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Effect of Various Late Postemergence Herbicide Treatments on Crabgrass Control at 5 to 7 Tiller Stage and Beyond

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BRIEF SUMMARY

Crabgrass continues to be the key target among annual grassy weeds in Ohio and the Midwest in spring and summer. In the last few years, there appear to be more considerable breaks in preemergence control and more significant populations of crabgrass occurring in lawns and landscapes. The strategy for germinated and tillered crabgrass in turfgrass is defensive by the use of postemergence herbicides.

This is a late postemergence crabgrass efficacy/control study with crabgrass at least 5 to 7 tiller stage and well beyond. Postemergence herbicide treatments were applied on August 11, 2008. Several formulations of Quinclorac (Drive), including the new XLR8, Drive 75DF at several rates (0.75 to 2.0lbs ai/A) and repeats, and Drive 75DF with sulfentrazone and various surfactants and mesotrione (Tenacity) were evaluated for crabgrass efficacy/control.

The statistical design was a randomized complete block with 16 treatments replicated three times (Table 1).

The study was conducted on a silty clay loam soil site with a relatively high population of crabgrass. Mowing was performed at a height of two inches and clippings returned. Irrigation was provided several times per week to encourage crabgrass infestation. No other herbicides were applied to the study site. Herbicides were applied with a CO_2 pressurized sprayer at 40 psi with flat fan nozzles at 2 gallons liquid per thousand square feet. Irrigation was withheld for at least 24 hours after the herbicide application.

Brief Summary Comments (Table 1)

Crabgrass discoloration and efficacy/control became noticeable for all treatments about 10-14 days after application (i.e. August 25).

Q4 provided poor crabgrass control/efficacy not exceeding 40%.

XLR8 provided slightly more rapid initial discoloration than all other treatments including sulfentrazone combos except for the two highest Drive 75DF treatments (24 oz. wt. PR – 1.5 lbs ai/A and 32 oz. wt. PR – 2.0 lbs ai/A). (PR = product)

All Drive/quinclorac treatments/formulations provided excellent control at study termination with ≥ 85% control.

The inclusion of sulfentrazone (0.25 lbs ai/A) with Drive (0.75 lbs ai/A) did not enhance Drive efficacy relative to Drive alone.

Drive at the 32 oz wt. PR (2.0 lbs ai/A), Drive repeat (16 oz. wt. PR – 0.75 lbs ai/A), Drive + sulfentrazone repeat (16 oz. wt. PR – 0.75 lbs ai/A + 0.25 lbs ai/A) provided close to 100% post crabgrass control with almost no escapes or regrowth.

The inclusion of Lesco and Hawkeye surfactant as a substitute for MSO did not improve Drive efficacy and may have actually exhibited a slight reduction in final control.

Tenacity (8 oz/A) with DU resulted in > 90% control with a single application. Tenacity with DU and other herbicides and surfactants will be evaluated in 2009 to determine post crabgrass efficacy/control and possibly a one application strategy. Tenacity phytotoxicity/injury with the latter combinations will also be evaluated.

Table 1. Effect of Various Late Postemergence Herbicide Treatments on Crabgrass Control at 5 to 7 Tiller Stage and Beyond.

Treatment[1]	Form Conc	Product Rate/A	% Crabgrass Control[2]				
			18-Aug-08	25-Aug-08	1-Sep-08	10-Sep-08	18-Sep-08
Drive*	75% WG	16 oz wt	0.0a	88.3bc	88.3bcd	91.7bc	91.7bc
XLR8	180 GA/L SL	64 fl oz	0.0a	93.3ab	91.0bcd	96.0ab	96.0ab
BAS 79000H	294 GA/L SL	64 fl oz	0.0a	90.0bc	88.3bcd	91.7bc	91.7bc
Q4	184.4 GA/L EC	128 fl oz	0.0a	43.3g	40.0g	36.7e	31.7f
Untreated	--	---	0.0a	0.0h	0.0h	0.0f	0.0g
Drive	75% WG	21.3 oz wt	0.0a	75.0ef	91.7abc	90.0c	90.0cd
Drive + Sulfentrazone	75% WG + 4 lbA/G	16 oz wt + 236 fl oz	0.0a	78.3de	86.7cd	86.7cd	86.7de
Drive	75% WG	24 oz wt	0.0a	94.3ab	95.7ab	95.7ab	96.3a
Drive	75%WG	32 oz wt	0.0a	98.7a	99.0a	99.3a	99.7a
Drive + repeat**	75%WG	16 oz wt	0.0a	90.0bc	99.3a	99.3a	99.3a
Drive	75%WG	16 oz wt	0.0a	90.0bc	88.3bcd	90.0c	88.3cd
Drive + Sulfentrazone + repeat**	75%WG + 4 lbA/G	16 oz + 236 fl oz	0.0a	90.0bc	99.3a	99.3a	99.3a
Drive + Lesco Surf	75%WG + 100% OL	16 oz + 24 fl oz	0.0a	85.0cd	83.3de	83.3d	86.7de
Drive + Hawkeye Surf	75%WG + 100% OL	16 oz + 24 fl oz	0.0a	75.0ef	73.3f	81.7d	83.3e
Tenacity + DU	4 lb A/G + 1% OL	348 fl oz + 75 fl oz	0.0a	68.3f	78.3ef	91.7bc	91.7bc
DU Alone	1% OL	75 fl oz	0.0a	0.0h	0.0h	0.0f	0.0g
LSD			0	8.1	7.8	5.3	4.5

[1]treatments applied August 11 , 2008.

[2] % Crabgrass control rated as a visual assessment of % crabgrass relative to untreated plots .

* All Drive treatments contained MSO at 0.25 % V/V except Q4 unless specified otherwise.

** Repeat treatments made on August 26, 2008.

*** DU is dawn ultra at 1% v/v.

Effect of Various Postemergence Herbicides on Crabgrass (Digitaria spp) Control at Different Maturity Stages

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INTRODUCTION

Crabgrass continues to be the key target among annual grassy weeds in Ohio and the Midwest in spring and summer. In the last few years, there appear to be more considerable breaks in Preemergence control and more significant populations of crabgrass occurring in lawns and landscapes. The strategy for germinated and tillered crabgrass in turfgrass is defensive by the use of postemergence herbicides.

Several formulations of quinclorac (Drive) were evaluated at various crabgrass maturity stages (3 to 5 leaf, 2 to 3 tiller, and 5 to 7 tiller) for postemergence crabgrass efficacy. Treatments were made on July 2, July 11, and July 23 at the 3 to 5 leaf, 2 to 3 tiller, and 5 to 7 tiller stages, respectively. The study was designed as a randomized complete block with three replications for each maturity stage. So each maturity stage was analyzed separately due to different dates of application and rating dates. Herbicides were applied with a CO_2 pressurized sprayer at 40 psi with flat fan nozzles at 2 gallons liquid per thousand square feet. Irrigation was withheld for at least 24 hours after the herbicide application.

The study was conducted on a silty clay loam soil site with a relatively high population of crabgrass. Mowing was performed at a height of two inches and clippings returned. Irrigation was provided several times per week to encourage crabgrass infestation. No other herbicides were applied to the study site.

RESULTS

3 to 5 Leaf Stage (Table 1)
Crabgrass control was excellent for all quinclorac (Drive) formulations and Q4 with 95 to 100% control within two weeks after application.

2 to 3 Tiller Stage (Table 2)
Q4 provided poor control of 2 to 3 tiller stage crabgrass. This is consistent with Q4 efficacy on tillered crabgrass in our other OSU research trials.

XLR8 provided the most rapid discoloration of 2 to 3 tiller crabgrass (i.e. July 21) BAS XLR8 and BAS 79000H experimental efficacy was similar on August 9 (i.e. 90 to 95 % control). The trend was for slightly better herbicide efficacy with BAS XLR8 in August at 88% control. Both BAS formulations provided better crabgrass control than Drive 75DF. Regrowth of crabgrass from the base or crown rosette area occurred with Drive 75DF and both BASF formulations that appeared to be controlled on August 9. This tendency for regrowth from the base or crown

rosette area when crabgrass is in the intermediate maturity stage and tillering rapidly or most prolifically has been observed previously in OSU research and also reported back from companies and users in the field. However, XLR8 and BASF 79000H provided superior mid post crabgrass control (2-3 tiller) than Drive 75DF. It would be recommended that XLR8 be used in the future for post crabgrass control especially in the mid post maturity stage by lawn and landscape companies.

5 to 7 Tiller Stage (Table 3)

Q4 provided poor control of 5 to 7 tiller stage crabgrass (i.e. 40% or less). XLR8 exhibited a trend for more rapid discoloration initially and slightly better crabgrass control than BAS 79000H and Drive 75DF. Drive 75DF provided good to excellent crabgrass control at ≥ 85%. Both BASF formulations provided excellent crabgrass control at 90 to 95%. At study termination, crabgrass control overall was better at the 5 to 7 tiller stage (Table 2 versus Table 3) due primarily to significantly less crabgrass regrowth.

Table 1. Effect of Various Postemergence Herbicide Treatments on Crabgrass Control at 3 to 5 Leaf Stage.

Treatment[1]	Form Conc	Product Rate/A	% Crabgrass Control[2]				
			7-Jul-08	15-Jul-08	21-Jul-08	30-Jul-08	9-Aug-08
Untreated	----	---	0.0c	0.0b	0.0b	0.0c	0.0c
Drive 75DF + MSO	75%+100%	16 oz wt+24 fl oz	93.3ab	100.0a	100.0a	100.0a	98.7a
XLR8	180 GL+100%	64 fl oz+24 fl oz	91.7b	100.0a	100.0a	100.0a	98.3ab
BAS 79000H + MSO	294GA/L + 100%	64 fl oz+24 fl oz	94.3ab	100.0a	100.0a	100.0a	99.3a
Q4	184.4GA/L	128 fl oz	97.0a	100.0a	100.0a	98.7b	95.0b
LSD			3.82	0	0	0.97	4.3

[1]treatments applied July 2, 2008.

[2] % Crabgrass control rated as a visual assessment of % crabgrass per plot .

Table 2. Effect of Various Postemergence Herbicide Treatments on Crabgrass Control at 2 to 3 Tiller Stage.

Treatment[1]	Form Conc	Product Rate/A	% Crabgrass Control[2]					
			21-Jul-08	30-Jul-08	9-Aug-08	14-Aug-08	21-Aug-08	29-Aug-08
Drive 75DF + MSO	75%+100%	16 oz wt+24 fl oz	48.3b	50.0c	75.0b	70.0b	68.3b	68.3b
XLR8 + MSO	180 GL+100%	64 fl oz+24 fl oz	76.7a	86.7a	95.3a	88.3a	88.3a	88.3a
BAS 79000H + MSO	294GA/L +100%	64 fl oz+24 fl oz	51.7b	73.3b	90.0a	80.0a	80.0a	80.0a
Q4	184.4GA/L	128 fl oz	20.0c	18.3d	16.7c	13.3c	8.3c	8.3c
Untreated	----	---	0.0d	0.0e	0.0d	0.0c	0.0c	0.0c
			13.7	12.4	10.9	13.6	11.3	11.3

[1]treatments applied July11, 2008.

[2] % Crabgrass control rated as a visual assessment of % crabgrass per plot .

Table 3. Effect of Various Postemergence Herbicide Treatments on Crabgrass Control at 5 to 7 Tiller Stage.

Treatment[1]	Form Conc	Product Rate/A	% Crabgrass Control[2]					
			30-Jul-08	9-Aug-08	14-Aug-08	21-Aug-08	29-Aug-08	10-Sep-08
Drive 75DF + MSO	75%+100%	16 oz wt+24 fl oz	83.3b	91.7a	93.3a	88.3c	86.7b	85.0c
XLR8 + MSO	180 GL+100%	64 fl oz+24 fl oz	90.0a	97.3a	97.7a	97.7a	95.0a	95.0a
BAS 79000H + MSO	294GA/L +100%	64 fl oz+24 fl oz	86.7ab	91.7a	93.3a	93.3b	90.0ab	90.0b
Q4	184.4GA/L	128 fl oz	36.7c	40.0b	43.3b	40.0d	36.7c	30.0d
Untreated	----	---	0.0d	0.0c	0.0c	0.0e	0.0d	0.0e
			5.8	7.8	5.6	3.9	5.9	0

[1]treatments applied July 23, 2008.

[2] % Crabgrass control rated as a visual assessment of % crabgrass per plot .

Effect of Tenacity (Mesotrione) on Preemergence and Postemergence Efficacy of Crabgrass (Digitaria spp) at Various Rates, Maturity Stages and Herbicide Combinations

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INTRODUCTION

Crabgrass (Digitaria spp) continues to be the key target among annual grassy weeds in Ohio and the Midwest in spring and summer. In the last few years, there appear to be more considerable breaks in preemergence control and more significant populations of crabgrass occurring in lawns and landscapes. The strategy for germinated and tillered crabgrass is defensive by the use of postemergence herbicides. The present arsenal of postemergence herbicides include fenoxyprop p-ethyl (Acclaim Extra), quinclorac (Drive), and Dithiopyr (Dimension). The latter postemergence herbicides are reasonably effective under certain conditions. For example, Acclaim Extra does not provide good efficacy on mature crabgrass and under low soil moisture conditions. Dimension provides best efficacy on non-tillered crabgrass. Drive has been reported to exhibit variability in crabgrass control due to possible reduced efficacy in the intermediate stage of crabgrass maturity. Thus, the lack of reliability in crabgrass control has been evident with all the latter post crabgrass herbicides at times. A new herbicide, Mesotrione (Tenacity) has been reported to exhibit both preemergence and postemergence crabgrass activity and this has been confirmed in several OSU research trials in 2006 – 2007.

OBJECTIVES

The objectives of several 2008 research trials were to: (1) determine the efficacy of Tenacity for preemergence crabgrass control (study I), (2) determine the efficacy of Tenacity as a postemergence herbicide at various stages of crabgrass maturity (study II), and (3) determine the efficacy of Tenacity as a postemergence herbicide in combination with other postemergence herbicides and a surfactant.

MATERIALS AND METHODS

Three Tenacity efficacy studies were conducted in the summer of 2008 for crabgrass control at the Ohio Turfgrass Foundation Research and Educational Facility. The experimental areas were all verticut in several directions to significantly thin the turf and then overseeded in mid April with two pounds of crabgrass seed per one thousand square feet to ensure adequate crabgrass populations and pressure. The soil type on all the areas was a silty clay loam with a pH of 7.4. Mowing was performed two times per week at a height of two inches and clippings removed. Irrigation was provided on a frequent, every day basis during crabgrass germination and establishment and thereafter, three times per week. No other herbicides were applied to the crabgrass studies. All herbicide treatments

were applied with a CO_2 pressurized sprayer equipped with two flat fan nozzles delivering two gallons of liquid per one thousand square feet. All Tenacity treatments contained MSO surfactant at 0.25% v/v.

In study I percent crabgrass cover is reported on a scale of 0% to 100% with 0% = no crabgrass cover and 100% = complete crabgrass cover. In studies II and III percent crabgrass control is reported and rated on a scale of 0% to 100% with 0% representing no control and 100% representing complete control.

Study I was initiated on April 24, 2008 for evaluation of Tenacity as a preemergence herbicide. Tenacity was evaluated at several rates and sequential applications (Table 1). Tenacity treatments at all rates and sequential applications were split with and without Barricade (prodiamine) at 0.65 lbs ai/A. Repeat or sequential applications were made on May 13 (19 days after initial treatment – DAIT). The statistical design was a randomized complete block with ten treatments and each replicated three times.

