THIRD

ANNUAL PROGRESS REPORT

concerning

BREEDING AND DEVELOPMENT OF BENTGRASS

submitted by

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EXECUTIVE SUMMARY

THIRD ANNUAL PROGRESS REPORT

BREEDING AND DEVELOPMENT OF BENTGRASS

Principle Investigator: Dr. M. C. Engelke

Research Associate: Ms. Virginia G. Lehman

RESEARCH PERIOD OF THIS REPORT : 1 November 1986
to 1 November 1987

Reference Semiannual Report Filed 1 May 1987.

The Bentgrass Breeding Program at Texas A&M - Dallas was initiated in April 1985 as a joint effort between the United States Golf Association, Bentgrass Research, Inc., and the Texas Agricultural Experiment Station.

The Germplasm Introduction Nursery presently contains over 375 unique vegetative accessions from around the world, an additional 270 advanced generation selections identified for superior heat tolerance and rooting characteristics, and 70 seeded accessions.

Four limited clone Synthetic populations were generated in Oregon during the 1987 pollination season. An additional 77 polycross populations involving the very best of the bent germplasm collection produced sufficient seed for selection within the next generation. Significant differences existed between clones for root extension and root areas, which were used in a specific RHT crossing block in Oregon in 1987, from which seed will be used to conduct parent-progeny regression for root characters. Specific clones have been selected from 'Seaside' for improved turf quality, density, and color and have been placed in isolation for generation of the first generation of a 'Seaside II' cultivar.

Additional crosses and polycross populations will be created in 1988 based on laboratory, greenhouse, and field data collected in Oregon and at TAES-Dallas.

Laboratory and Greenhouse research screening procedures continues at TAES-Dallas with specific emphasis on rooting characteristics, and membrane stability (tissue tolerance to high temperatures). New facilities are being constructed in the fall of 1987 to create a Turfgrass Root Investigation Facility (TRIF)for examining root characteristics under field conditions.

Field evaluation trials have been conducted on the 1985 green and on native soil (simulated Fairway conditions) since 1985. These field trials have provided necessary information concerning thatching tendency, mowing quality, color retention, density of stand etc., to assist in selecting plant materials for the Oregon Crossing Blocks.

The excellent cooperation between the Unites States Golf Association, and Bentgrass Research, Inc. has been instrumental in implementing the procedures necessary for timely development of a new bentgrass for the Golf Industry.

THIRD ANNUAL BENTGRASS REPORT 1987

I. INTRODUCTION

This annual report, as required in the contract, is for the period of 1 November 1986 to 1 November 1987. Ms. Jo Ann Treat, President, Texas Research Foundation, and Mr. Charles W. Smith, Director, Administration and Services for the United States Golf Association, signed the original contract agreement effective 8 April 1985. The Second Semi-Annual Progress Report was submitted 1 May 1987.

II. PERSONNEL

The Bentgrass breeding project includes a full-time Research Associate position, presently filled by Virginia Lehman. The one-half time technical assistant position is currently filled by Mark McCormack, a horticulture student at Richland Community College.

III. IMPLEMENTATION

A. GERMPLASM ACQUISITION

INTRODUCTION: Genetic variability in the desired plant characters is essential in genetic improvement of bentgrass. Genetic recombination of individuals which have improved traits will result in the accumulation of multiple desirable traits.

OBJECTIVE: Assemble a germplasm pool of unique bentgrasses with genetic variation in plant characters.

PROGRESS: The current collection contains 375 unique vegetative accessions , 270 advanced generation selections, and 70 seeded accessions. Polycross seed lots developed during the 1987 summer in Oregon were received in August. These seed lots must be thrashed and cleaned during the 1987-88 winter.

FUTURE WORK: The evaluation phase of germplasm development is a continuing process. The 1987 green was constructed to hasten the process of germplasm evaluation.

B. GERMPLASM ASSESSMENT

INTRODUCTION: Characterization of plants is necessary to determine which traits are to be included in selection indices. This characterization is conducted in these areas: greenhouse, laboratory, and the field.

1A. GREENHOUSE - RESPONSE TO HIGH SOIL TEMPERATURES

1. Response of commercial bentgrass cultivars to high soil temperatures.

JUSTIFICATION: Evaluation of the relative heat tolerance of the commercially available bentgrass cultivars should provide information which may determine cultivar use in specific environments.

PROGRESS: The first phase of this evaluation was completed and reported in the 1987 semiannual report. A second study was initiated during July 1987. The soil temperatures accelerated too rapidly, resulting in population decimation, without any discernible cultivar differences. The soil temperature monitoring equipment is currently under redevelopment, with a second study planned for initiation in 1988.

1B. GREENHOUSE - CHARACTERIZATION OF ROOTS

1. OBJECTIVE: Comparison of root characters of Seaside and Seaside-RHT (Root Heat Tolerant) bentgrass populations.

JUSTIFICATION: Numerous morphological and physiological characters of a plant contribute to its biological performance. An extensive root system may allow the bentgrass plant to reach reservoirs of soil moisture lower in the profile, and avoid secondary, heat-induced drought injury.

PROGRESS: Evaluation of 90 clones each of Seaside and Seaside-RHT has been completed in the greenhouse. A single tiller of each clone was established in a 60 cm column of sand held inside clear polyethylene tubing, racked inside of a PVC column. The individual clones were replicated four times. Three g of Osmocote 14-14-14 were mixed with approximately 900 g of fine, washed sand. A single layer of steel blue blotter paper was placed on the soil surface to prevent desiccation. Root extension was monitored weekly over the duration of the study. The plants were clipped to a 2.5 cm height weekly, with clippings collected. At harvest, the number of major roots was counted at each 10 cm depth of soil. The number of rooted tillers per plant was counted. The root area was determined using a Delta-T leaf area meter.

There were no differences between the Seaside and Seaside-RHT populations for average root area, however, individual clones with in the populations differed at depths greater than 30 cm (Appendix Table 1). Averaged over both populations 35 percent of total root area was in the top 10 cm depth (Figure 1.) The percent root area at each succeeding 10 cm soil depth was: 22.5, 16.1, 12.0, 9.1, and 4.8 respectively.

Similarly, root extension of individual clones of the bentgrasses varied after the second date of examination (Appendix Table 1). There were no differences between the Seaside and Seaside - RHT population means for root extension, which reached 42.6 cm by the end of the study (Figure 2).

