Performance of Fine Fescues under Abrasive Wear during Three Seasons

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INTRODUCTION

- Fine fescues (*Festuca spp.*) would have greater utilization for turf if tolerance to wear stress and recuperative ability were improved.
- Abrasive wear can be a greater factor in differentiating traffic tolerance of turfgrass species than compaction alone (Carrow, 1980).
- Rutgers Wear Simulator (abbreviated as RWS) was designed to apply abrasive wear with minimal soil compaction.
- Turf response to wear can vary based on the season during which the wear is applied (Park et al., 2010) and the tolerance of fine fescues to wear during seasons is not well understood.

OBJECTIVE

Evaluate the performance of fine fescues under abrasive wear in spring (April to June), summer (July to August), and autumn (September to October), respectively.

MATERIAL S & METHODS

Field Management

Field was seeded in September, 2012 on a loam in North Brunswick, NJ.

Nitrogen application (kg/ ha):
Establishment: 73kg (autumn 2012) and 44kg (spring 2013).
Trial: 44kg (2013); 44kg (2014); and 54kg (2015).

Mowed weekly at 6.4 cm. Irrigated to avoid severe drought stress.
Pesticides applied preventatively to control diseases and insects.

Experimental Design

This study consisted of three trials each using a 2 x 10 factorial split-plot design with 4 replications.

The main plot factor in each trial was the season with wear treatment (spring, summer or autumn) compared to an untreated control.

The sub-plot factor consisted of ten fine fescues entries .

	Cultivar	Species	Scientific Name
1	Radar	Chewings	*F. rubra* subsp. *fallax*
2	Columbra II	Chewings	*F. rubra* subsp. *fallax*
3	Beacon	Hard	*F. brevipila*
4	Aurora Gold	Hard	*F. brevipila*
5	Marvel	Strong Creeping Red	*F. rubra* L. *rubra*
6	Garnet	Strong Creeping Red	*F. rubra* L. *rubra*
7	Shoreline	Slender Creeping Red	*F. rubra* L. var. *littoralis*
8	Seabreeze GT	Slender Creeping Red	*F. rubra* L. var. *littoralis*
9	Quatro	Sheep	*F. ovina* L.
10	Blueray	Blue x Hard	*F. glauca* x *F. brevilipa*

Traffic Application

Traffic Period:

	Year 1	Year 2
Autumn	24 Sep. to 10 Nov. (2013)	24 Sep. to 10 Nov. (2014)
Spring	21 Apr. to 9 June (2014)	22 Apr. to 10 June (2015)
Sumer	7 July to 25 Aug. (2014)	8 July to 26 Aug. (2015)

* 4 weeks rest between two seasons to allow recovery.

Intensity:

1 pass/week of RWS for 8 weeks in each traffic season.

Data Collection and Analysis

Fullness of turf canopy (FTC; 0-100%) and bruising (1 to 9) were visually assessed after each traffic period.

Analysis of variance performed on data using a 2 (control vs wear) x 10 (entries) split-plot design. Means separation using Fisher's protected least significant difference (LSD) test at p<5%.

Table 1. ANOVA of fullness of turf cover (FTC)[1] after abrasive wear in autumn, spring, and summer in year 1 and year 2.

	Autumn		Spring		Summer	
ANOVA Source	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Control	82	92	87	90	86	85
Wear (RWS)	65	78	72	79	71	73
LSD(5%)	8	7	4	9	10	5
Main Effect for Traffic						
Traffic	*	**	***	*	*	**
Entry	***	***	***	***	***	***
Traffic*Entry	NS	NS	NS	**	***	NS

[1] 100% = full canopy

Figures 1-6: Fullness of turf cover （FTC）after wear treatment in autumn, spring, and summer in year 1 and year 2.

NS : not significantly different at p<0.05 level.
* : significantly different between "RWS" and "Control" at p<0.05 level.
LSD(5%) : Mean separation among entries using Fisher's protected least significant difference (LSD) test at p<5%.