Study II evaluated the efficacy of Tenacity for crabgrass control at four different maturity stages (Table 2). Tenacity treatments were made on (1) May 29 early-post 3-5 leaf, (2) June 11 mid-post 1-2 tiller, (3) June 24 mid-post 3-4 tiller with sequential applications on July 8, and (4) August 11 late-post 5-7 tiller and beyond with sequential applications on August 26. Tenacity rates were 4, 8, 12, or 16 oz/A with repeat/sequential applications of 4oz + 4 oz and 8oz + 8oz at the 3-4 tiller and 5-7 tiller stages and beyond (Table 2).

Study III evaluated the efficacy of Tenacity for crabgrass control in combination with Dimension (dithiopyr), Acclaim Extra (fenoxyprop p-ethyl), Drive (quinclorac), and one surfactant (Dawn Ultra). All treatments were applied on August 22, 2008. Crabgrass was in the 5-7 tiller stage and beyond. In addition to percent crabgrass control, discoloration was rated on a scale of 1-9 with 1 representing severe discoloration/browning and 9 representing no discoloration relative to the untreated check.

RESULTS AND DISCUSSION

Study I (Preemergence Efficacy)

Preemergence herbicide efficacy of Tenacity is presented as percent crabgrass cover in Table 1. All Tenacity treatments were initially applied on April 24, alone and in combination with Barricade. In the untreated check, crabgrass emergence/cover became noticeable in mid to late May and increased rapidly in June and July. All Barricade treatments alone and in combination with Tenacity resulted in minimal crabgrass emergence/cover or excellent season-long crabgrass control.

Tenacity at 4 oz/A resulted in noticeable crabgrass emergence in late May (May 27 - Table 1) that was not much different from the untreated check. A repeat/sequential application of Tenacity alone at 4oz + 4oz/A resulted in a significant reduction in crabgrass emergence/cover through June (i.e. ≤ 6.7% cover), and a significant reduction in season-long control relative to Tenacity at 4oz/A alone and the untreated check.

Tenacity alone at 8oz/A resulted in no crabgrass emergence/cover until early June, providing 30-40 days of pre activity. Crabgrass cover however after early June increased rapidly at Tenacity 8oz/A alone and also did not differ much from Tenacity 4oz/A alone. Tenacity alone at 8oz + 8oz/A provided a significant reduction in crabgrass emergence/cover through June (i.e. ≤ 13.3% cover). Results were relatively similar to Tenacity alone at 4oz + 4oz/A throughout the July 15 rating period.

Study II evaluated the efficacy of Tenacity at four different crabgrass maturity stages (Table 2). Dates of application for each crabgrass maturity stage are provided in Table 2 footnotes.

At early post 3-5 leaf, Tenacity provided good postemergence crabgrass control (~ 80%) at 4oz/A and excellent crabgrass control at 8,12, and 16oz/A.

Crabgrass control at the 1-2 tiller mid-post stage was unacceptable with Tenacity at 4, 8, and 12oz/A but provided good control at the single Tenacity 16oz/A rate (i.e. ~ 80%).

Crabgrass control at the 3-4 tiller stage was good to excellent at both the multiple (sequential) Tenacity rates of 4oz + 4oz/A and 8oz + 8oz/A. Crabgrass control at the higher single rates of 12oz/A and 16oz/A was unacceptable.

Crabgrass control at the late-post 5-7 tiller stage was excellent at all Tenacity treatments at 2-3 weeks after application (i.e. 98-100%).

Study III evaluated the efficacy of Tenacity on late-post crabgrass in combination with several other postemergence herbicides and a single surfactant treatment (Dawn Ultra 1%). Both crabgrass efficacy and discoloration ratings are provided in Table 3. Tenacity alone at 5oz/A in a single treatment resulted in poor control. However, considerable whitening/bleaching of the crabgrass foliage was apparent. Herbicide efficacy of the Tenacity combinations with Dimension, Acclaim Extra and Drive were unacceptable with an overall average of between 40-50%. Discoloration ratings within a few weeks after application suggested that potential crabgrass control might occur so a second sequential application was not made. Surprisingly, the Tenacity + Dawn Ultra (1%v/v) combination resulted in excellent late postemergence crabgrass control (i.e. > 90%) in a single application.

Research is suggested for 2009 to evaluate treatment strategies to determine the efficacy of Tenacity at various crabgrass maturity stages and in combination with other herbicides, surfactants and other additives. The objective of an efficacious single postemergence application of Tenacity is a key objective. The Tenacity + Dawn Ultra combination needs to be reevaluated for both potential benefit to Tenacity efficacy and desirable species safety/phytotoxicity.

Table 1. Preemergence Crabgrass Control with Tenacity Alone or with Barricade[a]

Treatment	Rate oz/A	% Crabgrass Cover[b]					
		27-May	8-Jun	18-Jun	30-Jun	7-Jul	15-Jul
1. Untreated	--	13.3a[c]	43.3a	70.0a	71.7a	78.3a	85.0a
2. Untreated + Barricade[d]		6.7ab	0.0d	0.0f	0.0e	0.3e	1.7e
3. Tenacity	4	8.3ab	30.0b	56.7b	60.0b	75.0a	83.3a
4. Tenacity + Barricade	4	3.3ab	0.0d	0.0f	0.0e	0.0e	0.7e
5. Tenacity	4 + 4[e]	0.0b	4.0d	5.0e	6.7de	20.0d	21.7d
6. Tenacity + Barricade	4 + 4[e]	0.0b	0.0d	0.0f	0.0e	0.0e	0.0e
7. Tenacity	8	0.0b	21.7c	40.0c	50.0c	65.0b	75.0b
8. Tenacity + Barricade	8	0.0b	0.0d	0.0f	0.7e	0.7e	1.7e
9. Tenacity	8 + 8[e]	0.0b	4.0d	11.7d	13.3d	26.7c	28.3c
10. Tenacity + Barricade	8 + 8[e]	0.0b	0.0d	0.0f	0.0e	0.0e	0.7e
LSD[f]		10.8	8.0	3.4	8.5	5.3	5.9

[a] All initial treatments applied on April 24, 2008 prior to crabgrass germination

[b] Crabgrass cover was rated on a scale of 0% to 100% where 0 represents no crabgrass cover and 100 represents complete crabgrass cover

[c] Numbers followed by the same letter are not significantly different within columns

[d] Treatments were applied alone and in a split plot with Barricade applied at 0.65 lb ai/A

[e] Repeat applications made on May 13 (19 DAIT)

[f] LSD = 0.05

Table 2. Postemergence Crabgrass Control at Four Crabgrass Maturity Stages[a]

Treatment	Rate oz/A	% Crabgrass Control[b]					
Early-post 3-5 leaf		**10-Jun**	**18-Jun**	**28-Jun**	**7-Jul**	**15-Jul**	
1. Untreated	--	0.0c	0.0c	0.0c	0.0c	0.0c	
2. Tenacity	4	88.0b	88.0b	78.0b	79.3b	77.3b	
3. Tenacity	8	100.0a	100.0a	99.7a	99.7a	99.3a	
4. Tenacity	12	100.0a	100.0a	100.0a	100.0a	99.3a	
5. Tenacity	16	100.0a	100.0a	100.0a	100.0a	100.0a	
LSD		0	0	8.6	6.2	8.0	
Mid-post 1-2 tiller		**20-Jun**	**25-Jun**	**30-Jun**	**7-Jul**	**15-Jul**	**28-Jul**
6. Untreated	--	0.0a	0.0c	0.0c	0.0b	0.0b	0.0d
7. Tenacity	4	0.0a	0.0c	47.7b	66.7a	61.0a	33.0c
8. Tenacity	8	0.0a	22.0b	54.7b	68.7b	53.3a	44.3bc
9. Tenacity	12	0.0a	26.7b	57.0b	71.0a	57.0a	52.0b
10. Tenacity	16	0.0a	57.0a	82.7a	81.3a	78.3a	79.3a
LSD		0	11.9	20.1	17.8	28.8	13.9
Mid-post 3-4 tiller		**30-Jun**	**7-Jul**	**15-Jul**	**28-Jul**	**10-Aug**	
11. Untreated	--	0.0b	0.0b	0.0c	0.0d	0.0d	
12. Tenacity	4+4[c]	0.0b	0.0b	77.0b	81.3b	83.3b	
13. Tenacity	8+8	0.0b	21.0b	100.0a	100.0a	99.7a	
14. Tenacity	12	6.7a	46.7a	66.7b	56.0c	53.0c	
15. Tenacity	16	8.3a	55.7a	77.0b	52.3c	52.3c	
LSD		3.4	22.9	14.3	6.1	12.5	
Late-post 5-7 tiller and beyond		**18-Aug**	**25-Aug**	**1-Sep**	**5-Sep**	**12-Sep**	
16. Untreated	--	0.0c	0.0c	0.0d	0.0c	0.0c	
17. Tenacity	4+4[d]	0.0c	20.0b	23.3c	98.7b	98.7b	
18. Tenacity	8+8	0.0c	36.7a	43.3b	100.0a	100.0a	
19. Tenacity	12	11.7b	43.3a	63.3a	98.7b	98.7b	
20. Tenacity	16	21.7a	50.0a	70.0a	100.0a	100.0a	
LSD		2.9	13.5	7.9	0.6	0.6	

a. Early postemergence treatments applied May 29, 2008 at 35-40% crabcover, 1-2 tiller on June 11 at 65-70% crabcover ,3-4 tiller on June 24 at 75-80% crabcover, and 5-7 tiller and beyond on August 11 at 75 - 80% crabcover

b. Crabgrass control rated on a scale of 0% to 100% where 0 represents no crabgrass kill or control and 100 represents complete crabgrass kill or control.

c. Sequential (repeat) applications at 3-4 tiller stage applied July 8.

d. Sequential applications at 5-7 tiller and beyond applied on August 26.

Table 3. Tenacity and Tenacity Herbicide Combinations on Late Postemergence Crabgrass Control - 2008[a]

Treatment[b]	Rate oz/A	% Crabgrass Control [c]						
		26-Aug	31-Aug	6-Sep	12-Sep	17-Sep	23-Sep	29-Sep
Tenacity	5	0.0a (9)[d]	3.3b (6)	16.7c (5.3)	21.7d (5)	13.3d (7)	10.0d (8)	10.0d (8)
Tenacity + Dimension	5 + 16	0.0a (9)	5.0b (6)	23.3c (4.7)	46.7c (3.3)	43.3c (3)	43.3c (3.3)	43.3c (3.3)
Tenacity + Acclaim Extra	5 + 20	0.0a (9)	10.0b (6)	33.3b (5)	43.3c (4)	43.3c (4)	40.0c (5)	43.3c (5)
Tenacity + Drive	5 + 8	0.0a 6.3)	41.7a (4.3)	63.3a (4)	66.7b (4)	63.3b (6)	53.3b (5.7)	53.3b (5.7)
Tenacity + Dawn Ultra	5 + 1%	0.0a (9)	0.0b (7)	70.0a (3.7)	86.7a (2.7)	91.7a (2)	91.7a (1)	93.3a (1)
Dawn Ultra Alone	1%	0.0a (9)	0.0b (9)	0.0d (9)	0.0e (9)	0.0e (9)	0.0e (9)	0.0e (8)
Untreated	--	0.0a (9)	0.0b (9)	0.0d (9)	0.0e (9)	0.0e (9)	0.0e (9)	0.0e (9)
LSD[f]		0	10.1	9.1	14.4	10.1	8.9	9.5

[a] All treatments were initiated on August 22, 2008 with crabgrass cover uniformly 95% and at the 5 to 7 tiller stage and beyond

[b] All treatments contained MSO surfactant at 0.25 % v/v

[c] Crabgrass control was rated on a scale of 0% to 100% with 0 representing no crabrass control/kill and 100% representing complete crabgrass control/kill

[d] Discoloration ratings are provided in parentheses on a scale of 1 to 9 with 1 representing severe discoloration browning and 9 representing no discoloration relative to the untreated check

Evaluation of Compost and Compost Topdressing Programs for Enhancing the Playability and Sustainability of Established Soil-Based Athletic Turf

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Athletics fields that are under excessive use or were constructed on poor soils often present unacceptable playability and turfgrass quality. Little information is available regarding the effects of compost topdressing on the playing quality and durability of soil-based athletic fields. The purpose of this research is to evaluate how two compost types (sewage sludge bio-solid compost and yard waste compost) and a sand/compost mix used as topdressing might affect playing quality, and determine the related compost treatments and application methods that potentially can improve playability and durability of soil sports fields. Composts as soil amendment have been used for a long time. Good quality compost has been shown to improve turf characteristics especially in sand-based sports field root zones. However, few studies have reported if playability and quality improves by means of topdressing with compost in soil-based sports fields. We propose that a positive effect between compost topdressing and playability can occur based on application rates and incorporation methods. The results will provide recommendations on the potential benefits of compost use and best management compost practices for providing good quality playing conditions for sports fields under moderate management practices and traffic intensity.
The objectives of this research are:

The objectives of this compost topdressing research project are:

(i) Evaluate two compost types (sewage sludge bio-solid compost and yard waste compost) and a sand/compost mix that are considered to possess good quality compost characteristics and bulking agent.
(ii) Evaluate the potential benefits of compost topdressing to improve soil physical and chemical properties of established athletic field soils.
(iii) Evaluate the effect of compost topdressing on key playability characteristics including wear tolerance, surface hardness, turf ground cover, sod strength, and overall turfgrass color and quality.

