

Evaluation of Controlled Release Nitrogen Fertilizers on Creeping Bentgrass

M.A. Anderson and J.B. Ross

Summary

The objective of this trial was to evaluate various fertilizers for their effect on a creeping bentgrass putting green. Colour ratings provide an evaluation of nitrogen release and initial green-up when compared with an untreated control. In addition, colour ratings provided an evaluation of how consistently the fertilizer released its nitrogen when compared with the untreated control (Table 2). Those fertilizers that consistently showed superior green-up after each fertilizer application were Par-Ex, AGI #1, and AGI #3. Those fertilizers that consistently had the best colour or were equal to the best were Par-Ex, AGI #1, AGI #3, and the Poly Plus Program.

Quality ratings were also determined on a weekly basis. The fertilizers that consistently were the best or equal to the best were AGI #1 and AGI #3 (Table 3). In addition, the Par-Ex showed superior quality on 13 out of 17 rating dates, while the Poly Plus Program and AGI #2 were the best or equal to the best on 12 out of 17 rating dates. Of the organic based fertilizers Sanctuary produced superior quality on 11 out of 17 rating dates.

The fertilizer that consistently produced the highest clipping yield was Par-Ex (Table 4). It produced the highest amounts on 14 of 17 rating dates. This was followed in descending order by the Poly Plus Program (8 rating dates), Contec old formula (5), Contec new formula (5), and AGI #3 (5). Higher total clipping yields would indicate a more efficient use of the nitrogen applied. Total clipping yield for various fertilizers in descending order were Par-Ex (222.6 grams), Poly Plus Program (200.5), Contec new formula (193.3), AGI #1 (189.9), AGI #3 (189.1), Contec old formula (173.5), Select (163.2), Sanctuary (151.9) and AGI #2 (146.1).

Introduction

Previous research conducted at the Prairie Turfgrass Research Centre has shown that temperature is one of the greatest factors in determining the nitrogen release pattern of fertilizers. The research has shown that, because of our cool climate, fertilizers may react very differently than what is reported from other areas of North America. This trial was initiated in order to evaluate various fertilizers for their effects on growth within the cool climate of Alberta.

Materials and Methods

Plots were laid out on a native soil Penncross creeping bentgrass green at the Prairie Turfgrass Research Centre, Olds College, Olds, Alberta, Canada. Plots, which were 1.5 by 3 metres in size, were replicated four times and laid out in a Randomized Complete Block Design. Prior to the initiation of the study an application of urea at the rate of 0.5 kg N/100m² was applied in order to grow the plots out of winter dormancy and assist in recovery. Due to two late spring snowfalls this application was not conducted until May 9, 2003.

Treatment applications were made every three weeks (May 23, June 13, July 3, July 24, August 14 and September 5) at a rate of 0.2 kg N/100m². Applications of the granular fertilizers were made using a Gandy drop spreader, which was calibrated for each fertilizer to apply the

appropriate amount. The liquid products were applied with a compressed air plots sprayer. The sprayer was equipped with TeeJet 8004 nozzles and was calibrated to apply 5.7 litres/100m².

Colour and quality, as well as clipping yields, were rated weekly. The National Turfgrass Evaluation Program system of rating was used for colour and quality, where 1 is poor and 9 is superior. Colour was rated by 1 indicated a brown dormant turf and 9 indicated a dark green turf colouration. Density and area cover were combined with colour to determine quality ratings. Density, which is a subjective rating of shoots per unit of area, was rated as 1 is poor density and 9 is superior density. The area cover rating is described as the area covered by the desired turfgrass and is rated by 1 indicates a complete lack of cover and 9 equals complete cover. Bare areas and/or weed encroachment reduced the rating values. Clippings were collected with a reel mower that made one pass down the centre of each plot. Clippings were dried for 48 hours and weighed to give a value for clipping yield.

Results were evaluated based on those fertilizers that consistently performed the best. Generated data was first analyzed using an Analysis of Variance (ANOVA) test. When statistically significant treatment differences are present, least significant difference (LSD) values are presented at the bottom of each table. Treatment differences that were greater than the LSD value indicate a strong probability that the differences were as a result of the treatment and did not occur by chance. Therefore, within a column, if the same letter follows numbers there is no significant difference between treatments.

In addition, the data that shows superior colour, quality and clipping yield was evaluated by determining how many weeks the particular fertilizer was either the best or equal to the best fertilizer. This is indicated by the frequency of superior ranking or superior clipping yield. Total clipping yield was determined by adding clipping yields from all 17 weeks.

