Two-Year Evaluation of Nitrogen Products Applied on Tall Fescue in Riverside, California: 1995-1997

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I. SUMMARY

Two one-year studies were conducted to evaluate nitrogen fertilizer treatments on a mature stand of Bonsai tall fescue. The first year included 16 nitrogen treatments, and the second included 12 treatments. Eight of the treatments were comparable for both years. During Year One, 16 nitrogen fertilizer treatments were evaluated from March 9, 1995 to March 6, 1996 and included (in part): 11 granular products applied at a rate of 6.0 lb N/1000 ft^2 per year and applied three to six times during the year at rates ranging from 1.0 to 2.0 lb N/1000 ft^2 per application; and one product that was sprayed normally at 0.68 lb N/1000 ft^2 per application once every one, two, or three months (the annual N rate for these spray treatments was 2.5, 3.9, and 7.7 lb N/1000 ft^2, respectively). During Year Two, 12 nitrogen fertilizer treatments were evaluated from March 15, 1996 to March 12, 1997 and included (in part): seven granular products applied at a rate of 6.0 lb N/1000 ft^2 per year and applied four to six times during the year at rates ranging from 1.0 to 2.0 lb N/1000 ft^2 per application; and one product that was sprayed at 0.5 lb N/1000 ft^2 per application once every one, two, or three months (the annual N rate for these spray treatments was 2.0, 3.0, and 6.0 lb N/1000 ft^2, respectively).

During the studies, visual turfgrass quality and clipping yields were measured once every two weeks. Also, environmental measurements were collected from an on-site California Irrigation Management Information System (CIMIS) weather station. Results from these studies are listed below.

1. An annual N rate of 6.0 lb/1000 ft^2 produced good quality tall fescue with an average visual quality rating of 6.4 (on a 1 to 9 scale, with 1 = poorest, 5 = minimally acceptable, and 9 = best tall fescue). This average includes all treatments for two years that were applied at an annual N rate of 6.0 lb/1000 ft^2.

2. Nitrogen treatments, which included differences in annual nitrogen rates, nitrogen source, and number of applications per year, significantly affected visual turfgrass quality ratings. Selected treatments, involving either a fast-release or slower-release nitrogen source, performed well in these studies.

3. Seasonal temperatures influenced visual quality and clipping yield measurements, with the most favorable conditions for tall fescue performance during the period of mid-September through late November, and mid-February through early July. Tall fescue nitrogen fertilizer strategies should be developed in consideration of seasonal growth patterns, once the annual nitrate rate has been defined.

4. Generally, those treatments that had the highest annual average visual turfgrass quality also had the greatest annual accumulative clipping yield. This suggests that tall fescue visual quality follows leaf growth.

II. MATERIALS AND METHODS

A description of this study is shown in Tables 1 through 3 (pages 7-11).

Year One

Sixteen nitrogen fertilizer treatments were evaluated for one year, from March 9, 1995 to March 6, 1996, on a mature stand of Bonsai tall fescue, including a high (fertilized) and a low (no fertilizer) check treatment (Table 2, page 8). Twelve of the treatments were granular-applied and received 6 lb N/1000 ft^2 per year applied three to six times during the year at rates ranging from 1.0 to 2.0 lb N/1000 ft^2 per application, with the exception of one treatment which received 5 lb N/1000 ft^2 per year in five applications. Three treatments were spray-applied and normally received 0.68 lb N/1000 ft^2 per application (in two gallons of finished spray volume per 1000 ft^2) either every month, every other month, or every three months. During Year One, these spray-applied treatments received a total of 7.7, 3.9, and 2.5 lb N/1000 ft^2 per year, respectively.

Visual turfgrass quality and clipping yields were measured on a biweekly schedule, commencing two and three weeks after initial treatment applications, respectively. Clipping yields were based on four days of growth and on a subsample of 27% of the total surface area of each plot. Due to inclement weather and fungicide treatments, one visual quality rating and two clipping yields were not taken. Environmental measurements were collected from an on-site California Irrigation Management Information System (CIMIS) weather station (Figure 1, page 12; Table 4, pages 14-17).

Year Two

Twelve nitrogen fertilizer treatments were evaluated for one year from March 15, 1996 to March 12, 1997, on the same mature stand of Bonsai tall fescue as used in Year One, including a high (fertilized) and

a low (no fertilizer) check treatment (Table 2, page 9). Eight treatments were carried over from the first to second year and applied on the same plots. Therefore, two-year comparisons were only conducted on these treatments. Seven of the 12 treatments tested in Year Two were granular-applied and received 6 lb N/1000 ft^2 per year, applied four to six times during the year at rates ranging from 1.0 to 2.0 lb N/1000 ft^2 per application. Three of the spray-applied treatments normally received 0.5 lb N/1000 ft^2 per application (in two gallons of finished spray volume per 1000 ft^2) either every month, every other month, or every three months. A fourth spray-applied treatment received 0.5 lb N/1000 ft^2 per application every three months, and 0.02 lb N/1000 ft^2 in the intervening months from an iron-based fertilizer. During Year Two, these spray-applied treatments received a total of 6.0, 3.0, 2.0, and 2.2 lb N/1000 ft^2 per year, respectively.

Visual turfgrass quality and clipping yields were measured every two weeks commencing two and three weeks after initial treatment applications, respectively. Clipping yields were based on seven days of growth and on a subsample of 27% of the total surface area of each plot. Note that the plots were mowed once per week in Year Two and twice per week in Year One (Table 1, page 7). Due to inclement weather, fungicide treatments, etc., data is unavailable for four of the clipping yield sample dates. Environmental measurements continued to be collected from an on-site California Irrigation Management Information System (CIMIS) weather station (Figure 2, page 13; Table 4, pages 14-17).

Table 1. Materials and methods outline for the 1995-1997 tall fescue N-product evaluation study.

Objectives:
To evaluate the performance of nitrogen fertilizers applied to established tall fescue (*Festuca arundinacea*) over two consecutive one-year trials (both running March to March).

Cultivar:
'Bonsai' tall fescue.

Experimental Site:
A mature plot established at the UCR Turfgrass Field Research Center, Riverside, CA on September 28, 1993. The root zone is a native soil which is classified as a Hanford fine sandy loam; pH = 7.4; Olsen-P = 17 ppm; exchangeable K = 75 ppm as of March 1995. Analysis on an adjacent plot (May 1996): soluble forms (meq/L) of Ca = 6.8, Mg = 2.5, Na = 5.0, HCO_3 = 0.6; ESP = 2%; SAR = 2; CEC = 11.7 meq/100 g; OM = 1.51%; Sand = 51%; Silt = 40%; Clay = 9%; EC = 1.25 mmhos/cm.

DANR Analytical Lab. soil analysis methods: pH = saturated paste (s.p.), pH meter; Olsen-P = alkaline extraction (ext.) by 0.5 Normal $NaHCO_3$ and for soils with pH > 6.5 by ascorbic acid reduction of phosphomolybdate complex and meas. by spectrophotometry; exchangeable K = equilib. ext. using 1 Normal ammonium acetate (pH 7.0), subsequent determination by atomic absorption/emission spectrophotometry; soluble (sol.) Ca and Mg = s.p., inductively coupled plasmic atomic emission spectrometry; sol. Na = s.p., emission spectrometry; HCO_3 = s.p. ext., titration with 0.05 Normal H_2SO_4 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.

Experimental Design:
Randomized Complete Block design with four replications. Plot size 4.5 ft x 6.0 ft. Overall analyses were repeated measure designs with fertilizer treatments as the main plot factor and rating date as the repeated measure factor.

Mowing:
Twice a week for the first year, then once a week for the second year. Both years the plot was mowed with a walk-behind rotary mower set at 1.5 inches. Clippings removed.

Irrigation:
Plots irrigated to prevent visual drought symptoms and overwatering.

Fertilizer Treatments *(see Table 2)*:

- Annual N rate set at 6 lb/1000 ft^2 for most treatments.
- Test ran from March 9, 1995 to March 6, 1996 for Year One and March 15, 1996 to March 12, 1997 for Year Two.
- Note that only eight treatments were carried over from the first to the second year and applied on the same plots.

Measurements:

Both years visual turfgrass quality ratings were taken once every two weeks, beginning two weeks after initial treatment applications, using a 1 to 9 scale with 1 = poorest, 5 = minimally acceptable, 9 = best tall fescue.

Both years clipping yields were taken once every two weeks, beginning three weeks after initial treatment applications. In Year One, yields were from 4 days of growth and were collected with the same mower used for routine mowing. In Year Two, yields were from 7 days of growth and were collected with the same mower as used in Year One (a new mower was used for routine mowing). A subsample of clippings was collected from 27% of the total surface area of each plot (both years). Clippings in both years were dried for 48 hours in a forced-air oven maintained at 60ºC, and then weighed.

Environmental measurements were collected from an on-site California Irrigation Management Information System (CIMIS) weather station.

Table 2. Nitrogen treatments tested for the 1995-1997 tall fescue N-product evaluation study.

TRT	Company	YEAR ONE (1995-1996): Fertilizer Programs Product analyses (N-P_2O_5-K_2O) and application rates (lb N/1000 ft^2)						lb N / 1000ft^2 / 12 months
Application Dates --->		March 9	May 9	July 10	September 10	November 9	N/A	
1	Scotts	27-3-4 (1.5)	27-3-4 (1.0)	27-3-4 (1.0)	27-3-4 (1.0)	27-3-4 (1.5)	--	6.0
2*	Sea Source	Turf Rally 16-4-8 (1.5)	Turf Rally 16-4-8 (1.0)	Turf Rally 16-4-8 (1.0)	Turf Rally 16-4-8 (1.0)	Turf Rally 16-4-8 (1.5)	--	6.0
Application Dates --->		March 9	May 18	August 14	October 20	N/A	N/A	
3*	Pursell	Polyon 43-0-0 (2.0)	Polyon 42-0-0 (1.0)	Polyon 42-0-0 (1.0)	Polyon 43-0-0 (2.0)	--	--	6.0
Application Dates --->		March 9	June 17	September 19	December 15	N/A	N/A	
4	Vigoro	Excote 44-0-0 (2.0)	Excote 43-0-0 (1.0)	Excote 43-0-0 (1.0)	Excote 44-0-0 (2.0)	--	--	6.0
5	Vigoro	Excote 43-0-0 (2.0)	Excote 43-0-0 (1.0)	C. IBDU 31-0-0 (1.0)	C. IBDU 31-0-0 (2.0)	--	--	6.0
6	Vigoro	Excote 43-0-0 (2.0)	Excote 43-0-0 (1.0)	Excote 44-0-0 (1.0)	Excote 44-0-0 (2.0)	--	--	6.0
7	Vigoro	N Humate / IBDU 16-0-0 (2.0)	N Humate / IBDU 16-0-0 (1.0)	N Humate / IBDU 16-0-0 (1.0)	N Humate / IBDU 16-0-0 (2.0)	--	--	6.0
Application Dates --->		Once every month, every second month, or every third month as indicated.						
8*	Itronics	20-1-8 (W/V) (monthly app.: 0.46 first 2 apps., then 0.68): 3/9/95, 4/11/95, 5/11/95, 6/9/95, 7/10/95, 8/12/95, 9/11/95, 10/9/95, 11/9/95, 12/10/95, 1/9/96, 2/9/96 **(12 apps.)**						7.7
9*	Itronics	20-1-8 (W/V) (every second month: 0.46 first app., 0.68 subsequently): 3/9/95, 5/11/95, 7/10/95, 9/11/95, 11/9/95, 1/9/96 **(6 apps.)**						3.9
10*	Itronics	20-1-8 (W/V) (every third month: 0.46 first app., 0.68 subsequently): 3/9/95, 6/9/95, 9/11/95, 12/10/95 **(4 apps.)**						2.5
Application Dates --->		March 9	May 18	August 14	October 20	January 30	N/A	
11	CIC Canola	Canola 6-2-1 (2.0)	Poly Supreme 23-5-10 (1.0)	Canola 6-2-1 (1.0)	Poly Supreme 23-5-10 (0.5)	Poly Supreme 23-5-10 (0.5)	--	5.0
Application Dates --->		March 16	May 9	July 10	September 10	November 9	N/A	
12*	Greener Pastures	Greener Pastures 15-1-15 (1.5)	Greener Pastures 15-1-15 (1.0)	Greener Pastures 15-1-15 (1.0)	Greener Pastures 15-1-15 (1.0)	Greener Pastures 15-1-15 (1.5)	--	6.0
Application Dates --->		March 16	July 15	October 20	N/A	N/A	N/A	
13*	U.H.S.	Turfgo 25-5-16 (2.0)	Turfgo 25-5-16 (2.0)	Turfgo 25-5-16 (2.0)	--	--	--	6.0
Application Dates --->		March 16	May 9	July 10	September 10	November 28	N/A	
14	U.H.S.	Turfgo 24-4-16 (1.0)	Turfgo 24-4-16 (1.0)	Turfgo 24-4-16 (1.0)	Turfgo 24-4-16 (2.0)	Turfgo 24-4-16 (1.0)	--	6.0
Application Dates --->		March 9	May 9	July 10	September 10	November 9	January 30	
15*	UCR	Turf Supreme 16-6-8 (1.0)	Turf Gold 21-3-5 (1.0)	Poly Supreme 23-5-10 (1.0)	Turf Supreme 16-6-8 (1.0)	Nitra King 22-3-9 (1.0)	Nitra King 22-3-9 (1.0)	6.0
16	Check	N/A						0.0

* Treatment tested for two years.

Table 2 *(cont'd)*. Nitrogen treatments for the 1995-1997 tall fescue N-product evaluation study.

TRT[z]	Company	YEAR TWO (1996-1997): Fertilizer Programs Product analyses (N-P_2O_5-K_2O) and application rates (lb N/1000 ft^2)						lb N / 1000ft^2 / 12 months
Application Dates		Once every month, alternating between 20-1-7 (one month) and Iron treatements (two months)						
1	Itronics	Gold'n'Gro 20-1-7 (W/V) at 0.5 N/1000ft^2; Gold'n'Gro Iron 5-0-0 (5% iron, 3% sulfur [W/V]) at 8 fl.oz./1000ft^2: 3/18/96 (20-1-7), 4/26 (Iron), 5/27 (Iron), 6/17 (20-1-7), 7/22 (Iron), 8/19 (Iron), 9/23 (20-1-7), 10/25 (Iron), 11/18 (Iron), 12/20 (20-1-7), 1/27/97 (Iron), 2/21 (Iron) *[plots were the Scotts treatment from Year One]*						2.2
Application Dates		March 15	May 11	July 10	September 11	November 18	N/A	
2*	Sea Source	Turf Rally 16-4-8 (1.5)	Turf Rally 16-4-8 (1.0)	Turf Rally 16-4-8 (1.0)	Turf Rally 16-4-8 (1.0)	Turf Rally 16-4-8 (1.5)	--	6.0
Application Dates		March 15	May 20	August 19	October 14	N/A	N/A	
3*	J.R. Simplot	Polyon 43-0-0 (1.5)	Polyon 42-0-0 (1.5)	Polyon 42-0-0 (1.0)	Polyon 43-0-0 (2.0)	--	--	6.0
Application Dates		N/A						
7	Check	N/A [*plots were the N Humate/ IBDU treatment from Year One]*						0.0
Application Dates		Once every month, every second month, or every third month as indicated.						
8*	Itronics	Gold'n'Gro 20-1-7 (W/V): Sprayed at 0.5 each month: 3/18/96, 4/15, 5/22, 6/17, 7/22, 8/19, 9/23, 10/25, 11/18, 12/20, 1/27/97, 2/21 **(12 apps.)**						6.0
9*	Itronics	Gold'n'Gro 20-1-7 (W/V): Sprayed at 0.5 every second month: 3/18/96, 5/22, 7/22, 9/23, 11/18, 1/27/97 **(6 apps.)**						3.0
10*	Itronics	Gold'n'Gro 20-1-7 (W/V): Sprayed at 0.5 every third month: 3/18/96, 6/17, 9/23, 12/20 **(4 apps.)**						2.0
Application Dates		March 15	June 14	September 11	November 22	January 16	N/A	
11	J.R. Simplot	Re-Gain 16-3-7 (1.5)	Re-Gain 17-1-4 (1.5)	Turf Supreme 16-6-8 (1.0)	Nitra King 22-3-9 (1.0)	Nitra King 22-3-9 (1.0)	--	6.0
Application Dates		March 15	May 11	July 10	September 11	November 18	N/A	
12*	Greener Pastures	Greener Pastures 15-1-15 (1.5)	Greener Pastures 15-1-15 (1.0)	Greener Pastures 15-1-15 (1.0)	Greener Pastures 15-1-15 (1.0)	Greener Pastures 15-1-15 (1.5)	--	6.0
Application Dates		March 15	July 26	September 11	November 22	N/A	N/A	
13*	U.H.S.	Turfgo 25-5-16 (2.0)	Turfgo 25-5-16 (1.25)	Turfgo 25-5-16 (1.5)	Turfgo 25-5-16 (1.25)	--	--	6.0
Application Dates		March 15	May 20	July 26	October 14	November 22	February 03	
14	U.H.S.	Turfgo 20-5-10 (1.0)	Turfgo 20-5-10 (1.0)	Turfgo 20-5-10 (1.0)	Turfgo 20-5-10 (1.0)	Turfgo 20-5-10 (1.0)	Turfgo 20-5-10 (1.0)	6.0
Application Dates		March 15	May 15	July 10	September 11	November 22	January 16	
15*	UCR	Turf Supreme 16-6-8 (1.0)	Turf Gold 21-3-5 (1.0)	Poly Supreme 23-5-10 (1.0)	Turf Supreme 16-6-8 (1.0)	Nitra King 22-3-9 (1.0)	Nitra King 22-3-9 (1.0)	6.0

[z] Note: there are a total of 12 treatments. The treatment numbers correspond to the treatment numbers (and treatment plots) used in Year One.

