RUTGERS

New Jersey Agricultural
Experiment Station

2019
Turfgrass Proceedings

The New Jersey Turfgrass Association

In Cooperation with
Rutgers Center for Turfgrass Science
Rutgers Cooperative Extension

2019 RUTGERS TURFGRASS PROCEEDINGS

of the

GREEN EXPO Turf and Landscape Conference
December 10-12, 2019
Borgata Hotel
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 2019 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 Anne Diglio, Barbara Fitzgerald, and Nalini Kaul for administrative support.

Deborah Spinella, Proceedings Layout Editor
Dr. Bruce B. Clarke, Coordinator

TALL FESCUE PERFORMANCE AT RUTGERS HORT. FARM NO. 2

Bradley S. Park and James A. Murphy[1]

INTRODUCTION

The evaluation of tall fescue (*Schedonorus arundinaceus* [Schreb.] Dumort. syn. *Festuca arundinacea* Schreb. syn. *Lolium arundinaceum* [Schreb.] Darbysh.) tolerance to traffic (wear and compaction) is a Rutgers Center for Turfgrass Science research priority, in part, because tall fescue cultivars are frequently established on sports fields and other recreational surfaces subject to traffic.

We are using the Rutgers Wear Simulator (RWS; Bonos et al., 2001) and Cady Traffic Simulator (CTS; Henderson et al., 2005) to impart traffic stress damage to turf plots at Rutgers Hort. Farm No. 2. The traffic tolerance of entries comprising the 2012 National Turfgrass Evaluation Program (NTEP) Tall Fescue test was reported in previous Rutgers Turfgrass Proceedings (Park et al. 2014, 2015, 2016, 2018). The 2018 NTEP Tall Fescue test was established at Rutgers Hort. Farm No. 2 in early autumn 2018.

The objective of this study was to assess the traffic tolerance of tall fescue cultivars and experimental selections comprising the 2018 NTEP Tall Fescue Test during autumn 2019.

MATERIALS AND METHODS

Evaluation Trial

The one-hundred-thirty-two (132) entries of the 2018 Tall Fescue Trial were seeded into 5 x 6-ft plots in September 2018 on a well-drained loam (sand=44%; silt=31%; clay=25%) at Hort. Farm No. 2 in North Brunswick, NJ. The seeding rate was 6.0 lb seed per 1000 ft^2.

Soil test results from spring 2018 indicated that the soil pH was 5.9; soil phosphorous (P) and potassium were 105 and 455 lb per acre (Mehlich 3), respectively. The test was mowed approximately two times per week at a height of 1.5-inch. Evapotranspiration data were used to guide irrigation system programming with the primary goal to avoid excessive wetness or tall fescue developing severe drought stress symptoms.

One (1) lb of N per 1000 ft^2 as 16-0-8 was applied at seeding on 20 September 2018 followed by 0.9 lbs N per 1000 ft^2 on 5 October 2018. A total of 4.5 lb N per 1000 ft^2 was applied in 2019 (1.0, 0.6, 0.7, 0.7, 0.7, and 0.8 lb N per 1000 ft^2 on 4 April, 10 May, 31 May, 11 July, 27 August, and 7 October 2019, respectively).

Crabgrass (*Digitaria* spp.) was controlled on a preemergence basis and turfgrass diseases including brown patch (caused by *Rhizoctonia solani*) and Pythium spp. were controlled preventatively during summer 2019 to improve assessment of entry response to traffic.

Application of Wear and Traffic Stresses

Traffic was applied as a strip-plot to approximately ½ of each tall fescue plot. The other ½ of each plot did not receive traffic. During autumn, 28 passes of traffic were applied using a combination of the RWS and a vibratory pavement roller (14 passes of each machine) from 3 to 30 September 2019. Initially, two passes with the RWS and two passes with the roller were made per week from 3 to 20 September 2019; this intensity of traffic was deemed insufficient. Traffic intensity was increased to 4 passes per week with each machine from 23 to 30 September 2019.

The RWS was operated at ground speed of 2.5 miles per hour (mph) and 250 rpm for the paddles. The pavement roller (~ 2500 lb) was operated at 2.4 mph with the vibratory function engaged. Every other pass of each machine was made in the opposite direction.

[1]Sports Turf Education and Research Coordinator and Extension Specialist in Turfgrass Management, respectively. New Jersey Agricultural Experiment Station, School of Environmental and Biological Sciences, Rutgers, The State University of New Jersey, New Brunswick, NJ 08901-8520.

Evaluation of the Effects of Traffic

Trafficked and non-trafficked plots were visually assessed for uniformity of turf cover (1 to 9 scale; 9=most complete turf cover) and fullness of turfgrass canopy (0 to 100% scale; 100% = full canopy) at the conclusion of the autumn 2019 traffic period.

A digital camera (Canon PowerShot G12; Canon USA, Inc., Lake Success, NY) was positioned within an enclosed box equipped with artificial lighting to capture digital images of trafficked and non-trafficked plots at the conclusion of each seasonal traffic period. Individual digital image size was 1600 x 1200 pixels and camera settings included a shutter speed of 1/40 s, and aperture of F2.8, and ISO of 100 and a focal length of 7 mm.

Images were imported into Turf Analyzer (Green Research Services, LLC, Fayetteville, AR) to determine green cover (0 to 100% scale; 100%=complete green cover). A hue range of 50 to 107 and a saturation range of 0 to 100 were used in the software to identify green leaves in the images.

Trial data were analyzed as a 2 (traffic and no traffic) x 132 (entries) factorial arranged in a strip-plot design with the three replications. Data were subjected to analysis of variance and means were separated using Fisher's protected least significant difference (LSD) test at p ≤ 0.05.

