

FOURTH ANNUAL PROGRESS REPORT

concerning

BREEDING AND DEVELOPMENT

OF ZOYSIAGRASS

Submitted by:

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Texas A&M University System

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EXECUTIVE SUMMARY
FOURTH ANNUAL ZOYSIA PROGRESS REPORT
ZOYSIAGRASS BREEDING AND DEVELOPMENT

Principle Investigator: Dr. M. C. Engelke

Research Assistant: Ms. Melinda Quick

Research Period: 1 November 1986 to 1 November 1987

The zoysiagrass breeding program has just started its Fifth year with the Financial Support of the United States Golf Association. Major Regional Field Trials were initiated with cooperators for several states providing comparative evaluation of four experimental DALZ zoysia varieties with four commercially available zoysiagrass cultivars, including 'Meyer', 'Emerald', 'Belair', and 'El Toro'.

Additional trials have been established to evaluate sod production potential (Ferris, Texas), and under the Linear Gradient Irrigation System (LGIS) at Texas Agricultural Experiment Station - Dallas to determine water use requirements. A replicated management study will be planted in the Spring 1988 to evaluate the optimum nutritional requirements and influence of mowing height/frequency on turf quality and persistence. The establishment rate of the experimentals show considerable promise, however, the primary reason for their selection is related to the high rhizome production, and their inherent ability to recover following sod harvest, or divot injury.

Numerous agronomic and biological characteristics are presently being assessed on the DALZ lines selected during 1985, including shade tolerance (Dallas), salinity tolerance (El Paso), water use requirements (Dallas, and College Station), disease (Dallas, and Carbondale, IL), sod traits (Dallas), nutritional requirements (Missouri), putting quality (Dallas), and general turf adaptation (Arizona, Oklahoma, Illinois, Missouri, California and Dallas). The data base developed through cooperation with Scientists at each of these locations will provide the basis for releasing and recommending the use and distribution of new varieties. Two of the DALZ lines may be increased under foundation field conditions (~ 0.40 ha during 1988) to provide sufficient planting stock for potential release in the early 1990's.

Selections have been made from open-cross progeny which were field planted in 1985 without the benefit of irrigation or fertilization. These plants will be advanced into replicated field management/variety evaluation trials to determine their agronomic strengths.

Twenty-seven plants from the Oriental collection have been selected for their seed production potential. Progeny from each of the clones will be evaluated for agronomic traits and seed production to identify superior parental clones for turf quality and seed production potential.

FOURTH ANNUAL ZOYSIAGRASS REPORT 1987

Index

ANNUAL REPORT NOVEMBER 1987

BREEDING AND DEVELOPMENT OF ZOYSIAGRASS

	Page No.
Executive Summary	i
Index	iii
I. Introduction	1
II. Personnel	1
III. Greenhouse Germplasm	1
A. Greenhouse - Screening for Mite Resistance	1
B. Greenhouse - Propagation Technique Study	2
C. Greenhouse & Field - Hybridization	2
D. Seed Production Characteristics	3
IV. Field Studies	4
A. Linear Gradient Irrigation System	4
B. Zoysia Shade Study	6
C. Putting Green	6
D. Regional Field Trials	7
V. APPENDIX	10

USGA ANNUAL REPORT FOR 1987

ZOYSIAGRASS BREEDING AND DEVELOPMENT

I. INTRODUCTION

The contract for Breeding and Development of Zoysiagrass is established through the Texas A&M Research Foundation. This is the fourth annual report, and is submitted, as required in the contract, for the period November 1, 1986 through November 1, 1987. Ms. Jo Ann Treat, President, Texas Research Foundation, and Mr. Charles Smith, Director of Administration and Services for the United States Golf Association, signed the original contract agreement effective May 1984. Annual reports have been submitted and are on file for September 1984, November 1985, and November 1986. Semiannual reports were submitted May 1985, May 1986, and May 1987.

II. PERSONNEL

The support position of Research Assistant for the Zoysiagrass Breeding project is held by Ms. Melinda Quick (Vitae provided May 1986). The halftime Technical Assistant position is held by Mr. George Wehrmaker. Mr. Wehrmaker plans to vacate this position in January 1988, to complete his undergraduate degree. At that time, the position of Technical Assistant is expected to be filled without delay.

III. GREENHOUSE GERMPLASM

The Zoysia sp. germplasm of over 1000 unique accessions continues to be maintained in Deepots in the greenhouse to insure individual integrity. All plant materials are fertilized, watered, clipped and provided chemical pest control to maintain optimum plant health.

