Evaluation of stress response characteristics facilitated by endophytes in cool-season turfgrass

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Current Findings (2023)

In 2022 endophyte populations were identified within the 25 fine fescue cultivars (various cultivars of chewings fescue, hard fescue, sheep, fescue, and strong creeping red fescue) within the A-LIST fine fescue trial established in Corvallis, OR. A second round of tiller samples were collected in autumn 2023 and are currently being processed with PCR for endophyte determination. During the summer of 2023 these 25 cultivars were irrigated with 50% evapotranspiration replacement. Strong differences in drought stress were observed between the fine fescue species (Figure 1). Hard fescue cultivars had the greatest retention of green color and quality and greatest normalized difference vegetation index (NDVI) value (a measure of plant health), followed by chewing fescue and sheep fescue. Strong creeping red fescue cultivars had the lowest retention of green color, quality and NDVI during the summer drought period. When considering endophyte presence, a correlation between endophytes and drought tolerance was not observed. For instance, Jetty hard fescue, which was endophyte positive, had one of the lowest NDVI values during the drought stress period, while the PPG FL 128 hard fescue entry, which was endophyte negative, had the greatest NDVI values during the drought stress period (Image 2).

Future Research 2024

In 2024, continued PCR evaluation of the collected tiller samples will be evaluated in laboratory PCR evaluations. By summer 2024, ALIST samples will have been tested for endophyte as seed, in year 1 of establishment, and in year 2 of establishment. A final collection of samples will occur in autumn 2024. In addition to continued endophyte testing and identification, multivariate statistics and correlation analysis will be conducted to compare endophyte status with turf quality metrics. Recommendations for endophyte-cultivar combinations associated with improved turf quality of both perennial ryegrass and fine fescue will be shared with industry members.
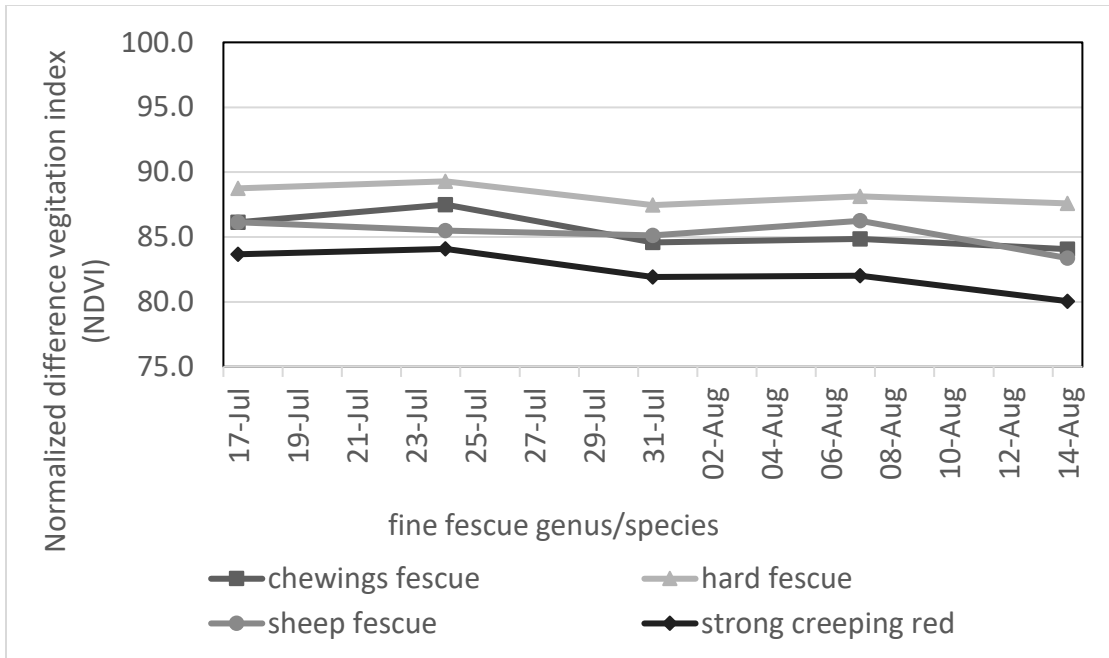
Figure 1: Normalized difference vegetation index values (100 represents the healthiest turf possible) for four different fine fescue genus and species (representing 25 cultivars total) when irrigated at 50% reference Evapotranspiration (ETref) Replacement in Corvallis, OR in 2023.
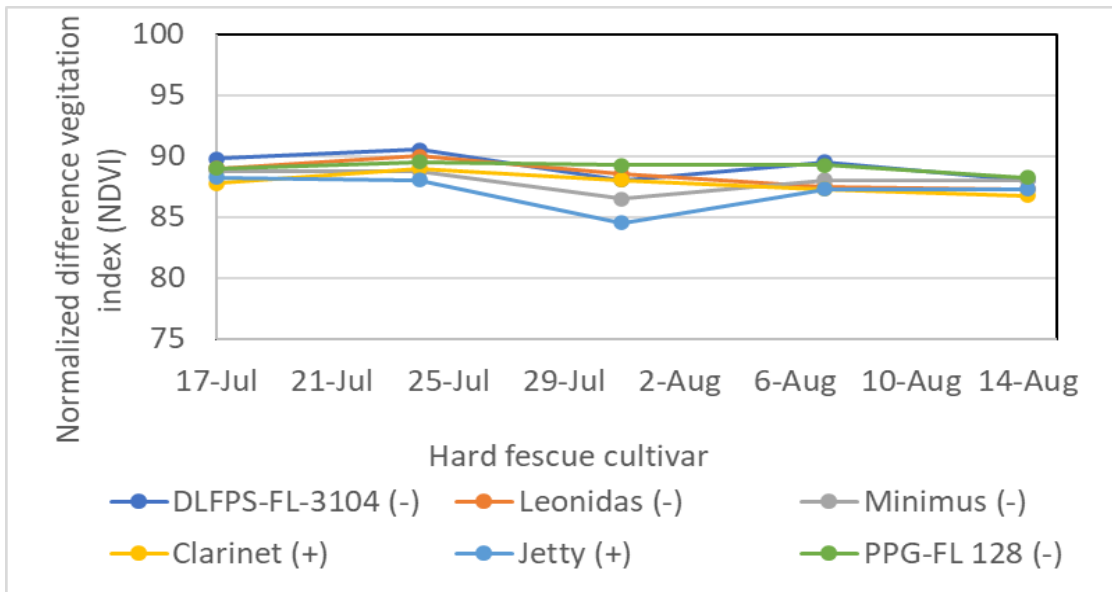

Figure 2: Normalized difference vegetation index values (100 represents the healthiest turf possible) for six different hard fescue genus and species [endophytes present (+) in seed at planting; endophytes absent (-) in seed] when irrigated at 50% reference Evapotranspiration (ETref) Replacement in Corvallis, OR in 2023.