Evaluation of Non-trafficked Plots

Plots were visually rated for ground cover (0 to 100% scale) to evaluate turfgrass establishment on 15 October 2018. Turfgrass quality was assessed during April through October 2019; spring green-up was rated on 16 April 2019. A 1 to 9 rating was utilized for both parameters where 9 equaled the best turfgrass quality and best spring green-up. Gray leaf spot disease (caused by *Pyricularia grisea*) symptoms were observed in the trial on several entries on 9 September 2019; plots were visually evaluated for disease damage using a 1 to 9 sale where 9 equaled the least disease.

Analysis of variance was performed on these data as a single factor randomized complete block design with three replications. Means were separated using Fisher's protected least significant difference (LSD) test at p ≤ 0.05.

RESULTS

Traffic reduced uniformity of turf cover and FTC of tall fescue during autumn 2019 (Table 1). The entry effect interacted with the traffic factor for uniformity of turf cover, FTC, and green cover. Digital image analysis for green cover was not effective at measuring the traffic injury observed on turf plots and will not be further discussed.

Tall fescue cultivars and experimental selections with the best uniformity of turf cover after autumn traffic were GLX ACED (PST-5DART), TD2, O'Keefe (LTP-TF-122), Degas (LTP-TF-111), K18-ROE, PPG-TF-267, K18-RS6, RH3, Dragster, K18-WB1, JT 268, ZRC1, NAI-ROS4, PPG-TF-313, DLFPS-TF/3552, Grande 3, Bonfire (JS-DTT), PST-5TRN, PST-5BYOB, Moondance GLX, Monument (PST-5SQB), 3N1, DLFPS-321/3707, JT 233, PPG-TF 244, PPG-TF-257, PPG-TF-312, PPG-TF-336, PPG-TF-231, PPG-TF-306, PPG-TF-318, GO-RH20, NAI-3N2, 3B2, and TF456 (Table 2). Entries with poorest uniformity of turf cover were RAD-TF 115 (Turbo SS), OG-WALK, and Kentucky-31.

Entries with the highest FTC after autumn traffic were TD2, Degas (LTP-TF-111), O'Keefe (LTP-TF-122), RH3, JT 268, PPG-TF-267, K18-RS6, Dragster, GLX ACED (PST-5DART), K18-ROE, ZRC1, NAI-ROS4, PST-5TRN, PPG-TF-312, PPG-TF-306, TF456, K18-WB1, 3N1, 3B2, DLF-PS-321/3696, BY-TF-169, DLFPS-321/3702, PPG-TF-313, Grande 3, Moondance GLX, PPG-TF-257, PPG-TF-336, PPG-TF-318, DLFPS-321/3699, DLFPS-321/3701, PPG-TF-337, Raptor III, DLFPS-TF/3552, PST-5BYOB, DLFPS-321/3707, JT 233, PPG-TF 244, PPG-TF-231, GO-RH20, NAI-3N2, BAR-TF-134, AH2, DLFPS-321/3693, PPG-TF-262, RHL2, and DLFPS-321/3703 (Table 2). Kentucky-31 had the lowest FTC after autumn traffic; other entries with low FTC (< 50%) were NAI-FQZ-17, Escalade, Naturally Green, BAR FA 8228, OG-WALK, and RAD-TF 115 (Turbo SS).

Performance of Tall Fescue Without Traffic

Tall fescue cultivars and experimental selections with the best average turf quality during 2019 were K18-RS6, JT 268, AH2, PPG-TF-238, RHF, TD2, O'Keefe (LTP-TF-122), PPG-TF-313, PPG-TF-312, K18-WB1, PPG-TF-318, K18-NSE, RH3, ZRC1, RHL2, AH1, 5LSS, COL-TF-148, PPG-TF-338, RC4, PPG-TF-336, TF456, PPG-TF-308, and PPG-TF-320 (Table 3). Kentucky-31 had the poorest average turf

quality during 2019. Other entries with poor average turf quality (< 4.0) during 2019 were ATF 1768, Bandit, BAR-FA8230, BAR 9FE MAS, Grand Prix (FC15-01P), NAI-FQZ-17, SETFM2, Naturally Green, RAD-TF 115 (Turbo SS), BAR FA 8228, OG-WALK, and Palomar.

Tall fescue entries that had the greatest ground cover (i.e. best establishment) on 15 October 2018 were Kentucky-31, Lifeguard, PST-5SQB, AH2, and PST-5BYOB (Table 4). Thirty-seven entries had the least ground cover (i.e. poorest establishment); among these entries 3N1, PST-5DC24, PST-5MINK exhibited less than 50% ground cover.

Seventy-nine (79) entries exhibited acceptable (≥ 6.0) spring green-up on 16 April 2019 (Table 4). Kentucky 31 exhibited the best spring green-up; other entries with better spring green-up (≥ 7.0) were K18-ROE, Monument (PST-5SQB), Estrena, Palomar, and Escalade. Entries with the poorest spring green-up were DLFPS-321/3696, PST-5DC24, RC4, DLFPS-321/3708, GO-AOMK, RAD-TF0.0, and RAD-TF 115 (Turbo SS).

One-hundred twenty-eight tall fescue cultivars and experimental selections had the least gray leaf spot disease on 9 September 2019; disease symptoms were not observed (= 9.0) on 121 of these entries. The most severe gray leaf disease symptoms were observed on RAD-TF 115 (Turbo SS).

DISCUSSION

One-hundred one (101) of the 132 tall fescue entries in this test were not commercially available as of the publication of these Proceedings in July 2020. Results generated from this test and other turfgrass trials are important for seed company personnel charged with making decisions on whether to commercialize experimental selections. Moreover, the presentation of trial results allow sports field managers, golf course superintendents, landscapers, sod producers and other turfgrass practitioners to make data-based cultivar decisions for the facilities they manage. Lastly, results provide university extension and outreach personnel a means to deliver non-biased recommendations to end users in the form of presentations, reports, and fact sheets.

REFERENCES

Bonos, S.A., E. Watkins, J.A. Honig, M. Sosa, T. Molnar, J.A. Murphy and W.A. Meyer. 2001. Breeding cool-season turfgrasses for wear tolerance using a wear simulator. Int. Turf Soc Res. J. 9:137-145.

