Table 1. Effect of rolling on dollar spot, 2016 (PGR + N Trial).

	Dollars Spot Infection Centers (DSIC)[z]						DS %[y]	(DSIC)[z]	DS %[y]		
Main Effect[x]	8-Jun	16-Jun	22-Jun	13-Jul	20-Jul	28-Jul	4-Aug	15-Aug	24-Aug	30-Aug	7-Sep
No-Roll	7	9	2	64	89	109	27 %	137	21 %	24 %	26 %
Rolled	15	14	6	50	78	94	19 %	85	18 %	18 %	20 %
P value[w]	***	***	***	**	NS	NS	**	***	*	**	**

[z] Number of dollar spot infection centers(DSIC) per plot were reported as the mean of 4 replications per treatment and pooled for main effect.

[y] Dollar spot infection percentage (DS %) was estimated per plot, reported as the mean of 4 replications per treatment and pooled for main effect.

[x] All treatments listed in Table 3 were included for analysis within rolled and no-roll main effects.

[w] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively.

Table 2. Effect of rolling on turf quality, 2016 (PGR + N Trial).

	Turf Quality[z]				
Main Effect[y]	4-Aug	15-Aug	24-Aug	30-Aug	7-Sep
No-Roll	3.5	4.3	4.5	4.7	5.0
Rolled	3.9	4.9	4.8	5.1	5.6
P value[x]	**	**	**	**	***

[z] Turf quality was assessed on 1-9 scale, with 6=commercially acceptable. Turf quality was reported as the mean of 4 replications per treatment and pooled for main effect.

[y] All treatments listed in Table 3 were included for analysis within rolled and no-roll main effects

[x] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively

Table 3. Effect of PGRs and nitrogen on dollar spot infection centers

		Dollars Spot Infection Centers (DSIC)[z]						
Trt #	Treatment[yx]	8-Jun	16-Jun	22-Jun	13-Jul	20-Jul	28-Jul	15-Aug
1	Untreated	16 ab[w]	18 ab	5 b	76 b	134 a	164 a	204 a
2	Urea 46-0-0	17 ab	13 b-d	3 bc	96 a	138 a	160 a	159 b
3	AS 21-0-0	12 bc	12 b-e	3 bc	51 cd	87 b	100 b	102 d
4	Primo MAXX	22 a	20 a	10 a	66 bc	131 a	155 a	210 a
5	Trimmit	5 cd	8 d-f	4 bc	38 de	14 c	23 c	27 e
6	Urea 46-0-0 + Primo MAXX	15 ab	14 a-c	3 bc	81 ab	135 a	160 a	143 bc
7	Urea 46-0-0 + Trimmit	4 d	6 ef	2 c	41 de	23 c	42 c	23 e
8	Ammonium Sulfate 21-0-0 + Primo MAXX	6 cd	11 c-f	2 bc	41 de	72 b	93 b	117 cd
9	Ammonium Sulfate 21-0-0 + Trimmit	4 d	5 f	2 c	26 e	16 c	19 c	16 e
	P value[v]	***	***	***	***	***	***	***

[z] Number of dollar spot infection centers per plot were reported as the mean of 4 replications.

[y] Urea and ammonium sulfate were applied as a foliar spray at 0.25 lbs/N 1,000 ft^2 every 21 days. Primo MAXX was applied as a foliar spray at 0.25 fl oz/1,000 ft^2 every 21 days. Trimmit was applied as a foliar spray at 0.23 fl oz/1,000 ft^2 every 21 days.

[x] Rolled and no roll plot data were included for analysis within the treatment main effects.

[w] Means followed by the same letter are not significantly different according to Fisher's protected least significant difference test ($\alpha = 0.05$).

[v] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively

Table 4. Effect of PGRs and nitrogen on dollar spot infection percentage (DS %).

		Dollars Spot Infection % (DS%)[z]			
Trt #	Treatment[yx]	4-Aug	24-Aug	30-Aug	7-Sept
1	Untreated	39 a[w]	46 a	46 a	51 a
2	Urea 46-0-0	27 b	22 c	25 b	32 b
3	AS 21-0-0	27 b	19 cd	17 c	18 d
4	Primo MAXX	39 a	39 b	49 a	55 a
5	Trimmit	11 cd	7 e	2 d	3 e
6	Urea 46-0-0 + Primo MAXX	26 b	15 d	23 bc	26 bc
7	Urea 46-0-0 + Trimmit	9 d	3 e	0 d	1 e
8	Ammonium Sulfate 21-0-0 + Primo MAXX	21 bc	22 c	21 bc	21 cd
9	Ammonium Sulfate 21-0-0 + Trimmit	8 d	3 e	3 d	2 e
	P value[v]	***	***	***	***

[z] Dollar spot infection percentage (DS %) was estimated per plot and reported as the mean of 4 replications.