* Treatments tested for two years.

Table 3. Calendar of the 1995-1997 tall fescue N-product evaluation study.

Date	Activity
March 15, 1995	Initial application for Scotts, Sea Source, Pursell, Vigoro, Itronics, CIC Canola and UCR Check treatments.
March 16, 1995	Initial application for Greener Pastures and United Horticultural Supply (UHS) treatments.
March 22, 1995 - March 6, 1996	Biweekly ratings of visual turfgrass quality.
March 31, 1995 - February 28, 1996	Biweekly measurements of clipping yields.
April 11, 1995	Itronics treatment application.
May 9, 1995	Scotts, Greener Pastures, UHS and UCR check applications.
May 11, 1995	Itronics treatment applications.
May 18, 1995	Pursell and CIC Canola applications.
June 9, 1995	Itronics treatment application.
June 17, 1995	Vigoro treatment application.
July 10, 1995	Scotts, Sea Source, Itronics, Greener Pastures, UHS, and UCR check applications.
July 15, 1995	UHS treatment application.
August 12, 1995	Itronics treatment application.
August 14, 1995	Pursell, CIC Canola treatment applications.
September 10, 1995	Scotts, Sea Source, Pursell, Greener Pastures, UHS, UCR check applications.
September 11, 1995	Itronics treatment applications.
September 19, 1995	Vigoro treatment applications.
October 9, 1995	Itronics treatment application.
October 20, 1995	Pursell, CIC Canola, UHS applications.
November 9, 1995	Scotts, Sea Source, Itronics, Greener Pastures, UCR check applications.
November 28, 1995	UHS treatment application.
December 10, 1995	Itronics treatment applications.
December 15, 1995	Vigoro treatment applications.
January 9, 1996	Itronics treatment applications.
January 30, 1996	CIC Canola, UCR check applications.
February 9, 1996	Itronics treatment application.
March 6, 1996	One-year study completed.

Table 3 *(cont'd)*. Calendar of the 1995-1997 tall fescue N-product evaluation study.

Date	Activity
March 15, 1996	Initial application for Greener Pastures, Sea Source, J.R. Simplot, United Horticultural Supply (UHS), and UCR Check treatments.
March 18, 1996	Initial applications for Itronics treatments.
March 27, 1996 - March 5, 1997	Biweekly ratings of visual turfgrass quality.
April 3, 1996 - March 12, 1997	Biweekly measurements of clipping yields.
April 15, 1996	Itronics (Gold'n'Gro [12]) treatment application.
April 26, 1996	Itronics (Gold'n'Gro Iron) treatment application.
May 11, 1996	Sea Source and Greener Pastures applications.
May 15, 1996	UCR Check application.
May 20, 1996	J.R. Simplot (Polyon 43-42) application.
May 22, 1996	Itronics (Gold'n'Gro [12] and [6]) treatment applications.
May 27, 1996	Itronics (Gold'n'Gro Iron) treatment application.
June 14, 1996	J.R. Simplot (Re-Gain) application.
June 17, 1996	Itronics treatment applications.
July 10, 1996	Sea Source, Greener Pastures, and UCR Check applications.
July 22, 1996	Itronics treatment applications.
July 26, 1996	UHS applications.
August 19, 1996	J.R. Simplot (Polyon 43-42) and Itronics applications.
September 11, 1996	Sea Source, J.R. Simplot (Re-Gain), Greener Pastures, UHS (Turfgo 25-5-16),and UCR Check applications.
September 23, 1996	Itronics treatment applications.
October 14, 1996	J.R. Simplot (Polyon 43-42) and UHS (Turfgo 20-5-10) applications.
October 25, 1996	Itronics treatment applications.
November 18, 1996	Sea Source, Greener Pastures, and Itronics treatment applications.
November 22, 1996	J.R. Simplot (Re-Gain), UHS, and UCR Check applications.
December 20, 1996	Itronics treatment applications.
January 16, 1997	J.R. Simplot (Re-Gain) and UCR Check applications.
January 27, 1997	Itronics treatment applications.
February 3, 1997	UHS (Turfgo 20-5-10) application.
February 21, 1997	Itronics treatment applications.
March 12, 1996	Second year of study completed.

Figure 1. Environmental data for Riverside, CA: 1995-96.

Average weekly temperatures for air (maximum, minimum, and average) and soil (10.2 cm depth).

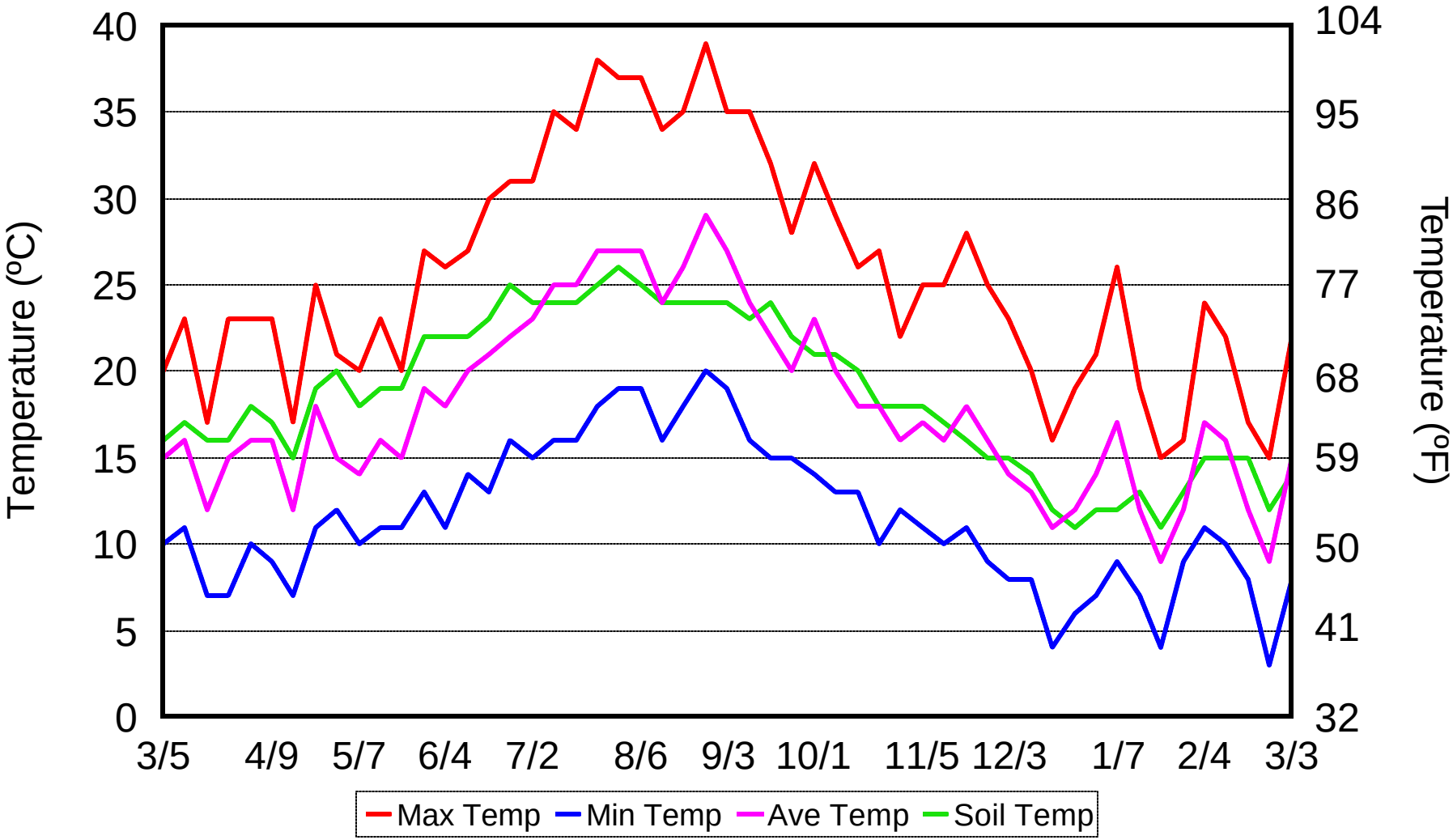


Figure 2. Environmental data for Riverside, CA: 1996-97.

Average weekly temperatures for air (maximum, minimum, and average) and soil (10.2 cm depth).

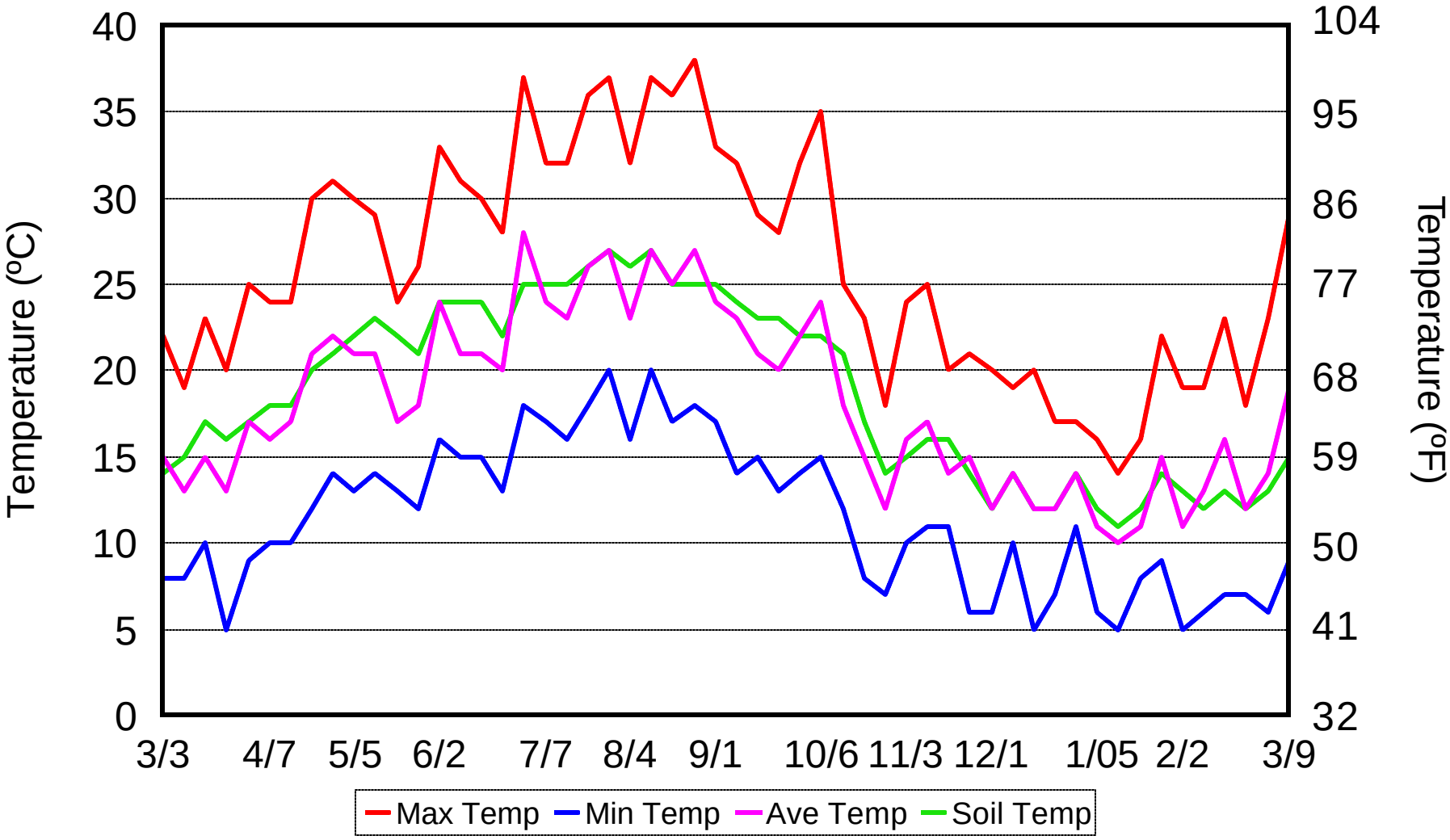


Table 4. CIMIS environmental measurements by week from March 5, 1995 to March 16, 1997 in Riverside, CA.

Date	Accumulative ET_o (mm/week)	Accumulative Precipitation (mm/week)	Average Daily Solar Radiation (W/m^2/day)	Average Daily Temperature (^0C)	Average Daily Relative Humidity (%)	Average Daily Soil Temperature at 10.2 cm Depth (^0C)
03/05/95 - 03/11	17.85	86.00	137	15	49	16
03/12 - 03/18	24.26	0.00	199	16	51	17
03/19 - 03/25	20.56	25.00	165	12	47	16
03/26 - 04/01	36.87	0.00	260	15	29	16
04/02 - 04/08	30.11	0.00	226	16	46	18
04/09 - 04/15	37.95	0.00	257	16	37	17
04/16 - 04/22	23.29	21.00	181	12	50	15
04/23 - 04/29	37.77	0.00	259	18	43	19
04/30 - 05/06	27.81	9.00	211	15	50	20
05/07 - 05/13	26.00	1.00	204	14	51	18
05/14 - 05/20	28.67	0.00	224	16	49	19
05/21 - 05/27	19.27	0.00	152	15	52	19
05/28 - 06/03	33.20	1.00	231	19	46	22
06/04 - 06/10	40.17	0.00	299	18	42	22
06/11 - 06/17	35.63	21.00	259	20	43	22
06/18 - 06/24	43.97	0.00	320	21	42	23
06/25 - 07/01	42.09	0.00	290	22	43	25
07/02 - 07/08	42.72	0.00	293	23	42	24
07/09 - 07/15	46.86	0.00	302	25	31	24
07/16 - 07/22	44.52	1.00	296	25	34	24
07/23 - 07/29	48.02	0.00	307	27	35	25
07/30 - 08/05	47.08	0.00	299	27	37	26
08/06 - 08/12	46.63	0.00	287	27	32	25
08/13 - 08/19	43.79	0.00	287	24	35	24
08/20 - 08/26	42.90	0.00	269	26	33	24
08/20 - 08/26	42.90	0.00	269	26	33	24
08/27 - 09/02	42.96	2.00	249	29	26	24

ET_o = Reference evapotranspiration.

Table 4 *(cont'd)*. CIMIS environmental measurements by week from March 5, 1995 to March 16, 1997 in Riverside, CA.

Date	Accumulative ET_o (mm/week)	Accumulative Precipitation (mm/week)	Average Daily Solar Radiation (W/m^2/day)	Average Daily Temperature (^0C)	Average Daily Relative Humidity (%)	Average Daily Soil Temperature at 10.2 cm Depth (^0C)
09/03 - 09/09	41.86	0.00	249	27	30	24
09/10 - 09/16	33.29	0.00	250	24	30	23
09/17 - 09/23	31.97	0.00	228	22	48	24
09/24 - 09/30	27.71	0.00	202	20	50	22
10/01 - 10/07	32.30	0.00	208	23	34	21
10/08 - 10/14	24.29	0.00	174	20	49	21
10/15 - 10/21	20.10	0.00	158	18	52	20
10/22 - 10/28	24.56	0.00	160	18	32	18
10/29 - 11/04	14.62	0.00	114	16	52	18
11/05 - 11/11	18.75	0.00	141	17	45	18
11/12 - 11/18	16.22	0.00	128	16	47	17
11/19 - 11/25	18.24	0.00	125	18	34	16
11/26 - 12/02	18.50	0.00	120	16	35	15
12/03 - 12/09	12.35	0.00	96	14	48	15
12/10 - 12/16	11.70	8.00	91	13	50	14
12/17 - 12/23	13.60	2.00	96	11	44	12
12/24 - 12/30	15.14	0.00	104	12	39	11
12/31 - 01/06/96	17.84	0.00	116	14	38	12
01/07 - 01/13	20.20	0.00	132	17	32	12
01/14 - 01/20	12.69	5.00	112	12	51	13
01/21 - 01/27	10.64	19.00	104	9	54	11
01/28 - 02/03	9.36	20.00	81	12	56	13
02/04 - 02/10	22.43	0.00	152	17	43	15
02/11 - 02/17	17.29	0.00	124	16	49	15
02/18 - 02/24	14.51	60.00	112	12	51	15
02/25 - 03/02	18.32	19.00	157	9	46	12

ET_o = Reference evapotranspiration.

Table 4 *(cont'd)*. CIMIS environmental measurements by week from March 5, 1995 to March 16, 1997 in Riverside, CA.