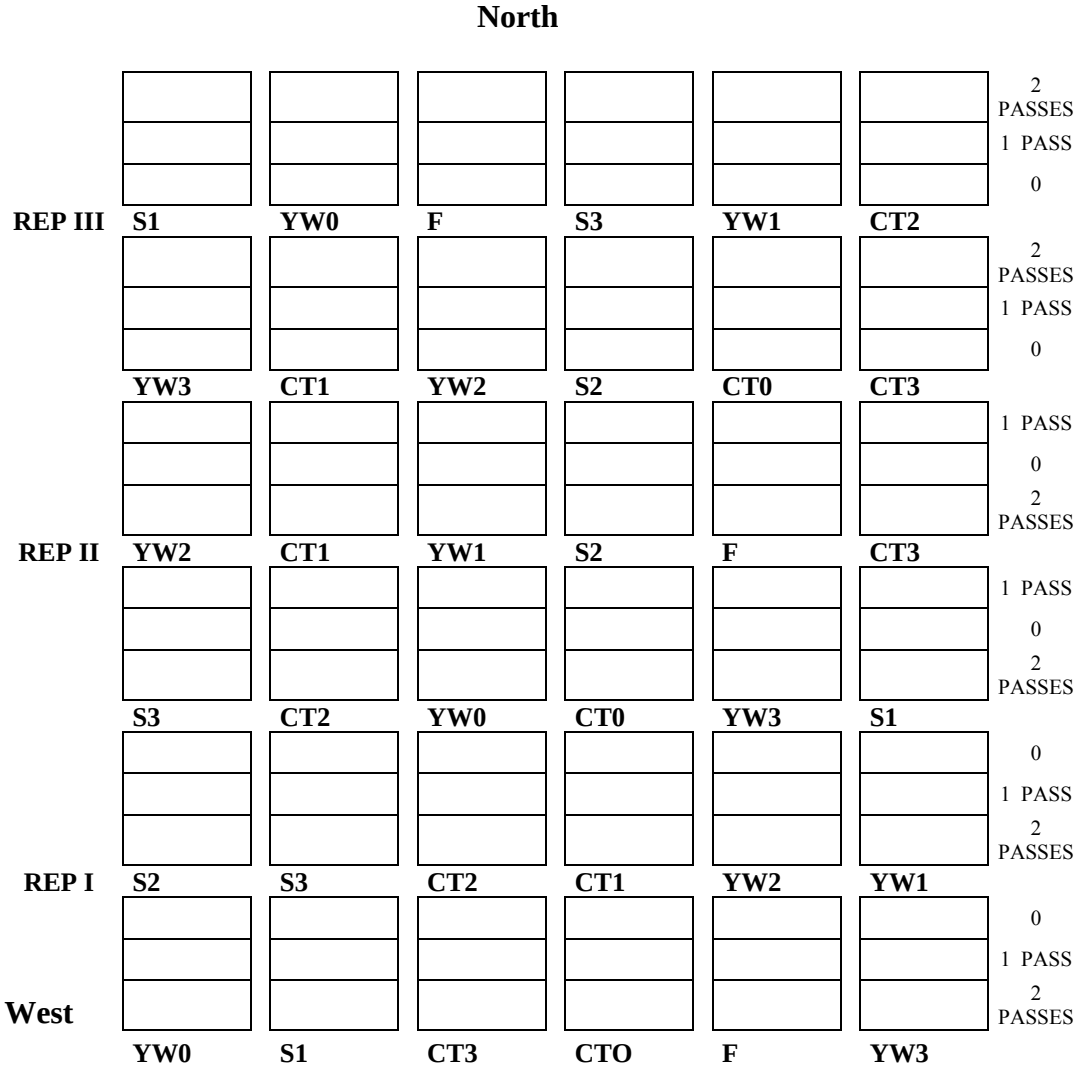
PLOT ESTABLISHMENT AND MAINTENANCE

The plots were established on June 2009 on an establish stand of improved turf-type Tall Fescue. The experimental design is a split-split plot design with three replications.

The trial will receive moderate maintenance with respect to mowing (2 1/2 inches with a Toro Sidewinder mower, 3 times a week) and irrigation (10 minutes twice a week with an automatic irrigation system). Artificial wear will be applied to simulate traffic at the equivalent of six

games per week (4 passes, three times per week) with the Brower Turfgrass wear simulator. Wear will be imposed spring and fall during periods typically of football and soccer play. No fertility program will be applied to the plots; the only exception will be a treatment with a moderate fertility program.

Compost topdressing maintenance strategies that will be evaluated include compost type, compost topdressing rate and coring intensity at the time of compost topdressing applications. The coring equipment used is a Ryan GA30 at full speed and the topdresser equipment is a Turfco Mete-R-Matic F15B. The plots were first cored then topdressed and dragged to mix cores with compost.
Plot size :5' x 9'



Field Treatments

Two compost and coring applications will be made in spring and fall of 2009 and 2010. In 2009 the first application was done on June 23 and the second application is expected to be done in late October.

Table 1. Compost Treatments and Rates

TRT	Product	Rate	Number of passes	Equipment setting
YW0	Untreated			
YW1	Yard Waste Compost (Kurtz brothers)	¼ inch	2	Heavy application , setting 4
YW2	Yard Waste Compost (Kurtz brothers)	½ inch	4	Heavy application , setting 4
YW3	Yard Waste Compost (Kurtz brothers)	1 inch	8	Heavy application , setting 4
F	Contec DG Anderson 18-9-18	3lbs N/1000 sq ft per year	1	Scotts drop spreader setting 3 1/8
S1	70/30 Sand/Com-Til	¼ inch	2	Heavy application setting 1
S2	70/30 Sand/Com-Til	½ inch	4	Heavy application setting 1
S3	70/30 Sand/Com-Til	1 inch	8	Heavy application setting 1
CT0	Untreated			
CT1	Com-Til (City of Columbus)	¼ inch	2	Heavy application , setting 4
CT2	Com-Til (City of Columbus)	½ inch	4	Heavy application , setting 4
CT3	Com-Til (City of Columbus)	1 inch	8	Heavy application , setting 4

Table 2. Coring Treatments, Ryan GA30

TRT	Number of passes	Setting
0	-	-
1x	1	1 full speed
2x	2	1 full speed

Measurements

Measurement	Equipment	Timing
Soil bulk density	Standard soil test method	2 times between applications
Soil moisture content	TDR	2 times between applications
Soil organic matter content	CLC Labs	2 times between applications
Surface evenness	To be determine	2 times between applications
Surface traction - Rotational shear strength	Canaway Turf Shear Tester	2 times between applications
Surface traction - Lateral shear strength	Clegg Turf Shear tester	2 times between applications
Surface hardness/resiliency	Clegg Impact Tester	2 times between applications
Soil nutrient status	CLC Labs	2 times between applications
Percent living turf/ground cover	NTEP Method	Every two weeks
Percent material cover	Visual evaluation	Every two weeks
Turf Color	NTEP Method	Every two weeks
Water infiltration rate	IN2-W Turf Tec-Infiltrometer	2 times between applications
Compost lab analysis	CLC Lab and Superior Labs	One time for each compost

Broadleaf Herbicide Demonstration

D.S. Gardner and E. R. Horner
Dept. of Horticulture and Crop Science, The Ohio State University

Several new herbicide active ingredients and combination products have been introduced to the market during the past few years.

Aminocyclopyrachlor
This herbicide is in development by Dupont. **Aminocyclopyrachlor** is a significant achievement in broadleaf weed control. It is active against virtually all broadleaf weeds, with the exception of oxalis and knotweed. Control of dandelion, clover and plantain is excellent. But, the unique thing about this herbicide is that it is also very effective against ground ivy, wild violet and Canada thistle. In fact, control of all 6 of these weeds is greater than 80% within 30 days and greater than 90% at 56 and 84 days after application.

What will make the introduction of this herbicide more significant is that it works nearly as well when applied as a granular formulation as it does when applied as a liquid. With most of our traditional broadleaf herbicides there is usually a decrease in performance when using the granular form compared to the liquid and sometimes this can be in excess of a 30% difference (if the liquid gives you 95% control than with some granular products applied at the same rate you get ~65-75%). In testing that has been done with Aminocyclopyrachlor there is virtually no difference in control when using the granular formulation. What makes this more significant is that you can apply this herbicide to dry turf. As long as irrigation or rainfall hits the turf within 72 hours the weed control will exceed 90% at 56 and 84 days after application. There is not a brand name yet but registration is tentatively slated for 2010.

Mesotrione
A new herbicide introduced by Syngenta under the trade name of **Tenacity™**. Mesotrione is effective both pre-and postemergence against dandelion, white clover, crabgrass, nimblewill, creeping bentgrass, orchardgrass, and many other grass and broadleaf weeds. As a broadleaf herbicide, Tenacity™ has good activity against dandelions and fair activity against clover. A second application is required in order to control certain weeds. Otherwise, one application will result in suppression of the weed, followed by regrowth in about 42-56 days. You can also improve control by combining Tenacity™ with another chemistry. Our research indicates that Tenacity™ has better activity when combined with either dicamba, fluroxypyr, or triclopyr. Our research also suggests that mesotrione does not combine well with either Quicksilver® or Dismiss® for broadleaf weed control. Tenacity™ also can be used pre- and post-emergence for control of crabgrass, on newly seeded turfgrass and for the control of perennial grasses such as Bentgrass and orchardgrass. Tenacity may be used on golf courses and sod farms. Registration in lawns and sports turf areas is pending.

Sulfentrazone
Marketed as Dismiss® herbicide and Q4® (along with 2,4-D, dicamba and quinclorac), sulfentrazone is in the same class of chemistry as carfentrazone. However, sulfentrazone is thought to have more soil activity in addition to being a contact material like carfentrazone. It also has activity on nutsedge. Sulfentrazone is also a component of the product Echelon® (combination with prodiamine). Echelon has some activity against broadleaf weeds and sedges. However, its best use is for pre and early to mid-postemergence control of crabgrass.

Pyraflufen-ethyl
This herbicide was released last year by SePro under the trade name Octane®. Similar to carfentrazone and sulfentrazone (Quicksilver® and Dismiss®, respectively), pyraflufen ethyl is a protox inhibitor and a fast acting contact herbicide. Like Quicksilver® and Dismiss® it is intended for use in a tank mix with other herbicides to control perennial broadleaf weeds like dandelion and clover. When used in tank mixes it results in faster burn-down of weed tissue without affecting long term control. One note of caution, however, is that you may want to avoid combining it with a broadleaf herbicide combination that already contains another protox inhibitor, such as Speedzone®, Powerzone®, Q4®, or Echelon®. Octane® can also be used when establishing turfgrass from seed. Consult the label for specifics. Also, this product can be used as a stand alone herbicide against young summer annual broadleaf weeds, such as knotweed, spurge, and black medic.

Penoxsulam
Dow Agrosciences is marketing this herbicide under the trade name LockUp™. LockUp™ is currently being sold in the south as an atrazine replacement in retail and lawncare. It is sold as a single entity product and not in combination. There are no plans for a stand alone product in the cool season turf market. However, Dow has received registrations for **LockUp™** in combination with 2,4-D and 2,4-D + dicamba for sale in cool-season turfgrass markets. It is formulated as a granular product. Research at Ohio State indicates that penoxsulam, especially when combined with 2,4-D and/or dicamba, provides good control of dandelions when used in early spring.

New Combination Products For Weed Control
Many new combination products have been formulated in an attempt to control both broadleaf weeds and grassy weeds postemergence with a single application. Some of these products also will control yellow nutsedge. Quinclorac is of course not new, but increasingly quinclorac is appearing in combination products, not just for crabgrass control, but also for broadleaf weed control, particularly clover. The previously mentioned herbicide Q4® (2,4-D, dicamba, quinclorac, sulfentrazone) was the first product of this type and is effective when used on broadleaf weeds, nutsedge, and crabgrass. **Solitare®** is a new herbicide from FMC. It combines quinclorac and sulfentrazone, but at higher rates. The result is excellent control of broadleaf weeds, sedges and crabgrass. **Quincept®** combines 2,4-D, dicamba, and quinclorac and thus controls both crabgrass and broadleaf weeds. **Onetime®** herbicide combines MCPP, dicamba, and quinclorac and also controls both crabgrass and broadleaf weeds.

While not formulated to control crabgrass or nutsedge, **4 Speed** (2,4-D, MCPP, dicamba, and pyraflufen) and **4 Speed XT** (2,4-D, dicamba, triclopyr, and pyraflufen) herbicides give

excellent control of broadleaf weeds. Another new product is **Spoiler®**, which combines 2,4-D, MCPP, and 2,4-DP.

Plot Plan:

N➔

1	2	3	4	5	6	7	8	9	10

Treatments Applied July 22

	TREATMENT	RATE PER ACRE
1.	Untreated	
2.	Aminocyclopyrachlor (2SL)	6 fl oz
3.	Aminocyclopyrachlor (.05G)	200 lb
4.	Tenacity	8 fl oz
5.	LockUp + 2,4-D + Dicamba	175 lb
6.	Solitare	20 fl oz
7.	Quincept	8 pints
8.	Onetime	4 pints
9.	4 Speed	4 pints
10.	4 Speed XT	4 pints

Broadleaf Herbicides and Combination Products

Products	2,4-D	2,4-DP	MCPA	MCPP	Dicamba	Clopyralid	Fluroxypyr	Quinclorac	Triclopyr	Carfentrazone	Sulfentrazone	Pyrfaflufen
Formula 40, Dymec, Weedone LV4, Weedar 64, LESCO A-4D, Weeddestroy AM-40, Opti-Amine, Harball, Barrage HF	✓											
MCPP 4-Amine, Lescopex, Turfgro MCPP 4K, Mecomec 2.5, Mecomec 4				✓								
2 Plus 2	✓			✓								
Banvel, Diablo, Vanquish					✓							
Four-Power Plus, Super D Weedone	✓				✓							
Trimec Classic, Trimec 899, Trimec 992, Trimec LAF-637, Strike 3, Three Way Selective, Trimec Bent, Bent Selective, Triplet WS, Triplet SF, Trexsan, Mec-Amine-D, Mec Amine-BG, Trimec Plus[1]	✓			✓	✓							
MCPA 4-Amine			✓									
Tri-Power, Trimec Encore			✓	✓	✓							
Weedone DPC, Turf D-DP	✓	✓										
Trimec Turf Ester, Super Trimec, Brushmaster	✓	✓			✓							
Three Way Ester, Tri-ester, Tri-amine, Dissolve, Spoiler	✓	✓		✓								
Tri-ester II, Tri-amine II		✓	✓	✓								
Turflon									✓			
Chaser, Chaser 2, Turflon II amine	✓								✓			
Cool Power, Horsepower			✓		✓				✓			
Lontrel						✓						
Chaser Ultra			✓		✓	✓						
Confront						✓			✓			
Momentum	✓					✓			✓			
Battleship			✓			✓			✓			
Millenium Ultra 2, Millenium Ultra Plus[1]	✓				✓	✓						
Spotlight							✓					
Chaser Ultra 2		✓	✓				✓					
Battleship III			✓				✓		✓			
Momentum FX, Momentum FX2	✓						✓		✓			
Escalade, Escalade 2, Escalade Low Odor	✓				✓		✓					
Strike Three Ultra 3	✓	✓					✓					
Drive								✓				
Onetime				✓	✓			✓				
Quincept	✓				✓			✓				
Quicksilver										✓		
Shutout	✓			✓						✓		
Speedzone	✓			✓	✓					✓		
Powerzone			✓	✓	✓					✓		
Dismiss											✓	
Surge	✓			✓	✓						✓	
Q4	✓				✓			✓			✓	
Octane												✓
4 Speed	✓			✓	✓							✓

Recommended Herbicides for Broadleaf Weed Control

Weed Species	Preemergence									Postemergence											
	Bensulide	Ethofumesate	Benefin	Pendimethalin	Prodiamine	Dithiopyr	Siduron	Oxadiazon	Isoxaben	Mesotrione[1]	2,4-D	2,4-DP	MCPA	MCPP	Dicamba	Clopyralid	Fluroxypyr	Triclopyr	Quinclorac	Carfentrazone	Sulfentrazone	Pyraflufen
Summer Annual Broadleaf Weeds																						
Black Medic						✓								✓	✓	✓	✓		✓			
Carpetweed					✓	✓					✓			✓	✓							
Common Mallow														✓	✓	✓						
Corn Speedwell			✓	✓		✓		✓								✓						
Knotweed				✓	✓	✓			✓					✓	✓							
Lambsquarters	✓				✓				✓													
Oxalis (Yellow Woodsorrel)				✓	✓	✓		✓	✓		a	a				b		b				
Pigweed					✓	✓		✓	✓	✓	✓			✓								
Pineappleweed						✓										✓						
Prostrate Spurge				✓	✓	✓		✓	✓	✓	✓	✓		✓	✓							
Purslane		✓		✓	✓	✓		✓	✓	✓					✓							
Virginia Pepperweed											a			a	a							
Winter Annual Broadleaf Weeds																						
Common Chickweed		✓	✓	✓		✓			✓					✓	✓							
Common Groundsel								✓			a			a	a							
Henbit	✓		✓	✓	✓	✓			✓						✓			✓				
Prickly Lettuce											a			a	a							
Shepard's Purse	✓				✓	✓			✓													
Sowthistle (Annual)										✓					✓							
Biennial and Perennial Broadleaf Weeds																						
Birdsfoot trefoil														✓		✓	✓					
Blackseed Plantain											✓			✓		✓		✓				
Buckhorn Plantain											✓			✓		✓		✓				
Bull Thistle															✓	✓						
Canada Thistle											✓				✓	✓						
Chicory															✓							
Creeping Speedwell (Veronica)											✓			✓					✓			
Curly Dock											✓				✓	✓						
Dandelion										✓	✓		✓		✓			✓	✓	✓		
Field Bindweed																			✓			
Ground Ivy (Creeping Charlie)											a			a	a			✓				a
Indian Mock Strawberry											a			a	a							
Mouse-ear Chickweed														✓	✓	✓						
Red Clover														✓		✓	✓					
White Clover										✓				✓	✓	✓	✓		✓			
Wild Carrot											a			a	a							
Wild Violet															✓	✓		✓				
Yarrow															✓							

[1] Mesotrione can be used pre- or post-emergence against annual and perennial broadleaves.

