

Grain Processing Corporation Nitrogen Fertilizer Field Study on Tall Fescue in Riverside, California

Final Report

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Objective: To evaluate nine quickly-available and slowly-available nitrogen (N) fertilizers when applied once at a N rate of 0.8 lb/1000 ft² on a mature stand of tall fescue. The evaluations are visual turfgrass quality and color ratings.

Cultivar: Bonsai tall fescue (*Festuca arundinacea*)

Experimental site: A plot established on 28 Sept. 1993 at the UCR Turfgrass Field Research Facility, Riverside, California. The root zone is a native soil which is classified as a Hanford fine sandy loam. Results from a soil test² taken on 1 Mar. 2006 showed the following: pH = 6.9; Olsen-P = 44.3 ppm (sufficient); exchangeable K = 121.5 ppm (sufficient); cation exchange capacity (CEC) = 13.0 meq/100 g dry soil (sufficient); organic mater (OM) = 2.29% (sufficient). Also, a soil test taken during April 1997 showed 51% sand, 38% silt, and 11% clay.

Prior fertilization: The plot has been fertilized at an annual N rate of approximately 4.5 lb/1000 ft² which would be considered well fertilized. This fertilization regime has involved applications of: a N-only fertilizer in Feb.; a complete fertilizer on approximately 7 Apr.; a N-only fertilizer once every 6 to 7 weeks; and a complete fertilizer during the first part of Nov. (listing of applications are in chronological order).

Experimental design: Randomized complete block design with four replications (Fig. 1). Overall ANOVA was a repeated-measures design with date as the repeated-measures factor. Plot size was 4.5 x 6.0 ft.

Mowing: The plot was mowed once per week with a 68-inch rotary riding mower. During the cool season (approximately 10 Oct. to 15 June), the mowing height was set at 1.75 inch and during the warm season the mowing height was set at 2.25 inch.

Irrigation: The plot was irrigated to prevent visual drought symptoms and over watering.

Treatments: Nine N fertilizer products were applied on 29 Mar. 2006 at a N rate of 0.8 lb/1000 ft² (Table 1). Treatments also included a no-fertilizer control (check).

Measurements: Visual turfgrass quality and color ratings were simultaneously taken once every 2 weeks for 18 weeks following treatment applications. The first rating date was 12 Apr. and the last rating date was 2 Aug. A 1 to 9 scale was used for quality (1 = worst, 5 = minimally acceptable, and 9 = best tall fescue) and color (1 = brown, 5 = minimally acceptable, and 9 = darkest green tall fescue).

Results: Visual turfgrass quality ratings are shown in Fig. 2 and Table 2 and visual turfgrass color ratings are shown in Fig. 3 and Table 3. In terms of the overall (Tables 2 and 3), the 10 treatments (9 fertilizer and 1 check treatment) were not significantly different for visual turfgrass quality nor color. However, there were significant differences among treatments during April and May rating dates. During the 18 weeks of the study, all treatments, including the check, resulted in satisfactory tall fescue quality and color. Considering the relatively high visual turfgrass quality and color of the check treatment, it is probably fair to reason that the N status of the plot was good during the study which may have minimized differences due to fertilizer treatments. Thus, the results of this study may be different if a plot with a low N status is used. Another approach to this issue could be a study with a longer duration and involving multiple fertilizer treatment application dates.

²DANR Analytical Lab. soil analysis methods: pH = saturated paste (s.p.), pH meter; Olsen-P = alkaline extraction (ext.) by 0.5 Normal NaHCO₃ for soils with pH > 6.5 by ascorbic acid reduction of phosphomolybdate complex and meas. by spectrophotometry; exchangeable K, Na, Ca, and Mg = equilib. ext. using 1 Normal ammonium acetate (pH 7.0), subsequent determination by atomic absorption/emission spectrophotometry; Fe = equilib. ext. using DTPA, subsequent determination by atomic absorption spectrometry; soluble (sol.) Ca and Mg = s.p. ext., inductively coupled plasmic atomic emission spectrometry; sol. Na and K = s.p. ext., emission spectrometry; HCO₃ and CO₃ = s.p. ext., titration with 0.05 Normal H₂SO₄ acid; SAR = est. calc. from Ca, Mg, and Na on s.p. ext.; CEC = barium acetate saturation and calcium replacement; OM = potassium dichromate reduction of organic carbon and subsequent spectrophotometric measurement; EC_s = semi-quantifies the amount of soluble salts in the saturation paste extract using conductivity meter; particle size analysis of sand, silt and clay determined by soil suspension by hydrometer.

Figure 1. Plot plan for GPC nitrogen fertilizer field study.