A. GREENHOUSE - Screening for Mite Resistance

INTRODUCTION: Previous reports detail the significant problem of the mite Eriophyes zoysiae, infestations on Zoysiagrass. Resistance to the mite in newly developed cultivars will be highly desirable, and emphasized in the breeding program.

OBJECTIVE: Develop an effective and efficient greenhouse screening technique to identify biotic resistance in the Zoysiagrass germplasm to Eriophyes zoysiae.

PROGRESS: Procedures attempted to May 1987 have been detailed in previous reports. Beginning in November 1986, we discontinued the use of chemicals for insect control with the intent of managing the mite population in order to

effectively screen the Zoysia germplasm nursery (greenhouse) for potential mite resistance.

Mite activity did not develop significantly in the greenhouse this past year, therefore little progress has been made. Limited activity was noticed under field conditions, however, zoysia plants expressing symptoms in the field will be returned to the greenhouse in order to restore the mite inoculum source. This will permit additional screening in the spring and summer of 1988. The fact the mite population under greenhouse conditions failed to maintain high inoculum levels is encouraging from a management stand point. The potential problems from mite infestations may not be as serious as once considered. Regardless, the screening program will continue.

FUTURE DIRECTION: The mite is primarily active on new plant tissue and is also the most active in the spring and early summer. Notes have been recorded over the past 4 years on the susceptibility of different clones (both greenhouse and field) to the mite. Vegetative propagules of those clones which have not expressed symptoms, as well as several that are known to be susceptible will be established in mid to late winter to promote juvenile growth and they will be challenged with populations of the mite under controlled greenhouse conditions. We have numerous clones which have never expressed symptoms of susceptibility to the mite, however, additional testing and more precise procedures are necessary to confirm the resistance level.

B. GREENHOUSE - Propagation Technique Study

The propagation technique study reported in the November 1986 annual report will be the topic of a Poster Paper to be presented to the 1987 American Society of Agronomy Meetings to be held in Atlanta, from November 30, through December 3, 1987. The poster will be on display from 8:00 a.m. until 10:00 p.m. December 1. The authors will be present at the display from 2:00 p.m. until 4:00 p.m. If you are in attendance we would appreciate the opportunity to discuss this topic with you at that time.

C. GREENHOUSE & FIELD - HYBRIDIZATION

HYBRIDIZATION: Select for drought tolerance of open pollinated seedlings of Oriental Parents

INTRODUCTION: Plant breeding is the manipulation of genetic resources with respect to characteristics which favor the plants survival and/or performance. To facilitate genetic manipulation, the plants must be exposed to extremes in the environment in order to identify those plants with an evolutionary advantage. The plant breeders role in developing new varieties of turf is to accelerate the

evolutionary process through decisive manipulation of the environment. Since our prime objective is to develop plants that are better adapted to natural environmental conditions, the most efficient method of screening is to subject progenies and other genetic recombinants to environmental extremes and permit natural selection of those plants which are most compatible.

OBJECTIVES: Expose numerous genetic recombinants (hybrids) to prolonged environmental stress conditions, and to identify individual superior genotypes.

PROGRESS: Seed was harvested from selected parental clones of the Oriental germplasm which had been allowed unrestricted cross pollination. Seed from these open pollinated populations was germinated under greenhouse conditions. In June 1985, a space plant nursery of approximately 600 open pollinated zoysiagrass hybrids, representing approximately 250 families, were established to field plantings at TAES-Dallas. Initially, the plants were irrigated and fertilized to insure establishment. Individual plants were allowed to grow unrestricted and without benefit of supplemental irrigation or fertilization for 1 year. In the fall of 1986, drought survival notes were recorded. In the spring of 1987, thirteen individuals were selected for their drought tolerance and rate of spread. Currently, these selections are being increased in the greenhouse for planting in a replicated, irrigated field trial to be established in the spring of 1988. One of these plants has shown particular promise in its color, texture and rate of spread under greenhouse conditions. This selection has been given the designation DALZ8701. Future data collection will include, but not be limited to, date of greenup and dormancy, morphological characterization, rate of spread, date of floral initiation, winter color, heat and drought tolerance, water use and sod strength and regrowth.

D. SEED PRODUCTION CHARACTERISTICS

OBJECTIVES: Select genotypes with seed production potential and examine the reproductive characteristics conducive to developing a Zoysia which is phenotypically stable and can be established from seed.

PROGRESS: The following oriental accessions have been selected for their seed production potential based on the degree of floral production and seed set under greenhouse conditions at TAES-Dallas.