Where the recommendation is denoted by a letter, the combination of herbicides with the same letter is recommended.

Best Choice

Effective

Tenacity Herbicide For Control of Creeping Bentgrass

D. S. Gardner and E. R. Horner
Dept. of Horticulture and Crop Science, The Ohio State University

A new herbicide introduced by Syngenta under the trade name of **Tenacity™**. Mesotrione is effective both pre-and postemergence against dandelion, white clover, crabgrass, nimblewill, creeping bentgrass, orchardgrass, and many other grass and broadleaf weeds. It has been available in agriculture for many years and has a very distinctive mode of action. It inhibits carotenoid pigment synthesis and results in a bleaching of the affected tissue which causes the target weed to turn white. Tenacity may be used on golf courses and sod farms. Registration in lawns and sports turf areas is pending.

One of the difficulties that turf managers face when establishing turf from seed is competition from weeds. Tenacity™ has excellent safety on Kentucky bluegrass, perennial ryegrass, and tall fescue. In fact, research conducted at Ohio State shows that Tenacity™ can be applied at seeding and results in no visible injury beyond 7 days after emergence nor any reduction in establishment rate.

Tenacity™ is the first turfgrass herbicide that results in rapid, easy to visualize reductions in weedy perennial grasses. Tenacity™ has activity against a variety of perennial grassy weeds, including creeping bentgrass. Multiple applications are required. Some phytotoxicity has been reported when repeated applications are made to perennial ryegrass. However, this problem can be minimized by applying in cooler weather and also by avoiding making sequential applications too close together. Best control, according to most research, of creeping bentgrass is achieved if three applications are made on 21 day intervals.

Plot Plan:

N➔

1	2	3	4	5	6	7	8	9	10

Initial Treatments Applied July 15

	TREATMENT	DATE APPLIED
1.	Untreated	
2.	Tenacity 5 fl oz/A	July 15
3.	Tenacity 5 fl oz/A+NIS†	July 15
4.	Tenacity 5 fl oz/A+NIS	July 22
5.	Tenacity 5 fl oz/A	July 29
6.	Tenacity 5 fl oz/A+NIS	July 29
7.	Tenacity 5 fl oz/A+NIS	Aug 5
8.	Tenacity 5 fl oz/A+NIS	July 15 + July 29
9.	Tenacity 5 fl oz/A+NIS	July 15 + Aug 5
10.	Tenacity 5 fl oz/A+NIS	July 22 + Aug 5

† NIS – Non ionic surfactant (methylated seed oil) 2%v/v

2007 Low Input Sustainable Turfgrass Trial: A Regional Cooperative Research Project

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OVERVIEW

A trial is being conducted at 14 institutions throughout the Midwest in order to indentify turfgrass species that are most capable of performing under low maintenance conditions. The species included in this evaluation are based on the most recent LIST study results. This study will evaluate multiple cultivars of each species that performed well in order to determine if cultivar differences exist at a low-input level (3" mowing height, no fertilizer or irrigation after establishment, no pesticides). Our objective is to identify species that can perform as acceptable turf under low-input.

MATERIALS AND METHODS

The trial was planted as a randomized complete block design with 3 replications (25 plots per rep, 75 plots total). Individual plot size was 3' X 5'. Plots were established using a typical fall seeding procedure. In order to ensure successful establishment, a starter fertilizer was used at seeding (approx 1.5 lb P_2O_5/1000 ft^2). The trial was irrigated during fall establishment. No pesticides were used at any time. A total of 10 species was used for this trial. More than one cultivar was evaluated for several of the species.

The trial was mowed monthly at a height of 3 inches during the growing season, clippings returned. No irrigation, fertilizer, or pesticides were applied. A soil test was conducted at the beginning of each growing season in order to assess pH and soil nutrition.

DATA COLLECTION

Persistence and uniformity are the two primary criteria to determine quality for each plot. Turfgrass quality, and stand density data are being collected monthly during the growing season (April-Oct) following the NTEP protocol (1-9 scale, 9=greatest quality). Additionally, establishment vigor was evaluated on a 1-9 scale eight weeks after seeding, and during the first week of May 2008. When disease occurs, the disease is being identified and % plot affected recorded. Diseases not identifiable in the field are being sent to a turfgrass disease diagnostic laboratory. Data will be collected for two full growing seasons (the study will end in the fall of 2009).

Figure 1. Plot Plan for 2007-2009 Low Input Sustainable Turfgrass Trial

N➔

19	7	3	24	1	16	25	9	11	23	12	20	5	13	17	10	14	21	2	6	15	18	4	8	22
10	23	21	12	5	6	15	17	13	11	18	22	19	8	4	25	2	1	20	24	7	3	14	9	16
2	7	12	18	20	1	8	5	9	6	23	4	24	22	11	21	25	16	10	14	3	17	13	19	15

Table 1. Cultivars included in 2007 LIST trial

	Species	***Cultivar***
1	Kentucky bluegrass	Diva
2	Tall fescue	Rebel Exeda
3	Tall fescue	Falcon IV
4	Tall fescue	Barlexas II
5	Hard fescue	SR 3150
6	Hard fescue	Predator
7	Hard fescue	Firefly
8	Hard fescue	Reliant IV
9	Chewings fescue	Intrigue
10	Chewings fescue	Jamestown II
11	Chewings fescue	Culumbra II
12	Tufted hairgrass	SR 6000
13	Tufted hairgrass	ShadeChamp
14	Tufted hairgrass	Barcampsia
15	Prairie junegrass	SRK
16	Prairie junegrass	Barleria
17	Texas bluegrass hybrid	Bandera
18	Texas bluegrass hybrid	Thermal Blue
19	Texas bluegrass hybrid	Dura Blue
20	Colonial bentgrass	Barking
21	Colonial bentgrass	Revere
22	Idaho bentgrass	Spike
23	Sheeps fescue	Azure
24	Sheeps fescue	Barok
25	Sheeps fescue	Azay

The Effects of Trinexapac-ethyl (TE) on Cool-Season Grass Seed Germination and Establishment

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AIMS

1. To determine if TE has any adverse effects on cool-season grass germination and establishment
2. To determine if TE had any effect on the incidence of seedling diseases

MATERIALS AND METHODS

Native soil was broadcast seeded with perennial ryegrass (Lolium perenne) at 12 lbs/1,000 sq.ft. and Kentucky bluegrass (Poa pratensis) at 4 lbs/1,000 sq.ft. and lightly raked in. TE was applied, either as Primo MAXX liquid or granular Governor. Perennial ryegrass TE rate = 1.0 fl. oz. K. bluegrass TE rate = 0.5 fl. oz. equivalent. Primo was applied using a hand-held CO_2 powered boom and Governor was broadcast by hand onto wet leaf tissue or soil. Irrigation was applied on a syringing cycle 5 x daily until germination, and then to replenish ET rates and maintain healthy growth.
Fertilizer schedule: 7/16/08: 13-28-13 @ 1lbs N/1,000 sq.ft and 8/5/08: 21-4-11 @ 0.75 lb N/1,000 sq.ft. Granular Subdue fungicide applied (25 oz/M) to half of the plots & watered in 7/18/08 and 7/29/08. Weather statement: July was a dry month, with day-time temperatures ~ 90°F. Mowing height: 2.5 inches, clippings returned.

Treatments (Figure 1 below): The study was initiated on July 16th, 2008 and then repeated on October 6th 2008

The Effect of Trinexapac-ethyl on the Establishment of Perennial Ryegrass and Kentucky Bluegrass Seed 2008

Pamela J. Sherratt, John R. Street and A. Drake

R1	10	2	3	4	5	6	7	8	9	1	11	12	13	14	15	16	17	18
R2	11	18	12	16	1	13	14	17	15	7	4	10	9	5	8	2	6	3
R3	8	5	3	10	7	9	2	4	6	17	14	12	16	1	15	18	11	13

Subdue / No Subdue

Perennial Ryegrass Treatments:

1. Primo 1 day before seeding
2. Governor 1 day before seeding
3. Primo at seeding (wet seed)
4. Governor at seeding
5. Primo at germination
6. Governor at germination
7. Primo 7 days after germination
8. Governor 7 days after germination
9. Untreated

Kentucky Bluegrass Treatments:

10. Primo 1 day before seeding
11. Governor 1 day before seeding
12. Primo at seeding (wet seed)
13. Governor at seeding
14. Primo at germination
15. Governor at germination
16. Primo 7 days after germination
17. Governor 7 days after germination
18. Untreated

Location: Zone 13 East Field
Plots size: 3'x10'. 1' borders between reps
Irrigated to replenish ET & mowed at 2 inches
Treatments began: 16th July 2008
PRG seeding rate: 12 lbs/1,000 sq.ft
KB seeding rate: 4 lbs/1,000 sq/ft.
Primo MAXX® (liquid) and Governor™ (dispersible granule) label rates: 0.6 fl.oz/M Kentucky bluegrass, and 1.0 fl.oz/M Perennial ryegrass

RESULTS

TE Effects on Seed Germination and Establishment

TE had no adverse effect on seed germination, establishment and subsequent percent ground cover of perennial ryegrass and Kentucky bluegrass turf (Tables 1). Kentucky bluegrass was typically slow to establish and therefore infested with weeds like crabgrass, goosegrass and nutsedge.

Table 1. Number of Plants at Three Weeks after Germination*

Perennial Ryegrass	July (first study)	November (repeat study)
Primo 1 day before seeding	8 (50)	6 (39)
Gov 1 day before seeding	7 (44)	6 (39)
Primo at Seeding	9 (56)	9 (56)
Gov at Seeding	9 (56)	7 (44)
Primo at Germination	5 (29)	8 (50)
Gov at Germination	9 (56)	8 (50)
Primo 7 days after germination	9 (56)	10 (63)
Gov 7 days after germination	5 (29)	6 (38)
Untreated	9 (56)	10 (63)
LSD (0.05)	3	3
Kentucky Bluegrass		
Primo 1 DBS	3 (21)	3 (21)
Gov 1 DBS	5 (29)	3 (21)
Primo at Seeding	3 (21)	4 (25)
Gov at Seeding	2 (14)	4 (25)
Primo at Germination	3 (21)	4 (25)
Gov at Germination	3 (21)	4 (25)
Primo 7 DAG	4 (25)	4 (25)
Gov 7 DAG	4 (25)	3 (21)
Untreated	4 (25)	2 (14)
LSD (0.05)	NS**	3

*Plant count using point quadrant with 16 reference points (percent cover in parenthesis)
**NS= Not significant at LSD 0.05

In addition to seed germination and percent ground cover, TE had no adverse effect on seedling turf density, color and overall quality. In fact, Primo Maxx improved color

Subdue Fungicide Effect on Seed Germination and Establishment

Note: Data was taken just from perennial ryegrass plots as Kentucky bluegrass had not established very well due to weed pressure

Disease Incidence: There were no signs of seedling disease (pythium, brown patch etc.) for the duration of the July study or the repeat study in October.

Growth & Quality: The application of Subdue fungicide significantly improved seedling growth and quality in the first study in July (Table 2). The study was repeated in October but there were no Subdue effects on either visual quality/density or point quadrant counts.
Tissue Nitrogen: Tests were conducted on seedlings from the July study. Subdue plants contained 3.76% N and the non-Subdue plants contained 3.16% N.

Table 2. The Effects of Subdue Fungicide on Clipping Yield, Sward Height and Quality of Spring-Established Perennial Ryegrass

Treatment	Clipping Yield (g) 33 DAS* (8/19/08)	Sward Height (mm) 18 DAS 8/11/08	Quality (1-9)** 34 DAS (8/20/08)
Subdue Applied			
Primo 1 day before seeding	4.16	37	6.3
Gov 1 day before seeding	5.76	40	5.1
Primo at seeding	3.99	37	5.3
Gov at seeding	5.64	35	5.0
Primo at Germination	2.80	28	5.0
Gov at Germination	2.61	30	5.6
Primo 7 days after germination	2.82	28	5.3
Gov 7 days after germination	2.97	32	5.3
Untreated	7.73	35	5.3
No Subdue Applied			
Primo 1 day before seeding	1.83	28	4.0
Gov 1 day before seeding	0.09	25	4.6
Primo at seeding	0.38	22	4.6
Gov at seeding	0.02	23	4.3
Primo at Germination	0.16	20	4.0
Gov at Germination	0.02	20	4.3
Primo 7 days after germination	0.01	20	4.6
Gov 7 days after germination	0.09	20	3.3
Untreated	0.15	26	4.3
LSD (0.05)	-	12	1.5

*DAS = days after seeding
**Quality based on NTEP rating, with 1 representing poorest and 9 representing best

CONCLUSSIONS

- Trinexapac-ethyl did not adversely affect germination and establishment of either perennial ryegrass or Kentucky bluegrass
- Primo MAXX somewhat improved turfgrass seedling quality (color/density)
- Applications of granular Subdue fungicide in the July study significantly improved color, density, growth and overall quality. The improved color was due to an increase in tissue nitrogen as percent tissue N was greater in the plants that received a Subdue application.
- The quality of the Subdue plants was such that the author feels the turf was 'playable' in 4 weeks, as opposed to 6 weeks which is typically suggested for perennial ryegrass turf. Having turf playable quickly is critical for athletic turf managers with heavily trafficked fields.
- Subdue had no effect in the October study, suggesting that Subdue may be suppressing soil pathogens that have an adverse effect on turf growth when soils are at a critical temperature
- The Subdue portion of this study is being repeated in 2009 to further examine the role that Subdue can play in enhancing turfgrass establishment during warm temperatures

References

(1) Bell, G. E., Danneberger, T. K., McDonald, M. B., (1997). Chemical inhibition of cool season turfgrass germination. International Turfgrass Society Research Journal. 8 (Part 1): p. 411-417.

(2) Bingaman, B., Christians, N. E. and Gardner, D.S. (1997). The effects of Trinexapac-ethyl on perennial ryegrass seedlings. *Iowa Turfgrass Research Report*. p. 38-40.