Table 1 - Treatment schedule for creeping bentgrass fertilizer trial, 2003.

Product Name	Analysis	Nitrogen Rate/3 wks	Notes
Untreated control	N/A	None	
Par-Ex	21-2-16	0.2 kg/100m ²	Synthetic
Select	21-3-16	0.2 kg/100m ²	Synthetic
Sanctuary	12-2-12	0.2 kg/100m ²	Organic
Contact old formulation	19-2-15	0.2 kg/100m ²	Synthetic
Contec new formulation	19-2-15	0.2 kg/100m ²	Synthetic
AGI #1	12-2-10	0.2 kg/100m ²	Synthetic/organic
AGI #2	12-2-10	0.2 kg/100m ²	Synthetic/organic
AGI #3	12-2-10	0.2 kg/100m ²	Synthetic/organic
Super N Concentrate 0.5 oz and liquid	46-0-0	0.2 kg/100m ²	Synthetic 0.5 oz concentrate mixed with 1 lb. liquified urea
Super N Concentrate 0.77 oz and granular	46-0-0	0.2 kg/100m ²	Synthetic 0.77 oz concentrate mixed with 1 lb. granular urea
Super N Concentrate 0.77 oz and liquid	46-0-0	0.2 kg/100m ²	Synthetic 0.77 oz concentrate mixed with 1 lb. liquified urea
Sustane	17-8-4	0.2 kg/100m ²	
Novex program	1 st and 2 nd app. 18-2-18 Other app. 19-2-19	0.2 kg/100m ²	Synthetic
Poly Plus Program	1 st & 2 nd 12-24-14 3 rd & 4 th 18-2-18 5 th & 6 th 14-0-26	0.2 kg/100m ²	Synthetic

Results

The summer of 2003 was not considered typical for the Canadian Prairie Provinces. May was cold and wet, while June, July, August and September had above normal temperatures and below normal precipitation. Normally, the turf greens up in mid-April and minimal growth occurs until a flush of growth occurs in late May to early June. After a three to four week flush of growth, plants typically will reduce their growth until the cool periods of fall when growth ceases almost completely. This year a flush of growth occurred in early June. Plants normally break dormancy at this time but a particularly greater than normal flush occurred, in part due to the urea that was applied on May 9. Generally, all plots had better quality throughout the growing season in comparison to past years, which may also have been due to the early application of urea.

Colour ratings were determined in order to evaluate initial green-up following application of the fertilizers. In addition, colour ratings provided an evaluation of how consistently the fertilizer released its nitrogen when compared with the untreated control (Table 2). Those fertilizers that consistently showed superior green-up after each fertilizer application were Par-Ex, AGI #1, and AGI #3. Those fertilizers that consistently were the best or equal to the best were Par-Ex, AGI #1, AGI #3, and the Poly Plus Program.

Table 2 – Creeping bentgrass fertility trial colour ratings, 2003.

Colour Rating	May 29	June 5	June 12
Untreated	N/R	7.50 ABC	7.25 BC
Par-EX	N/R	8.00 A	7.75 AB
Select	N/R	8.00 A	7.50 ABC
Sanctuary	N/R	7.75 AB	7.25 BC
Contec Old Formula	N/R	7.75 AB	7.25 BC
Contec New Formula	N/R	7.75 AB	7.25 BC
AGI Turf 1	N/R	7.75 AB	7.75 AB
AGI Turf 2	N/R	8.00 A	7.25 BC
AGI Turf 3	N/R	8.00 A	7.75 AB
Super N .5oz liquid sprayed	N/R	7.75 AB	7.75 AB
Super N .77oz granular	N/R	7.00 CD	7.00 C
Super N .77oz liquid sprayed	N/R	6.75 D	7.00 C
Sustane	N/R	7.25 BCD	7.25 BC
Novex Program	N/R	7.75 AB	7.00 C
Poly-Plus Program	N/R	8.00 A	8.00 A
LSD ₀₅ =	N/S	0.61	0.58

*Values followed by the same letter are not significantly different at $p=0.05$.