N ↑

Rep A	1	2	3	4	5	6	7	8	9	10
	1	10	2	5	8	3	9	7	4	6
	11	12	13	14	15	16	17	18	19	20
	5	9	3	2	4	1	7	6	8	10
Rep B	21	22	23	24	25	26	27	28	29	30
	10	8	4	1	2	9	5	7	6	3
Rep C	31	32	33	34	35	36	37	38	39	40
	3	10	9	4	5	6	7	2	1	8

} 6 ft
4.5 ft

Treatments	
1. Gro-Well 15-0-4	6. Milorganite 6-2-0 4% Fe
2. Gro-Well 12-0-6	7. Nature Safe 10-2-8
3. Gro-Well 9-0-0	8. Nature Safe 21-3-7
4. Cockadoodle DOO 4-3-3	9. Turf Supreme 16-6-8
5. Scott's Turf Builder 29-3-4 2% Fe	10. Check

Table 1. Treatments for the GPC nitrogen fertilizer field study.

Treatment	Analysis (N-P ₂ O ₅ -K ₂ O)	N source(s)	
		Quickly available	Slowly available
1. Gro-Well	15-0-4	0.20% water soluble 7.0% urea	7.8% water insoluble
2. Gro-Well	12-0-6	0.20% water soluble 4.0% urea	7.8% water insoluble
3. Gro-Well	9-0-0	0.77% water soluble	8.23% water insoluble
4. Cockadoodle DOO	4-3-3	0.73% water soluble	3.27% water insoluble
5. Scotts Turf Builder Lawn Fertilizer	29-3-4 with 2% iron	6.6% ammoniacal 12.3% urea 2.5% water soluble	6.8% water soluble 0.8% water insoluble
6. Milorganite	6-2-0 with 4% iron	0.75% water soluble	5.25 % water insoluble
7. Nature Safe	10-2-8	0.25% ammoniacal 0.75 % water soluble	9.0% water insoluble
8. Nature Safe	21-3-7 blended with UFLEXX	0.01 % ammoniacal 0.69% water soluble 18.20% urea	2.1 % water insoluble
9. Turf Supreme	16-6-8	16% ammoniacal	
10. Check	–	–	

Figure 2. Visual turfgrass quality ratings (1 to 9 scale, with 1 = worst, 5 = minimally acceptable, and 9 = best tall fescue) for the GPC nitrogen fertilizer field study on tall fescue in Riverside, Calif.

