# **Turfgrass Breeding and Genetics**

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The long-term goal of our turf grass breeding program at MSU is to develop turfgrass germplasms that are stress tolerant (biotic and abiotic) and require less pesticide application, fertilization and irrigation. Four major strategies will be used for germplasm enhancement:

- 1) Conventional breeding methods including ecotype selection and hybridization.
- 2) DNA molecular markers for assisting in selection.
- 3) Understanding the genetic mechanisms controlling important agronomic traits such as drought and cold tolerance.
- 4) Using intra and interspecific hybridization and confirm it with DNA markers such as SSR, AFLP, and RPAD.

## Bentgrass Project

The main objective of the bentgrass breeding program is to develop breeding methodologies to improve creeping bentgrass for gray snow mold caused by *Typhula incarnata*. In 2000 and 2001, we collected over 1000 clones of creeping bentgrass from older golf courses throughout Michigan. Over 400 clones were tested artificially for reaction to an isolate of *T. incarnata* during the spring of 2001. Over 30 clones showed significant resistance to this disease. Those clones will be used in diallel crossing to choose compatible parents for our next resistant cultivar release. The artificial screening requires cold controlled temperature and incubation of the pathogen in media and corn meal for over 2 months. Anther 2 months is required to identify which plants are resistant or susceptible. Development of quick, inexpensive and reliable screening methods are needed for this disease.

We have performed initial studies on the genetic diversity and distances of 110 plant introductory lines (PI) representing 14 species of bentgrass collected from all over the world. The DNA molecular marke5r amplified length polymorphism (AFLP) revealed three cluster groupings which indicate the degree of relatedness or similarity between plant introductory lines. The high heterogeneity that we found exhibited implies a potential for improving bentgrass with desirable characteristics from different species within the genus. The ultimate objective of this project is to identify and evaluate markers for improved characteristics such as disease resistance and stress tolerance.

## Introgression of Lolium perenne and Festucamairei Project

The prime objective of this research is to utilize the highly informative single sequence repeats (SSR) markers identified from *L. perenne* to assess the genomic introgression of *F. mairei* into *L.* 

*perenne*. Out of 40 SSR markers tested, 13 markers covering seven linkage groups fully discriminated the parents. Nine markers revealed that *F. mairei's* genome was transferred in backcross derivatives.

Reaction to gray leaf spot disease was highly repeatable among replicates and resulted in biologically and statistically significant (P<0.001) differences among the backcross derivative hybrids. We intend to identify the major gene resistance in the backcross derivative hybrid to gray leaf spot disease. The genomic DNA and RNA from those backcross derived hybrids were extracted and primers from R genes cloned in rice were designed. Polymerase chain reactions (PCR) and reverse transcriptions (RT-PCR) to amplify the specific DNA fragments from grass were conducted. Those backcross derivative hybrids will be planted for further testing for release as new turfgrass cultivars.

compounded by these sports fields having thatequate funding for routine maintenance and burfgrass reestablishment. Ultimately, the goal is to admini divince makers on the inputs required to maintain these sports fields, fin the prostfiles, research protocos must be explored to roduce costs, and increase the turn, compa time for a sports field to be trady for play again. For the Michigan sports field manager, the windows of opportunity to recetablish turfgrass are quite limited due to either use or climate. The need to cost effectively evaluate rapid, timely establishment procedures, specifically for sports fields, is crucial for long term success.

### Objectives

If a sports field manager has only 60 days to get a sports field ready in the summer, what is the quickest way to re-establish these high traffic areas if there is minimal to zero turigrass cover? This study will evaluate mowing and facility regimes for re-establishment of sports fields during the summer growing window. By evaluating these two cultural practices, the objective is twofold, first, to evaluate the reduction of weed encroachment and the impact certain weeds have on the playing surface. Second, we are evaluating "plant fitness" for when the sports field needs to be ready for its target date. In essence which combination of regimes "plant fitness" for when the sports field needs to be ready for its target date. In essence which combination of regimes will perform better once traffic has been initiated.

### Materials & Methods

The design of the experiment was a two factor study with three replications over two seasons (Table 1). This study was conducted at the Hancock Turfgrass Research Center (HTRC) on the campus of Michigan State University in East Lansing, MI. Due to other experiments taken place on these plots in the last on years, Basunid was used to statilize the soil. After the quarantine period was over, a 30:70 sports grass mixture of perennial ryograss (Lolium nergina var. SR4400, SR4500 and Manhatma III) and Kentucky bluegrass (Reg originals var. Champagne and Rugby II) was acceled for both experiments at a 4#/1000ff rate. Experiment I was initiated to evaluate plant fitness heading into a playing season. In Experiment II, weed seed dandelion, black medic, crabgrass and clover. Establishment took place on May 31 for Expl and Juna I for Expt II. Germoniton blankets were placed over the took place on May 31 for Expt I removed after 12 days for both experiments. The four weed seeds used for this experiment Werd and Juna I for Expt II. Germoniton blankets were placed over the top of the seeded areas and trans I for Expt II. Germoniton blankets were placed over the top of the seeded areas and weeds, and soil temperatures over the next 60 days. A three week traffic regime will commence