and drought stress, and seedling emergence and establishment, which were rated during the first few months after plots are sown.

## RESULTS AND DISCUSSION

Results of each test are presented in Tables 1 through 5. Within each table, entries are ranked by the overall (multiple-year) turf quality average. The 1996 tests at Adelphia and North Brunswick are ranked by the 1997 turf quality average. The yearly ratings represent the average of many ratings taken during the growing season. Although overall turf quality ratings are generally indicative of turf performance, they do not specifically indicate how one entry compares to another in terms of color difference, seasonal

growth pattern, or reaction to specific diseases, insects, or other stress factors (even though all of these factors are components of overall turf quality).

**Turf Quality.** Recent entries represent a trend towards the development of tall fescues with a lower growth profile, higher tiller density, finer leaves, and darker green color. Under favorable environmental conditions, these entries produce a very acceptable turf. Results in Tables 1 through 5 indicate that major improvements in the turf characteristics of tall fescue have been made since Kentucky 31 was introduced in 1943. For example, two cultivars, Rebel and Arid, topped the tests when first released, but are now inferior to the experimental entries and cultivars that have been developed in the last few years.

**Disease Resistance.** Development of increased disease resistance is still an important breeding objective. Data from Table 2 indicate the need for improved resistance to brown patch, caused by the fungus *Rhizoctonia solani*. Since brown patch is usually more severe on the dense, lush cover that turf-type tall fescues produce, development of resistance to this disease has been difficult.

**Color.** Improvements in dark green color is very noticeable in Tables 4 and 5. Newer cultivars such as Gazelle, Picasso, and many of the experimental entries have a richer color than older cultivars such as Kentucky 31, Arid, and Rebel II. However, some of these improved entries are slower to green up in the spring, as shown in Table 5. For example, Picasso did not green up as early as the older turf-type varieties.

## SUMMARY

The tall fescue breeding effort has resulted in new entries with significant improvements in turf quality when compared to earlier introductions. The newer cultivars are more attractive turf-types with better resistance to many, but not all, diseases. The incorporation of endophytes into some cultivars has also helped to enhance

resistance to many harmful insect pests and increase persistence under unfavorable environmental conditions.

### **ACKNOWLEDGMENTS**

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Table 1. Performance of tall fescue cultivars and selections in a turf trial established in October 1993 at Adelphia, NJ.

	Cultivar or Selection	-----Turf Quality <sup>1</sup> -----				
		1994-1997 Avg.	1994 Avg.	1995 Avg.	1996 Avg.	1997 Avg.
1	Jaguar 3	6.0	6.7	5.4	5.9	5.8
2	Gazelle	5.7	6.4	5.5	5.8	5.1
3	Pixie	5.4	6.3	5.1	5.2	5.0
4	Rebel Jr	4.9	5.7	4.6	4.5	4.7
5	Rebel 3D	4.5	4.9	4.1	4.6	4.5
6	GQ	4.3	4.6	4.4	3.7	4.6
7	Arriba	4.3	4.6	3.8	4.2	4.4
8	Wrangler	4.1	4.3	4.0	3.7	4.3
9	Oasis	4.1	4.5	3.7	3.7	4.3
10	Rebel III	4.0	3.8	4.0	4.0	4.1
11	Rebel II	4.0	4.5	3.7	3.8	3.8
12	Amigo	3.9	4.3	3.4	3.7	4.3
13	Tribute	3.9	4.2	3.8	3.4	4.0
14	Mesa	3.3	3.4	3.2	3.1	3.5
15	Brigantine E+	3.3	3.0	3.2	3.4	3.7
16	Titan	3.2	3.5	2.7	3.1	3.4
17	Arid	3.2	3.4	2.8	3.0	3.5
18	Fawn	2.0	2.1	1.7	1.7	2.6
19	Ky-31	1.7	2.2	1.6	1.4	1.6
	LSD at 5% =	0.6	0.9	0.7	0.7	0.7

<sup>1</sup>9 = best turf quality

Table 2. Performance of tall fescue cultivars and selections in a turf trial established in September 1994 at Adelphia, NJ.