Organic & Synthetic Fertilizer Study (2009-2013)

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AIM

To evaluate the effect of organic and synthetic fertilizer on the quality of Kentucky bluegrass turf and soil organic matter content

MATERIALS AND METHODS

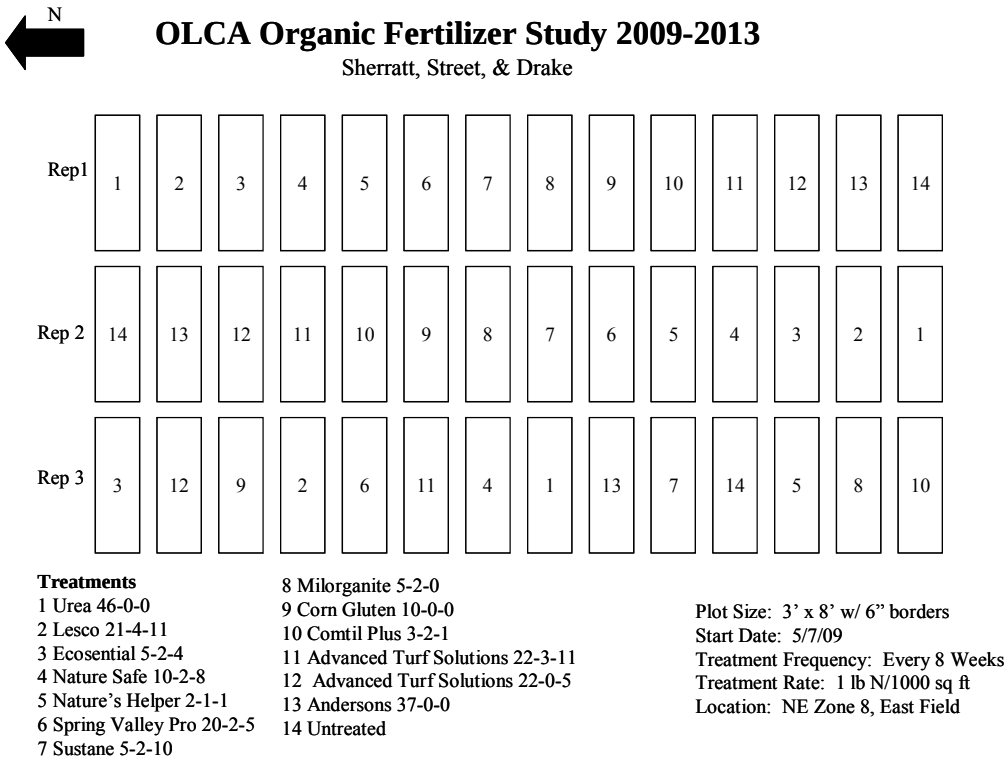
Common "Kenblue" Kentucky bluegrass turf mowed 1/week at 3 inch (75 mm) height with a rotary mower. Clippings returned. Organic &/or synthetic fertilizers applied every eight weeks, commencing May 7thth, 2009. See plot plan below for fertilizer treatments. Measurements: Turf quality (density, color, weed infestation, disease incidence etc.), soil chemical analysis (macro and micronutrients, nitrate nitrogen), tissue nitrogen analysis, and soil organic matter content.

PRELIMINARY RESULTS

- Soil is a clay loam/clay (27% sand, 33% silt, 40% clay)
- Soil pH 7.7
- Soil organic matter 3.9% (low-medium)
- P, K, Ca, and Mg all in the sufficient range.
- Tissue Nitrogen 2.4% (low range)

Turf quality (color, density, uniformity) to date has been ranked as follows:

ATS 22-0-5 > ATS 22-3-11 > Spring Valley Professional > Urea > Andersons 37-0-0 > Lesco 21-4-11 > Sustane > Corn Gluten > Ecosential > Nature Safe > Nature's Helper > Comtil Plus > Untreated



Nitrogen Economics

The study will address cost of nitrogen source and turf quality. For example, corn gluten meal costs $4.50/lb N versus $1.25/lb N for urea, but factors to consider include soil health and turf quality obtained by these nitrogen sources over time.

Effects of Trinexapac-ethyl (TE) on the Wear Tolerance of Kentucky Bluegrass under Traffic

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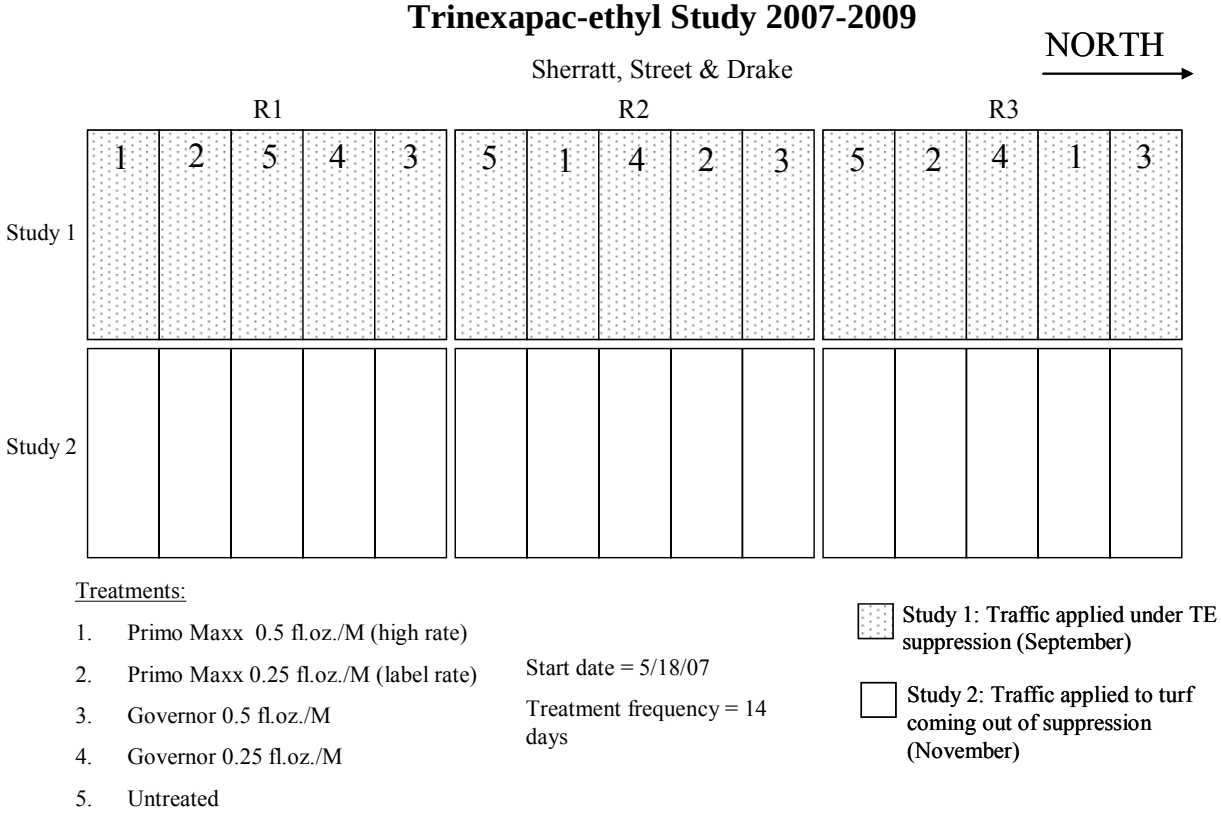
AIM

To evaluate the effect of the growth regulator trinexapac-ethyl (TE) on the quality and wear tolerance of Kentucky bluegrass turf under traffic

MATERIALS AND METHODS

There were two studies:
(1) Traffic applied to turf under TE suppression, and
(2) Traffic applied to turf coming out of TE suppression, 6 weeks after final TE application.
Kentucky bluegrass turf maintained at 2 inch (50 mm) mowing height and mowed 1/week. Clippings returned. Fertilizer applied at a rate of 3.0lb N/1,000sq.ft/season. Irrigation applied as necessary to maintain healthy turf. TE applications made every 2 weeks as a dispersible granule (Governor), or a liquid (Primo Maxx). See plot plan below for TE treatments and rates.

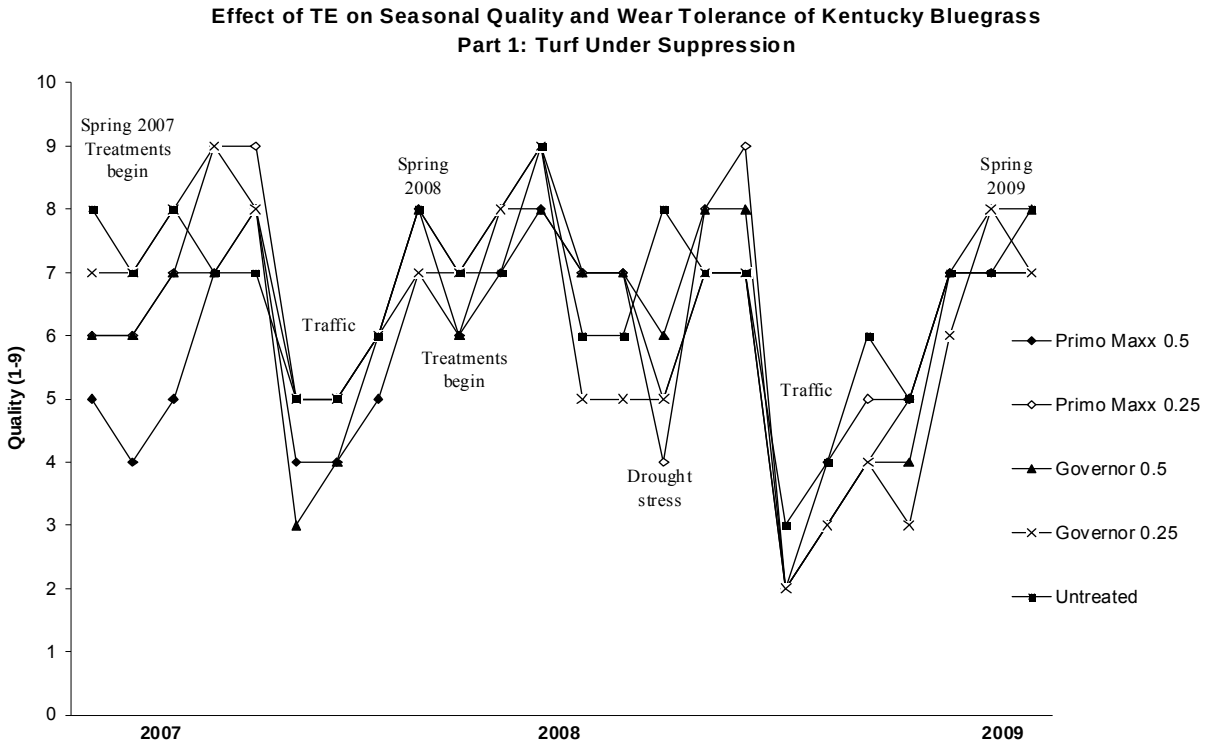
Trinexapac-ethyl Study 2007-2009



PRELIMINARY RESULTS

For both Study 1 and Study 2, clippings were reduced by 50-80% with the label and high TE rates respectively. Turf color, density and texture were significantly improved by applications of TE.

Results Study 1: Wear Applied to Turf under TE Suppression (Figure 1 below):



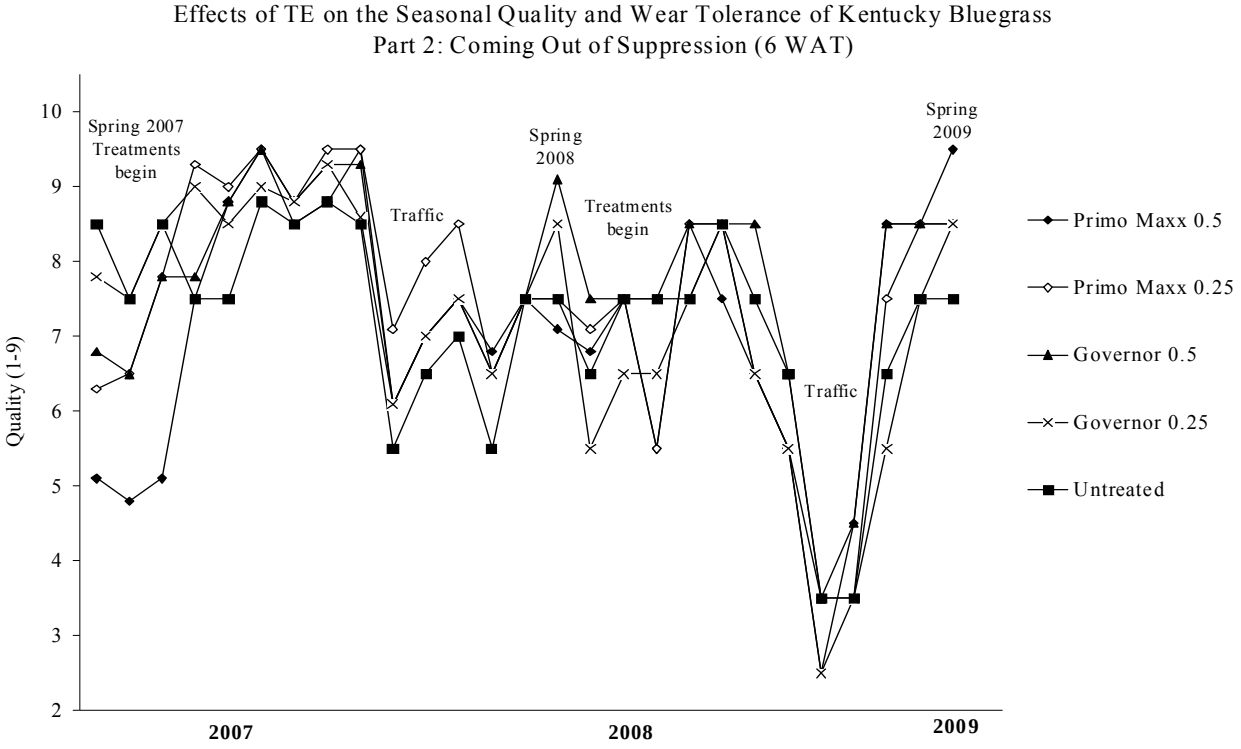
- At the onset of applications each spring, TE caused some minor phytotoxicity. After four applications (8 weeks), TE significantly enhanced turfgrass quality (density, color, uniformity)
- In August 2008, during an irrigation break-down, TE caused some phytotoxicity
- Label rate TE (0.25 oz every two weeks) had no detrimental effect on traffic tolerance.
- High rate TE (0.50 oz every two weeks) did not respond well to traffic.
- Label rate Primo Maxx and high rate Governor did not adversely affect turf recuperation after traffic
- High rates of TE slowed down the recuperation process.
- In both May 2008 and May 2009, several months after the last TE application made the previous September, label rate TE appreciably enhanced spring green-up and turf quality

OTHER OBSERVATIONS/COMMENTS

Varieties of Kentucky bluegrass appeared to respond differently to one another when TE was applied. Some were suppressed more than others.

Applications of TE appeared to suppress or prevent adjacent white clover from encroaching onto the plots

Results Study 2: Wear Applied to Turf Coming out of TE Suppression (Figure 2 below)



- At the onset of applications each spring, TE caused some minor phytotoxicity. After four applications (8 weeks), TE significantly enhanced turfgrass quality (density, color, uniformity)
- In August 2008, during an irrigation break-down, TE caused some phytotoxicity
- Label rate TE displayed some improved wear tolerance
- Label rate TE offered the greatest recuperative potential
- In May 2008, several months after the last TE application made the previous September, all TE treatments displayed enhanced spring green-up and turf quality
- In May 2009, several months after the last TE application made the previous September, both rates of Primo Maxx and the high rate of Governor displayed enhanced spring green-up and turf quality
- During 2009, the label rate of Governor did not enhance either turf quality or traffic tolerance, suggesting that rates may need to be higher for the same response seen with Primo Maxx

In summary, TE reduced clippings by ~ 50% and improved turf quality. TE applied every 2 weeks at label rate had no detrimental effect on traffic tolerance or recuperative potential. Turf coming out of TE suppression had enhanced recuperative potential. TE applied in the fall expedited spring green-up the following year.