TAES#	TAES#	TAES#	TAES#
1624	1600	1580	1567
1927	1594	1633	1624
1590	1599	1606	1625
1785	2151	2222	1738
1888	1648	2145	1798
1707	1657	1632	1948
1621	1678		

It has been noted that all of these accessions are Z. japonica types with coarser and broader leaves, i.e. the 'Meyer' type. Very little seed production potential has been observed among the finer leaf types of Z. matrella's or Z. tenuifolia's

FUTURE DIRECTION: These clones will be vegetatively increased under greenhouse conditions and transplanted to an isolated field sight in the spring of 1988 to create a synthetic population of hybrids. Seed will be harvested by maternal clone, with subsequent populations established and the progeny individually evaluated for seed production potential and turf related characteristics.

IV. FIELD STUDIES

A. LINEAR GRADIENT IRRIGATION SYSTEM

The LGIS at Texas A&M Research and Extension Center - Dallas was developed specifically to evaluate the water requirements of the newly developed turfgrasses under actual field conditions. The description and philosophy of the system was reported in May 1986 semiannual USGA report under the appendix and titled: MINIMAL CULTURAL REQUIREMENTS FOR QUALITY TURF IN THE URBAN ENVIRONMENT.

Construction of the system was initiated in the Spring of 1986 with only a portion of the grasses established by fall. A total of 25 different zoysia varieties were selected and increased for inclusion in the LGIS trials. This includes 19 DALZ lines which represent the elite selections and products of the turf breeding program thus far, plus six commercial cultivars. The commercial cultivars include: 'Meyer', 'Emerald', 'El Toro', 'Belair', 'FC13521', and 'Korean Common' a seeded zoysia. The field design is a randomized complete block design with two replications on either side of center trench for a total of four replications. Each plot measures 1.5 m wide x 20 m perpendicular to the center trench (i.e. across the gradient), and covers approximately 20 sq.

meters (325 sq. ft.).

Each of the selected varieties were propagated in greenhouse flats measuring 2.3 square meters. This would provide sufficient material to plant a total of 80 square meters with an area:area conversion of 1:35 which is an acceptable rate of sprigging.

The plots were established from sprigs taken from the greenhouse, and evenly distributed by hand across the plot area. All plots were then covered with a wood fiber mulch to reduce drying and enhance establishment. Adequate irrigation was provided to insure optimum rooting and establishment, and thereafter to prevent drought stress. The plots received an application of 33-0-0, 0.5 kg/are (1# N/1000 f. s.) rate, 2 weeks after planting, with an additional application of 0.5 kg/are every 4 weeks through late September. Sufficient growth had occurred on the plots by mid-August at which time the mowing height was lowered to 2.5 cm (1 in.) with mowing on a weekly basis.

Notes were taken 2 weeks after planting on rate of root development with several experimentals performing initially as well as the commercial varieties (Table 1). The spreading of the individual plants was noticeable within 6 weeks at which time estimates of the area of coverage was initiated. Statistically, significant differences were noticeable among all varieties at all dates. Further testing is essential, however, the initial performance of some of the DALZ lines shows considerable promise. Of particular interest is DALZ8502, which is a fine leaf Z. matrella type which typically will spread slower. DALZ8502 was selected specifically for its rhizome production and recovery. It appears the initial establishment rate may also be competitive. Notes on per cent cover will continue to be taken until all plots are fully established. Full establishment is projected for late spring and early summer. The initial moisture gradient will be imposed on the established plots during the summer of 1988 to determine the relative minimum and optimum water requirements of each of the experimentals. A minimum of 3 years data will be required to substantiate turf performance at the various moisture levels.

SPECIAL NOTE: The Construction and Establishment of the Linear Gradient Irrigation System will be the subject of a Poster Paper to be presented to the 1987 American Society of Agronomy Meetings which will be held in Atlanta, from November 30, through December 3, 1987. The poster will be on display from 8:00 am. until 10:00 pm. December 1. The authors will be present at the display from 2:00 pm. until 4:00 pm. If you are in attendance we would appreciate the opportunity to discuss this topic with you at that time.

TABLE 1. Performance data of the Experimental and Commercial varieties of Zoysiagrasses during establishment under the Linear Gradient Irrigation at Texas A&M Research and Extension Center - Dallas, during 1987.

