

Bentgrass Breeding  
1984 Progress Report to  
United States Golf Association  
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All planned phases of the bentgrass breeding project were continued during the year, but with major weather constraints encountered in early August during the maturity and harvest period. Rain totalling 6.15 inches during nine days from August 1-14 caused lodging, vegetative growth and seed shattering. Drying facilities could not handle an unprecedented wet harvest, and a late season resulted in convergence of colonial bent maturity into the later creeping bent period.

I. Creeping Bent

A. Due to high seed demand, Penneagle Breeders seed harvest took first priority. Rain delays caused major shattering and resulted in a harvest of 35 pounds of a projected 180-200.

B. Initial harvest of 14 salt tolerant creeping bents was equally poor with five lines failing to flower.

C. PSU-126 experimental has been distributed to 126 cooperators to date in 30 states, Canada and S. Africa. Based on University Park performance for seven years, an 18-hole greens renovation in Delaware following methyl bromide fumigation was seeded to 126. An excellent third year Oregon experimental seed harvest in 1984 has yielded an additional 750 pounds of seed for testing.

A quarter acre breeders nursery of PSU-126 was established in June and will be tripled in size next year. Forty acres were established in Oregon for additional commercial growing experience. Pending field testing results, a release of PSU-126 is projected in 1986.

II. Colonial Bent - Selecting for rhizomatous growth habit was continued into the first to third open pollinated generation, and into the second self-pollinated generation.

A. Greenhouse. Approximately 28,000 plants were grown from seed for 5 months:

16,733	2nd generation selfed, SB1-135 series
960	1st generation selfed, 500 series
970	1st generation selfed, SB136-170 series
3,011	1st generation open pollinated, SB 136-170 series
5,023	1st generation 500 series
1,400	1st generation irradiated SB-1

Plants were screened for both deep (emerging from bottom of flat paks) and shallow rhizomes, and for plant vigor. SB 136-170 first generation open-pollinated parental progeny, 100 per each of 31 parents only averaged 45.4% with rhizomes (Table 1). First generation progeny of SB 1-135 series in previous years' work were found to average over 80%. The newer material will apparently require more generations of selecting for rhizomatous types. Only slightly better results, 48.9% average, were gained from the 500 series parents (Table 2).

The majority of 1984 screening was involved with first and second generation self-pollinated material totalling 18,663 progeny (Tables 3 and 4). As anticipated, all ranges of rhizomatous progeny from 0 to 94% resulted from selfing. These results confirm that rhizomatous bent parental selections are very heterozygous for the rhizome character and no clue is in evidence as to the number of genes, other than multiple-genic, responsible for rhizomes. The problem is compounded by majority of material, 97 of 102 parents examined, being hexaploid: 42 chromosomes. No literature has ever been published regarding genetic control of rhizomes in grasses.

Self-fertility results for over 70 parents are shown in Tables 4 and 5. The SB 136-170 material averaged 6.6% and ranged from 0-62.9%, and the 500 series averaged 4.0 with a 0-22.7 range. These results are similar to those obtained for other parents in previous years, and the work of Dudeck and Perkins with other colonial bents.

B. Field. Approximately 8500 selected rhizomatous progeny from the greenhouse screenings were space-planted in the nursery in June 1984 for further selecting.

Approximately 400 plants were field selfed including: (1) SB1 and SB90 parents from irradiated rhizome sections, (2) cross section of 2nd generation selfed SB1-SB56 series, (3) 1st generation selfed plants from SB60-135 series which were poorly represented in the 1982 nursery, and (4) 14 new parental selections.

Weather conditions prevented the bulk harvest by family line of over 13,000 progeny plants in 1984. Except for the bulk harvest of 8 new selections, harvesting was limited to head samples of approximately 3500 plants plus all selfed plants. The planned bulked harvest would have been for turf plot plantings. These will now have to be delayed for another generation since all unharvested plants were destroyed, and 3.5 acres methy bromided in September for 1985 plantings.

