UNIVERSITY OF KENTUCKY

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To: All persons with any interest in turfgrass science, management, research, or education in Kentucky

From: D.W. Williams, UK Turfgrass Program______________________

Re: Contributions to the fund supporting the establishment of the A.J. Powell, Jr. Turfgrass Research Center

Date: 22 June 2010

As you probably know, Dr. A.J. Powell, Jr. retired fully effective 1 June 2010. Dr. Powell established the UK turf research efforts and research center. He served the turf industry for 38+ years. Clearly, he will be sorely missed in many ways, both professionally and personally and by many in our industry. In an effort to honor Dr. Powell and his decades of effort, we plan to dedicate the land and buildings associated with turf research efforts in his name.

I am very pleased to announce we have permission to proceed with the official establishment of the A.J. Powell, Jr. Turfgrass Research Center on the UK Spindletop Farm. This is an opportunity for the clients, colleagues, and professional organizations across Kentucky who have been touched by Dr. Powell and his tireless dedication to our work (growing grass) to contribute to this common goal which I know all will deem as appropriate and well-deserved.

We will erect a permanent sign denoting the A.J. Powell, Jr. Turfgrass Research Center at the intersection of the road leading to the turf research buildings and the road that passes behind the Spindletop Mansion. In addition, all future correspondences including all publications will reference the fact that the work was conducted at the Powell Turfgrass Research Center. In short, this will be a permanent and full assignment of all the space and physical plant now and in the future dedicated to turf research on the UK Spindletop Farm to the A.J. Powell, Jr. Turfgrass Research Center.

We would very much appreciate your assistance in reaching this goal, both by your contribution and by sharing this information with your colleagues. Please send your tax deductible contribution to:

Marci Hicks, Director of Development
E S Good Barn, 1451 University Drive
Lexington, KY 40546-0097

Checks should be made out to UK College of Agriculture with' A.J. Powell Signage' on the memo line.
If you wish to contribute by means other than a check (e.g., credit card), please contact Ms. Marci Hicks at telephone number: 859.257.7200.

Lastly, if we receive funding support in excess of the costs of this official designation, we would like to have your permission to deposit any excess funds into the already established Dr. and Mrs. A.J. Powell, Jr. undergraduate scholarship fund. A brief note providing your permission and included with your check will allow us to use any excess funds in this manner. Please contact me (David Williams) at 859.257.2715 or dwilliam@uky.edu if you have any questions.

THANK YOU IN ADVANCE AND VERY MUCH FOR YOUR SUPPORT OF THIS VERY IMPORTANT EFFORT!

2010 Turfgrass Field Day

Thank you for your support!

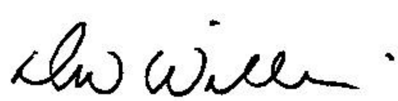
We would like to express our sincere appreciation to Billy Cross of Century Equipment and Rick Curtsinger of Reynolds Equipment. Mr. Cross and Century have loaned a Toro Sidewinder mower to the UK turf program for maintenance of the fairway height cool season grasses.

Rick Curtsinger and Reynolds Equipment have loaned a zero-turn rotary mower and Gator to the UK turf program for maintenance of the lawn-height NTEP (Tall fescue and Kentucky bluegrass) trials. The Gator is used in daily maintenance activities throughout the year.

The loan of this equipment makes a huge positive difference in the quality of research we are able to conduct. Without this support, you, the end-user, would have less information and also lower-quality information if we were not able to properly manage these test areas.

We thank Mr. Cross and Mr. Curtsinger as well as Century Equipment and Reynolds Equipment for their support. It is of their own free will that they offer the support, and we appreciate it very, very much.

