Annual Progress Report, 1993

Characterization of Water Use Requirements and Gas Exchange of Buffalograss Turf

Submitted by: Daniel C. Bowman

With the increasing demand for water across the western United States, it is prudent to pursue all avenues of water conservation. Since irrigation accounts for nearly half of urban water use, considerable savings could be realized by planting turfgrasses with low water requirements. Buffalograss may be the ideal species for both water savings and aesthetics, but water use data are scarce and one can only speculate on water requirements. Results from this study will be used to generate crop coefficients for buffalograss and identify intraspecific water use differences, if any, among a diverse selection of genotypes.

A field project was installed at the UNR Valley Road Field Station to determine water use requirements of seventeen buffalograss genotypes representing a diverse genetic background. This project utilizes a line source water gradient designed to provide a continuous gradient of irrigation volumes ranging from a value slightly exceeding potential ET to essentially zero. It consists of a single straight row of sprinkler heads, selected for uniform and predictable application pattern and spaced for a two head overlap. Irrigation depth decreases with distance from the line source so that a water gradient is formed perpendicular to the line (see Fig. 1). By planting the buffalograss varieties in strips down the gradient (perpendicular to the irrigation line), turf performance can be measured at any given irrigation amount. Further, minimum irrigation requirements are indicated by that point in the gradient beyond which the turf cannot survive.

During the summer of 1992, the field was disked and the irrigation system installed. The total experimental plot area measures 46.6 by 26.8 meters, and is surrounded by a 13 meter border planted to 'Vegas' tall fescue. In late August, 1992, plugs of 15 buffalograss selections, representing three ploidy levels, were planted on 15 inch centers in individual plots measuring 1.4 by 13.4 meters. Plugs were established under standard management practices. The experimental design was a randomized complete block design with four replicates. Because two genotypes arrived too late for planting in 1992, and because one of the diploid genotypes planted the previous fall winter killed, three additional genotypes were planted in June of 1993, giving a total of 17 genotypes (see list below). The plots were established under uniform moisture conditions using two additional lines of sprinkler heads, one on each side of the line source. These two will be turned off at the start of the water use experiment.

Mini-lysimeters (15 cm diameter, 30 cm depth and each with a drain hole and removable plug to stop drainage) were planted, four per genotype, and established in the greenhouse. Cores for the lysimeters were drilled in each plot 2 meters from the main irrigation line. These will be used to determine ET gravimetrically under non-limiting conditions.

Post-emergent weed control proved to be problematic, since very little is known about herbicide phytotoxicity in buffalograss. Unfortunately, some of the common herbicides, such as 2,4-D are phytotoxic. Consequently, weed control during the 1993 season was accomplished by hand, except for occasional spot treating with glyphosate. A combination fertilizer/pendimethalin product (Scotts Weed & Feed, 20-0-6) was applied on Sept. 21 for winter weed control.

By October, 1993, all genotypes, except the three planted late, were fully established. Both the diploid and tetraploid genotypes were maintaining good color as late as October 12, while the hexaploids were well into dormancy.

It is planned to establish the line source gradient beginning July 1, 1994. Both outside lines will be adjusted to water only the tall fescue border. Irrigation will be scheduled based on ET (Penman) as determined with an on-site weather station. Performance, actual ET, and plant water status data will be collected during both the 1994 and 1995 seasons.

List of genotypes included in study:

Experimental Diploids
- D 3-5 (Mexico)
- D 2-7 (Mexico)
- Kennemer 1 (Texas)

Experimental Tetraploids
- T 1-14 (Mexico)
- T 2-5 (Mexico)
- T 2-4 (Mexico)

Experimental Hexaploids
- Guymon 1 (Oklahoma)
- Guymon 2 (Oklahoma)
- Guymon 6 (Oklahoma)

Commercial, Vegetative Genotypes
- Prairie (Texas A&M)
- Neb. 609 (Univ. Nebraska)
- Neb. 315 (Univ. Nebraska)
- Highlight 1 (Univ. Calif., Davis)
- Highlight 2 (M912) (Univ. Calif., Davis)
- Washoe ((Univ. Nevada, Reno)

Commercial, Seeded Genotypes
Plains (Bamert Seed)
Topgun (Bamert Seed)

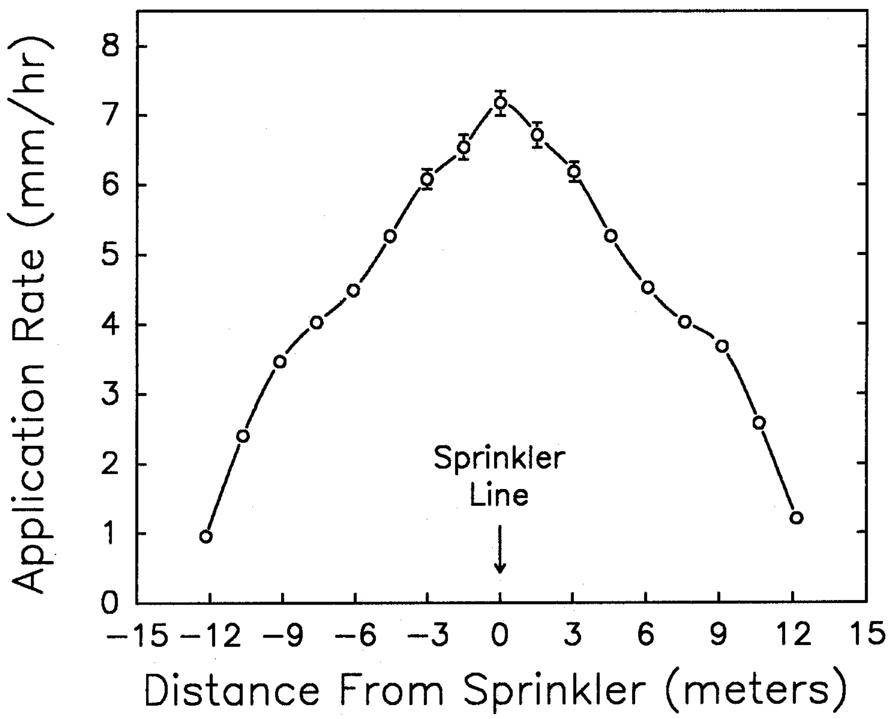

Figure 1. Irrigation distribution, expressed as application rate, of line source irrigation system. Values are means ± standard error of 12 samples. Replicate samples were obtained at 3.9 meter intervals across the length of the field.

Executive Summary, 1993

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