A GREEN SECTION SUPPORTED RESEARCH PROJECT

Velvet Bentgrass Putting Greens—

Fertilizer and Topdressing Management

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Velvet bentgrass (*Agrostis canina* L.) has not been used widely in modern times for putting greens. This is the case even though greens on some of the most prestigious golf clubs of the Northeast consist primarily of velvet bentgrass. The Newport and Misquamicut Golf Clubs in Rhode Island are good examples.

In the early days of golf course construction in the United States, and perhaps into the 1930s, the most common grass seed utilized on golf greens was South German mixed bent. The seed was a mixture of velvet, creeping (*A. Palustris* L.) and colonial (*A. tenuis* L.) bentgrass. Over the years when superintendents had very little fertilizer for their courses, velvet bentgrass often predominated and provided very excellent putting surfaces. During the past 20 to 30 years the intensity of management, including fertilizer useage, has increased dramatically. It appears that this has favored the more aggressive creeping bents at the expense of velvet bent.

Very little management research has been done with velvet bentgrass in recent years except at the Rhode Island Agricultural Experiment Station. Aside from displeasure with this grass on the part of many superintendents as they increased fertilizer rates, pure seed of velvet bentgrass was not available until the mid 1960s. There may have seemed little use in researching a grass species that was not available except in a vegetative form.

Turfgrass researchers at the University of Rhode Island released "Kingstown" velvet bentgrass in 1962 and seed reached the market a few years later. It seemed desirable to initiate further management studies with the species since seed was now available and the grass still had many admirers.

During 1967, 6,000 square feet of ground was seeded to Kingstown velvet bentgrass at the recommended rate of one pound of seed per 1,000 square feet. The soil in the test area was Bridgehampton fine sandy loam—a friable, well-drained soil. An establishment fertilizer with a 1-2-1 ratio was incorporated into the seedbed prior to seeding to supply two pounds of nitrogen. The soil pH at seeding was about 5.5 No limestone was added.

The entire area was maintained uniformly through 1968 until the green was well developed. Treatments were commenced in April of 1969. A split plot experimental design was utilized with 13 x 36 foot main plots as topdressing treatments and 12 x 13 foot subplots as fertilizer treatments. The treatments included were:

Topdressing applied:	*Nitrogen rates and timing:*
1. April and September	a. 3 lbs.—1 lb. Apr. and Sept. ½ lb. June and August
2. April, June and September	b. 5 lbs.—1 lb. Apr., Sept., Oct., ½ lb. May, June, July, Aug.
3. April, June, Sept., and Oct.	c. 7 lbs.—1 lb. each month from Apr. through October
4. Once each month April through Oct.	

A topdressing made from locally composted soil mixed with equal parts sand was used. Topdressing was blended, sterilized and stored for six to 12 months prior to use. It was applied with a mechanical spreader at a rate that readily brushed into the turf.

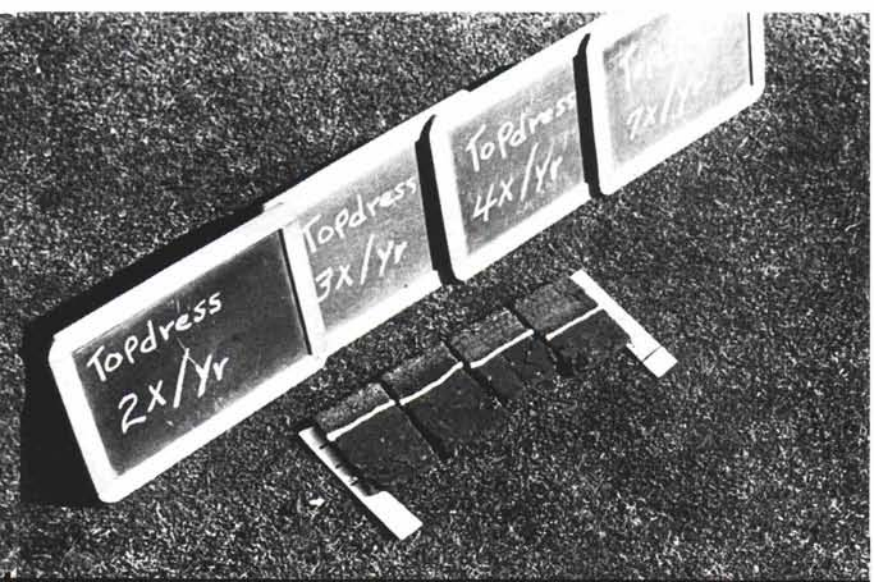

Figure 1.

Table I. Seasonal average turf scores of Kingstown velvet bentgrass as influenced by topdressing and fertilizer treatment.

Topdressing frequency	Year 1970	1971	1972 Score[1]	1973	1974
2 times	6.5	7.3	7.0b*	6.6b	5.4
3 times	6.5	7.3	7.2b	7.0ab	5.4
4 times	6.6	7.4	7.3ab	7.0ab	5.3
7 times	6.5	7.4	7.6a	7.4a	5.1
Fertilizer rate					
3 lbs.	5.8c	6.9b	6.7c	6.8b	6.1a
5 lbs.	6.7b	7.6a	7.4b	7.3a	5.1b
7 lbs.	7.1a	7.6a	7.7a	6.9ab	4.8b

[1] Seasonal average, 7 monthly scores, April through October.9 would represent perfect quality turf and 1 would represent completely brown or dead turf.

* Values followed by the same letter(s) are not significantly different at the 5% level using Duncans New Multiple Range Test.

The green was aerified with a plug or slicing-type aerifier prior to the April and September applications.

A 10-6-4 grade fertilizer was used for April, September and October treatments. Activated sewage sludge was used at all other times.