Date	Accumulative ET_o (mm/week)	Accumulative Precipitation (mm/week)	Average Daily Solar Radiation (W/m^2/day)	Average Daily Temperature (^0C)	Average Daily Relative Humidity (%)	Average Daily Soil Temperature at 10.2 cm Depth (^0C)
03/03/96 - 03/09	22.64	5.00	166	15	39	14
03/10 - 03/16	20.32	22.00	171	13	52	15
03/17 - 03/23	24.28	0.00	186	15	49	17
03/24 - 03/30	27.57	1.00	220	13	45	16
03/31 - 04/06	39.91	1.00	266	17	36	17
04/07 - 04/13	33.19	0.00	253	16	45	18
04/14 - 04/20	34.83	3.00	255	17	42	18
04/21 - 04/27	42.60	0.00	291	21	39	20
04/28 - 05/04	44.83	0.00	292	22	38	21
05/05 - 05/11	42.51	0.00	302	21	44	22
05/12 - 05/18	40.81	0.00	287	21	47	23
05/19 - 05/25	36.60	0.00	270	17	50	22
05/26 - 06/01	36.71	0.00	273	18	50	21
06/02 - 06/08	44.63	0.00	304	24	43	24
06/09 - 06/15	41.47	0.00	294	21	48	24
06/16 - 06/22	41.51	0.00	296	21	47	24
06/23 - 06/29	37.52	0.00	274	20	47	22
06/30 - 07/06	46.34	0.00	303	28	36	25
07/07 - 07/13	43.31	0.00	298	24	45	25
07/14 - 07/20	41.98	0.00	293	23	48	25
07/21 - 07/27	43.23	0.00	284	26	42	26
07/28 - 08/03	45.29	0.00	291	27	43	27
08/04 - 08/10	39.72	0.00	275	23	50	26
08/11 - 08/17	41.62	0.00	263	27	44	27
08/18 - 08/24	39.62	0.00	259	25	41	25
08/25 - 08/31	41.69	0.00	265	27	33	25
09/01 - 09/07	35.64	0.00	249	24	49	25
09/08 - 09/14	33.65	0.00	245	23	46	24

ET_o = Reference evapotranspiration.

Table 4 *(cont'd)*. CIMIS environmental measurements by week from March 5, 1995 to March 16, 1997 in Riverside, CA.

Date	Accumulative ET_o (mm/week)	Accumulative Precipitation (mm/week)	Average Daily Solar Radiation (W/m^2/day)	Average Daily Temperature (^0C)	Average Daily Relative Humidity (%)	Average Daily Soil Temperature at 10.2 cm Depth (^0C)
09/15 - 09/21	30.13	0.00	224	21	50	23
09/22 - 09/28	22.16	0.00	205	20	71	23
09/29 - 10/05	22.39	0.00	199	22	79	22
10/06 - 10/12	24.60	0.00	208	24	72	22
10/13 - 10/19	15.50	0.00	162	18	83	21
10/20 - 10/26	20.86	1.00	172	15	63	17
10/27 - 11/02	12.55	2.00	99	12	68	14
11/03 - 11/09	23.31	0.00	157	16	40	15
11/10 - 11/16	16.18	0.00	132	17	49	16
11/17 - 11/23	11.44	41.00	114	14	61	16
11/24 - 11/30	21.39	0.00	142	15	41	14
12/01 - 12/07	12.36	6.00	124	12	55	12
12/08 - 12/14	9.86	14.00	82	14	65	14
12/15 - 12/21	16.21	0.00	121	12	41	12
12/22 - 12/28	8.59	7.00	79	12	61	12
12/29 - 01/04/97	5.71	12.00	65	14	70	14
01/05 - 01/11	15.20	5.00	108	11	49	12
01/12 - 01/18	9.54	57.00	92	10	59	11
01/19 - 01/25	7.14	19.00	82	11	68	12
01/26 - 02/01	17.22	19.00	147	15	55	14
02/02 - 02/08	15.87	0.00	155	11	58	13
02/09 - 02/15	17.44	5.00	142	13	56	12
02/16 - 02/22	23.83	0.00	195	16	50	13
02/23 - 03/01	24.12	2.00	177	12	49	12
03/02 - 03/08	25.36	0.00	224	14	50	13
03/09 - 03/15	28.19	0.00	227	19	50	15

ET_o = Reference evapotranspiration.

III. RESULTS AND DISCUSSION

Visual Turfgrass Quality

Nitrogen fertilizer treatments significantly affected visual turfgrass quality on all rating dates in both years, with the exception of one rating date in the second year (Figures 3 and 4, pages 20-21; Tables 5 and 6, pages 22-25). As expected, seasonal temperatures influenced visual quality (Figure 5, page 26) and growth (clipping yield) (Figures 8 and 9, pages 31-32) in both years, with the most favorable conditions for tall fescue performance during the periods of mid-September through late November and early February through early July. These conditions correspond to **average** daily temperatures between 12 and 24 ºC (54 and 75 ºF) (Table 4, pages 14-17; Figures 1 and 2, pages 12-13). All nitrogen fertilizer treatments produced acceptable tall fescue visual quality (5.0 rating) for 12 months. There were significant differences among the nitrogen fertilizer treatments for overall visual quality in Year One (Table 5, page 23) and in Year Two (Table 6, page 25). Also, there were noteworthy differences among the nitrogen fertilizer treatments for number of rating dates the treatments rated 5.3, number of rating dates the treatments rated 5.4 to 6.7, inclusive, and number of rating dates the treatments rated 6.8 (Figures 6 and 7, pages 27-28). These ratings were quantified and are summarized in Tables 7 and 8 (pages 29-30) and listed along with overall visual turfgrass quality ratings.

The information in Tables 7 and 8 suggests that at an equal annual nitrogen rate, type of nitrogen source and number of applications influenced the performance of the nitrogen fertilizer treatments. Selected treatments, involving either a fast-release or a slower-release nitrogen source performed well in the study.

Clipping Yields

Clipping yields were significantly different among the nitrogen fertilizer treatments on each collection date (Figures 8 and 9, pages 31-32 and Tables 9 and 10, pages 33-36). Generally, those treatments that had the highest annual average visual turfgrass quality also had the greatest amount of annual accumulative clipping yield (for Year One, compare Table 5, page 23 to Table 9, page 34; and for Year Two, compare Table 6, page 25 to Table 10, page 36). This information suggests that clipping yields are an indirect indicator of the amount of nitrogen released by a fertilizer and absorbed by the turfgrass. It should be noted that comparisons between years for magnitude of clipping yield is not valid, because in Year One the turfgrass was mowed twice per week and in Year Two the turfgrass was mowed once per week. Normally, as mowing frequency is increased, daily growth is reduced.

Eight Treatments Tested for Two Years

Eight treatments were comparable over both years: Turf Rally, Polyon 43-42, Gold'n'Gro (12), Gold'n'Gro (6), Gold'n'Gro (4), Greener Pastures, Turfgo 25-5-16, and the UCR Check. The untreated check treatment was not comparable since the check plots were not the same for both years. There were noteworthy differences among these eight nitrogen fertilizer treatments for the number of rating dates (a total of 50 over two years) that the treatments were rated 5.3, or 5.4 to 6.7 inclusive, or 6.8 (Figure 10, page 37). These ratings were quantified and summarized in Table 11 (page 38), and listed along with overall visual quality ratings for two years.

Figure 3. 1995-1996 tall fescue N-product evaluation study: visual quality ratings (scale: 1-9; 9=best tall fescue).

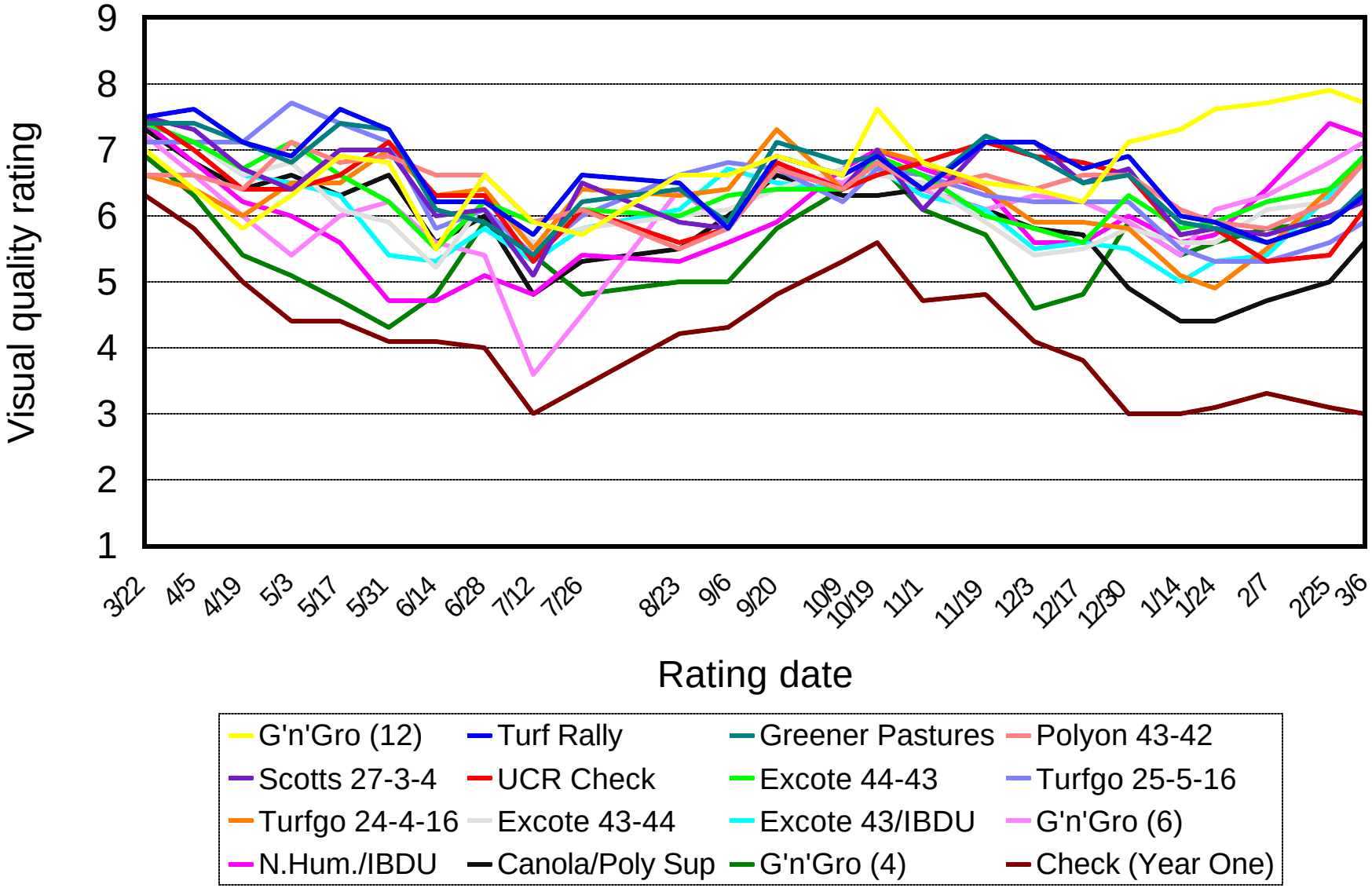


Figure 4. 1996-1997 tall fescue N-product evaluation study: visual quality ratings (scale: 1-9; 9=best tall fescue).

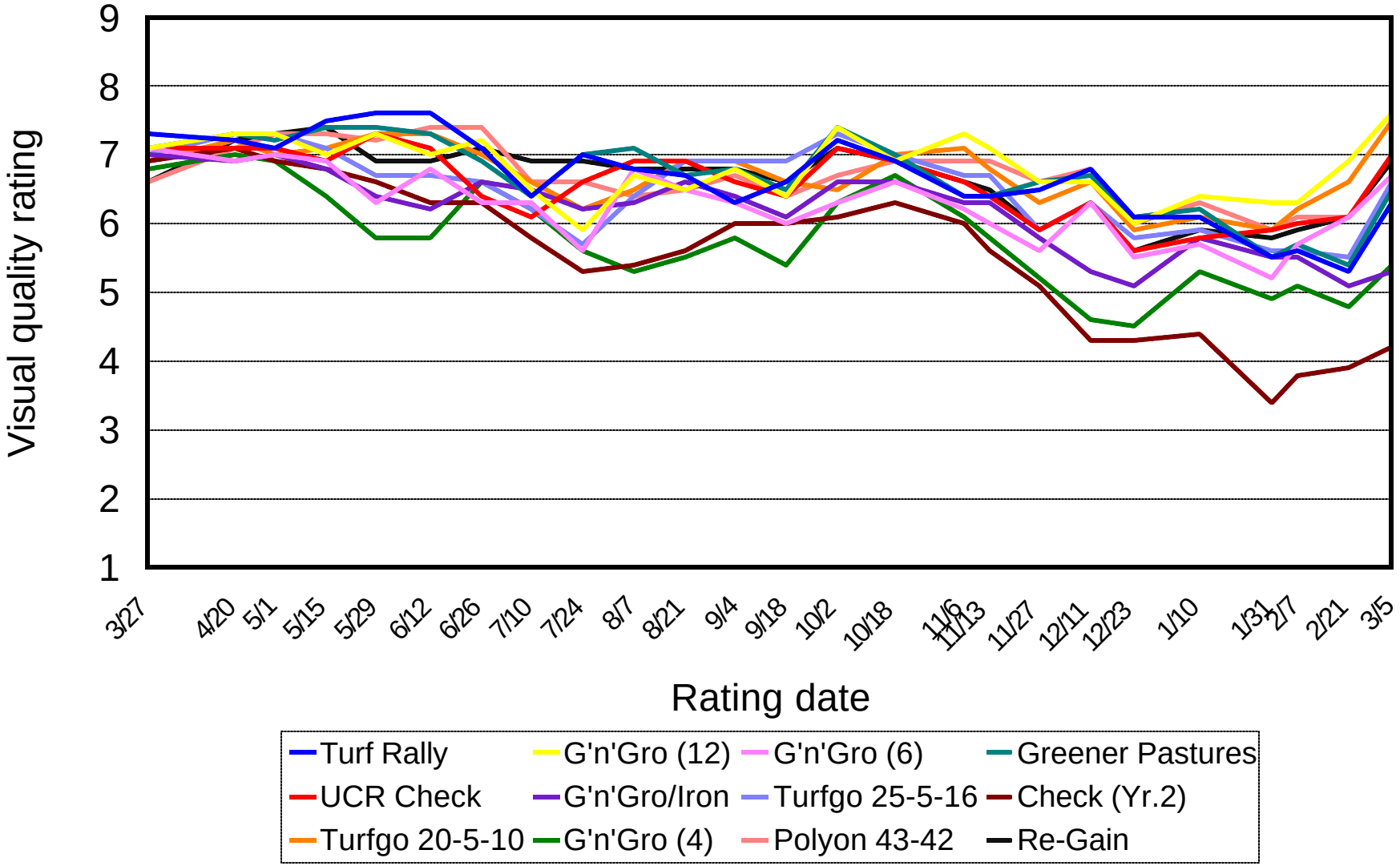


Table 5. N-product evaluation study on tall fescue, 1995-96: visual quality ratings. Scale: 1-9 (1 = poorest; 5 = minimally acceptable; 9 = best tall fescue).

Treatments[z]	03/22/95	04/05/95	04/19/95	05/03/95	05/17/95	05/31/95	06/14/95	06/28/95	07/12/95	07/26/95	08/23/95	09/06/95	09/20/95
Gold'n'Gro (12)	7.0	6.4	5.8	6.3	6.9	6.8	5.5	6.6	5.9	5.7	6.6	6.6	6.9
Turf Rally	7.5	7.6	7.1	6.9	7.6	7.3	6.2	6.2	5.7	6.6	6.5	5.8	6.9
Greener Pastures	7.4	7.4	7.1	6.8	7.4	7.3	6.1	5.9	5.4	6.2	6.4	5.9	7.1
Polyon 43-42	6.6	6.6	6.4	7.1	6.8	6.9	6.6	6.6	5.9	6.1	5.5	5.8	6.7
Scotts 27-3-4	7.5	7.3	6.7	6.4	7.0	7.0	6.0	6.1	5.1	6.5	5.9	5.8	6.7
UCR Check	7.5	7.0	6.4	6.4	6.6	7.1	6.3	6.3	5.3	6.1	5.6	5.8	6.8
Excote 44-43	7.4	7.1	6.7	7.1	6.6	6.2	5.5	6.2	5.9	6.1	6.0	6.3	6.4
Turfgo 25-5-16	7.1	7.1	7.1	7.7	7.4	7.1	5.8	6.1	5.4	6.0	6.6	6.8	6.7
Turfgo 24-4-16	6.6	6.4	6.0	6.5	6.5	7.0	6.3	6.4	5.5	6.4	6.3	6.4	7.3
Excote 43-44	7.4	7.1	6.6	6.8	6.1	5.9	5.2	6.2	5.6	5.8	6.0	6.1	6.4
Excote 43 / IBDU	7.4	7.1	6.6	6.5	6.3	5.4	5.3	5.8	5.3	5.8	6.1	6.7	6.5
Gold'n'Gro (6)	7.2	6.6	6.0	5.4	6.0	6.2	5.6	5.4	3.6	4.5	6.4	5.8	6.7
N. Humate / IBDU	7.4	6.8	6.2	6.0	5.6	4.7	4.7	5.1	4.8	5.4	5.3	5.6	5.9
Canola / Poly Supreme	7.3	6.8	6.4	6.6	6.3	6.6	5.6	6.0	4.8	5.3	5.5	6.0	6.6
Gold'n'Gro (4)	6.9	6.3	5.4	5.1	4.7	4.3	4.8	5.9	5.4	4.8	5.0	5.0	5.8
Check	6.3	5.8	5.0	4.4	4.4	4.1	4.1	4.0	3.0	3.4	4.2	4.3	4.8
LSD P=0.05	0.3	0.4	0.5	0.5	0.4	0.5	0.7	0.6	0.9	0.7	0.8	0.7	0.4

[z] Please see Table 2 for a detailed description of the treatments.

