

Evaluation of Controlled Release Nitrogen Fertilizers on Creeping Bentgrass (2002)

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Summary

The objective of this trial was to evaluate various fertilizers for their effect on a USGA specification creeping bentgrass putting green. Colour ratings provide an evaluation of nutrient release when compared with urea and an untreated control. Those fertilizer treatments that had consistently superior colour ratings were urea, Country Club 18-3-18, AGI Turf 1, AGI Turf 2, Raingrow 8-1-4 and the mixture of AGI Turf 1 and 4. N-Sure KS and MESOP 20-0-25 showed superior colour to the untreated control on half of the rating dates. The fertilizers that consistently ranked the highest for quality ratings were urea, AGI Turf1, AGI Turf 1 and 4, and AGI Turf 2. Those fertilizers that had consistently better quality than the untreated control on each of the rating dates were urea, Poultry Product, and Raingrow 8-1-4. The fertilizers that consistently produced clipping yields that were significantly higher than the untreated control were urea, AGI Turf1, AGI Turf 1 and 4, AGI Turf 2 and Raingrow 8-1-4. The treated control, urea, produced 97% more clippings than the untreated control.

Introduction

Fertilization by liquid sources has become popular for putting green use in recent years due to the development of new formulations, which have controlled release properties, reduced burn potential and good tank mixing capabilities with other products. When first developed, most liquid sources were completely water-soluble and had little residual effect on the turf. However, new products have been developed that are manufactured in a flowable form that release the nitrogen in a controlled manner over an extended period of time. As well, two organic fertilizers that were developed from composted agricultural waste materials and a number of new granular products were entered into this year's trial. The objective of this trial was to evaluate the various fertilizers for their effect on bentgrass.

Materials and Methods

Plots were laid out on a Penncross creeping bentgrass green that was constructed to United State Golf Association (USGA) specifications for putting greens. The plots were located at the Prairie Turfgrass Research Centre, Olds College, Olds, Alberta, Canada. Plot sizes were 1.5 by 3 metres and laid out in a randomized complete block design. Individual treatments were replicated four times and were applied on June 6, July 4, July 25, August 15 and September 10, 2002. Nitrogen applications were reduced in the spring of the year on the plot areas so that there was no effect from previous fertilizer applications.

Previous trials have shown that a water soluble and readily available nitrogen source, such as urea, produces a rapid colour change and increased clipping yield within a week after application. However, fluctuations in growth are also apparent and these wide fluctuations are considered to be detriment to good turf. For this reason, urea was used as a treated control or industry standard to which all fertilizers were compared. Products and treatment schedule are listed in Table 1.

Applications of the fertilizers were made using a Gandy drop spreader for the composted and granular products, while liquid products were applied using a CO₂ compressed air plots sprayer with a multiple nozzle boom equipped with TeeJet 8004 nozzles. All products, were applied every three weeks at a rate of 0.25kg N/100m² and were watered in immediately after application.

Table 1 - Treatment schedule for creeping bentgrass fertilizer trial, 2002.

Product Name	Nitrogen Rate	Total Nitrogen Applied	Formulation
1) Untreated control	None	None	
2) Urea 46-0-0	0.25 kg N/100m ² three week interval	1.25 kg/100m ²	100% water soluble nitrogen
3) Poultry Product 3-2-1	0.25 kg N/100m ² three week interval	1.25 kg/100m ²	100% composted poultry manure
4) Outlook Pork 4-2-1	0.25 kg N/100m ² three week interval	1.25 kg/100m ²	100% composted hog manure
5) Country Club 18-3-18	0.25 kg N/100m ² three week interval	1.25 kg/100m ²	7.2% methylene urea 4.0% urea nitrogen 2.3% ammoniacal nitrogen 4.5% water insoluble nitrogen
6) AGI Turf 1 12-2-10 Fortified Compost	0.25 kg N/100m ² three week interval	1.25 kg/100m ²	6.4% urea nitrogen 4.8% methylene urea 0.4% nitrogen from compost 0.4% monammonium P
7) AGI Turf 4 10-15-10 AGI Turf 1 12-2-10 Fortified Composts	0.25 kg N/100 m ² three week interval 1 st app Turf 4 2-5 apps Turf 1	1.25 kg/100m ²	AGI Turf4 2.7% urea nitrogen 4.0% methylene urea 0.34% nitrogen from compost 3.2% monammonium P AGI Turf1 (same as above)
8) AGI Turf 2 12-2-10 Fortified Compost	0.25 kg N/100 m ² three week interval	1.25 kg/100m ²	11.5% urea nitrogen 0.4% nitrogen from compost 0.4% monammonium P
9) Raingrow 8-1-4	0.25 kg N/100 m ² three week interval	1.25 kg/100m ²	100% organic nitrogen from compost
10) N-Sure KS 15-0-12	0.25 kg N/100 m ² three week interval	1.25 kg/100m ²	Urea-triazone 33% controlled release N
11) Evergro 20-0-25 MESOP	0.25 kg N/100 m ² three week interval	1.25 kg/100m ²	3.0% Urea nitrogen 11.5% Methylene urea 5.5% water insoluble nitrogen

