Project: Comparison of iron-based fertilizers for improved turf quality

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Summary: A replicated small plot study was conducted on greens height bentgrass to evaluate the performance of iron-based fertilizers for improved turf quality. Based on the results, the following conclusions were drawn:

- All three Becker-Underwood products resulted in significantly improved turf quality when compared against the non-treated check, as well as against a ferrous sulfate positive control
- The two experimental formulations (DPTA-507A and DPTA-507B) performed as well, and on some dates better than the Sprint 330 formulation. However, the performance of DPTA-507A and 507B were equivalent.
- Improved turf quality was evident for up to 10 days post-treatment with the three BU products, but by 15 days after application, differences were impossible to assess visually. Thus, at the rates tested (0.22 oz iron/1000 sq ft), re-application may be necessary every 10 - 14 days in order to maintain improved turf quality. Alternatively, higher rates may increase the duration of the effect.
- All formulations handled well, going into solution easily and leaving no residue on the screens.

Materials and Methods:

Treatments:

PRODUCT	RATE FORMULATION/1000	RATE IRON/1000
1. Sprint 330 (10% Fe) (DPTA #507A)	2 oz	0.2 oz
2. DPTA-#507B (11% Fe)	2 oz	0.22 oz
3. DPTA-#507C (11% Fe)	2 oz	0.22 oz
4. Ferrous sulfate $FeSO_4*7H_20$ (20% Fe)	1 oz	0.2 oz
5. No treatment		

Experimental design and application: The trial was conducted at La Jolla Country Club (Bruce Duenow, superintendent) on a bentgrass nursery (var. Crenshaw) with turf mowed at greens height (140/1000"). Plots measured 5 feet by 10 feet and treatments were replicated three times, in a randomized design (Figure 1).

Treatments were applied on October 1, 2001. Applications were made with a CO_2 backpack sprayer equipped with 8004 VS flat fan nozzles and delivering 0.98 gallons of water per 1000 square feet, with 30 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. Speed was 3 mph. Spray bottles were agitated by shaking 20 times prior to charging with compressed CO_2. Spray lines were purged with CO_2 and then water prior to changing treatments.

Evaluations: Turf quality was measured pre-treatment, as well as 3, 10 and 15 days post-treatment. Ratings were made visually (on a 0 - 9 scale, with 0 = worst possible turf and 9 = best possible turf). For additional information on turf quality, a chlorophyll meter (Spectrum Technology; Field Scout CM1000) that measures ambient and reflected 700 nm and 840 nm light to calculate a relative chlorophyll index was also utilized.

Data analysis: Data was subjected to analysis of variance, and treatment means were separated using Fisher's LSD, where P<0.05.

Figure 1. Plot plan.

2	**4**	**5**	**3**	**1**
3	**1**	**4**	**5**	**2**
1	**2**	**3**	**4**	**5**

Results (Table 1, Figures 2-4):

Table 1. Turf quality ratings taken visually ("Visual") and with a chlorophyll meter ("Chloro") on 3 rating dates: 3, 10 and 15 days after treatment. Visual ratings were made on a 0 - 9 scale, with 0 = worst possible quality. Treatment means were separated using analysis of variance (Fisher's LSD, p<0.05). Values in green print were indicate significantly better turf quality on that sampling date. DAT = days after treatment.

Trt #	Treatment	Product/1000 sq ft (oz Fe/1000)	10/4/01 (3 DAT)		10/11/01 (10 DAT)		10/16/01 (15 DAT)	
			Visual	Chloro	Visual	Chloro	Visual	Chloro
1	DPTA-507A	2 oz (0.22)	**7.9a**	**324.7a**	**8.0a**	329.0ab	7.8a	**317.7a**
2	DPTA-507B	2 oz (0.22)	**7.9a**	310.0ab	**7.8a**	**332.3a**	7.8a	**317.0a**
3	Sprint 330	2 oz (0.2)	**7.9a**	308.3ab	**7.7ab**	325.7ab	7.8a	**311.0a**
4	Ferrous sulfate $FeSO_4$*$7H_20$ (20% Fe)	1 oz (0.2)	7.8ab	305.7b	7.3bc	317.3ab	7.5a	305.3ab
5	No treatment	---	7.5b	296.7b	7.2c	310.7b	7.5a	292.7b

Formulation: All test products went into solution within one minute after mixing. The solutions were delivered with no problem through 8004 nozzles equipped with 50 mesh screens, and there was no residue left on the screens.

With the exception of the ferrous sulfate positive control, all treatments resulted in significantly improved turf quality (when compared to the non-treated check) on one or more evaluation dates. Since all treatments received almost the same rate of iron, this indicates that some quality of the formulation of the three Becker-Underwood products resulted in improved performance of the active ingredient.

Efficacy: The two experimental formulations (DPTA-507A and 507B) performed as well as, or on some dates, better than the Sprint 330 formulation. However, 507A and 507B did not differ significantly from one another in their performance. In terms of visual ratings alone, it was in fact impossible to statistically distinguish Sprint from 507A and 507B. It was only with the chlorophyll meter that significant differences emerged, with 507A performing slightly better than either Sprint or 507B on 10/4/01, and 507B performing slightly better than Sprint and 507A on 10/11/01.