Entry	Rate of ² Rooting	--- Percent Coverage ---			1987 Avg	Phenotypic ³ Stability
		233	264	292		
Meyer	2.9 A ¹	21.8 A	24.6 A	36.0 A	27.5 A	4
Emerald	2.5 A	11.7	13.3	22.0	15.0	1
El Toro	2.7 A	19.0	25.8 A	44.4 A	30.2 A	3
Belair	2.8 A	8.9	8.8	16.2	11.3	1
FC13521	2.3	9.9	10.6	17.8	12.8	0
KrnComm	2.1	32.1 A	32.6 A	43.5 A	36.1 A	3
DALZ8501	2.5 A	17.8	22.2 A	30.3	23.4	2
DALZ8502	2.5 A	22.6 A	28.2 A	32.5 A	30.1 A	4
DALZ8503	2.2	12.8	17.3 A	25.1	18.4	2
DALZ8504	2.3	14.7	16.4 A	26.9	19.3	1
DALZ8505	2.3	7.8	6.4	14.5	9.9	0
DALZ8506	2.1	14.4	16.6 A	26.2	19.1	1
DALZ8507	2.7 A	22.1 A	23.2 A	35.5 A	26.9	4
DALZ8508	2.4	14.4	11.6	20.7	15.6	0
DALZ8510	2.3	12.5	13.1	24.8	16.8	0
DALZ8511	2.5 A	16.4	20.8 A	30.2	22.5	2
DALZ8512	2.8 A	14.6	20.4 A	33.3 A	22.8	3
DALZ8513	2.5 A	16.0	20.0 A	29.5	21.8	2
DALZ8514	2.3	11.7	16.0 A	27.6	18.8	1
DALZ8515	1.8	6.7	6.7	10.9	8.1	0
DALZ8516	2.8 A	14.2	16.3 A	24.6	18.3	2
DALZ8517	2.6 A	13.2	15.7	24.6	18.3	1
DALZ8522	2.1	5.6	4.6	9.5	6.6	0
DALZ8523	2.0	12.9	15.0	20.7	15.8	0
DALZ8524	2.1	9.0	11.2	19.4	13.2	0

¹Means followed by the same letter in any column were not statistically different. Only those entries in the top rating are indicated. See below.

²Rate of rooting assessed on a 1 - 9 scale, where 9 was the best.

³Phenotypic Stability = the number of times the entry was statistically in the top category, and identified with an A. (Does not include the yearly AVG.)

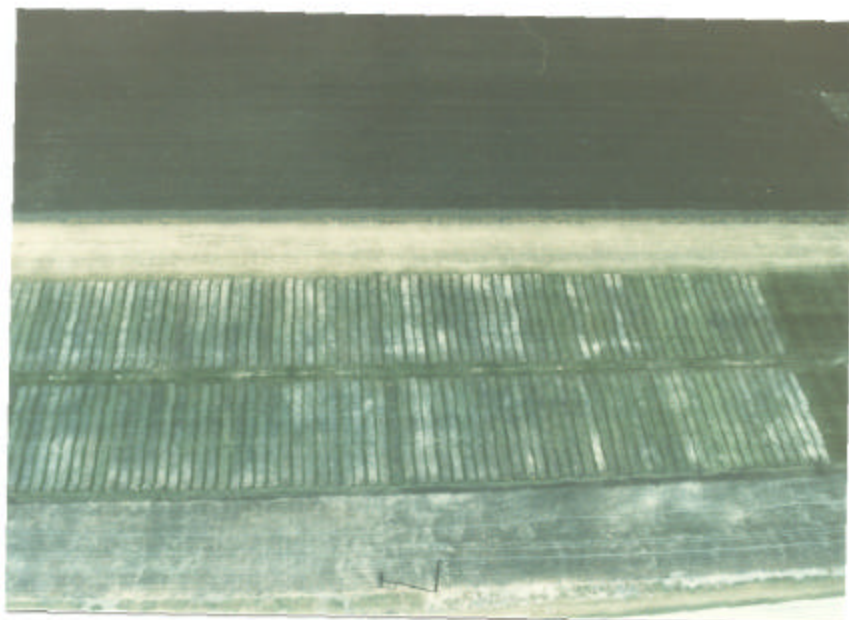


Figure 1. Linear Gradient Irrigation System (LGIS)
at Texas Agricultural Experiment Station - Dallas
aerial view taken 2 months after planting experimental
varieties including 19 DALZ lines.

B. ZOYSIA SHADE STUDY

OBJECTIVE: Identify the relative shade tolerance of the commercial and experimental varieties of Zoysiagrass.