Colour, quality, and clipping yields were rated weekly. The National Turfgrass Evaluation Program system of rating was used for colour and quality. In this study, 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 is a subjective rating of shoots per unit area where 1 is poor density and 9 is superior density. The area cover rating is described as the area covered by turf and is rated on a 1-9 basis where 9 equals complete cover and 1 indicates a complete lack of cover. Bare areas 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 for each plot.

Results were evaluated based on those fertilizers that consistently performed as an 'A' ranked fertilizer (highest ranking) in each criterion. The data that shows superior overall colour and quality was evaluated by determining how many weeks the particular fertilizer performed as an 'A' ranked fertilizer.

They were also evaluated for consistently superior performance, highest yield for the trial period and the percentage improvement over the unfertilized control. Total clipping yield was determined by adding clipping yields for each of the replications on each of the 14 dates.

Results

The summer of 2002 was not typical for the Canadian Prairie Provinces. May was cold and wet, June and July were hot and dry, and August and September were, once again, cold and wet. 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 will reduce their growth until the cool periods of fall when growth slows further. This year the growth flush was late and reduced growth in the fall was early.

Colour ratings provide an evaluation of how consistently the fertilizer releases its nitrogen when compared with the urea and untreated control (Tables 2 and 3). Those fertilizers that consistently were superior to the untreated control were urea, Country Club 18-3-18, AGI Turf 1, AGI Turf 2, Raingrow 8-1-4 and the mixture of AGI Turf 1 and 4. N-Sure KS and MESOP 20-0-25 showed superior colour to the untreated control on half of the rating dates (Table 3). It should be noted that from week eight on which corresponded with the third application of fertilizer, that all these fertilizers showed significantly better colour than the untreated control on each rating date. Prior to this urea was the only fertilizer that had consistently superior colour.

Table 2 –Comparison of colour ratings for various fertilizers.

Product Name	13-Jun	20-Jun	27-Jun	4-Jul	11-Jul
Control (No fertilizer applied)	4.50 B	5.25 BC	5.25 C	6.25 C	5.50 B
Urea (46-0-0)	5.00 AB	6.50 A	6.50 A	7.75 A	6.75 A
Poultry Product (3-2-1)	5.50 A	5.50 BC	5.75 BC	6.75 BC	5.75 B
Outlook Pork (4-2-1)	4.50 B	5.25 BC	5.75 BC	6.75 BC	5.75 B
Country Club (18-3-18)	4.75 AB	5.75 AB	6.00 AB	7.00 B	6.00 B
AGI Turf 1 (12-2-10)	4.50 B	4.75 C	6.00 AB	6.75 BC	5.75 B
AGI Turf 4 (10-15-10)& Turf 1	4.75 AB	5.00 BC	6.00 AB	6.50 BC	5.50 B
AGI Turf 2 (12-2-10)	4.25 B	5.25 BC	6.00 AB	6.75 BC	5.75 B
Raingrow (8-1-4)	5.00 AB	5.75 AB	6.00 AB	7.00 B	6.00 B
N-Sure KS (15-0-12)	4.25 B	4.75 C	5.75 BC	6.75 BC	5.75 B
MESOP (20-0-25)	4.50 B	5.75 AB	5.75 BC	6.75 BC	5.75 B
LSD @ .05 =	0.92	0.95	0.74	0.64	0.63