Colour Rating	June 19	June 26	July 3
Untreated	5.75 F	5.00 G	6.25 FGH
Par-EX	7.75 AB	6.75 BC	8.00 A
Select	7.00 BCD	6.25 CD	7.50 ABC
Sanctuary	7.00 BCD	6.00 DE	7.25 BCD
Contec Old Formula	7.25 ABC	6.25 CD	7.75 AB
Contec New Formula	6.75 CDE	6.75 BC	7.25 BCD
AGI Turf 1	8.00 A	7.50 A	8.00 A
AGI Turf 2	8.00 A	7.25 AB	7.50 ABC
AGI Turf 3	8.00 A	7.50 A	7.75 AB
Super N .5oz liquid sprayed	6.00 EF	5.25 FG	6.50 EFG
Super N .77oz granular	6.50 CDEF	5.00 G	5.75 H
Super N .77oz liquid sprayed	6.25 DEF	5.25 FG	6.25 FGH
Sustane	7.00 BCD	6.00 DE	6.75 DEF
Novex Program	6.75 CDE	6.75 BC	7.00 CDE
Poly-Plus Program	8.00 A	7.75 A	8.00 A
LSD ₀₅ =	0.77	0.70	0.71

*Values followed by the same letter are not significantly different at p=0.05.

Colour Rating	July 10	July 17	July 24
Untreated	5.00 G	5.00 F	7.00
Par-EX	7.25 A	7.75 A	7.00
Select	7.00 AB	7.25 ABC	7.25
Sanctuary	6.25 CD	7.00 ABC	7.75
Contec Old Formula	6.25 CD	7.00 ABC	7.25
Contec New Formula	6.25 CD	6.75 ABCD	7.25
AGI Turf 1	7.25 A	7.75 A	7.50
AGI Turf 2	6.50 BC	7.00 ABC	7.50
AGI Turf 3	7.00 AB	7.00 ABC	7.50
Super N .5oz liquid sprayed	6.00 CDE	5.75 DEF	7.00
Super N .77oz granular	5.50 EFG	5.75 DEF	6.75
Super N .77oz liquid sprayed	5.50 EFG	5.50 EF	7.25
Sustane	6.00 CDE	6.50 BCDE	7.25
Novex Program	6.25 CD	6.50 BCDE	7.25
Poly-Plus Program	7.00 AB	7.50 AB	7.00
LSD ₀₅ =	0.74	1.08	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Colour Rating	July 31	Aug 7	Aug 14
Untreated	5.00 G	5.25 G	5.75 D
Par-EX	8.00 A	8.00 A	7.50 AB
Select	7.00 BCD	7.50 ABC	7.25 ABC
Sanctuary	7.25 ABC	7.25 ABC	7.75 A
Contec Old Formula	8.00 A	7.25 ABC	7.50 AB
Contec New Formula	7.25 ABC	7.50 ABC	7.25 ABC
AGI Turf 1	8.00 A	7.75 AB	7.75 A
AGI Turf 2	8.00 A	7.25 ABC	7.50 AB
AGI Turf 3	7.75 AB	7.75 AB	7.25 ABC
Super N .5oz liquid sprayed	6.25 DE	6.75 CDE	6.75 BC
Super N .77oz granular	6.50 CDE	6.00 EFG	6.50 CD
Super N .77oz liquid sprayed	6.00 EF	6.25 DEF	6.75 BC
Sustane	6.00 EF	7.25 ABC	7.25 ABC
Novex Program	8.00 A	7.00 BCD	7.25 ABC
Poly-Plus Program	7.25 ABC	7.25 ABC	7.00 ABC
LSD ₀₅ =	0.79	0.84	0.85

*Values followed by the same letter are not significantly different at p=0.05.

Colour Rating	Aug 21	Aug 28	Sept 4
Untreated	4.25 EF	5.50 F	5.75 EF
Par-EX	6.50 AB	7.00 ABC	7.25 A
Select	6.50 AB	7.25 AB	7.00 AB
Sanctuary	6.75 AB	7.00 ABC	7.00 AB
Contec Old Formula	5.75 BCD	6.75 BCD	7.00 AB
Contec New Formula	6.50 AB	7.00 ABC	7.25 A
AGI Turf 1	6.50 AB	7.00 ABC	6.75 ABC
AGI Turf 2	5.75 BCD	6.75 BCD	6.50 BCD
AGI Turf 3	7.00 A	7.50 A	7.00 AB
Super N .5oz liquid sprayed	5.25 CDE	6.25 DE	6.00 DEF
Super N .77oz granular	4.50 EF	6.00 EF	6.25 CDE
Super N .77oz liquid sprayed	5.75 BCD	6.25 DE	6.00 DEF
Sustane	6.00 ABC	7.00 ABC	7.00 AB
Novex Program	6.00 ABC	7.00 ABC	6.50 BCD
Poly-Plus Program	5.75 BCD	7.25 AB	6.75 ABC
LSD ₀₅ =	1.16	0.75	0.72

*Values followed by the same letter are not significantly different at p=0.05.