FUTURE WORK: The data which has been collected on root number, shoot weights, tiller number, root dry weights, and tiller weights has yet to be analyzed. Frequency distribution analysis will be conducted on root area and extension. A 10 clone Synthetic

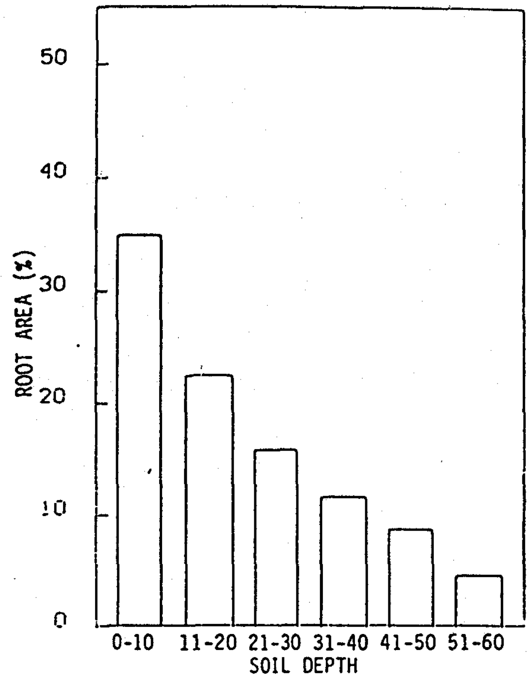

Figure 1. Mean percent root area per 10 cm soil depth of 180 clones of Seaside and Seaside-RHT bentgrass.

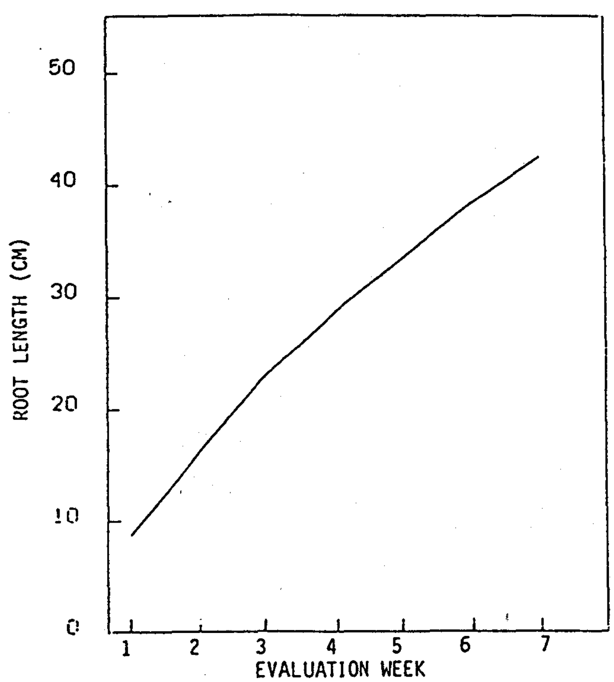

Figure 2. Mean root extension of 180 clones of Seaside and Seaside-RHT bentgrass.

The data presented (Table 1) is the ratio of partial EC/total EC for two sample dates. The values closest to 1.0 represent the more sensitive clones. Additional comparisons will be required to validate this procedure.

FUTURE WORK: The data for shoot membrane stability must be analyzed. Two additional studies of root and shoot EC are planned to clarify and reinforce completed studies. The membrane stability studies have the potential to allow screening of large numbers of genotypes. This data, in conjunction with root size and distribution data may allow determination of a selection index for developing an improved bentgrass. The correlation between actual canopy temperatures and water use of the thirteen clones selected for the root EC measurements will be studied under greenhouse conditions. Plant material has been propagated and is present in trays in the greenhouse to utilize for canopy temperature measurements.

3A. FIELD - AGRONOMIC ASSESSMENT

INTRODUCTION: The phenotypic expression (P) of observed plant performance is the product of the plant's genetic constitution (G) and a specific environment(E). As the environment changes, the expression of a plant may also change. Genetic constitution is constant, excepting mutation, so that the plant performance is attributed to the interaction of genotype with the environment (GXE). The potential for the GXE interaction to be significant requires extensive testing in many different environments. The purpose of the breeding program is to strengthen the genetic component of expression and to reduce the genotype times environment component, so that a change in environmental stress has less impact. This increases stability of the variety and predictability of performance. Multiple test locations and years are required for successful identification of important genetic traits.

1. OBJECTIVES: Identify genotypes with superior agronomic traits on a sand green with management similar to a putting green.

JUSTIFICATION: Evaluation of plant materials on a sand green identifies the best genotypes under simulated greens conditions.

PROGRESS: Ninety-six elite clones of bentgrass were established in two replications on a sand green on 24 September 1985. The performance of these genotypes for 1985-86 was reported in the previous annual reports. The evaluation of these genotypes has continued into the fall of 1987. Forty-five genotypes had acceptable quality in spring 1987 (Second Semi-Annual Progress Report). On 17 June 1987, two procedures were instigated to explore thatch and levels of puffiness of the elite clones. In one experiment, a 0.68 kg weight was dropped from a height of 77 cm, and the position the thatch held up the weight was determined (Thatch Bounce Test, in appendix Table 2). Following the weight measure, a vertical slice was removed from each plot and the actual thatch present in each slice was determined. On June 22

1987, the green was severely verticut, followed by topdressing. The mowing height was lowered to 0.47 cm prior to the heat stress of the summer. Mortality of some clones resulted from the intentional stress imposition.

Quality ratings for clones after the verticutting treatment, were weakly but negatively correlated with the thatch present in the slices of turf and with the thatch bounce test (Table 2).

FUTURE WORK: This evaluation has allowed us to eliminate many clones as potential parents. The best clones will be combined in a crossing block in Oregon (1988) for genetic recombination. This evaluation, on the east side of the 1985 green, is scheduled for removal since this first evaluation is completed. The east side of the green will be planted in larger variety blocks for comparison with polycross seed from the 1987 Oregon Seed production plots.

2. OBJECTIVE: Identify creeping bent genotypes which are adapted to native Texas soils and fairway conditions.

JUSTIFICATION: Creeping bentgrass provides a high quality, fine textured turf with potential growth throughout the year. The species, however, lacks inherent biological resiliency to cope with environmental extremes without some modification to the root zone. Initially, the available germplasm resources are being evaluated for their growth habit and quality on native soils.

PROGRESS: This evaluation was planted in May 1986. During the spring of 1987, a thatch measurement was recorded and was reported in the 1987 Second Semi-Annual Report. Evaluation of these plant materials continues.

FUTURE WORK: This plant material is well established, and will be subjected to closer mowing (1.3 cm), and hopefully heavier traffic. This plant material is genetically diverse, and under present environmental conditions, phenotypically variable. Preliminary evaluations favor the lower thatch, high spread, and more coarsely textured types. Future testing, including tiller density will aid in selection of morphological types adapted to fairway use. Some of these genotypes have produced seed in Oregon, and parent-progeny evaluations will be initiated in the future.