Table 5 *(cont'd).* N-product evaluation study on tall fescue, 1995-96: visual quality ratings. Scale: 1-9 (1 = poorest; 5 = minimally acceptable; 9 = best tall fescue).

Treatments[z]	10/09/95	10/19/95	11/01/95	11/19/95	12/03/95	12/17/95	12/30/95	01/14/96	01/24/96	02/07/96	02/25/96	03/06/96	Overall
Gold'n'Gro (12)	6.6	7.6	6.8	6.5	6.4	6.2	7.1	7.3	7.6	7.7	7.9	7.7	6.7
Turf Rally	6.6	6.9	6.4	7.1	7.1	6.7	6.9	6.0	5.9	5.6	5.9	6.3	6.6
Greener Pastures	6.8	6.9	6.4	7.2	6.9	6.5	6.6	5.9	5.8	5.6	5.9	6.4	6.5
Polyon 43-42	6.4	6.8	6.4	6.6	6.4	6.6	6.6	6.1	5.9	5.8	6.2	6.8	6.4
Scotts 27-3-4	6.4	7.0	6.1	7.1	7.1	6.5	6.7	5.7	5.8	5.7	6.0	6.2	6.4
UCR Check	6.4	6.6	6.8	7.1	6.9	6.8	6.6	5.7	5.8	5.3	5.4	6.1	6.4
Excote 44-43	6.4	6.9	6.6	6.0	5.8	5.6	6.3	5.8	5.9	6.2	6.4	6.9	6.3
Turfgo 25-5-16	6.2	6.7	6.6	6.3	6.2	6.2	6.2	5.5	5.3	5.3	5.6	5.9	6.3
Turfgo 24-4-16	6.4	7.0	6.8	6.4	5.9	5.9	5.8	5.1	4.9	5.5	6.4	6.8	6.2
Excote 43-44	6.7	6.6	6.5	5.9	5.4	5.5	5.8	5.6	5.6	6.1	6.2	6.8	6.1
Excote 43 / IBDU	6.4	6.7	6.3	6.1	5.5	5.6	5.5	5.0	5.3	5.4	6.3	6.9	6.1
Gold'n'Gro (6)	6.5	6.8	6.4	6.1	6.3	6.2	5.9	5.4	6.1	6.3	6.8	7.1	6.1
N. Humate / IBDU	6.7	7.0	6.7	6.4	5.6	5.6	6.0	5.6	5.7	6.4	7.4	7.2	6.0
Canola / Poly Supreme	6.3	6.3	6.4	6.1	5.8	5.7	4.9	4.4	4.4	4.7	5.0	5.6	5.8
Gold'n'Gro (4)	6.4	6.8	6.1	5.7	4.6	4.8	5.9	5.4	5.6	5.8	5.9	6.3	5.5
Check	5.3	5.6	4.7	4.8	4.1	3.8	3.0	3.0	3.1	3.3	3.1	3.0	4.2
LSD P=0.05	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.5	0.3	0.4	0.5	0.1

[z] Please see Table 2 for a detailed description of the treatments.

Table 6. N-product evaluation study on tall fescue, 1996-97: visual quality ratings. Scale: 1-9 (1 = poorest; 5 = minimally acceptable; 9 = best tall fescue).

Treatments[z]	03/27/96	04/20/96	05/01/96	05/15/96	05/29/96	06/12/96	06/26/96	07/10/96	07/24/96	08/07/96	08/21/96	09/04/96	09/18/96
Gold'n'Gro (12)	7.1	7.3	7.3	7.0	7.3	7.0	7.2	6.5	5.9	6.7	6.5	6.8	6.4
Greener Pastures	7.1	7.3	7.2	7.4	7.4	7.3	6.9	6.4	7.0	7.1	6.7	6.8	6.5
Polyon 43-42	6.6	7.1	7.3	7.3	7.2	7.4	7.4	6.6	6.6	6.4	6.5	6.7	6.4
Turfgo 20-5-10	6.9	7.2	7.0	7.1	7.3	7.3	7.0	6.6	6.2	6.5	6.9	6.9	6.6
Re-Gain	6.6	7.2	7.3	7.4	6.9	6.9	7.1	6.9	6.9	6.8	6.8	6.8	6.6
Turf Rally	7.3	7.2	7.1	7.5	7.6	7.6	7.1	6.4	7.0	6.8	6.7	6.3	6.6
UCR Check	7.1	7.1	7.1	6.9	7.3	7.1	6.4	6.1	6.6	6.9	6.9	6.6	6.4
Turfgo 25-5-16	7.0	7.3	7.3	7.1	6.7	6.7	6.6	6.2	5.7	6.4	6.9	6.9	6.9
Gold'n'Gro (6)	7.1	6.9	7.0	6.9	6.3	6.8	6.3	6.3	5.6	6.8	6.5	6.3	6.0
Gold'n'Gro / Iron	7.0	6.9	7.0	6.8	6.4	6.2	6.6	6.5	6.2	6.3	6.6	6.4	6.1
Gold'n'Gro (4)	6.8	7.0	6.9	6.4	5.8	5.8	6.6	6.2	5.6	5.3	5.5	5.8	5.4
Check *(Year 2)*	6.9	7.1	6.9	6.8	6.6	6.3	6.3	5.8	5.3	5.4	5.6	6.0	6.0
LSD P=0.05	0.3	0.3	NS	0.4	0.5	0.6	0.6	0.4	0.6	0.4	0.4	0.5	0.5

[z] Please see Table 2 for a detailed description of the treatments.

Table 6 *(cont'd).* N-product evaluation study, 1996-97: visual quality ratings. Scale: 1-9 (1 = poorest; 5 = minimally acceptable; 9 = best tall fescue).

Treatments[z]	10/02/96	10/18/96	11/06/96	11/13/96	11/27/96	12/11/96	12/23/96	01/10/97	01/31/97	02/07/97	02/21/97	03/07/97	Overall
Gold'n'Gro (12)	7.4	6.9	7.3	7.1	6.6	6.6	6.0	6.4	6.3	6.3	6.9	7.6	6.8
Greener Pastures	7.4	7.0	6.4	6.4	6.6	6.7	6.1	6.2	5.5	5.7	5.4	6.5	6.7
Polyon 43-42	6.7	6.9	6.9	6.9	6.6	6.8	6.0	6.3	5.9	6.1	6.1	7.0	6.7
Turfgo 20-5-10	6.5	7.0	7.1	6.8	6.3	6.6	5.9	6.1	5.9	6.2	6.6	7.5	6.7
Re-Gain	7.1	6.9	6.6	6.5	5.9	6.3	5.6	5.9	5.8	5.9	6.1	6.9	6.6
Turf Rally	7.2	6.9	6.4	6.4	6.5	6.8	6.1	6.1	5.5	5.6	5.3	6.3	6.6
UCR Check	7.1	6.9	6.6	6.4	5.9	6.3	5.6	5.8	5.9	6.0	6.1	7.0	6.6
Turfgo 25-5-16	7.3	7.0	6.7	6.7	5.9	6.3	5.8	5.9	5.6	5.6	5.5	6.6	6.5
Gold'n'Gro (6)	6.3	6.6	6.2	6.0	5.6	6.3	5.5	5.7	5.2	5.7	6.1	6.7	6.3
Gold'n'Gro / Iron	6.6	6.6	6.3	6.3	5.8	5.3	5.1	5.8	5.5	5.5	5.1	5.3	6.2
Gold'n'Gro (4)	6.3	6.7	6.1	5.8	5.2	4.6	4.5	5.3	4.9	5.1	4.8	5.4	5.7
Check *(Year 2)*	6.1	6.3	6.0	5.6	5.1	4.3	4.3	4.4	3.4	3.8	3.9	4.2	5.5
LSD P=0.05	0.5	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.5	0.5	0.1

[z] Please see Table 2 for a detailed description of the treatments.

Figure 5. Average weekly air and soil tempertaures and average visual quality ratings of the eight, two-year treatments, 1995-97.

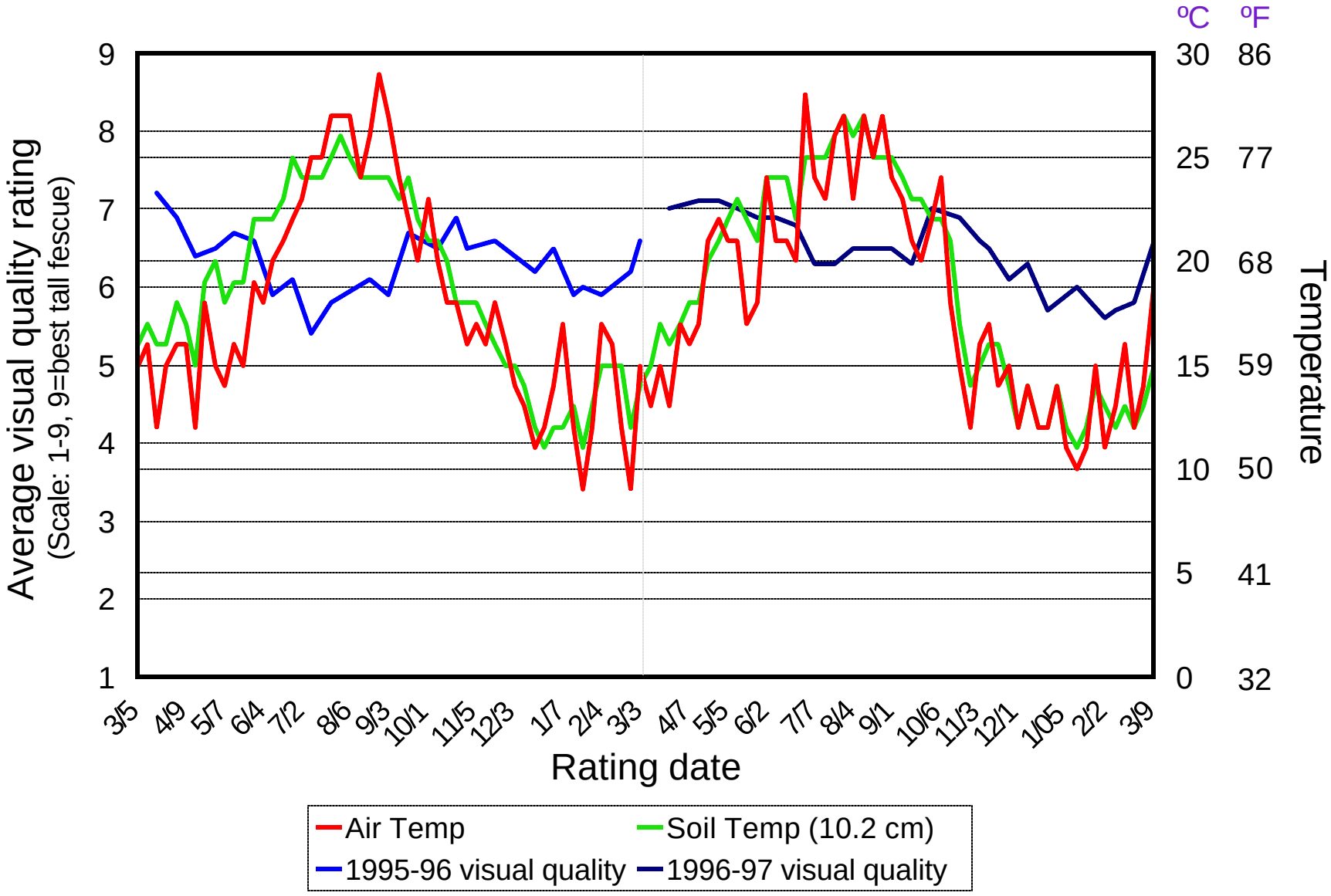


Figure 6. 1995-1996 tall fescue N-product evaluation study: number of rating dates at three levels of visual quality ratings.

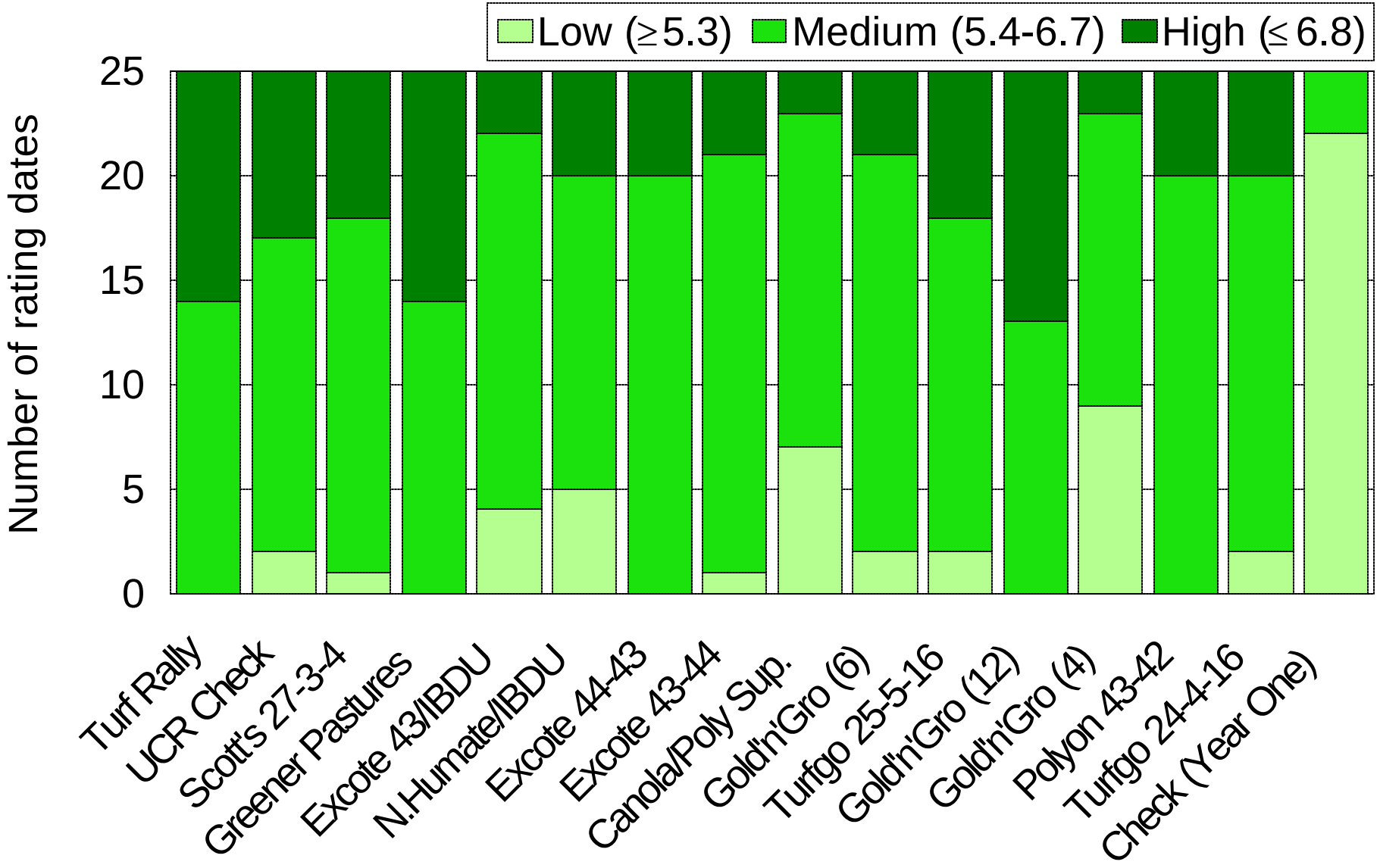


Figure 7. 1996-1997 tall fescue N-product evaluation study: number of rating dates at three levels of visual quality ratings.

