



PROJECT TITLE: DROUGHT TOLERANCE TESTING OF COOL-SEASON GRASSES

Rationale/Description of Problem:

This project evaluates drought tolerance, persistence and recovery of cool-season grasses under field conditions. Periodic droughts and water restrictions are becoming more commonplace across the U.S. Information is needed on the ability of grasses to tolerate drought conditions (i.e. remain green during drought), recover from drought, and remain green/persist under reduced irrigation levels. This information is needed to compare the differences in drought tolerance among cool-season species, as well as cultivars within a species.

Objectives:

The objective of this trial is to determine the drought tolerance, recovery from drought and tolerance of reduced irrigation levels of cool-season species and cultivars. We want to obtain specific information on a grass' ability to remain green and growing, persist over time and recover from extensive drought or reduced irrigation.

Materials & Methods

This trial will evaluate two types of drought stress, *acute* and *chronic*. Acute drought stress is caused by extended periods of little or no rain/supplemental irrigation, followed by rain or irrigation. Chronic drought stress is caused by reduced irrigation, usually as a percentage of ET_0 , over a period of several months or longer. Acute stress is more common in the more humid eastern, southeastern and midwestern states, where summer rain is more frequent, although not reliable, and irrigation may not be available. Chronic stress is more prevalent in the western states where irrigation is needed to grow turfgrasses, however, the amount of water available is limited or restricted.

Entries will be planted in approximately 1 m x 1 m plots (10 sq. ft.) for the *acute* test locations and 1.5 m x 1.5 m for the *chronic* trial locations, replicated four times in a randomized complete block design within each species. Plots will be established in fall 2009, using conventional and traditional irrigation and establishment procedures. Drought conditions or reduced irrigation will not be imposed until all plots are well established. Data will be collected during 2010 and 2011 (Acute) or 2011 and 2012 (Chronic – see below).

Since this trial could conceivably contain several different cool-season species with different management needs, entries will be grouped in blocks based on their annual nitrogen needs. Nitrogen will be applied 2-3 times per year using one of two nitrogen levels, low or high. Low nitrogen entries, such as fineleaf fescue will receive 0.25 lbs. of nitrogen per growing month equivalent annually, while high nitrogen requiring species, such as perennial ryegrass, will receive 0.5 lbs. of nitrogen per growing month equivalent annually. Plots will be maintained with a rotary mower set at a height of 1.5 to 2 inches.

Acute Drought Testing

To evaluate acute drought tolerance, rainout shelters will be used. Rainout shelters repel natural rainfall when it appears, but are either removed from the plot area during dry periods or are built in such a way that rainfall is restricted. Therefore, the rainout shelters will be used to simulate drought periods by restricting rainfall for a 60-75 day period in summer. To initiate the simulated drought period, first the experimental area will be saturated with 2.5 cm of irrigation per day for three consecutive days to produce uniform wet conditions. Then, drought conditions will be imposed for a period of 60-75 days. Digital images will be collected every 3-5 days to document drought response and cultivar greenness. These images will be collected during the entire drought period on every entry that has green tissue visible. After the drought period, plots will be irrigated with 5 cm of irrigation to simulate drought recovery. Thereafter, the experimental area will be irrigated with 2.5 cm of irrigation weekly, to further evaluate drought recovery. Digital images will be collected weekly until all entries are 100% recovered.

Chronic Drought Testing

Chronic drought stress will be imposed during the first full growing season after all entries are fully established. Prior to the initiation of drought stress, irrigation will be maintained at 100% of ET_0 . To impose chronic stress, irrigation levels will be lowered to the appropriate levels needed, by location, to induce sufficient drought stress. For instance, at a particular location, 50% of ET_0 in spring/fall and 65% of ET_0 in summer may provide sufficient drought stress. This level may need to be adjusted at other locations. Digital images will be collected weekly to document plot color, percent greenness and ground cover. During year two, irrigation levels will again be set at the levels noted above, unless it is determined by NTEP and the evaluator that the level needs to be adjusted.

Trial Specifics

The NTEP will function as the coordinating agent for this trial. Trials will be conducted under the leadership of a university turfgrass research scientist (i.e. research cooperator), who has a faculty appointment. This person will sign a research agreement and will be responsible for establishment of the trial, coordination of the maintenance regime, collection and submission of the data to NTEP.

NTEP will solicit entries for the trial from sponsoring companies. Trials will be conducted with experimental and named cultivars of cool-season grasses.

Trial locations will include three sites (3) with removal rainout shelters (acute) and three (3) sites where ET_0 can be monitored and irrigation accurately applied according to ET (chronic). We propose that the three acute stress trials be located in the eastern half of the U.S. while the three chronic stress trials are located in the western U.S.

NTEP will administer the program and its funding, set the advisory committee and gather their input and recommendations for the trial. NTEP will organize and distribute the seed which will constitute entries for each trial location. NTEP will also provide maintenance and data collection protocols to each site, collect, analyze and disseminate the performance data in annual and final reports, and conduct an annual site visit of each trial site.

Data Collection

The research cooperator will be responsible for data collection. For this trial, data collection will be conducted using digital cameras. Digital images will be collected on a regular basis (see above Materials and Methods). NTEP will contract for the processing of the digital images. The research cooperator will be responsible for submission of data to NTEP by February 1 of each year. Annual funding will be based on receipt of a complete set of data by the February 1 deadline.

Planting Dates and Funding

Trials will be established in late summer/fall of 2009. Research cooperators will be paid based on the number of entries in the trial. For example, if the trial contains forty (40) entries, cooperators will be paid a maximum of \$15,000 total if all requirements of the research agreement are fulfilled. If a smaller number of entries are submitted, this payment figure will be decreased.