

Forced Transition of Tifway 419 Using Select Cultural Management Practices

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Abstract

A test was devised to investigate a forced spring transition from perennial ryegrass, back to Tifway (419) bermudagrass with scalping as the main treatment. Scalping of the turf was combined with various nitrogen and aerification treatments performed initially on May 22, 1997. Turfgrass aeration, either with or without extra nitrogen applications, when combined with an initial scalping operation, did not enhance bermudagrass transition by twenty-eight days after treatment (DAT), at the end of June 1997. Turfgrass color, quality and density were adversely affected from initial aerification treatments, especially when combined with initial scalping. The turf recovered best from multiple applications of nitrogen (applied at scalping and again at 7DAT). Turfgrass density (visual estimates) showed that in conjunction with scalping, two applications of nitrogen, totaling 1.5 lbs./month, without aerification, provided a dense turf at 16DAT, which was second only to the untreated control plot. At 27 DAT, scalping + N + N + aerification treated plots had the highest estimate of visual density, eventually showing a benefit from aerification. Scalped and aerified turf alone (no nitrogen) had unacceptable turf density at 16DAT and 27DAT. Generally, two 0.75 lb./N/m applications with aerification proved beneficial over the single application of nitrogen plus aerification, when both turfs were initially scalped. Although non-significant statistically, the additional treatment of nitrogen provided 10% more bermudagrass cover than the single application of nitrogen, for turfs both overseeded and scalped. Scalping alone, plus a single application of N, produced 33% less bermudagrass by June 30, than that of the untreated control.

Introduction

Conversion from overseeded perennial ryegrass to bermudagrass is often a concern and a pretentious event on golf courses. Transition problems can be defined as (1) loss of ryegrass without accompanying or a diminished stand of bermudagrass, (2) persistent lingering ryegrass, or (3) a disruptive non-uniform polystand. Published referee and technical articles dealing with actual transition have yielded contrasting results. A test was devised at the Karsten Turfgrass Research Facility in Tucson, Arizona, to investigate the effect of scalping overseeded Tifway (419) bermudagrass, with or without additional treatments of nitrogen and aerification on transition (the return to bermudagrass).

Materials and Methods

A six year old stand of Tifway (419) bermudagrass was overseeded at 18 lbs./M of turf-type perennial ryegrass during mid-October of 1996. The turf received minimal disruption during the overseed preparation. The bermudagrass turf was scalped from 7/8" (normal) to 1/2" with a reel-type mower and was then lightly verticut to denude foliage with minimal crown or stolen disruption. The overseed was then topdressed with 1/4" of composted manure and rolled.

The turf was mowed at 1.25" following emergence, then lowered to 1.0" and then to 0.75" by December 1, 1996 as the final height. All turf was irrigated to avoid drought stress and maintained under fairway conditions.

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On May 22, 1997, the following six treatments were applied on the bermudagrass overseeded to ryegrass.

- 1 = untreated check (no scalping/no fertilizer)
- 2 = scalped plus 0.75 lb. (N) 5/22
- 3 = scalped plus 0.75 lb (N) plus aerification 5/22
- 4 = scalped plus aerification only 5/22
- 5 = scalp plus 0.75 (N) 5/22 + 0.75 lb. (N) 5/29
- 6 = scalp plus 0.75 (N) 5/22 + aerification 5/22 + 0.75 lb.(N) 5/29

Plot size was 12' x 12'. The nitrogen source used was ammonium nitrate (34-0-0), and applied as 0.75 lb./N/1000 ft². For the spring transition, plots were scalped from 7/8" to 3/4" to 5/8" to 1/2" using a reel mower in up to three directions, per height. Plots were aerified with 5/8" hollow tines (3" depth) and cores were removed (no topdressing).

All plots received 110% of Reference ETo for the two week (May 22-June 6) transition period and then were returned to 85% ETo (Rainbird Weather Station).

Plots were evaluated for percent bare ground, turfgrass color and overall quality on three dates from May 29 to June 18, 1997. The percentage plot bermuda (0-100%) was evaluated on July 2, 1997 twelve days after an application of an experimental herbicide which caused the bermuda to loose chlorophyll and turn white.

All data were analyzed using the analysis of variance technique using SAS software in a randomized complete block design (RCBD) featuring four replications. Least significant difference (LSD) values were calculated as the treatment mean separation statistic, only when the main effect of "treatment" was significant at the 0.05 probability level, or less. Orthogonal linear contrasts were used for select treatment comparisons addressing N applications, and/or aerification treatments, and appear in the discussion when applicable.

Results and Discussion

The percent visible bare ground (0-100% scale) was significant among cultural management treatments on May 29, seven days after treatment (7DAT)(Table 1). Among the treated plots, the percent bare cover ranged from 26% to 51%, with the *scalp-aerify* treatment having the most bare ground (51%) followed closely by the *scalp-nitrogen-aerification treatment* (49%). The *scalp-N-* treatments had 38% and 26% bare ground at 7DAT. Note that at this time, only the first application of nitrogen was applied and effective. The second application was applied later that same day.

