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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.

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

INCIDENCE OF *NEOTYPHODIUM* ENDOPHYTE IN SEED LOTS OF CULTIVARS AND SELECTIONS OF THE 1996 NATIONAL TALL FESCUE TEST

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Since researchers began learning of the significance of endophyte infection in grasses 20 years ago (Bacon et al., 1977), a wealth of information has been gained. *Neotyphodium* endophytes have been found in many grasses, and infection by these fungi has been associated with enhanced performance, stress tolerance, and insect and disease resistance (Breen, 1994; Funk and White, 1997). These fungi can also have detrimental effects on grazing mammals, and this factor has limited the use of endophytes in tall fescue (*Festuca arundinacea* Schreb.), an important pasture grass. However, many turf-type cultivars have now been developed and tall fescue has become an important turfgrass species.

In 1996, the National Turfgrass Evaluation Program (NTEP) distributed seed for a National Tall Fescue Test to many locations around the country. These tests will be evaluated for a number of years, and the performance data will be used by researchers and by turfgrass managers when selecting new cultivars. Since endophytic fungi can have a significant impact on turf performance, it is important to know the degree to which seed of these cultivars is infected with endophyte. Therefore, we analyzed remnant seed of the 129 entries in this test and report the percentage of seed infected with endophyte (which may or may not be viable).

PROCEDURE

A sample of seed was taken from each entry in the 1996 National Tall Fescue Test and stained using the rose bengal staining method (Saha et al., 1988). Seeds were soaked in an alkaline solution (5.0% aqueous ethyl alcohol, 0.5% rose bengal, and 2.5% sodium hydroxide) for 20 to 24 hours, rinsed thoroughly in water, and then soaked in a 0.25% aqueous rose bengal solution for 6 hours. Samples were then refrigerated until evaluated. Twenty five Individual seeds were squashed and examined under a microscope at 200X for evidence of endophyte. Where endophyte was detected, an additional 50 seeds were examined to increase the accuracy of each estimate.

RESULTS AND DISCUSSION

Of the 129 cultivars and selections examined, 101 entries (78%) had seeds infected with endophyte (Table 1). Of these, 21 entries (16%) had high infection levels (greater than 75% of seeds infected), 49 (38%) had moderate infection levels (25 to 75%), 31 (24%) had low infection levels (less than 25%), and 28 entries (22%) had no infected seeds. Compared to similar data from the 1992 National Tall Fescue Test, this represents an increase in endophyte content of turf-type tall fescues. In the 1992 test, 13% of the entries were highly infected with endophyte, and 30% were moderately infected.

Unfortunately, the turfgrass plants that develop from the tested seed lots may not be infected with endophyte to the same level reported in Table 1. As infected seeds germinate the endophytic fungus grows into the developing seedling and continues to live in the mature grass plant. However, the endophyte can lose viability in seed that has been stored for over a year or under warm, humid conditions. Thus, it is possible that some turfgrass plots established

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in the 1996 National Test may have lower levels of infection than indicated in Table 1 (endophyte content of seed). Analysis of plant tissue from this field test could be used to confirm this possibility.

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Table 1. Percent endophyte infection of seeds from cultivars and selections entered in the 1996 National Tall Fescue Test. (NOTE: The endophyte in these seeds are not necessarily viable and the infection rate in the resulting turf plots may be lower.)

NTEP No.	Cultivar or Selection	Endophyte infection[1] (%)
117	Coronodo Gold (PST-5RT)	97
29	Rembrandt (LTP-4026 E+)	95
1	ATF-192	91
7	ATF-253	91
114	Masterpiece (LTP-SD-TF)	91
87	Wolfpack (PST-R5TK)	89
110	PRO 8430	88
120	ZPS-2PTF	88
85	PST-5TO	87
89	Gazelle	85
119	Pick RT-95	84
128	Shenandoah	83
2	ATF-196	81
94	Coronado	81
108	SRX 8084	80
83	Kentucky-31 E+	79
92	Tomahawk-E	79
23	Alamo E+	78
11	AA-A91	77
82	ISI-TF11	76
109	SR 8210	76
75	Crossfire II	75
22	Pixie E+	72
32	Anthem (TMI-FMN)	72
81	ISI-TF-9	72
98	Titan 2	72
118	Jaguar 3	72
100	EA 41	71
93	Tarheel	70
8	ATF-257	69

Table 1 (continued).

NTEP No.	Cultivar or Selection	Endophyte infection[1] (%)
52	Bravo (RG-93)	68
84	ZPS-5LZ	68
31	Millenium (TMI-RBR)	64
73	WRS2	64
36	Bonsai 2000	59
41	Mustang II	59
42	ATF-188	59
46	OFI-96-31	59
123	PST-523	59
91	Coyote	56
33	Equinox (TMI-N91)	55
95	Apache II	55
30	Plantation (Pennington-1901)	51
77	Pick FA N-93	51
53	WVPB-1D	48
72	Cochise II	47
99	Lion	47
54	WVPB-1C	45
96	SS45DW	44
122	Bonsai	44
5	ATF-182	43
26	Pick FA 15-92	43
113	Empress	43
40	Pick FA B-93	40
88	Bandana (PST-R5AE)	40
76	Pick GA-96	39
24	J-101	36
34	Twilight II (TMI-TW)	33
51	PC-AO	33
28	R5AU	30
38	BAR FA 6LV	29
47	OFI-96-32	29
18	J-3	28
74	WX3-275	28
121	Sunpro	28

Table 1 (continued).

NTEP No.	Cultivar or Selection	Endophyte infection[1] (%)
111	Pick FA 20-92	27
16	Arid	27
21	J-5	27
112	Pick FA XK-95	27
35	Aztec II (TMI-AZ)	25
39	Pick FA UT-93	24
25	Shortstop II	23
55	Koos 96-14	23
49	JSC-1	21
86	PST-5E5	21
90	Safari	19
62	MB 213	18
14	CU9501T	17
45	DLF-1	17
67	Renegade	17
69	Falcon II	16
116	PST-5M5	16
102	OFI-951	15
61	MB 212	13
64	MB 215	12
68	Southern Choice	12
9	Tulsa	11
15	CU9502T	11
48	EC-101	11
56	MB 26	11
101	OFI-FWY	11
3	ATF-22	9
50	AV-1	9
71	Duster	9
59	MB 210	8
60	MB 211	8
63	MB 214	8
66	Marksman	8
129	Genesis	8
13	AA-983	7

Table 1 (continued).

NTEP No.	Cultivar or Selection	Endophyte infection[1] (%)
57	MB 28	7
4	ATF-38	0
6	ATF-20	0
10	Regiment	0
12	AA-989	0
17	J-98	0
19	DP 50-9011	0
20	DP 7952	0
27	Pick FA 6-91	0
37	BAR FA 6D	0
43	TA-7	0
44	WVBP-1B	0
58	MB 29	0
65	MB 216	0
70	BAR FA6 US6F	0
78	JTTFA-96	0
79	JTTFC-96	0
80	ISI-TF10	0
97	SSDE31	0
103	OFI-931	0
104	Finelawn Petite	0
105	PSII-TF-10	0
106	PSII-TF-9	0
107	SRX 8500	0
115	Leprechaun	0
124	BAR Fa6 US1	0
125	BAR Fa6 US2U	0
126	BAR Fa6 US3	0
127	BAR Fa6D USA	0

[1] Percent infection based on 75 seeds examined for each endophyte-infected entry and 25 seeds for each endophyte-free entry.