New Varieties of Kentucky Bluegrass for Minnesota

By Nancy Jo Ehlke

Turfgrasses are the major erosion control and landscape surface in Minnesota. There are over 200,000 acres of home lawns, 55,0000 acres of cemeteries, 20,000 acres in school grounds and over 40,000 acres in golf courses. Kentucky bluegrass *(Poa pratensis* L.*)* is the most prevalent grass species found in these landscape surfaces in Minnesota. Turfgrasses are an important industry in Minnesota where there are over 30,000 acres of grass seed production and 15,000 acres of commercial sod production. Minnesota now ranks third in the production of Kentucky bluegrass seed behind Oregon and Washington. However, because of residue management concerns and the high cost of production, acreage of Kentucky bluegrass for seed production is expanding outside of its traditional area of adaptation in the Pacific Northwest. Kentucky bluegrass seed produced in Minnesota has several advantages over seed produced in Washington and Oregon. The seed is consistently of high quality and the seed is free of annual bluegrass seed, a noxious weed in the turf and sod industry.

In 1957, 'Park' Kentucky bluegrass was released by the University of Minnesota to the Northern Minnesota Bluegrass Growers Association. To date, this is the major veriety in seed production in northern Minnesota occupying over 95% of the Kentucky bluegrass acreage. Park is characterized as having good seedling vigor, but has dramatically lost market share due to poor disease resistance and the development of higher quality turf types of Kentucky bluegrass by the turf industry. Most of these high quality Kentucky bluegrass varieties are proprietary and are not available for seed production in northern Minnesota. Therefore, the overall goal of my Kentucky bluegrass variety development program is to develop high turf quality varieties of Kentucky bluegrass that produce consistently high seed yields in northern Minnesota for use in the turf industry in Minnesota and throughout the United States.

The development of Kentucky bluegrass varieties with high seed yield and excellent turf performance that are significantly different from existing varieties is difficult because the species is apomictic. Apomixis is a form of reproduction where the genotype of the maternal parent is identically reproduced in the progeny. Prior to 1970, selection among natural ecotype populations was the only breeding method that had produced successful cultivars. In other words, most of the older varieties were "collected" or "found" in turf areas such as parks, cemeteries and school yards. Hybridization and breeding efforts are also complicated by apomixis. Controlled crossing or hybridization between Kentucky bluegrass clones has been used to generate genetic variability; however, successful hybridization rates are low and range from 0 to 17% of the progeny produced being distinctly different from the maternal parent.

Because of the limitations of traditional plant breeding approached with Kentucky bluegrass, my research at the University of Minnesota in cooperation with Dr. David A. Somers and Dr. Donald L. Wyse has developed the technology needed for a tissue culture system in Kentucky bluegrass that is successful with a wide range of varieties. Briefly, tissue culture is a technique where a small portion from a plant is aseptically placed on nutrient media for growth. The plant tissue proliferates into an undifferentiated mass of cells that derive their nutrients from the media. In our Kentucky bluegrass system, we use immature flowers as our source of plant material to initiate tissue culture. After these cells have proliferated into callus, which is an undifferentiated mass of cells, the content of the nutrient media can be manipulated with hormones that will induce the callus cultures to produce roots and leaves. These plants can be removed from the nutrient media and potted in soil for further evaluation. Because tissue culture is an extreme disruption in plant growth and development, genetic and cytogenetic changes are frequently observed in plants regenerated from tissue culture and these changes are termed somaclonal variation. Cell and tissue culture technology have induced useful somaclonal variation in other species such as corn and oats. In Kentucky bluegrass, because of the limited success obtained with hybridization and the lack of new germplasm being readily available on plant collections in the USA and other countries, somaclonal variation induced by tissue culture is an alternative source of genetic variation.

In my research program, Kentucky bluegrass plants have been regenerated from tissue culture and established in the field at St. Paul in 1991. In 1992, the plants were evaluated for turf and seed production characteristics. Parental plants were selected based on turf quality, new traits and/or seed production potential. Seed was harvested off of the selected clones and the progeny from the selected plants were transplanted to the field in May, 1993 at St. Paul and Rosemount. Data was collected on individual plants a for rhizome development, least rust resistance, color and growth habit. Preliminary analysis of the field data indicates that somaclonal variation is an important source of genetic variation in apomictic Kentucky bluegrass.

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Plants show variation for turf traits and disease incidence, and often show better turf characteristics than the original varieties used in our tissue culture system. In September, 1994, I selected individual plants for further evaluation in small turf plots. I am excited about the possibility of developing new varieties of Kentucky bluegrass using tissue culture. Based on our initial field evaluations, tissue culture induced somaclonal variation will be useful in generating genetic variability in Kentucky bluegrass. However, it will be at least three more years before we know if we have been successful in developing high quality turf varieties of Kentucky bluegrass for Minnesota.