## ZOYSIAGRASS PERFORMANCE, WATER USE, AND ROOTING AS AFFECTED BY TRAFFIC AND NITROGEN

UNIVERSITY OF GEORGIA
Griffin, GA

Dr. Robert N. Carrow
Principal Investigator

1991 Research Grant: $10,296
(first year of study)

Zoysiagrass (Zoysia japonica) is a deep rooted, drought resistant species in many areas of the United States, especially the transition zone. Due to considerable genetic diversity among ecotypes, zoysiagrass has been targeted by the USGA as a species that could be developed through breeding/genetics to exhibit low water use, high drought avoidance and high drought tolerance.

Areas requiring special attention for developing a water conserving zoysiagrass are: a) have moderate to low ET rates under both non-limited and limited soil moisture, b) develop and maintain a deep, viable root system under the major soil stresses of high soil strength and high acidity, and c) have good to excellent drought tolerance when tissues are subjected to drying. Objectives of the current study were to evaluate 9 zoysiagrass experimentals from Dr. Milt Engelke's breeding program verses three commercial cultivars for:

a) ET, spatial rooting/water extraction patterns, and drought avoidance/ tolerance responses
b) basic cultural requirements (fertility, disease, insect, traffic tolerance)
c) data obtained in Georgia can be related to similar data in Texas to determine environmental stability of these grasses to environment, disease, and insect pressures.

Grasses were plugged at 12 inch centers on 8-12 July 1991 from plugs provided by Dr. Milt Engelke. Fertilization was monthly with 10-10-10 at 1.0 lb N/1000 $ft^2$ from July through September. Mowing was 1.0 inch with clippings returned. Ronstar 2G was applied after plugging at a rate of 1.75 lbs ai/acre for preemergence annual grass control.

To date, zoysiagrasses demonstrating the most rapid establishment are El Toro, DALZ 8514 and DALZ 8512, while those slowest to cover were DALZ 8502 and DALZ 8516. All grasses had good color but darkest green were DALZ 8516, 8508, 9006 and 8502. Narrowest leaf texture (about 2.0 mm) was exhibited by DALZ 8502, 9006, 8507 and 8508, while widest (5.0mm) were DALZ 8512, 8514, and El Toro. While not a part of the original project, Dr. Kris Braman is determining the resistance of these cultivars to mole cricket and white grub injury.

November 1991

Annual Progress Report

# ZOYSIAGRASS PERFORMANCE, WATER USE, AND ROOTING AS AFFECTED BY TRAFFIC AND NITROGEN

UNIVERSITY OF GEORGIA
Griffin, GA

Dr. Robert N. Carrow
Principal Investigator

1991 Research Grant: $10,296
(first year of support)

Zoysiagrass (Zoysia japonica) is a deep rooted, drought resistant species in many areas of the United States, especially the transition zone. Due to considerable genetic diversity among ecotypes, zoysiagrass has been targeted by the USGA as a species that could be developed through breeding/genetics to exhibit low water use, high drought avoidance and high drought tolerance.

Meyer, the most commonly used cultivar, is deep rooted and has very good drought avoidance in many soils. However, in acidic soils (pH < 5.2), rooting is markedly restricted. Many humid region soils have surface or subsurface soil horizons within this pH range. Also, Meyer, once exposed to drought, does not have good drought tolerance and tends to demonstrate rapid leaf firing. Most zoysiagrasses, including Meyer, have very high evapotranspiration (ET) rates whenever soil water is not limited. Thus, new zoysiagrasses must demonstrate substantial improvements in these area if they are to be widely used as water conserving grasses. Specifically, water conserving zoysiagrasses must a) have moderate to low ET rates under both non-limited and limited soil moisture, b) develop and maintain a deep, viable root system under the major soil stresses of high soil strength and high acidity, and c) have good to excellent drought tolerance when tissues are subjected to drying.