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

Product Name	18-Jul	25-Jul	1-Aug	8-Aug	15-Aug
Control (No fertilizer applied)	5.50 CDE	5.50 C	5.00 E	5.00 EF	5.00 E
Urea (46-0-0)	7.00 A	6.75 A	7.00 AB	6.75 A	7.00 A
Poultry Product (3-2-1)	5.75 BCDE	5.75 BC	5.75 CDE	5.75 CD	6.25 BC
Outlook Pork (4-2-1)	6.00 ABCDE	5.50 C	5.75 CDE	4.75 F	5.25 E
Country Club (18-3-18)	5.75 BCDE	6.00 ABC	7.00 AB	6.50 AB	7.00 A
AGI Turf 1 (12-2-10)	6.75 AB	6.50 AB	7.50 A	6.75 A	7.25 A
AGI Turf 4 (10-15-10)& Turf 1	6.50 ABC	6.00 ABC	7.25 AB	6.75 A	6.75 AB
AGI Turf 2 (12-2-10)	6.25 ABCD	6.50 AB	7.75 A	6.75 A	7.00 A
Raingrow (8-1-4)	6.00 ABCDE	6.25 ABC	6.25 BCD	5.75 CD	6.00 CD
N-Sure KS (15-0-12)	5.75 BCDE	6.25 ABC	6.25 BCD	5.75 CD	6.25 BC
MESOP (20-0-25)	5.50 CDE	5.75 BC	6.75 ABC	6.00 BC	6.00 CD
LSD @ .05 =	1.00	0.79	1.1	0.53	0.51

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

Product Name	22-Aug	29-Aug	5-Sep	12-Sep
Control (No fertilizer applied)	4.25 E	4.25 DE	4.75 D	4.25 E
Urea (46-0-0)	7.00 A	6.25 AB	6.50 ABC	6.75 A
Poultry Product (3-2-1)	5.75 BC	5.75 ABC	5.75 C	6.50 AB
Outlook Pork (4-2-1)	4.50 E	4.00 E	4.25 D	4.50 E
Country Club (18-3-18)	6.25 ABC	6.50 A	6.50 ABC	6.25 ABC
AGI Turf 1 (12-2-10)	6.50 AB	6.50 A	6.75 AB	7.00 A
AGI Turf 4 (10-15-10)& Turf 1	6.50 AB	6.50 A	6.75 AB	6.75 A
AGI Turf 2 (12-2-10)	7.00 A	6.50 A	7.00 A	7.00 A
Raingrow (8-1-4)	6.25 ABC	5.50 BC	6.25 ABC	5.75 BCD
N-Sure KS (15-0-12)	5.75 BC	5.50 BC	5.75 C	5.50 CD
MESOP (20-0-25)	5.50 CD	5.50 BC	6.00 BC	5.50 CD
LSD @ .05 =	0.79	0.83	0.79	0.91

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

Table 3 – Frequency of superior overall colour ratings.

Product Name	Frequency of Superior Overall Colour
Control (No fertilizer applied)	0 Out of 14 ratings
Urea (46-0-0)	14 Out of 14 ratings
Poultry Product (3-2-1)	3 Out of 14 ratings
Outlook Pork (4-2-1)	1 Out of 14 ratings
Country Club (18-3-18)	11 Out of 14 ratings
AGI Turf 1 (12-2-10)	10 Out of 14 ratings
AGI Turf 4 (10-15-10) & Turf 1	11 Out of 14 ratings
AGI Turf 2 (12-2-10)	10 Out of 14 ratings
Raingrow (8-1-4)	7 Out of 14 ratings
N-Sure KS (15-0-12)	1 Out of 14 ratings
MESOP (20-0-25)	2 Out of 14 ratings

Quality ratings were also evaluated on a weekly basis. Those fertilizers that had consistently better quality than the untreated control on each of the rating dates were urea, Poultry Product, and Raingrow 8-1-4 (Table 4). The fertilizers that consistently produced superior quality ratings were urea, AGI Turf 1, AGI Turf 1 and 4, and AGI Turf 2 (Table 5).

Table 4 –Comparison of overall quality values for various fertilizers.