Effects of Fertilizer, Fungicide and Seaweed Extract on the Establishment and Quality of Bermudagrass Grown on Sand

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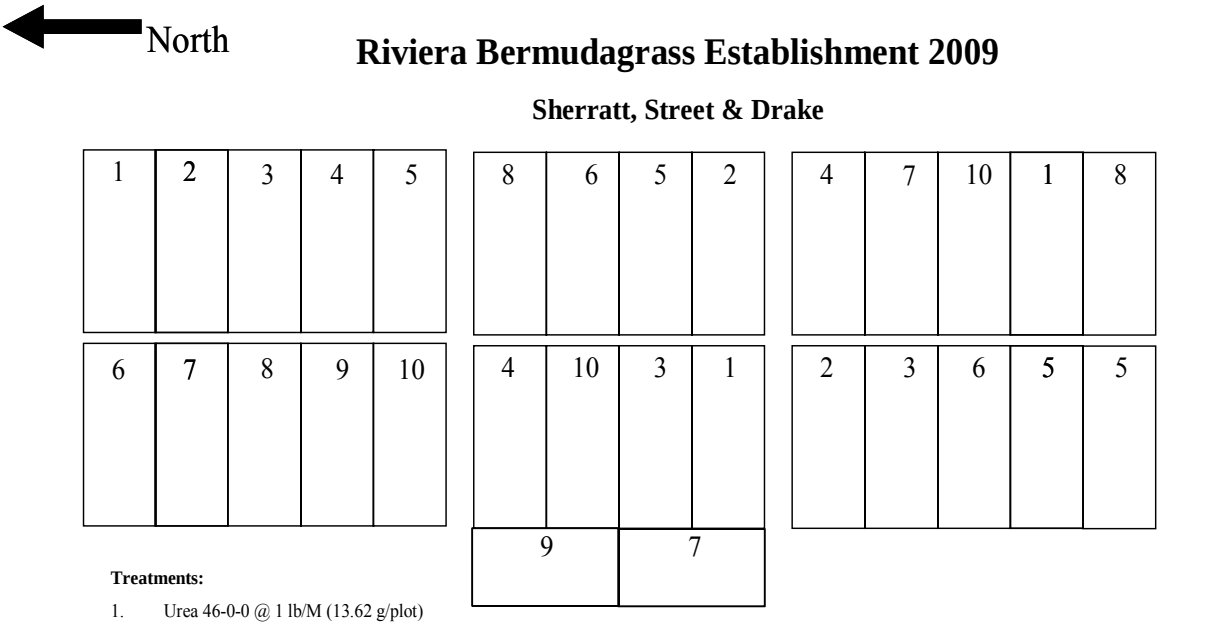
Establishing turfgrass on a sand rootzone can be a challenge, particularly a warm-season turf like Bermudagrass that does not favor spring and early summer temperatures in Ohio. A study was carried out to determine if there were fertilizer, fungicide or biostimulant products that could expedite the establishment process.

Material and Methods: Riviera Bermudagrass was broadcast seeded at 1 lb/1,000 sq.ft onto a sand rootzone. Some mature Riviera turf was also present (~20% cover). Starter fertilizer 12-24-8 was applied at 1 lb N/1,000 sq.ft. Treatments (see Figure 1 below) were applied June 11th, 2009. Plots are irrigated to maintain healthy growth and turf mowed at 1-inch height.



Treatments:

1. Urea 46-0-0 @ 1 lb/M (13.62 g/plot)
2. Triple Super P 0-46-0 @ 1 lb/M (13.62 g/plot)
3. TSP 0-46-0 @ 2 lb/M (27.3 g/plot)
4. KMag 0-0-22 @ 1 lb/M (37 g/plot)
5. Granular Subdue (25 oz/M = 12.6 g/plot)
6. Maxicrop (1:1000) (3.8 mls/gal)
7. BioPack Southwest Landmark (1 tsp/0.5 gal)
8. Nutriplant + surfactant (5.32 and 6.25 mls/ 2 L bottle)
9. Nutriplant alone (5.32 mls/ 2 L bottle)
10. Untreated

Location: Bermudagrass Sand RZ

Seed & Fertilizer date: 6/9/9

TRTM date: 6/10/9

Plot size: 3 x 6

Results to date would suggest that urea 46-0-0 is by far the best available resource for enhancing Bermudagrass establishment. However, at print time the study is only six weeks old.

Golf Ball Type, Golf Course Architecture and Green Speed

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Technological development of all equipment in golf has forced changes on golf course architects in a range of ways. The most staggering changes have been large increases in golf course lengths to take into account changes in club head speed, professional golfer conditioning, and course conditioning, all which have improved dramatically in the last 25 years. The sloping of greens complexes has had to be reduced to allow for pin placements and it is now considered a maximum of 2° is all that can be allowed to reduce the possibility of balls rolling off greens. In general there has been little attention paid to the golf ball surface and as ball makers look to gain a share in a global market worth hundreds of millions of dollars. There are a range of golf ball surfaces and dimple designs that are currently on the market which all claim to have an impact on playability in different ways.

Three golf ball surfaces standard spherical, dimple in dimple and hexagonal were chosen for this study. The balls were also split into construction types, two, three and four piece types. The golf balls were also used based on dimple numbering <300 per ball, 330 – 359 per ball and 360>. Three locations in central Ohio, PGA tour prepared, country club prepared and public course prepared type surfaces were used. Golf ball gravitational centers or 'sweet spots' were found using centrifugal force (Technasonik, Check-Go Pro) to equalize all balls prior to testing. Two types of green speed meters were used, the USGA standard Stimpmeter and a privately produced version (Pelzmeter, Pelz Golf Institute). The experiment was set up in a randomized block design with a sleeve of each ball (x3) being used along with both speed meters and replicated twice per location except the public course surface due to weather restrictions where one block was run. Golf balls were weighed after testing of green speeds. Greens slopes varied between 0.2% and 0.9% not going higher than 1% in any location.

Analysis of the data indicated that as expected there was a difference between all three locations and so superintendents need to avoid doing direct comparisons with courses close by who may have different budgets and different agronomic practices. Speeds at the Tour prepared course averaged at 13 ft 7 inches, country club 11 ft 6 inches and public course 8 ft 6 inches. Dimple shape did not have any effect on ball roll or distance while there was variation between the private speed measure and the stimpmeter with less deviation found when human error was removed in the stimpmeter. Ball construction and dimple number also had no effect on speed differences. Golf ball weights were found to be different with differences of 0.3g found in some instances while average distance was not significantly affected by the weight change it may have affected the accuracy of the speed overall.

The main issue noted was that at even 0.5% slope some numbers on the tour prepared course reached above 18 ft. These numbers are a problem and as golf courses continue to be prepared to higher and higher standards superintendents may need to become more involved in construction to try and prevent creation of areas which will become unplayable. On another point the use of stimpmeters is important and maintenance of the equipment is important as using them for weed removal and practicing putting can cause damage and lead to inaccurate results – in some cases reducing the actual green speed readings. Heights of cut also play a large role with a difference of less than .1 of an inch causing large differences in green speeds.

Influence of Golf Ball Type and Stimpmeter on Putting Green Ball Roll

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For better or worse, ball roll or green speed is an important aspect in high quality putting green surfaces. Both agronomic and turf equipment advances over the last 30 years has lead to an increase in ball roll of in some cases over 3 feet (Gilhuly, 2005). Most ball roll studies have focused on agronomic practices to increase ball roll. Little research has been conducted on the impact of golf equipment technology, specifically golf ball design and construction, on ball roll.

OBJECTIVES

1) Determine the impact of construction, surface design, and weight on ball roll.
2) Compare ball roll measurements between the USGA Stimpmeter and Pelzmeter.

MATERIALS AND METHODS

Ball roll measurements were taken at Muirfield Village Golf Club (MVGC) in Dublin, Ohio, The Country Club at Muirfield Village (TCC) in Dublin, Ohio, and the Ohio Turfgrass Research and Educational Facility (OTF) in Columbus, Ohio. The sites at MVGC and TCC were the practice putting greens. The practice putting green at MVGC was a blend of Penn "A1", "A4", and "G6" single cut at 0.09 inch with a Toro Greensmaster Flex 21 mower and rolled prior to ball roll measurements. The practice putting green at TCC was a mix of creeping bentgrass and Poa annua single cut at 0.12 inch with a Jacobsen E-walk prior to ball roll measurements. The OTF research green was comprised of "Penncross" creeping bentgrass single cut at 0.17 inch with a with a Toro Greensmaster Flex 21 mower. The greens at the 3 locations were USGA greens constructed. The average ball roll at the time of the study was 13' 7", 11' 6", and 8' 6", for MVGC, TCC, and OTF, respectively.

The golf balls chosen for the study varied in their construction, surface, and dimple number[1]. The golf ball construction type evaluated was two, three and four piece. The dimple or surface pattern evaluated included the standard spherical, dimple in dimple, and hexagonal. In addition, the number of dimples (<300, 300 – 359, and > 360) on the golf balls were evaluated. The gravitational center of each golf ball was found using centrifugal force (Technasonik, Check-Go Pro) prior to testing.

Ball roll determinations were made with the USGA stimpmeter and the Pelzmeter (Pelz Golf Institute). The experiment was set up in a randomized block design with a sleeve of each ball (x3) being used along with both speed meters and replicated twice per location except at OTF due to weather restrictions where one block was run. The green slopes along the test areas did not exceed 1 percent (0.2 to 0.9%) as determined with a Machlanburg-Duncan Smart Leveler. Upon completion of the study the golf balls were weighed.

RESULTS

1) Golf ball construction, and dimple pattern had no significant (P = 0.05) effect on ball roll

2) The weight of the balls varied among and between brands. Golf balls within the same brand (sleeve) varied in weight as much as 0.3 grams. However, no significant (P = 0.05) effect on ball weight and roll was found.
3) No significant difference (P = 0.05) was detected in ball roll between the USGA stimpmeter and the Pelzmeter. There was however less variation among the three balls directionally rolled with the Pelzmeter.

[1] Callaway Tour i, Callaway HXHot, Maxfli VT2, Nike Karma, Srixon SoftFeel, Srixon Trispeed, TaylorMade PRed, Titleist ProVI, Top Flight XL Plus, Top Flight D2, Top Flight Gamer

Acknowledgement:
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Shade Management of Cool Season Turfgrasses

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Shade stress on turfgrasses causes leaf elongation and reduced energy availability for growth. Decreased quantity or photosynthetic photon flux density (PPF) and quality or the red: far red light ratio (R:FR) of light affects the morphology of turfgrass plants by increasing production of giberellic acid and reducing available non-structural carbohydrates. There are increased levels of water found within the leaf tissue and lower use of nitrogen has been indicated as a potential management strategy. Turfgrasses are affected by different shade conditions, buildings and non biological shade reduces light intensity while trees and competition from plants and weeds affect the spectral composition. Lawncare managers must be cognizant of the different light situations that may exist in their home lawns and alter their management accordingly.

In shade conditions created by trees and biological conditions reduced rates of nitrogen are encouraged, studies have been carried out to determine which source of nitrogen (N) is best suited to retaining turfgrass quality in shade and investigate if the plant growth regulator trinexapac-ethyl [4-(cyclopropyl-α-hydroxy-methylene)-3,5-dioxo-cyclohexane carboxylic acid ethyl ester] (TE) (Syngenta AG, Switzerland) can delay loss of quality of bentgrass under tree shade. The N treatments included $(NH_2)_2CO$, $Ca(NO_3)_2$ and $(NH_4)_2SO_4$ foliarly applied weekly at a rate of 0.43g m^{-2}, TE was applied bi-weekly at 0.3975 L ha^{-1}. TE was effective in reduced PPF conditions and R:FR conditions. It was equally efficient in both light environments suggesting that prior shade research using NS on creeping bentgrass is relevant to shade management in private industry. Applications of $(NH_2)_2CO$ increased total chlorophyll content, otherwise few differences were observed due to nitrogen. The use of Primo is not recommended on rough blue grass (*Poa trivialis*), tall fescue (*Festuca arundinicea*) or sheeps fescue (*Festuca ovina*) however as there is a strong phytotoxic response from Trinexapac ethyl applications.

The use of reduced nitrogen rates decreases excess levels of shoot production and thus reduces the loss of cover seen under trees. The nitrogen source has a role but lower rates are considered to be of higher importance. Issues that occur with trees and must be taken into account are water requirements – tree roots have been found to be extremely competitive and will pull water from great distances. Irrigation changes may be required in warm conditions for home owners and companies should discuss increases in water application around tree roots.

Lawncare managers should also take into account the tree types which exist in the homeowner's landscape. Interactions between tree roots and surrounding surfaces can be negative, black walnut and eastern hemlock are examples of problem trees. Production of toxic compounds around the tree roots may lead to loss of surface quality, Kentucky bluegrass (*Poa pratensis*), Perennial ryegrass (*Lolium perenne*) and some fescues have the potential to impact development of newly planted trees and prior to planting companies should make sure if there is any possible interactions to be concerned about.

Shade management brings a host of problems but with careful management and accounting for all the variations that occur lawncare managers can produce high quality shaded conditions.

Impact of Signature® Fungicide on Bentgrass Leaf Structure in Shade

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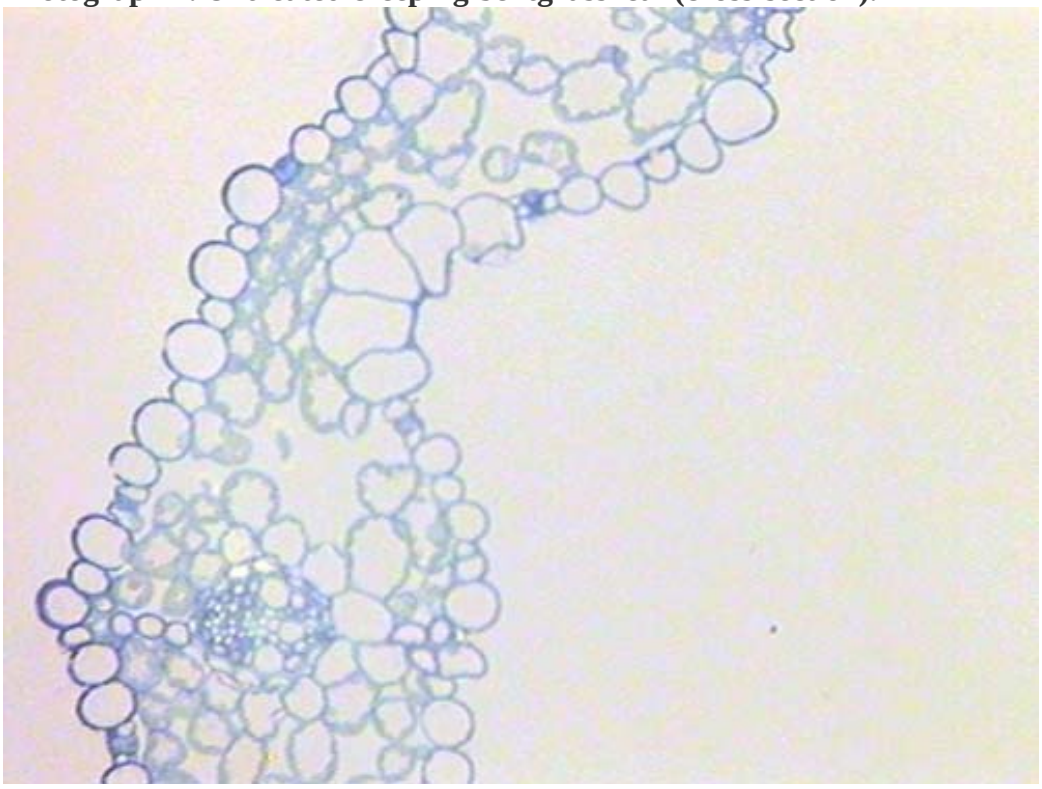
Dept. of Horticulture and Crop Science, The Ohio State University

Many factors contribute to summer bentgrass decline including high temperature, high humidity, excessive soil moisture, poor air movement, poor soil aeration, and excessive organic matter accumulation. Although no pathogen has been specifically identified with summer bentgrass decline, Aliette Signature (fosetyl aluminum), Daconil (chlorothalonil) or Fore (mancozeb) in combination or alone have been reported to improve creeping bentgrass quality during summer stress times. The reason(s) for the improved quality is not well understood.