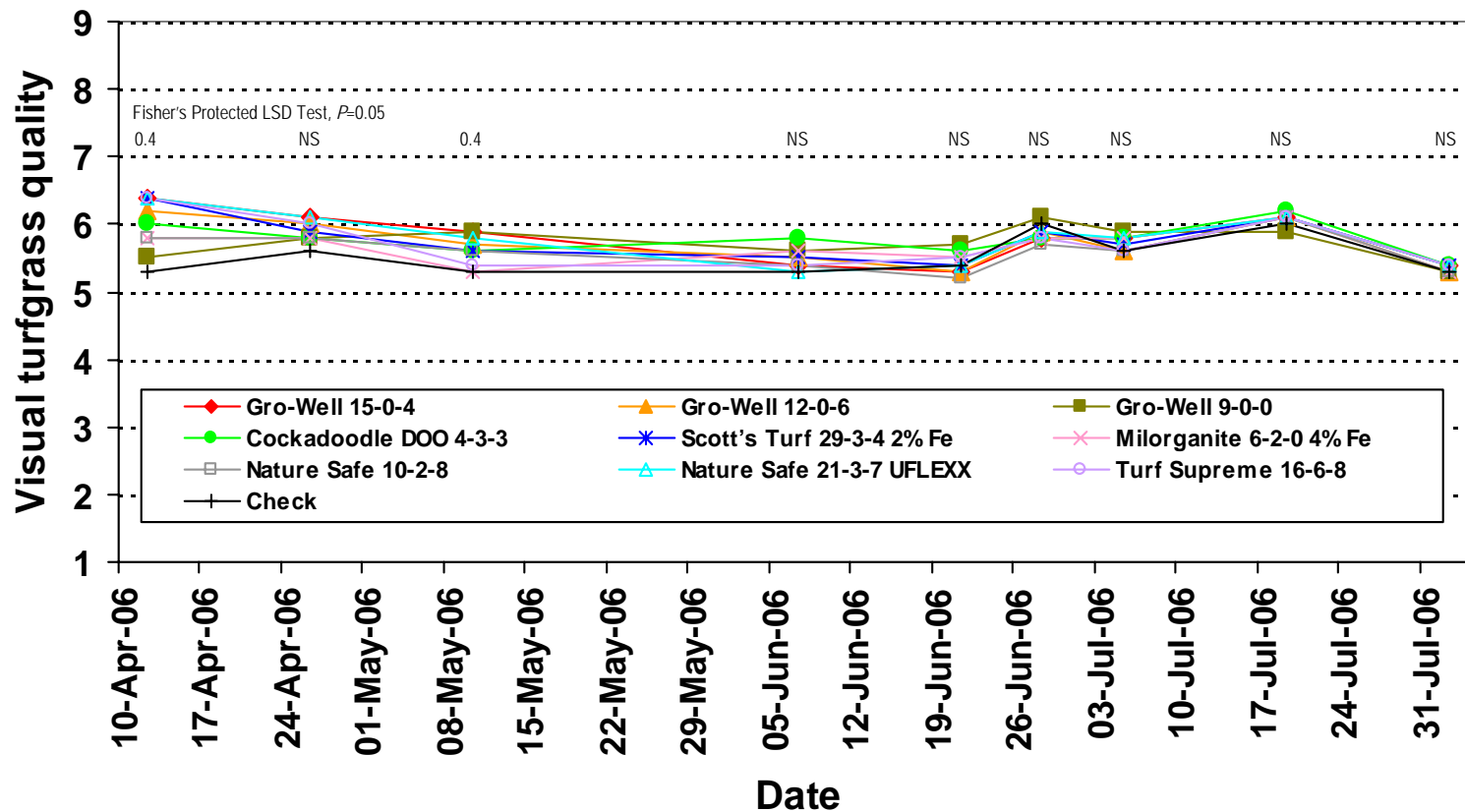


Table 2. Visual turfgrass quality ratings (1 to 9 scale, with 1 = worst, 5 = minimally acceptable, and 9 = best tall fescue) for the GPC nitrogen fertilizer field study on tall fescue in Riverside, Calif.

Treatment ^z	12 Apr. 2006	26 Apr. 2006	10 May 2006	7 June 2006	21 June 2006	28 June 2006	5 July 2006	19 July 2006	2 Aug. 2006	Overall
Gro-Well 15-0-4	6.4	6.1	5.9	5.4	5.3	5.8	5.8	6.1	5.4	5.8
Gro-Well 12-0-6	6.2	6.0	5.7	5.5	5.3	5.9	5.6	6.1	5.3	5.7
Gro-Well 9-0-0	5.5	5.8	5.9	5.6	5.7	6.1	5.9	5.9	5.3	5.7
Cockadoodle DOO 4-3-3	6.0	5.8	5.6	5.8	5.6	5.8	5.8	6.2	5.4	5.8
Scott's Turf 29-3-4 2% Fe	6.4	5.9	5.6	5.5	5.4	5.9	5.7	6.1	5.4	5.8
Milorganite 6-2-0 4% Fe	5.8	5.8	5.3	5.6	5.5	5.8	5.8	6.1	5.3	5.7
Nature Safe 10-2-8	5.8	5.8	5.6	5.4	5.2	5.7	5.6	6.1	5.3	5.6
Nature Safe 21-3-7 UFLEXX	6.4	6.1	5.8	5.3	5.4	5.9	5.8	6.1	5.4	5.8
Turf Supreme 16-6-8	6.4	6.0	5.4	5.4	5.5	5.8	5.6	6.1	5.4	5.7
Check	5.3	5.6	5.3	5.3	5.4	6.0	5.6	6.0	5.3	5.5
LSD, $P=0.05^y$	0.4	NS	0.4	NS	NS	NS	NS	NS	NS	NS
ANOVA effect (P)										
Treatment (T)	<0.0001	0.2151	0.0150	0.5085	0.6398	0.3313	0.4502	0.8913	0.8402	0.1164
Date (D)										0.0003
T x D										<0.0001

^zAll N fertilizer product treatments applied on 29 Mar. 2006 at a N rate of 0.8 lb/1000 ft².

^yMean separation within columns by Fisher's protected LSD test, $P=0.05$.

Note: On 5 June 2006 one application of urea 46-0-0 was accidentally made at a N rate of 0.5 lb/1000 ft².

Figure 3. Visual turfgrass color ratings (1 to 9 scale, with 1 = brown, 5 = minimally acceptable, and 9 = darkest green tall fescue) for the GPC nitrogen fertilizer field study on tall fescue in Riverside, Calif.

