Project: Evaluation of Captor for Management of Sodic Soils

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Summary

In a replicated field trial conducted on a Bermudagrass fairway with a history of high sodium levels, the product Captor was evaluated for its ability to improve turf quality by reducing sodium levels in the soil. Key results include:

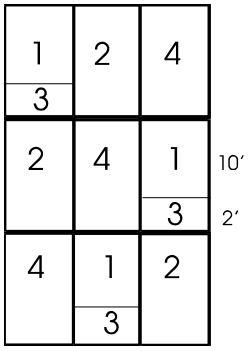
- Following three applications of Captor, no significant differences in turf quality were observed when data was analyzed at the P<0.05 level. However, using a less stringent P of <0.10, a significant improvement in turf quality was observed on the last sampling date only, for a treatment of Captor at 88 oz/1000 square feet (30 gallons per acre).
- Reduced rates of Captor (88 oz/1000 square feet for the initial application, followed by 30 oz/1000 square feet for subsequent applications) had no significant effect on turf quality when compared to the non-treated check.
- No phytotoxicity was observed, even when the rate of Captor was doubled to simulate spray overlap.

Materials and Methods

Location: Research plots were located on a common bermudagrass fairway at Vista Valley Country Club, Vista, CA.

Experimental design and application: Plots measuring 5 by 10 feet were replicated three times in a randomized design, with the exception of treatment 3. For this treatment, which represented the effects of an overlap application of Treatment 1, a 5 by 2 foot area was used for each plot (Figure 1).

Figure 1. Plot plan. Fairway 10, Vista Valley Country Club.



Treatments were applied with a CO_2 backpack sprayer equipped with 8004 VS flat fan nozzles and delivering 1.96 gallons of water per 1,000 square feet, with 28 psi at the boom. Calibration of each nozzle was confirmed prior to application to be within 5% of the desired nozzle flow rate. Boom height was 17 inches above the ground. The spray swath was 5 feet and speed was 3 mph. Spray bottles were agitated by shaking 10 times prior to charging with compressed CO_2. Treatments 1 and 3 were irrigated with 1/10" water following application, while the remaining treatments received no post-treatment irrigation. To accomplish this selective irrigation, the designated plots were sprayed with 18.9 liters of water each, delivered through the boom of the backpack sprayer described above. Water was applied by moving the sprayer up and down the length of the plot approximately 12 times. A flow meter was used to monitor the total volume of water applied to each plot.

Treatments and Evaluations: Treatments are listed in Table 1 below. Applications were made approximately 3 weeks apart on July 9, July 29 and August 20, 1997. Turf quality was rated on a scale of 0 - 9, with 0 equal to the worst possible turf, and 9 equal to the best possible

turf. Quality ratings were made on three dates -- July 29, August 20, and September 12, 1997. Data was subjected to analysis of variance, and treatment means separated using Fisher's LSD, where P<0.10.

On 9/12/97, ten 1 inch soil cores were taken from each replicate plot, with the exception of treatment 3 (the overlap treatment) which was excluded from this analysis. The soil cores were shipped to Brookside Laboratories in New Knoxville, OH for soil chemistry testing. Parameters measured included soil pH, phosphorous (Bray II), calcium, magnesium, potassium, sodium, sulfate, boron, iron, managanese, copper, zinc, elecrical conductivity, total exchange capacity and percent organic matter. The results for each treatment were compared with average fairway values from PACE Consulting's data base of California golf courses (Table 2). Data was subjected to analysis of variance, and treatment means separated using Fisher's LSD, where P<0.05.

Results and Discussion:

Turf Quality: There were no significant differences in turf quality among treatments on on any of the rating dates. However, when the less stringent P value of 0.10 was used in the analysis of variance, we saw that treatment 2 (Captor at 88 oz/1000 square feet, not watered in) had significantly higher turf quality than the non-treated check (Table 1). This effect was noted only for the last evaluation date (9/12/97). It's important to note that the turf quality in all plots (even those for treatment 2) was in the unacceptable range (greater than 6.0 is considered acceptable). Treatments that were watered in (treatments 1 and 3) did not result in improved turf when compared to the check, regardless of the rate of Captor that was applied. For this reason, it does not appear to be critical to water the product in.

Table 1. Mean turf quality ratings (with 0 = worst possible turf, and 9 = best possible turf). Values followed by the same letter are not significantly different (Fisher's LSD, p<0.10). No significant differences occurred at the P<0.05 level.

Treatment	7/29/97	8/20/97	9/12/97
1. Captor (88 oz/30 oz, water in)	5.17a	5.00a	4.83ab
2. Captor (88 oz, no water)	5.00a	4.83a	5.50b
3. Captor (88 oz X 2, water in)	4.83a	5.00a	5.17ab
4. Non-treated check	4.83a	4.67a	4.67a

Soil chemistry: In an attempt to understand the basis for turf quality results, soil chemistry analyses were performed (raw data attached). There were no obvious patterns in the results or any significant differencesamong treatments (Table 2).

Phytotoxicity: Treatment 3, which received double the recommended rate of Captor, in an attempt to simulate a sprayer overlap, showed no signs of phytotoxicity to turf, nor did any of the other Captor treatments.

Based on this data, there is reason to believe that a series of successive Captor applications (3 or more) may result in improved fairway turf quality on sodic soils. However, the lack of confirming trends in the soil chemistry data indicate that no significant changes to soil chemistry occurred after three applications of Captor. This is not completely surprising, since the quantity of calcium applied with each Captor treatment (approximately 0.5 lb/1000 square feet, or 11 ppm) is 25% the rate of calcium that is typically applied in over-the-top applications of gypsum. Compared to the high levels of calcium already present in the soil, it would be difficult to detect a change of anything less than 10%, or about 300 ppm. In other words, the rate tested may have been too low, or the number of applications made (three) was not sufficient to add enough calcium to the soil to produce a change in soil chemistry.

To confirm the results observed in this test, namely that Captor at 88 oz/1000 square feet produced a small improvement in turf quality, a test examining additional applications (6 or more) over a longer period of time and/or a test evaluating higher rates of Captor would be necessary.

Table 2. Soil test results from experimental plots (mean of three replicates) compared against average fairway values from PACE Consulting's data base of California golf courses. Analysis conducted by Brookside Laboratories, New Knoxville, OH.

	Trt 1 Captor 88/30 oz	**Trt 2 Captor 88 oz**	**Trt Non-treated check**	**PACE Avg Fairway Values**
pH	7.57	7.80	7.73	7.20
Phosphorous (ppm)	134.0	97.3	77.7	101
Calcium (ppm)	3653.0	3697.0	3795.3	2640
Magnesium (ppm)	1135.0	1208.3	1155.0	611
Potassium (ppm)	188.7	164.7	168.7	235
Sodium (ppm)	776.0	843.0	767.0	584
Sulfate (ppm)	530.7	633.3	688.7	490
Boron (ppm)	3.4	3.2	3.2	1.7
Iron (ppm)	343.7	338.7	355.0	157
Manganese (ppm)	60.7	67.3	73.7	43
Copper (ppm)	2.7	2.4	2.5	2.4
Zinc (ppm)	10.9	9.0	7.8	8.4
Electrical conductivity (dS/m)	7.6	7.8	7.4	6.4
Total exchange capacity (meq/100g)	32.8	33.9	33.6	24.0
Organic matter (%)	5.7	5.1	5.2	4.4
% calcium	55.6	54.6	56.4	59.0
% magnesium	28.8	29.7	28.7	23.0
% potassium	1.4	1.2	1.3	3.0
% sodium	10.2	10.8	10.0	11.0