Progress: Twenty-four of the elite zoysia lines and or selections identified with a DALZ prefix where planted at random with five commercial cultivars (including Meyer, Emerald, El Toro, Belair and FC13521) in a three replicate field planting, and which was duplicated under full sun and heavy shade. The shade was created by using grain sorghum planted at approximately 6200 plants per are, and which attained a midsummer height in excess of 2.5 meters. Two-inch plugs of each of the clones were planted on 0.6 meter centers. The study was fertilized at a rate of 0.5 kg/are at establishment, and at 6 week intervals through late September. Irrigation was supplied daily through establishment, and as needed afterwards to avoid stress.

The shade cover is scheduled to be removed in mid-November. At which time, notes will be taken on degree of spread, stolon length and total plant area covered.

FUTURE DIRECTION: Future shade studies of this nature will be conducted at TAES - Lubbock in cooperation with Dr. Charles Wendt which will enable us to use facilities they designed for excluding rain, i.e. rainout shelters. During the normal use of these facilities, the cover or roof is retracted and parked out-of-the way of their target area. This parked condition creates a constant and uniform shade, under which we will establish replicated plantings of the varieties of interest. A duplicate planting will be established under full sun adjacent to the shade site to provide comparative information. Plants will be propagated under greenhouse conditions during the winter and spring of 1987/88, and will be planted at the Lubbock sites by mid-June 1988. Plant performance will be assessed in the fall of 1988 by evaluating the degree of plant development using aerial photographic equipment and area digitizer of video images. New equipment is presently being acquired through grants from the TAES-Director's office for obtaining computerized color video digitizing equipment. Such capabilities will enable us to quantify color and growth responses easily and with greater accuracy.

C. PUTTING GREEN - DALZ8502

OBJECTIVE: Determine the potential of DALZ8502 as a putting surface, and establish its managerial requirements for optimum performance.

JUSTIFICATION: Plots of DALZ8502 were established to a putting green in the summer of 1986, and mowed at 0.5 - 0.6 cm height (0.2 - 0.25 inches). The plot performed well except for heavy thatching under the high fertilizer level maintained on the bentgrass green.

PROGRESS: DALZ8502 a fine textured, highly rhizomatous plant was established in three replications to a sand based bentgrass green in July 1986 for preliminary assessment of its potential as a putting surface. The plant did not enter complete dormancy during the mild 1986/87 winter and resumed active growth in early February 1987. Through the spring, plant tissue was not removed at the 0.6 cm (0.25 in.) mowing height being maintained on the green.

In early April, plant material was increased in the greenhouse to provide sufficient material to establish a plot 38 sq. meter (400 sq. feet) on the new green. In late July, 18 sq. ft. of material was harvested as sod, then separated into sprigs of 2-6 node segments, and evenly distributed by hand across the plot. The plot was heavily topdressed and rolled to insure maximum sprig/soil interface. Irrigation was supplied at frequent intervals each day through out the establishment phase, and daily, or to avoid stress thereafter. A complete balanced fertilizer was applied at a 0.5 kg/are 2 weeks after planting. An additional 0.25 kg/are of 33-0-0, alternating with 34-5-7 was applied at 3 week intervals through mid-October. Complete coverage is expected by mid-spring 1988. During the summer of 1988, evaluations will include; ball roll and speed characteristics, height of cut performance, fertilization rate performance, and eventually overseeding adaptability.

D. REGIONAL FIELD TRIALS

During the fall/spring 1986/87, four experimental accessions, identified for superior growth characteristics, and four commercial cultivars were provided to numerous research programs throughout the United States for extensive REGIONAL FIELD TRIALS (Table 2.)

All vegetative plant materials were initially propagated from a single sprig in sand or similar media under greenhouse conditions at TAES-Dallas. Using single sprigs for the initial increase assures the genetic uniqueness of the plant and reduces the possibility of contamination for external sources. Approximately 0.6 sq. meters of plant material of each of the accessions were provided to each of the cooperators. They in turn increased the plant material in their greenhouses for subsequent planting to field plots, or maintained under greenhouse conditions to ensure purity and genetic integrity for subsequent lab and greenhouse studies.

Table 2. Locations and cooperators involved in the REGIONAL FIELD TRIALS of Commercial and Experimental varieties of zoysiagrasses.