Sincerely,



D.W. Williams
UK Turfgrass Science Program

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2009 WEATHER SUMMARY*

Spindletop Reseach Farm
Lexington, KY

	----------Air Temperature----------								-----Sod-----	
						Average	No. of Days		4” Temp	
	Average			Extreme		Departure	Max	Min	Average	
Month	Max	Min	Avg	Max	Min	From Norm	>=90	<=32	Max	Min
Jan	37	19	28	59	0	-3	0	29	36	34
Feb	47	28	38	69	1	3	0	17	38	36
Mar	58	38	48	76	10	4	0	10	48	45
Apr	65	46	55	84	32	0	0	1	56	52
May	74	55	64	86	39	0	0	0	67	63
Jun	83	64	74	93	48	2	3	0	77	72
Jul	80	63	71	86	54	-5	0	0	75	71
Aug	83	64	73	90	51	-2	1	0	75	72
Sep	77	59	68	83	46	0	0	0	71	69
Oct	62	45	54	79	29	-3	0	1	59	56
Nov	58	39	49	71	29	4	0	6	51	49
Dec	43	28	36	63	17	0	0	22	40	38

	----------Precipitation----------						
		Departure			Greatest	Percent	Number
		From	Cumulative		24 Hour	Rain	Rain Days
Month	Total	Normal	Total	Departure	Total	Days	>=.01
Jan	2.45	-0.41	2.45	-0.41	0.63	35	11
Feb	2.86	-0.35	5.31	-0.76	0.75	25	7
Mar	2.19	-2.21	7.5	-2.97	0.48	32	10
Apr	4.48	0.60	11.98	-2.37	1.07	53	16
May	5.05	0.58	17.03	-1.79	0.94	52	16
Jun	5.41	1.75	22.44	-0.04	1.29	47	14
Jul	5.89	0.89	28.33	0.85	2.10	39	12
Aug	5.38	1.45	33.71	2.30	2.10	42	13
Sep	5.37	2.17	39.08	4.47	1.10	30	9
Oct	4.83	2.26	43.91	6.73	0.94	39	12
Nov	0.94	-2.45	44.85	4.28	0.37	13	4
Dec	3.86	-0.12	48.71	4.16	1.00	39	12

* Information collected and reported by Tom Priddy and the UK College of Ag Weather Center Staff.

Comparative toxicity of Acelepryn®, a novel anthranilic diamide, and other insecticides on beneficial and non-target invertebrates in turf

Jonathan L. Larson, Carl T. Redmond, and Daniel A. Potter
Department of Entomology, University of Kentucky, Lexington

Rationale & Nature of Work

- Chlorantraniliprole, an anthranilic diamide that is a potent and selective activator of insect ryanodine receptors which are critical for muscle contraction, is among the least toxic and most active chemical insecticides ever discovered. Introduced to the turf and landscape industries as DuPont™ Acelepryn® in 2008, a single, low dose (0.1 lb AI/A) application provides 3-4 months protection from a wide variety of key turf pests including white grubs, annual bluegrass weevils, billbugs, and caterpillars.

- Classified as Reduced Risk by the US EPA, Acelepryn® has very low toxicity to birds, fish and mammals. Its activity against both grubs and caterpillars allows multiple-targeting surface and subsurface pests with one application, and its novel mode of action is attractive for resistance management.

- Nicotinoid insecticides (imidacloprid, clothianidin, thiamethoxam), mainstays for preventive grub control for the past 16 years, are less active against cutworms and other caterpillars. Recently, several combination products (nicotinoid + pyrethroid) have been marketed for multiple-targeting grubs and surface-feeding pests with one application.

- A multi-year graduate project was initiated in autumn 2009 to compare under realistic use conditions the ecotoxicological impacts of an anthranilic diamide (Acelepryn), a representative nicotinoid (clothianidin; Arena®; from Valent), and a combination product (clothianidin + bifenthrin; Aloft®, from Arvesta) on natural enemies, pollinators, and decomposers in turf. This report summarizes the early returns from the work.

Impact on Turf Predators and Predation on Cutworm Eggs

Methods:

- Six replicates of 6 × 6 m plots were marked in irrigated Kentucky bluegrass roughs of a Lexington, KY golf course. Pitfall traps (500 ml centrifuge tubes with ethylene glycol; 9 traps per plot) were installed 20 Aug. 2009 and operated for 1 week for pretreatment counts.