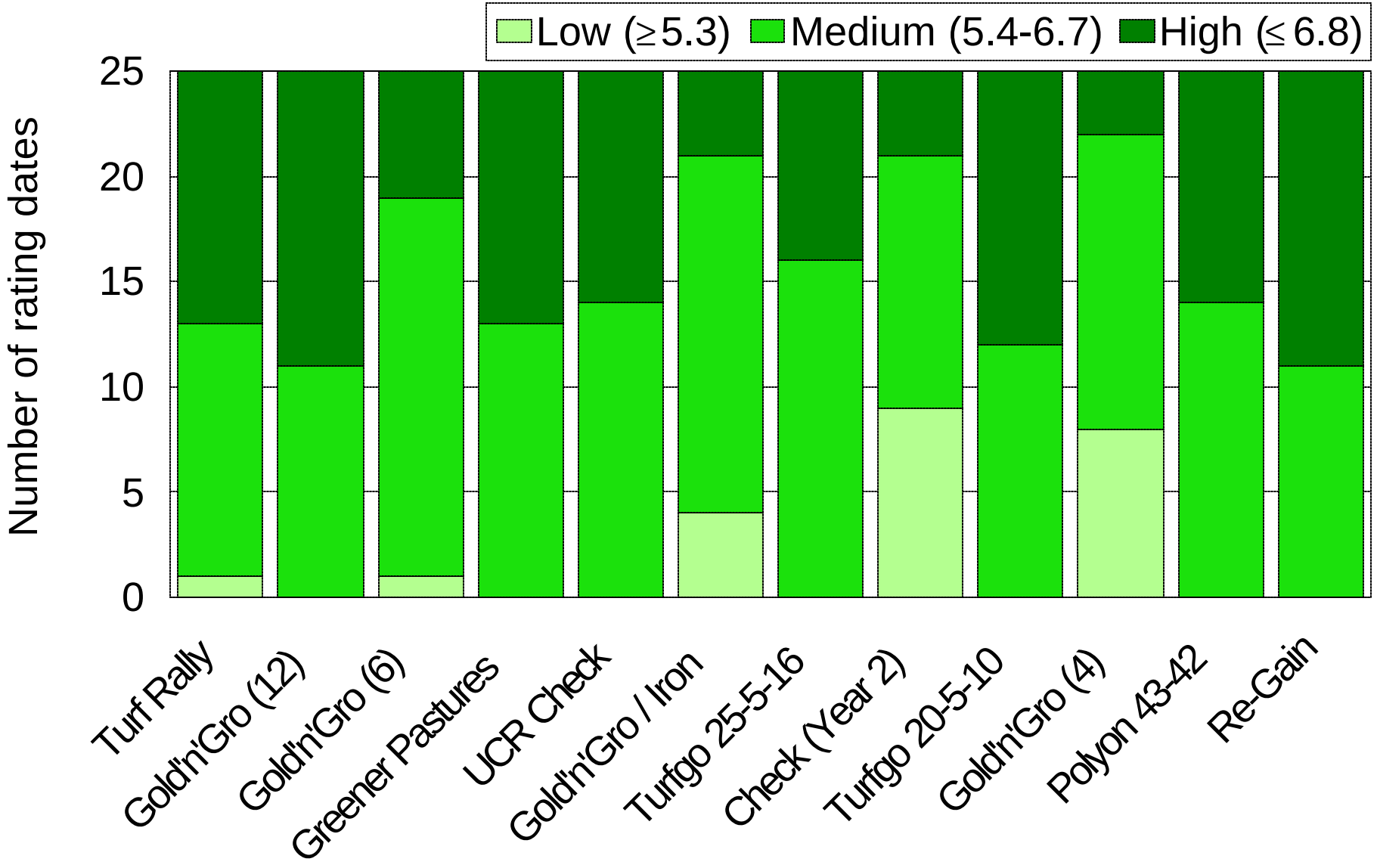


Table 7. Visual quality consistency scores for 1995-96. Scores based on the number of rating dates (25 total) the visual quality ratings were in one of three categories: 3 points for high (6.8), 2 points for medium (5.4-6.7) and 1 point for low (5.3) ratings; and overall visual quality ratings (scale: 1-9, 9 = best tall fescue).

Treatment[z]	Score	Overall Quality	lb N / 1000 ft^2 per 12 months	Number of Applications
Gold'n'Gro (12)*	62	6.7	7.7	12
Greener Pastures*	61	6.5	6.0	5
Turf Rally*	61	6.6	6.0	5
Scott's 27-3-4	56	6.4	6.0	5
UCR Check*	56	6.4	6.0	6
Excote 44-43	55	6.3	6.0	4
Polyon 43-42*	55	6.4	6.0	4
Turfgo 25-5-16*	55	6.3	6.0	3
Excote 43-44	53	6.1	6.0	4
Turfgo 24-4-16	53	6.2	6.0	5
Gold'n'Gro (6)*	52	6.1	3.9	6
N. Humate / IBDU	50	6.0	6.0	4
Excote 43 / IBDU	49	6.1	6.0	4
Canola / Poly Supreme	45	5.8	5.0	5
Gold'n'Gro (4)*	43	5.5	2.5	4
Check	28	4.2	0.0	0
LSD P=0.05 for overall quality ratings: 0.1.				

[z] Please see Table 2 for a detailed description of the treatments.
* Treatments tested for two years.

Table 8. Visual quality consistency scores for 1996-97. Scores based on the number of rating dates (25 total) the visual quality ratings were in one of three categories: 3 points for high (6.8), 2 points for medium (5.4-6.7) and 1 point for low (5.3) ratings; and overall visual quality ratings (scale: 1-9, 9 = best tall fescue).

Treatment[z]	Score	Overall Quality	lb N / 1000 ft^2 per 12 months	Number of Applications
Gold'n'Gro (12)[*]	64	6.8	6.0	12
Re-Gain	64	6.6	6.0	5
Turfgo 20-5-10	63	6.7	6.0	6
Greener Pastures[*]	62	6.7	6.0	5
Polyon 43-42[*]	61	6.7	6.0	4
Turf Rally[*]	61	6.6	6.0	5
UCR Check[*]	61	6.6	6.0	6
Turfgo 25-5-16[*]	59	6.5	6.0	4
Gold'n'Gro (6)[*]	55	6.3	3.0	6
Gold'n'Gro / Iron	50	6.2	2.2	12
Gold'n'Gro (4)[*]	45	5.7	2.0	4
Check *(Year 2)*	45	5.5	0.0	0
LSD P=0.05 for overall quality ratings: 0.1.				

[z] Please see Table 2 for a detailed description of the treatments.
[*] Treatments tested for two years.

Figure 8. 1995-1996 tall fescue N-product evaluation study: clipping yields (g dry mass / 7.44 ft² per 4 days of growth).

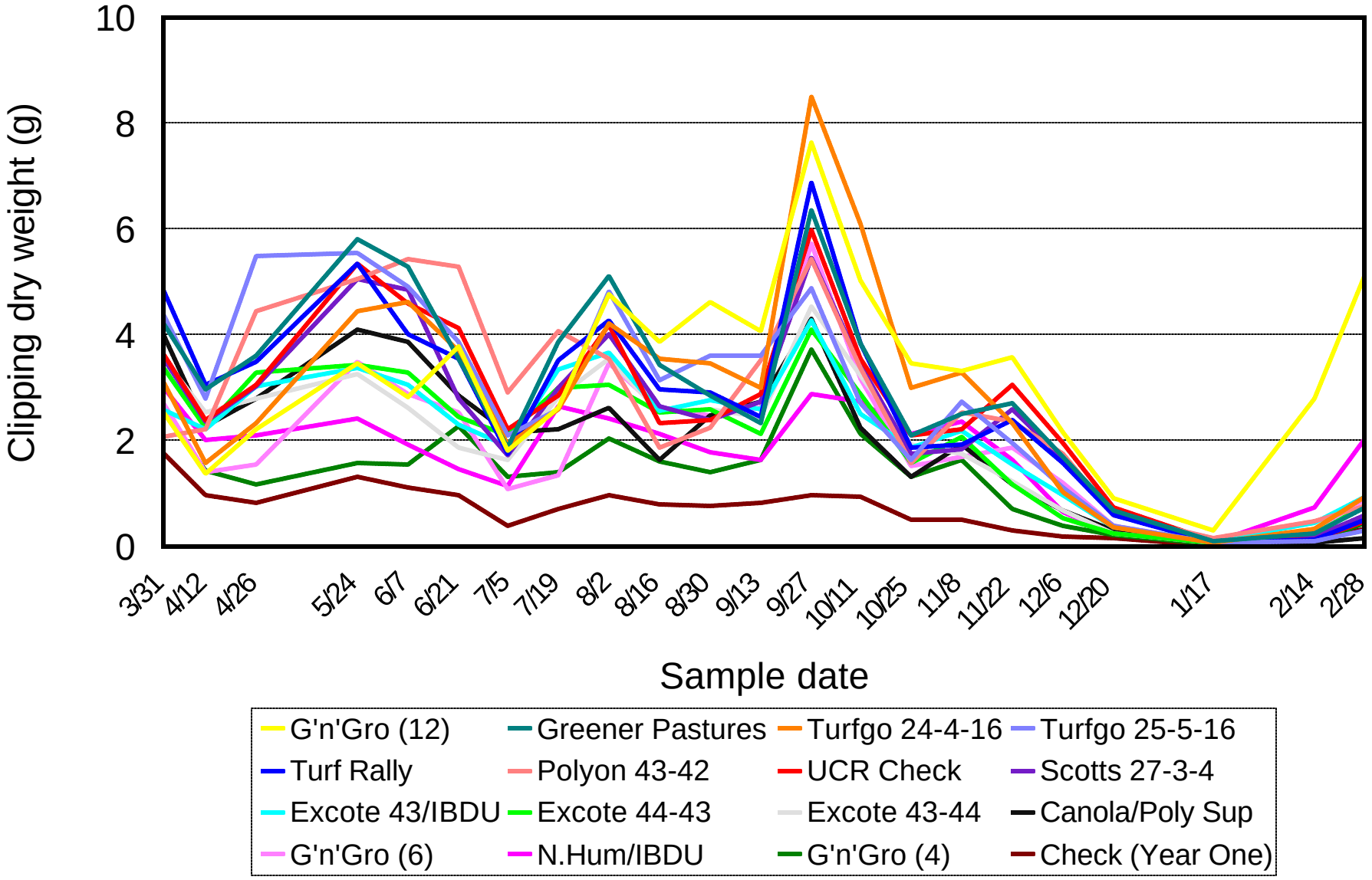


Figure 9. 1996-1997 tall fescue N-product evaluation study: clipping yields (g dry mass / 7.44 ft² per 7 days of growth).

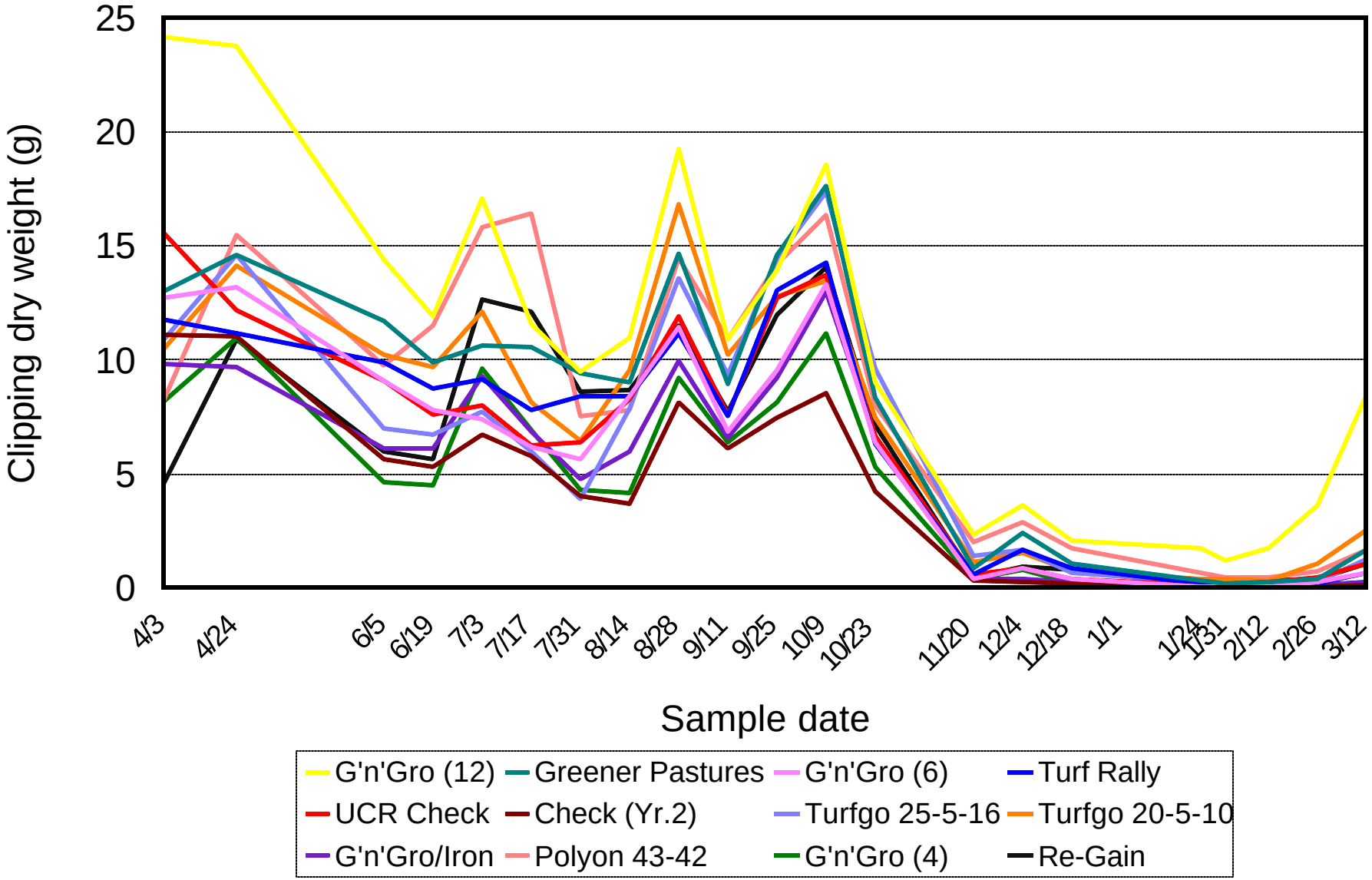


Table 9. N-product evaluation study on tall fescue, 1995-96: clipping yields (g dry clippings / 7.44 ft^2 per 4 days).

Treatments[z]	03/31/95	04/12/95	04/26/95	05/24/95	06/17/95	06/21/95	07/05/95	07/19/95	08/02/95	08/16/95	08/30/95	09/13/95	09/27/95
Gold'n'Gro (12)	2.57	1.36	2.20	3.45	2.83	3.78	1.79	2.61	4.77	3.85	4.61	4.06	7.62
Greener Pastures	4.24	2.97	3.61	5.79	5.27	3.53	1.85	3.86	5.12	3.42	2.86	2.32	6.36
Turfgo 24-4-16	3.13	1.58	2.34	4.45	4.61	3.69	1.93	2.59	4.22	3.53	3.47	3.00	8.49
Turfgo 25-5-16	4.42	2.79	5.48	5.55	4.92	3.87	2.09	2.60	4.82	3.14	3.61	3.59	4.89
Turf Rally	4.87	3.05	3.49	5.33	4.01	3.55	1.76	3.51	4.28	2.97	2.92	2.44	6.88
Polyon 43-42	2.07	2.20	4.44	5.05	5.44	5.28	2.91	4.06	3.54	1.87	2.25	3.50	5.42
UCR Check	3.66	2.38	3.06	5.35	4.58	4.11	2.20	2.84	4.17	2.33	2.39	2.88	5.99
Scotts 27-3-4	3.58	2.36	3.03	5.06	4.86	2.80	1.73	2.99	4.00	2.65	2.38	2.72	5.45
Excote 43 / IBDU	2.59	2.21	3.02	3.37	3.06	2.31	1.90	3.34	3.67	2.57	2.75	2.60	4.27
Excote 44-43	3.39	2.23	3.27	3.42	3.27	2.44	2.08	2.99	3.05	2.54	2.59	2.12	4.10
Excote 43-44	3.56	2.54	2.80	3.24	2.61	1.85	1.62	2.82	3.53	2.53	2.58	2.44	4.53
Canola / Poly Supreme	4.03	2.28	2.78	4.10	3.86	2.85	2.14	2.21	2.61	1.63	2.46	2.74	4.29
Gold'n'Gro (6)	2.72	1.40	1.53	3.49	2.89	2.54	1.08	1.33	3.45	2.59	2.46	2.61	5.71
N. Humate / IBDU	3.02	2.00	2.08	2.42	1.91	1.47	1.14	2.65	2.42	2.11	1.78	1.62	2.87
Gold'n'Gro (4)	2.55	1.44	1.16	1.57	1.55	2.28	1.31	1.40	2.03	1.61	1.41	1.62	3.71
Check	1.78	0.95	0.83	1.31	1.10	0.96	0.39	0.70	0.97	0.80	0.75	0.81	0.96
LSD P=0.05	0.82	0.59	0.76	1.09	1.02	1.13	0.61	0.73	1.01	0.70	1.24	0.87	1.06

[z] Please see Table 2 for a detailed description of the treatments.

Table 9 *(cont'd).* N-product evaluation study on tall fescue, 1995-96: clipping yields (g dry clippings / 7.44 ft^2 per 4 days).