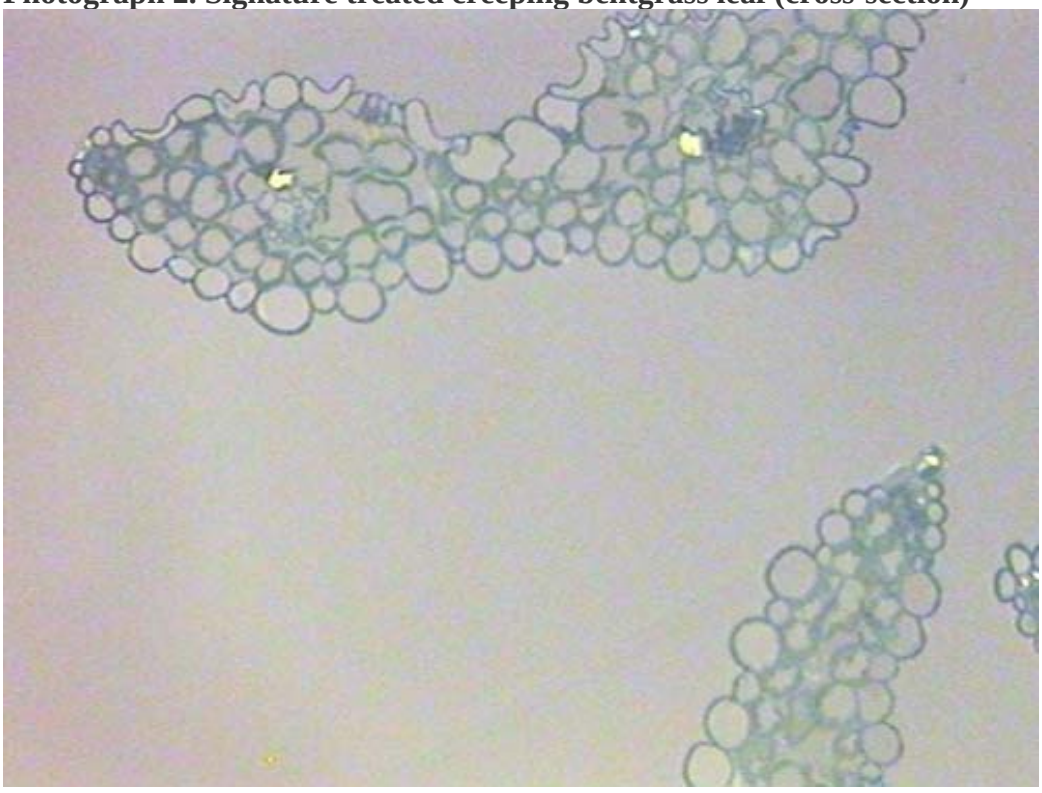
Last year we set up a study on a 2 year creeping bentgrass turf mowed at 0.5 inches (1.25 cm) under heavily shaded conditions. The treatments - Aliette® and Aliette Signature® were applied at 4 oz/1000 sq.ft each on a 2 week schedule starting May 15th and ending on August 8th. The study was laid out in a randomized complete design. Plant samples were taken on August 11th and leaf cross sections were made.

What we found is rather striking. In the control or untreated photograph (top) the leaf cells are typical of the response you would expect under low light conditions – thin cell walls, poor structure and gaps among the cells. In the Aliette Signature treated plants the leaf cross sections look like the type of cells that you would find under full sun conditions (bottom). It appears at this time in the study that repeated applications of Aliette Signature impacts positively the morphological characteristics of the plant, maybe making it more stress tolerant. We are rather cautious on these results in that the data collected were from only one year.
The study is being repeated this year to see if the results are reproducible. Treatment applications were initiated on May 20, 2009. Repeated applications are made on a 14-day schedule.

Photograph 1. Untreated creeping bentgrass leaf (cross-section).



Photograph 2. Signature treated creeping bentgrass leaf (cross-section)



Evaluation of Fungicides for the Control of Dollar Spot in Creeping Bentgrass Fairways, 2007

J. W. Rimelspach, T. E. Hicks, and M. J. Boehm
Dept. of Plant Pathology, The Ohio State University

The test was conducted at The Ohio State University Turfgrass Research Center, Columbus, OH on a stand of creeping bentgrass (*Agrostis palustris* 'Penncross') established in 1983. Mowing height was 0.50-in. with clippings removed and the area was irrigated as needed. The condition of the sward was good with fair color, minimal thatch and good density. A single fertilizer application of 18-5-11 at 0.125 lb N/1000 sq ft was made 4 Apr. The soil was Crosby B silt loam, pH 7.3. Treatment plots measured 3 ft x 5 ft with 1 ft alleys between plots, and 2 ft between blocks, and were arranged in a randomized complete block design, with four replications. All treatments were initiated on 15 May and ended 17 Jul. Applications were made with a hand-held, CO_2-powered boom sprayer using 6503 TeeJet nozzles at a pressure of 40 psi, (water equivalent to 2.0 gal water/1000 sq ft) for all treatments. Applications were made at 21 day intervals. Data was transformed by arcsine square root (y) and analyzed using analysis of variance with Tukey's HSD (Honestly Significant Difference) least significant difference (LSD) (α=0.05). Visual counting of dollar spot infection centers were taken weekly. The average maximum and minimum air temperatures (°F) and total precipitation (in.) for each month respectively were: May 80.7, 49.1, and 0.30; Jun 83.5, 57.8 and 3.48; Jul 84.2, 58.7 and 3.81; and Aug 89.7, 64.1 and 2.67.

Dollar spot was moderate at the beginning of the study, became severe by 6 Jun, declined due to unfavorable environmental conditions until 28 Jun and then remained severe until the end of the study. The Tartan treatments (1.5 and 2.0 fl oz) performed well and reduced the disease to acceptable levels with a single application. After the second application all treatments provided acceptable control and maintained control throughout the study. No phytotoxicity or growth regulation effects were noted.

Treatment, formulation, and rate per 1000 sq ft	Interval (days)	Number of dollar spot infection centers/plot*				
		31 May	6 Jun	18 Jun	28 Jun	11 Jul
Unsprayed control	-	21 a	84 a	27 a	96 a	100 a
26/36 Fungicide 60.7SC 4.0 fl oz	21	8 ab	32 ab	0 b	0 b	1 b
Cleary's 3336 PLUS 19.4SC 4.0 fl oz	21	4 ab	21 ab	0 b	0 b	1 b
Tartan 280SC 1.5 fl oz	21	0 b	3 b	0 b	0 b	0 b
Tartan 280SC 2.0 fl oz	21	0 b	3 b	0 b	1 b	0 b
Headway 1.3ME 1.5 fl oz	21	0 b	7 ab	0 b	2 b	0 b

* The number of dollar spot infection centers were counted in each plot, numbers represent mean of four replicated treatments; mean followed by different letters are significantly different, data was transformed by arcsine square root (y) and analyzed using analysis of variance with Tukey's HSD (Honestly Significant Difference) with a least significant difference (LSD) (α=0.05).

Evaluation of Early Fungicide Applications for the Control of Dollar Spot in Creeping Bentgrass Fairways, 2008

J. W. Rimelspach, T. E. Hicks, and M. J. Boehm
Dept. of Plant Pathology, The Ohio State University

The test was conducted at The Ohio State University Turfgrass Research Center, Columbus, OH on a stand of creeping bentgrass (*Agrostis palustris* 'Penncross') established in 1983. Mowing height was 0.50-in. with clippings removed and the area was irrigated as needed. The condition of the sward was good with fair color, minimal thatch and good density. A single fertilizer application of 18-5-11 at 0.5 lb N/1000 sq ft was made 4 Apr. The soil was Crosby B silt loam, pH 7.3. Treatment plots measured 6 ft x 10 ft with 1 ft alleys between plots, and 2 ft between blocks, and were arranged in a randomized complete block design, with four replications. All treatments were initiated on 23 Apr and reapplied on 2 Jun. Applications were made with a hand-held, CO_2-powered boom sprayer using 6503 TeeJet nozzles at a pressure of 40 psi, (water equivalent to 2.0 gal water/1000 sq ft) for all treatments. Data was transformed by arcsine square root (y) and analyzed using analysis of variance with Tukey's HSD (Honestly Significant Difference) least significant difference (LSD) (α=0.05). Visual counting of dollar spot infection centers were taken weekly. The average maximum and minimum air temperatures (°F) and total precipitation (in.) for each month respectively were: May 70.5, 48.2, and 2.78; Jun 82.8, 61.3 and 8.70; Jul 84.5, 62.7 and 1.28.

Dollar spot was not active at the beginning of the study. The disease became active in early May with the development of symptoms and continued to increase in severity throughout the study. All treatments gave satisfactory disease control for 9 weeks and Tourney + Daconil and Emerald gave exceptional disease suppression to 11 weeks. No phytotoxicity or growth regulation effects were noted.

Treatment, formulation, and rate per 1000 sq ft	Apps 23 Apr & 2 Jun	Number of dollar spot infection centers/plot*					
		13 May	9 Jun	16 Jun	25 Jun	1 Jul	9 Jul
Unsprayed control		10 a	15 a	70 a	80 a	79 a	150 a
Tourney 50WP 0.37 oz.		0 b	1 a	21 b	4 b	23 b	9 b
Tourney 50WP 0.37 oz + Daconil Ultrex 82.5WG 3.25 oz		0 b	1 a	16 b	1 b	17 b	2 c
Emerald 70WG 0.18 oz		0 b	0 a	9 b	2 b	6 b	3 c
Banner Maxx 1.3ME 1.0 fl oz + Daconil Ultrex 82.5WG 3.25 oz		0 b	1 a	31 b	3 b	23 b	5 cb

* The number of dollar spot infection centers were counted in each plot, numbers represent mean of four replicated treatments; means followed by different letters are significantly different, data was transformed by arcsine square root (y) and analyzed using analysis of variance with Tukey's HSD (Honestly Significant Difference) with a least significant difference (LSD) (α=0.05).

Evaluation of Products for the Control of Dollar Spot in Creeping Bentgrass Greens, 2008

J. W. Rimelspach, T. E. Hicks, and M. J. Boehm
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The test was conducted at The Ohio State University Turfgrass Research Center, Columbus, OH on a stand of creeping bentgrass(*Agrostis palustris* 'Providence') greens established in 1996. Mowing height was 0.17-in. with clippings removed and the area was irrigated as needed. The condition of the sward was good with fair color, minimal thatch and good density. Fertilizer applications consisted of 0.75 lb N/1000 sq ft 15Apr from 7-7-7 and 0.3 lb N/1000 sq ft 9 May from 9-9-9. The root zone material was an USGA 85:15 mix of sand and municipal waste compost, pH 7.9. Treatment plots measured 3 ft x 6 ft with 0.5 ft alleys between plots, and 0.5 ft between blocks, and were arranged in a randomized complete block design, with four replications. All treatments were initiated on 2 Sep and ended on 30 Sep. Applications were made with a hand-held, CO_2-powered boom sprayer using 6503 TeeJet nozzles at a pressure of 40 psi, (water equivalent to 2.0 gal water/1000 sq ft) for all treatments. Data was transformed by arcsine square root (y) and analyzed using analysis of variance with Tukey's HSD (Honestly Significant Difference) least significant difference (LSD) (α=0.05). Visual counting of dollar spot infection centers were taken weekly. The average maximum and minimum air temperatures (°F) and total precipitation (in.) for each month respectively were: Aug 84.3, 60.8, and1.42; Sep 80.5, 57.0 and1.77.

Dollar spot was not present at the beginning of the study but developed symptoms after the initiation of the applications and continued to increase in severity until late Sep. Daconil Ultrex at the 7 day interval gave a high degree of consistent disease management. Dewcure also provided very significant disease suppression in the study. No phytotoxicity or growth regulation effects were noted.

		Number of dollar spot infection centers/plot*			
Treatment, formulation, and rate per 1000 sq ft	App. Interval (days)	12 Sep	17 Sep	23 Sep	3 Oct
Untreated Control	-	19 a	37 a	45 a	42 a
EXP 40WG 1.0 oz	7	12 ab	28 ab	27 a	27 a
EXP 40WG 2.0 oz	14	8 ab	22 ab	28 a	27 a
EXP 40WG 4.0 oz	14	11 ab	27 ab	28 a	32 a
Daconil Ultrex 82.5WG 1.8 oz	7	2 b	2 b	1 c	0 c
Daconil Ultrex 82.5WG 3.2 oz	14	0 b	10 c	10 b	4 b
Dewcure 1.5 % V/V	14	1 b	13 bc	5 b	3 b

* The number of dollar spot infection centers were counted in each plot, numbers represent mean of four replicated treatments; means followed by different letters are significantly different, data was transformed by arcsine square root (y) and analyzed using analysis of variance with Tukey's HSD (Honestly Significant Difference) with a least significant difference (LSD) (α=0.05).

Evaluation of Products for Turfgrass Color and the Control of Dollar Spot in Creeping Bentgrass Greens, 2008

J. W. Rimelspach, T. E. Hicks, and M. J. Boehm
Dept. of Plant Pathology, The Ohio State University

The test was conducted at The Ohio State University Turfgrass Research Center, Columbus, OH on a stand of creeping bentgrass (*Agrostis palustris* 'Providence') greens established in 1996. Mowing height was 0.17-in. with clippings removed and the area was irrigated as needed. The condition of the sward was good with fair color, minimal thatch and good density. Fertilizer applications consisted of 0.75 lb N/1000 sq ft 15Apr from 7-7-7 and 0.3 lb N/1000 sq ft 9 May from 9-9-9. The root zone material was an USGA 85:15 mix of sand and municipal waste compost, pH 7.9. Treatment plots measured 3 ft x 6 ft with 0.5 ft alleys between plots, and 0.5 ft between blocks, and were arranged in a randomized complete block design, with four replications. All treatments were initiated on 12 Jun and ended on 4 Sep. Applications were made with a hand-held, CO_2-powered boom sprayer using 6503 TeeJet nozzles at a pressure of 40 psi, (water equivalent to 2.0 gal water/1000 sq ft) for all treatments. Data was transformed by arcsine square root (y) and analyzed using analysis of variance with Tukey's HSD (Honestly Significant Difference) least significant difference (LSD) (α=0.05). Visual counting of dollar spot infection centers were taken weekly. Turfgrass quality rated on a scale of 1-9. The average maximum and minimum air temperatures (°F) and total precipitation (in.) for each month respectively were: Jun 82.8, 61.3 and 8.70; Jul 84.5, 62.7 and 1.28; Aug 84.3, 60.8, and 1.42.

