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Reduced water consumption of perennial ryegrass in the western USA

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Project Objective(s):

1) Identify the commercially available perennial ryegrass cultivars best adapted to limited irrigation in the Upper West/Mountain region of the US.
2) Identify promising perennial ryegrass accessions for future plant breeding aimed at increasing the turfgrass quality under limited irrigation.
3) Characterize the effect of genotype x environment interaction on the ability of perennial ryegrass to maintain turf quality under limited irrigation.
4) Identify germplasm for future genetic dissection of water use efficiency.

Start Date: 2014

Project Duration: 3 years

Total Funding: $50, 500

Perennial ryegrass's high performance and ease of management make it an important option for golf course use in the U.S. Unfortunately, this species has a relatively high irrigation requirement to maintain high quality. Identification of limited irrigation tolerant germplasm and subsequent selection for this trait is an important component in the effort to maintain perennial ryegrass performance on golf courses while limiting irrigation. The focus of this research is the evaluation of a 31 perennial ryegrass cultivars and 66 perennial ryegrass accessions for turfgrass quality under limited irrigation and traffic.

In 2014, we requested over 70 perennial ryegrass accessions the USDA NPGS-GRIN system. Because the GRIN system could not supply sufficient seed for seeded studies, we increased seed of each accession using plastic sheeting and fencing to create isolation (Figure 1). We transplanted 25 genotypes of each accession to an individual crossing block in 2015. We harvested seed – bulked across accession genotypes – in 2016. After processing and cleaning the resulting seed, we established seeded plots of the 31 commercial cultivars and the 66 accessions which produced sufficient seed at Kaysville and Millville, UT field sites (Figure 2). At both locations, we incorporated two additional treatments into the study: 1) traffic simulation vs. no traffic simulation, and 2) 75 % evapotranspiration replacement irrigation vs. 50 % evapotranspiration irrigation replacement. We initiated the traffic and irrigation treatments in 2017. We also began collecting digital imagery of the plots at both locations on a biweekly basis. We then used the digital images to assign numeric values to each plot corresponding to percent ground cover and green color index.

We completed data collection for the year in October. We are now processing digital images to convert them to quantitative data. Once finished, we will complete the analysis for the 2017 data. We will take another year of data in 2018. At the completion of the study, we will publish a peer-reviewed

scientific journal article and have the information to make recommendations to turfgrass managers for improved wheatgrass turfgrass management.

- Completed year 1 of data collection.
- Preliminary data analysis and results available in the next few months.
- Will complete study in 2018.

Figure 1. Crossing block used to produce additional seed for 25 USDA NPGS-GRIN genotypes in 2015.

Figure 2. Plots of the 31 commercial cultivars and the 66 accessions which produced sufficient seed were established in Kaysville and Millville, UT.