Henderson, J.J., J.L. Lanovaz, J.N. Rogers III, J.C. Sorochan, and J.T. Vanini. 2005. A new apparatus to simulate athletic field traffic: The Cady Traffic Simulator. Agron. J. 97:1153-1157.

Park, B.S., J.A. Murphy, and J.B. Clark. 2018. Trafficked and non-trafficked tall fescue performance at Rutgers Horticultural Research Farm II during 2017. Rutgers Turf Proc. 49:225-252.

Park, B.S., J.A. Murphy, H. Chen, and J.B. Clark. 2016. The 2012 NTEP Tall Fescue Test: Results at Rutgers Horticultural Research Farm II during 2015. Rutgers Turf Proc. 47:203-224.

Park, B.S., J.A. Murphy, H. Chen, and J.B. Clark. 2015. Tall fescue research at the Rutgers Horticultural Research Farm II during 2014. Rutgers Turfgrass Proc. 46:203-224.

Park, B.S., J.A. Murphy, H. Chen, J.B. Clark, and W.A. Meyer. 2014. Tall fescue research at the Rutgers Horticultural Research Farm No. 2 during 2013. Rutgers Turfgrass Proc. 45:241-252.

Table 1. Uniformity of cover, fullness of turf canopy, and green cover as affected by traffic and tall fescue entry during autumn 2019.

	Uniformity of Turf Cover[1]	Fullness of Turfgrass Canopy[2]	Green Cover[3]
	1 to 9 Scale	0 to 100% Scale	
Level of Traffic[4]			
No Traffic	8.7	94	90
Traffic	5.8	60	86
Source of Variation			
Traffic	**	**	NS
Entry	***	***	**
Traffic x Entry	***	***	**
CV (%)	8.6	6.1	5.6

[1]9 = most dense, uniform canopy

[2]100% = full canopy

[3]100% = complete green cover; measured by digital image analysis

[4]Twenty-eight machine passes were applied using the Rutgers Wear Simulator (14 passes) and vibratory pavement roller (14 passes) during 3 to 30 September 2019.

NS,**,*** Nonsignificant and significant at the 0.01 and 0.001 probability level, respectively.

Table 2. Uniformity of turf cover and fullness of turfgrass canopy as affected by the interaction of tall fescue entry and traffic during autumn 2019. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

Tall fescue entry	Autumn 2019 Traffic[1]			
	Uniformity of Turf Cover[2]		Fullness of Turfgrass Canopy[3]	
	No Traffic	Traffic	No Traffic	Traffic
	1 to 9 Scale		0 to 100% Scale	
1 GLX ACED (PST-5DART)	9.0	7.7	93	70
2 Degas (LTP-TF-111)	9.0	7.3	98	75
3 TD2	9.0	7.3	100	75
4 RH3	9.0	7.3	98	73
5 O'Keefe (LTP-TF-122)	9.0	7.3	100	73
6 K18-RS6	9.0	7.3	100	72
7 Dragster	9.0	7.3	97	72
8 PPG-TF-267	9.0	7.3	98	72
9 K18-ROE	8.7	7.3	95	70
10 JT 268	9.0	7.0	100	73
11 ZRC1	9.0	7.0	100	70
12 NAI-ROS4	9.0	7.0	98	70
13 K18-WB1	9.0	7.0	98	68
14 PPG-TF-313	9.0	7.0	98	67
15 PPG-TF-312	9.0	6.7	100	70
16 PST-5TRN	8.7	6.7	92	70
17 TF456	9.0	6.7	98	70
18 PPG-TF-306	9.0	6.7	97	70
19 3B2	9.0	6.7	95	68
20 3N1	9.0	6.7	98	68
21 Moondance GLX	9.0	6.7	93	67
22 Grande 3	9.0	6.7	95	67
23 PPG-TF-336	9.0	6.7	98	67
24 PPG-TF-318	9.0	6.7	98	67
25 PPG-TF-257	9.0	6.7	97	67
26 PST-5BYOB	8.7	6.7	93	65
27 GO-RH20	9.0	6.7	98	65
28 NAI-3N2	8.7	6.7	95	65
29 PPG-TF-231	9.0	6.7	100	65
30 DLFPS-321/3707	9.0	6.7	100	65

(Continued)

Table 2. Uniformity of turf cover and fullness of turfgrass canopy as affected by the interaction of tall fescue entry and traffic during autumn 2019. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

		----------------------------Autumn 2019 Traffic[1]----------------------------			
		Uniformity of Turf Cover[2]		Fullness of Turfgrass Canopy[3]	
	Tall fescue entry	No Traffic	Traffic	No Traffic	Traffic
		1 to 9 Scale		0 to 100% Scale	
31	JT 233	9.0	6.7	98	65
32	DLFPS-TF/3552	9.0	6.7	97	65
33	PPG-TF 244	9.0	6.7	95	65
34	Monument (PST-5SQB)	8.7	6.7	95	63
35	Bonfire (JS-DTT)	9.0	6.7	97	63
36	DLFPS-321/3696	9.0	6.3	97	68
37	DLFPS-321/3702	9.0	6.3	97	68
38	BY-TF-169	9.0	6.3	100	68
39	DLFPS-321/3699	8.7	6.3	95	67
40	Raptor III	9.0	6.3	95	67
41	PPG-TF-337	9.0	6.3	98	67
42	DLFPS-321/3701	9.0	6.3	100	67
43	AH2	9.0	6.3	97	65
44	BAR-TF-134	9.0	6.3	97	65
45	Paramount	9.0	6.3	95	63
46	TMT1	9.0	6.3	97	63
47	PPG-TF-308	9.0	6.3	97	62
48	RHL2	9.0	6.0	98	65
49	DLFPS-321/3693	9.0	6.0	98	65
50	PPG-TF-262	9.0	6.0	98	65
51	AH1	9.0	6.0	98	63
52	PPG-TF-238	9.0	6.0	97	63
53	DLFPS-TF/3553	9.0	6.0	95	63
54	RC4	9.0	6.0	97	62
55	PST-5THM	8.0	6.0	90	60
56	RH1	9.0	6.0	95	60
57	BGR-TF3	8.3	6.0	90	60
58	PPG-TF-249	9.0	6.0	93	60
59	PPG-TF-320	9.0	6.0	97	60
60	Fayette	9.0	6.0	95	58