	Cultivar or Selection	-----Turf Quality <sup>1</sup> -----				Brown Patch <sup>2</sup> July 1997
		1995-1997 Avg.	1995 Avg.	1996 Avg.	1997 Avg.	
1	Southern Choice	5.0	5.7	5.1	4.1	3.7
2	Tomahawk	4.9	5.1	4.8	4.8	4.3
3	Pixie	4.9	5.3	4.8	4.6	4.7
4	LA 38	4.8	4.6	5.1	4.7	4.7
5	Jaguar III	4.7	5.5	4.4	4.3	4.0
6	Gazelle	4.7	5.5	4.6	4.1	2.3
7	Wrangler II	4.7	4.8	4.7	4.5	4.3
8	Marksman	4.7	5.1	4.4	4.5	4.3
9	Starlet	4.6	5.0	4.5	4.4	4.0
10	Safari	4.6	4.9	4.5	4.4	5.0
11	Renegade	4.5	5.0	4.3	4.2	3.7
12	Alamo	4.5	4.8	4.3	4.3	4.0
13	Rebel III	4.3	5.0	4.1	4.0	4.0
14	Falcon II	4.3	5.1	4.0	3.9	3.3
15	EA 37	4.2	4.1	4.4	4.2	3.7
16	GQ	4.2	4.2	4.1	4.4	4.3
17	Rebel 3D	4.1	4.9	3.8	3.5	2.7
18	Rebel Jr	4.0	4.6	3.7	3.7	4.0
19	Monarch	4.0	4.1	3.8	4.1	4.0
20	Crossfire	4.0	4.2	4.0	3.7	4.7
21	Oasis	3.9	4.0	3.7	3.9	4.0
22	Eldorado	3.9	4.1	3.4	4.2	4.3
23	Tribute	3.8	4.4	3.6	3.9	4.7
24	Rebel II	3.8	3.7	3.8	3.9	4.7
25	Rebel	3.7	4.0	3.5	3.6	4.3
26	Thunderbird	3.6	3.9	3.4	3.5	3.7
27	Winchester	3.6	4.1	3.1	3.6	4.0
28	Wrangler	3.3	3.4	2.9	3.7	3.7
29	Arid	3.2	3.5	2.9	3.3	4.0
30	Falcon	2.9	3.2	2.6	3.0	4.3

(Continued)

Table 2 (continued).

Cultivar or Selection	-----Turf Quality <sup>1</sup> -----				Brown Patch <sup>2</sup> July 1997
	1995-1997 Avg.	1995 Avg.	1996 Avg.	1997 Avg.	
31 FR-13	2.4	3.3	2.6	1.4	3.0
32 Ky 31	1.7	2.1	1.5	1.5	4.0
33 Fawn	1.5	1.8	1.3	1.3	4.7
LSD at 5% =	0.6	0.7	0.7	0.9	1.5

<sup>1</sup>9 = best turf quality

<sup>2</sup>9 = least brown patch

Table 3. Performance of tall fescue cultivars and selections in a turf trial established in August 1995 at Adelphia, NJ.

	Cultivar or Selection	-----Turf Quality <sup>1</sup> -----		
		1996-1997 Avg.	1996 Avg.	1997 Avg.
1	Masterpiece	6.4	6.7	6.0
2	ISI-H6	5.8	6.5	5.1
3	Syn R5AM-95	5.7	5.9	5.4
4	Syn R5AU-95	5.1	5.3	4.9
5	Pixie	5.1	5.7	4.5
6	Tarheel	5.1	5.2	4.9
7	Syn R5EL-95	5.1	5.2	4.9
8	Wolfpack	5.0	4.6	5.4
9	Hounddog V	5.0	5.3	4.6
10	Wrangler II	4.8	5.0	4.5
11	Tomahawk	4.7	5.0	4.5
12	Onyx	4.7	5.1	4.3
13	Safari	4.7	4.9	4.5
14	Rebel 3D	4.6	5.2	4.0
15	LA 38	4.6	4.6	4.6
16	Syn R5GEN-95	4.6	4.7	4.5
17	GQ	4.5	4.2	4.7
18	Lancer	4.4	4.4	4.3
19	Benton	4.3	4.4	4.2
20	Bravo	4.2	4.5	3.9
21	EA 41	4.2	4.4	4.0
22	Rebel Jr	4.2	4.1	4.3
23	Monarch	4.2	3.9	4.4
24	Duke	4.1	4.0	4.2
25	Mini Mustang	4.1	4.1	4.1
26	Oasis	4.0	3.6	4.4
27	Shenandoah	4.0	3.6	4.4
28	Montauk	4.0	4.0	3.9
29	Crossfire	4.0	3.8	4.1
30	LA 46	3.9	3.9	3.9

(Continued)

Table 3 (continued).

	Cultivar or Selection	-----Turf Quality <sup>1</sup> -----		
		1996-1997 Avg.	1996 Avg.	1997 Avg.
31	Maverick II	3.8	3.6	4.0
32	Stetson	3.8	3.1	4.5
33	Lion	3.8	3.5	4.1
34	Amigo	3.8	3.4	4.1
35	Rebel III	3.8	3.8	3.7
36	Arriba	3.7	3.3	4.1
37	Trailblazer II	3.7	3.6	3.8
38	Rebel II	3.6	3.7	3.5
39	Mustang	3.5	3.7	3.2
40	Savoy	3.4	3.1	3.7
41	Mesa	3.4	3.1	3.7
42	Arid	3.2	3.1	3.2
43	Fawn	1.2	1.2	1.2
	LSD at 5% =	0.6	0.7	0.7

<sup>1</sup>9 = best turf quality

Table 4. Performance of tall fescue cultivars and selections in a test established in September 1996 at North Brunswick, NJ.

Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Seedling Vigor <sup>2</sup> Sept. 25 1996	Seedling Vigor <sup>2</sup> Oct. 3 1996	Density <sup>3</sup> Oct. 3 1996	Color <sup>4</sup> Oct. 9 1996	Winter Quality <sup>1</sup> Dec. 16 1996	Leaf Texture <sup>5</sup> Nov. 7 1997
1 Millennium	6.8	8.7	4.7	8.3	6.7	5.0	6.7
2 MB 26	6.1	5.7	2.7	5.7	7.0	4.7	5.3
3 BAR Fa6 US2U	6.1	5.7	3.0	5.0	7.3	5.3	5.0
4 MB 213	6.0	6.3	3.3	6.7	7.3	5.3	5.7
5 J-98	6.0	4.7	3.0	4.7	7.7	4.7	5.0
6 MB 28	6.0	7.7	4.3	6.7	6.7	4.7	5.7
7 Pick FA 6-91	6.0	5.3	3.0	5.0	8.3	4.3	4.7
8 Plantation	5.9	8.0	4.3	7.7	6.0	5.0	6.7
9 Picasso	5.9	7.3	3.7	6.7	7.7	5.0	6.7
10 J-3	5.9	8.0	4.3	7.7	6.0	5.0	6.7
11 Coronado	5.9	6.0	3.7	6.3	7.0	5.3	5.0
12 Pick FA XK-95	5.9	5.0	2.3	3.7	6.0	5.0	6.3
13 BAR Fa6D USA	5.8	4.7	3.3	5.7	7.0	5.3	7.7
14 J-101	5.8	5.7	3.7	5.0	6.3	4.7	5.3
15 Gazelle	5.8	4.7	2.7	4.3	7.7	5.0	7.0
16 OFI-96-31	5.7	6.3	4.3	6.7	6.3	5.0	5.7
17 ZPS-5LZ	5.7	3.3	2.3	4.3	8.7	4.3	5.3
18 BAR FA 6D	5.7	7.0	3.7	7.3	6.0	5.0	6.7
19 Shortstop II	5.7	4.7	2.0	4.0	7.0	4.3	5.7
20 MB 29	5.6	6.7	4.0	5.7	7.3	4.3	4.3

(Continued)

Table 4 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Seedling Vigor <sup>2</sup> Sept. 25 1996	Seedling Vigor <sup>2</sup> Oct. 3 1996	Density <sup>3</sup> Oct. 3 1996	Color <sup>4</sup> Oct. 9 1996	Winter Quality <sup>1</sup> Dec. 16 1996	Leaf Texture <sup>5</sup> Nov. 7 1997
21	Pick FA 20-92	5.6	6.0	2.7	5.7	7.3	4.7	6.7
22	Anthem II	5.6	6.7	4.3	7.0	6.0	5.7	4.7
23	J-5	5.6	2.7	2.7	5.3	7.0	4.3	5.0
24	MB 215	5.6	6.7	3.7	5.3	7.0	4.3	5.0
25	MB 214	5.5	6.3	3.0	5.3	7.0	4.0	4.7
26	Sunpro	5.5	5.3	3.3	5.0	6.0	4.3	6.3
27	BAR Fa6 US1	5.5	4.0	2.0	3.3	7.0	5.0	7.0
28	Aztec II	5.5	8.7	4.7	8.0	5.7	5.3	6.0
29	BAR Fa6 US3	5.5	5.7	3.0	5.3	6.7	4.7	6.3
30	CU9501T	5.5	8.3	5.0	7.3	5.0	4.3	5.7
31	TA-7	5.5	8.0	5.3	7.0	6.3	5.7	4.7
32	Crossfire II	5.4	5.3	4.0	4.3	5.0	4.0	5.7
33	ISI-TF10	5.4	6.0	4.0	5.0	5.7	5.3	4.7
34	MB 216	5.4	8.0	4.0	7.3	6.7	5.0	3.7
35	AA-989	5.4	8.0	4.0	7.0	6.0	4.7	5.7
36	Coyote	5.4	5.3	3.3	4.7	7.0	5.0	6.0
37	PST-523	5.4	7.0	4.0	6.0	5.3	5.0	5.7
38	AA-A91	5.4	8.0	4.3	6.7	5.3	4.3	6.3
39	Genesis	5.4	8.7	5.0	7.7	5.7	4.3	5.0
40	Pick FA 15-92	5.4	3.3	2.7	2.7	6.7	4.3	6.7