3. OBJECTIVES: Determine differences in agronomic performance between Seaside and Seaside-RHT under greens conditions.

JUSTIFICATION: Populations A and B of Seaside-RHT were selected for heat tolerance. Turf quality must be determined on these selections to maintain the relationship of high quality and heat tolerance.

PROGRESS: Vegetative propagules of 294 plants were established to the sand base green in April 1986. Quality determinations are continuing to be made. During summer 1987, number of tillers, which reflects plant density, was counted for each clone.

Table 1. Root membrane stabilities of 13 Seaside and Seaside-RHT bentgrass clones analyzed on different dates.

Access	Population	date 1	date 2
307	RHT	.	0.56 e*
404	RHT	0.82a	0.70abc
502	RHT	0.79ab	0.59 de
503	RHT	0.72cde	0.61 de
505	RHT	0.84a	0.67a-d
703	RHT	0.77bc	0.70abc
107	SEASIDE	0.66e	0.71abc
204	SEASIDE	0.72cde	0.67a-d
2735	SEASIDE	0.70de	0.63cde
304	SEASIDE	0.79ab	0.65b-e
401	SEASIDE	0.75bcd	0.74ab
604	SEASIDE	0.78b	0.76a
701	SEASIDE	0.76bc	0.69abc
SEASIDE		0.64a	0.74a
RHT (Seaside)		0.69a	0.79a

*Means followed by the same letter in the same column are not significantly different at the k=100 level, using the Waller-Duncan K ratio test.

Table 2. Correlation coefficients and associated probabilities for elite germplasm characters measured during summer 1987.

	CHARACTERS		
	Thatch	Quality	
Slice	0.24, p=.0001	-0.12, p=0.01	avg=7.8 n=410
Thatch	.	-0.10, p=0.05	
	avg=15.0 n=406	avg=3.6 n=413	

FUTURE WORK: The data for root characters collected from the 1987 green will be analyzed along with tiller number per core. Repeated sampling of root number and extension is planned for the planting on the 1987 green.

6. OBJECTIVE: Characterize new bentgrass accessions in the Germplasm Introduction Nursery (GPIN).

JUSTIFICATION: The GPIN serves to screen and eliminate less desirable bentgrass accessions from further, expensive and time-consuming testing.

PROGRESS: During May 1987, 371 accessions were planted in a two replicate nursery in the 1987 green (Figure 3). This population consists of plants from France and Italy, as well as the most recently acquired accessions. During the summer and fall 1987, notes were taken on spread with an axis measuring device. This device is used to quantitatively measure spread, rather than rating spread with the traditionally used scale of 1-9. The clones, differed significantly in size on both dates of evaluation (Appendix Table 5). By comparing size on these two dates, it was possible to determine a rate of spread for each clone, which is not possible using the qualitative rating system.

FUTURE WORK: Germplasm assessment is a continuing requirement. As plant materials come into the collection, they will be added to the GPIN. As plant materials are screened through the heat bench, they will also be added to the GPIN for preliminary field evaluation.

7. OBJECTIVES: Determine the floral production characteristics and associated seed production of the elite clones of bentgrass in a commercial seed production area.

JUSTIFICATION: The floral response of bentgrass is photo-thermoperiodically determined. Early screening for floral and seed production will eliminate sterile clones from the breeding program which would delay cultivar development.

PROGRESS: Fifty clones of elite bentgrass were sent to Dr. Jerry Pepin, Pickseed West, Tangent Oregon in October 1985. This polycross nursery, designated Syn. 1-85 (Appendix Table 6), has many of the clones under evaluation on the 1985 sand green. This synthetic produced seed during 1987 which will be thrashed and cleaned during the 1987/88 winter. These clones varied significantly in the number of panicles produced, their spread rating, and type of growth habit (Figure 4).

The information collected on Syn. 1-85 regarding date of flowering, seed production, and spread characters during 1986 enabled selection of seven clones which were put into hybrid combination for the 1987 seed production year. This synthetic, designated Syn. 1-86 (Appendix Table 7), produced seed during the 1987 year, and represents the first selective refinement of genetic recombination of the elite clones.

Two additional synthetics, designated Syn. 5-86 and Syn. 6-86 (Appendix Tables 8 & 9), were established during fall 1986. Syn. 5-86 consists of the highest quality Seaside and Seaside-RHT clones on the 1985 green. These clones showed variation in number of panicles and stage of maturity during the 1987 season, and produced seed in hybrid combination for further evaluation. Syn. 6-86 consists of six clones each of Seaside and Seaside-RHT and access 2735 as a standard. This synthetic has been composed of clones whose morphological characters such as root number, root extension, and membrane stability has been explored. By examining the progeny of these parents in hybrid combination, heritability estimates may be obtained for each of the characters.

FUTURE WORK: The seed production nurseries in Oregon have tremendously accelerated some aspects of the breeding program. Screening for quality and stress tolerance must be performed in the stressful environments in which the varieties will be utilized. Seed production is necessary for both genetic recombination and to ultimately get the variety to the consumer.

IV. FACILITY DEVELOPMENT

1. TURFGRASS ROOT INVESTIGATION FACILITY (TRIF)

OBJECTIVE: Explore limits of rooting in sand based media at depths greater than current facilities allow.

JUSTIFICATION: The advantage of a larger, more extensive root system is to provide greater quantities of water to the plant. A facility that will allow the establishing of the plants under adequate irrigation and easy access to roots will allow the correlation of root characters and moisture stress tolerance/avoidance.

PROGRESS: The Texas Agricultural Experiment Station has funded development of such a facility under expanded research allocations. The site will consist of a 8 x 18 m site with a 1.8 m deep layer of sand over a 0.3 m gravel base. The site will drain to a sump from slit tile. The site will be adjacent to the 1985 green.

FUTURE WORK: Site construction is scheduled to begin during November 1987. Plant material will be propagated during the winter of 1987-88 for spring planting.

APPENDIX TABLE 1. Root areas at 6 soil depths (10 cm increments) and mean root extension of Seaside and Seaside-RHT bentgrass clones. Seaside is designated by a '.1' and Seaside-RHT is designated by a '.2'.