(Continued)

Table 2.   Uniformity of turf cover and fullness of turfgrass canopy as affected by the interaction of tall fescue entry and traffic during autumn 2019. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

	--------------------------Autumn 2019 Traffic[1]--------------------------			
	Uniformity of Turf Cover[2]		Fullness of Turfgrass Canopy[3]	
Tall fescue entry	No Traffic	Traffic	No Traffic	Traffic
	1 to 9 Scale		0 to 100% Scale	
61 SETF104	8.7	6.0	95	58
62 DLFPS-321/3703	8.3	5.7	97	65
63 RHF	9.0	5.7	97	63
64 DLFPS-321/3705	9.0	5.7	95	62
65 PPG-TF-338	9.0	5.7	100	62
66 PST-5GLBS	8.7	5.7	90	62
67 SE5CR1	9.0	5.7	97	62
68 Estrena	9.0	5.7	100	62
69 PPG-TF-255	9.0	5.7	97	60
70 ProGold	8.3	5.7	93	60
71 Padre 2	9.0	5.7	97	60
72 PST-5DC24	8.0	5.7	88	60
73 PPG-TF-323	8.7	5.7	100	60
74 SE5302	8.7	5.7	93	60
75 PPG-TF-315	9.0	5.7	97	60
76 RDC	9.0	5.7	98	58
77 PST-5MCMO	8.7	5.7	92	58
78 PPG-TF-254	9.0	5.7	93	58
79 DLFPS-321/3679	9.0	5.7	93	58
80 Hemi	9.0	5.7	95	57
81 K18-NSE	9.0	5.7	98	57
82 AST8118LM	8.7	5.7	88	55
83 DLFPS-321/3706	9.0	5.7	98	55
84 GO-AOMK	8.7	5.3	93	62
85 Bullseye LTZ	9.0	5.3	97	60
86 DLFPS-321/3708	8.7	5.3	93	60
87 RS1	9.0	5.3	97	60
88 SETFM3	8.3	5.3	92	58
89 TF445	9.0	5.3	97	58
90 Copious TF	8.3	5.3	92	53

(Continued)

Table 2. Uniformity of turf cover and fullness of turfgrass canopy as affected by the interaction of tall fescue entry and traffic during autumn 2019. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

| Tall Fescue Entry | Autumn 2019 Traffic[1] | | | |
| | Uniformity of Turf Cover[2] | | Fullness of Turfgrass Canopy[3] | |
	No Traffic	Traffic	No Traffic	Traffic
	1 to 9 Scale		0 to 100% Scale	
91 DLFPS-321/3695	9.0	5.3	95	53
92 JT-517	8.3	5.3	88	52
93 Bandit	8.0	5.3	87	52
94 Grand Prix (FC15-01P)	8.3	5.3	88	52
95 Lifeguard	8.7	5.0	92	58
96 5LSS	9.0	5.0	98	58
97 PST-5GQ	8.7	5.0	92	57
98 PPG-TF 305	8.3	5.0	98	57
99 Bullseye	8.7	5.0	92	57
100 DLFPS-321/3694	8.7	5.0	97	55
101 COL-TF-148	9.0	5.0	100	55
102 AST8218LM	8.3	5.0	85	53
103 A-TF31	8.7	5.0	85	53
104 SETFM2	8.3	5.0	90	53
105 PST-5MINK	8.3	5.0	87	53
106 RAD-TF131	9.0	5.0	90	53
107 PPG-TF 316	9.0	5.0	97	53
108 ATF 1768	8.0	5.0	93	53
109 Tango	8.7	5.0	90	53
110 Bravo 2	8.0	5.0	90	53
111 NT-3	9.0	5.0	93	53
112 NAI-ST5	8.7	5.0	97	53
113 BAR-FA8230	8.7	5.0	88	52
114 DLFPS-TF/3550	8.7	4.7	92	53
115 SE5STAR	8.3	4.7	90	52
116 BAR 9FE MAS	8.0	4.7	83	52
117 ATF2116	8.3	4.7	90	52
118 PST-5E6	8.7	4.7	88	50
119 RAD--TF105	8.7	4.7	90	50
120 NAI-TUE	8.7	4.7	92	50

(Continued)

230

Table 2. Uniformity of turf cover and fullness of turfgrass canopy as affected by the interaction of tall fescue entry and traffic during autumn 2019. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

| | | ---------------------------Autumn 2019 Traffic[1]--------------------------- | | | |
| | | Uniformity of Turf Cover[2] | | Fullness of Turfgrass Canopy[3] | |
	Tall fescue entry	No Traffic	Traffic	No Traffic	Traffic
		1 to 9 Scale		0 to 100% Scale	
121	NAI-FQZ-17	8.0	4.7	88	48
122	Escalade	8.0	4.7	88	47
123	Firehawk SLT	8.3	4.3	95	52
124	PST-5DZM	8.7	4.3	92	52
125	Palomar	8.0	4.3	83	50
126	LBF	8.7	4.3	88	50
127	Burmingham	8.3	4.3	93	50
128	Naturally Green	7.7	4.0	85	47
129	BAR FA 8228	7.3	4.0	80	43
130	OG-WALK	7.3	3.3	80	43
131	RAD-TF 115 (Turbo SS)	8.0	3.3	82	40
132	Kentucky-31	6.7	2.3	68	28
	Columns (down) LSD at 5% =	1.1		10	
	Rows (across) LSD at 5% =	1.2		9	

[1]Twenty-eight machine passes were applied using the Rutgers Wear Simulator (14 passes) and vibratory pavement roller (14 passes) during 3 to 30 September 2019.
[2]9 = most dense, uniform canopy
[3]100% = full canopy

