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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 includes lecture notes of papers presented at the 1998 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 includes research papers containing original research findings and reviews covering selected subjects in turfgrass science. The primary objective of this section 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

PERFORMANCE OF ZOYSIAGRASS CULTIVARS AND SELECTIONS IN A NEW JERSEY TURF TRIAL

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The *Zoysia* genus is a warm-season grass indigenous to Pacific-Rim countries, which range from 50°N latitude in northern China southward to New Zealand (Watson and Dallwitz, 1992). Zoysiagrass species have been collected from a wide range of environmental conditions and can be used in many growing situations. Since this grass adapts well to different environments, it grows fairly well in the Transition zone, of which New Jersey is a part. In the Transition zone, some cool-season and warm-season turfgrasses encounter the limits of their southern and northern adaptation (Turgeon, 1996).

Zoysiagrass species produce stolons and rhizomes to create a thatchy turf if fertilized frequently. These grasses are adapted for low maintenance growth and do not require heavy fertilization or frequent irrigation. Zoysiagrasses are drought tolerant for two reasons: 1) since the root system is very extensive during the summer months, roots penetrate soil horizons that cool-season grasses cannot reach, and 2) leaf rolling when temperatures get too high reduces transpiration and helps plants to conserve water.

Among the *Zoysia* genus there are three species that are commonly used as turf-type grasses. *Zoysia japonica*, known as Japanese or Korean lawngrass, is the most cold tolerant of the *Zoysia* genus. This grass has a coarse texture and dull color and is the least attractive of the zoysiagrass species. *Z. japonica* is the only zoysiagrass which has a seeded form; all other zoysiagrass species are vegetatively

propagated. *Zoysia matrella*, also known as manilagrass, has a finer and denser growth habit than *Z. japonica*. *Zoysia tenuifolia*, referred to as mascarene grass, is the finest and darkest grass of the group. It is the least cold hardy of the *Zoysia* genus, which makes it susceptible to winter injury. Each species of zoysiagrass has unique qualities that makes it suitable for certain circumstances.

PROCEDURES

Cultivars and Selections

In 1997, selections were made from old turf trials located at the Rutgers Horticultural Research Farm II at North Brunswick. The selections were tillered and grown in the greenhouse until they were large enough to be planted in the field. Twelve transplants were placed 6 inches apart in 3 X 4 spacing in field plots arranged in a randomized complete block design with three replications. Borders between plots were sprayed when needed with Finale to prevent aggressive entries from contaminating adjoining plots.

Management

The trial was grown under low maintenance conditions with no irrigation and a minimal amount of fertilizer applied. At establishment, soil pH was amended to 6 to 6.5 with agricultural limestone, and nitrogen fertilizer was applied at 1.0 lb/1000 ft². During the winter, cool-season grasses or weeds were eradicated with Roundup, and Dacthal was applied in the spring to help reduce annual grasses. Manage was

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applied twice throughout the growing season to help reduce nut sedge. In June of 1998, 1.25 lb of nitrogen was applied in two applications.

RESULTS AND DISCUSSION

Results for this test are presented in Table 1. Entries are ranked according to a one-year turf quality average. A high turf quality average is indicative of a darker green color, finer leaf texture, uniformity within the plot, and lower growth habit.

Summer color in the *Zoysia* genus varied greatly with species. Selection HF2-78 278-Mori 118, a *Z. matrella* species, had the darkest color rating in the trial. Many of the other higher ranked entries (Table 1) are also *Z. matrella* selections. Emerald, which had the third highest color ranking, is a hybrid of *Z. japonica* and *Z. tenuifolia*. The cultivar Meyer ranked low, like most of the other *Z. japonica* entries in this trial.

Fine leaf texture ratings are associated with *Z. matrella* species. The finest entry in the trial was a *Z. tenuifolia* selection. The top twelve entries in the trial, including Emerald and *Z. matrella* selections, were all close in ratings. *Z. japonica* cultivars have a significantly coarser leaf texture.

Percent cover was rated approximately 6 months and 1 year after the trial was planted. Many of the top entries grew slowly the first six months, but almost completely vegetated the plots after a year. *Z. japonica* entries such as HF2-69 26-FZ-107 and HF2-111 Auburn grew rapidly the first 6 months. The *Z. tenuifolia* selections were very slow growing and seemed to be poorly adapted to the environmental conditions of New Jersey.

Most of the top entries for quality in the trial were *Z. matrella* selections. They had better

quality ratings because they usually have finer textured leaves, a denser growth, and a darker color. HF2-78 278-Mori-118 had the best average quality rating and the highest color rating of the trial. Entries that had lower ratings were usually *Z. japonica* selections due to their coarse texture and dull color.

SUMMARY

Many of the turf quality ratings in this trial were related to the density of zoysiagrass species. *Z. matrella* entries received the better quality ratings in the trial. Their brighter color and finer leaf texture makes a better quality turfgrass. Improvements still needed to be made in the breeding of the *Zoysia* genus.

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Table 1. Performance of zoysiagrass cultivars and selections in a turf trial established in spring of 1997 at Adelphia, NJ.