[y] Urea and ammonium sulfate were applied as a foliar spray at 0.25 lbs/N 1,000 ft^2 every 21 days. Primo MAXX was applied as a foliar spray at 0.25 fl oz/1,000 ft^2 every 21 days. Trimmit was applied as a foliar spray at 0.23 fl oz/1,000 ft^2 every 21 days.

[x] Rolled and no roll plot data were included for analysis within the treatment main effects.

[w] Means followed by the same letter are not significantly different according to Fisher's protected least significant difference test ($\alpha = 0.05$).

[v] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively

Table 5. Effect of PGRs and nitrogen on turf quality.

		Turf Quality[z]						
Trt #	Treatment[yx]	28-Jun	13-Jul	28-Jul	15-Aug	24-Aug	30-Aug	7-Sept
1	Untreated	5.9 b[w]	5.0 bc	3.0 e	3.0 f	3.4 e	3 e	3.4 e
2	Urea 46-0-0	7.1 a	5.5 b	3.9 cd	3.9 de	4.9 c	4.4 d	4.1 d
3	AS 21-0-0	5.6 bc	3.4 d	4.5 bc	4.8 bc	3.5 e	5.0 c	5.3 c
4	Primo MAXX	5.1 d	4.8 c	3.3 de	3.1 ef	3.6 de	2.6 e	3.0 e
5	Trimmit	5.6 bc	5.1 bc	4.9 b	5.3 b	5.6 b	6.1 b	6.4 b
6	Urea 46-0-0 + Primo MAXX	6.8 a	6.3 a	4.4 bc	4.3 cd	6.0 b	4.5 cd	4.5 d
7	Urea 46-0-0 + Trimmit	6.9 a	6.3 a	5.8 a	6.3 a	7.0 a	7.5 a	8.0 a
8	Ammonium Sulfate 21-0-0 + Primo MAXX	4.4 e	3.3 d	4.4 bc	4.8 bc	3.6 de	4.6 cd	5.3 c
9	Ammonium Sulfate 21-0-0 + Trimmit	5.3 cd	3.3 d	5.8 a	6.1 a	4.0 d	6.1 b	7.5 a
	P value[v]	***	***	***	***	***	***	***

[z] Turf quality was assessed on 1-9 scale, with 6=commercially acceptable.

[y] Urea and ammonium sulfate were applied as a foliar spray at 0.25 lbs/N 1,000 ft^2 every 21 days. Primo MAXX was applied as a foliar spray at 0.25 fl oz/1,000 ft^2 every 21 days. Trimmit was applied as a foliar spray at 0.23 fl oz/1,000 ft^2 every 21 days.

[x] Rolled and no roll plot data were included for analysis within the treatment main effects.

[w] Means followed by the same letter are not significantly different according to Fisher's protected least significant difference test ($\alpha = 0.05$).

[v] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively

Table 6. Nitrogen Source Treatment List and Notes			
Trt #	Product[z]	Rate (lb/1,000 ft^2)	Notes
1	Untreated	---	
2	Urea 46-0-0	0.25 lb N	Dissolved in water, used in 2015 pilot
3	Ammonium Sulfate 21-0-0	0.25 lb N	Dissolved in water, ag grade
4	Calcium Nitrate 15-0-0	0.25 lb N	Dissolved in water
5	Urea 46-0-0	0.25 lb N	Granular application
6	Ammonium Sulfate 21-0-0	0.25 lb N	Granular application
7	Ammonium Sulfate 13-2-13	0.25 lb N	Granular application, used in pilot study
8	Calcium Nitrate 15-0-0	0.2 lb N	Granular application
9	Seablend 12-0-12	0.25 lb N	Granular application
10	Polyon (1.25 lb/N)	1.25 lb N	Granular application, applied once
11	Polyon (1.5 lb/N)	1.5 lb N	Granular application, applied once
12	Polyon (1.25 lb/N) and 30-0-0	1.25 lb N/3 fl oz	Polyon applied once, 30-0-0 biweekly (3 oz/M)
13	Ammonium Sulfate 21-0-0	0.25 lb N	Liquid application, finer particle, easier to dissolve

[z] All treatments were applied on a 21–day interval, except for the Polyon (trt 10, 11 and 12).

Table 7. Effect of rolling on dollar spot and turf quality, 2016 Nitrogen Source Trial.

	(DSIC)[z]	DS %[y]				Turf Quality[x]		
Main Effect[w]	8-Jun	28-Jul	31-Aug	7-Sep	14-Sep	28-Jun	24-Aug	14-Sep
No-Roll	24	36%	31%	31%	33%	5.9	3.9	4.6
Rolled	17	31%	25%	25%	19%	6.1	4.3	4.8
P value[v]	**	***	***	***	***	**	**	*

[z] Number of dollar spot infection centers(DSIC) were counted per plot and reported as the mean of 4 replications per treatment and pooled for main effect.

