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Identifying Drought Resistant Cool-Season Turfgrass for Reduced Irrigation Environments

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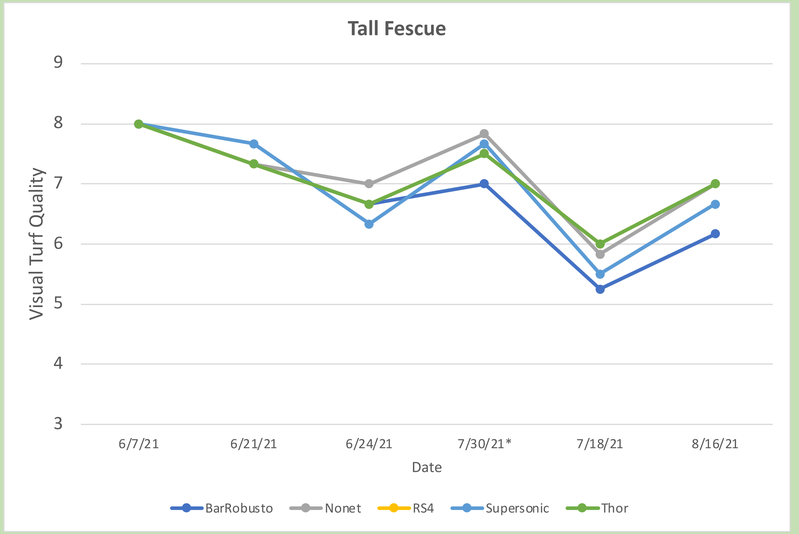
Introduction

The use of water for irrigation of recreational turfgrass areas has come under increased scrutiny, particularly in urbanized areas where the demand on water supply is high. The increased adoption of water conservation practices has been identified as playing a crucial role in the significant water savings and enhanced water use efficiency of turfgrasses. One important strategy is to select for grasses that are more drought resistant and that can maintain green cover under reduced irrigation. There is significant genetic variability among cool-season turfgrasses for drought resistance and drought recovery, and species vary in their physiological mechanisms that aid in plant survival in response to drought. In addition to selecting grasses based on their improved genetics to drought, there is also great interest in understanding the role of plant-associated microorganisms and to determine whether these microbes can alter the plants' ability to tolerate environmental stressors.

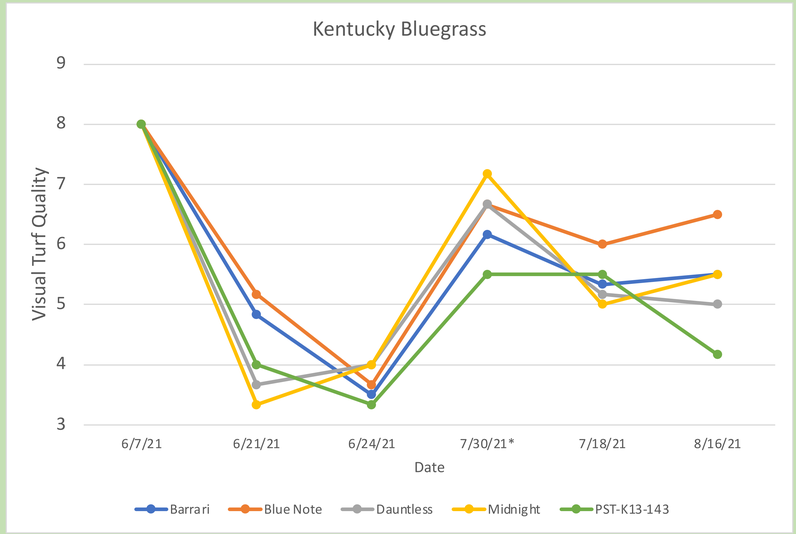
Methods

We tested the genetic variations in drought responses of 2 cool-season turfgrasses that have been shown to differ in their mechanisms of drought resistance. Tall fescue (Festuca arundinacea) generally exhibits deep rooting, which helps these grasses to maintain water uptake from deeper soil in order to maintain turf function under reduced irrigation. In contrast, grasses such as Kentucky bluegrass (Poa pratensis) often go dormant in response to moderate drought stress but then have good drought recovery due to protected rhizomes in the soil. The study included 19 cultivars of tall fescue and 15 cultivars of Kentucky bluegrass. For this specific project, we narrowed evaluation to 6 cultivars of each species based on their differential responses to drought stress in the 2 prior years of the study.

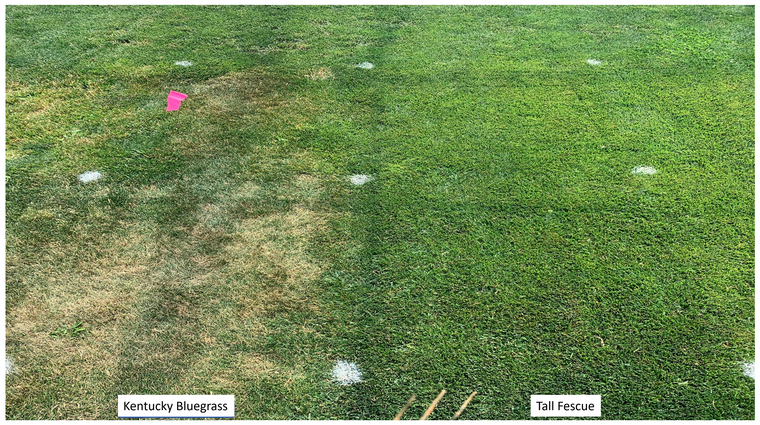
Results



- In Figure 1, we can see the VTQ (visual turf quality) of the tall fescue decreased in a smaller margin after the first dry down (6/21/21); and recovered in a smaller margin compared to Kentucky bluegrass (Figure 2) after the reduced irrigation. *The line of RS4 and Thor are overlapped.



- In Figure 2, we can see the VTQ of the Kentucky bluegrass decreased drastically after the initial dry down (6/21/21) and recover by a larger margin compared to the tall fescue (Figure 1). However, after we start to irrigate the grass again on 06/24/21, the Kentucky Bluegrass have a better drought recovery than the Tall Fescue.



Conclusion

The water conservation practice in the agriculture aspect had identified as playing an important role when it comes to water-saving and enhance water use efficiency. The results of the experiment demonstrates that Tall Fescue have better drought intolerance than the Kentucky Bluegrass given by its advantageous physiological mechanism of its root. We can see that the visual quality of the Tall Fescue only dropped from around 8 to 7 after the initial dry down; whereas the visual quality of the Kentucky Bluegrass dropped from around 8 to 4. However, the Kentucky Bluegrass have a better drought recovery than the Tall Fescue because the Kentucky Bluegrass had extensive underground rhizomes and meristem. The Kentucky Bluegrass will get dormant to protect the rhizomes which help the grass during the recovery process. There are more question for the researcher to answer; for instance, what is the difference in microbiome method between different species? What is the relationship between microbiome and turfgrass?