<u>Location</u>	<u>Cooperator</u>	<u>Type Trial</u>	<u>Date Established</u>
Tucson, AZ	Dr. Charles Mancino Dr. Dave Kopek	Field	Apr. 24, 1987
Hayward, CA	Mr. Ali Harivandi	Field	August, 1987
Columbia, MO	Dr. John Dunn Dr. Dave Minner	Field + Nitrogen	May 28, 1987
Carbondale, IL	Dr. Annamarie Pennucci Dr. Herb Portz	Field + Pathology	Feb. 12, 1987
Edwardsville, IL	Dr. Annamarie Pennucci Mr. Duke Ajemian	Field	June 5, 1987
Stillwater, OK	Dr. Mike Kenna	Field	Feb. 23, 1987
El Paso, TX	Dr. Garald Horst	Lab - Salinity	June 1985
College Station, TX	Dr. James B. Beard Dr. Robert Greene	Field - Water Electrophoresis	June 1986 Jan. 12, 1987
Ferris, Texas	Dr. M. C. Engelke Mr. David Doguet	Field - Sod	Sept. 13, 1986

The accessions included in these regional field trials include:

Commercial Varieties

Meyer	Emerald
El Toro	Belair

Experimental Varieties

DALZ8501	DALZ8502
DALZ8508	DALZ8516

As identified, one such trial was established on a Sod Farm owned by Quality Turf, Mr. David Doguet, President. The site is near Ferris, Texas and henceforth, will be referred as the Ferris planting. This particular site was selected for several reasons, paramount was cooperation and control of germplasm. The site is approximately 20 miles south of Dallas, and is on one of the largest sod farms in the region. The plots were planted by sprigging and hand planting on September 13, 1986. Performance of the plots are constantly monitored by TAES personnel with data presented in Table 3. Although the site had been previously fumigated, considerable contamination still occurred from bermudagrass. Contamination was minimized by hand digging and the use of glyphosate for control. To date, notes on establishment have been collected from this site on a monthly basis (Table 3). Plots will be harvested in the spring/summer of 1988 to determine sod strength, sod quality, and regrowth characteristics.

I am including additional terminology of PHENOTYPIC STABILITY as a statistic to be considered in the evaluation of data and in the assessment of the overall performance of the experimental and commercial lines. PHENOTYPIC STABILITY is defined here as a measure of the ability of a plant to adapt to its environment. The higher the rating, the better the plant is performing in the environment(s) tested. The value of this statistic will come to bear when data from multiple locations, in multiple years is assembled and analyzed.

The germplasm exchange agreements and acknowledgment of receipt of materials are included in the appendix along with additional correspondence received. Data was provided by Dr. Mancino from Arizona State University and is presented in Table 4. Since most of the sites received material during 1987, limited information is presently available for regional analysis.

Table 3. REGIONAL FIELD TRIAL - FERRIS, TEXAS. Establishment data, color ratings and estimates of Phenotypic stability of commercial and experimental zoysiagrasses planted at Ferris, Texas 1986.

Entry	----- Per Cent Coverage ² -----							1987 AVG	Phenotypic ³ stability	
	162	187	Julian date		233	247	289		Color	\\
Belair	20.0A ¹	40.0	31.7	61.7A	75.0A	89.7A	96.3A	59.2	7.7A	6
El Toro	36.7A	63.3A	73.3A	85.0A	97.7A	99.0A	99.0A	79.1A	6.0	7
Emerald	30.0A	50.0A	48.3	70.0A	81.7A	86.7A	95.0A	66.0	6.7A	7
Meyer	20.0A	38.3	30.0	60.0A	75.0A	81.7A	92.3A	56.8	6.0	5
DALZ8501	36.7A	53.3A	61.3A	71.7A	85.0A	91.7A	98.3A	71.2	5.3	7
DALZ8502	20.0A	36.7	40.0	46.7	58.3	65.0	75.7A	48.9	6.0	2
DALZ8508	20.0A	43.3A	55.0A	63.3A	76.7A	80.0A	90.0A	61.2	6.3	7
DALZ8516	11.7	23.3	21.6	33.3	48.3	60.0	66.7	37.8	7.3A	1

¹Means followed by the same letter in any column were not statistically different. Only those entries in the top rating are indicated. See below.

²%Coverage is an estimate of the area averaged over 10 readings per plot.

³Phenotypic Stability = the number of times the entry was statistically in the top category, and identified with an A. (Does not include the yearly AVG.)

Table 4. Summary of Zoysia performance trials at Tucson, Arizona 1987.