Percent bare ground was not affected by the cultural treatments on June 7 (16DAT), as most plots had between 10%-28% bare ground (Table 1). Oddly enough, the *scalp-N-N* plots had the highest mean percent of bare ground (28%), while the *scalp-N-* (one time single -N- applications) had the lowest bare ground (8%) among treated turf. Note however, that the range was from 8%-28% among all treatments and the F value statistic for the "treatment" main effect was non-significant at 0.72. This means that there was more random variation at 16DAT during regrowth within treatment replications, than between treatments themselves.

Overall turfgrass color was not affected by treatments at June 7 (16DAT). Treatments ranged from 6.3 to 7.3 on a scale from 1-9, with 9 being dark green. The *unscalped-unfertilized control* plots averaged 5.8 in color (Table 2). Turfgrass quality scores were significant for the "treatment" effect at 16DAT. The *untreated control* and the *scalp + N + N* turfs received scores of 6.3 which was of acceptable quality. This was followed by the *scalp + N* and *scalp + N + N + aerify*. Both of these had average quality scores of 5.3, a less than acceptable score. At 16DAT, note that both nitrogen treatments were superior to their counterpart treatments when aerification was included. The *scalped-aerification* treatment (no nitrogen added) had the lowest quality turf (4.0)(Table 2).

Turfgrass visual density scores were very much a determinant of visual quality, as well. Turfgrass density scores ranged from 4.0 (open canopy)(*scalp-aerification*), to 9.0 (most dense) for the *control*. The remaining treatments were almost similar in rank to the overall quality ratings, showing at this time a decrease in performance from aerification across all nitrogen applications. Note also the *scalp-aerification* performance had low quality scores as well (quality mean = 4.0)(Table 2).

On June 18 (27DAT), plots were scored for percent bare ground, color, quality and turfgrass density. The percent bare ground from treatments occurred in a range from (1%-4%) but was significant (Table 1). The *scalp + aerification* treatment had 4% bare ground, followed also by *scalp + aerification + N* at 4%. The control had 2.6% bare ground, simply because no nitrogen applications were applied the previous month. By mid-July, a fairway should be 95% or

greater in coverage as was observed for imposed treatments in this study. Color scores ranged from 5.0 to 7.0 (Table 2). Scalping with two applications of nitrogen (*scalp* + *N* + *N*) had the darkest color turf (mean = 7.0), followed by *scalp* + *aerification* + *N* + *N* which had a mean of 6.9. The *check* had a mean score of 5.5. Both aerification treatments *scalp* + *aer* + *N* and *scalp* + *aer* had lower ranking color scores than the *check* at 5.4 and 5.0, respectively. Note that at 27DAT, the *scalp* + *N* treatment had ranked higher for color than the *scalp* + *aerification* + *N* treatment (Table 2).

On June 18 (27DAT) turfgrass quality scores were identical in rank to those of turfgrass color among treatments. Note that the aerification treatments (*scalp* + *aerification* + *N* and *scalp* + *aerification*) ranked lower than the untreated *control*, and that the Tifway responded favorably to the double applications of nitrogen (*scalp* + *N* + *N*). Cultural treatments consisting of *scalp* + *N* + *N* and *scalp* + *aer* + *N* + *N*, had mean quality scores of 7.6 and 7.1, respectively, both of which were superior to the *scalp* + *N* treatment (mean = 6.0) (Table 2).

At 28DAT, large and significant differences in turfgrass visual density scores occurred, ranging from 4.8 to 7.8. By this time, the Tifway (419) bermudagrass had benefited well from the double applications of nitrogen. The *scalp* + *aer* + *N* + *N* and *scalp* + *N* + *N* treated turf had mean density scores of 7.8 and 7.3, respectively. These plots were better in appearance than the *scalp* + *N* turf (mean = 6.4), which was similar to that of the *control* (mean = 6.1). Note that the aerification plus scalping treatments had the lowest density, when they received no nitrogen, or only one 0.75 lb. N/M application the previous month. This demonstrates the need for sequential applications of nitrogen after early summer cultural management practices, especially if aerification is practiced (Table 2).

Finally, the percent bermudagrass transition was scored on June 30, 1997, by estimating the percent of the plot that was extremely chlorotic and/or bleached white from an application of an experimental herbicide known to cause chlorophyll loss in bermudagrass. The herbicide application was made as a 20" band width across each plot, twelve days prior to the visual estimation.

Percent plot bermudagrass scores ranged from 39% (*scalp* + *N*), to 59% bermudagrass for both the *control* and *scalp* + *aer* + *N* + *N* treated plots. The *scalp* + *aer* treated bermudagrass had 49% bermudagrass, while the *scalp* + *N* turf had 39% bermudagrass. The range of actual bermudagrass cover (transition) ranged 20% over all treatments, but was not statistically significant. The maximum effect between treatments was almost a 33% difference in bermudagrass (39% *scalp* + *N*, compared to 58% *scalp* + *N* + *N* + *aer*). Again, note that the *check* had 59% bermudagrass which received no treatments.