Colour Rating	Sept 11	Sept 18	Sept 25
Untreated	6.00 D	5.75 C	5.25 G
Par-EX	7.25 AB	7.75 A	7.75 A
Select	7.25 AB	7.50 A	6.50 CDE
Sanctuary	7.00 ABC	7.75 A	6.75 BCDE
Contec Old Formula	7.25 AB	8.00 A	7.00 ABCD
Contec New Formula	7.25 AB	8.00 A	7.25 ABC
AGI Turf 1	7.25 AB	7.50 A	7.25 ABC
AGI Turf 2	7.00 ABC	7.50 A	6.75 BCDE
AGI Turf 3	7.75 A	8.00 A	7.50 AB
Super N .5oz liquid sprayed	7.00 ABC	7.25 A	6.25 DEF
Super N .77oz granular	6.25 CD	7.50 A	6.00 EFG
Super N .77oz liquid sprayed	7.25 AB	7.50 A	6.25 DEF
Sustane	7.25 AB	7.50 A	7.00 ABCD
Novex Program	7.00 ABC	7.75 A	7.00 ABCD
Poly-Plus Program	7.00 ABC	8.00 A	7.50 AB
	LSD ₀₅ = 0.83	0.86	0.77

*Values followed by the same letter are not significantly different at p=0.05.

Colour Rating	Frequency of Superior Ranking
Untreated	1
Par-EX	16
Select	13
Sanctuary	11
Contec Old Formula	12
Contec New Formula	12
AGI Turf 1	17
AGI Turf 2	11
AGI Turf 3	17
Super N .5oz liquid sprayed	5
Super N .77oz granular	2
Super N .77oz liquid sprayed	3
Sustane	9
Novex Program	9
Poly-Plus Program	16

Quality ratings were also determined on a weekly basis. The fertilizers that consistently were the best or equal to the best were AGI #1 and AGI # 3 (Table 3). In addition, the Par-Ex showed superior quality on 13 out of 17 rating dates, while the Poly Plus Program and AGI #2 were the best or equal to the best on 12 out of 17 rating dates. Of the organic based fertilizers Sanctuary produced superior quality on 11 out of 17 rating dates.

Table 3 – Creeping bentgrass fertility trial quality ratings, 2003.

Overall Quality Rating	May 29	June 5	June 12
Untreated	N/R	7.25 BCDE	7.00 AB
Par-EX	N/R	7.30 BCDE	7.15 A
Select	N/R	7.40 ABC	7.15 A
Sanctuary	N/R	7.50 ABC	7.08 AB
Contec Old Formula	N/R	7.33 BCD	7.00 AB
Contec New Formula	N/R	7.30 BCDE	7.00 AB
AGI Turf 1	N/R	7.68 AB	7.08 AB
AGI Turf 2	N/R	7.23 BCDE	7.00 AB
AGI Turf 3	N/R	7.68 AB	7.15 A
Super N .5oz liquid sprayed	N/R	6.90 DE	7.15 A
Super N .77oz granular	N/R	7.08 CDE	6.83 BC
Super N .77oz liquid sprayed	N/R	6.90 DE	6.68 C
Sustane	N/R	7.08 CDE	6.93 ABC
Novex Program	N/R	7.48 ABC	6.93 ABC
Poly-Plus Program	N/R	7.85 A	7.23 A
LSD ₀₅ =		0.48	0.30

*Values followed by the same letter are not significantly different at p=0.05.

Overall Quality Rating	June 19	June 26	July 3
Untreated	5.75 H	5.83 HIJ	6.08 J
Par-EX	7.15 ABC	6.68 BCD	7.23 AB
Select	6.78 BCDE	6.60 CDE	7.00 ABCD
Sanctuary	6.68 CDEF	6.43 DEFG	6.78 CDEFG
Contec Old Formula	6.93 ABCD	6.40 DEFG	7.00 ABCD
Contec New Formula	6.60 DEFG	6.50 DEF	6.83 BCDEF
AGI Turf 1	7.40 A	7.08 ABC	7.15 ABC
AGI Turf 2	7.23 AB	7.18 AB	6.98 ABCDE
AGI Turf 3	7.23 AB	7.28 A	7.23 AB
Super N .5oz liquid sprayed	6.25 FG	5.90 GHIJ	6.43 FGHIJ
Super N .77oz granular	6.15 GH	5.50 J	6.35 HIJ
Super N .77oz liquid sprayed	6.30 EFG	5.68 IJ	6.28 HIJ
Sustane	6.65 DEF	6.23 DEFGH	6.43 FGHIJ
Novex Program	6.68 CDEF	6.68 BCD	6.58 EFGHI
Poly-Plus Program	7.33 A	7.25 A	6.68 DEFGH
LSD ₀₅ =	0.49	0.53	0.42

*Values followed by the same letter are not significantly different at p=0.05.