The cutting height was maintained at ¼ inch and mowing was done on Monday, Wednesday and Friday. Pesticides were applied as required to prevent or control disease, insects and weeds. Eighteen practice-green putting cups were installed fairly uniformly throughout the test area and were changed at frequent intervals. Members of the university golf team, students in physical education classes, members of the University staff as well as the general public were encouraged to, and did, use the green throughout the entire test period.

The full schedule of treatments was not completed until October, 1969. Data were collected on a monthly basis starting in April, 1970, and this has been continued since that time. A scoring system was used in which 9 was considered perfect turf and 1 was completely brown or dead turf. In early spring and late fall even the best scores may not exceed 4 or 5. The figures presented in the tables are averages of three replications and include all months from April through October of each year. Average seasonal turf scores for the years 1970 through 1974 for both topdressing and fertilizer treatments are presented in Table I.

During the early years of study it is obvious that little difference resulted from frequency of topdressing application but that major differences occurred in relation to fertilizer rate. The fertilizer influence on color may markedly affect the visual quality scores. Color, however, may not be important. It is an esthetic value but may not necessarily influence putting quality.

Through the five years of the study, topdressing treatments resulted in significant differences in quality in 1972 and 1973, but the differences were not large. In late 1973 replicated two-inch plugs were taken from each plot, to the original soil level, and the organic matter content of the thatch and mat layer was determined. The information is presented in Table II.

Although the effect of topdressing frequency was minor on surface appearance, as indicated by quality scores, a large difference in organic matter content occurred. This could well be significant and important over the years in maintaining healthy greens. The influence of fertilizer rate on organic matter content was apparent but not significant. Topdressing has greater influence on this factor than does fertilizer. See Figure I.

Turfgrass response to fertilization, as shown in Table I, was most interesting During the first three years visual quality increased with the rate. This was particularly apparant when the rate increased from three to five pounds and, to a lesser extent,

Table II. Organic matter content of thatch and mat layer under Kingstown velvet bentgrass as influenced by seasonal topdressing frequency and fertilizer rate.

Topdressing frequency	% Organic matter	Fertilizer rate	% Organic matter
2 times	12.9b*	3 lbs.	11.6
3 times	12.6b	5 lbs.	11.4
4 times	12.0b	7 lbs.	12.5
7 times	9.8a		

* Values followed by the same letter(s) are not significantly different at the 5% level using Duncans New Multiple Range Test.

when the rate increased from five to seven pounds. In 1971 the quality of turf on the seven-pounds plots was no better than on those receiving five pounds of fertilizer. By 1973 a reverse trend was noted, and by 1974 the quality had completely reversed, with the quality of turf on the three-pound plots significantly better than that on the five- or seven-pound plots.

There are two primary factors that contributed to this reversal in response to fertilization. First, it was noted during the first years of the study that copper spot *(Gloeocercospora sorgi)* incidence was positively correlated with nitroten rates increased. Injury resulting opened the turf to *Poa annua* invasion. Second, during the summer of 1973 extremely hot, humid weather occurred for a prolonged period. Turf on the plots receiving higher levels of nitrogen were actually scorched. This did not occur at the three-pound nitrogen rate. Again, *Poa annua* invasion was accelerated as a result. Photos taken in the spring of 1975 clearly illustrated the increase in *Poa annua* with increasing fertilizer rates. The percent of *Poa* present in December, 1974, as influenced by topdressing frequency and the amount of fertilizer used is shown in Table III.

For those who understand the management requirements of velvet bentgrass, these results might be predictable. The results also apply, however, to creeping bentgrasses. Although the fertility level might be at a higher level for creeping bentgrasses, probably fewer problems will occur if seasonal fertilizer rates are at lower levels than frequently used. Golfers may need to be reeducated to differentiate putting quality from color. It would be worth all the effort if a quality surface could be assured with the use of less fertilizer.

Table III. Percentage of *Poa annua* comprising turf cover, in December, 1974, as influenced by topdressing frequency and level of fertilization.

Topdressing frequency	% Poa annua	Fertilizer rate	% Poa annua
2 times	13.4	3 lbs.	2.7c*
3 times	15.7	5 lbs.	15.3b
4 times	15.4	7 lbs.	27.2a
7 times	15.8		

* Values followed by the same letter(s) are not significantly different at the 5% level using Duncans New Multiple Range Test.

A GREEN SECTION SUPPORTED RESEARCH PROJECT

Sulfur and Bentgrass Putting Green Turf

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Adequate soil fertility is of great importance to the growth and development of turfgrasses. The major plant food elements nitrogen, phosphorous and potassium have received most of the attention in turfgrass fertility research and practice; however, lack of any one of the essential plant nutrients, N, P, K, Ca, Fe, S, Mn, B, Mg, Cu, Zn, Mo, and Cl will result in unsatisfactory growth. The information presented in this paper will deal mainly with sulfur, but will attempt to bring out the influence of N, P, and S on various factors related to putting green turfgrass quality.

THE SULFUR PICTURE HAS CHANGED

A number of factors are responsible for increased sulfur needs of turfgrasses. Coleman (2) indicated that the use of high-analysis fertilizers that contain little or no sulfur, increased growth, and decreased gain of atmospheric sulfur by soils and plants as a result of decreased combustion of coal and other high sulfur fuels are some of these factors.

It is common knowledge that nutrients leach from sand at a faster rate than from heavier textured soils. Due to current emphasis on the use of sand for building putting greens and tees, we should be aware of the continual need to regularly supply all nutrients including sulfur in a reasonable ratio. In general, the higher the application of nitrogren, the greater the stress for sulfur and other nutrients due to increased growth. Nitrogen applications for greens vary from less than five to over 20 pounds per 1,000 square