Rutgers

New Jersey Agricultural
Experiment Station

2013
Turfgrass Proceedings

The New Jersey Turfgrass Association

In Cooperation with
Rutgers Center for Turfgrass Science
Rutgers Cooperative Extension

2013 RUTGERS TURFGRASS PROCEEDINGS

of the

GREEN EXPO Turf and Landscape Conference
December 10-12, 2013
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 2013 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 Ann Jenkins for administrative and secretarial support.

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

RESPONSE OF FINE FESCUES TO WEAR DURING AUTUMN 2013

Hui Chen, Bradley S. Park, and James A. Murphy[1]

The fine fescues (*Festuca* spp.) are a group of turfgrass species that have a very fine leaf texture. Newer improved cultivars are capable of forming a dense turf cover. Fine fescues have a relatively low requirement for water and fertilizer compared to other commonly utilized grasses. In fact, excessive fertilization and irrigation can lead to failure of fine fescue turf. Excellent shade tolerance is another characteristic of fine fescues that makes this group of turfgrasses useful in blends and mixtures with other cool-season grasses.

There are six species and subspecies of fine fescues that are generally used as turfgrass. Strong creeping red fescue (*Festuca rubra* L. *rubra*) produces long, abundant rhizomes and exhibits the widest variation in green color among cultivars, ranging from light to dark green. Slender creeping red fescue (*F. rubra* L. var. *littoralis* Vasey ex Beal) has shorter and weaker rhizomes compared to strong creeping red fescue. Chewings fescue [*F. rubra* L. subsp. *fallax* (Thuill.) Nyman] is a bunch-type grass and is considered to be more tolerant of lower mowing heights than other fine fescues. Hard fescue (*F. brevilipa* R. Tracey) also has a bunch-type growth habit and is more tolerant of high temperature stress when managed under limited irrigation, infrequent and higher mowing, and low nitrogen fertility. Sheeps fescue (*F. ovina* L.) has a bunch-type growth habit and produces a low-input turf with stiff leaves. Blue fescue (*F. glauca* Vill.) is a bunch type species with bluish color that is normally used as ornamental plant instead of turfgrass. Blue x hard fescue is a hybrid of blue fescue and hard fescue that exhibits a bluish green color and forms a denser turf canopy compared to blue fescue.

Durability and persistence under traffic stress is an important attribute of widely used turfgrasses. Although fine fescues possess a number of positive attributes, these species are not utilized to the same extent as other cool-season turfgrass species due, in part, to a lower tolerance of traffic and slower recuperative ability after damage (Shearman and Beard, 1975; Cook, 2003; Minner and Valverde, 2005). More extensive and recent studies of fine fescues have reported better tolerance to traffic under reduced maintenance (Stier, 2002; Horgan et al., 2007; Watkins et al., 2010; Cortese et al., 2011) or in mixtures (Newell et al., 1996). Improvement in the traffic tolerance of fine fescues would enable greater use of these species by the turf industry.

Traffic is a general term often used to describe one or more abiotic stresses including wear, compaction of soil, soil displacement, and divot removal (Carrow and Petrovic, 1992). Wear injury results from abrasion, tearing, or shredding of the leaf tissue. Soil compaction decreases soil porosity and increases soil strength which inhibits root growth and water infiltration and drainage. Carrow (1980) indicated that wear can be a greater factor contributing to differences among turfgrass species caused by traffic than compaction alone. A recent study also showed that injury caused by wear is the principal stress under traffic, accounting for 90% of the injury compared to soil compaction (Dest et al., 2009). The Rutgers Wear Simulator (RWS) was designed to apply abrasive wear to aboveground plant parts such as leaves, stems, and shoots and cause minimal soil compaction (Bonos et al., 2001).

[1]Graduate Assistant, 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.

Turf response to wear can vary based on the season during which the wear is applied. Park et al. (2010) demonstrated that wear treatment caused less damage on Kentucky bluegrass during the spring than either the summer or autumn. Additionally, cultivar differences in response to wear were more evident during spring than summer or autumn. Thus, the authors concluded that spring would be the best time to screen for wear tolerant cultivars of Kentucky bluegrass. There is limited information on the traffic tolerance of fine fescue species. The objectives of this field study were to assess the relative tolerance of six fine fescue species to wear during the seasons of spring, summer, and autumn, and the ability to recuperate. Results of the autumn application are reported here.

MATERIALS AND METHODS

This trial used a 4 x 10 factorial arranged in a split-plot design with 4 replications. The main plot factor was four levels of wear applied in the seasons of spring (April to May), summer (July to August), autumn (October to November), and a non-trafficked control. The subplot factor consisted of ten fine fescues entries: Aurora Gold and Beacon hard fescue, Culumbra II and Radar Chewings fescue, PPG-FRR-106 and Garnet strong creeping red fescue, Shoreline and Seabreeze GT slender creeping red fescue, Quatro sheeps fescue, and Blueray blue x hard fescue.

