Perimeter is firmed as plug is watered.

Job completed. Can you find the plug?

Growth Of Bentgrass Roots As Influenced By Temperature And Management

By JAMES B. BEARD
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A critical evaluation of the effect of temperature and management on the growth of bentgrass roots was conducted in controlled-climate chambers, using especially built root boxes 10" square and 16" deep. One side of the box consisted of a slanting glass side for observing roots.

On December 23, 1957, dormant creeping bentgrass plugs, 4 inches in diameter, were taken from the experimental putting green, sliced to a thickness of ¼" and placed in the root observation boxes. Two boxes were placed in each of the following constant-temperature chambers, 60°, 70°, 80° and 90° F. Each of the temperature rooms had a constant day length of 12 hours. For each temperature there were two cutting treatments, cut daily at ½" and uncut.

The root elongation was marked and measured daily on the glass side of the boxes for a period of eight weeks. From that date the average rate of root growth per day was calculated. The average daily growth in inches of bentgrass roots for the four temperatures for the cut and uncut treatments was:

Cutting Treatment	Temperature in °F			
	60° in.	70° in.	80° in.	90° in.
Uncut	0.32	0.33	0.39	0.18
Cut	0.18	0.17	0.20	0.13

Note that the growth rate was greatly reduced in raising the temperature from 80° to 90° under both cutting treatments. Through the daily measurements of root growth on both cut and uncut cultures, it was observed that the growth of individual roots was not uniform but cyclic in nature. Within a ten-day period the growth rate of individual roots varied from 1" to 0.1".

Furthermore, the 90° F. temperature condition reduced the number of roots, the depth of penetration and the thickness of roots. In addition, the roots under 90° F. temperature condition were not a healthy white color but were brown and inactive.

Upon termination of the root elongation studies, the roots were removed from the boxes, washed free of soil, oven dried at 70° C. for 24 hours, weighed and ashed in a muffle furnace at 700° C. for 4 hours.

Total weight of the organic constituents of roots in grams, harvested from a 4 inch plug after 8 weeks growth was:

Cutting Treatment	Temperature in °F 60° gms.	70° gms.	80° gms.	90° gms.
Uncut	6.43	4.52	1.78	0.55
Cut	0.19	0.09	0.04	0.03

Results indicated that as the temperature was raised, the weight of roots in terms of the organic component was reduced very noticeably.

In another test using the root boxes, eight weekly foliar applications of materials, including glucose, fructose and vitamin B1 were applied. Under those limited test conditions there was no consistent increase in root activity.

To supplement those results, tests were placed under more natural conditions on the experimental putting green at Purdue University. Three root observation boxes were constructed into the putting green in late March. The boxes were 18" deep and had a slanting glass side which allowed close observation of the root development and deterioration under undisturbed conditions. Root color ratings were taken three times weekly. Because of unusually wet summer weather, the initiation of new roots from the surface had been observed twice last summer. Also, two core samples 15" deep were taken three times weekly. Actual root counts at depths of 2", 5", 10" and 15" were made on those plugs.

To measure the effect of summertime temperatures, micro-climatic techniques were used. A 60-point continuous potentiometer recorder was used to record soil temperatures at seven depths in two replications, plus air temperature at three heights and relative humidity. Thermocouples were inserted at the following depths: surface mat, ½", 1½", 3", 6", 12" and 18". Air temperatures were taken at 1", 12" and 36" heights.

Besides those parameters, cooperative studies with Mr. Ed Jordan, graduate assistant, were designed to measure the following parameters: soil moisture at 1", 2", 4" and 6" depths, light intensity in accumulated units per day, plus total yield, reducing sugars, fructose, N. P and K in clippings from plots receiving six levels of nitrogen feeding.

All of this data was entered on IBM punched cards. The simple and multiple correlations and regressions will be run to find some of the relationships and their importance in creeping bentgrass performance.

H. Burton Musser Advances Turfgrass Management

By CHARLES K. HALLOWELL

Mid-Atlantic Director, USGA Green Section

On June 30 Dr. H. Burton Musser retired as Professor of Agronomy, College of Agriculture, Pennsylvania State University, thus concluding thirty years of continuous service to turfgrass studies.

Those who have known "Burt" Musser throughout much of his career find it difficult—if not impossible—to conceive of his actually retiring. Undoubtedly, he will find many ways to put his knowledge, experience and judgment to work. Yet this "stepping down," as he has put it, does present an appropriate opportunity to evaluate his contributions to turfgrass.

The contributions which H. Burton Musser has made to turfgrass are many indeed. A list of them prepared recently included:

1. Isolated by systematic selection and breeding; (a) Pennlawn creeping red fescue, (b) Pennlu creeping bentgrass (veg. strain) and (c) Penn-