

# Improving Winterhardiness in Perennial Ryegrass Through Breeding

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The lack of winterhardiness of some cool season grasses limits their usefulness in northern climates. Perennial ryegrass is one species which lacks good winterhardiness in Minnesota but has desirable qualities, such as wear tolerance and rapid establishment, that are useful in sports turf applications. Since 2004, turfgrass researchers at the University of Minnesota have been testing germplasm that could be useful in improving the winterhardiness of perennial ryegrass. Studying winterhardiness can be difficult because it is dependent on tolerance to many different stresses, and these stresses vary from winter to winter. Combining data from multiple seasons and screening methods gives us the best information on this complex trait. The screening process we used involved both direct, non-repeatable field studies and indirect, repeatable laboratory freezing tolerance studies.

Data from the 2004-2005 season, which was a winter characterized by little snow cover and wide fluctuation in temperature, indicated that only seven of the 300 unimproved ryegrass lines studied had better winterhardiness than the most winterhardy check variety, NK200. A sample of 21 lines was also subjected to freezing tolerance screening, which involved freezing plants of each line to eight predetermined temperatures and checking for survival in the greenhouse. These data were then used to determine the temperature at which 50% of the plants are killed (LT50). The LT50 data agreed well with the data from the field, although a few accessions did not behave as expected. Overall, these data indicate that freezing tolerance was an important trait in the winter of 2004-2005, although not the only important trait. Freezing tolerance tests may be very useful in screening breeding materials

reliably from year to year, but cannot completely replace screening for hardiness to multiple winter stresses in the field. We conclude that better winterhardiness could be achieved by using the most winterhardy germplasm from this study in future breeding work.

We began another project this year to improve the usefulness of fungal endophytes in perennial ryegrass. The benefits of endophyte infection include better stress tolerance and plant vigor, but not all endophyte strains provide the same amount of benefit. We are developing a breeding method that will allow us to find valuable endophyte strains to include in perennial ryegrass varieties. If developed successfully, we would be able to make choices on which endophyte strains provide our varieties with the greatest benefit, increasing the value of new perennial ryegrass varieties.

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