The fine fescue entries were seeded in September 2012 on a loam at the Rutgers Horticultural Research Farm II in North Brunswick, NJ. Testing in March 2014 indicated that soil pH was 6.44 and soil phosphorous (P) and potassium (K) were 260 and 269 lb per acre, respectively. The trial was mowed at 2.5 inch (6.4 cm) and irrigated to avoid drought stress. Nitrogen (N) was applied at 0.75 and 0.70 lb per 1000 ft^2 on on 12 September and 12 October 2012, respectively. During 2013, nitrogen was applied at 0.89, 0.48, and 0.40 lb per 1000 ft^2 on 26 March, 1 May, and 9 September, respectively. Fungicides were applied preventively to control summer patch, brown patch, leaf spot, and dollar spot diseases.

Eight passes (one pass per week) of the RWS was used to apply wear to all fine fescue subplots from 24 September to 10 November 2013. Paddles on the RWS rotated at 250 rpm while the machine moved at 2.5 miles per hour. Wear will be applied to the spring and summer main plots with the RWS in 2014.

Turf quality (assessed on a 1 to 9 scale where 9 = ideal turf) was visually evaluated once a month during 2013. Uniformity and density of turf cover (UDC; evaluated on a 1 to 9 scale where 9 = most uniform turf cover), fullness of turf canopy (FTC; 0 to 100% scale where 100% = full canopy), and leaf bruising (1 to 9 scale where 9 = no bruising) were visually assessed before and after each traffic period. Percent green cover was evaluated using digital image analysis after each traffic period.

Because only two levels of wear (control and autumn wear) were completed during 2013, data were analyzed a 2 x 10 factorial combination of seasonal wear and fine fescue entries arranged in a split-plot design with four replications. Once all levels of wear have been implemented, analysis of variance will be performed on data using a 4 x 10 factorial combination of seasonal and entries arranged in a split-plot design with four replications. Means were separated using Fisher's protected least significant difference (LSD) test at $p \leq 0.05$.

RESULTS AND DISCUSSION

As expected, fine fescue plots that were not subjected to wear had greater uniformity and density (UDC), fullness of cover (FTC), and green cover and less leaf bruising than plots that received 8 passes of the RWS in autumn. There were significant season x cultivar interactions for UDC, FTC, and green cover which indicated that the relative performance among fine fescues depended on the level of wear (Table 1).

The UDC and FTC responses of fine fescues to autumn wear were similar (Tables 2 and 3). Radar, Beacon, and Blueray had the greatest UDC after autumn wear while Aurora Gold and Seabreeze GT had the lowest UDC. Surprisingly, the UDC and FTC of Radar in wear and untreated control plots were statistically similar. Wear during autumn bruised leaf tissue and reduced UDC and FTC for all other entries relative to the non-trafficked control during the autumn. Bruising damage was greatest on Culumbra II and Radar, while Quatro had the least bruising injury (Table 4).

Green cover after 8 passes of the RWS dramatically decreased compared to the untreated control

(Table 5). Columbra II had the lowest green cover after autumn wear, which was at least partially due to the extensive leaf bruising damage caused by wear. Seabreeze GT, Beacon, PPG-FRR-106, Blueray, and Quatro had the best percent green cover although all of those were lower than or equal to 40% green cover. The high green cover of Seabreeze GT was partially due to less leaf bruising from wear but could be biased. The poor establishment of Seabreeze GT allowed annual bluegrass to encroach (Table 6). Image analysis is not able to distinguish between annual bluegrass and fine fescue.

Continued evaluation of fine fescue responses to wear during spring and summer in 2014 will increase our understanding of wear tolerance and recuperative ability among fine fescues.

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. Turfgrass Soc. Res. J. 9:137-145.

Carrow, R. N. 1980. Influence of soil compaction on three turfgrass species. Agron. J. 72:1038–1042.

Carrow, R. N., and A. M. Petrovic. 1992. Effects of traffic on turfgrass. Pages 285–330 *in*: Turfgrass. D. V. Waddington et al., eds. Agron. Monogr. 32. ASA, CSSA, and SSSA, Madison, WI.

Cook, T. 2003. The fine fescues: *Festuca* sp. [Online] Available at http://horticulture.oregonstate.edu/system/files/TheFineFescues-1.pdf. Corvallis, OR: Oregon State University.

Cortese, L. M., D. A. Smith, R. F. Bara, M. M. Wilson, E. N. Weibel, S. A. Bonos, and W. A. Meyer. 2011. Performance of fine fescue cultivars and selections in New Jersey Turf Trials. Rutgers Turf. Proc. 42:45-76.