Table 3. Performance of tall fescue entries without traffic during 2019 in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

	Tall fescue entry	Turf Quality[1]							
		2019 Avg.	April	May	June	July	Aug.	Sep.	Oct.
		1 to 9 scale							
1	K18-RS6	8.3	7.7	7.7	8.3	9.0	8.3	9.0	8.0
2	JT 268	8.0	7.7	8.3	8.3	8.3	7.0	8.3	7.7
3	AH2	7.7	6.0	7.7	8.7	8.0	7.0	9.0	7.7
4	PPG-TF-238	7.5	6.7	7.3	7.7	7.7	7.7	7.7	7.7
5	RHF	7.4	7.3	8.0	7.0	7.3	7.3	8.0	6.7
6	TD2	7.3	5.3	6.7	7.0	8.0	7.0	9.0	8.3
7	O'Keefe (LTP-TF-122)	7.3	6.7	7.0	7.3	6.7	7.0	8.7	7.7
8	PPG-TF-313	7.3	6.3	7.3	7.7	7.3	7.3	8.0	7.0
9	PPG-TF-312	7.2	5.7	6.0	8.3	7.7	7.3	8.0	7.7
10	K18-WB1	7.2	7.0	7.0	7.3	6.7	7.0	7.7	7.7
11	PPG-TF-318	7.2	5.7	6.7	6.7	8.7	8.0	8.3	6.3
12	ZRC1	7.1	4.7	5.7	7.7	7.7	7.7	8.7	8.0
13	RH3	7.1	6.0	7.3	6.7	7.7	6.7	8.0	7.7
14	RHL2	7.1	5.7	6.3	8.3	6.7	7.3	8.0	7.7
15	K18-NSE	7.1	6.7	7.3	8.7	6.3	6.7	7.7	6.7
16	AH1	7.1	5.0	6.0	7.3	7.3	8.0	8.7	7.7
17	PPG-TF-338	7.1	5.7	6.7	7.7	6.3	7.3	8.0	8.0
18	5LSS	7.1	5.3	6.3	7.3	8.0	7.7	7.3	7.7
19	COL-TF-148	7.1	6.7	7.3	7.7	6.7	6.7	8.0	6.7
20	RC4	7.0	5.0	7.3	7.0	7.0	7.3	8.0	7.7

(Continued)

Table 3.   Performance of tall fescue entries without traffic during 2019 in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

	Tall fescue entry	Turf Quality[1]							
		2019 Avg.	April	May	June	July	Aug.	Sep.	Oct.
		1 to 9 scale							
21	TF456	7.0	6.3	7.0	6.7	7.0	6.7	8.0	7.7
22	PPG-TF-336	7.0	5.0	6.0	7.7	7.7	8.0	7.7	7.3
23	PPG-TF-308	7.0	5.3	6.7	6.7	7.7	7.0	8.7	6.7
24	PPG-TF-320	7.0	6.0	6.3	7.3	7.7	7.0	7.7	6.7
25	Estrena	6.9	6.0	6.3	7.0	7.3	7.3	7.0	7.3
26	DLFPS-TF/3552	6.9	5.0	6.3	7.0	7.3	7.0	8.3	7.3
27	Raptor III	6.9	7.0	7.0	6.7	7.3	6.7	7.7	6.0
28	PPG-TF-262	6.9	5.7	6.7	7.3	6.7	6.3	8.0	7.3
29	PPG-TF-267	6.8	6.7	6.7	6.0	7.0	5.7	8.3	7.3
30	PPG-TF-231	6.8	4.7	6.0	7.3	7.3	7.3	8.0	6.7
31	NAI-ROS4	6.7	5.3	5.0	7.3	7.0	6.0	8.0	8.0
32	DLFPS-321/3695	6.7	6.3	6.0	7.3	6.3	6.3	7.7	6.7
33	Paramount	6.7	5.7	6.0	7.7	7.3	6.7	7.0	6.3
34	JT 233	6.7	6.0	6.3	7.0	7.0	7.0	7.0	6.3
35	BY-TF-169	6.6	5.7	5.3	6.7	6.7	7.3	7.7	7.0
36	DLFPS-TF/3553	6.6	5.7	6.3	7.0	6.7	7.0	7.3	6.3
37	NT-3	6.6	5.7	6.3	7.0	7.3	7.0	6.7	6.3
38	RH1	6.6	5.7	5.7	6.3	7.7	7.3	7.3	6.0
39	Dragster	6.6	5.7	5.3	8.0	6.7	7.0	8.0	5.3
40	DLFPS-321/3693	6.5	4.7	5.0	5.7	7.0	7.3	8.0	8.0

(Continued)

Table 3.   Performance of tall fescue entries without traffic during 2019 in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

| Tall fescue entry | Turf Quality[1] | | | | | | | |
	2019 Avg.	April	May	June	July	Aug.	Sep.	Oct.
				1 to 9 scale				
41 DLFPS-321/3699	6.5	6.3	7.3	7.0	6.7	6.7	6.3	5.3
42 PPG-TF-257	6.5	4.3	6.3	7.7	6.7	6.0	8.0	6.7
43 Bullseye LTZ	6.5	4.7	6.0	7.0	6.7	6.3	7.7	7.0
44 NAI-3N2	6.5	5.0	5.0	7.7	7.0	6.7	7.3	6.7
45 TMT1	6.5	5.3	4.7	7.0	7.0	7.0	8.0	6.3
46 PPG-TF-337	6.5	4.3	6.7	8.0	6.7	5.7	7.7	6.3
47 PPG-TF 244	6.4	5.3	5.3	5.7	7.0	6.7	7.3	7.7
48 PPG-TF-254	6.4	6.3	6.0	6.7	6.7	6.0	6.7	6.7
49 BAR-TF-134	6.4	6.0	6.0	6.3	6.3	6.3	7.7	6.3
50 DLFPS-TF/3550	6.4	5.3	6.3	6.7	7.0	6.3	7.0	6.3
51 GO-RH20	6.4	5.0	6.0	6.0	7.0	5.7	8.0	7.0
52 PPG-TF-323	6.4	4.7	5.3	6.3	6.7	6.7	8.3	6.7
53 PPG-TF-315	6.4	5.7	5.0	7.0	7.0	6.7	7.3	6.0
54 DLFPS-321/3703	6.3	5.0	5.3	6.0	6.3	6.7	7.7	7.3
55 Bonfire (JS-DTT)	6.3	4.7	5.7	5.7	6.7	7.0	7.7	7.0
56 PPG-TF-306	6.3	4.7	6.0	6.7	6.3	6.0	8.0	6.7
57 DLFPS-321/3701	6.3	5.0	5.0	7.3	7.0	6.3	7.7	6.0
58 DLFPS-321/3694	6.3	6.3	6.0	8.3	5.7	5.0	7.0	6.0
59 Firehawk SLT	6.3	6.0	6.0	8.0	7.3	5.7	6.3	4.7
60 DLFPS-321/3707	6.2	4.7	5.0	5.7	6.0	6.3	8.3	7.7