ACC	1	2	3	4	5	6	LEN
101.1	42.6	25.5	16.7	9.0	5.7	2.7	.
102.1	47.5	28.3	16.7	8.9	6.6	1.0	380
103.1	32.1	20.9	10.7	10.0	11.1	10.9	545
104.1	32.7	19.0	12.6	11.7	6.7	1.0	473
106.1	21.1	17.1	13.7	14.6	14.3	8.2	501
107.1	33.5	19.4	19.7	18.8	7.0	3.0	353
201.1	25.8	16.9	8.7	7.0	1.8	0.3	360
202.1	22.5	16.4	13.1	7.0	5.3	5.2	439
203.1	42.8	24.8	14.4	12.0	13.1	14.6	462
204.1	49.6	23.9	16.6	11.7	4.3	0.0	335
205.1	25.5	23.1	19.9	13.8	8.0	7.4	347
206.1	37.4	21.6	15.7	6.8	1.0	0.1	375
207.1	31.8	18.2	13.4	15.7	1.7	0.0	368
301.1	26.3	16.8	17.3	12.4	6.5	1.0	440
302.1	33.7	14.7	9.9	6.9	0.3	0.0	333
303.1	37.6	25.6	16.3	12.7	9.6	9.1	360
304.1	24.6	17.8	8.9	6.7	7.4	1.1	362
305.1	27.4	17.2	12.1	5.5	1.9	0.0	309
306.1	43.1	30.8	29.2	27.3	24.1	11.9	446
307.1	44.7	20.5	9.7	7.2	6.3	4.9	.
401.1	23.4	14.8	12.9	5.3	1.5	0.0	356
402.1	22.4	12.1	10.9	8.2	6.1	3.8	460
403.1	34.0	26.4	17.8	10.4	8.4	2.5	450
404.1	26.0	16.9	10.6	10.5	3.8	1.2	407
405.1	30.4	18.9	10.8	4.9	3.1	0.1	279
406.1	38.2	27.3	19.9	21.2	30.0	30.1	545
407.1	27.8	15.0	9.0	4.9	3.2	5.3	421
501.1	25.3	17.6	10.6	11.6	9.3	0.6	466
502.1	23.2	14.1	6.9	4.1	1.0	0.1	395
503.1	53.7	33.7	32.1	20.7	21.9	13.1	542
504.1	32.3	24.4	22.2	17.5	18.8	13.8	450
505.1	23.5	15.7	9.4	3.9	3.7	0.0	366
506.1	32.3	26.1	21.4	16.7	16.0	11.8	486
507.1	46.4	35.9	26.6	25.3	26.0	19.5	474
601.1	21.7	17.6	14.2	8.0	5.9	6.5	485
602.1	34.3	18.6	16.1	11.8	11.7	10.5	386
603.1	29.9	17.2	14.5	6.3	6.2	2.7	373
604.1	23.9	12.5	13.2	9.6	7.6	2.0	459
605.1	26.2	17.1	12.8	11.9	10.8	9.8	436
606.1	50.4	24.2	11.7	9.9	9.8	5.7	504
607.1	14.8	11.7	9.4	3.2	1.2	0.0	414
701.1	36.6	28.3	18.1	14.7	13.2	12.4	370
702.1	33.5	24.6	18.1	14.2	16.4	13.4	506
703.1	30.2	21.1	20.4	16.4	11.5	0.1	415
704.1	33.7	25.6	22.9	12.8	11.1	8.3	400
705.1	28.3	17.8	8.0	5.6	3.2	0.0	396
706.1	40.8	14.4	9.2	8.1	3.3	0.1	402
707.1	20.0	8.5	7.1	3.8	2.7	0.0	465

ACC	1	2	3	4	5	6	LEN
202.2	21.1	11.9	14.5	11.4	3.8	0.3	482
203.2	22.5	12.0	13.2	10.2	4.9	0.8	463
204.2	38.9	24.2	10.7	4.8	5.1	1.4	367
205.2	34.7	19.3	21.5	17.6	15.2	7.4	423
206.2	30.1	20.4	16.7	13.2	8.2	0.6	408
207.2	36.9	25.1	11.3	13.8	1.5	0.0	377
301.2	18.3	8.7	6.3	4.9	1.1	1.6	400
302.2	27.1	19.8	10.6	6.8	4.8	1.6	366
303.2	29.3	21.4	17.0	17.5	13.3	5.5	430
304.2	45.6	31.6	17.6	15.1	10.7	8.4	390
305.2	32.6	17.2	9.9	6.6	4.9	0.2	404
306.2	10.8	9.9	6.1	10.4	3.3	19.0	.
401.2	20.1	13.6	8.3	3.6	1.2	1.7	418
402.2	27.3	15.1	7.4	6.6	7.4	0.0	417
403.2	47.2	15.9	10.9	8.3	8.0	7.1	331
404.2	42.1	27.1	17.4	14.1	15.7	9.5	512
405.2	31.5	23.5	18.3	20.3	4.9	0.5	386
406.2	27.2	14.7	8.0	6.1	5.9	1.7	414
407.2	32.0	20.1	15.4	11.3	11.3	1.8	411
502.2	30.1	19.0	14.9	12.0	10.8	10.3	.
503.2	28.7	12.8	12.1	8.3	8.6	1.1	411
504.2	15.8	14.2	11.9	8.6	9.2	5.0	383
505.2	21.5	14.9	15.3	12.4	12.4	4.9	484
506.2	17.5	12.6	9.5	4.4	1.7	0.0	404
507.2	45.6	22.6	10.4	4.1	3.1	0.4	461
601.2	30.1	12.6	6.1	5.3	6.5	0.5	533
602.2	36.9	28.2	19.4	14.2	13.7	10.3	506
603.2	18.5	23.4	17.4	14.2	10.3	2.9	448
604.2	39.6	21.9	14.3	11.6	9.0	1.1	410
605.2	17.2	13.8	14.9	10.4	6.7	1.4	.
606.2	34.8	23.5	18.2	13.4	12.1	10.9	507
607.2	28.7	18.9	11.2	8.3	2.9	1.4	438
701.2	44.4	33.6	28.8	28.9	21.7	7.3	.
703.2	44.2	16.1	9.1	7.2	2.1	1.2	462
704.2	26.8	23.7	12.5	11.3	6.7	0.3	336
705.2	24.9	13.5	12.1	4.5	2.9	0.2	360
706.2	31.5	19.9	14.7	9.6	8.4	3.0	545
707.2	22.6	17.7	12.6	7.5	2.7	0.1	428
801.2	18.6	17.2	11.3	5.7	4.4	0.5	401
802.2	23.9	14.2	12.6	7.8	2.9	0.1	458
803.2	30.1	24.7	21.8	19.6	14.7	15.7	486
804.2	28.4	15.9	8.5	6.3	4.2	0.0	449
805.2	28.6	17.3	8.2	2.4	4.5	0.9	472
806.2	38.8	25.4	17.2	10.4	7.7	11.1	499
807.2	30.8	23.7	23.7	17.5	16.9	15.9	505
901.2	25.4	22.5	14.9	11.6	10.6	4.6	459
902.2	20.7	18.4	10.6	12.6	3.4	0.1	497
903.2	27.4	15.4	9.7	6.7	1.6	0.0	388
904.2	46.3	31.3	24.7	23.4	15.9	9.3	447
905.2	30.6	20.1	16.9	13.7	8.5	0.0	410
907.2	31.1	20.3	15.4	16.5	4.9	2.6	466
1001.2	29.1	19.9	12.7	8.8	5.0	4.8	582
1002.2	16.9	10.6	6.9	3.9	1.2	0.0	376
1003.2	29.5	22.4	15.3	14.1	10.3	4.6	538