Overall Quality Rating	July 10	July 17	July 24
Untreated	6.00 H	5.90 FG	7.08 B
Par-EX	7.08 A	7.23 A	7.00 B
Select	7.00 AB	7.08 AB	7.15 B
Sanctuary	6.68 BCDE	6.83 ABCD	7.53 A
Contec Old Formula	6.58 CDEF	6.90 ABCD	7.15 B
Contec New Formula	6.68 BCDE	6.93 ABC	7.28 AB
AGI Turf 1	7.08 A	7.23 A	7.25 AB
AGI Turf 2	6.75 ABCD	6.93 ABC	7.23 AB
AGI Turf 3	6.90 ABC	7.00 AB	7.35 AB
Super N .5oz liquid sprayed	6.58 CDEF	6.43 DE	7.25 AB
Super N .77oz granular	6.18 GH	6.33 EF	7.03 B
Super N .77oz liquid sprayed	6.25 FGH	6.28 EFG	7.15 B
Sustane	6.70 ABCDE	6.65 BCDE	7.08 B
Novex Program	6.68 BCDE	6.75 ABCDE	7.25 AB
Poly-Plus Program	7.00 AB	7.08 AB	7.00 B
LSD ₀₅ =	0.39	0.48	0.36

*Values followed by the same letter are not significantly different at p=0.05.

Overall Quality Rating	July 31	Aug 7	Aug 14
Untreated	6.00 E	6.08 I	6.25 B
Par-EX	7.50 AB	7.60 A	6.93 A
Select	7.08 C	7.15 BCD	6.75 A
Sanctuary	7.08 C	7.28 ABC	7.00 A
Contec Old Formula	7.30 BC	7.08 BCDE	6.85 A
Contec New Formula	7.08 C	7.33 ABC	6.93 A
AGI Turf 1	7.70 A	7.33 ABC	7.00 A
AGI Turf 2	7.30 BC	7.15 BCD	6.93 A
AGI Turf 3	7.43 ABC	7.43 AB	6.85 A
Super N .5oz liquid sprayed	6.48 D	6.823 DEFG	6.75 A
Super N .77oz granular	6.45 D	6.35 HI	6.60 AB
Super N .77oz liquid sprayed	6.40 D	6.68 FGH	6.68 A
Sustane	6.60 D	7.15 BCD	6.85 A
Novex Program	7.30 BC	7.00 CDEF	6.85 A
Poly-Plus Program	7.08 C	7.08 BCDE	6.60 AB
LSD ₀₅ =	0.37	0.40	0.42

*Values followed by the same letter are not significantly different at p=0.05.

Overall Quality Rating	Aug 21	Aug 28	Sept 4
Untreated	5.58 G	5.98 F	6.35 DE
Par-EX	6.90 ABCD	7.00 AB	7.08 A
Select	6.98 ABCD	7.00 AB	7.00 AB
Sanctuary	7.08 AB	7.00 AB	7.00 AB
Contec Old Formula	6.23 CDEFG	6.93 ABC	7.00 AB
Contec New Formula	7.00 ABC	7.00 AB	7.08 A
AGI Turf 1	7.00 ABC	7.00 AB	6.93 ABC
AGI Turf 2	6.60 ABCDE	6.93 ABC	6.85 ABC
AGI Turf 3	7.35 A	7.15 A	7.00 AB
Super N .5oz liquid sprayed	6.43 BCDEF	6.50 DE	6.60 CDE
Super N .77oz granular	5.78 FG	6.33 EF	6.68 BCD
Super N .77oz liquid sprayed	6.68 ABCDE	6.58 CDE	6.70 BCD
Sustane	6.75 ABCDE	6.90 ABC	7.00 AB
Novex Program	6.75 ABCDE	6.90 ABC	6.75 ABC
Poly-Plus Program	6.18 DEFG	7.00 AB	6.83 ABC
LSD ₀₅ =	0.82	0.39	0.35

*Values followed by the same letter are not significantly different at p=0.05.