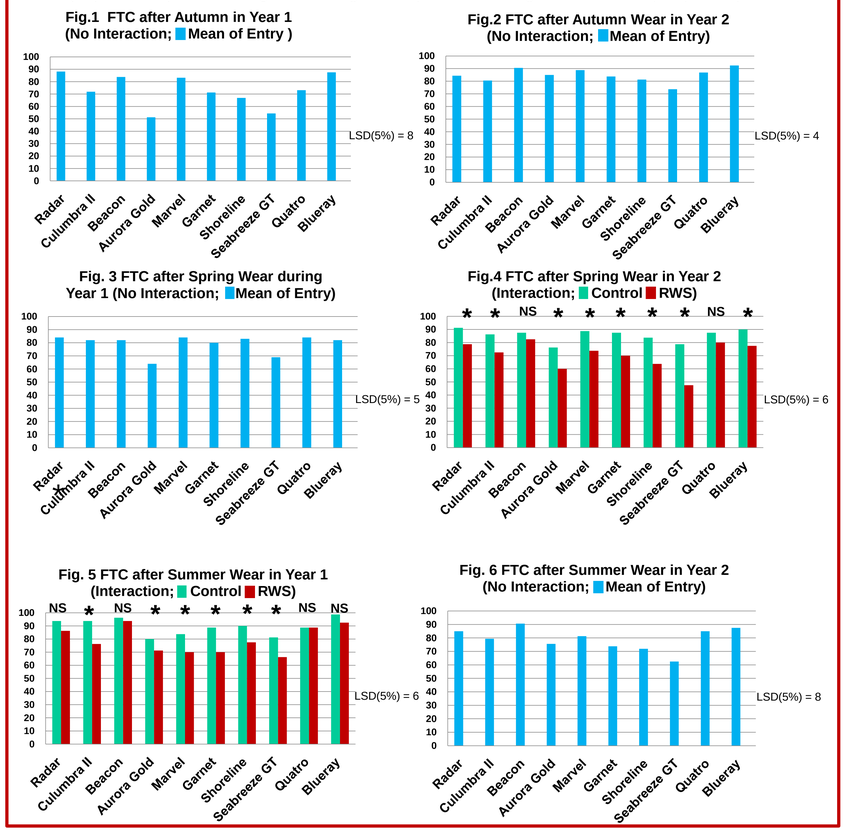

Table 2. ANOVA of leaf bruising[1] after abrasive wear in autumn, spring, and summer in year1 and year 2.

	Autumn		Spring		Summer	
ANOVA Source	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Control	9.0	8.6	9.0	8.8	9.0	9.0
Wear (RWS)	4.0	4.5	8.1	5.9	5.8	4.8
LSD(0.05)	0.5	1.1	0.2	0.9	0.3	0.6
Main Effect for Traffic						
Traffic	***	**	***	**	***	***
Entry	***	***	NS	***	***	***
Traffic*Entry	***	***	NS	***	***	***

[1] 9 = least bruising or green

Table 3. Leaf bruising after abrasive wear in autumn, spring, and summer in year 1 and year 2.
(data for control level not shown; sort by average bruising ratings)

	Autumn		Spring		Summer	
Entry	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Beacon	6.8	7.0	8.8	5.3	5.5	5.8
Radar	3.3	6.3	7.8	7.0	6.5	6.0
Quatro	4.5	5.3	7.8	6.3	7.0	5.8
Columbra II	4.3	6.5	7.5	7.3	5.5	5.3
Blueray	4.5	5.3	8.5	5.0	5.8	3.8
Marvel	3.8	2.5	8.3	5.3	6.8	5.0
Shoreline	4.0	3.3	8.3	5.5	5.8	4.5
Aurora Gold	3.0	1.3	7.3	7.0	7.0	4.3
Seabreeze GT	3.3	5.3	7.8	5.0	3.8	3.3
Garnet	2.5	2.3	8.8	5.5	4.5	4.0
LSD(0.05)	0.6	0.7	NS	0.7	0.8	0.6

RESULTS

- No "traffic x entry" interactions were detected for FTC after autumn wear. Blueray, Radar, Beacon, Marvel and Quatro had greater FTC than other entries during autumn (Table 1; Figure 1 and 2).
- The "traffic x entry" interaction was significant for FTC during spring in year 1 and summer in year 2 (Table 1). Beacon and Quatro maintained good FTC that was not different from the untreated control (Figure 4 and 5).
- Beacon and Blueray had the greatest FTC in all the rating dates. Quatro and Radar maintained good FTC in 5 out of 6 rating dates. Seabreeze GT had the worst FTC after wear in all seasons (Figure 1-6).
- Leaf bruising was more severe in autumn and summer than spring (Table 2).
- Beacon and Blueray were more tolerant to leaf bruising while Radar and Columbra II were most vulnerable to leaf bruising especially in autumn (Table 3).

The abrasive wear applied by Rutgers Wear Simulator (RWS) causes crushing and tearing on turf plot

Rutgers Wear Simulator (RWS) results in thinning (left) on fullness of turf cover and leaf bruising (right)

CONCLUSIONS

- In general, Beacon, Blueray, Quatro, and Radar maintained the best FTC while Seabreeze GT was the poorest entry across all seasons.
- The "traffic x entry" interactions on FTC indicates Beacon and Quatro can exhibit excellent performance under wear.
- Leaf bruising response of fine fescues to wear varied over seasons.
- Radar can maintain a full canopy under wear but a dramatic discoloration (bruising) of the canopy can occur. The RWS can be used as an useful tool in screening for bruising tolerance of fine fescues in autumn and summer.
- Quarto had the least bruising in autumn but was more susceptible to bruising in summer.
- Further studies will be conducted to understand the seasonal effect of wear on fine fescues. Different statistics method will be used to compare FTC and bruising data across seasons.

REFERENCES

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