1985 Progress Report to
United States Golf Association

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Considerable progress was achieved in all aspects of our bentgrass program in 1985, and compared to the previous year excessive rains were not detrimental to field work at planting or harvest time.

I. Equipment and Facilities

a. Mechanical planters to handle greenhouse plants were purchased and utilized for field planting. Practically all nurseries were machine planted with enormous gains in labor efficiency and fatigue.

b. Natural gas hot air seed dryer with 350 sq. ft. floor space was constructed to dry the 1985 seed crop.

c. Effluent water line tap was installed as a high pressure nursery water source, and over 3500 ft. of aluminum irrigation pipe was obtained for optimal irrigation.

d. Following 1985 harvest, nursery plants were stripped for composting and 500 cu. yds. of previously composted plants and soil were Royer shredded and returned to improve nursery land. In September, 4.5 acres of nursery land were methyl bromide fumigated for 1986 nursery planting.

e. Two automatic traveling boom irrigators are being installed in the greenhouse for watering, fertilization and pesticide applications.

f. By utilizing a new size Todd planter flat and greenhouse bench arrangement approximately 75,000 plants were grown in the greenhouse in 1984-85 – a 69% increase.

g. Divot machine for rapid uniform divot removal was designed and constructed for mounting on a Toro sand Pro with hydraulic lift.

II. Penneagle Creeping Bent

Breeder Seed was produced in 1985 and a new one acre Breeders Nursery was established in July 1985. Commercial seed production is projected to increase 35-40% in each of the next three years.

III. PSU-126 Creeping Bent

Test seed has been distributed to 140 golf courses in 32 states and several countries to date. Formal requests for performance information shall be issued this winter with anticipation of Experiment Station release in the spring of 1986. PSU test plots show no deficiencies following eight years of testing. Cool weather brown patch, Rhizoctonia cerealis, was encountered in the test in 84-85 and the PSU-126 showed a high level of resistance.

This variety has performed well on the Wilmington (Del.) C. C. North Course greens following complete renovation in September 1984. The new Montour Heights Club in Pittsburgh and the 9-hole addition of the Scranton C. C. are slated to be planted to PSU-126 greens in 1986.

Oregon seed yield trials in 1985 showed an accepted level of seed yield, between Penncross and Penneagle. Breeder Seed nursery was doubled in size following another stage of reselection in 1984-85.

A space-planted Referee Test was established in 1985 along with five creeping bent varieties for Plant Variety Protection data. Data was obtained from a similar Oregon test established in 1984 for the necessary two location test data. Preliminary electrophloresis laboratory results show a good differential identifying pattern utilizing three enzyme systems to date.

IV. Experimental Creeping Bents.

Eleven salt tolerant bents were nursery established for 2nd generation seed production in 1986 along with clonal plantings of 21 new salt tolerant selections from greens and fairways.

Clonal nursery plantings were made of 22 selections from Penncross and Penneagle segregates following five years mowing at 3/32-inch height of cut. Following the advent of the Stimpmeter and unprecedented demands on superintendents for ultra close-cut greens it appears paramount that bents be developed for closer mowing tolerance.

V. Colonial Bent Rhizome Development Project.

1. SB 1-56 Series - Open pollinated progeny.

Seven 2nd generation progeny plants each of 378 second generation half-sib families were selected for individual plant seed harvest in 1984. These plants were selected in the field based on plant spread and field. The top 156 of 378 families were chosen for continuing into third generation progeny testing based on second generation half-sib family progeny performance in 1984.

Due to limitations of greenhouse space, the third generation progeny size was limited to 39 plants for rhizome development analysis during the 1984-85 winter-spring period. Thus 42,588 3rd generation plants [156 2nd gen. half sib families x (7 2nd gen progeny x 39 plants each)] were screened for rhizomes. Particular emphasis was placed on deep rhizomes (those emerging thru holes in bottom of flat sections) and date marking their emergence.

Based on date of emergence, 20 progeny plants with deep rhizomes of 134 3rd generation half-sib families were field planted in 1985 to produce 4th generation seed in 1986.

Percent production of rhizomes of 2nd generation parents is shown in Table 1. We are concerned that rhizome means of progeny are not increasing toward 100 percent rhizomatous types at a greater rate following three generations of selection. However, selection for rhizome production shall continue.

2. SB 60-135 - Open pollinated progeny.

Seven 1st generation progeny sibs each of 67 parents were also field selected and individually harvested in 1984 for continued progeny tests. Approximately 18,000 plants [67 families x (7 1st gen progeny x 39 plants each)] were greenhouse planted for screening. Following date marking for deep rhizome development 20 progeny each of 63 second generation sib families were field

planted in 1985 for third generation seed production in 1986. Summary results, similar to the SB 1-56 series, are shown in Table 2.