ACC	1	2	3	4	5	6	LEN
802.1	22.5	15.2	8.1	7.3	5.5	1.4	436
803.1	33.3	17.1	10.7	10.8	8.7	2.7	389
804.1	17.3	13.8	8.7	5.2	6.1	0.8	328
805.1	18.4	11.3	5.5	1.9	4.6	2.9	477
806.1	39.6	24.6	18.8	11.7	8.9	9.7	539
807.1	27.6	8.9	5.9	1.9	2.6	1.1	396
901.1	32.1	17.6	19.5	11.8	13.1	7.8	484
902.1	35.8	21.9	17.4	13.3	11.7	5.6	455
903.1	35.3	22.0	11.8	8.6	4.1	1.0	454
904.1	30.3	20.4	12.6	7.5	4.3	0.0	434
905.1	19.8	15.5	10.3	6.1	3.8	2.7	508
906.1	24.5	20.4	14.9	12.1	13.2	11.6	494
907.1	14.8	11.0	10.3	10.1	4.8	0.6	376
1002.1	33.0	22.0	13.9	9.7	8.4	3.9	290
1003.1	23.6	12.3	3.6	0.5	0.3	1.1	400
1004.1	40.3	30.1	18.3	13.9	8.7	2.2	396
1006.1	36.0	24.3	27.9	20.7	12.6	0.0	412
1007.1	9.6	12.5	7.9	5.7	3.3	0.6	443
1101.1	45.6	23.9	13.4	9.1	4.7	1.7	382
1102.1	30.6	22.9	15.9	17.7	16.7	15.2	525
1103.1	30.8	17.7	10.5	7.3	3.2	2.0	417
1105.1	18.4	13.3	8.3	3.0	0.0	0.0	326
1106.1	44.0	21.6	14.2	10.5	9.9	4.6	358
1107.1	33.3	15.3	10.6	6.3	4.3	0.3	398
1201.1	33.3	18.5	12.4	10.2	4.4	0.1	405
1202.1	15.3	8.8	5.4	1.4	0.1	0.0	385
1203.1	25.2	19.1	13.9	8.9	8.3	8.7	378
1204.1	16.4	11.9	4.4	3.4	4.5	0.2	393
1205.1	10.9	7.1	5.7	4.9	6.2	4.3	400
1206.1	34.8	24.0	19.7	16.6	11.0	3.7	446
1207.1	17.3	9.3	4.2	4.8	4.7	2.1	380
1301.1	38.8	23.9	18.3	16.6	13.1	4.3	391
1302.1	14.0	7.5	5.9	5.1	0.3	0.0	382
1303.1	22.3	21.3	20.8	19.5	14.7	16.9	487
1304.1	43.4	24.9	19.9	14.6	15.1	5.5	387
1305.1	26.7	18.5	10.1	6.9	4.1	0.0	406
1306.1	17.4	14.5	7.1	2.2	0.4	0.0	321
1307.1	35.9	27.4	23.0	13.9	8.3	1.6	419
1401.1	34.6	22.3	15.8	10.2	9.9	1.7	426
1402.1	32.8	29.7	22.9	20.4	20.6	9.9	414
1404.1	35.0	26.4	17.8	12.9	9.4	0.0	404
1406.1	42.2	27.4	21.7	13.9	14.7	1.9	470
1407.1	10.3	10.8	5.7	1.3	0.3	1.1	.
2735.1	18.0	12.9	12.2	8.3	7.1	1.7	.
101.2	32.5	19.6	12.1	9.4	7.6	9.5	428
102.2	37.9	22.3	16.2	10.2	8.0	3.0	402
103.2	36.8	17.3	5.6	3.4	2.3	0.0	457
104.2	57.9	28.3	19.3	15.2	9.8	2.8	456
105.2	42.0	25.8	16.8	4.5	2.2	0.0	380
106.2	35.0	24.4	13.4	7.0	7.2	2.0	352
107.2	28.3	17.2	7.3	6.6	1.0	0.0	405
201.2	31.3	19.8	12.6	5.4	3.1	0.4	361

ACC	1	2	3	4	5	6	LEN
1005.2	37.2	14.9	13.0	9.4	12.1	7.9	477
1006.2	24.0	20.7	15.5	13.9	11.3	13.3	504
1007.2	38.3	23.4	23.3	18.6	13.7	9.9	490
1101.2	28.9	21.1	17.7	13.9	11.2	0.4	422
1102.2	22.2	7.9	3.8	1.5	0.8	0.0	429
1103.2	24.0	20.4	15.4	12.4	8.4	10.6	385
1104.2	20.8	17.3	10.9	15.1	9.3	5.2	420
1105.2	29.4	14.9	8.6	10.2	11.7	2.1	430
1106.2	20.9	11.8	10.6	6.6	3.0	0.1	425
1107.2	24.4	22.1	15.8	10.9	9.9	4.6	523
1201.2	34.3	20.5	16.6	13.8	14.6	6.6	465
1202.2	22.1	11.9	8.5	1.1	2.6	0.0	349
1203.2	24.6	14.9	14.9	9.5	5.7	4.9	488
1204.2	33.5	18.3	15.7	9.9	2.1	0.0	426
1205.2	28.4	14.4	10.4	9.4	1.9	0.6	368
1206.2	31.3	17.7	9.1	9.3	6.3	3.5	415
1207.2	46.5	32.2	15.4	14.1	4.3	0.8	382
1301.2	26.3	14.3	13.0	7.4	7.8	7.4	486
1302.2	18.5	8.9	7.6	1.8	3.2	1.1	432
1303.2	43.6	22.9	13.2	11.0	14.9	15.4	502
1304.2	37.9	31.3	22.0	16.8	17.9	15.9	476
1305.2	25.8	21.9	16.5	16.4	16.1	11.4	515
1306.2	29.7	21.3	13.9	9.5	8.3	2.8	487
1307.2	32.0	18.2	14.9	14.9	15.6	9.4	487
1401.2	35.3	15.7	10.7	10.4	7.4	8.6	492
1402.2	29.4	22.2	10.5	13.8	9.9	0.8	441
1403.2	32.0	22.3	22.1	17.4	22.6	10.6	458
1404.2	28.9	16.6	12.1	5.2	0.3	0.0	350
1405.2	31.3	26.2	22.1	14.9	11.7	1.3	457
1406.2	33.9	18.7	8.7	6.4	6.1	0.1	343
1407.2	10.2	10.9	6.8	5.5	3.0	0.0	471

APPENDIX TABLE 2 . Mean quality rating on 2 dates after severe verticutting, depth of thatch layer, and height of position of thatch weight for elite bentgrass germplasm.