[y] Dollar spot infection percentage (DS %) was estimated per plot and reported as the mean of 4 replications and pooled for main effect.

[x] Turf quality was assessed on 1-9 scale, with 6=commercially acceptable.

[w] All treatments listed in Table 6 were included for analysis within rolled and no-roll main effects.

[v] *, **, *** and NS refer to significance at P ≤ 0.05, 0.01, 0.001 and not significant, respectively.

Table 8. Effect of nitrogen source on dollar spot infection centers and dollar spot infection percentage, 2016 Nitrogen Source study.

		(DSIC)[z]		DS %[y]						
Trt #	Product[x]	13-Jul	21-Jul	28-Jul	4-Aug	16-Aug	24-Aug	31-Aug	7-Sep	14-Sep
1	Untreated	75 a-c[w]	127 ab	49 a	56 a	56 a	53 a	53 a	49 a	47 a
2	Urea 46-0-0	68 bc	95 cd	31 b-f	38 b-d	31 de	25 e-g	25 de	28 bc	31 bc
3	Ammonium Sulfate 21-0-0	57 cd	98 c	33 b-e	44 b	34 c-e	32 c-e	22 e	20 de	19 e-g
4	Calcium Nitrate 15-0-0	45 de	72 de	32 b-e	29 e	26 e	16 h	11 f	13 e	13 g
5	Urea 46-0-0	65 bc	110 bc	37 bc	42 b	41 bc	33 cd	34 bc	29 bc	27 b-e
6	Ammonium Sulfate 21-0-0	69 a-c	119 bc	33 b-e	41 bc	43 bc	42 b	37 b	30 b	27 b-d
7	Ammonium Sulfate 13-2-13	88 a	147 a	34 b-d	41 bcb-d	41 bc	36 bc	31 b-d	32 b	27 b-d
8	Calcium Nitrate 15-0-0	77 ab	118 bc	38 b	42 b	39 b-d	33 cd	24 de	26 b-d	23 d-f
9	Seablend 12-0-12	69 a-c	117 bc	39 b	44 b	44 b	29 c-f	29 b-e	31 b	32 b
10	Polyon (1.25 lb/N)	62 b-d	100 c	24 f	30 d	30 de	23 f-h	22 e	29 bc	25 b-f
11	Polyon (1.5 lb/N)	59 b-d	98 c	26 ef	37 b-d	35 b-e	30 c-f	26 c-e	29 bc	21 d-g
12	Polyon and 30-0-0 (3oz/14 day)	61 b-d	98 c	27 d-f	31 cd	31 de	21 gh	25 de	28 bc	23 c-f
13	Ammonium Sulfate 21-0-0	36 e	68 e	30 c-f	39 b-d	28 e	26 d-g	22 e	22 cd	19 fg
	P value[v]	***	***	***	***	***	***	***	***	***

[z] Number of dollar spot infection centers(DSIC) per plot were reported as the mean of 4 replications.

[y] Dollar spot infection percentage (DS %) was estimated per plot and reported as the mean of 4 replications.

[x] Rolled and no roll plot data were included for analysis within the treatment main effects.

[w] Means followed by the same letter are not significantly different according to Fisher's protected least significant difference test ($\alpha = 0.05$).

[v] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively.

Table 9. Effect of nitrogen source on turf quality, 2016 Nitrogen Source study.

