

has been observed previously, the deficiency symptoms are most evident early in the year but disappear later in the summer. This occurred in 1995 as well.

TOPDRESSING/HYDROJECT TREATMENT STUDY

The long-term greens topdressing study was continued in 1995. Treatments outlined in Table 13 were applied as in the past. The topdressing materials utilized were straight sand; 80% sand, 20% peat; and 60% sand, 20% peat, 20% soil. Treatments are 3 cu. ft. of topdressing material per 1000 sq. ft. applied at 3 week intervals; 12 cu. ft. applied in spring and fall; an untreated check; and the 12 cu. ft. applied in spring and fall after cultivation with a vertical operating aerifier having 1/2 inch tines and a 2-inch by 2-inch spacing. Plot size was 4 ft. by 12 ft. These treatments have been applied since 1986. In 1993, the plots were split with one-half treated weekly with the Hydroject. This was continued in 1995.

Quality rating data were collected in 1995 with numbers similar to those reported in the past. In 1994, there were fewer localized dry spots on the Hydroject treated plots. To substantiate this, no irrigation was applied to these plots for extended periods in 1995. Visual estimates of localized dry spots were taken in July, August, and September (Table 13). During July and early August, the extensive wet weather prevented the development of localized dry spots. But in late August and through September, the lack of rainfall permitted drying of the plots. The plots treated with the Hydroject had significantly less localized dry spot development with the greatest differences occurring in September. These numbers are summarized in Table 14. Certainly the Hydroject provides some water to the treated plots, but not nearly enough to meet the evapotranspiration needs of the turf during this period. Our conclusion is that the Hydroject reduces the tendency for development of localized dry spots. We have seen this in some earlier studies. Golf course superintendents have reported less susceptibility to localized dry spots on greens when treated regularly with the Hydroject. In addition, plots which have been topdressed with sand were somewhat more susceptible to localized dry spots than those which received some peat or soil in the topdressing.

Additional data taken included dollar spot counts, dew ratings, and soil moisture content and are reported in Table 15. The soil moisture measurements were done on soil samples taken to a depth of 3 inches with moisture content determined gravimetrically. There was no difference in the dollar spot counts. The dew ratings were not significantly different in the overall study on July 15, but the differences were significant on July 24. On July 21 the Hydroject treated plots had 15.9% moisture and the non-treated plots had 9.1%. On Sept. 19 the % moisture was 19.4% and 12.2%, respectively.

LATE FALL NITROGEN APPLICATIONS ON ANNUAL BLUEGRASS

In Fall, 1994 a study was initiated by two undergraduate students, Marc McMullen and Ed Borst, to evaluate the effect of application of several experimental nitrogen fertilizers on an annual bluegrass fairway turf. The carriers utilized are listed in Table 16. Other than urea, all carriers are experimental nitrogen carriers from the following companies: Lesco, Anderson, and Sherritt. The Sherritt Org. is an organic carrier. These materials were applied at the rate of 1 lb. N per 1000 sq. ft. on the dates shown in Table 16.

Conclusions from this study are consistent with results from studies conducted several years ago. When nitrogen is applied as early as October 15, there is little residual effect the following spring. Applications in early November give somewhat more response the following spring, while when applied in mid-November the spring response is much longer. This is particularly true for the water soluble urea. When soluble N sources are utilized, the N should be applied later in the fall to achieve a good residual color the next spring.

If the nitrogen is applied about the time growth ceases, soluble nitrogen is taken up by the turf without causing any significant increase in growth (and mowing). This usually occurs in early to mid-November, but varies with the year and location in the state. With more nitrogen in the plant, this increases the potential for photosynthesis during sunny days in November. This should result in an accumulation of carbohydrates since growth has ceased. The greater levels of carbohydrates will be available for the plant the next spring. We are still of the opinion that the N should be predominantly soluble N with no more than 25% slow release N. The objective is to get nitrogen into the plant soon after application. Since winter arrived early in 1995 there may not be as much benefit in increased carbohydrates from late fall N applications in the spring of 1996.

OTHER STUDIES

Several other studies were conducted in 1995. The long-term cultivation study on an annual bluegrass fairway turf had minor differences during the growing season, but nothing of major importance.

Table 12.

USGA Green Phosphorus Correlation Study, 1995 Color & Quality Ratings						
P ₂ O ₅ Applied lbs/1000	Quality Ratings (9 = Best)					
	May 1	June 1	July 1	Aug. 1	Sept. 1	Season Average
0# / Year	1.17 e	1.00 d	1.50 c	1.67 b	2.50 b	1.57 c
1# / Year	4.83 d	4.50 c	6.50 ab	7.00 a	6.67 a	5.90 b
2# / Year	6.17 ab	6.50 a	7.00 a	7.17 a	6.83 a	6.73 a
4# / Year	6.17 ab	6.50 a	7.00 a	7.33 a	6.83 a	6.77 a
4# in 1993 only	5.33 c	5.67 b	5.83 b	7.00 a	6.50 a	6.07 b
Bray Soil Test	5.83 b	6.50 a	7.00 a	7.50 a	7.00 a	6.77 a
Olsen Soil Test	6.33 a	6.50 a	7.00 a	7.33 a	6.83 a	6.80 a

Means in columns followed by the same letter are not significantly different at the 5% level using the LSD range test.*

Table 13.