- Plots were treated with Acelepryn, Arena, or Aloft at labeled rate for white grubs on 27 Aug., or left untreated (control), followed by 2 cm irrigation. Pitfall traps were reinstalled; then emptied weekly for 4 weeks after treatment (WAT).

- Insecticide impact on predatory activity was assessed by placing two “egg sticks” (wood plant stake with strip of cloth with 20 newly-laid black cutworm eggs) in each plot at 1 and 4 WAT. Numbers of eggs missing and presumed eaten were counted after 24 h.

- Trap captures were pooled within plots, sorted, and predatory insects (ants, rove beetles, spiders) were compared among treatments. Numbers of missing eggs per plot were similarly analyzed.

Results:

- Acelepryn had no measurable impact on density/activity (pitfall trap captures) of predatory invertebrates (ants, rove beetles, or spiders) relative to untreated control plots (Fig. 5). Similarly, Acelepryn did not reduce natural predation on black cutworm eggs.

- Aloft significantly reduced captures of spiders. We attribute this to the pyrethroid (bifenthrin) in the formulation because no such reduction occurred with Arena (clothianindin alone).

- Aloft also reduced predation on black cutworm eggs. Intoxication of ants, the main predators on cutworm eggs in turf, was the likely cause.

Impact on Earthworms and Soil Decomposer Arthropods

Methods:

- Six replicates of 4 × 4 m plots were established in a stand of Kentucky bluegrass (*Poa pratensis* L.). Treatments were the same as for the predator study except that a fourth insecticide, carbaryl (Sevin® SL, from Bayer) was included as a positive control because of its known toxicity to earthworms. Plots were treated in early Oct. 2009 at label rates for grubs, with 2 cm post-treatment irrigation. Another similar trial was conducted on a push-up green in spring.

- Earthworms and soil arthropods were sampled at 1 and 3 WAT, the former by hand-sorting soil samples, and the latter by extracting them using in Berlese funnels, a device that uses heat and light to slowly dry samples of turf and soil placed on a coarse screen over a funnel, forcing the tiny invertebrates downward to drop into vials of alcohol. Collembola (springtails) and oribatid mites, which were the predominant decomposers, as well as mesostigmatid mites (which are mostly predatory) were counted and analyzed as above.

Results:

- Acelepryn had no impacts on earthworms or beneficial soil micro-arthropods.

- Sevin, as expected, had the greatest impact on earthworms reducing their numbers by 74% at 1 WAT. Arena and Aloft also significantly reduced earthworm numbers (32 & 35% respectively, at 1 WAT), and Arena also reduced casting activity on the pushup green. Arena, Aloft, and Sevin also significantly reduced springtails (Collembola), and in the case of Aloft, predatory mites.

Summary and Implications

- Chlorantraniliprole (Acelepryn®), a recently-labeled anthranilic diamide insecticide with a favorable toxicological profile that provides extended control of a wide range of key turf pests, had no measurable impact on populations of beneficial predatory or decomposer arthropods or earthworms in turf treated at the label rate for white grub control. It provides season-long of grubs and grass feeding caterpillars.

- Two other insecticides, Arena and Aloft, representing other main types of products (nicotinoids and combination nicotinoid/pyrethroids, respectively) used for preventive control or multiple-targeting insect pests in turf, had greater impacts on non-target and beneficial species, including earthworms. The combination product, in particular, significantly reduced predation on black cutworm eggs, as well as abundance of spiders, Collembola, predatory mites, and earthworms.

- Natural enemies and decomposers lend stability to perennial turfgrass systems such as lawns, sport fields, and golf courses. Chlorantraniliprole (Acelepryn®) seems a good fit for controlling pest insects on lawns, sport fields, and golf courses where preservation of beneficial invertebrates is a concern.

- But, because Acelepryn has little or no activity on ants or earthworms, superintendents who substitute it for pyrethroids or combo products for cutworm control on putting greens may see an increased activity of those secondary pests.

We thank Ben Barnes, Idlehour Country Club, and Jerry Ducker (Lexington Country Club) for their cooperation.