Access	Quality		Slice	Thatch
2757	7.0a	3.0	7.5	16.3a*
1486	7.0a	4.0a	8.0	14.8
2737	7.0a	1.0	8.0	15.8a
2890	7.0a	1.0	9.5a	15.5a
2761	7.0a	5.0a	9.5a	16.0a
2756	6.5a	1.5	7.3	15.8a
2767	6.5a	5.0a	9.0a	15.8a
3006	6.5a	6.5a	7.5	14.8
2744	6.5a	1.0	7.3	16.0a
2771	7.6a	1.0	8.3	14.8
3001	6.5a	3.5a	7.8	15.0a
2755	6.5a	1.0	8.5	16.3a
2999	6.5a	4.0a	8.3	15.0a
2563	6.0a	2.5	8.3	14.5
1199	6.0a	4.5a	8.8a	16.3a
2770	6.0a	5.0a	9.3a	15.0
2764	6.0a	3.5a	9.3a	15.3a
1499	6.0a	3.0	7.8	15.3a
1254	6.0a	6.5a	7.8	15.0a
2752	6.0a	1.5	8.5	16.0a
2885	6.0a	7.0a	7.0	15.0a
2754	6.0a	2.0	8.5	15.5a
2740	6.0a	5.5a	7.5	15.3a
3003	6.0a	6.0a	6.8	15.0a
2765	6.0a	2.5	9.3a	16.3a
1256	6.0a	1.0	7.5	15.3a
2763	6.0a	2.5	8.5a	15.0a
2557	6.0a	1.0	8.8a	13.0
1248	6.0a	6.0a	8.5	13.0
2747	6.0a	5.0a	8.5a	15.8a
1252	6.0a	5.0a	8.0	14.3
2561	6.0a	1.5	7.3	16.5a
2749	6.0a	2.5	7.5	15.0a
0288	6.0a	6.5a	8.3	15.3a
2893	6.0a	3.0	6.0	13.0
1487	6.0a	1.0	7.8	14.0
2743	5.5a	4.0a	.	.
2772	5.5a	3.0	7.3	15.8a
2758	5.5a	3.0	10.0a	16.0a
2768	5.5a	3.5a	9.8a	16.0a
1253	5.5a	.	8.0	15.0a
2738	5.5a	2.5	6.5	14.0
2750	5.5a	2.0	8.8a	14.5
1249	5.5a	4.5a	8.0	14.3
2883	5.5a	4.0a	7.3	15.0a
2751	5.5a	2.5	7.3	15.8
2748	5.5a	5.0a	8.5	16.0a
0287	5.0a	6.5a	6.5	14.5
2736	5.0a	1.0	7.8	16.0a
2734	5.0a	7.0a	7.3	14.0
0145	5.0a	6.5a	6.8	14.0
2559	5.0a	1.0	7.0	16.5a
1487	5.0a	4.0	7.8	14.0
3002	5.0a	5.5a	7.0	15.3a
2753	5.0a	1.0	7.8	15.8a
2892	5.0a	3.0	7.0	15.0a
2741	5.0a	1.0	8.0	14.5
2900	5.0a	7.0a	8.3	14.5
2887	5.0a	5.5a	7.8	17.3a
1410	5.0a	2.5	7.8	14.5
0289	4.5a	6.0a	8.5	15.0a
2380	4.5a	4.0	7.5	14.0
1498	4.5a	2.5	7.5	14.8a
2895	4.0a	1.5	6.8	14.8
2994	4.0a	5.0a	7.0	15.3a
2739	4.0a	1.0	7.5	15.3a
2889	4.0a	4.0a	7.3	15.5a
2560	4.0a	5.5a	6.0	16.5a
0137	4.0a	6.5a	7.3	13.0
0140	4.0a	3.0	7.0	13.8
2896	3.5	1.5	7.3	13.8
2886	3.5	7.5a	7.3	16.0a
2563	3.5	3.0	.	14.5
1418	3.5	2.0	7.8	15.0a
0139	3.0	5.5a	5.8	13.8
2899	3.0	3.0	5.3	14.3
1486	3.0	4.0	8.0	14.8
1198	3.0	5.5a	7.8	14.8
1197	3.0	7.0a	6.3	14.5
2960	3.0	4.0a	7.0	15.3a
3000	3.0	4.5a	6.5	15.0a
0153	2.5	2.5	5.0	13.0
2891	2.0	3.0	6.8	14.0
0141	2.0	4.5a	5.8	13.3
0150	2.0	3.5a	4.8	14.0
1755	1.5	1.0	6.5	13.5
2735			7.0	14.3
1261	8.0a	1.0	9.3a	14.8a
1247	7.5a	4.5a	9.0a	15.5a
1257	7.5a	4.0a	7.3	14.3
2762	7.5a	3.5a	10.0a	15.8a
1255	7.5a	5.0a	9.0a	15.0a
1251	7.5a	3.5a	8.3	14.0
2769	7.5a	2.5	8.0	15.5a
2745	7.5a	3.5a	10.0a	14.8
2759	7.0a	1.5	10.0a	15.3a
2760	7.0a	4.0a	.	15.5a
2898	7.0a	4.0a	7.0	13.5
2766	7.0a	5.0a	8.5	15.3a
1250	7.9a	5.0a	7.8	15.3a
2742	7.0a	3.0	9.5a	15.0a

*Means followed by the same letter are not significantly different at the k=100 lebel using the Duncan/Waller K ratio test. Means with an "a" were in the highest rating group.

APPENDIX TABLE 3 . Mean tiller number of "R" Seaside and "A and B" Seaside-RHT clones of bentgrass, August 1987.