<u>Variety</u>	<u>% Survival</u> ^{1/}	<u>% Cover</u> ^{2/}	<u>Color</u> ^{4/}	<u>Texture</u> ^{5/}	<u>Quality</u> ^{6/}
Dalz 8501	97 \pm 3	11.7 BC ^{3/}	6.8 A	7.3 C	2.3 AB
Dalz 8502	93 \pm 9	5.3 CD	7.0 A	8.8 A	1.3 C
Dalz 8508	93 \pm 9	8.3 BCD	5.5 BC	8.2 AB	1.8 BC
Dalz 8516	93 \pm 7	2.0 D	6.8 A	6.3 D	1.3 C
Bel-Air	92 \pm 3	13.3 B	5.0 C	5.3 E	1.5 BC
Meyer	95 \pm 6	11.7 BC	5.2 C	4.8 EF	1.8 BC
El Toro	96 \pm 5	28.3 A	7.0 A	4.2 F	2.8 A
Emerald	-	5.7 CD	6.3 AB	7.7 BC	1.3 C

^{1/} Based on the survival rate of 105 individual stolons 53 days after planting.

^{2/} 75 days after planting as individual unrooted stolons on one-foot centers

^{3/} in 5' x 7' plots. (Means followed by the same letter are not significantly different at the P = .05 level).

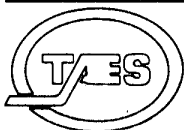
^{4/} Color based on a scale of 1 to 9 with 9 = dark green, 6 = acceptable color and 1 = brown turf. Rating made 75 DAP.

^{5/} Texture based on a scale of 1 to 9 with 9 = fine and 1 = coarse.

^{6/} Quality based on a scale of 1 to 9 with 9 = ideal turf, 6 = acceptable turf and 1 = poor turf. Quality takes into account % cover, color and texture

APPENDIX

TEXAS A&M UNIVERSITY
RESEARCH AND EXTENSION CENTER AT DALLAS



THE TEXAS AGRICULTURAL EXPERIMENT STATION
17360 COIT ROAD DALLAS, TEXAS 75252
PHONE (214) 231-5362

MEMORANDUM OF AGREEMENT

TO:

FROM: M. C. Engelke, Turfgrass Breeder and Geneticist
Texas Agricultural Experiment Station - Dallas

SUBJECT: TRANSFER AND TESTING OF PLANT MATERIAL

PLANT SPECIES: _____

Description and quantity of material released:
Experimental Designation Quantity & Type Material

PURPOSE OF RELEASE: description of proposed testing procedure(s)
or objectives, i.e. field evaluation, disease assessment, etc.

Modifications to Purpose:

Location of Planting:

OTHER: Plant material may not be released to a third party and
may not be used for any purpose other than the original
specific request without the expressed written permission
from M. C. Engelke, and/or Texas Agricultural Experiment
Station.

RELEASED BY: _____
(Rep of Turf Breeding Program) Date _____

RECEIVED BY: _____
(Name of Requesting Cooperator or Rep) Date _____

TEXAS AGRICULTURAL EXPERIMENT STATION

MEMORANDUM OF AGREEMENT

between

THE TEXAS AGRICULTURAL EXPERIMENT STATION

and

Cooperator, Agency, Company

The purpose of this agreement is to provide for the cooperative evaluation of advanced and potentially new strains of from the Genetic and Breeding Research Programs of the Texas Agricultural Experiment Station (hereafter referred to as the Station) and relates specifically to further procedures for orderly, effective release of Station originated strains to seed and sod growers, seedsmen, and thence to planters and other cooperators of the testing and evaluation program.

The Station, through its duly authorized representative, (name of breeder or scientist) at (location) herewithin makes available to (company, agency, cooperator) (indicate amount and type material, i.e. 1 sq ft. sod, 100 g seed) of the strain(s) (identify material to be tested) to be evaluated for (quality, adaptability, general turf performance, seed production, sod production, disease, insect, chemical analysis, or) potential.

(Company, agency, cooperator) certifies that it has under its direct control and operation trial grounds maintained at (location) and has in its employ individuals qualified to grow and evaluate this (ese) strains.

(Company, etc.) further certifies that it will:

1. Accept the plant materials (vegetative, or seed, etc.) of the above described strain and protect them from unauthorized distribution and propagation.
2. Propagate this (ese) strains under such field, greenhouse, or laboratory techniques as required to compare their performance characteristics with such commercial varieties and strains as may be mutually determined by the Station and the cooperating agency.

3. Record and provide test results to the Station during or after trials.

4. Cooperator will not retain any seed or propagating materials from these strains, and dispose of materials as outlined or authorized by the Station; cooperator will destroy all plants produced from these strains at the end of the evaluation period.

It is mutually agreed:

1. That decisions relative to the further propagation or the release of any of these strains shall be the sole responsibility of the Station.

2. That all evaluation data obtained shall be subject to analysis and publication by the Station and that its subsequent use in advertising or sales promotion literature will require the expressed permission of the Station.

3. That this agreement shall become effective upon approval by all parties concerned and shall be terminated at the end of _____.

