A REALISTIC WHOLE PLANT MICROCULTURE SELECTION SYSTEM FOR TURFGRASSES

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Although the program was partially crippled by the lack of USGA funding support for 1989, our research later in 1988 and in 1989 adapted parallel salt-tolerant and salt-susceptible lines of bermudagrass, creeping bentgrass, and St. Augustinegrass to both solution batch culture and microculture test systems, in order to thoroughly evaluate the symptoms and responses that characterize reaction to saline environments in the root zone.

The solution batch culture system [similar to systems now used in testing for tolerance by the NASA 'Plants in Space' program] was specifically developed to accommodate the grasses from small plug stage [start of experiment] to 8-week old plant [termination]. The batch culture system allowed multiple replicates to be grown in control [2.2 dSm] nutrient solution, or, for the appropriate treatments, very gradually brought up to encounter high-salinity levels similar to what might be found in saline soils. The systems approach allowed the whole plant to be continuously monitored for response to saline conditions - not just a single feature like clippings growth or size as in previous research.

Microcomputerized video image analysis was adapted to analyze parameters of shoot growth and density, blade color, root length, and root system area over time. The technique yielded highly quantitative data on overall growth response. In addition, measurements of dry weight facilitated RGR analysis and osmotic adjustment response was quantified using a vapor pressure osmometer. The unique attributes of this batch system approach have been recently reported [Meyer et al., 1989, J. Plant Nutrition 12:893-908]. The microculture system parallel was designed to make some of the same analyses on tolerant and susceptible grass responses in a compact, efficient screening test. While dry weight [RGR] analysis was not feasible in microculture, additional advantages of the microculture system include smaller scale, and very clear presentation and observation of root system responses in the gellan-gum tissue culture matrix.

Both systems have been quite effective at separating traits of grasses in terms of their relative tolerance to saline environments; most notable the overall growth response [stunting], ability of tolerant plant root systems to increase in length proportionate to level of

stress, and osmotic adjustment. Given the high degree of correlation between solution culture and microculture screening tests, the more efficient and scaled-down microculture screen is envisioned as a practical tool for screening untested germplasm for use in roadside erosion control, or for turfgrasses to be irrigated with saline water.