Overall Quality Rating	Sept 11	Sept 18	Sept 25
Untreated	6.53 D	6.23 E	6.00 I
Par-EX	7.08 A	7.00 BCD	7.43 A
Select	7.08 A	7.10 ABC	6.65 DEFGH
Sanctuary	7.00 AB	7.28 AB	6.83 CDEFG
Contec Old Formula	7.08 A	7.33 AB	7.00 ABCDE
Contec New Formula	7.08 A	7.33 AB	7.08 ABCD
AGI Turf 1	7.08 A	7.25 AB	7.18 ABC
AGI Turf 2	7.00 AB	6.93 BCD	6.83 CDEFG
AGI Turf 3	7.15 A	7.53 A	7.35 AB
Super N .5oz liquid sprayed	7.00 AB	6.90 BCD	6.58 EFGH
Super N .77oz granular	6.68 BCD	6.75 CD	6.30 HI
Super N .77oz liquid sprayed	7.08 A	7.08 ABCD	6.40 GHI
Sustane	7.08 A	7.08 ABCD	6.93 BCDEF
Novex Program	6.90 ABC	7.25 AB	6.93 BCDEF
Poly-Plus Program	7.00 AB	7.23 ABC	7.25 ABC
LSD ₀₅ =	0.34	0.49	0.46

*Values followed by the same letter are not significantly different at p=0.05.

Overall Quality Rating	Frequency of Superior Ranking
Untreated	1
Par-EX	13
Select	11
Sanctuary	11
Contec Old Formula	10
Contec New Formula	11
AGI Turf 1	17
AGI Turf 2	12
AGI Turf 3	17
Super N .5oz liquid sprayed	4
Super N .77oz granular	1
Super N .77oz liquid sprayed	4
Sustane	8
Novex Program	10
Poly-Plus Program	12

The fertilizer that consistently produced the highest clipping yield was Par-Ex (Table 4). It produced the highest amounts on 14 of 17 rating dates. This was followed in descending order by the Poly Plus Program (8 rating dates), Contec old formula (5), Contec new formula (5), and AGI #3 (5). Higher total clipping yields would indicate a more efficient use of the nitrogen applied. Total clipping yield for various fertilizers in descending order were Par-Ex (222.6 grams), Poly Plus Program (200.5), Contec new formula (193.3), AGI #1 (189.9), AGI #3 (189.1), Contec old formula (173.5), Select (163.2), Sanctuary (151.9) and AGI #2 (146.1).

Table 4 – Creeping bentgrass fertility trial clipping yields, 2003.

Clipping Dry Wts (g/m ²)	May 29	June 5	June 12
Untreated	N/R	16.725 BCDE	24.85 CD
Par-EX	N/R	18.525 ABCD	25.28 CD
Select	N/R	16.425 BCDE	24.88 CD
Sanctuary	N/R	18.13 ABCD	23.08 CD
Contec Old Formula	N/R	18.78 ABC	24.35 CD
Contec New Formula	N/R	21.38 A	42.20 A
AGI Turf 1	N/R	20.70 AB	26.55 BCD
AGI Turf 2	N/R	18.95 ABC	24.10 CD
AGI Turf 3	N/R	22.15 A	28.05 BC
Super N .5oz liquid sprayed	N/R	21.18 A	23.63 CD
Super N .77oz granular	N/R	14.25 DEF	17.45 D
Super N .77oz liquid sprayed	N/R	11.63 F	16.70 D
Sustane	N/R	15.53 CDEF	18.63 CD
Novex Program	N/R	21.68 A	25.68 CD
Poly-Plus Program	N/R	22.45 A	36.50 AB
LSD ₀₅ =		4.33	10.47

*Values followed by the same letter are not significantly different at p=0.05.

Clipping Dry Wts (g/m ²)	June 19	June 26	July 3
Untreated	5.40 EF	4.83 EFG	6.50 FG
Par-EX	8.70 BC	8.33 BC	13.53 AB
Select	6.60 BCDEF	6.23 DEF	11.23 ABC
Sanctuary	8.43 BC	6.85 BCD	7.73 EF
Contec Old Formula	7.78 BCD	6.63 BCDE	8.45 CDEF
Contec New Formula	6.75 BCDEF	6.50 CDE	10.15 CDE
AGI Turf 1	8.85 B	8.63 B	10.73 BCD
AGI Turf 2	6.88 BCDE	6.48 CDE	8.23 DEF
AGI Turf 3	8.80 B	8.48 BC	9.88 CDE
Super N .5oz liquid sprayed	4.50 F	5.28 DEFG	5.65 FG
Super N .77oz granular	4.40 F	5.00 DEFG	6.13 FG
Super N .77oz liquid sprayed	4.73 EF	3.83 G	4.20 G
Sustane	5.63 DEF	5.03 DEFG	6.45 FG
Novex Program	6.38 CDEF	6.83 BCDE	6.38 FG
Poly-Plus Program	11.65 A	10.73 A	13.98 A
LSD ₀₅ =	2.35	2.00	2.88

*Values followed by the same letter are not significantly different at p=0.05.