			A	1001.1	17.00	B	1401.3	15.00	B	501.3	15.50	R	901.2	12.00
A	101.1	14.50	A	1002.1	14.00	B	1402.3	9.00	B	502.3	13.50	R	902.2	12.50
A	102.1	10.50	A	1003.1	12.50	B	1403.3	12.00	B	503.3	11.50	R	903.2	10.50
A	103.1	15.00	A	1004.1	13.00	B	1404.3	14.50	B	504.3	8.50	R	904.2	9.50
A	104.1	14.50	A	1005.1	12.00	B	1405.3	11.00	B	505.3	10.50	R	905.2	12.00
A	105.1	11.00	A	1006.1	14.50	B	1406.3	14.00	B	506.3	10.50	R	906.2	11.00
A	106.1	15.50	A	1007.1	18.50	B	1407.3	12.00	B	507.3	10.50	R	907.2	11.50
A	107.1	13.00	A	1101.1	14.50	R	101.2	17.00	B	601.3	11.00	R	1001.2	11.00
A	201.1	23.50	A	1102.1	12.00	R	102.2	11.00	B	602.3	15.00	R	1002.2	10.00
A	202.1	18.50	A	1103.1	20.50	R	103.2	11.50	B	603.3	13.50	R	1003.2	11.00
A	203.1	13.00	A	1104.1	12.50	R	104.2	16.50	B	604.3	17.00	R	1004.2	12.00
A	204.1	10.50	A	1105.1	8.50	R	105.2	16.50	B	605.3	17.00	R	1005.2	11.00
A	205.1	14.50	A	1106.1	11.50	R	106.2	8.50	B	606.3	17.50	R	1006.2	22.00
A	206.1	19.50	A	1107.1	9.00	R	107.2	15.50	B	607.3	17.00	R	1007.2	10.50
A	207.1	16.00	A	1201.1	14.00	R	201.2	9.50	B	701.3	12.00	R	1101.2	.
A	301.1	15.00	A	1202.1	13.50	R	202.2	12.50	B	702.3	12.50	R	1102.2	14.00
A	302.1	11.00	A	1203.1	9.00	R	203.2	12.50	B	703.3	11.50	R	1103.2	13.00
A	303.1	12.50	A	1204.1	12.00	R	204.2	17.50	B	704.3	17.00	R	1104.2	13.50
A	304.1	11.00	A	1205.1	12.00	R	205.2	14.50	B	705.3	17.50	R	1105.2	12.50
A	305.1	16.00	A	1206.1	14.00	R	206.2	17.00	B	706.3	14.00	R	1106.2	14.50
A	306.1	13.50	A	1207.1	14.00	R	207.2	13.50	B	707.3	15.50	R	1107.2	18.50
A	307.1	10.50	A	1301.1	16.50	R	301.2	13.00	B	801.3	15.50	R	1201.2	16.50
A	401.1	14.50	A	1302.1	15.00	R	302.2	11.00	B	802.3	9.00	R	1202.2	15.50
A	402.1	14.00	A	1303.1	12.50	R	303.2	16.50	B	803.3	13.50	R	1203.2	14.00
A	403.1	11.50	A	1304.1	16.00	R	304.2	16.00	B	804.3	10.50	R	1204.2	16.00
A	404.1	13.50	A	1305.1	20.00	R	305.2	11.00	B	805.3	20.00	R	1205.2	13.00
A	405.1	16.00	A	1306.1	13.50	R	306.2	14.00	B	806.3	12.50	R	1206.2	12.50
A	406.1	17.00	A	1307.1	12.00	R	307.2	14.00	B	807.3	14.00	R	1207.2	13.50
A	407.1	12.50	A	1401.1	11.00	R	401.2	13.50	B	901.3	11.50	R	1301.2	17.50
A	501.1	15.00	A	1402.1	18.00	R	402.2	14.00	B	902.3	10.00	R	1302.2	11.00
A	502.1	14.50	A	1403.1	15.50	R	403.2	7.50	B	903.3	11.00	R	1303.2	21.50
A	503.1	17.50	A	1404.1	22.00	R	404.2	13.00	B	904.3	10.00	R	1304.2	10.00
A	504.1	8.00	A	1405.1	14.00	R	405.2	15.00	B	905.3	18.50	R	1305.2	14.50
A	505.1	13.00	A	1406.1	18.50	R	406.2	10.00	B	906.3	14.50	R	1306.2	18.50
A	506.1	12.50	A	1407.1	17.00	R	407.2	12.50	B	907.3	15.50	R	1307.2	10.50
A	507.1	13.50	B	101.3	12.00	R	501.2	11.00	B	1001.3	16.50	R	1401.2	14.00
A	601.1	15.00	B	102.3	23.00	R	502.2	13.50	B	1002.3	13.00	R	1402.2	14.00
A	602.1	12.00	B	103.3	15.00	R	503.2	14.00	B	1003.3	19.00	R	1404.2	13.00
A	603.1	14.00	B	104.3	8.50	R	504.2	14.50	B	1004.3	15.50	R	1405.2	7.50
A	604.1	17.50	B	105.3	14.00	R	505.2	16.00	B	1005.3	12.50	R	1406.2	12.00
A	605.1	17.00	B	106.3	17.00	R	506.2	13.00	B	1006.3	17.00	R	1407.2	16.00
A	606.1	10.50	B	107.3	11.50	R	507.2	11.00	B	1007.3	14.00	R	2735.2	13.00
A	607.1	14.00	B	201.3	11.50	R	601.2	15.00	B	1101.3	22.00			
A	701.1	12.50	B	202.3	17.50	R	602.2	8.50	B	1102.3	8.50			
A	703.1	11.50	B	203.3	19.00	R	603.2	11.00	B	1103.3	16.00			
A	704.1	13.50	B	204.3	16.50	R	604.2	13.00	B	1104.3	12.50			
A	705.1	15.00	B	205.3	14.00	R	605.2	15.00	B	1105.3	12.00			
A	706.1	12.00	B	206.3	16.00	R	606.2	9.00	B	1106.3	10.50			
A	707.1	18.50	B	207.3	11.00	R	607.2	15.50	B	1107.3	16.50			
A	801.1	13.00	B	301.3	15.50	R	701.2	18.00	B	1201.3	15.00			
A	802.1	14.00	B	302.3	14.00	R	702.2	11.50	B	1202.3	10.00			
A	803.1	18.50	B	303.3	12.00	R	703.2	14.00	B	1203.3	13.00			
A	804.1	15.00	B	304.3	13.00	R	704.2	11.50	B	1204.3	10.50			
A	805.1	9.00	B	305.3	16.33	R	705.2	16.00	B	1205.3	16.00			
A	806.1	13.50	B	306.3	12.50	R	706.2	13.50	B	1206.3	9.50			
A	807.1	14.00	B	307.3	15.50	R	707.2	12.00	B	1207.3	10.00			
A	901.1	11.50	B	401.3	16.00	R	801.2	14.00	B	1301.3	13.50			
A	902.1	23.00	B	402.3	10.00	R	802.2	13.50	B	1302.3	10.00			
A	903.1	14.50	B	403.3	11.50	R	803.2	11.50	B	1303.3	15.50			
A	904.1	12.00	B	404.3	13.00	R	804.2	13.50	B	1304.3	18.00			
A	905.1	15.00	B	405.3	15.00	R	805.2	9.50	B	1305.3	14.50			
A	906.1	10.50	B	406.3	12.00	R	806.2	17.50	B	1306.3	15.00			
A	907.1	13.50	B	407.3	16.00	R	807.2	13.50	B	1307.3	10.00			

APPENDIX TABLE 4. Mean root length and number of roots at 10 cm depths from 13 bentgrass clones from the 1985 green, summer 1987.