(Continued)

Table 4 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Seedling Vigor <sup>2</sup> Sept. 25 1996	Seedling Vigor <sup>2</sup> Oct. 3 1996	Density <sup>3</sup> Oct. 3 1996	Color <sup>4</sup> Oct. 9 1996	Winter Quality <sup>1</sup> Dec. 16 1996	Leaf Texture <sup>5</sup> Nov. 7 1997
41	BAR FA6 US6F	5.3	6.0	4.3	5.7	6.0	4.7	6.0
42	Rembrandt	5.3	7.3	3.7	6.3	6.0	4.7	6.0
43	Twilight II	5.3	5.7	3.7	5.0	6.3	5.0	4.7
44	ZPS-2PTF	5.3	6.3	3.7	6.7	6.7	4.7	7.3
45	BAR FA 6LV	5.3	7.3	3.3	7.3	6.3	5.0	7.7
46	MB 212	5.3	7.7	5.3	7.3	5.7	5.0	5.7
47	Pick GA-96	5.3	4.0	3.3	5.0	6.3	4.7	6.3
48	SR 8210	5.3	8.3	4.3	8.0	5.7	4.3	5.7
49	Tarheel	5.3	5.3	4.3	6.0	4.7	4.7	4.3
50	ISI-TF-9	5.3	7.3	5.3	6.7	5.3	5.0	5.0
51	OFI-931	5.3	6.7	4.0	7.3	5.7	5.0	5.0
52	Pick FA B-93	5.3	6.0	3.3	6.7	6.0	4.3	7.3
53	Equinox	5.2	6.3	5.0	6.3	4.7	4.3	6.3
54	CU9502T	5.2	7.3	4.7	6.7	4.3	4.7	7.0
55	Pick FA N-93	5.2	2.0	1.7	2.0	7.3	4.3	4.7
56	SRX 8500	5.2	6.3	2.7	5.3	5.7	3.3	5.3
57	Apache II	5.2	7.3	3.7	6.7	5.0	4.3	5.0
58	MB 211	5.2	5.3	3.7	4.0	6.3	4.3	5.0
59	ATF-038	5.2	6.0	3.7	6.0	5.0	4.7	5.0
60	EA 41	5.2	4.7	3.3	5.0	6.7	3.3	5.0

(Continued)

Table 4 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Seedling Vigor <sup>2</sup> Sept. 25 1996	Seedling Vigor <sup>2</sup> Oct. 3 1996	Density <sup>3</sup> Oct. 3 1996	Color <sup>4</sup> Oct. 9 1996	Winter Quality <sup>1</sup> Dec. 16 1996	Leaf Texture <sup>5</sup> Nov. 7 1997
61	MB 210	5.2	6.7	4.3	5.0	4.7	4.3	5.3
62	Regiment	5.2	8.7	5.3	7.3	3.7	5.0	6.3
63	ATF-196	5.1	4.7	3.3	4.0	5.0	5.0	7.3
64	Koos 96-14	5.1	5.3	3.7	4.0	5.3	4.0	4.3
65	Masterpiece	5.1	5.3	3.7	3.0	5.3	4.7	7.3
66	PST-5E5	5.1	5.3	4.0	5.7	5.3	4.7	4.7
67	R5AU	5.1	9.0	4.7	8.7	4.7	4.0	5.7
68	Koelaria 'Barkeol'	5.1	2.0	1.0	1.0	3.3	3.3	8.7
69	WRS2	5.1	6.0	4.0	5.3	6.0	4.3	5.7
70	Pick RT-95	5.0	4.3	3.7	5.0	7.0	4.3	6.3
71	Rebel 3D	5.0	7.0	4.3	6.0	5.0	5.3	3.3
72	Renegade	5.0	8.0	5.7	7.7	4.0	4.3	3.7
73	WVPB-1D	5.0	6.7	5.7	6.7	4.7	4.3	5.7
74	OFI-951	5.0	5.0	3.0	5.0	6.3	4.3	7.0
75	Southern Choice	5.0	8.0	4.7	5.7	5.7	4.3	5.0
76	Alamo E+	4.9	6.3	4.3	6.7	6.3	4.3	5.0
77	Empress	4.9	5.3	3.7	4.0	5.0	4.0	6.3
78	Finelawn Petite	4.9	6.0	4.3	5.3	5.0	4.7	4.7
79	Coronado Gold	4.9	3.3	3.0	3.3	5.0	4.7	4.7
80	PST-5M5	4.8	5.3	4.0	4.7	4.3	4.0	5.0

(Continued)