(Continued)

Table 3.   Performance of tall fescue entries without traffic during 2019 in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

	Tall fescue entry	2019 Avg.	April	May	June	July	Aug.	Sep.	Oct.
					1 to 9 scale				
61	K18-ROE	6.2	6.7	5.0	6.7	6.0	5.7	7.3	6.3
62	Degas (LTP-TF-111)	6.2	5.7	5.7	6.7	7.0	5.3	7.0	6.3
63	Padre 2	6.2	6.0	6.0	7.0	5.3	6.3	6.7	6.3
64	RDC	6.2	5.0	5.3	6.0	6.3	6.7	8.0	6.0
65	TF445	6.2	6.3	6.0	6.3	6.0	6.3	6.3	6.0
66	Hemi	6.1	5.3	5.3	6.3	5.7	5.7	7.0	7.3
67	PPG-TF-255	6.1	4.7	6.0	6.0	6.3	6.3	7.0	6.3
68	PPG-TF 316	6.0	4.0	6.0	7.0	5.7	5.7	7.7	6.3
69	SE5CR1	6.0	4.3	4.7	6.7	5.3	6.3	8.0	6.3
70	PPG-TF-249	6.0	4.0	7.0	6.7	5.7	6.3	6.7	5.3
71	RS1	5.9	5.0	5.0	6.3	6.3	6.0	7.0	5.7
72	PPG-TF 305	5.9	5.7	5.7	6.3	6.3	5.3	7.0	5.0
73	DLFPS-321/3706	5.9	5.0	5.7	7.0	6.3	4.7	7.0	5.3
74	DLFPS-321/3705	5.8	5.0	4.7	5.3	6.0	6.0	7.3	6.3
75	DLFPS-321/3696	5.8	4.7	4.7	6.0	5.7	7.0	7.0	5.7
76	NAI-ST5	5.8	5.3	6.7	6.7	6.3	5.0	6.3	4.0
77	DLFPS-321/3702	5.7	5.0	4.3	6.3	5.7	6.3	6.7	5.7
78	Monument (PST-5SQB)	5.7	6.0	5.3	7.7	5.0	5.0	5.3	5.7
79	GLX ACED (PST-5DART)	5.7	5.3	4.7	5.7	5.7	5.0	6.7	6.7
80	DLFPS-321/3708	5.7	4.3	5.0	6.7	6.3	5.7	6.7	5.0

Turf Quality[1]

(Continued)

Table 3. Performance of tall fescue entries without traffic during 2019 in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

	Tall fescue entry	2019 Avg.	April	May	June	July	Aug.	Sep.	Oct.
						1 to 9 scale			
81	SETF104	5.7	5.0	5.7	6.0	6.0	5.7	6.3	5.0
82	3N1	5.6	5.7	4.3	5.3	6.7	5.3	6.3	5.7
83	A-TF31	5.4	5.7	6.3	7.0	5.7	4.0	5.0	4.3
84	NAI-TUE	5.4	5.7	6.3	7.0	5.7	4.0	5.3	4.0
85	PST-5TRN	5.4	5.3	5.7	5.3	5.0	5.0	5.7	5.7
86	3B2	5.3	4.3	5.0	5.3	4.3	4.7	7.3	6.3
87	PST-5BYOB	5.2	5.0	4.7	5.0	5.3	4.7	6.7	5.3
88	SE5302	5.2	5.7	5.7	5.7	5.0	4.3	5.7	4.7
89	Grande 3	5.2	5.7	4.0	5.7	5.7	5.0	6.3	4.3
90	Fayette	5.2	5.0	4.3	5.7	5.0	5.0	6.3	5.0
91	GO-AOMK	5.2	4.3	5.7	5.3	6.3	4.3	6.0	4.3
92	ProGold	5.2	6.7	5.0	5.3	4.7	4.7	5.7	4.3
93	DLFPS-321/3679	5.1	4.7	4.3	5.3	5.3	5.7	6.0	4.7
94	RAD--TF105	5.1	4.3	5.3	6.3	5.0	5.0	5.3	4.3
95	PST-5MCMO	5.0	6.0	4.7	5.0	3.7	5.3	6.0	4.3
96	Bullseye	5.0	5.0	5.0	6.0	5.3	4.0	5.7	3.7
97	AST8118LM	4.9	6.0	5.3	6.0	5.3	3.7	4.7	3.3
98	PST-5GQ	4.8	5.3	4.0	5.0	4.7	4.3	5.7	4.7
99	Burmingham	4.8	5.7	4.7	5.3	4.7	3.7	5.3	4.0
100	PST-5DZM	4.7	5.3	6.0	5.0	5.0	3.3	5.0	3.0

(Continued)

Table 3. Performance of tall fescue entries without traffic during 2019 in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