Access	Population	Length	10cm Number	20cm Number
307	A	200	5	2
404	A	217	8	3
502	A	170	4	1
503	A	153	8	0
505	A	205	8	2
703	A	169	7	0
107	R	187	6	1
204	R	221	9	6
2735	R	143	9	0
304	R	135	6	0
401	R	230	7	4
604	R	195	7	3
701	R	188	7	1

APPENDIX TABLE 5. Range of mean spread values for 368 GPIN clones during summer 1987.

Avg Spread	Min. Spread	Max. Spread	Min. signf Difference
8.34	9.3	12.4	3.3

APPENDIX TABLE 6. Mean seedhead, spread rating, and growth habit for Syn. 1-85, Tangent, Oregon, 1987.

Access	Seed Heads	Spread	Growth Habit	Access	Seed Heads	Spread	Growth Habit
137	3.7	7.7a	6.0a	139	3.7	2.7	3.3
141	3.7	1.7	3.7	150	2.3	1.7	1.3
153	6.0	8.7a	1.0	288	2.7	9.0a	8.3a
1198	5.0	6.3a	6.0a	1199	1.0	7.0a	8.3a
1247	7.3	5.7	2.3	1250	5.3	3.3	3.7
1252	7.7a	5.0	2.3	1256	1.0	7.0a	3.7
1257	3.7	7.0a	2.7	1258	1.0	4.7	3.7
1261	1.0	5.3	4.7	1410	0.7	7.7a	4.7
1416	5.3	6.0	2.0	1486	0.7	8.7a	8.0a
1499	4.3	8.7a	5.0	1906	9.0a	5.0	2.7
2560	1.3	4.3	7.7a	2734	3.7	7.7a	4.7
2735	1.7	6.7a	3.3	2737	4.3	7.7a	3.0
2738	8.3a	4.7	1.7	2739	5.7	8.0a	6.3a
2740	8.3a	6.3a	3.3	2741	9.0a	6.3a	2.0
2743	8.3a	7.0a	2.7	2744	5.0	6.0	5.0
2745	5.3	5.3	4.7	2747	2.0	7.3a	8.0a
2749	1.0	5.7	6.7a	2758	9.0a	6.3a	2.3
2759	0.0	4.7	5.3	2760	0.0	6.0	8.7a
2761	6.7a	4.3	2.3	2762	0.3	6.0	6.3a
2766	4.3	8.3a	7.3a	2771	1.3	6.7a	8.0a
2772	1.7	7.7a	8.0a	2820	7.0a	8.0a	4.0
2823	1.3	7.0a	5.3	2887	1.7a	5.7	7.7a
2892	3.7	5.3	7.3a	2895	7.3a	4.3	2.7
2897	8.0	7.7a	4.0	2898	4.0	4.0	3.3
2913	1.0	6.3a	7.3a	2914	2.5	5.0	6.0a

*Means followed by the same letter in the same column are not significantly different at the k=100 level using the Duncan/Waller K ratio test. Means with an a are in the highest rating group.

APPENDIX TABLE 7. Seed production characters for Syn. 1-86, Tangent, Oregon, 1987.

Access	Panicle number	Number of plants at Floral Stage* 1	2	3	4
1252	5.7			1.0	2.0
2758	5.7		0.5	1.5	1.0
2761	4.7		0.5	2.0	0.5
1247	6.3			1.0	2.0
2740	3.7		1.0	1.0	1.0
2895	6.0			1.0	2.0
1250	5.7			1.5	1.5

*Where 1=no panicles, 2=boot, 3=pre-anthesis, and 4=Anthesis

APPENDIX TABLE 8. Seed production characters for Syn. 5-86, Tangent, Oregon, 1987.

Access	Panicle number	Number of plants at Floral Stage* 1	2	3	4
1006.3	2.3	2.0			1.0
105.3	5.6			2.0	1.0
902.1	3.7		2.5	0.5	
205.3	1.0		3.0		
1002.1	4.3	1.0		1.0	1.0
106.3	5.6		0.5	0.5	1.0
1003.1	6.3			1.0	2.0
801.1	3.3		3.0		
201.3	5.3		1.0	2.0	
406.2	3.7		2.5	0.5	

*Where 1=no panicles, 2=boot, 3=pre-anthesis, and 4=Anthesis

APPENDIX TABLE 9. Seed production characters for Syn. 6-86, Tangent, Oregon, 1987.

Access	Panicle number	Number of plants at Floral Stage*			
		1	2	3	4
703.2	0.0	3.0			
404.2	6.3				3.0
307.2	3.3		1.5	1.5	
505.2	4.3		2.5	0.5	
2735	0.0	3.0			
204.1	3.6		3.0		
503.2	5.0		1.0	2.0	
401.1	5.3				3.0
604.1	5.0		0.5	2.0	0.5
304.1	5.3		0.5	1.5	1.0

*Where 1=no panicles, 2=boot, 3=pre-anthesis, and 4=Anthesis

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: Dr. Jerry Pepin

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

SUBJECT: TRANSFER AND TESTING OF PLANT MATERIAL

PLANT SPECIES: Bentgrass

Description and quantity of material released:

Experimental Designation					Quantity & Type Material
2737	1198	2758	1257	1256	3 vegetative propagules of each accession, 1" plugs
2897	2771	0137	1199	2744	
2823	2734	2760	1250	0153	
2560	2738	2759	2735	2887	
1258	2762	1247	2749	0139	Designated Syn. 1-85
2820	1486	0141	2914	1410	
0150	2772	0288	1261	2898	
2741	2739	1416	1252	2743	
2895	1906	2913	2740	2747	
2892	2761	2766	1499	2745	

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

Field evaluation of seed production characters

Modifications to Purpose:

Location of Planting:

Tangent, OR

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: Virginia Lehman 1 October 1985
(Rep of Turf Breeding Program) Date

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

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PLANT SPECIES: Bentgrass

Description and quantity of material released:

Experimental Designation					Quantity & Type Material
Syn. 6-86		Syn. 5-86		Syn. 1-86	
505A	304R	205.3	902.1	2895	3 Vegetative clones of each accession, 1" plugs
503A	204R	1006.3	106.3	2761	
307A	401R	1003.1	201.3	2758	
703A	2735	1002.1	406.2	2740	
404A	604R	801.1	105.3	1250	
				1247	
				1252	

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

Field evaluation of seed production characters

Modifications to Purpose:

Location of Planting:

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RELEASED BY: Virginia Lehman 1 October 1986
(Rep of Turf Breeding Program) Date

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(Name of Requesting Cooperator or Rep) Date

FIGURE 3. 1987 Establishment of a germplasm introduction nursery, morphological characterization study, and root exploration study on the 17,000 sq. ft. green constructed by Bentgrass Research, Inc.

Figure 4. Oregon crossing block of Syn 1-85. Note variation in panicle production, growth habit, color and spread, 1987.