		Turf Quality[z]								
Trt #	Product[yx]	13-Jul	21-Jul	28-Jul	4-Aug	16-Aug	24-Aug	31-Aug	7-Sep	14-Sep
1	Untreated	5.1 c[x]	3.0 d	2.5 f	2.6 d	2.4 f	2.9 f	2.8 f	3.4 d	3.9 d
2	Urea 46-0-0	6.9 a	4.4 ab	3.6 cd	3.5 bc	3.9 ab	4.5 a-c	4.4 bc	4.4 bc	4.5 c
3	Ammonium Sulfate 21-0-0	4.9 c	3.9 bc	3.6 cd	2.6 d	3.3 c-e	3.3 ef	4.4 bc	4.5 bc	4.8 bc
4	Calcium Nitrate 15-0-0	5.4 c	4.4 ab	3.5 cd	3.5 bc	4.0 a	4.8 ab	5.3 a	5.3 a	5.6 a
5	Urea 46-0-0	6.1 b	3.9 bc	3.0 e	3.1 cd	3.0 e	4.0 cd	3.8 de	4.3 c	4.4 cd
6	Ammonium Sulfate 21-0-0	6.1 b	4.1 bc	3.4 de	3.3 b-d	3.0 e	3.8 de	3.6 e	4.4 bc	4.8 bc
7	Ammonium Sulfate 13-2-13	6.5 ab	4.1 bc	3.6 cd	3.4 bc	3.1 de	3.9 d	3.9 c-e	4.1 c	4.5 c
8	Calcium Nitrate 15-0-0	6.6 ab	3.6 c	3.4 de	3.3 b-d	3.0 e	4.1 cd	4.1 b-e	4.4 bc	4.5 c
9	Seablend 12-0-12	6.3 b	4.0 bc	3.4 de	3.5 bc	3.1 de	4.1 cd	4.1 b-e	4.4 bc	4.4 cd
10	Polyon (1.25 lb/N)	6.3 b	4.9 a	4.5 a	4.4 a	3.6 a-d	4.8 ab	4.3 b-d	4.6 bc	4.8 bc
11	Polyon (1.5 lb/N)	6.4 ab	4.9 a	4.3 ab	3.9 ab	3.4 b-e	4.3 b-d	4.1 b-e	4.4 bc	4.9 bc
12	Polyon and 30-0-0 (3oz/14 day)	6.5 ab	4.8 a	4.4 a	4.4 a	3.6 a-d	4.9 a	4.5 b	4.5 bc	4.8 bc
13	Ammonium Sulfate 21-0-0	5.0 c	4.0 bc	3.9 bc	3.3 b-d	3.8 a-c	3.9 d	4.0 b-e	4.9 ab	5.3 ab
	P value[w]	***	***	***	***	***	***	***	***	***

[z] Turf quality was assessed on 1-9 scale, with 6=commercially acceptable.

[y] Rolled and no roll plot data were included for analysis within the treatment main effects.

[x] Means followed by the same letter are not significantly different according to Fisher's protected least significant difference test ($\alpha = 0.05$).

[w] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively.

Table 10. Bio-control treatment list and effect of bio-control products on dollar spot control.

Trt #	Product[x]	Rate (per/1,000 ft^2)	DSIC[z]	DS %[y]			
			16-Jun	20-Jul	28-Jul	4-Aug	17-Aug
1	Untreated	---	22 a-c[w]	38 ab	44 a	50 ab	42 bc
2	Civitas	8.5 fl oz	14 c	25 cd	34 bc	31 c	25 d
3	Civitas	17 fl oz	17 bc	20 d	30 c	23 d	14 e
4	Rhapsody	3 fl oz	26 a	46 a	45 a	54 a	49 ab
5	Rhapsody	6 fl oz	25 ab	33 bc	36 bc	44 b	41 c
6	Trew Stone (stone dust)	4 oz	28 a	37 ab	39 ab	48 ab	45 a-c
7	1-2-3 NPP	2 fl oz	25 ab	43 a	46 a	54 a	50 a
s	Holganix 66GC CT	4 oz	26 a	33 bc	39 ab	44 b	43 a-c
P value[v]			*	***	**	***	***

[z] Number of dollar spot infection centers(DSIC) per plot were reported as the mean of 4 replications.

[y] Dollar spot infection percentage (DS %) was estimated per plot and reported as the mean of 4 replications.

[x] Rolled and no roll plot data were included for analysis within the treatment main effects. All treatments were applied on a 14-day interval.

[w] Means followed by the same letter are not significantly different according to Fisher's protected least significant difference test ($\alpha = 0.05$).

[v] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively.

Table 11. Effect of bio-control products on turf quality.

Trt #	Product[y]	Rate (per/1,000 ft^2)	Turf Quality[z]			
			28-Jun	20-Jul	4-Aug	17-Aug
1	Untreated	---	5.5 c[x]	3.9 c	3.1 c-e	3.1 cd
2	Civitas	8.5 fl oz	6.8 b	4.9 b	4.0 b	4.1 b
3	Civitas	17 fl oz	7.3 a	5.6 a	5.1 a	4.8 a
4	Rhapsody	3 fl oz	5.6 c	3.4 d	2.9 e	2.8 de
5	Rhapsody	6 fl oz	5.5 c	4.0 c	3.4 cd	3.1 cd
6	Trew Stone (stone dust)	4 oz	5.3 c	3.8 cd	3.5 c	3.1 cd
7	1-2-3 NPP	2 fl oz	5.5 c	3.8 cd	3.0 de	2.6 e
8	Holganix 66GC CT	4 oz	5.4 c	4.1 c	3.3 c-e	3.3 c
	P value[w]		***	***	***	***

[z] Turf quality was assessed on 1-9 scale, with 6=commercially acceptable.

[y] Rolled and no roll plot data were included for analysis within the treatment main effects.

[x] Means followed by the same letter are not significantly different according to Fisher's protected least significant difference test ($\alpha = 0.05$).

[w] *, **, *** and NS refer to significance at $P \leq 0.05$, 0.01, 0.001 and not significant, respectively.