Dollar spot was present at a modest level at the beginning of the study and persisted. Autograph + Kestrel + Pegasus 3.6 oz had high turfgrass quality ratings. Autograph + Kestrel + Pegasus 2.0 oz and both Signature Ultra + Banner Maxx + Daconil Weather Stik treatments had excellent dollar spot control and turfgrass quality ratings.

Treatment, formulation, and rate per 1000 sq ft	Appl. Interval (days)	Number of dollar spot infection centers/plot*				Turfgrass color quality**		
		12 Jun	1 Jul	31 Jul	6 Aug	1 Jun	6 Aug	22 Aug
Untreated control……..	-	10 a	28 a	30 a	34 a	5 c	6 a	3 c
Autograph 70DF 4.57 oz + Kestrel 14.3ME 2.0 oz + Pegasus HPX 54WP 2.0 oz……..	14	5 a	3 cd	0 c	0 b	7 ab	7 a	9 a
Autograph 70DF 4.57oz + Kestrel 14.3ME 2.0 oz + Pegasus HPX 54WP 3.6 oz……..	14	12 a	4 bcd	0 c	0 b	8 a	8 a	9 a
Signature Ultra 80WG 4.0 oz + Banner Maxx 1.3SC 2.0 fl oz + Daconil Weather Stik 6F 2.0 fl oz...	14	6 a	2 d	1 c	0 b	7 abc	7 a	9 a
Signature Ultra 80WG 4.0 oz + Banner Maxx 1.3SC 2.0 fl oz + Daconil Weather Stik 6F 3.6 fl oz...	14	11 a	4 bcd	1 c	0 b	7 ab	7 a	9 a
EXP 82.5DF 3.24 oz + EXP 80DG 4.0 oz……	14	8 a	11 bc	12 b	5 b	6 abc	7 a	6 b
Signature Ultra 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.25 oz…	14	12 a	14 b	10 b	2 b	6 bc	7 a	8 a

* The number of dollar spot infection centers were counted in each plot, numbers represent mean of four replicated treatments; means followed by different letters are significantly different, data was transformed by arcsine square root (y) and analyzed using analysis of variance with Tukey's HSD (Honestly Significant Difference) with a least significant difference (LSD) (α=0.05).
** Turfgrass color quality on a 1 to 9 scale, where 9=highest color quality and 6=acceptable

Control of the Turfgrass Ant, *Lasius neoniger*, on Ohio Golf Courses

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Department of Entomology, The Ohio State University
Ohio Agricultural Research Center & Ohio State Extension

Lasius neoniger is commonly called the turfgrass ant because it is one of the most common inhabitants of turfgrass in northeastern North America. On golf courses, the ant throws up volcano-shaped mounds of soil. On golf greens and tees, this mounding can kill the short cut turf, interfere with play and dull mower blades prematurely. Applications of insecticides with short residual activity (e.g., Dursban and pyrethroids) often stop mounding activity for two to three weeks. Unfortunately, these treatments only kill foraging workers and the mounding activity soon begins again because most of the colony survives, including the queen and brood (larvae).

Recent control tests using neonicotinoid insecticides have shown significant reductions in mounding activity five to eight weeks after an application. This suggests that these insecticides are either reducing food sources or they are slowly acting within the colony to kill the brood and/or queen. With this in mind, we have tried alternate application timing such as late fall and early spring applications.

Fall applications appear to significantly reduce colony activity the following season but spring applications continue to need several weeks to achieve control. The combination product, Aloft (contains clothianidin plus bifenthrin), seems to be able to quickly reduce mounding activity as well as provide long-term action

Table 1. Control of *Lasius neoniger* mounds in plots treated Fall 07 (30 Oct) and Fall 08 (7 Nov), Crockett's Green Hills Executive Course Clyde, OH.

Treatment/[a] Formulation	Rate	% Cont/[b] 9May08	% Cont 12Jun08	% Cont 18Jul08	% Cont 29Aug08	% Cont 21May09
Aloft SC	7.2 oz/A	87.7	94.3	94.4	95.3	96.0
Aloft SC	14.4 oz/A	100.0	88.6	97.2	90.7	90.0
Meridian 25 WG	0.26 lbAI/A	98.8	95.7	95.8	95.3	84.0
Arena 50WG	0.25 lbAI/A	88.9	95.7	95.8	94.4	96.0
Talstar F	0.2 lbAI/A	35.8	31.4	26.8	26.2	0.0

[a] Treatments applied using CO_2 sprayer to plots 15 x15ft, replicated 4x.
[b] Data taken by counting mounds from center 5 ft x 10 ft area of each plot. Percent control based on average mounds in check plots.

Table 2. Control of *Lasius neoniger* mounds in plots treated Fall 07 (30 Oct), Spring 08 (1 May) and Fall 08 (7 Nov), Crockett's Green Hills Executive Course Clyde, OH.

Treatment/[a] Formulation	Rate	% Cont/[b] 9May08	% Cont 12Jun08	% Cont 18Jul08	% Cont 29Aug08	% Cont 21May09	% Cont 5Jun09
Aloft SC	7.2 oz/A	100.0	94.0	99.2	93.2	82.5	95.3
Aloft SC	14.4 oz/A	100.0	81.2	93.2	95.8	75.3*	75.0*
Meridian 25 WG	0.26 lbAI/A	94.7	97.0	96.1	98.9	95.0	93.5
Arena 50WG	0.25 lbAI/A	94.7	97.0	100.0	89.5	98.0	87.5
Talstar F	0.2 lbAI/A	8.9	0.0	0.0	6.3	21.6*	1.7*

[a] Treatments applied using CO_2 sprayer to plots 15 x15ft, replicated 4x.
[b] Data taken by counting mounds from center 5 ft x 10 ft area of each plot. Percent control based on average mounds in check plots.
* Plots NOT retreated in 2009.

Table 3. Control of *Lasius neoniger* mounds in plots treated Spring 08 (1 May) and Spring 09 (21 May), Crockett's Green Hills Executive Course Clyde, OH.

Treatment/[a] Formulation	Rate	% Cont/[b] 9May08	% Cont 12Jun08	% Cont 18Jul08	% Cont 29Aug08	% Cont 21May09	% Cont 5Jun09
Aloft SC	7.2 oz/A	97.9	71.8	84.4	84.4	75.6	94.5
Aloft SC	14.4 oz/A	100.0	89.1	83.7	76.9	95.0	98.2
Meridian 25 WG	0.26 lbAI/A	61.0	94.4	93.9	94.7	85.7	76.1
Arena 50WG	0.25 lbAI/A	44.0	73.0	98.0	94.7	83.2	81.2
Talstar F	0.2 lbAI/A	14.9	7.5	0.0	8.9	62.2	94.0

[a] Treatments applied using CO_2 sprayer to plots 15 x15ft, replicated 4x.
[b] Data taken by counting mounds from center 5 ft x 10 ft area of each plot. Percent control based on average mounds in check plots.

ODA Rule Changes That Affects Turf/Landscape Applicators

Effective April 3, 2009, the Ohio Department of Agriculture implemented rule changes to the turf category definition and commercial recordkeeping requirements. They are to be commended for reworking some areas that have historically been confusing for applicators and making them more user friendly. And, as a result, these changes should help applicators keep in compliance with state regulations.

First, the definition of commercial category 8 (turf) was expanded to allow commercial turf applicators to make herbicide applications to ornamental beds in the landscape. Previously, an applicator with the turf category could not control weeds around/in ornamental beds near the turf without an additional category (6c or 6A) on his/her license. Now individuals who have category 8 do not need to obtain additional certification in category 6c.

Secondly, the items that all commercial turf/landscape applicators must keep for all their applications were simplified. The main area of change was how to record the rate of pesticide applied. Now, applicators must record the total amount of each pesticide product used and, if diluted, the total volume of use dilution applied. Below is the complete list of what commercial (non-structural) pest control records must include:

a) Name of responsible commercial applicator and names of the trained servicepersons applying pesticides under the commercial applicator's direct supervision
b) Name and address of person contracting for service
c) Date of application
d) Type and size of area to be treated
e) Location or field identification number of treatment area if different than the address in (b)
f) Trade name (brand name) and EPA registration number of pesticides used
g) Total amount of each pesticide product used
h) If diluted, total volume of use dilution applied
i) Type of equipment used
j) Time of day of application, including the time of starting the actual application and the time of the completion of application or, if uncompleted, the time when operations ceased for the day
k) Wind direction, velocity and air temperature

Changes were also made to commercial structural pest control record requirements for pest control applicators. The complete changes are listed on ODA's website at:
http://www.agri.ohio.gov/apps/odaprs/pestfert-PRS-index.aspx

Remember, commercial applicators must keep records of all pesticide applications they make including spot treatments. And, records must be kept on all pesticides whether they are restricted or general use and that includes homeowner products if they are used commercially. Applications to public sites such as schools, daycare, hospitals and golf courses etc are considered commercial applications and must be recorded.

Joanne Kick-Raack
State Program Director
Pesticide Education Program
Ohio State University Extension

Sending Turfgrass Samples to OSU Plant and Pest Diagnostic Clinic

J. W. Rimelspach, and M. J. Boehm
Dept. of Plant Pathology, The Ohio State University

The C. Wayne Ellett Plant and Pest Diagnostic Clinic (PPDC), at The Ohio State University is a cooperative unit involving personnel from Plant Pathology and Entomology and have responsibilities in extension, research, and teaching. The Clinic supports extension agents, industry, and homeowners by identifying and diagnosing plant diseases and disorders, insects, weeds and environmental problems. Samples arrive from turf managers, landscapers, golf courses, athletic fields, and many other associates working in the green industry.

If a problem is suspected send a sample from the declining area to the Plant and Pest Clinic as soon as the symptoms begin, also send a completed turf sample form or letter describing the symptoms and the history of the site. **Turf sample forms** and information about **fees for samples** can be obtained online at http://ppdc.osu.edu/

1) Dig an area at least 6" x 6" with the soil and roots attached, or send several sections of turf to show the abnormal pattern in question. Select samples to illustrate both dying and healthy turf. Diagnosticians will examine the most recently infected turf, as pathogens progress from dying turf to healthy turf. If only dead grass is sent, often there is little to diagnosis.
2) Wrap the sample tightly with newspaper or tin foil, **do NOT use plastic, and do NOT add water.**
3) Place in a box and add ample packing material so that the sample does not move in the box.
4) Complete the turf form (go online if you need a form at **http://ppdc.osu.edu/)** and place a plastic bag to keep dry and send with the sample.
5) Photos and a wonderful help to see the over all condition of the turf area.
6) Send overnight or as soon as possible, as turf decomposes quickly. Avoid sending over weekends.

Complete the Turfgrass Form, noting the symptoms on the turf, the shape and size of the patches, the amount or size of the affected area, and when the problem began. List the temperature and climate when the problem began, and if it has occurred in the past. Is the turf irrigated? Is the problem worse in the sun or shade? The form also asks if the turf is newly seeded or sodded, or if it is an established lawn. Other important considerations especially for golf courses and sod farms are the cultural practices done and fertilizers and pesticides applied. Describe the rate and formulation of each chemical applied, and when each was applied. Also, mention if growth regulators were used. These questions are on the PPDC Turf form, which you can also be obtained from us or your local county OSU Extension Office.

The more information provided to us, the more complete the reply. The PPDC must have sufficient background information to determine all of the factors which contributed to the turf's condition. Diagnosis of the entire problem can then be made quickly and accurately. If possible include photographs of the problem, remember a picture is worth a thousand words, and gives us a more complete overview of the area. Include your phone number so that you can be contacted for additional questions and the diagnosis. Send to:

C. Wayne Ellett Plant and Pest Diagnostic Clinic
Rm. 110 Kottman Hall / 2021 Coffey Rd. / Columbus, OH 43210
(614)292-5006
http://ppdc.osu.edu/

TURFGRASS SAMPLE FORM

C. Wayne Ellett PLANT AND PEST DIAGNOSTIC CLINIC
110 Kottman Hall
2021 Coffey Road
Columbus, OH 43210-1087
PHONE: 614-292-5006 FAX: 614-292-4455
E-MAIL: ppdc@cfaes.osu.edu
WEBSITE: http://ppdc.osu.edu

Office Use Only
Sample # _____
Date Rec. _____
Amt. Rec. _____
Ck. # _____
Ser Amt. _____

Contact:
Name: _____
Company: _____
Address: _____
_____
_____
Phone: _____
Fax: _____
E-mail: _____

SEND RESULTS TO:
□ Contact □ OSUE Educator □ Other

BILL TO:
□ Contact □ OSUE Educator □ Other

Other: _____
_____
_____

COUNTY SAMPLE FROM: _____ TURFGRASS IS: □ **Residential** or □ **Commercial**

CURRENT ASSOCIATION MEMBERSHIPS: □ **OTF** □ **OLCA** □ **OSTMA** □ **OSPA**

Extension Educator: _____ **Educator County:** _____

PROVIDE INFORMATION FOR DIAGNOSIS *(Use reverse side as needed.)*

Turfgrass(s) and % of stand: □ Kentucky bluegrass ___% □ perennial ryegrass ___% □ fine fescue ___%
□ tall fescue ___% □ *Poa annua* ___% □ creeping bentgrass (variety: _____) ___% □ other _____.

Turf Established: □ seeded □ sodded **Age:** _____ **Soil Type:** □ sand □ loam □ clay □ other _____

Soil Conditions: □ wet □ dry **Drainage:** □ poor □ good **Soil Compaction:** □ yes □ no **Irrigation:** □ yes □ no

Type of Irrigation and when does it run? _____

Turfgrass Use: □ home lawn □ golf *(□green □tee □fairway □rough)* □ sports *(which?)* _____ □ other _____

Date Symptoms Noticed: ___/___/___ Has the problem happened before? □ yes □ no When? _____

Weather *(when problem started)*: **Rainfall:** □ wet □ dry □ average **Temperatures:** days _____°F nights _____°F

Light Conditions: □ full sun □ partial shade □ full shade % sunlight ____ Receiving morning sunlight? □ yes □ no

Current Conditions: Rainfall: □ wet □ dry □ normal **Temperatures:** days _____°F nights _____°F

Maintenance: mowing frequency ____ height _____ core cultivation *(last date)* _____ topdressing frequency _____

Symptoms *(Patterns on affected turfgrass)*: □ circles □ streaks □ spots □ large areas □ random □ thinning
□ other _____

Suspected Problems: _____

Chemical Applications: List fungicides used, rates, and dates of applications. List other chemicals applied.

Fertilizer Program: Rate: _____ lbs of N / 1000 sq. ft. per year **Date** *(of last application and rate)*: _____

Home Lawns: Are you on a lawn service? □ yes □ no How many apps have been applied this year and when? ____
Are you on a do-it-yourself program? □ yes □ no How many apps have been applied this year and when? _____

DESCRIBE SYMPTOMS AND PROVIDE ANY ADDITIONAL INFORMATION. *(Continue on back.)*

Include photos and / or sketches of the affected plants and areas. Remember a picture is worth 1000 words!

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