### III. Plans For Next Year

A. Increase greenhouse screening capacity from 28,000 to 60,000 plants by utilizing a smaller size planter flat and other modifications.

B. Purchase a mechanical planter to hopefully reduce hand planting labor and time by approximately 75%.

C. Construct a new gas dryer to increase drying capacity by 400%.

D. Continue next generation of selection work for open- and self-pollinated plants harvested in 1984 within constraints of greenhouse space.

E. Eric Nelson is tentatively planning on continuing research toward a Ph.D. utilizing tissue culture to produce haploid plants. This technique could conceivably cut down years of selection work to produce near homozygous types of colonial bent.

F. Continue work with new selections made in 1984.

Table 1. Greenhouse rhizome screening of SB 136-170 series, 1st generation open-pollinated, 100 plant progeny. 1984.

<u>% Rhizomes</u>	<u>No. of Families</u>
90-100	0
80-90	3
70-80	3
60-70	4
50-60	3
40-50	5
30-40	1
20-30	4
10-20	7
0-10	1

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<u>Rhizomes</u>	<u>Average</u>	<u>Range</u>
Deep	24.2 %	2.0-64.0 %
Shallow	21.1	6.0-44.7
Combined	45.4	10.0-85.0
Seedling Vigor	6.7	6.0-8.0

Table 2. Greenhouse rhizome screening of 500 series, 1st generation open-pollinated, 100 plant progeny. 1984.

<u>% Rhizomes</u>	<u>No. of Families</u>
90-100	0
80-90	1
70-80	3
60-70	8
50-60	14
40-50	8
30-40	7
20-30	4
10-20	4
0-10	1

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<u>Rhizomes</u>	<u>Average</u>	<u>Range</u>
Deep	23.7 %	1.0-54.0 %
Shallow	25.6	8.0-53.2
Combined	48.9	10.0-84.0
Seedling Vigor	6.1	

Table 3. Greenhouse rhizome screening of 2nd generation self-pollinated, SB1-135 series. 1984.

<u>%</u>	<u>Distribution of Parental Families</u>		
	<u>Deep</u>	<u>Shallow</u>	<u>Combined</u>
90-100	0	0	1
80-90	0	0	0
70-90	0	0	5
60-70	1	0	11
50-60	4	1	17
40-50	5	0	15
30-40	19	7	12
20-30	16	33	12
10-20	18	32	8
1-10	22	13	6
0	3	2	1

Vigor: Range 1.5-8.0, population ave. 5.8

Table 4. Greenhouse rhizome analysis for SB 136-170 and 500 series, first generation self-pollinated. 1984.

<u>Rhizomes</u>	<u>Population Ave</u>	<u>Range</u>
Deep	22.6 %	0-56%
Shallow	19.9	0-42
Combined	42.7	0-80
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Seedling Vigor	6.4	4.0-8.0

Table 5. Self-Fertility SB 136-170 series

	<u>Ave Seeds/Head</u>	<u>Range</u>
Self Seed-Set	10.5	0-110.6
Open Pollinated	189.7	45.2-408.6
% Self-Fertility	6.6	0-62.9

Self-fertility 500 series

Self Seed-Set	5.8	0-38.0
Open-Pollinated	159.1	27.0-299.1
% Self-Fertility	4.0	0-22.7

Table 6. Cobalt-60 Irradiation of SB-1 Parental Seed

<u>K-rads</u>	<u>% Germination</u>		
	<u>Normal</u>	<u>Coleoptile Only</u>	<u>Albino</u>
0	95.8	0.2	0
1	95.9	1.1	0.4
3	95.5	1.6	0.4
6.8	92.6	3.7	0
11.3	51.5	41.4	1.0
16	12.3	81.8	0.5
20	21.3	72.0	1.4
24	4.1	89.1	1.2
28	1.1	86.1	1.1
32	0	82.8	1.4