Treatments[z]	10/11/95	10/25/95	11/08/95	11/22/95	12/06/95	12/20/95	01/03/96	01/17/96	02/14/96	02/28/96	Accum.
Gold'n'Gro (12)	5.01	3.45	3.32	3.58	2.14	0.91	1.23	0.29	2.78	5.14	73.35
Greener Pastures	3.84	2.09	2.49	2.71	1.68	0.67	0.61	0.09	0.23	0.72	66.33
Turfgo 24-4-16	6.09	2.99	3.29	2.32	1.01	0.36	0.24	0.06	0.33	0.93	64.65
Turfgo 25-5-16	2.70	1.64	2.72	1.96	1.12	0.38	0.24	0.05	0.09	0.29	62.96
Turf Rally	3.84	1.85	1.91	2.38	1.58	0.58	0.52	0.07	0.11	0.51	62.41
Polyon 43-42	3.38	1.58	2.52	2.36	1.75	0.58	0.63	0.14	0.46	0.75	62.18
UCR Check	3.54	2.09	2.22	3.05	1.95	0.73	0.66	0.09	0.12	0.48	60.87
Scotts 27-3-4	3.44	1.74	1.84	2.60	1.65	0.62	0.71	0.09	0.17	0.59	57.06
Excote 43 / IBDU	2.51	1.85	2.18	1.54	0.96	0.34	0.21	0.08	0.44	0.93	48.70
Excote 44-43	2.89	1.57	2.06	1.16	0.53	0.24	0.09	0.05	0.25	0.76	47.09
Excote 43-44	3.23	1.93	1.75	1.21	0.67	0.23	0.14	0.05	0.20	0.78	46.84
Canola / Poly Supreme	2.25	1.31	1.93	1.18	0.68	0.29	0.12	0.05	0.07	0.16	46.02
Gold'n'Gro (6)	3.18	1.50	1.70	1.85	1.19	0.37	0.21	0.06	0.29	0.84	44.99
N. Humate / IBDU	2.74	2.11	2.35	1.64	0.65	0.25	0.13	0.05	0.74	2.03	40.18
Gold'n'Gro (4)	2.12	1.30	1.64	0.70	0.39	0.22	0.10	0.04	0.07	0.44	30.66
Check	0.92	0.51	0.50	0.31	0.17	0.15	0.07	0.02	0.11	0.32	15.39
LSD P=0.05	0.85	0.61	0.60	0.52	0.37	0.25	0.24	0.08	0.38	0.42	n/a

[z] Please see Table 2 for a detailed description of the treatments.

Table 10. N-product evaluation study on tall fescue, 1996-97: clipping yields (g dry clippings / 7.44 ft^2 per 7 days).

Treatments[z]	04/03/96	04/24/96	06/05/96	06/19/96	07/03/96	07/17/96	07/31/96	08/14/96	08/28/96	09/11/96	09/25/96
Gold'n'Gro (12)	24.12	23.77	14.42	11.93	17.10	11.54	9.51	10.93	19.23	10.90	13.93
Polyon 43-42	8.13	15.47	9.76	11.50	15.80	16.42	7.50	7.80	14.44	10.89	14.20
Greener Pastures	12.99	14.58	11.67	9.89	10.63	10.55	9.44	9.01	14.65	8.94	14.58
Turfgo 20-5-10	10.39	14.15	10.02	9.67	12.09	8.16	6.44	9.52	16.81	10.23	12.79
Turfgo 25-5-16	10.81	14.58	7.02	6.71	7.72	5.97	3.92	7.87	13.56	9.35	14.45
Turf Rally	11.76	11.13	9.86	8.76	9.13	7.82	8.39	8.40	11.14	7.50	13.02
UCR Check	11.57	12.18	9.09	7.58	8.03	6.28	6.38	8.27	11.89	7.58	12.74
Re-Gain	4.51	10.92	6.01	5.62	12.63	12.12	8.63	8.68	11.47	7.70	11.98
Gold'n'Gro (6)	12.70	13.16	9.07	7.77	7.36	6.20	5.67	8.39	11.44	6.84	9.53
Gold'n'Gro / Iron	9.83	9.71	6.11	6.14	9.28	6.88	4.74	5.99	9.92	6.61	9.24
Gold'n'Gro (4)	8.11	10.95	4.63	4.52	9.59	6.95	4.33	4.17	9.20	6.39	8.15
Check *(Year 2)*	11.09	11.03	5.63	5.33	6.69	5.77	4.05	3.70	8.11	6.10	7.47
LSD P=0.05	2.55	4.17	1.79	1.23	2.20	2.53	1.31	1.47	3.99	1.21	2.12

[z] Please see Table 2 for a detailed description of the treatments.

Table 10 ***(cont'd).*** N-product evaluation study on tall fescue, 1996-97: clipping yields (g dry clippings / 7.44 ft^2 per 7 days).

Treatments[z]	10/09/96	10/23/96	11/20/96	12/04/96	12/18/96	01/24/97	01/31/97	02/12/97	02/26/97	03/12/97	Accum.
Gold'n'Gro (12)	18.54	9.00	2.32	3.63	2.05	1.74	1.19	1.73	3.62	8.44	219.64
Polyon 43-42	16.33	7.98	2.01	2.88	1.71	0.64	0.46	0.44	0.75	1.67	166.78
Greener Pastures	17.59	8.31	0.85	2.39	1.10	0.31	0.19	0.25	0.40	1.70	160.02
Turfgo 20-5-10	13.42	7.45	1.14	1.56	0.74	0.39	0.39	0.32	1.07	2.58	149.33
Turfgo 25-5-16	17.36	9.58	1.39	1.69	0.68	0.25	0.15	0.14	0.29	1.24	134.73
Turf Rally	14.25	6.34	0.57	1.69	0.85	0.18	0.14	0.12	0.19	0.68	131.92
UCR Check	13.71	6.67	0.59	0.88	0.39	0.15	0.18	0.27	0.49	1.07	125.99
Re-Gain	14.07	7.14	0.47	0.92	0.81	0.15	0.16	0.36	0.40	1.10	125.85
Gold'n'Gro (6)	13.29	6.41	0.37	0.90	0.41	0.06	0.05	0.09	0.23	0.64	120.58
Gold'n'Gro / Iron	12.99	6.62	0.42	0.42	0.23	0.10	0.05	0.04	0.10	0.27	105.69
Gold'n'Gro (4)	11.19	5.29	0.42	0.81	0.18	0.07	0.06	0.07	0.13	0.25	95.46
Check *(Year 2)*	8.53	4.22	0.30	0.24	0.22	0.04	0.06	0.04	0.09	0.13	88.84
LSD P=0.05	1.89	1.31	0.43	0.77	0.54	0.34	0.26	0.37	0.72	1.73	n/a

[z] Please see Table 2 for a detailed description of the treatments.

Figure 10. 1995-1997 tall fescue N-product evaluation study: number of rating dates at three levels of visual quality ratings.

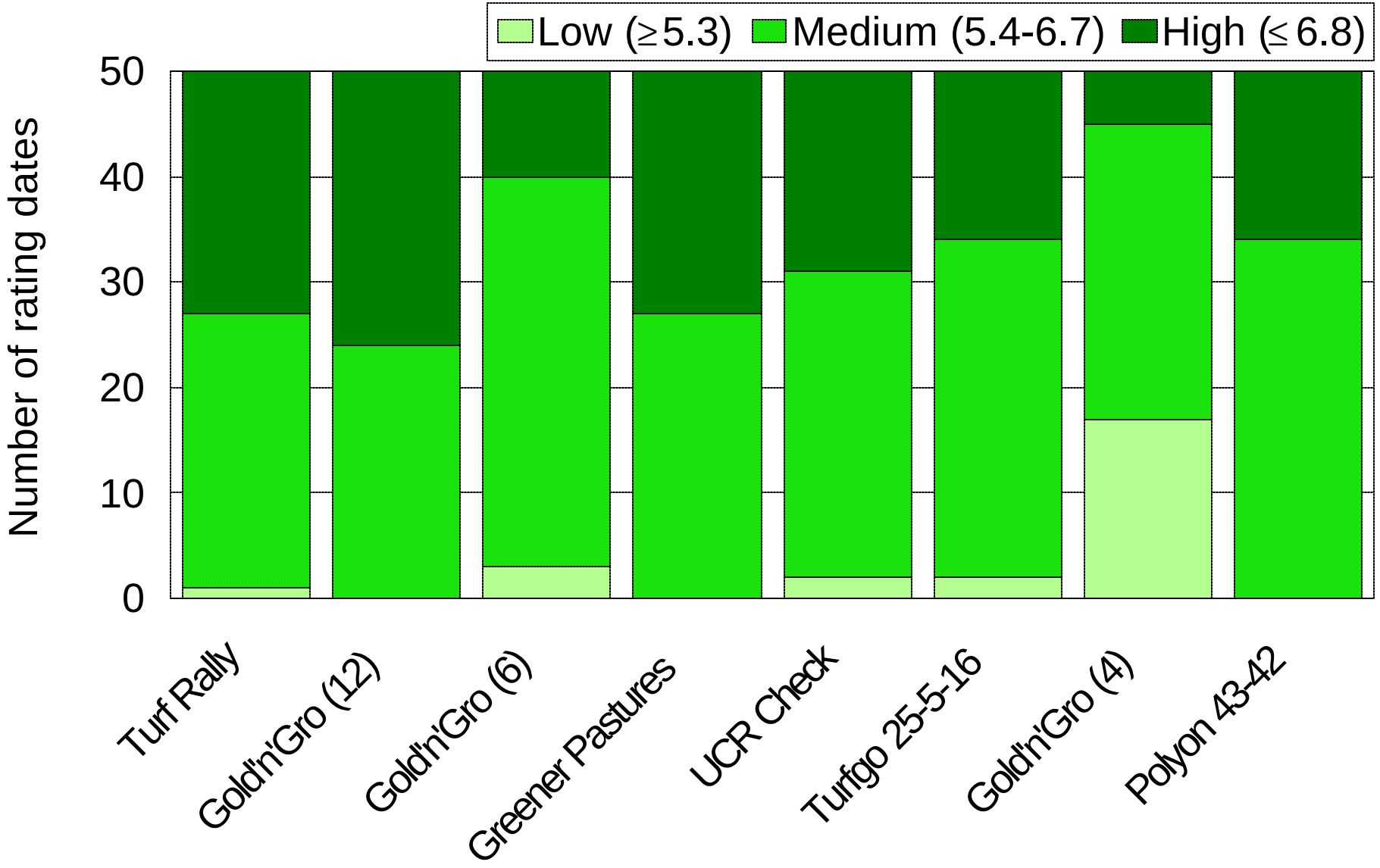
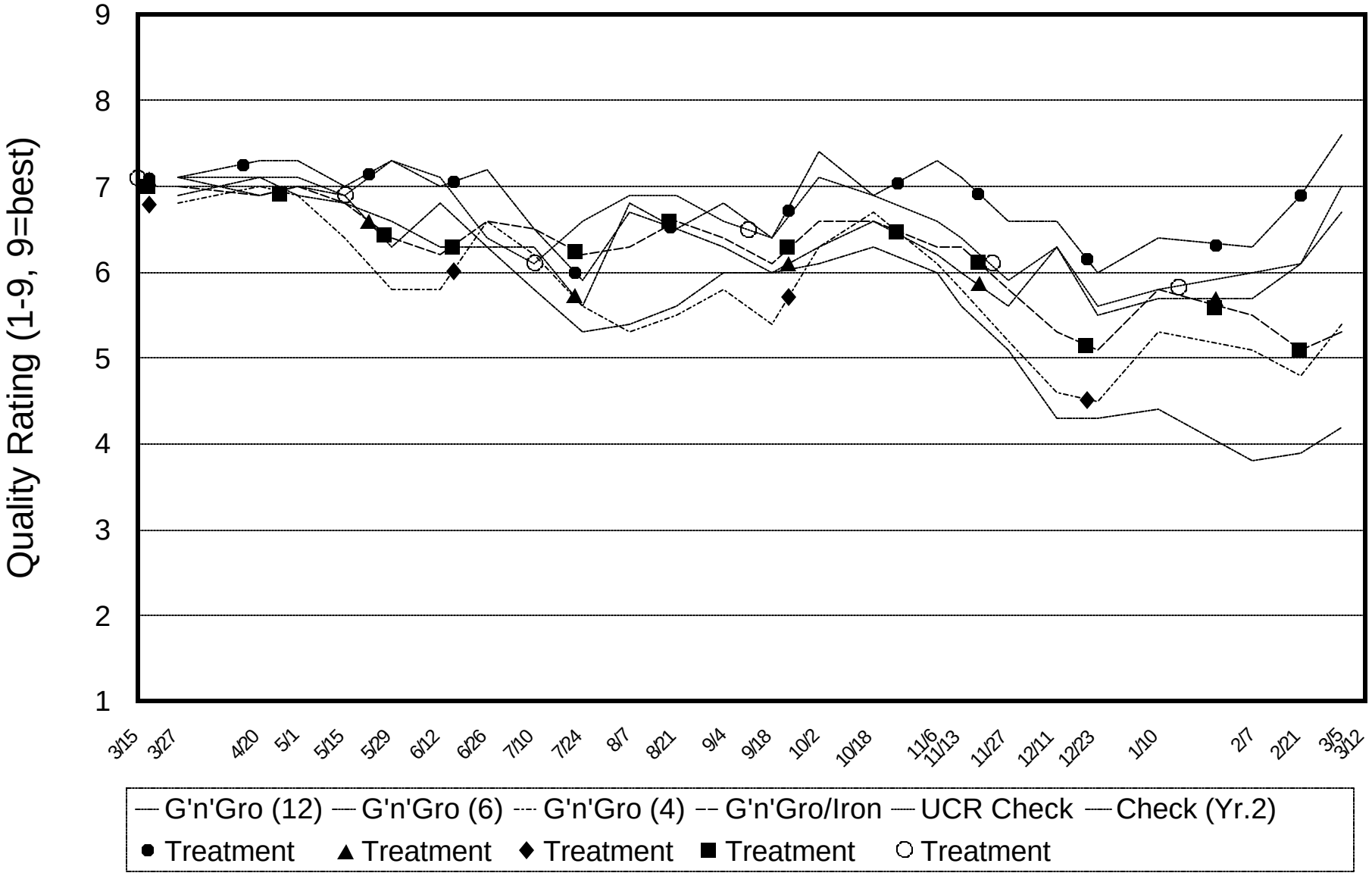


Table 11. Visual quality consistency scores for 1995-97. Scores for eight two-year treatments based on the number of rating dates (50 total) the visual quality ratings were in one of three categories: 3 points for high (6.8), 2 points for medium (5.4-6.7) and 1 point for low (5.3) ratings; and overall visual quality ratings (scale: 1-9, 9 = best tall fescue).

Treatment[z]	Score	Overall Quality	lb N / 1000 ft^2 per 12 months		Number of Applications	
			Year 1	Year 2	Year 1	Year 2
Gold'n'Gro (12)	126	6.8	7.7	6.0	12	12
Greener Pastures	123	6.6	6.0	6.0	5	5
Turf Rally	122	6.6	6.0	6.0	5	5
UCR Check	117	6.5	6.0	6.0	6	6
Polyon 43-42	116	6.6	6.0	6.0	4	4
Turfgo 25-5-16	114	6.4	6.0	6.0	3	4
Gold'n'Gro (6)	107	6.2	3.9	3.0	6	6
Gold'n'Gro (4)	88	5.6	2.5	2.0	4	4
LSD P=0.05 for overall quality ratings: 0.1						

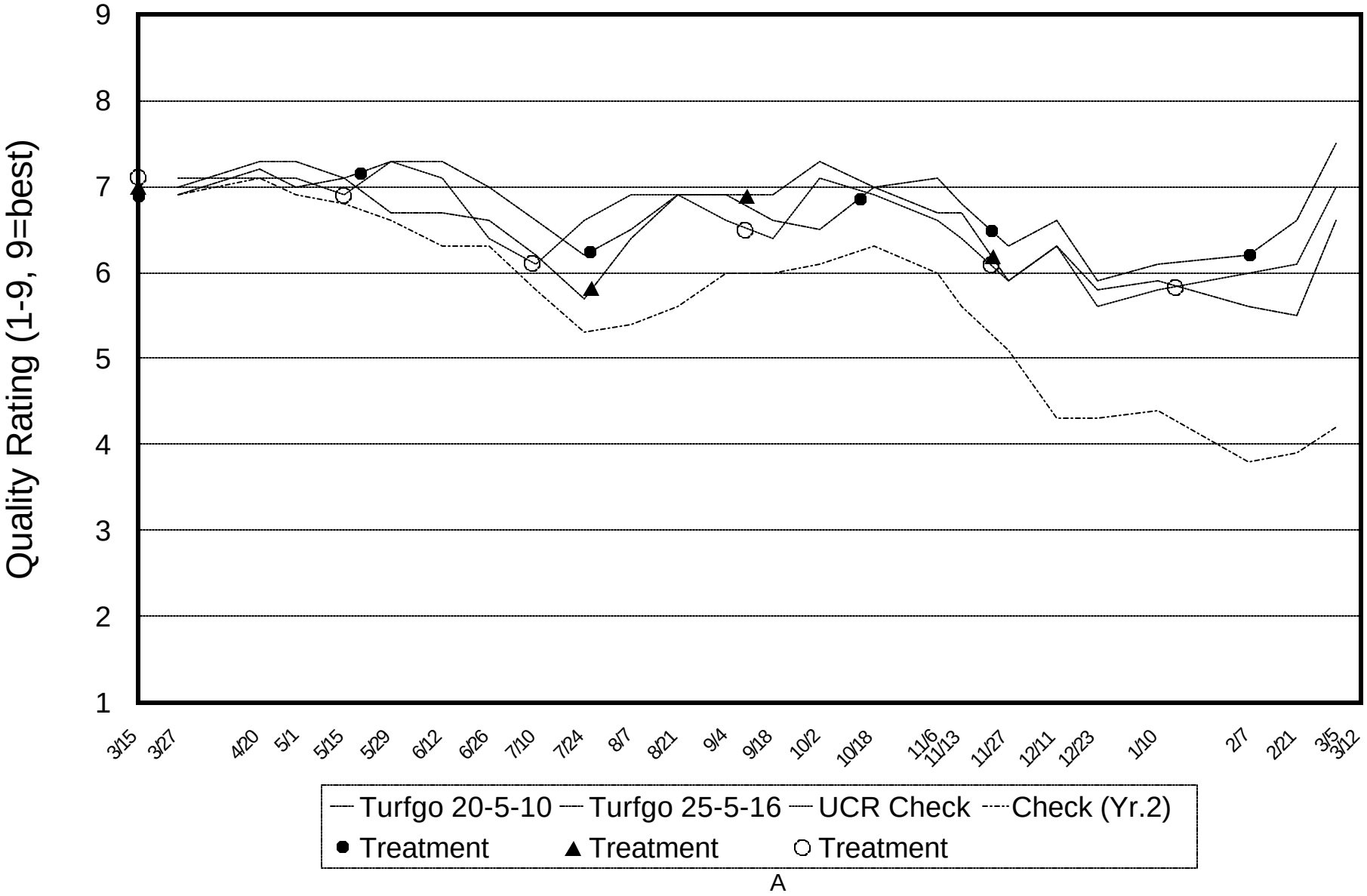
[z] Please see Table 2 for a detailed description of the treatments.