Product Name	13-Jun	20-Jun	27-Jun	4-Jul	11-Jul
Control (No fertilizer applied)	4.60 D	5.18 E	5.35 C	5.65 D	5.53 D
Urea (46-0-0)	6.15 AB	6.43 A	6.43 A	7.00 A	6.68 A
Poultry Product (3-2-1)	6.43 A	6.08 ABC	6.35 A	6.65 AB	6.35 AB
Outlook Pork (4-2-1)	5.48 BCD	6.08 ABC	6.15 AB	6.50 ABC	6.25 ABC
Country Club (18-3-18)	5.50 BCD	5.85 BCD	5.93 ABC	6.25 BC	5.78 BCD
AGI Turf 1 (12-2-10)	5.65 ABC	5.60 BCD	6.43 A	6.65 AB	6.10 ABCD
AGI Turf 4 (10-15-10)&Turf 1	5.65 ABC	5.75 BCD	6.18 AB	6.18 BCD	6.00 BCD
AGI Turf 2 (12-2-10)	5.43 BCD	5.85 BCD	6.00 AB	6.25 BCD	6.08 BCD
Raingrow (8-1-4)	5.58 ABC	6.15 AB	6.18 AB	6.50 ABC	6.18 ABC
N-Sure KS (15-0-12)	4.93 CD	5.18 E	5.70 BC	6.00 CD	5.70 CD
MESOP (20-0-25)	4.83 CD	5.53 CDE	5.68 BC	6.00 CD	5.68 CD
LSD @ .05 =	0.91	0.55	0.61	0.58	0.58

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

Product Name	18-Jul	25-Jul	1-Aug	8-Aug	15-Aug
Control (No fertilizer applied)	5.48 F	5.90 DE	5.50 E	5.78 G	6.23 F
Urea (46-0-0)	6.93A	6.93A	7.25AB	7.00AB	7.00AB
Poultry Product (3-2-1)	6.58ABC	6.50ABC	6.60 BC	6.60 BCD	6.78 BCD
Outlook Pork (4-2-1)	6.58ABC	6.25 CDE	6.15 CDE	5.93 FG	6.33 F
Country Club (18-3-18)	6.35ABCD	6.35 BCD	7.03AB	6.83ABC	7.00AB
AGI Turf 1 (12-2-10)	6.83AB	6.78AB	7.53A	7.00AB	7.18A
AGI Turf 4 (10-15-10)&Turf 1	6.93A	6.70ABC	7.50A	7.08A	6.93ABC
AGI Turf 2 (12-2-10)	6.35ABCD	6.68ABC	7.50A	7.00AB	7.00AB
Raingrow (8-1-4)	6.33ABCD	6.60ABC	6.75 BC	6.50 CDE	6.70 CD
N-Sure KS (15-0-12)	6.15BCDE	6.35 BCD	6.33 CD	6.23 DEF	6.78 BCD
MESOP (20-0-25)	5.50 E	5.83 E	6.18 CDE	6.08 FG	6.60 DE
LSD @ .05 =	0.71	0.52	0.68	0.40	0.27

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

Product Name	22-Aug	29-Aug	5-Sep	12-Sep
Control (No fertilizer applied)	5.00 E	5.10 H	5.28 G	4.65 F
Urea (46-0-0)	7.00 AB	6.65 AB	6.90 ABC	7.15 AB
Poultry Product (3-2-1)	6.60 BC	6.43 BCD	6.68 BCD	7.00 ABC
Outlook Pork (4-2-1)	5.58 D	5.50 GH	5.58 FG	5.75 DE
Country Club (18-3-18)	6.93 AB	6.53 ABC	7.05 AB	6.98 ABC
AGI Turf 1 (12-2-10)	7.10 AB	6.85 AB	7.25 AB	7.43 A
AGI Turf 4 (10-15-10) &Turf 1	7.20 A	6.93 A	7.43 A	7.43 A
AGI Turf 2 (12-2-10)	7.35 A	6.78 AB	7.28 AB	7.50 A
Raingrow (8-1-4)	6.60 BC	6.10 CDE	6.85 ABC	6.43 BCD
N-Sure KS (15-0-12)	6.08 CD	6.03 DEF	6.25 CDE	6.35 CD
MESOP (20-0-25)	6.00 D	5.85 EFG	6.08 DEF	5.93 DE
LSD @ .05 =	0.55	0.49	0.66	0.77

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

Table 5 – Frequency of superior overall quality ratings.

