

Comparative Turfgrass Performance of *Lolium perenne* Germplasm under Limited Irrigation

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Introduction

- Perennial ryegrass
 - High turfgrass quality
 - Disease resistance
 - Cultivars—drought susceptible
 - Loses color & turns “stemmy”
- Variation to drought in germplasm
- Acute vs. chronic drought stress
 - Chronic drought is geographic
 - Requires irrigation
- Generally too much irrigation
- Can perennial ryegrass thrive at lower irrigation amounts?
- Is there variation among germplasm for performance at lower irrigation?

Objectives

- Characterize turfgrass quality of perennial ryegrass germplasm collection at low irrigation
 - NPGS accessions
 - Commercial cultivars
- Simulated traffic
- Different mowing heights

Materials and Methods

- 91 perennial ryegrass populations
 - 62 NPGS collections
 - East. Europe, C. Asia, & Turkey
 - 29 cultivars
- 2 sites (Kaysville & Providence, UT)
- 2 years (2017 and 2018)
- Treatments
 - Simulated traffic or no traffic
 - 51 or 76 mm mowing height
- Split-block modification of RCBD
- Irrigation @ 60% ET₀ replacement
- Data collection
 - Approx. biweekly digital images
 - Converted by Turf Analyzer
 - Ground Cover
 - Dark Green Color
 - Density
 - Quality
- ASReml-R software
 - Variance components
 - BLUPs
 - BLUEs



Table 1. BLUEs corresponding to traffic, mowing height, and traffic x mowing height interaction.

Effect	Cover	Color	Density	Quality
No Traffic	4.18 ^b	5.84 ^a	6.48 ^a	5.21 ^a
Traffic	4.38 ^a	5.97 ^a	6.44 ^a	5.25 ^b
51 mm	4.10 ^b	5.86 ^a	6.37 ^b	5.19 ^b
76 mm	4.46 ^a	5.94 ^a	6.54 ^a	5.27 ^a
NT : 51 mm	3.90 ^c	5.74 ^b	6.39 ^a	5.15 ^b
NT : 76 mm	4.46 ^a	5.93 ^a	6.57 ^a	5.28 ^a
T : 51 mm	4.30 ^b	5.99 ^a	6.36 ^a	5.23 ^a
T : 76 mm	4.46 ^a	5.95 ^a	6.52 ^a	5.27 ^a

Table 2. BLUPs corresponding to the populations with the numerically highest and lowest turfgrass quality values in each traffic and mowing height treatment combination.

Treatment	Population	Origin	BLUP	LSD
NT:L ¹	High Population 598453	Romania	5.40	0.25
	Low Population 220597	Afghanistan	4.50	
NT:H	High Population 610807	Romania	5.81	0.32
	Low Population 545609	Turkey	4.57	
T:L	High Population 610820	Romania	5.57	0.24
	Low Population 223385	Iran	4.88	
T:H	High Population 610820	Romania	5.61	0.28
	Low Population 545609	Turkey	4.29	

¹NT, no traffic; T, traffic; L, 51 mm, H, 76 mm

Table 3. Spearman correlation estimates among traits within the same treatment (traffic x mowing height combination).

No Traffic : 51 mm				
	Cover	Color	Density	
	Color	-0.59***		
	Density	0.18	0.11	
	Quality	0.82***	-0.24*	0.43***
No Traffic : 76 mm				
	Color	-0.31**		
	Density	0.12	0.32**	
	Quality	0.66***	0.15	0.63***
Traffic : 51 mm				
	Color	-0.48***		
	Density	-0.26*	0.61***	
	Quality	0.71***	0.04	0.32**
Traffic : 76 mm				
	Color	-0.42***		
	Density	0.10	0.29**	
	Quality	0.80***	0	0.47***

Fixed Effects (Table 1)

- Location
 - P < 0.05 only for density
- Traffic
 - P < 0.01 for all traits but density
- Mowing height
 - P < 0.01 for all traits but color
- All two-way interactions
 - P < 0.01 for all traits but density
 - No traffic:2” mowing exhibited lower values for all traits but density
- Evaluated populations within traffic x mowing height treatments

Random Effects

- Date variation differed from zero for all traits
- Population variation differed from zero for all traits
- Date x population variation differed from zero for all traits but No Traffic x 3” mowing quality and Traffic x 3” mowing density

BLUPs

- Accessions frequently possessed significantly high values across environments
 - Cover—502412, 577266, 598453, 619003
 - Color—545614 & nine cultivars
 - Density—Top Gun II
 - Quality—W6 9344, W6 11195, 229476, 440475, 577266, 598543, 598454, 598517, 610807, 610820, 619003

DISCUSSION

- Potential with perennial ryegrass NPGS collection to improve turfgrass quality under limited irrigation
 - Particularly for ground cover and turf quality
- Under drought—perennial ryegrass responds well to traffic with higher mowing height