1996-1997 Tall Fescue Fertility Trial
Quality Ratings (Scale: 1-9; 9=best tall fescue)
Itronics "Gold'n'Gro" vs. High (UCR) and Low Check



A

1996-1997 Tall Fescue Fertility Trial
Quality Ratings (Scale: 1-9; 9=best tall fescue)
Turfgo 20-5-10 and 25-5-16 vs. High (UCR) and Low Check



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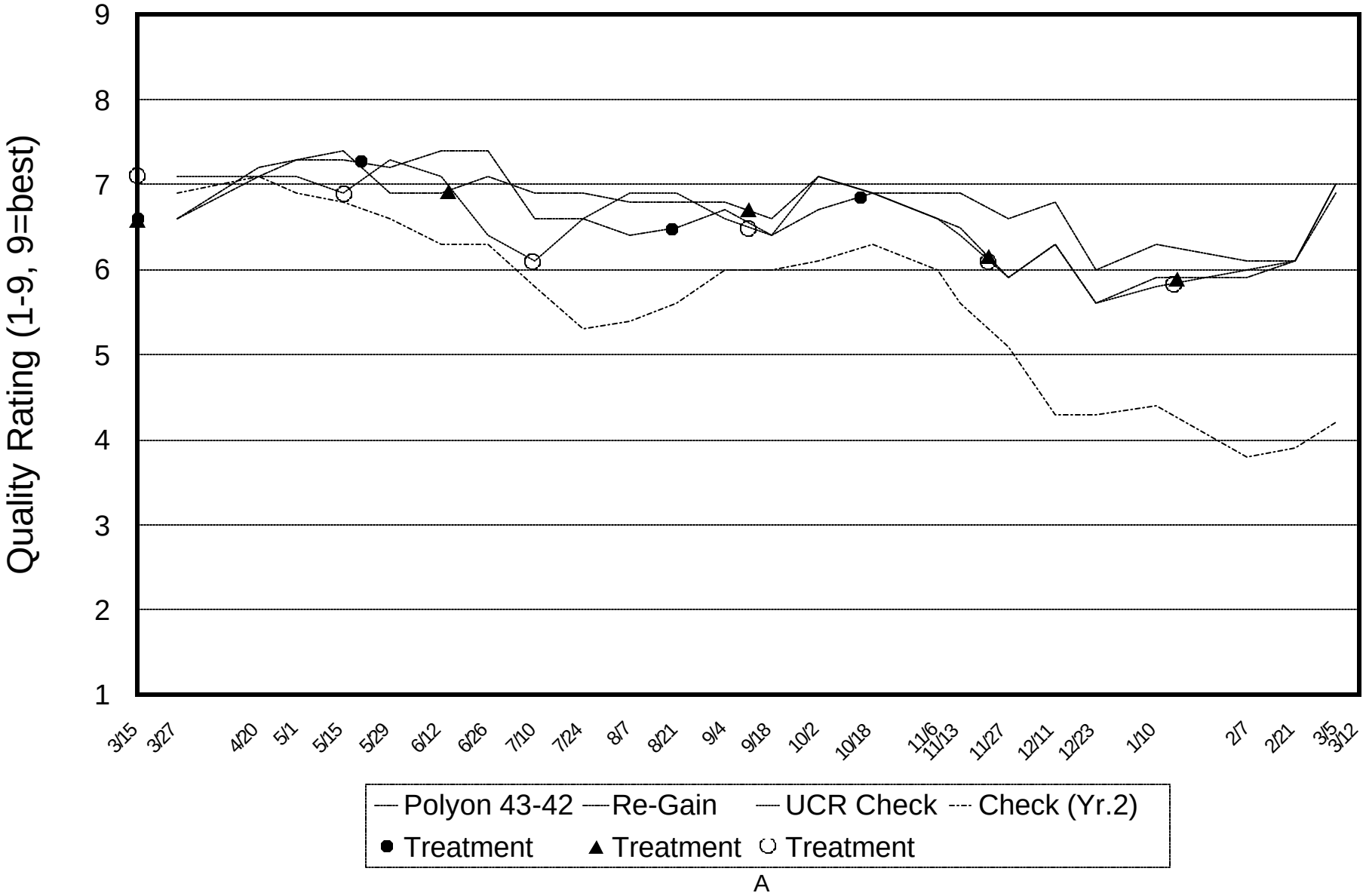
1996-1997 Tall Fescue Fertility Trial
Quality Ratings (Scale: 1-9; 9=best tall fescue)
Polyon 43-42 and Re-Gain vs. High (UCR) and Low Check



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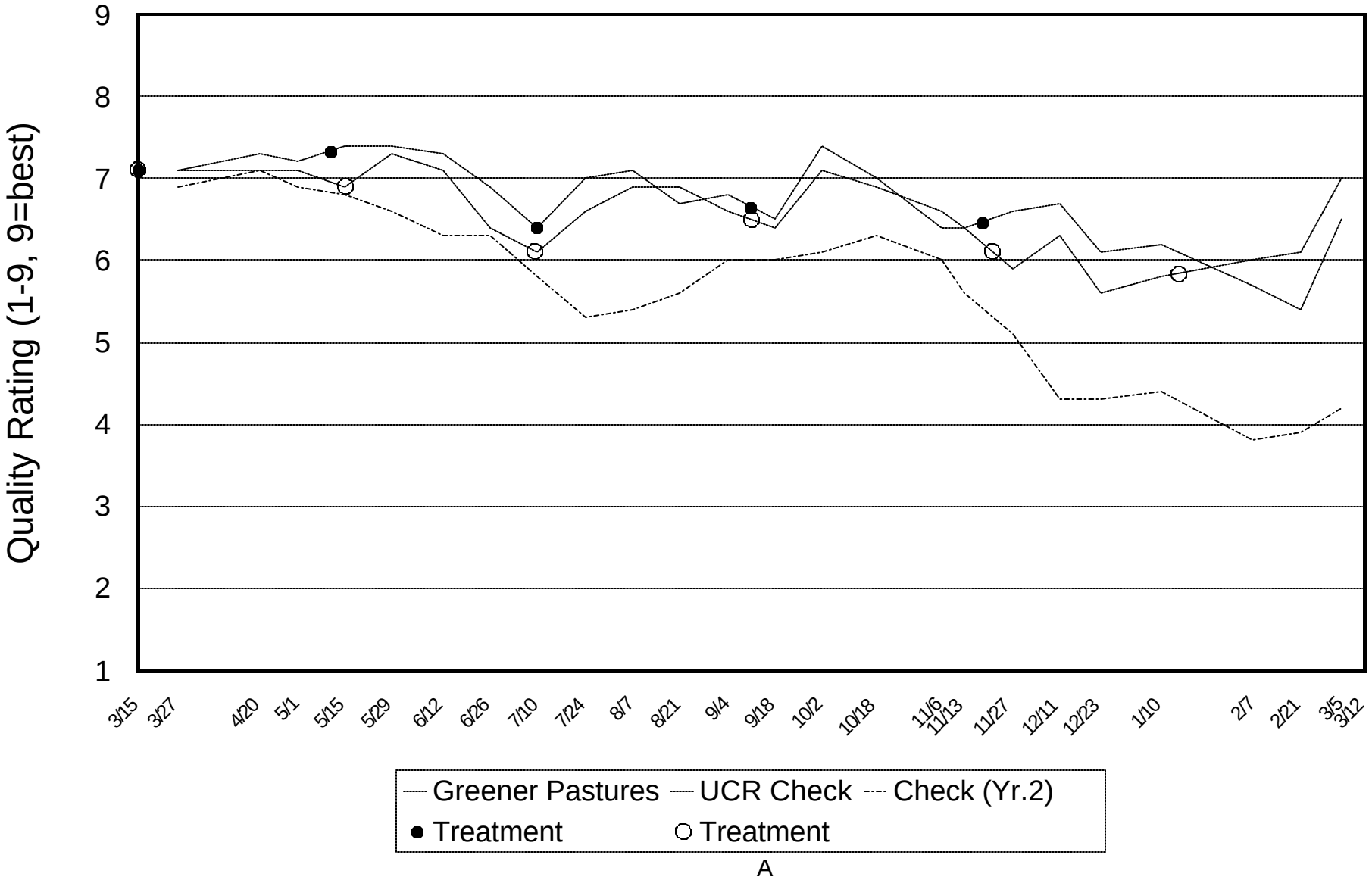
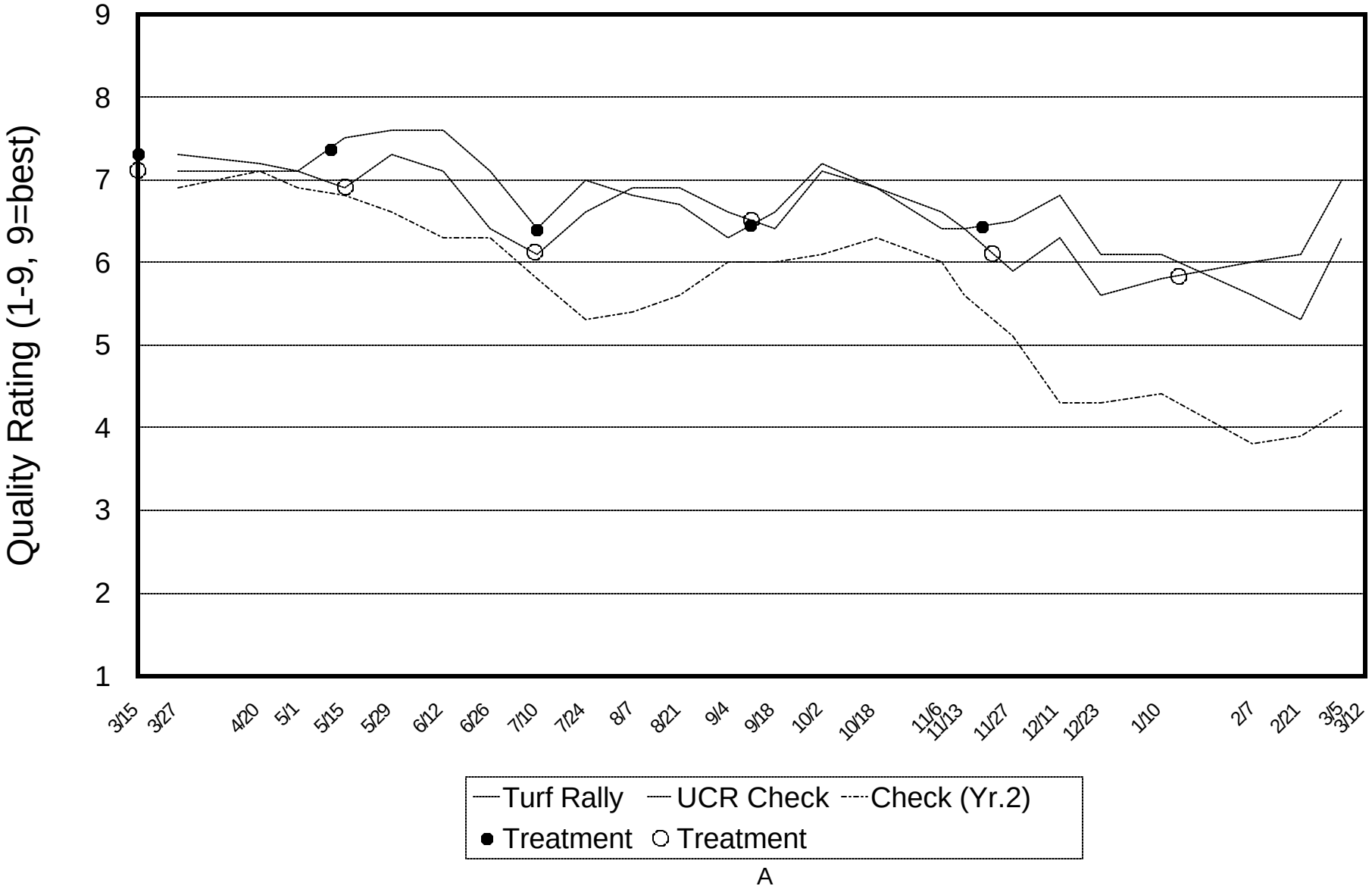
1996-1997 Tall Fescue Fertility Trial
Quality Ratings (Scale: 1-9; 9=best tall fescue)
Greener Pastures 15-1-15 vs. High (UCR) and Low Check



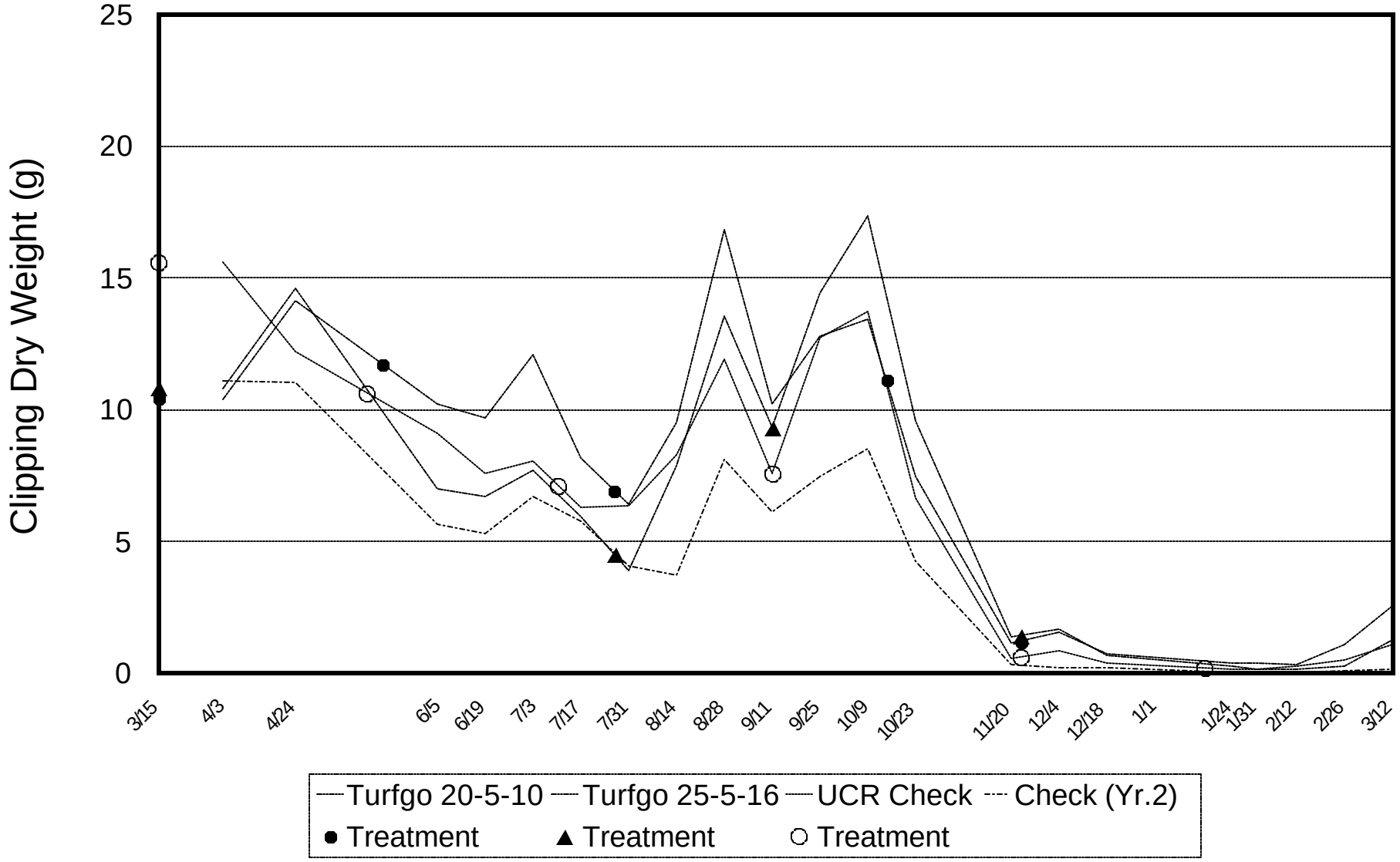
A

1996-1997 Tall Fescue Fertility Trial
Quality Ratings (Scale: 1-9; 9=best tall fescue)
Sea Source "Turf Rally" vs. High (UCR) and Low Check