Product Name	Frequency of Superior Overall Quality
Control (No fertilizer applied)	0 Out of 14 ratings
Urea (46-0-0)	14 Out of 14 ratings
Poultry Product (3-2-1)	8 Out of 14 ratings
Outlook Pork (4-2-1)	5 Out of 14 ratings
Country Club (18-3-18)	9 Out of 14 ratings
AGI Turf 1 (12-2-10)	13 Out of 14 ratings
AGI Turf 4 (10-15-10) & Turf 1	11 Out of 14 ratings
AGI Turf 2 (12-2-10)	10 Out of 14 ratings
Raingrow (8-1-4)	8 Out of 14 ratings
N-Sure KS (15-0-12)	0 Out of 14 ratings
MESOP (20-0-25)	0 Out of 14 ratings

The fertilizers that consistently produced similar amounts of clippings to urea were Raingrow 8-1-4 (12% less), AGI Turf 1 and 4 (18% less), AGI Turf 2 (21% less), AGI Turf 1 (23% less), Poultry Product (24% less), Country Club 18-3-18 (32% less) and Outlook Pork compost (48% less). The others were all much lower (greater than 58% lower). Those that consistently produced clipping yields that were consistently higher than the untreated control were urea, AGI Turf1, AGI Turf 1 and 4, AGI Turf 2 and Raingrow 8-1-4 (Table 7).

Table 6 – Comparison of clipping yields (g/m^2) for various fertilizers.

Product Name	13-Jun	20-Jun	27-Jun	4-Jul	11-Jul
Control (No fertilizer applied)	20.2 BCD	11.5 E	10.8 CDE	9.1 AB	5.2 D
Urea (46-0-0)	26.2 ABCD	21.1 A	16.9 A	7.9 B	13.2 AB
Poultry Product (3-2-1)	30.7 A	18.8 AB	12.4 BCD	6.4 B	15.4 AB
Outlook Pork (4-2-1)	22.6 ABCD	12.6 DE	8.7 E	10.1 AB	17.3 A
Country Club (18-3-18)	24.9 ABCD	14.6 CDE	10.9 CDE	9.2 AB	11.8 BC
AGI Turf 1 (12-2-10)	25.9 ABCD	15.7 BCD	10.4 CDE	6.7 B	12.0 BC
AGI Turf 4 (10-15-10) & Turf 1	27.0 ABC	17.3 ABC	12.5 BCD	10.3 AB	11.9 BC
AGI Turf 2 (12-2-10)	24.7 ABCD	15.8 BCD	12.7 BC	8.7 B	13.4 AB
Raingrow (8-1-4)	27.9 AB	19.3 AB	14.4 AB	8.7 B	11.9 BC
N-Sure KS (15-0-12)	19.3 BCD	14.5 CDE	11.4 BCDE	7.0 B	11.1 BC
MESOP (20-0-25)	19.5 BCD	13.5 CDE	13.1 BC	12.6 A	5.4 D
LSD @ .05 =	8.7	4.1	3.3	4.6	4.4

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

Product Name	18-Jul	25-Jul	1-Aug	8-Aug	15-Aug
Control (No fertilizer applied)	4.8 G	6.9 DE	4.1 E	2.6 E	3.9 G
Urea (46-0-0)	14.9 A	12.5 A	9.7 BC	9.2 A	10.2 A
Poultry Product (3-2-1)	8.1 DE	8.6 CD	13.8 A	7.9 A	5.8 EF
Outlook Pork (4-2-1)	8.3 DE	7.7 CDE	12.6 AB	5.8 BC	5.0 EFG
Country Club (18-3-18)	10.3 CD	9.4 BC	9.3 C	8.2 A	9.6 AB
AGI Turf 1 (12-2-10)	12.4 ABC	12.2 A	10.4 BC	8.3 A	9.6 AB
AGI Turf 4 (10-15-10) & Turf 1	11.3 BC	9.6 BC	9.1 C	8.1 A	9.1 ABC
AGI Turf 2 (12-2-10)	13.7 AB	9.4 BCD	9.2 C	8.7 A	7.7 CD
Raingrow (8-1-4)	11.6 BC	11.8 AB	11.7 ABC	7.4 AB	8.6 BC
N-Sure KS (15-0-12)	7.6 DEF	8.4 CDE	8.8 CD	5.4 CD	6.4 DE
MESOP (20-0-25)	5.7 EFG	7.2 CDE	5.8 DE	4.5 CDE	5.2 EFG
LSD @ .05 =	2.7	2.4	3.2	2.0	1.4