Table 4 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Seedling Vigor <sup>2</sup> Sept. 25 1996	Seedling Vigor <sup>2</sup> Oct. 3 1996	Density <sup>3</sup> Oct. 3 1996	Color <sup>4</sup> Oct. 9 1996	Winter Quality <sup>1</sup> Dec. 16 1996	Leaf Texture <sup>5</sup> Nov. 7 1997
81	PST-5TO	4.8	4.0	4.3	3.3	5.7	5.0	6.0
82	Bravo	4.8	7.3	5.0	6.7	6.0	4.3	5.0
83	Tomahawk-E	4.8	3.3	3.7	3.0	5.3	4.7	5.0
84	WX3-275	4.8	6.0	4.0	5.7	5.7	3.7	4.3
85	Duster	4.8	7.0	5.0	5.7	5.0	4.3	6.0
86	WVBP-1B	4.8	7.3	5.3	6.0	5.0	4.7	5.0
87	WVPB-1C	4.8	5.7	5.0	5.3	5.7	5.3	5.0
88	ISI-TF11	4.8	7.0	4.7	6.3	4.3	4.0	4.3
89	Tulsa	4.8	7.0	4.7	6.0	5.0	5.3	6.7
90	Falcon II	4.7	9.0	6.3	8.3	4.7	4.7	5.3
91	Jaguar 3	4.7	6.0	4.3	6.0	5.3	4.7	5.0
92	ATF-022	4.7	5.7	4.0	5.3	5.0	3.7	4.7
93	OFI-FWY	4.7	6.0	4.0	5.7	5.0	4.7	6.0
94	ATF-188	4.7	6.3	4.0	5.3	5.0	4.7	6.7
95	Cochise II	4.6	4.7	3.7	4.0	5.7	4.3	5.0
96	Pick FA UT-93	4.6	3.7	2.0	3.7	7.7	3.3	6.7
97	ATF-253	4.6	6.0	3.7	4.7	5.0	3.7	4.3
98	EC-101	4.6	6.0	5.3	5.0	4.3	4.3	4.3
99	OFI-96-32	4.6	6.0	4.7	6.0	6.0	4.7	3.0
100	Wolfpack	4.6	6.0	4.3	4.7	4.7	4.0	4.3

(Continued)

Table 4 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Seedling Vigor <sup>2</sup> Sept. 25 1996	Seedling Vigor <sup>2</sup> Oct. 3 1996	Density <sup>3</sup> Oct. 3 1996	Color <sup>4</sup> Oct. 9 1996	Winter Quality <sup>1</sup> Dec. 16 1996	Leaf Texture <sup>5</sup> Nov. 7 1997
101	ATF-020	4.5	5.0	3.3	3.7	4.0	4.3	3.3
102	Leprechaun	4.5	7.7	3.3	7.0	4.7	4.3	6.3
103	AA-983	4.5	4.0	2.7	3.7	7.0	5.0	5.7
104	Lion	4.5	4.7	3.7	5.0	4.7	3.7	4.7
105	Marksman	4.5	8.0	5.3	7.7	4.3	4.7	4.3
106	ATF-182	4.4	6.0	3.7	4.7	3.7	4.3	4.7
107	PSII-TF-9	4.4	6.3	5.0	6.3	4.7	4.0	3.3
108	DP 50-9011	4.4	6.3	6.3	5.3	4.7	5.0	5.7
109	PSII-TF-10	4.4	4.7	3.0	4.3	4.7	4.3	3.7
110	Pixie E+	4.3	7.7	4.7	6.3	5.3	4.3	4.3
111	SSDE31	4.3	5.3	4.7	4.3	4.7	5.0	5.0
112	Mustang II	4.2	7.0	5.0	6.3	3.7	4.0	5.0
113	SRX 8084	4.2	6.3	4.7	6.3	4.3	4.0	4.3
114	SS45DW	4.2	4.7	5.0	4.7	4.3	4.3	3.7
115	Titan 2	4.2	9.0	7.3	8.7	3.3	3.7	4.3
116	PC-AO	4.2	6.0	4.7	5.3	4.0	4.0	4.0
117	PST-R5AE	4.1	5.0	4.0	4.7	5.0	4.3	5.3
118	Shenandoah	4.1	8.7	7.3	7.7	3.3	4.0	3.7
119	JSC-1	4.1	5.0	4.3	4.3	4.0	3.7	3.0
120	TMI-N91	4.1	7.0	5.7	6.7	4.3	4.3	5.7

(Continued)

