Final report: Evaluation of the cold tolerance of tall fescue cultivars after deharderning events

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In Canada and the Northern USA , the cooler temperatures in fall induce plant cold acclimation responses, allowing plants to survive the freezing temperature of winter. Climate change is also associated with a wider variation of temperatures during the winter-spring interseason. In fact, data from the past 15 years shows that air temperature fluctuates and can increase long enough in early spring to induce cold de-acclimation. This is problematic because winterkill could happen if the temperature drops below freezing again.

We tested seeds of newly developed tall fescue cultivars used in the most recent National Turfgrass Evaluation Program (NTEP). Initial experiments showed that the cold LT_{50}, the temperature at which 50% of the plants die due to freezing injury, for those tall fescue cultivars ranged between -9.9 and -12.4 °C. But variation between the experiments was observed for two important reasons:

- ***Younger stands are more sensitive to freezing stress***. The ability of tall fescue cultivars to survive freeze stress was correlated with seeding time. 24 days-old tall fescue plants did not survive our freezing stress of -12°C, whereas most of the 66 days-old plants survived the -12°C freeze. Seeding tall fescue in late summer/early fall would allow a better and stronger establishment resulting in increased survival to freeze stress.
- ***Soil moisture content impacts freezing tolerance***. Drier soil before a freezing event resulted in higher freeze intolerance. Care should be taken during the establishment period and before winter to keep the soil moist by irrigating as needed.

Cold de-acclimation experiments were artificially created in field conditions. During these experiments, we only tested several cultivars based on the initial LT_{50} results. In the field, tents were mounted on the plots in February of 2022 and 2023 after artificial removal of the snow layer; two heaters were placed inside the tent to increase the temperatures. Plots received either 3, or 7 days of cold de-acclimation; (around 70 °F/ 20 °C); the control plots (no tent) stayed covered with an untouched protective snow cover. Experimental set up was repeated twice at different locations.

Results indicated:

- **For all cold de-acclimated areas, the tall fescue cultivars survived the freezing events** that occurred after removal of the tents.
- However, **the spring green up of the cold de-acclimated plots was slower than for the control plots** (no tent/ under snow). But no strong differences were observed between the 3 and 5 days cold de-acclimated plots.

This difference in spring green-up could become problematic as it could impact the ability of the stand to survive further summer stresses: heat, drought, brown patch, insect damage etc.; those stresses could become even worse in the case of a shorter spring. Faster spring green up could be improved with improved management practices (fertility-mowing-irrigation) and with potential overseeding.