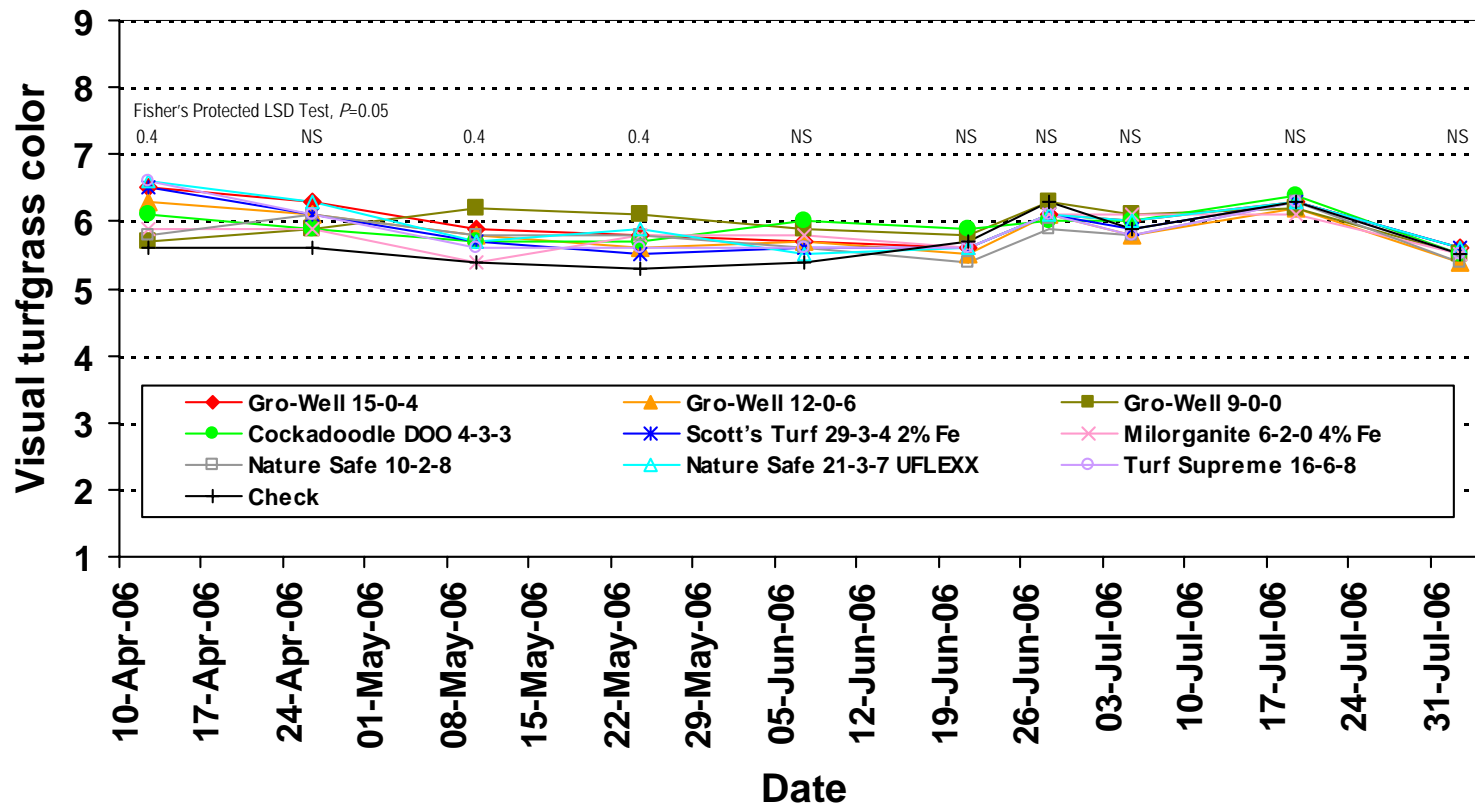


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Gro-Well 12-0-6	6.3	6.1	5.8	5.6	5.7	5.5	6.1	5.8	6.2	5.4	5.8
Gro-Well 9-0-0	5.7	5.9	6.2	6.1	5.9	5.8	6.3	6.1	6.2	5.5	6.0
Cockadoodle DOO 4-3-3	6.1	5.9	5.7	5.7	6.0	5.9	6.0	6.0	6.4	5.5	5.9
Scott's Turf 29-3-4 2% Fe	6.5	6.1	5.7	5.5	5.6	5.6	6.1	5.9	6.3	5.6	5.9
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Nature Safe 21-3-7 UFLEXX	6.6	6.3	5.7	5.9	5.5	5.6	6.1	6.0	6.3	5.6	6.0
Turf Supreme 16-6-8	6.6	6.1	5.6	5.6	5.6	5.6	6.1	5.8	6.3	5.5	5.9
Check	5.6	5.6	5.4	5.3	5.4	5.7	6.3	5.9	6.3	5.5	5.7
LSD, $P=0.05^y$	0.4	NS	0.4	0.4	NS	NS	NS	NS	NS	NS	NS
ANOVA effect (P)											
Treatment (T)	<0.0001	0.1459	0.0209	0.0024	0.2628	0.5826	0.2456	0.4424	0.7138	0.5143	0.0731
Date (D)											0.0002
T x D											<0.0001

^zAll N fertilizer product treatments applied on 29 Mar. 2006 at a N rate of 0.8 lb/1000 ft².

^y Mean separation within columns by Fisher's protected LSD test, $P=0.05$.

Note: On 5 June 2006 one application of urea 46-0-0 was accidentally made at a N rate of 0.5 lb/1000 ft².