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

Product Name	22-Aug	29-Aug	5-Sep	12-Sep
Control (No fertilizer applied)	3.8 F	2.9 E	2.5 D	4.2 E
Urea (46-0-0)	12.6 B	11.7 A	7.5 AB	8.2 ABC
Poultry Product (3-2-1)	15.5 A	7.9 BC	3.9 CD	4.9 DE
Outlook Pork (4-2-1)	10.6 B	3.7 DE	2.2 D	5.4 DE
Country Club (18-3-18)	10.2 BC	9.5 ABC	6.9 AB	8.2 ABC
AGI Turf 1 (12-2-10)	11.2 B	9.9 AB	6.5 AB	9.4 A
AGI Turf 4 (10-15-10) & Turf 1	11.3 B	11.1 A	8.0 A	9.0 AB
AGI Turf 2 (12-2-10)	11.9 B	11.5 A	8.0 A	7.6 BC
Raingrow (8-1-4)	11.3 B	10.6 AB	7.0 AB	8.6 AB
N-Sure KS (15-0-12)	8.1 CD	6.6 CD	5.8 BC	6.5 CD
MESOP (20-0-25)	6.3 DE	8.9 ABC	7.7 AB	7.9 ABC
LSD @ .05 =	2.389	3.051	2.008	1.843

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

Table 7 – Superior clipping yield ratings, total yields and yield compared to control.

Product Name	Superior Clipping Yield	Total Yield g/m ²	Yield Compared to Control
Control (No fertilizer applied)	0 Out of 14 ratings	92.5 g	
Urea (46-0-0)	11 Out of 14 ratings	181.8 g	97% increase
Poultry Product (3-2-1)	8 Out of 14 ratings	160.1 g	73% increase
Outlook Pork (4-2-1)	3 Out of 14 ratings	137.4 g	49% increase
Country Club (18-3-18)	7 Out of 14 ratings	153.0 g	65% increase
AGI Turf 1 (12-2-10)	8 Out of 14 ratings	160.6 g	74% increase
AGI Turf 4 (10-15-10) & Turf 1	11 Out of 14 ratings	165.6 g	79% increase
AGI Turf 2 (12-2-10)	6 Out of 14 ratings	163.0 g	76% increase
Raingrow (8-1-4)	8 Out of 14 ratings	170.8 g	85% increase
N-Sure KS (15-0-12)	9 Out of 14 ratings	126.9 g	37% increase
MESOP (20-0-25)	4 Out of 14 ratings	123.3 g	33% increase

Discussion

Colour ratings for the top performing products did not consistently improve until after the third application of fertilizer (week eight). This would indicate that this sand-based green was initially quite low in nutrient content and that it took some time before there was a significant growth response. This finding is consistent with previous observations when soils are initially deficient.

The Raingrow 8-1-4 is a liquid extract of a composted material that showed good performance. The clipping yields were equal to or better than all the controlled release synthetic fertilizers in this study. In past trials, organic fertilizers have consistently rated lower than the best synthetic fertilizers, but this product displayed consistent growth. The frequency of top ranking for quality and colour was lower than the best controlled release synthetic fertilizers.

The two composted materials are in the formulation development stage and were somewhat coarse in nature, which resulted in considerable mower pick up of the material. As a result, artificially high values for clipping yields were evident, particularly after application of the products. However for quality, the Poultry Product was top ranked eight out of 14 weeks, which was similar to Raingrow 8-1-4. Outlook Pork compost was top ranked for five rating periods. Colour rating for both of these products was consistently lower than most of the other fertilizers.

The N-Sure KS ranked low for colour, quality and clipping yield this year. In last year's trial it performed much better in all three areas. Possible explanations for reduced performance may be cooler climatic conditions or that this year's trial was established on a sand-based versus a soil-based green.

The three AGI trial entries performed quite well. AGI Turf 1, which had some methylene urea in the product, produced more consistent quality and clipping yields than did the AGI Turf 2, which had a higher urea content. The combination of AGI Turf 4 (10-15-10) and AGI Turf 1 (12-2-10) did improve clipping yield consistency over the other two entries which had lower rates of phosphorus.

The Evergro MESOP 20-0-25 ranked low for colour, quality and clipping yield. The high level of methylene urea in the product may have slowed the release of the nitrogen in our cool climate.