Similar results occurred over a four year period on bermudagrass putting green turf conducted by Mazur at Clemson S.C. In that test, aeration, frequent topdressing, and light 2x verticutting at weekly intervals were no different than the check plot mean for transition. In that test, all turf was fertilized equally.

Conclusion

1. Turfgrass aeration, either with or without extra nitrogen applications, when combined with an initial scalping operation, did not enhance bermudagrass transition 28DAT, at the end of June 1997.
2. Turfgrass color, quality and density were adversely affected by treatments. However, when combined with initial scalping, multiple applications of nitrogen produced the best looking turf.
3. Turfgrass density (visual estimates) showed that in conjunction with scalping, two applications of nitrogen (*scalp* + *N* + *N*), totaling 1.5 lbs./month, without aerification, provided a dense turf at 16DAT, second only to the untreated control plot.
4. At 27 DAT, *scalping* + *N* + *N* + *aerification* treated plots had the highest estimate of visual density, showing a benefit from aerification.
5. *Scalped and aerified* turf (without nitrogen) had unacceptable turf density at 16DAT and 27DAT.
6. Generally, two 0.75 lb./N/M applications with aerification (*scalp* + *aerification* + *N* + *N*) proved beneficial over the single application of nitrogen plus aerification (*scalp* + *aerification* + *N*), when both turfs were initially scalped.
7. Although non-significant statistically, the additional treatment of nitrogen provided 10% more bermudagrass

cover than the single application of nitrogen, for turfs both overseeded and scalped.

8. Scalping alone, plus a single application of N, produced 33% less bermudagrass by June 30, then that of the untreated control.

Table 1. Mean¹ percent ground and percent plot bermudagrass of overseeded² Tifway (419) bermudagrass after select cultural management practices for a forced spring transition. University of Arizona, 1997.

TREATMENTS ³	% BARE GROUND ⁴			% PLOT BERMUDA ⁵
	MAY 29 (7DAT)	JUNE 7 (16DAT)	JUNE 18 (27DAT)	JUNE 30 (40 DAT)
Unscalped Control	1.0%	1.0%	2.6%	59.4%
Scalp + (N)	37.5%	8.1%	1.8%	39.3%
Scalp + (N) + (aerify)	48.7%	13.3%	4.0%	45.6%
Scalp + (aerify)	51.2%	11.2%	4.1%	48.7%
Scalp + (N) + (N)	26.2%	27.7%	2.2%	55.6%
Scalp + (N) + (N) + (aerify)	35.6%	26.2%	1.9%	58.8%
TEST MEAN ⁶	33.4%	14.6%	2.8%	51.2%
LSD VALUE ⁷	17.7%	N.A.	1.3%	N.A.

¹Values are the mean of four replications.

²Tifway (419) bermuda, maintained year round at 7/8", overseeded in fall 18 lbs./M PLS turf type perennial ryegrass.

³Plots scalped, aerified May 22, 1997. Nitrogen applications = May 22 (N), and May 29 (N) + (N), 1997. (34-0-0).

⁴Percent bare ground = area showing soil (0-100%).

⁵Percent bermuda = percent of plot showing bermudagrass turf (0-100%).

⁶Test Mean = mean of all treatments on each evaluation date.

⁷LSD Value = least significant difference mean separation statistic. Treatment means with numerical differences greater than the LSD value, are significantly different from each other.

Table 2. Mean¹ turfgrass color, quality and density scores of overseeded² Tifway (419) bermudagrass after select cultural management practices for a forced spring transition. University of Arizona, 1997.

TREATMENTS ³	COLOR ⁴		QUALITY ⁵		DENSITY ⁶	
	JUNE 7 (16DAT)	JUNE 18 (27DAT)	JUNE 7 (16DAT)	JUNE 18 (27DAT)	JUNE 7 (16DAT)	JUNE 18 (27DAT)
Unscalped Control	5.8	5.5	6.3	5.4	9.0	6.1
Scalp + (N)	7.3	5.9	5.3	6.0	5.0	6.4
Scalp + (N) + (aerify)	6.5	5.4	4.5	4.9	4.8	4.8
Scalp + (aerify)	6.3	5.0	4.0	4.8	4.0	4.9
Scalp + (N) + (N)	6.5	7.0	6.3	7.6	6.8	7.3
Scalp + (N) + (N) + (aerify)	6.8	6.9	5.3	7.1	5.5	7.8
TEST MEAN ⁷	6.5	6.0	5.3	6.0	5.8	6.2
LSD VALUE ⁸	N.A	1.1	1.1	1.0	1.1	1.0

¹Values are the mean of four replications.

²Tifway (419) bermuda, maintained year round at 7/8", overseeded in fall 18 lbs./M PLS turf type perennial ryegrass.

³Plots scalped, aerified May 22, 1997. Nitrogen applications = May 22 (N), and May 29 (N) + (N), 1997. (34-0-0).

^{4 5 6} Color, quality, density (1-9). 1 = no/dead turf, 9 = best possible.

⁷Test Mean = mean of all treatments on each evaluation date.

⁸LSD Value = least significant difference mean separation statistic. Treatment means with numerical differences greater than the LSD value, are significantly different from each other.