Longevity of effect: Improved turf quality as a result of application of Sprint, 507A and 507B was visually apparent 3 days and 10 days after application. However, by 15 days post-treatment, it was not possible to visually distinguish any of the treatments from one another, including the non-treated check. It was only with the chlorophyll meter that treatment differences were observed at the 15 DAT, indicating that at the rates tested, re-application may be necessary every 10 - 14 days. Alternatively, higher rates of the products might result in increased longevity of the improved turf quality effect.

Use of the chlorophyll meter vs. visual quality ratings: The Spectrum chlorophyll meter is an as yet unproven tool for quantifying differences in turf quality. However, based on the data generated in this trial, it appears to provide reliable data that correlates relatively well with visual observations. In addition, the meter appears to be able to distinguish among treatments that are too difficult to separate with the human eye alone. Data generated in a separate turf variety trial (Figure 5) also indicates that chlorophyll meter readings correlate well with visual turf quality readings.

Figure 2. Visual turf quality ratings. Treatment means were separated using analysis of variance (Fisher's LSD, $p<0.05$).

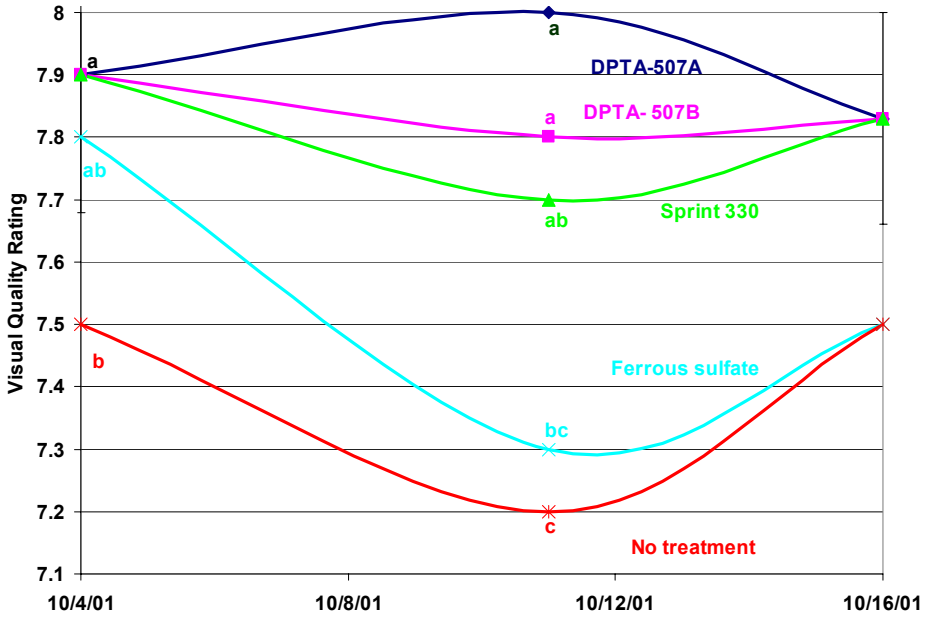

Figure 3. Turf quality ratings made using the Spectrum chlorophyll meter. Treatment means were separated using analysis of variance (Fisher's LSD, p<0.05).

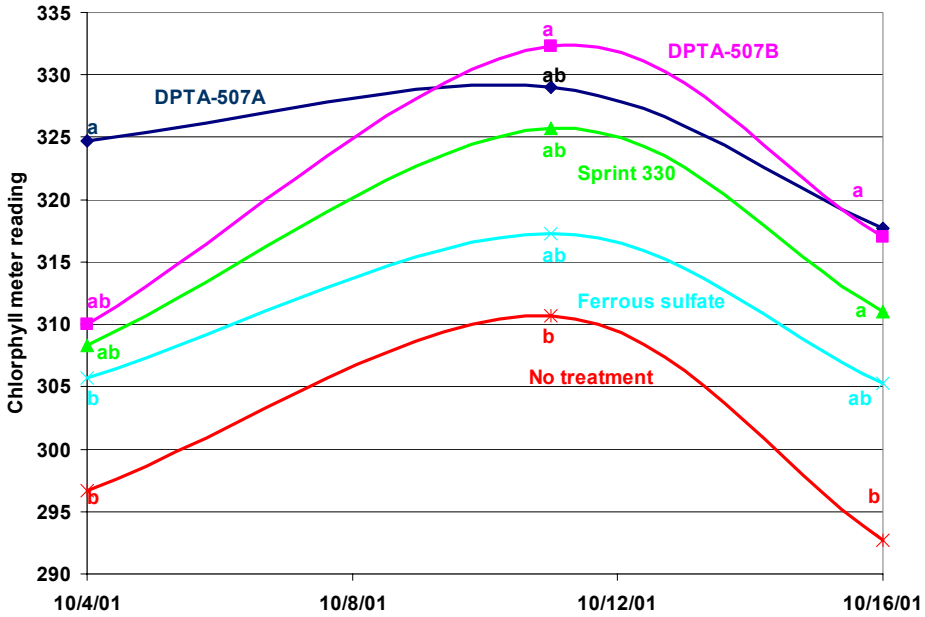

Figure 4. October 4, 2001 (3 days after treatment). Treatments in the first replicate are labeled, for the sake of orientation. Note the lighter colored turf in the treatment 5 (non-treated control) plots.

Figure 5. Correlation between visual turf quality data and Spectrum chlorophyll meter readings, generated in a separate turf variety trial conducted at Fairbanks Ranch Country Club. Based on 262 paired observations, the relationship is:

Turf quality = 2.71 X ln (meter reading) - 9.71	**r^2 = 0.73 (p<0.001)**