Tall fescue entry	2019 Avg.	April	May	June	July	Aug.	Sep.	Oct.
				1 to 9 scale				
101 LBF	4.7	5.3	5.7	5.7	4.7	4.3	4.7	2.3
102 Moondance GLX	4.6	4.3	4.3	3.7	3.7	4.0	6.7	5.7
103 Lifeguard	4.6	5.3	4.3	5.0	3.3	3.7	5.7	5.0
104 RAD-TF131	4.6	4.3	4.3	4.7	4.3	4.7	5.0	4.7
105 SE5STAR	4.6	5.0	4.3	5.7	3.7	3.7	5.7	4.0
106 PST-5GLBS	4.5	5.0	5.0	4.3	4.7	3.3	5.3	4.0
107 BGR-TF3	4.5	4.3	4.3	5.0	5.7	4.0	5.0	3.3
108 SETFM3	4.5	5.0	4.7	5.3	4.3	4.0	5.0	3.3
109 PST-5DC24	4.4	4.0	4.3	5.0	5.0	3.3	5.7	3.3
110 Bravo 2	4.3	4.7	4.7	5.0	4.3	3.3	4.3	4.0
111 AST8218LM	4.3	4.7	4.3	5.0	4.7	4.3	4.0	3.3
112 ATF2116	4.3	5.0	4.3	5.0	4.3	3.7	5.0	3.0
113 PST-5E6	4.2	4.7	4.0	4.0	4.0	3.3	5.7	4.0
114 Tango	4.2	4.7	4.3	4.3	4.7	3.3	4.3	3.7
115 Copious TF	4.1	4.3	4.3	6.3	3.7	3.0	4.7	2.7
116 PST-5THM	4.1	4.7	3.0	3.7	3.7	4.0	5.3	4.3
117 JT-517	4.0	4.7	5.0	5.0	4.0	3.0	4.0	2.7
118 PST-5MINK	4.0	4.0	4.7	4.7	3.7	3.7	4.0	3.3
119 Escalade	4.0	5.3	3.7	4.3	4.0	3.0	4.7	2.7
120 ATF 1768	3.9	4.7	4.3	4.3	3.0	2.7	5.3	3.0

(Continued)

Table 3. Performance of tall fescue entries without traffic during 2019 in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

| Tall fescue entry | Turf Quality[1] | | | | | | | |
	2019 Avg.	April	May	June	July	Aug.	Sep.	Oct.
				1 to 9 scale				
121 Bandit	3.9	4.0	3.7	4.7	3.3	3.7	4.3	3.3
122 BAR-FA8230	3.9	5.3	4.0	5.0	3.0	2.7	4.3	2.7
123 BAR 9FE MAS	3.8	6.0	4.0	3.7	3.0	3.0	4.3	2.3
124 Grand Prix (FC15-01P)	3.7	4.3	3.3	4.0	3.7	2.7	4.7	3.3
125 NAI-FQZ-17	3.7	4.7	3.7	4.3	3.3	3.0	3.7	3.0
126 SETFM2	3.6	4.0	3.3	3.7	3.7	3.3	4.3	3.0
127 Naturally Green	3.4	4.3	3.3	4.7	3.3	2.7	3.7	2.0
128 RAD-TF 115 (Turbo SS)	3.3	3.0	3.7	4.3	3.7	3.7	3.0	2.0
129 OG-WALK	2.8	4.3	3.7	3.3	2.3	1.3	2.7	2.0
130 BAR FA 8228	2.8	4.3	3.0	3.7	2.7	2.0	2.7	1.3
131 Palomar	2.6	4.3	2.3	2.3	2.3	1.7	3.7	1.7
132 Kentucky-31	1.1	1.3	1.0	1.0	1.3	1.0	1.0	1.0
LSD at 5% =	1.3	1.9	2.0	2.1	2.0	1.8	1.7	2.0
CV	13.6	22.9	23.2	20.8	20.9	20.2	16.0	22.0

[1]9 = best turf quality

Table 4. Performance of tall fescue entries without traffic in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

	Tall fescue entry	Ground Cover[1] 15 Oct. 2018	Spring Green Up[2] 16 Apr. 2019	Gray Leaf Spot[3] 9 Sep. 2019
		0 to 100 % scale	1 to 9 scale	
1	K18-RS6	75	6.7	9.0
2	JT 268	67	6.0	9.0
3	AH2	85	6.7	9.0
4	PPG-TF-238	80	6.3	9.0
5	RHF	65	6.3	9.0
6	TD2	78	6.3	8.7
7	O'Keefe (LTP-TF-122)	65	6.0	9.0
8	PPG-TF-313	70	6.3	8.7
9	PPG-TF-312	58	6.3	9.0
10	K18-WB1	77	6.0	9.0
11	PPG-TF-318	65	6.0	9.0
12	ZRC1	63	6.3	9.0
13	RH3	77	6.3	9.0
14	RHL2	75	6.0	9.0
15	K18-NSE	80	6.7	9.0
16	AH1	75	6.3	9.0
17	PPG-TF-338	80	5.0	9.0
18	5LSS	70	5.7	9.0
19	COL-TF-148	67	5.7	9.0
20	RC4	67	4.7	9.0
21	TF456	72	6.7	9.0
22	PPG-TF-336	77	5.7	9.0
23	PPG-TF-308	67	6.0	9.0
24	PPG-TF-320	78	5.7	9.0
25	Estrena	78	7.0	9.0
26	DLFPS-TF/3552	55	6.0	9.0
27	Raptor III	62	6.3	9.0
28	PPG-TF-262	62	6.0	9.0
29	PPG-TF-267	67	6.0	9.0
30	PPG-TF-231	67	6.7	9.0
31	NAI-ROS4	60	6.3	9.0
32	DLFPS-321/3695	80	6.3	9.0
33	Paramount	52	6.0	9.0
34	JT 233	62	5.7	9.0
35	BY-TF-169	55	6.3	9.0

(Continued)

Table 4. Performance of tall fescue entries without traffic in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