	Cultivar or Selection	-----Turf Quality ¹ -----				-----Color ² -----				Winter	Cover	Cover	Dwarf-	Leaf	Leaf
		1998 Avg.	June 1998	July 1998	Aug. 1998	1998 Avg.	June 1998	Aug. 1998	Oct. 1998	Color ³ Nov. 1997	(%) Sept. 1997	(%) June 1998	ness ⁴ Sept. 1997	Tex- ture ⁵ Sept. 1997	Tex- ture ⁵ July 1998
1	HF2-78 278-Mori118	8.1	8.3	7.7	8.3	7.9	8.7	8.7	6.3	6.7	50.0	78.3	6.0	8.0	8.0
2	HF2-112 Auburn	7.2	7.3	7.3	7.0	6.1	6.3	6.3	5.7	7.0	38.3	80.0	7.0	8.3	7.0
3	HF2-28 290-FZ-21	7.1	7.0	7.0	7.3	6.1	6.7	5.7	6.0	6.3	68.3	81.7	6.0	7.7	7.0
4	WAM Hampton GA	7.1	7.7	7.0	6.7	5.9	6.0	6.3	5.3	7.7	40.0	81.7	7.7	8.0	7.3
5	Emerald	7.1	6.7	7.3	7.3	6.7	7.3	7.0	5.7	6.3	38.3	76.7	6.7	8.0	7.3
6	HF2-91 Ozark 1b	7.0	7.3	7.0	6.7	6.3	7.0	6.3	5.7	6.7	36.7	80.0	7.7	8.3	7.3
7	HF2-114 Emerald	6.9	6.7	7.3	6.7	6.0	6.3	6.7	5.0	7.7	30.0	76.7	7.7	8.3	7.0
8	HF2-15 Indyck Fine	6.8	6.7	7.0	6.7	6.2	6.7	6.3	5.7	7.0	30.0	78.3	7.0	8.0	7.0
9	Indyck Fine	6.6	6.7	6.7	6.3	6.6	7.0	6.7	6.0	7.0	26.7	73.3	7.3	8.0	7.3
10	HF2-96 West	6.4	7.0	6.7	5.7	6.3	7.0	6.3	5.7	7.3	33.3	75.0	7.0	8.0	7.0
11	RyderxDurham	6.2	6.7	6.7	5.3	5.9	7.0	5.3	5.3	7.0	33.3	71.7	7.7	8.3	7.3
12	HF2-48 179-FZ102	6.1	7.0	5.7	5.7	5.6	6.3	4.7	5.7	7.0	40.0	80.0	8.0	8.3	6.7
13	HF2-125 290-FZ-28	5.2	6.0	5.0	4.7	4.8	5.3	4.7	4.3	5.0	63.3	83.3	2.3	4.0	5.0
14	HF2-137 CherryHill 5	4.8	5.7	4.7	4.0	4.4	4.7	4.0	4.7	5.7	43.3	78.3	3.0	3.7	4.0
15	HF2-91 Ozark 1a	4.8	5.3	4.3	4.7	4.3	5.0	4.0	4.0	5.7	48.3	75.0	2.7	4.0	4.7
16	HF2-16, GW-Cem-6	4.7	5.3	4.3	4.3	4.2	4.3	4.0	4.3	5.0	58.3	83.3	2.3	4.0	4.7
17	Applewood 7	4.7	5.0	4.7	4.3	4.6	4.7	5.0	4.0	6.0	38.3	75.0	2.7	4.0	4.3
18	Homdel Cem4	4.7	5.3	4.7	4.0	4.6	5.3	4.3	4.0	5.3	51.7	76.7	2.3	4.0	4.3
19	HF2-21 GW Cem 1	4.6	5.3	4.7	3.7	4.6	5.0	4.3	4.3	5.7	51.7	78.3	2.7	4.0	3.7
20	Applewood 4	4.6	4.7	5.0	4.0	4.3	4.3	3.7	5.0	6.3	60.0	75.0	3.7	4.3	5.3

(Continued)

Table 1 (continued).