Natural Enemies and Site Characteristics Affecting Distribution and Abundance of Native and Invasive White Grubs on Golf Courses

Carl Redmond and Daniel A. Potter
University of Kentucky

Objectives:
1. Determine identity and incidence of pathogens and parasitoids of Japanese beetle (JB) and masked chafer (MC) grubs on golf courses across Kentucky, the first such study in the transitional turfgrass zone. Quantify site characteristics associated with particular grub species and natural enemies, and prospect for potential new bio-control agents. .
2. Evaluate how grass species and mowing height affect the susceptibility of white grubs to natural enemies in the field.
3. Test if a lag in buildup of natural enemies explains why Japanese beetle grub populations tend to reach outbreak densities on golf courses as the pest expands into new geographical regions and then stabilize over time.

Biological insecticides and natural enemy conservation can reduce the need for chemical inputs on golf courses. This work is the first survey of white grubs and their natural enemies on golf courses in the transitional climatic zone, and the first anywhere for masked chafers (*Cyclocephala* spp.), the most important native grub pests. We seek new pathogens having promise as bio-insecticides, and to clarify how site characteristics might be altered to enhance natural suppression of grub populations.

Grub survey kits were sent to 34 golf superintendents throughout Kentucky in late summer asking them to collect 30 grubs and a soil sample from their worst non-treated grub site. Six additional golf courses were intensively sampled in late August, mid-September, and early October to track natural enemy incidence over time. Grubs were identified, incubated for 30 d, and dissected to assess mortality from bacterial, fungal, or protozoan pathogens. Masked chafers (MC) and Japanese beetles (JB) accounted for 64 and 30%, respectively, of grubs sent in by superintendents. MC also predominated on Lexington courses. Grub populations declined from about 18/0.1 m^2 in late August to about 5/0.1 m^2 in October and 2/0.1 m^2 the following spring owing to natural mortality agents. *Tiphia* wasps, *Metarhizium* fungus, *Serratia* (amber disease) and *Paenibacillus* (milky disease) bacteria, and entomopathogenic nematodes (EPN) infected 2, 5, 8, 20, and 18% of the MC grubs, and 0, 3, 5, 12, and 19% of the JB grubs sent in by superintendents, but much higher mortality from particular agents was seen on some courses. *Ovavesicula*, a protozoan that reduces egg production by adult JB, was uncommon in KY but gregarines (*Stichtospora*) infected 26% of JB grubs in the spring. The latter two pathogens were absent or uncommon in MC grubs.

Replicated stands of irrigated turfgrasses used in fairways or roughs of transition zone golf courses were sampled for grub species preference and incidence of parasitoids and pathogens. Plots maintained at fairway height (5/8”) consisted of creeping bentgrass (CB), perennial ryegrass (PR), zoysiagrass (Z), and bermudagrass (B). Plots at rough height (2.5 in) consisted of turf-type tall fescue (TF), Kentucky bluegrass (KB), PR, or a TF/KB mix. Of the fairway-height grasses, Z and B had the highest incidence of MC grubs. MC predominated in CB whereas JB favored PR. JB populations were highest in rough-height grasses, outnumbering MC 2-4 fold. Two years of rating skunk damage showed greatest foraging in CB and PR at fairway height. There was little to no skunk activity in fairway-height Z or B, or in rough-height grasses. Milky disease was the most common pathogen of MC, present in both fairway and rough cut grass (rates to 24.0% and 20% for fairway Z and rough cut KB, respectively). *Tiphia* *pygidialis* parasitism on MC grubs occurred in all grasses but was greatest in Z. *Tiphia vernalis* parasitism on JB grubs occurred in all grasses except B, however at rates lower than *T. pygidialis* on MC.