3. Inbreeding

Selfing as a breeding technique to select for rhizomatous reproduction was continued on all colonial bent populations. Amount of selfing was dictated by the number of plants four individuals could bag during the pre-anthesis period; approximately 500 plants in 1985.

In 1984 107 2nd generation inbreds representing 16 parents and 31 1st generation inbreds in the SB 1-56 series set seed for progeny testing. Third generation half-sib families produced 1 to 54 progeny plants each. Approximately 1100 of 3000 plants screened for rhizomes were field planted in 1985 for further selfing (Table 3).

In the SB 60-135 Series 137 1st generation inbred progeny from 33 parents that were poorly represented in previous work were progeny tested. Over 1100 plants of 3400 screened progeny were field planted in 1985. In both of these series uniformity within lines in contrast to interline variability is becoming apparent in the field. Inbreeding depression, as expressed by plant vigor is obvious as well. It is not known how well the weaker inbred types will survive winters in the field. The degree of restored vigor and rhizome growth as well shall be eagerly anticipated pending survival.

Self-pollination of 25 SB-1 and 28 SB-90 plants derived from cobalt 60 irradiated rhizome sections yielded 600 and 1200 progeny, respectively. Family size ranged from 1 to 72 plants. These first generation inbred families were screened for rhizomes and gross mutations. Following date marking for rhizome emergence, 470 plants were field planted for further selfing. Rhizome analysis is shown in Table 5.

4. Other Colonial Bents

Eight rhizomatous bents were selected from bermuda fairways in Australia following treatment with atrizine to control Poa annua in 1984. Plants were greenhouse crossed in all possible combination and 1200 progeny field planted in September 1985. Future work will include selection, inbreeding and selection for triazine herbicide tolerance.

Auburn University supplied us with 14 selections which were field planted for seed production and further evaluation.

5. Future Plans 1985-86

a. Continued advance generation rhizomatous screening for selfed and open pollinated generations of colonial bents.

b. Establish mini-turf plots for screening various colonial bent populations for turf quality and rhizomes.

c. Establish turf plots of experimental creeping bents for initial turf testing.

d. We plan to go to Scotland and Wales on a colonial bent selection trip in the spring of 1986.

e. Eric Nelson has completed his Masters Thesis, Breeding and Selection for Rhizomatous Colonial Bentgrasses, Agrostis tenuis Sibth., a copy of which is being forwarded to Bill Bengeyfield with this report.

Eric has been promoted to Instructor of Agronomy. For his Ph.D. research Eric plans to investigate the feasibility of anther culture in colonial bent.

In brief, anther tissue is haploid in chromosome content. Should one succeed in producing plants from anthers, and doubling chromosome number with colchicine, pure line plants could be produced. This would produce the same result theoretically as selecting for 8-12 generations. A most ambitious objective!

Table 1. Analysis of 3rd generation, open pollinated progeny for deep and shallow rhizomes from 1084 2nd generation parents.
SB 1-56 Series, 1984-85

Rhizomes	Ave	Min	Max	Total Plants	Field Planted
% Deep	47.6	5.1	89.7		
% Shallow	20.1	0	53.8		
% Total	67.6	8	100		
				41,766	2.700

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Table 2. Analysis of 2nd generation open pollinated progeny for deep and shallow rhizomes from 469 1st generation parents.
SB 60-135 Series, Open pollinated.

Rhizomes	Ave	Min	Max	Total Plants	Field Planted
% Deep	44.5	12.8	92.3		
% Shallow	14.2	0	38.5		
% Total	58.7	15.4	94.9		
				18,208	1,250

Table 3. Analysis of 3rd inbred generation progeny for deep and shallow rhizomes from 107 2nd generation inbred parents.
SB 1-56 Series, 1984-85

Rhizomes	Ave	Min	Max	Total Plants	Field Planted
% Deep	48.6	0	100		
% Shallow	15.1	0	66.7		
% Total	63.7	10.3	100		
				2,980	1,100

Table 4. Analysis of 2nd generation inbred generation progeny for deep and shallow rhizomes from 137 parents.
SB 60-135 Series, 1984-85

Rhizomes	Ave	Min	Max	Total Plants	Field Planted
% Deep	48.1	0	100		
% Shallow	14.3	0	100		
% Total	62.4	0	100		
				3,430	1,100

Table 5. Analysis of 1st inbred generation progeny for deep and shallow rhizomes. Parents derived from Cobalt 60 irradiated rhizome sections.

SB-1

Rhizomes	Ave	Min	Max	Total Plants
% Deep	61	0	100	
% Shallow	11	0	100	
% Total	72	17	100	
				603

SB-90

	32	10	74	
	8	0	29	
	40	13	100	
				1,197