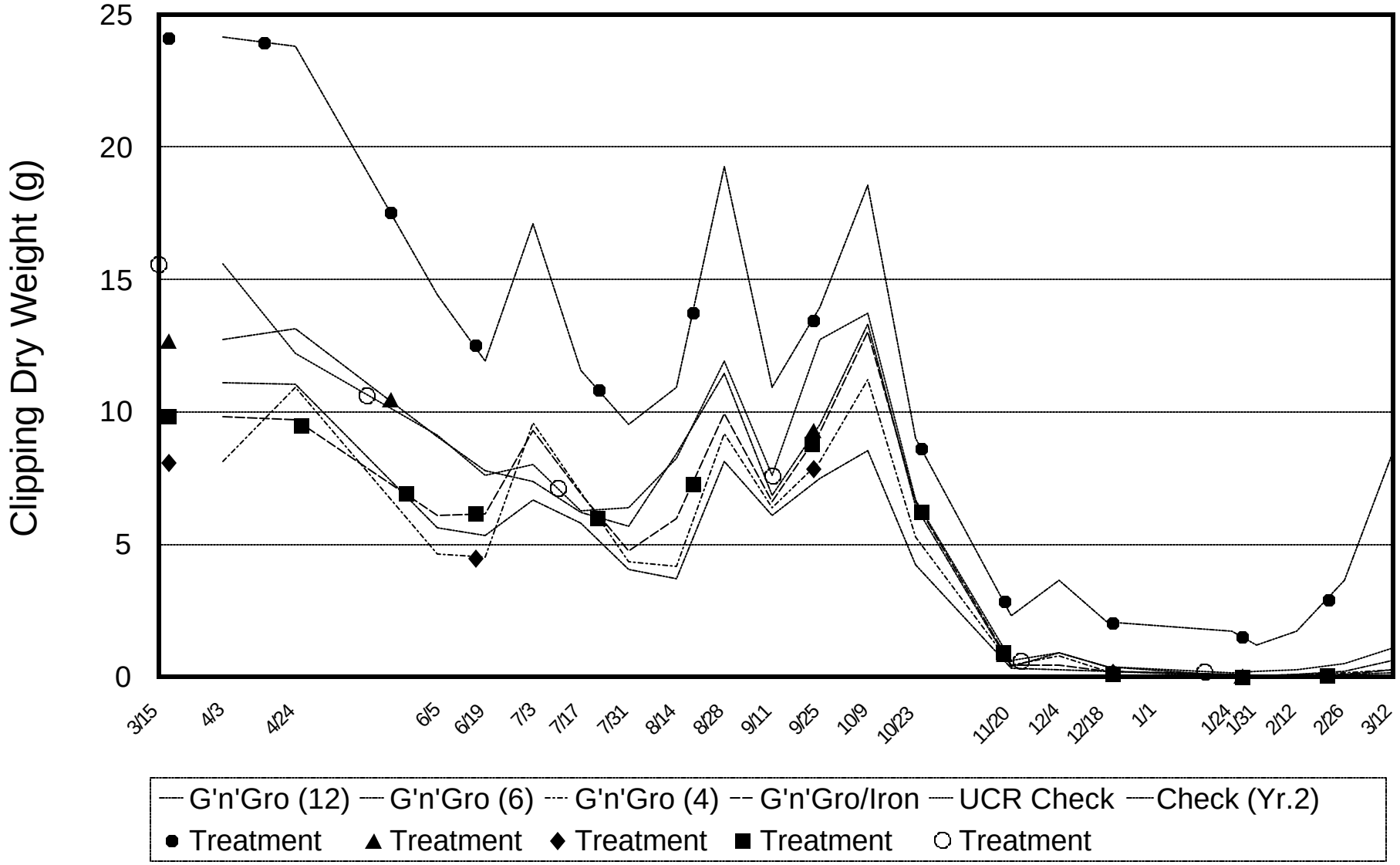


A

1996-1997 Tall Fescue Fertility Trial
Clipping Yields (grams / 7 days growth / 27 ft²)
Turfgo 20-5-10 and 25-5-16 vs. High (UCR) and Low Check

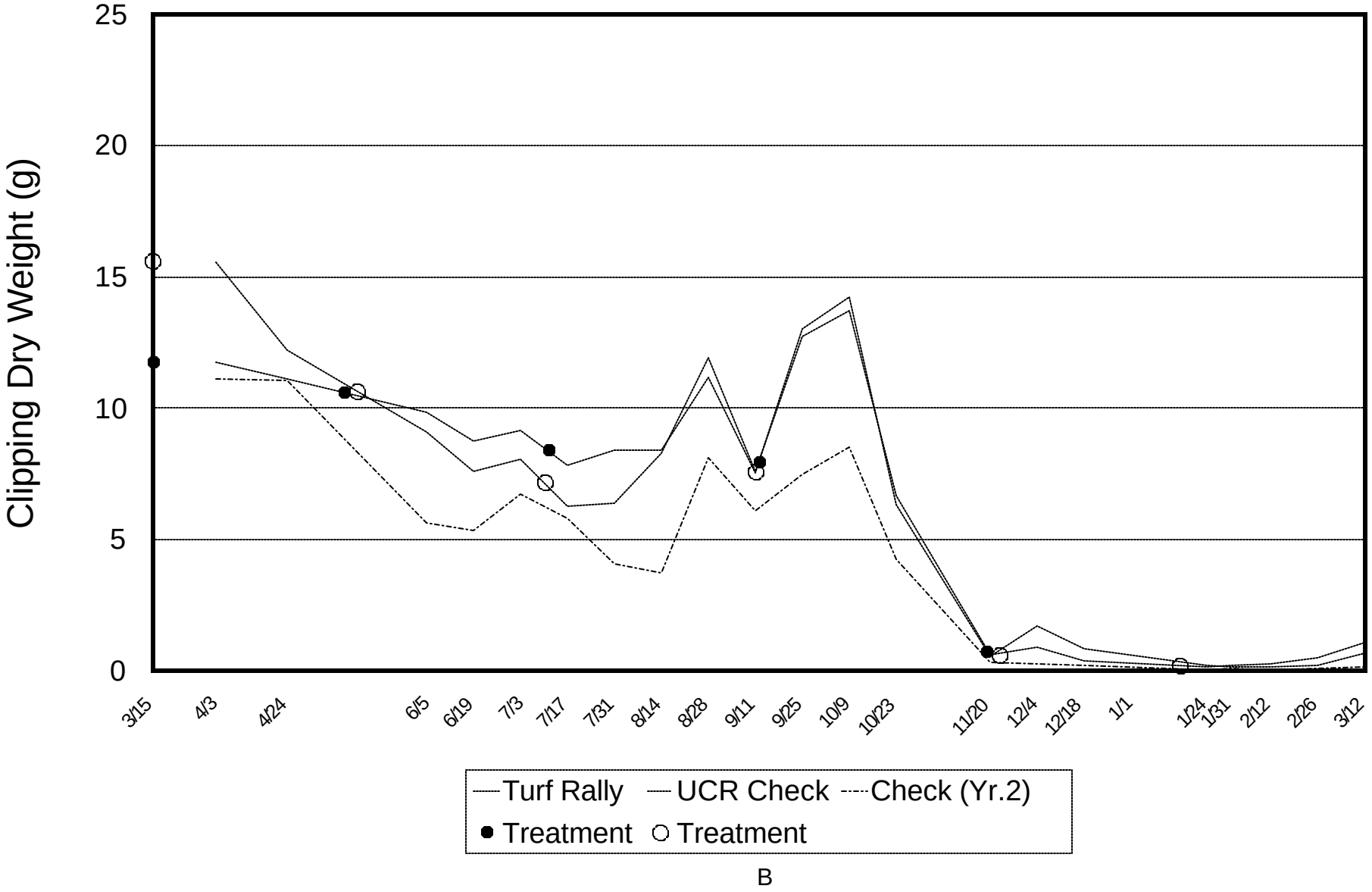


1996-1997 Tall Fescue Fertility Trial
Clipping Yields (grams / 7 days growth / 27 ft²)
Itronics "Gold'n'Gro" vs. High (UCR) and Low Check



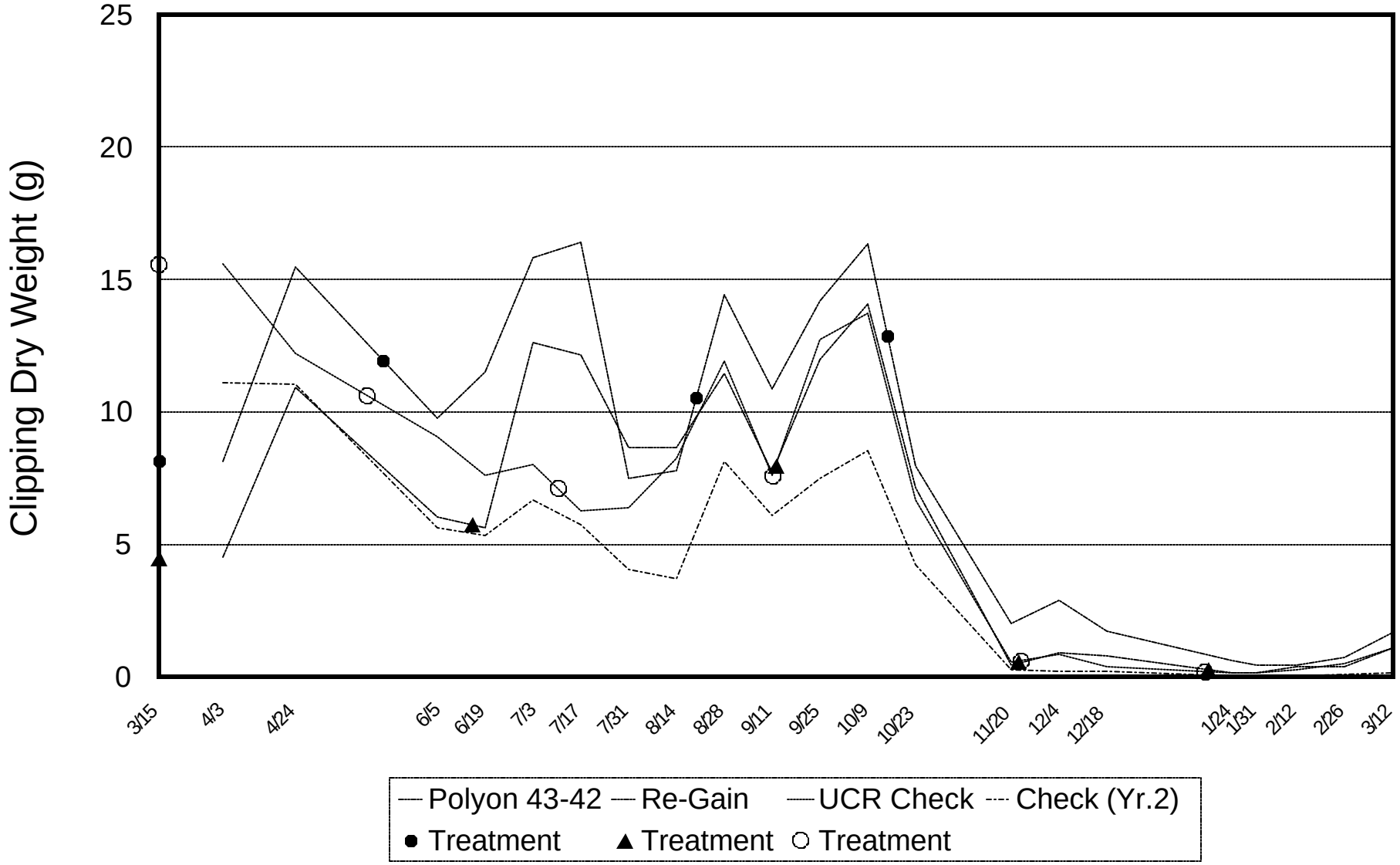
B

1996-1997 Tall Fescue Fertility Trial
Clipping Yields (grams / 7 days growth / 27 ft²)
Sea Source "Turf Rally" vs. High (UCR) and Low Check



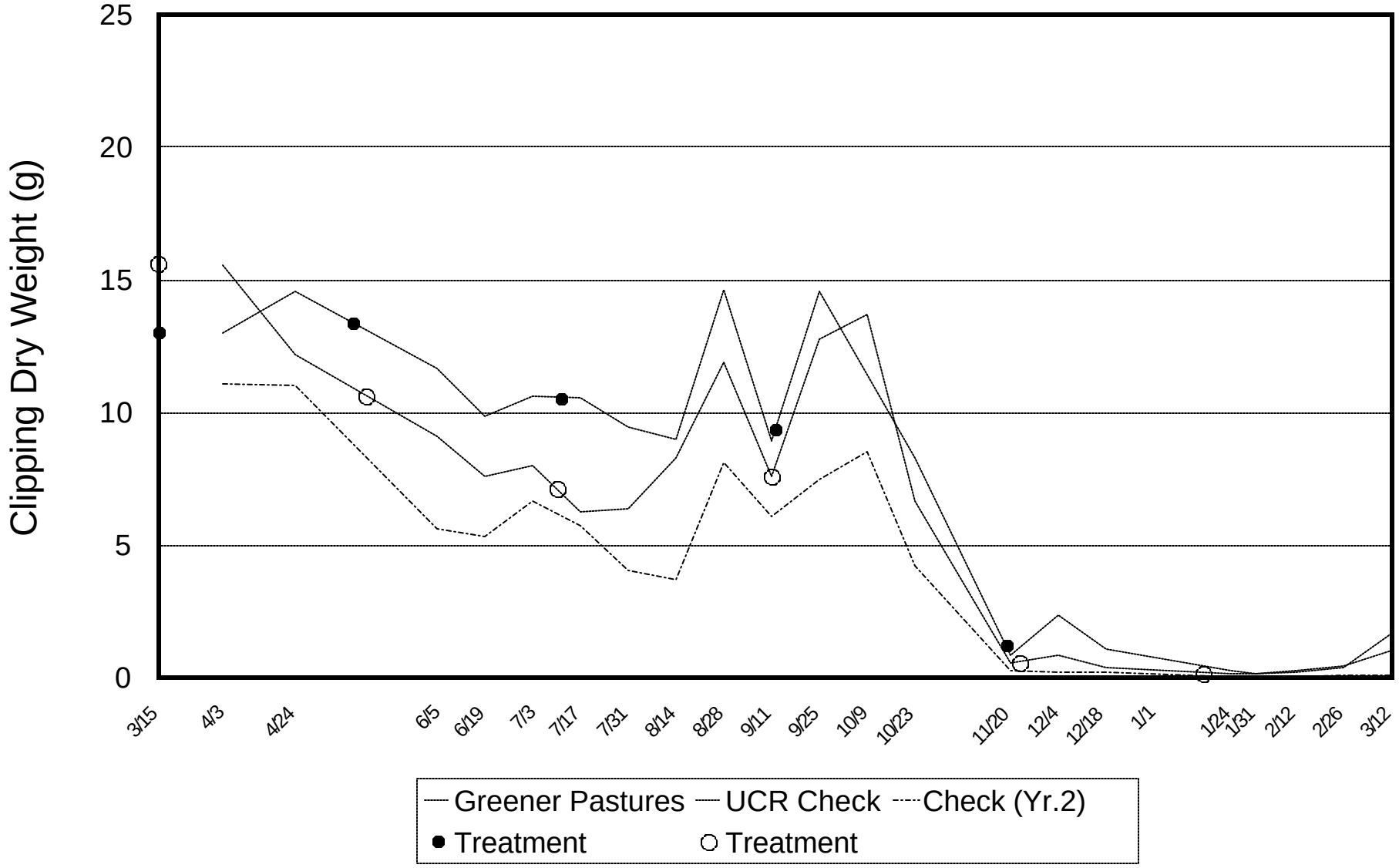
B

1996-1997 Tall Fescue Fertility Trial
Clipping Yields (grams / 7 days growth / 27 ft²)
Polyon 43-42 vs. High (UCR) and Low Check



B

1996-1997 Tall Fescue Fertility Trial
Clipping Yields (grams / 7 days growth / 27 ft²)
Greener Pastures vs. High (UCR) and Low Check



B