Table 4 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Seedling Vigor <sup>2</sup> Sept. 25 1996	Seedling Vigor <sup>2</sup> Oct. 3 1996	Density <sup>3</sup> Oct. 3 1996	Color <sup>4</sup> Oct. 9 1996	Winter Quality <sup>1</sup> Dec. 16 1996	Leaf Texture <sup>5</sup> Nov. 7 1997
121	Safari	4.0	8.7	6.3	8.7	3.7	3.7	4.7
122	ATF-192	3.9	6.0	3.0	5.0	4.0	3.3	4.3
123	Bonsai	3.9	5.3	3.0	4.0	4.7	4.0	4.7
124	Rebel Jr	3.8	5.3	4.7	5.3	4.0	4.0	2.7
125	H7 Space GR 95	3.6	8.0	6.7	7.3	3.7	3.0	4.3
126	ATF-257	3.5	6.0	5.0	5.7	3.3	3.7	5.3
127	JTFC-96	3.5	6.0	5.7	5.0	3.0	4.0	3.0
128	PRO 8430	3.5	5.3	4.0	4.0	3.3	3.7	4.3
129	JTFA-96	3.3	6.0	5.7	5.3	3.0	3.3	4.7
130	Arid	3.2	9.0	8.0	7.7	2.3	3.3	2.0
131	DLF-1	3.1	6.0	6.7	5.0	3.3	3.7	3.0
132	Rebel II	2.7	5.0	5.3	4.7	3.0	4.0	1.7
133	AV-1	2.6	4.7	5.3	3.7	3.3	3.3	2.0
134	DP 7952	2.5	8.3	7.3	7.3	2.7	3.3	2.3
135	Kentucky-31 E+	1.8	9.0	8.7	8.0	2.0	2.0	1.0
	LSD at 5% =	0.9	1.9	1.2	2.5	1.3	1.2	2.0

<sup>1</sup>9 = best turf quality<sup>2</sup>9 = most vigorous turf<sup>3</sup>9 = densest turf<sup>4</sup>9 = darkest green color<sup>5</sup>9 = finest leaf texture

Table 5. Performance of tall fescue cultivars and selections in a turf trial established in September 1996 at Adelphia, NJ.

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Establish- ment <sup>2</sup> Sept. 1996	Color <sup>3</sup> Oct. 1996	Early Spring Green-up <sup>4</sup> April 1997	Fine Leaf Texture <sup>5</sup> Oct. 1997
1	Gazelle	6.3	5.7	7.7	5.7	6.7
2	Picasso	6.2	6.3	6.7	4.7	5.3
3	Millenium	6.1	7.3	6.7	6.3	6.0
4	BAR FA 6 US3	6.0	6.3	6.7	5.0	5.7
5	TA-7	6.0	6.7	6.7	6.7	5.3
6	Coyote	6.0	6.0	7.3	5.7	5.7
7	AA-A91	5.9	6.7	6.7	6.0	6.3
8	Plantation	5.8	6.7	7.0	6.0	5.3
9	Rembrandt	5.7	6.3	6.7	6.0	5.3
10	MB-26	5.7	7.0	7.3	4.0	6.7
11	MB-213	5.7	5.7	7.7	4.0	5.0
12	MB-29	5.7	6.3	6.3	4.3	5.3
13	BAR FA 6 US1	5.6	5.7	7.0	4.7	6.3
14	WRS2-1A	5.6	6.7	6.7	6.0	5.7
15	Pick FA B-93	5.6	6.3	6.0	6.3	7.3
16	MB-214	5.5	6.0	7.7	5.0	5.3
17	J-98	5.5	6.3	7.0	4.3	6.0
18	OFI-951	5.5	6.0	6.7	4.3	5.7
19	Apache II	5.5	7.0	5.3	5.3	5.7
20	BAR FA 6LV	5.5	6.0	6.3	4.0	5.3
21	J-101	5.5	5.3	5.7	4.3	5.0
22	BAR FA 6D USA	5.5	5.0	6.7	4.3	6.0
23	ZPS-2PTF	5.5	6.3	6.0	4.7	5.7
24	ZPS-5L2	5.4	5.0	8.0	4.0	5.3
25	MB-215	5.4	6.0	7.0	4.3	5.0
26	Pick FA 20-92	5.4	5.7	6.7	3.7	5.0
27	SRX 8500	5.4	6.3	6.3	4.0	6.0
28	Pick FA XK-96	5.4	5.7	6.7	4.3	6.3
29	Coronado	5.4	6.3	6.7	5.7	5.0
30	MB-216	5.4	6.3	7.3	4.3	4.3

(Continued)