Clipping Dry Wts (g/m ²)	July 10	July 17	July 24
Untreated	3.88 H	5.28 I	5.45 HI
Par-EX	13.35 A	21.23 A	17.23 A
Select	8.08 CDE	12.10 CDEF	10.25 CDEF
Sanctuary	6.73 EFG	10.85 DEFG	10.80 CDE
Contec Old Formula	8.80 CD	13.98 BCD	12.13 BC
Contec New Formula	8.25 CDE	14.65 BC	11.33 BCD
AGI Turf 1	10.85 B	16.80 B	11.60 BCD
AGI Turf 2	7.48 DEF	9.78 EFG	7.93 EFGH
AGI Turf 3	9.95 BC	14.18 BC	10.45 CDE
Super N .5oz liquid sprayed	5.63 FGH	8.75 FGH	8.38 DEFGH
Super N .77oz granular	6.25 EFG	11.63 CDEF	8.98 CDEFGH
Super N .77oz liquid sprayed	3.98 H	5.90 HI	4.18 I
Sustane	5.08 GH	8.13 GHI	6.88 GHI
Novex Program	5.58 FGH	8.70 FGH	7.08 FGHI
Poly-Plus Program	12.98 A	14.78 BC	10.73 CDE
LSD ₀₅ =	2.02	3.41	3.23

*Values followed by the same letter are not significantly different at p=0.05.

Clipping Dry Wts (g/m ²)	July 31	Aug 7	Aug 14
Untreated	5.10 F	4.60 F	3.88 H
Par-EX	13.48 AB	12.75 A	11.73 A
Select	9.38 BCDEF	9.45 BC	9.23 BC
Sanctuary	9.43 BCDEF	9.38 BC	8.43 BCD
Contec Old Formula	11.65 ABCD	11.10 AB	8.68 BC
Contec New Formula	12.38 ABC	11.45 AB	7.38 BCDEF
AGI Turf 1	14.88 A	13.05 A	9.35 B
AGI Turf 2	8.90 BCDEF	8.03 CDE	8.45 BCD
AGI Turf 3	12.75 AB	10.43 ABC	8.00 BCDE
Super N .5oz liquid sprayed	7.48 DEF	6.20 DEF	6.43 DEF
Super N .77oz granular	8.95 BCDEF	9.38 BC	7.28 CDEF
Super N .77oz liquid sprayed	5.28 EF	5.78 DEF	5.70 FGH
Sustane	7.38 DEF	6.00 DEF	6.58 DEF
Novex Program	10.50 ABCDE	8.13 CD	7.73 BCDEF
Poly-Plus Program	10.95 ABCD	9.90 BC	7.45 BCDEF
LSD ₀₅ =	4.72	2.69	2.06

*Values followed by the same letter are not significantly different at p=0.05.

Clipping Dry Wts (g/m ²)	Aug 21	Aug 28	Sept 4
Untreated	6.38 I	3.28 J	2.70 G
Par-EX	21.55 A	11.13 A	8.15 A
Select	14.05 CD	7.10 BCDEF	5.75 BCD
Sanctuary	17.75 B	8.13 BCD	6.08 BC
Contec Old Formula	13.63 CD	9.20 AB	5.98 BCD
Contec New Formula	13.50 CD	8.20 BCD	5.55 BCDE
AGI Turf 1	12.60 DE	7.65 BCDE	4.88 BCDEF
AGI Turf 2	10.05 EFGH	6.85 CDEFGH	4.85 BCDEF
AGI Turf 3	16.80 BC	9.08 ABC	6.40 B
Super N .5oz liquid sprayed	7.95 GHI	4.55 HIJ	3.83 FG
Super N .77oz granular	10.68 DEFG	4.83 FGHIJ	4.33 DEFG
Super N .77oz liquid sprayed	7.00 HI	3.95 J	3.98 EFG
Sustane	8.85 FGHI	5.03 FGHIJ	4.28 DEFG
Novex Program	11.40 DEF	6.53 DEFGHIJ	4.40 CDEFG
Poly-Plus Program	13.15 DE	7.05 BCDEFG	4.50 CDEF
LSD ₀₅ =	3.42	2.32	1.72

*Values followed by the same letter are not significantly different at p=0.05.