Dest, W. M., J. S. Ebdon, and K. Guillard. 2009. Differentiating between the influence of wear and soil compaction and their interaction of turfgrass stress. Int. Turfgrass Soc. Res. J. 11:1067–1083.

Horgan, B., A. Hollman, E. Koeritz, and J. Stier. 2007. Fine fescues and colonial bentgrasses for fairways. Golf Course Mgt. 75:112-117.

Minner, D. D., and F. J. Valverde. 2005. Performance of established cool-season grass species under simulated traffic. Int. Turfgrass Soc. Res. J. 10:393-397.

Newell, A. J., F. E. Crossley, and A. C. Jones. 1996. Selection of grass species, cultivars and mixtures for lawn tennis courts. J. Sports Turf. Res. Inst. 72:42-60.

Park, B. S., T. J. Lawson, H. Samaranayake, and J. A. Murphy. 2010. Tolerance and recovery of Kentucky bluegrass subjected to seasonal wear. Crop Sci. 50:1526–1536.

Shearman R. C., and J. B. Beard. 1975. Turfgrass wear tolerance mechanisms: II. Effects of cell wall constituents on turfgrass wear tolerance. Agron. J. 67:211-215.

Stier, J. 2002. A kingdom of fairways: The 1st fine fescue symposium at GCSAA. Grass Roots 31(2): p. 5-7, 9, 11.

Watkins, E., A. B. Hollman, and B. P. Horgan. 2010. Evaluation of alternative turfgrass species for low-input golf course fairways. HortScience 45:113-118.

Table 1. Analysis of variance (ANOVA) of the uniformity and density of cover, fullness of turfgrass cover, leaf bruising, and green cover of fine fescues as affected by autumn wear on 11 November 2013 in North Brunswick, NJ.

	Uniformity and Density of Cover[1]	Fullness of Turfgrass Cover[2]	Leaf Bruising[3]	Green Cover[4]	
				Before Wear	After Wear
Season of Wear	--1 to 9 scale--	----%----	--1 to 9 scale--	-----------------%	-----------------
None	7.9	81.6	9.0	51.3	70.4
Autumn[5]	0.5	64.6	4.0	50.8	36.1
LSD at 5% =	0.5	6.0	0.2	NS	6.8
Source of Variation	----------------------	---------------Probability	of significant F test---------------	----------------------	
Season	***	***	***	NS	***
Cultivar	***	***	***	***	***
Season x Cultivar	**	***	NS	NS	**
CV (%)	7.4	5.0	7.3	14.1	8.6

[1] 9 = most dense, uniform canopy
[2] 100% = full canopy
[3] 9 = least bruised
[4] 100% = complete green cover determined by digital image analysis
[5] 1 pass per week from 24 September to 10 November 2013
NS, *, **, ***Not significant, or significant at the 0.05, 0.01, and 0.001 probability level, respectively

Table 2. Turfgrass uniformity and density of cover of fine fescues as affected by fall wear on 11 November 2013 in North Brunswick, NJ.

		Uniformity and Density of Cover (UDC)[1]		Relative UDC[2]
Cultivar	Species	No Wear	Fall Wear[3]	Fall Wear
		----------1 to 9 scale----------		---%---
Radar	Chewings fescue	8.8	7.8	88.9
Beacon	Hard fescue	8.5	7.3	85.4
Blueray	Blue x hard fescue	9.0	7.5	83.4
Quatro	Sheeps fescue	7.5	6.0	80.4
PPG-FRR-106	Strong creeping red fescue	9.0	6.8	75.0
Culumbra II	Chewings fescue	7.8	5.8	74.5
Shoreline	Slender creeping red fescue	7.3	5.3	73.2
Garnet	Strong creeping red fescue	7.8	5.5	71.9
Aurora Gold	Hard fescue	6.5	3.8	59.0
Seabreeze GT	Slender creeping red fescue	6.5	3.3	49.4
	LSD at 5% Row	1.0		–
	LSD at 5% Column	0.6		17.2

[1] 9 = most dense, uniform canopy
[2] Relative UDC = (UDC for fall wear/UDC for no wear) x 100
[3] 1 pass per week from 24 September to 10 November 2013

Table 3. Fullness of turf canopy of fine fescues as affected by fall wear on 11 November 2013 in North Brunswick, NJ.