Table 5 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Establishment <sup>2</sup> Sept. 1996	Color <sup>3</sup> Oct. 1996	Early Spring Green-up <sup>4</sup> April 1997	Fine Leaf Texture <sup>5</sup> Oct. 1997
31	OFI-96-31	5.4	7.0	6.7	5.0	6.3
32	Pick RT-95	5.4	5.0	6.3	5.3	5.7
33	AA-989	5.4	6.7	6.7	4.3	5.0
34	WRS2	5.4	6.3	6.7	5.3	5.0
35	PST-5E5	5.3	6.3	6.0	5.0	5.7
36	CU 950 1T	5.3	6.7	6.0	6.3	5.0
37	Aztec II	5.3	7.0	6.0	5.7	5.7
38	Twilight II	5.3	5.7	6.0	4.0	4.7
39	J-5	5.2	4.7	6.7	4.0	5.3
40	MB-212	5.2	6.0	6.0	4.7	5.7
41	Tarheel	5.2	6.0	5.0	4.7	4.7
42	BAR FA 6D	5.2	6.3	6.0	5.7	6.7
43	Equinox	5.2	7.0	5.3	5.3	6.0
44	MB-211	5.2	7.0	6.3	4.7	5.7
45	Masterpiece	5.2	5.7	6.0	5.3	5.3
46	MB-28	5.2	6.7	6.7	4.0	5.3
47	Tulsa	5.1	6.3	5.7	5.7	5.7
48	Rebel 3D	5.1	6.3	6.0	6.0	5.0
49	ISI TF-10	5.1	5.7	5.7	5.0	4.7
50	OFU-FWY	5.1	6.7	6.0	5.3	6.3
51	Pick FA 6-91	5.1	5.7	7.3	4.3	5.3
52	PST-5M5	5.1	6.3	6.3	4.3	5.7
53	Empress	5.1	5.7	5.7	4.7	6.0
54	MB-210	5.1	6.3	6.0	6.0	6.3
55	RG-93	5.0	6.7	6.3	5.0	5.3
56	SR 8210	5.0	7.0	5.3	5.7	6.0
57	BAR FA 6 US2U	5.0	6.3	6.7	5.0	4.7
58	J-3	5.0	5.7	6.3	4.3	5.0
59	WVPB-1C	5.0	5.7	5.3	6.0	5.0
60	OFI-931	5.0	6.7	6.0	5.0	6.0

(Continued)

Table 5 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Establishment <sup>2</sup> Sept. 1996	Color <sup>3</sup> Oct. 1996	Early Spring Green-up <sup>4</sup> April 1997	Fine Leaf Texture <sup>5</sup> Oct. 1997
61	KOOS 96-14	5.0	6.3	6.0	5.7	4.7
62	Southern Choice	5.0	6.7	5.7	6.0	5.7
63	BAR FA6 US6F	5.0	5.7	5.7	4.3	5.0
64	ATF-196	5.0	5.7	6.3	5.0	5.3
65	PST-523	5.0	6.0	5.0	6.0	5.3
66	Alamo E+	4.9	6.3	5.7	4.0	5.3
67	Shortstop II	4.9	6.0	6.3	4.3	5.7
68	Renegade	4.9	6.7	5.0	5.7	4.3
69	WVPB-1B	4.9	6.0	5.0	6.0	5.0
70	Pick GA-96	4.8	6.0	6.3	4.7	5.0
71	Genesis	4.8	6.3	5.3	5.7	4.7
72	Pick FA N-93	4.8	4.7	6.7	3.3	4.3
73	Pixie E+	4.8	6.0	5.0	6.0	5.3
74	Wolfpack	4.8	6.0	5.0	6.0	5.3
75	OFI-96-32	4.8	6.0	5.7	5.3	4.7
76	Sunpro	4.8	5.0	6.3	4.7	5.0
77	Pick FA UT-93	4.8	5.7	7.0	3.0	6.0
78	PST-5TO	4.7	6.0	5.3	5.7	5.3
79	PC-AO	4.7	6.3	5.0	6.0	4.7
80	Anthem II	4.7	6.7	6.3	5.3	6.7
81	Duster	4.7	6.0	6.0	5.3	4.7
82	Crossfire II	4.7	5.7	5.7	5.0	4.3
83	Finelawn Petite	4.7	6.7	5.0	6.0	5.0
84	PS11 TF-9	4.6	6.3	5.0	5.7	4.7
85	Coronado Gold	4.6	5.3	6.0	5.3	5.0
86	EC-101	4.6	6.3	5.0	5.7	4.7
87	R5AU	4.6	6.0	5.0	5.7	5.0
88	AA-983	4.6	5.0	6.7	4.0	4.7
89	ATF-038	4.6	5.7	5.7	5.3	4.3
90	Regiment	4.5	6.3	5.3	5.7	5.7

(Continued)