Clipping Dry Wts (g/m ²)	Sept 11	Sept 18	Sept 25
Untreated	2.85 I	1.93 F	1.20 I
Par-EX	8.70 A	5.53 A	3.40 AB
Select	5.48 CDEF	3.85 B	2.90 ABCD
Sanctuary	7.60 AB	3.83 B	3.45 A
Contec Old Formula	5.78 CDE	3.80 B	2.55 ABCDEF
Contec New Formula	5.55 CDEF	4.35 B	3.28 ABC
AGI Turf 1	5.25 CDEF	3.60 B	2.63 ABCDE
AGI Turf 2	4.35 FGH	2.68 EF	1.83 EFGHI
AGI Turf 3	5.85 CD	4.13 B	3.33 ABC
Super N .5oz liquid sprayed	3.33 HI	2.18 EF	1.93 DEFGHI
Super N .77oz granular	3.78 GHI	2.90 CDE	2.23 DEFGH
Super N .77oz liquid sprayed	3.35 HI	1.88 F	1.40 GHI
Sustane	4.25 FGH	2.78 DE	1.60 FGH I
Novex Program	4.53 EFGH	2.98 CDE	2.43 BCDEF
Poly-Plus Program	6.43 BC	3.58 BCD	3.38 AB
LSD ₀₅ =	1.31	0.82	0.98

*Values followed by the same letter are not significantly different at p=0.05.

Clipping Dry Wts (g/m ²)	Superior Clipping Yield	Total Clipping Yield
Untreated	0	105.0
Par-EX	14	222.6
Select	2	163.2
Sanctuary	3	151.9
Contec Old Formula	5	173.5
Contec New Formula	5	193.3
AGI Turf 1	4	188.9
AGI Turf 2	1	146.1
AGI Turf 3	5	189.1
Super N .5oz liquid sprayed	1	126.9
Super N .77oz granular	0	128.5
Super N .77oz liquid sprayed	0	93.6
Sustane	0	118.2
Novex Program	2	146.9
Poly-Plus Program	8	200.5

Discussion

The quality of the plots throughout the year was one of the best ever. The early application of urea, abundant precipitation in the early part of the season, and above normal temperatures during the rest of the growing season may have accounted for the high quality. The growing conditions that occurred in 2003, allowed for a fair evaluation of the various fertilizers in this climate.

The AGI products on every rating date had the best or were equal to the best for colour and overall quality. AGI #1 and #3 performed better than AGI #2 in all criteria. These two superior experimental fertilizers had very high clipping production, but were somewhat less than Par-Ex and the Poly Plus program.

The Par-Ex 21-2 16 was also a superior fertilizer in this trial. It had the best colour rating on all rating dates except one and had very high quality ratings. It produced more clippings than any of the other fertilizers and was consistent from week to week.

The Poly Plus program was one of three fertilizer programs in the trial. It too had very high colour and quality ratings and had very high clipping yields. Although, additional phosphorus and potassium was included in this program, many of the other fertilizers had potassium and phosphorus as well but never performed as good. For this reason, the growth characteristics could be attributable to a consistent release of nitrogen. The Novex program was not as good as the Poly Plus program. Colour, quality and clipping yields were moderate in comparison to the other fertilizers.

The Nu-Gro Select 21-3-16 had high colour and quality ratings. As well, clipping yields were high in comparison to most of the other products.

A new and an old formulation of Contec fertilizers were evaluated for their performance. Their colour ratings were high and overall quality was slightly better for the new formulation when the two formulations were compared. Clipping yields were also higher for the new formulation, which was considered to be very high in comparison to the other fertilizers.

The Sanctuary fertilizer was the top performing organic fertilizer in the trial. In comparison to the other fertilizers (including the synthetics), Sanctuary showed a medium colour rating and a high quality rating. Clipping yields were the highest for the organics and were moderate when evaluated against all fertilizers and programs.

The Super N Concentrate product was developed to slow the release of a readily available nitrogen source. It was mixed with a liquefied urea at two different rates, as well as mixed with a granular urea. The granular urea showed considerable speckling at the rates applied. Generally, the product was not effective and slowed the release of the urea nitrogen considerably. A reduced rate of concentrate may improve the performance of this product in our climate.

Sustane was the other organic product in this trial. It had colour and quality that was approximately in the middle in comparison to all products. Clipping yields were very low, which is consistent with previous year's findings.

Financial support for this trial was received from the Nu-Gro Corporation, Agronomic Growth Industries Ltd., New-Tech Turf Products, Agrotain International, Evergro Canada Inc., and Brett-Young Seeds Ltd.