	Tall fescue entry	Ground Cover[1] 15 Oct. 2018	Spring Green Up[2] 16 Apr. 2019	Gray Leaf Spot[3] 9 Sep. 2019
		0 to 100 % scale	1 to 9 scale	
36	DLFPS-TF/3553	67	5.3	9.0
37	NT-3	68	5.3	9.0
38	RH1	70	6.0	9.0
39	Dragster	52	6.3	9.0
40	DLFPS-321/3693	65	5.7	8.7
41	DLFPS-321/3699	70	5.3	9.0
42	PPG-TF-257	60	5.7	9.0
43	Bullseye LTZ	77	5.3	9.0
44	NAI-3N2	70	6.0	9.0
45	TMT1	80	5.3	9.0
46	PPG-TF-337	60	5.3	9.0
47	PPG-TF 244	70	6.0	9.0
48	PPG-TF-254	65	6.0	9.0
49	BAR-TF-134	68	6.7	9.0
50	DLFPS-TF/3550	68	5.3	9.0
51	GO-RH20	72	6.0	9.0
52	PPG-TF-323	53	5.0	9.0
53	PPG-TF-315	63	5.3	9.0
54	DLFPS-321/3703	65	5.0	9.0
55	Bonfire (JS-DTT)	75	5.7	9.0
56	PPG-TF-306	65	5.0	9.0
57	DLFPS-321/3701	57	5.3	9.0
58	DLFPS-321/3694	73	6.3	9.0
59	Firehawk SLT	75	6.7	9.0
60	DLFPS-321/3707	67	6.0	9.0
61	K18-ROE	80	7.0	9.0
62	Degas (LTP-TF-111)	60	6.7	9.0
63	Padre 2	68	6.3	9.0
64	RDC	80	5.7	9.0
65	TF445	77	6.0	9.0
66	Hemi	80	6.0	9.0
67	PPG-TF-255	68	5.3	9.0
68	PPG-TF 316	72	6.0	9.0
69	SE5CR1	58	6.3	9.0
70	PPG-TF-249	68	5.7	9.0

(Continued)

Table 4.   Performance of tall fescue entries without traffic in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

	Tall fescue entry	Ground Cover[1] 15 Oct. 2018	Spring Green Up[2] 16 Apr. 2019	Gray Leaf Spot[3] 9 Sep. 2019
		0 to 100 % scale	1 to 9 scale	
71	RS1	72	6.3	8.3
72	PPG-TF 305	75	6.0	9.0
73	DLFPS-321/3706	57	6.3	9.0
74	DLFPS-321/3705	55	5.7	9.0
75	DLFPS-321/3696	73	4.7	9.0
76	NAI-ST5	77	6.3	9.0
77	DLFPS-321/3702	65	5.7	9.0
78	Monument (PST-5SQB)	85	7.0	9.0
79	GLX ACED (PST-5DART)	73	6.0	9.0
80	DLFPS-321/3708	55	4.3	9.0
81	SETF104	67	5.7	8.3
82	3N1	48	6.3	9.0
83	A-TF31	58	6.0	9.0
84	NAI-TUE	68	6.0	9.0
85	PST-5TRN	63	6.3	9.0
86	3B2	58	6.0	9.0
87	PST-5BYOB	82	6.3	9.0
88	SE5302	55	6.0	9.0
89	Grande 3	72	6.3	9.0
90	Fayette	72	6.3	9.0
91	GO-AOMK	55	4.3	9.0
92	ProGold	73	6.7	9.0
93	DLFPS-321/3679	67	5.3	9.0
94	RAD--TF105	73	5.7	9.0
95	PST-5MCMO	62	6.0	9.0
96	Bullseye	78	6.0	9.0
97	AST8118LM	57	5.0	9.0
98	PST-5GQ	60	5.7	9.0
99	Burmingham	80	6.3	9.0
100	PST-5DZM	58	5.7	8.7
101	LBF	70	5.7	9.0
102	Moondance GLX	63	6.0	9.0
103	Lifeguard	87	6.7	9.0
104	RAD-TF131	70	4.0	6.7
105	SE5STAR	67	6.0	9.0

(Continued)

Table 4. Performance of tall fescue entries without traffic in a turf trial seeded in September 2018 at North Brunswick, NJ. (Includes all entries of the 2018 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test).

Tall fescue entry	Ground Cover[1] 15 Oct. 2018	Spring Green Up[2] 16 Apr. 2019	Gray Leaf Spot[3] 9 Sep. 2019
	0 to 100 % scale	1 to 9 scale	
106 PST-5GLBS	72	5.3	9.0
107 BGR-TF3	70	6.3	9.0
108 SETFM3	57	5.3	9.0
109 PST-5DC24	47	4.7	9.0
110 Bravo 2	70	6.0	9.0
111 AST8218LM	65	5.3	9.0
112 ATF2116	70	5.3	9.0
113 PST-5E6	53	6.7	9.0
114 Tango	70	6.0	9.0
115 Copious TF	72	5.7	9.0
116 PST-5THM	70	5.7	9.0
117 JT-517	65	5.0	9.0
118 PST-5MINK	45	5.0	8.7
119 Escalade	68	7.0	8.7
120 ATF 1768	63	5.3	9.0
121 Bandit	62	6.0	9.0
122 BAR-FA8230	70	6.3	8.7
123 BAR 9FE MAS	57	5.7	9.0
124 Grand Prix (FC15-01P)	58	6.3	9.0
125 NAI-FQZ-17	67	5.7	9.0
126 SETFM2	57	5.3	9.0
127 Naturally Green	73	5.7	9.0
128 RAD-TF 115 (Turbo SS)	77	3.7	6.0
129 OG-WALK	62	6.7	9.0
130 BAR FA 8228	73	6.0	9.0
131 Palomar	55	7.0	9.0
132 Kentucky-31	98	9.0	9.0
LSD at 5% =	17	1.0	0.5
CV (%)	15.6	10.6	3.3

[1]100% = complete ground cover
[2]9 = best spring green-up
[3]9 = least disease