Grub collection kits were sent to 20 cooperators to survey natural enemy load in JB populations throughout the species' range in the USA. The locations were divided into geographical regions: eastern states New Hampshire, Rhode Island, Massachusetts, Pennsylvania, New York, New Jersey, North Carolina and Georgia; central states Ohio(2), Illinois, Kentucky, Tennessee and Michigan; and Midwest states Wisconsin, Nebraska, Oklahoma, Arkansas, Iowa and Minnesota. JB populations were found in a wide range of soil parameters including: pH (4.4 to 7.7); organic matter (2.2% to 9.8%) and soil types (sand 78.6% to 14.4%; silt 71.9% to 15.3%; clay 20.26% to 3.1%). Pathogen infection was higher in the eastern states (17.3%) compared to central and Midwest states (5.8% and 3.3% respectively).

Stichospora infections had been noted in JB grubs in spring but little was known about their pathological effects. A method was developed for positive infection determination in living grubs. Infection increased length of time required for grub to pupate and decreased survival to adults. Further research is needed to determine effects on younger grubs and MOA of pathogen. Several EPN strains isolated from MC and JB were identified by PCR analysis as *Heterorhabditis bacteriophora*. Currently we are testing if strains from MC grubs are more infective to MC than to JB, and vice versa. If true, then matching the EPN strain to its natal host species could lead to better efficacy of nematode-based bioinsecticides against transitional-zone grub species.

Summary Points

Masked chafers and Japanese beetles accounted for about 66 and 30% of the grub infestations, respectively, on surveyed Kentucky golf courses. *Tiphia* wasps, milky disease, and other pathogens accounted for moderate to high natural mortality at some sites. Nematodes isolated from MC and JB grubs, and a protozoan pathogen (*Stichospora* sp.), are being evaluated as potential bio-insecticides.

Turfgrass species and mowing height affected the species makeup of grubs and natural enemies. Skunk foraging damage was greatest in cool-season grasses at fairway height, and least in warm-season grasses despite the presence of grubs.

JB grubs surveyed across the eastern and central United States showed a trend for higher pathogen loads in eastern states with longer history of infestation than in central or Midwestern states.

The Enemy of My Enemy is My Friend

USGA-Supported Study Seeks New Biological Controls for White Grubs

Carl T. Redmond and Daniel A. Potter
University of Kentucky

White grubs, the immature stage of stout-bodied beetles called scarabs, are the most destructive insect pests of golf courses in the cool-season and transitional climatic zones.[1] Grubs cause turf damage in two ways: by chewing off the roots resulting in dead patches that can be lifted or rolled back like a carpet, and by attracting skunks, raccoons, armadillos, and other varmints that dig up the turf to eat the grubs. Golf courses often sustain both types of injury. Many millions of dollars are spent each year to control white grubs in home lawns and on golf courses in the United States.

Golf course superintendents now rely almost exclusively on synthetic insecticides for grub control, applying a long-residual soil insecticide before egg hatch to intercept newly-hatched grubs, or spot-treating larger grubs in late summer if and when grub damage appears. Insecticides, however, are expensive and must be reapplied every year, and their overuse can impact the beneficial insects that help to buffer pest outbreaks. Sole reliance on insecticides, especially of the same chemical class, can also lead to pest resistance. Resistance to pyrethroids was recently documented in annual bluegrass weevil populations on New England golf courses and for southern chinch bugs on St. Augustinegrass lawns in Florida.[2, 3] Because societal pressures to reduce use of synthetic insecticides, even reduced risk products, likely will intensify, it is prudent to explore other approaches that can used to help reduce reliance on that one approach.

Integrated pest management (IPM) uses a combination of tactics to keep pests below damaging levels while minimizing undesirable side-effects. Although synthetic insecticides will likely remain essential IPM tools for golf courses for the foreseeable future, integrating non-chemical controls into a management plan can help reduce pesticide dependence, as well as labor and costs. That also helps reduce the likelihood of pests developing resistance to insecticides. Biological control, including use of microbial insecticides and conservation of natural enemies of pest species, is well-suited to perennial systems such as golf courses. At present, however, microbial insecticides constitute only a miniscule fraction of the turf insecticide market[4], and not enough is known about predators, parasites, and pathogens of white grubs to effectively enlist their aid.