	Cultivar or Selection	-----Turf Quality ¹ -----				-----Color ² -----				Winter	Cover	Cover	Dwarf-	Leaf	Leaf
		1998 Avg.	June 1998	July 1998	Aug. 1998	1998 Avg.	June 1998	Aug. 1998	Oct. 1998	Color ³ Nov. 1997	(%) Sept. 1997	(%) June 1998	ness ⁴ Sept. 1997	Tex- ture ⁵ Sept. 1997	Tex- ture ⁵ July 1998
21	HF2-29 Od DelCem	4.4	4.7	5.0	3.7	4.3	5.0	3.7	4.3	5.3	43.3	75.0	3.3	3.7	4.3
22	HF2-138 Audubon3	4.4	5.3	4.3	3.7	4.6	5.3	4.3	4.0	5.0	45.0	76.7	3.0	3.7	4.0
23	Applewood 1	4.4	5.3	4.7	3.3	4.8	5.0	4.7	4.7	5.3	51.7	76.7	2.3	4.0	4.0
24	Andrew Old Bridge	4.4	5.0	4.7	3.7	4.6	5.0	4.7	4.0	5.3	46.7	73.3	2.0	3.7	4.7
25	WAM Fayetteville GA	4.4	5.0	4.3	4.0	4.4	4.3	4.3	4.7	4.7	60.0	73.3	2.3	4.0	4.3
26	Applewood 2	4.3	4.7	4.7	3.7	4.9	5.3	4.3	5.0	4.7	58.3	83.3	1.3	3.3	4.7
27	Homdel Cem3	4.3	5.0	4.7	3.3	4.6	5.0	4.3	4.3	5.0	41.7	71.7	3.0	4.0	4.7
28	Homdel Cem5	4.3	4.7	4.3	4.0	4.3	4.3	4.3	4.3	5.0	46.7	75.0	2.0	4.0	4.0
29	HF2-47 Ozark2	4.2	4.7	4.3	3.7	4.1	4.3	4.0	4.0	5.0	48.3	76.7	3.0	4.0	4.0
30	Homdel Cem2	4.2	5.0	4.0	3.7	4.1	4.3	3.7	4.3	5.0	48.3	73.3	2.0	3.7	4.7
31	Homdel Cem1	4.1	4.7	4.0	3.7	4.7	5.0	4.7	4.3	5.7	46.7	71.7	3.0	3.7	4.3
32	Meyer	4.1	4.7	5.0	2.7	3.7	5.3	2.0	3.7	4.7	30.0	70.0	4.0	5.7	6.0
33	HF2-69 26-FZ-107	4.0	4.7	4.3	3.0	4.0	4.3	4.3	3.3	3.7	86.7	94.3	2.7	2.0	3.3
34	Applewood 3	4.0	5.0	4.3	2.7	4.3	5.0	3.7	4.3	5.0	56.7	80.0	1.3	3.3	4.3
35	Odessa Del	3.9	4.7	3.7	3.3	4.3	4.3	4.3	4.3	5.0	35.0	75.0	2.7	4.0	4.7
36	HF2-66 355-FZ-89	3.7	3.7	4.3	3.0	4.7	5.7	5.0	3.3	5.0	51.7	71.7	3.0	1.3	3.3
37	HF2-111 Auburn	3.7	4.7	3.3	3.0	4.4	4.3	4.7	4.3	3.3	93.3	96.0	2.3	1.7	2.0
38	Gaub Old Bridge	3.7	4.3	3.3	3.3	3.8	4.0	4.3	3.0	3.0	78.3	86.7	2.7	2.3	2.3
39	HF2-45 West?	3.7	4.7	3.3	3.0	4.0	4.3	4.0	3.7	3.0	91.7	96.7	2.7	2.3	2.7
40	HF2-73 363 FZ 30	3.6	4.3	3.0	3.3	4.1	4.0	4.3	4.0	3.3	65.0	80.0	3.0	1.7	3.0

(Continued)

Table 1 (continued).

Cultivar or Selection	-----Turf Quality ¹ -----				-----Color ² -----				Winter Color ³	Cover (%)	Cover (%)	Dwarf-ness ⁴	Leaf Tex- ture ⁵	Leaf Tex- ture ⁵
	1998 Avg.	June 1998	July 1998	Aug. 1998	1998 Avg.	June 1998	Aug. 1998	Oct. 1998	Nov. 1997	Sept. 1997	June 1998	Sept. 1997	Sept. 1997	July 1998
41 Odessa OT	3.4	4.0	4.0	2.3	3.8	5.3	2.3	3.7	6.0	21.7	66.7	3.7	4.3	5.3
42 Applewood 5	3.3	4.0	2.3	3.7	3.8	4.7	3.3	3.3	3.3	61.7	80.0	1.7	2.3	3.7
43 HF2-56 386 FZ 215	3.1	3.7	3.0	2.7	3.8	4.3	4.0	3.0	3.7	51.7	78.3	3.3	2.7	2.7
44 Applewood 6	3.0	3.7	2.7	2.7	3.6	4.0	4.0	2.7	4.0	78.3	88.3	1.7	2.7	2.7
45 HF2-25 328 FZ 280	2.9	3.7	2.0	3.0	3.7	4.0	3.7	3.3	3.7	45.0	71.7	2.3	2.0	2.3
46 Micro Z.tenufolia	1.2	1.3	1.3	1.0	6.9	6.3	6.7	7.7	8.0	15.0	30.0	9.0	9.0	9.0
LSD at 5% =	0.7	1.0	1.2	1.0	0.7	1.2	1.1	1.0	0.8	23.5	9.2	1.0	0.8	0.9

¹9 = best turf quality²9 = darkest color³9 = least dormant⁴9 = shortest⁵9 = finest texture

Table 2. Yearly nitrogen (N) applied and mowing height (Ht) on a zoysiagrass test established at Adelphia, NJ.

	1997		1998	
	N ¹	Ht ²	N	Ht
Table 1 (1997)	1.0	2.5	1.25	2.5

¹Annual N applied (lbs/1000 ft²).

²Mowing height in inches.