AGREEMENT:

Originating Plant Breeder, Project Leader

Date

Head of Department or Director of Station

Date

APPROVED:

(Cooperator)

Date

Director of Texas Agricultural
Experiment Station

Date



The University of Arizona

College of Agriculture
Department of Plant Sciences
Tucson, Arizona 85721

October 7, 1987

Melinda R. Quick
Texas A&M University
Research and Extension Center at Dallas
17360 Corr Road
Dallas, TX 75252-6599

Dear Melinda:

Enclosed please find a summary of our Zoysia evaluation data. All the Zoysias were planted on April 24, 1987, except for Emerald, which we needed to further increase in the greenhouse. Emerald was planted on June 16, 1987. Percent survival was very high for all of the varieties. This count was made 53 days after planting. The other variables were measured 75 days after planting. As of August 15, 1987 the spread of the Zoysia had been relatively small. However, we have noticed that some of the varieties have taken off since then. We will rate them at least one more time in 1987. Do not be alarmed by the low quality scores. They take into account the percentage of cover which is low. A closer look at individual plugs reveals turf of medium to excellent quality.

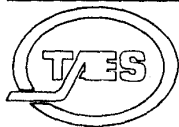
Sincerely,

Charles F. Mancino

Charles F. Mancino
Assistant Professor

CFM/es
enclosure

TEXAS A&M UNIVERSITY
RESEARCH AND EXTENSION CENTER AT DALLAS



THE TEXAS AGRICULTURAL EXPERIMENT STATION
17360 COIT ROAD DALLAS, TEXAS 75252
PHONE (214) 231-5362

MEMORANDUM

TO: Ali Harivandi University of California Hayward, CA

FROM: M. C. Engelke, Turfgrass Breeding and Genetics

SUBJECT: Transfer of Plant Material

Plant Species: Zoysia sp.

Type and Amount of Plant Material Released:

2 cell pack trays containing 72 plugs of each of the following:

DALZ8501	Meyer
DALZ8502	Emerald
DALZ8508	El Toro
DALZ8516	Belair

Purpose of Release: Plant material is to be used in field trial plots.
Evaluations will be made on turf establishment, quality and performance.

Modifications to Purpose:

Location of Planting:

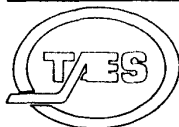
Other: Plant material may not be released to third party and may not be used for any purpose other than the original specific request, without express written permission from M. C. Engelke and/or Texas A&M University.

Released by: Michele Myers
Date: 8-17-87

Received by:
Title:
Date:

Please return original to Dr. M. C. Engelke (address top) and retain copy for your records.

TEXAS A&M UNIVERSITY
RESEARCH AND EXTENSION CENTER AT DALLAS



THE TEXAS AGRICULTURAL EXPERIMENT STATION
17360 COIT ROAD DALLAS, TEXAS 75252
PHONE (214) 231-5362

RELEASE OF PLANT MATERIAL TO TAMU - COLLEGE STATION
PLANT MATERIAL RELEASED TO John Walker ON JUNE 16, 1986.

PLANT MATERIAL IS TO BE EVALUATED UNDER FIELD CONDITIONS FOR TURF QUALITY.

PLANT MATERIAL RELEASED:

EL TORO	DALZ 8512	TENN. HARDY
BELAIR	8513	AC 44
DALZ 8501	8514	DALBD 8201
8502	8515	8202
8503B	8516	8203
8504	8517	
8505	8518	
8506	8519	
8507	8520	
8508	8521	
8509	DALCG 8502	
8510	8503	
8511	CENTENNIAL	

RELEASED BY

Melinda K. Quick

RELEASED TO

John Walker

DATE

6/14/86

TEXAS A&M UNIVERSITY
RESEARCH AND EXTENSION CENTER AT DALLAS



THE TEXAS AGRICULTURAL EXPERIMENT STATION
17360 COIT ROAD DALLAS, TEXAS 75252
PHONE (214) 231-5362

February 25, 1986

MEMORANDUM

TO: Gerald Horst
FROM: TAES-Dallas
SUBJECT: Transfer of Zoysiagrass - Dalz lines

The following Zoysiagrass Dalz lines have been transferred to
TAES-El Paso for additional research and development.

Dalz - 8501	- 8511	- 8519
8502	- 8512	- 8520
8503	- 8513	- 8521
8504	- 8514	
8505	- 8515	
8506	- 8516	
8507	- 8517	
8508	- 8518	
8509		
8510		

Melinda Quick

Acknowledgement of receipt.

868205
Date

Signature