This project seeks new knowledge about the natural enemies of white grubs on golf courses in the transitional climatic zone. It includes the first survey of pathogens of masked chafers (*Cyclocephala* spp.), the most widespread and destructive native grub pests in the United States. We seek new control agents with potential as bio-insecticides for turf pests, and better understanding of how site characteristics affect these agents for natural suppression of grub populations.

In 2007, kits were sent to 33 golf superintendents throughout Kentucky who were asked to collect a sample of 30 grubs and soil during September from the worst grub site on their course. Superintendents placed the white grubs in individual cups of peat moss and returned the kits by overnight mail. We identified each sampled grub to species, examined it for parasites or disease symptoms, and then held each one for 30 days to allow for any unseen disease to develop. Finally, each grub was dissected to determine the presence of bacterial, fungal, or nematode pathogens.

Masked chafer (MC) and Japanese beetle (JB) grubs accounted for 64 and 30%, respectively, of white grubs sent in from Kentucky golf courses, with May beetle, green June beetle, and black turfgrass ataenius comprising the rest. European chafer, Oriental beetle, and Asiatic Garden beetle, invasive grub species that are expanding their ranges beyond the northeastern United States, evidently are not yet established in Kentucky. Grubs occurred in a wide range of Kentucky soils and pH ranges with no particular relationship between soil type and predominant grub species. MC grubs dominated the samples from 13 courses, JB grubs dominated at three courses, and on 17 courses the sampled areas had a mixture of JB and MC grubs.

Various biological control agents were found. *Tiphia pygidialis*, a wasp that lays an egg on the back of masked chafer grubs and upon hatching its larva consumes the victim[5], was the most abundant parasite in autumn, killing 0 to 33% of the grubs at a given site. *Paenbacillus popilliae,* bacteria, causal agent of milky disease, were the most abundant pathogens. Infection rates averaged 12 and 20% for JB and MC grubs, respectively, across all sites, but some sites had as many as 31% of the JB and 73% of the MC infected with this lethal disease. Other pathogens included a greenish fungus (*Metarrhizium* sp.), *Serratia entomophila*, a bacterium that causes amber disease which causes infected grubs to stop feeding, and several strains of insect-parasitic nematodes. *Ovavesicula*, a protozoan that causes reduced fertility in adult beetles[6], was uncommon in Kentucky. Gregarines (*Stichtospora* sp.), a tapeworm-like parasite, were uncommon in autumn but infected as many as 27% of JB grubs in the spring (see below). Gregarine-infected JB grubs developed into normal sized beetles but their emergence was delayed about two weeks. Overall, none of the individual pathogens accounted for > 20% mortality, but collectively about 48% of sampled MC and 33% of JB grubs were infected with one or more debilitating or lethal pathogens.

Insect-pathogenic nematodes we isolated from JB and MC grubs are currently being identified using genetic markers. One of the strains from masked chafers is noticeably larger and more robust than commercially-available nematodes which originally were isolated from grubs other than MC. If the identifications confirm it as new, future studies will evaluate if it is more infective than commercial nematodes against MC. This could lead to a nematode-based bio-insecticide especially suited for the transitional climatic zone.

We also repeatedly sampled 18 sites on six central Kentucky golf courses in late August, mid-September, and early October 2007, and again in early May 2008, to track grub density and incidence of natural enemies over time. MC grubs predominated, as they had in the KY State survey. Interesting, grub populations declined from about 18 per square foot in late August, to about 5 grubs per square foot in October, to less than 2 grubs per square foot the following spring despite no insecticides having been applied. The incidence of the natural enemies patterned the state survey and doubtless contributed to the aforementioned grub population declines.

The Japanese beetle continues to aggressively expand its range into the Great Plains, Great Lakes, and central United States, and is an ever-present threat to become established in California, Oregon, and Washington. Historically, JB reaches outbreak levels when it first invades new areas, followed by gradual decline and stabilization. We sought to determine if buildup of diseases might explain that pattern. Grub collection kits were sent to 20 cooperators throughout the eastern and central United States who sent us samples 30 JB grubs from local golf courses and other turf sites. Samples of grubs and soil were sent in from eastern states (NH, MA, RI, NY, PA, NJ, NC, and GA) where JB has been established for > 50 years (it was first found in the USA in 1916, near Riverton, NJ), to Midwestern states, to states (WI, NE, OK, AK, IA, MN) into which JB more recently has spread.