Table 5 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Establishment <sup>2</sup> Sept. 1996	Color <sup>3</sup> Oct. 1996	Early Spring Green-up <sup>4</sup> April 1997	Fine Leaf Texture <sup>5</sup> Oct. 1997
91	ATF-182	4.5	6.0	5.3	5.3	6.7
92	ATF-020	4.5	5.7	5.3	6.7	6.0
93	PS11 TF-10	4.5	5.3	5.7	5.0	5.7
94	ATF-253	4.5	5.3	4.7	4.3	5.0
95	CU 950 2T	4.5	6.3	4.7	5.3	5.7
96	ATF-188	4.4	5.7	5.7	5.0	5.3
97	Safari	4.4	7.0	4.3	7.7	5.3
98	Lion	4.4	6.0	5.0	4.0	5.0
99	Marksman	4.4	5.7	5.7	6.0	5.7
100	ISI TF-9	4.4	5.7	5.3	6.0	5.0
101	ISI TF-11	4.4	6.7	5.3	4.7	4.7
102	Debutante	4.4	7.0	4.3	5.0	6.3
103	Leprechaun	4.4	6.7	4.7	5.3	5.7
104	Cochise II	4.3	6.0	6.0	4.3	5.7
105	Mustang II	4.3	6.0	4.7	5.3	4.7
106	Falcon II	4.3	6.3	5.0	6.7	6.0
107	SRX 8084	4.3	7.0	5.0	5.3	5.0
108	Pick FA 15-92	4.3	4.3	6.3	3.3	5.0
109	WVPB-1D	4.3	6.0	5.3	5.3	5.0
110	Rebel Jr.	4.3	5.7	4.3	5.3	4.7
111	SS 45 DW	4.3	5.7	5.0	4.7	5.0
112	ATF-022	4.3	5.3	4.7	6.7	5.7
113	Jaguar 3	4.3	5.3	5.3	5.3	6.0
114	Shenandoah	4.2	6.7	3.7	6.7	4.7
115	WX3-275	4.2	6.3	5.3	3.3	5.3
116	SS DE 31	4.2	5.0	4.3	5.0	3.7
117	TMI N91	4.2	6.3	4.7	5.7	5.0
118	Bandanna	4.1	6.0	4.7	5.0	5.3
119	EA 41	4.1	7.0	6.0	3.7	5.7
120	PRO 8430	4.1	6.3	5.0	4.7	5.0

(Continued)

Table 5 (continued).

	Cultivar or Selection	Turf Quality <sup>1</sup> 1997 Avg.	Establishment <sup>2</sup> Sept. 1996	Color <sup>3</sup> Oct. 1996	Early Spring Green-up <sup>4</sup> April 1997	Fine Leaf Texture <sup>5</sup> Oct. 1997
121	ATF-192	4.1	6.3	5.0	4.3	5.7
122	ATF-257	4.0	5.7	4.3	5.3	5.3
123	JSC-1	4.0	5.0	5.0	4.7	4.3
124	Tomahawk E+	4.0	5.0	5.7	4.3	4.0
125	Bonsai	3.9	5.0	4.7	4.7	4.3
126	Shenandoah	3.8	6.7	4.0	6.0	5.0
127	JTTFA-96	3.7	5.3	3.7	6.3	5.7
128	Veranda	3.7	6.7	4.3	6.0	5.0
129	Titan 2	3.7	7.0	3.7	5.7	5.0
130	JTTFC-96	3.6	5.3	3.7	5.7	3.7
131	DP 50-9011	3.5	5.3	4.7	5.0	4.7
132	DLF-1	3.3	5.7	3.3	7.0	4.0
133	Rebel II	3.2	5.0	3.0	6.3	3.0
134	AV-1	3.1	5.0	3.7	5.0	4.7
135	DP 7952	2.9	6.3	2.3	6.7	3.3
136	Arid	2.7	6.0	2.3	7.3	5.3
137	Kentucky 31 E+	1.4	6.7	1.0	6.7	1.0
	LSD at 5% =	0.6	1.0	1.0	1.1	1.4

<sup>1</sup>9 = best turf quality<sup>2</sup>9 = best establishment<sup>3</sup>9 = darkest green color<sup>4</sup>9 = most active<sup>5</sup>9 = finest leaf texture

Table 6. Yearly nitrogen (N) applied and mowing height (Ht) on tall fescue tests established at North Brunswick and Adelphia, NJ

	1994		1995		1996		1997	
	N <sup>1</sup>	Ht <sup>2</sup>	N	Ht	N	Ht	N	Ht
Table 1 (1993 Adelphia) .....	3.5	1.5	4.8	2.0	2.8	2.0	2.1	2.0
Table 2 (1994 Adelphia) .....			4.8	2.0	2.8	2.0	2.1	2.0
Table 3 (1995 Adelphia) .....					5.0	1.5	3.3	1.5
Table 4 (1996 North Brunswick) .....							4.4	1.5
Table 5 (1996 Adelphia) .....							4.5	1.5

<sup>1</sup>Annual N applied (lbs/1000 ft<sup>2</sup>).

<sup>2</sup>Mowing height in inches.