Great Lakes Topdressing Study Percent Localized Dry Spot												
Treatment	Rate	Frequency	Hydro-jet	July 15	July 18	July 20	July 28	Aug. 1	Aug. 28	Sept. 5	Sept. 14	Sept. 28
Sand	3ft ²	3 weeks	yes	0	1	1	11.7	18.5	4	5.7	3 d	4.3 d
Sand	3ft ²	3 weeks	no	25	15	16.7	30	18.5	10.7	38.3	66.7 ab	71.7 a
Sand	12ft ²	Spr./Fall	yes	0	2.7	1.7	16.7	13.8	3	15.7	7 cd	7.7 d
Sand	12ft ²	Spr./Fall	no	25	14.3	20	27	8	30	58.3	85 a	73.3 a
80sand:20peat	3ft ²	3 weeks	yes	0	0	1	3.3	7.3	2	1	3.3 d	2 d
80sand:20peat	3ft ²	3 weeks	no	0	10	11	25	16.8	6.3	25.7	60 b	65 abc
80sand:20peat	12ft ²	Spr./Fall	yes	0	0	0	5	0.8	1.3	2	3 d	1 d
80sand:20peat	12ft ²	Spr./Fall	no	0	6.7	6.7	27.7	19.3	4.7	23	55 b	53.3 c
60sand:20peat :20soil	3ft ²	3 weeks	yes	0	0	0	3.3	5.9	1	2	4.3 d	1.3 d
60sand:20peat :20soil	3ft ²	3 weeks	no	0	0	1	29.7	7.5	2	10	28.3 c	55 bc
60sand:20peat :20soil	12ft ²	Spr./Fall	yes	0	1	1	11	28.1	2.7	5.3	6.7 cd	8.3 d
60sand:20peat :20soil	12ft ²	Spr./Fall	no	21	10	14.3	40	10.4	23.3	22.7	65 ab	71.7 a
Check	-----	-----	yes	0	0	0	0	23	0	0	0 d	0 d
Check	-----	-----	no	0	0	0	2.7	8.3	0	13.3	18.3 cd	13.7 d

Great Lakes Topdressing Study Percent Localized Dry Spot												
Sand	12ft ²	Spr./Fall	Aerified	0	0	0	11.7	31.7	0.7	8.3	2.7 d	3.3 d
Sand	12ft ²	Spr./Fall	no	0	5	10	51.7	6.7	1.7	23.3	71.7 ab	66.7 ab
Means in columns followed by the same letter are not significantly different at the 5% level using the LSD means separation test.*												

Table 14.

Great Lakes Topdressing Study Percent Localized Dry Spot									
Treatment	July 15	July 18	July 20	July 28	Aug. 1	Aug. 28	Sept. 5	Sept. 14	Sept. 28
Hydrojected weekly	0	0.6	0.6	7.8	2.8	1.8	4.9 b	3.5 b	3.8 b
Not Hydrojected	8.8	7.6	9.8	29.8	23.0	9.8	26.7 a	58.7 a	56.3 a
Means in columns followed by the same letter are not significantly different at the 5% level using the LSD means separation test.*									

Table 15.

Great Lakes Topdressing Study						
	Dollar Spots per plot	Color Rating 9=best	Dew Rating 1= no dew 9=normal	Dew Rating 1= no dew 9=normal	Gravitational Moisture Content, %	Gravitational Moisture Content, %
Treatment	June 27	July 6	July 15	July 24	July 21	Sept. 19
Hydrojected weekly	68.3	7.0 b	8.6	8.2	15.9 a	19.4 a
Not Hydrojected	76.2	7.4 a	6.9	5.8	9.1 b	12.2 b
Means in columns followed by the same letter are not significantly different at the 5% level using the LSD means separation test.*						

Table 16.

1995 Late Fall Nitrogen Carrier Study on Annual Bluegrass Color Ratings Nitrogen Applied at a Rate of 1 lbs. N / 1000 Ft ²										
Treatment	Date Applied	Oct 26 '94	Nov 3 '94	Nov 10 '94	Nov 17 '94	Nov 30 '94	Mar 16 '95	Mar 24 '95	Apr 14 '95	Apr 24 '95
Urea	Oct. 15	6.2 a	6.0 b	6.3 a	6.5 a	5.8 ab	2.7 h	2.5 f	3.2 efg	3.8 ef
Urea	Nov. 3	4.0 d	4.0 e	4.7 defg	5.3 bc	5.5 cd	4.3 bcde	4.3 bc	5.0 bc	4.8 bc
Urea	Nov. 17	4.2 d	4.0 e	4.3 fg	4.3 ef	5.0 cd	5.3 a	5.5 a	5.7 ab	5.3 ab
Lesco 6152	Oct. 15	5.0 c	4.8 d	5.7 bc	6.2 a	6.3 a	3.8 def	3.3 def	4.3 cd	5.2 abc
Lesco 6152	Nov. 3	3.8 d	4.0 e	4.7 defg	5.2 bcd	5.8 ab	5.2 ab	4.8 ab	6.0 a	5.5 a