

BREEDING AND EVALUATING PERENNIAL RYEGRASS CULTIVARS FOR MINNESOTA

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Introduction

Improvements in perennial ryegrass (*Lolium perenne* L.) turf quality traits such as color, density, texture, mowability, disease resistance, and stress tolerance, have played an important role in the popularity of perennial ryegrass. Many improved turf-type cultivars do not have adequate levels of winter hardiness for the northern USA and Canada. To capitalize on the growing market for perennial ryegrass, the development of better winter hardiness, rust resistance and turf quality is imperative. New sources of winter hardiness have been identified in public collections of perennial ryegrass for use in our plant breeding program. Numerous studies have tried to use artificial screening methods to measure the cold tolerance and winter hardiness of turf grasses. Although some of these methods have merit, they have not been able to replace field evaluations for winter hardiness. Selection for improved winter hardiness is also complicated by the unpredictability and repeatability of the winter environment making selection difficult and expensive by requiring the use of multiple environments.

Materials and Methods

Plant breeding activities are underway to improve perennial ryegrass for turf and seed production and are focused on improving winter hardiness, disease resistance, and turf quality. The initial source of winter hardiness was NK 200, an older variety with acceptable winter hardiness but poor turf quality including coarse leaf texture and crown rust susceptibility. Progeny from the crosses were evaluated for winter hardiness and turf quality characteristics. Plants which combined winter hardiness and turf quality characteristics were selected for further evaluation and breeding activities. The recently identified new sources of winter hardiness are currently being introgressed into our perennial ryegrass breeding populations.

A second trait of interest in the breeding program is rust resistance. Crown and stem rust are the major diseases of perennial ryegrass in seed production and a prevalent disease in turf. Appropriate greenhouse screening methods for our breeding program are currently being developed. New sources of genetic resistance to rust will also be investigated by screening wild and landrace collections from the National Plant Germplasm system and Rutgers University that were previously characterized for novel winter hardiness genes. Recurrent selection for multiple resistance genes will be conducted to improve the level of rust resistance in our perennial ryegrass breeding populations.

A third trait of interest is herbicide tolerance. Quackgrass is a primary noxious weed in many states and contamination of perennial ryegrass seed with quackgrass destroys the economic value of the seed. Perennial ryegrass varieties with tolerance to Assure II (quizalofop) herbicide that effectively control quackgrass continue to be under development in our breeding program. Current research efforts include introgressing the herbicide tolerant trait into our elite breeding populations with improved turf quality, winter hardiness, and disease resistance.

An elite perennial ryegrass breeding population has been developed with a dense, spreading growth habit, high turf quality and improved winter hardiness. We are continuing selection in this population to improve its characteristics and have sent it to Rutgers University to improve its disease resistance and turf quality. Due to its dense growth habit and spreading characteristics, it appears this population

would be an asset on high traffic areas such as athletic fields, a growth market in Minnesota. Herbicide tolerance is also being introduced into this elite material.

Results and Discussion

The perennial ryegrass breeding program at the University of Minnesota has been highly successful in developing new cultivars with improved winter hardiness and herbicide tolerance. To date, the University of Minnesota perennial ryegrass breeding program has released four cultivars: PolarGreen, Ragnar, Ragnar II, and Arctic Green.

Summary

The University of Minnesota perennial ryegrass breeding program has been highly successful. Our cultivars and breeding populations possess high levels of winter hardiness. Turf quality has been substantially improved in our advanced breeding populations. Herbicide tolerance has been introduced into some of our advanced populations. Turf quality data and winter hardiness data can be found at the research section of <http://www.turf.umn.edu/> and additional winter hardiness and seed production data can be found at

<http://www.extension.umn.edu/forages/pdfs/2008Grass%20Seed%20Institute.pdf>.