		Fullness of Turf Canopy (FTC)[1]		Relative FTC[2]
Cultivar	Species	No Wear	Fall Wear[3]	Fall Wear
		---------------	%	---------------
Radar	Chewings fescue	93.8	82.5	88.2
Blueray	Blue x hard fescue	93.8	81.3	86.8
Beacon	Hard fescue	90.0	77.5	86.1
Quatro	Sheeps fescue	80.0	66.3	83.2
PPG-FRR-106	Strong creeping red fescue	92.5	73.8	79.9
Shoreline	Slender creeping red fescue	75.0	58.8	78.3
Culumbra II	Chewings fescue	81.3	62.5	76.6
Garnet	Strong creeping red fescue	81.3	61.3	75.3
Aurora Gold	Hard fescue	61.3	41.3	70.0
Seabreeze GT	Slender creeping red fescue	67.5	41.3	60.3
	LSD at 5% Row	10.8		–
	LSD at 5% Column	6.4		16.6

[1] 9 = fullest canopy
[2] Relative FTC = (FTC for fall wear/FTC for no wear) x 100
[3] 1 pass per week from 24 September to 10 November 2013

Table 4. Turfgrass bruising of fine fescues as affected by fall wear on 11 November 2013 in North Brunswick, NJ.

Cultivar	Species	Leaf Bruising[1]
		--1 to 9 scale--
Quatro	Sheeps fescue	7.9
Aurora Gold	Hard fescue	6.8
Seabreeze GT	Slender creeping red fescue	6.8
Blueray	Blue x hard fescue	6.6
Garnet	Strong creeping red fescue	6.5
PPG-FRR-106	Strong creeping red fescue	6.4
Beacon	Hard fescue	6.1
Shoreline	Slender creeping red fescue	6.1
Radar	Chewings fescue	6.0
Culumbra II	Chewings fescue	5.8
	LSD at 5% =	0.6

[1] 9 = least bruising; 1 pass per week from 24 September to 10 November 2013

Table 5. Green cover of fine fescues as affected by fall wear on 11 November 2013 in North Brunswick, NJ.

		Cover Before Traffic[1]	Cover After Traffic	
Cultivar	Species	Species/Cultivar Mean	No Wear	Fall Wear[2]
		-----------%	-----------	-----------
Seabreeze GT	Slender creeping red fescue	51.6	83.9	40.3
Beacon	Hard fescue	48.7	63.1	40.0
PPG-FRR-106	Strong creeping red fescue	64.1	69.5	39.8
Quatro	Sheeps fescue	47.0	74.3	38.9
Blueray	Blue x hard fescue	63.1	70.1	38.6
Aurora Gold	Hard fescue	33.6	55.7	35.3
Radar	Chewings fescue	58.8	75.6	34.9
Shoreline	Slender creeping red fescue	50.6	75.1	32.1
Garnet	Strong creeping red fescue	53.4	70.8	31.6
Culumbra II	Chewings fescue	39.7	65.9	29.8
	LSD at 5% Row	–	14.1	
	LSD at 5% Column	7.2	5.0	

[1] 100% = most green cover
[2] 1 pass per week from 24 September to 10 November 2013

Table 6. Turf establishment, spring green-up, turf quality, and susceptibility to summer patch of fine fescues before wear during 2013 in North Brunswick, NJ.

Cultivar	Species	Turf Establish-ment[1] 16 April	Spring-Green-up[2] 4 April	Turf Quality[3] 30 April	30 May	26 June	23 July	26 Aug.	24 Sept.	Summer Patch[4] 17 July
		----1 to 9 scale----								
Radar	Chewings fescue	7.1	7.1	5.9	8.2	8.4	7.2	7.3	7.4	9.0
PPG-FRR-106	Strong creeping red fescue	5.4	1.2	4.8	7.3	8.1	8.1	7.6	7.3	9.0
Blueray	Blue x hard fescue	4.2	6.3	4.9	5.7	6.7	7.4	7.5	7.3	8.8
Beacon	Hard fescue	3.6	6.9	4.9	6.4	7.1	6.8	6.8	7.0	8.3
Garnet	Strong creeping red fescue	5.5	8.4	4.6	7.2	8.3	7.6	5.5	5.9	9.0
Quatro	Sheeps fescue	5.6	7.4	5.2	5.4	5.3	5.7	5.5	5.2	8.7
Culumbra II	Chewings fescue	6.3	7.3	5.9	7.9	6.2	5.8	5.1	4.9	9.0
Shoreline	Slender creeping red fescue	5.4	7.0	4.8	6.9	6.9	6.4	5.1	4.9	8.6
Seabreeze GT	Slender creeping red fescue	2.1	1.2	1.0	1.2	2.2	3.4	3.8	4.1	8.9
Aurora Gold	Hard fescue	2.6	4.1	2.1	3.9	4.1	4.1	3.8	3.5	8.4
	LSD at 5% =	0.5	0.6	0.7	0.5	0.5	0.8	0.8	0.8	0.7

[1] 9 = best establishment
[2] 9 = earliest spring green-up
[3] 9 = best turf quality
[4] 9 = least disease