Objectives of the current study were to evaluate 9 zoysiagrass experimentals from Dr. Milt Engelke's breeding program verses three commercial cultivars for:

a) ET, drought resistance, and spatial rooting/water extraction patterns will be determined under field conditions. These data are essential if the USGA is to substantiate that their turfgrasses are truly superior in these characteristics. Of particular importance, will be to obtain such information under the two most prominent soil limiting factors turfgrasses encounter - high soil strength (in our situation, as surface compaction and throughout the profile) and acidic subsoils.

b) basic cultural programs (fertility, disease/insect, traffic tolerance) will be defined. Criteria to determine the "best" cultural programs will not be limited to shoot responses but will entail rooting and ET influences.

c) data obtained in Georgia can be compared to similar data in Texas to determine environmental stability of these grasses with respect to environment, disease, and insect pressures.

The twelve zoysiagrasses are listed in Table 1. Establishment was on 8-12 July 1991 by plugging at 12 inch centers with 1.8 x 1.8 x 2.5 inch plugs supplied by Dr. Milt Engelke.

Plots were treated with Ronstar 2G at 1.75 lbs ai/acre for preemergence annual grass control immediately after plugging. Fertilization was with 10-10-10 applied on 12 July, 14 August, and 4 September at 1.0 lb N/1000 $ft^2$ per treatment. Mowing has been at 1.0 inch with clippings returned. Nitrogen treatments to be initiated in 1992 are 1.25, 2.50, and 3.75 lb N/1000 $ft^2$/year. Traffic treatments to be started in 1992 are: none (except routine mowing); heavy soil compaction with a smooth power roller to minimize wear; heavy traffic with a traffic simulator applying severe wear plus compaction.

Rate of turf coverage data revealed that cultivars exhibiting the most rapid rate of establishment were El Toro, DALZ 8514 and DALZ 8512 (Table 1). DALZ 8502 and DALZ 8516 had the slowest coverage rate. Cultivars demonstrating the darkest green color were DALZ 8516, DALZ 8508, DALZ 9006 and DALZ 8502, while the lightest green was DALZ 8512. However, DALZ 8512 had very acceptable color. Narrowest leaf texture was evident for DALZ 8502, DALZ 9006, DALZ 8507 and DALZ 8508. DALZ 8512, El Toro, and DALZ 8514 had the widest leaf blades.

In addition to the data indicated in the objectives, Dr. Kris Braman has initiated a study to determine mole cricket and white grub resistance on these grasses. While not a part of the original project, this data will be very valuable.

Table 1. Zoysiagrass coverage, color, and leaf texture in 1991.

| Cultivar | Total Cover[a] 8 Aug | Total Cover[a] 29 Aug | Turf Color[b] 8 Aug | Turf Color[b] 29 Aug | Leaf Texture 8 Aug |
|---|---|---|---|---|---|
| | % | | | | mm |
| DALZ 8701 | 22cb | 32ef | 7.8cd | 8.0bc | 3.0e |
| DALZ 8502 | 19cb | 27f | 8.0ab | 8.0bc | 2.5f |
| El Toro | 43a | 74a | 7.8cd | 8.1abc | 5.0a |
| Meyer | 24b | 41d | 7.9bc | 8.2abc | 4.4b |
| DALZ 8507 | 23b | 39de | 7.8cd | 8.1abc | 2.9ef |
| DALZ 8512 | 44a | 55c | 7.8cd | 7.9c | 5.0a |
| DALZ 8516 | 17c | 28f | 8.2a | 8.4a | 3.6c |
| DALZ 8501 | 22cb | 34def | 7.8cd | 7.9c | 3.5cd |
| Emerald | 22cb | 34def | 7.9bc | 8.3ab | 3.1de |
| DALZ 8508 | 22cb | 35def | 8.0ab | 8.2abc | 2.9e |
| DALZ 9006 | 21cb | 33def | 8.0ab | 8.1abc | 2.8ef |
| DALZ 8514 | 47a | 65b | 7.7d | 8.1abc | 5.0a |
| LSD (.05) = | 5.5 | 8.0 | 0.21 | 0.34 | |
| CV (%) = | 12 | 11 | 1.5 | 2.5 | 13 |

[a]Initial percent turf coverage at establishment by plugging on 10 July 1991 was 15%.

[b]Turf color: 9 = dark green; 1 = no green.