The samples confirmed that JB grubs can handle a wide range of soil types and pH levels. Overall pathogen load, as predicted, was highest in the eastern states. Milky disease infection, for example, averaged about 7% (range 0–27%) and combined infection by *Ovavesecula* and gregarines averaged 6.1% (range 0–17%) in the East, whereas *Ovavesicula* was absent and gregarine infection was < 1% in grubs sent in from the Great Plains and Great Lakes states. Less than 1% of the JB grubs shipped to us were infected with pathogenic nematodes. Although the pathogen loads in our samples seem too low to convincingly explain why JB populations decline over time, the data from each location represent just a snapshot in time, so the cumulative toll of pathogens from egg hatch in mid-summer to beetle emergence the following year likely is much higher. Indeed, we saw dramatic declines in grub densities at the same sites on the six Kentucky golf courses from August to May of the following year.

In a separate study, we established two stands of replicated irrigated cool- and warm-turfgrasses that are used on golf courses in the transitional climate zone. The first stand is mowed at fairway height (1.6 cm, or 5/8") and contains creeping bentgrass, perennial ryegrass, zoysiagrass, and bermudagrass. The other stand is mowed at rough height (6.4 cm, or 2.5") and has turf-type tall fescue, Kentucky bluegrass, perennial ryegrass, and a tall fescue/ Kentucky bluegrass mix. The plots were sampled for grubs in September 2008 to determine if MC or JB favor certain grasses over others. All grubs were held and dissected to see if grass type affects incidence of pathogens. Twenty MC grubs were introduced into 0.1 m^2 (about 1 ft^2) enclosures in each plot to assess parasitism by *Tiphia pygidialis.* We also rated each plot for damage resulting from skunks digging for grubs.

Interestingly, the warm season grasses, zoysiagrass and bermudagrass, had the highest densities of MC grubs (about 7 and 4 grubs/0.1 m^2 (1 ft^2) respectively, compared to 1.3 and 0.5 MC grubs/0.1 m^2 in fairway-height bentgrass and ryegrass, and < 1–2 grubs/0.1m^2 in all rough-height grasses. MC grubs also suffered the highest rates of milky disease and parasitism by *Tiphia* in zoysiagrass ((24 and 10%, respectively) JB grubs were at least twice as abundant in rough-height perennial ryegrass. tall fescue, and mixed tall fescue/Kentucky bluegrass than in rough-height Kentucky bluegrass or any of the fairway-height grasses. Skunk damage was concentrated in fairway-height creeping bentgrass and perennial ryegrass, with almost none in the other grasses, including the grub-rich zoysiagrass and tall fescue. The pattern suggests that so long as some grubs are present, skunk foraging may be dictated more by ease of digging up the turf than by relative grub density. Parasitism rates of JB grubs by the spring-active *Tiphia vernalis* will be evaluated in May.

This ongoing study is providing new insight about natural enemies of white grubs on golf courses in the transitional climatic zone. The pathogens isolated, especially from masked chafers, may provide raw material for bio-insecticides better suited for controlling the types of grubs that predominate on courses in the Midwest, Southeast, and Great Plains states. Our data also provide a start toward understanding why grub populations vary from year to year, and being able to predict where on golf courses particular species of grubs are most likely to occur.

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Structural Defenses of Tall Fescue Grass and Feeding by Armyworms

Craig P. Keathley and Daniel A. Potter

University of Kentucky

Objectives:

1. Compare performance of the true armyworm (TAW) on 13 fescue cultivars differing in structural features such as thickness, edge spines, trichomes, and shear strength.
2. Determine if breeding grasses for improved forage quality (dry matter, fiber, ash, nitrogen) for livestock will make pastures more vulnerable to TAW outbreaks.

Grass breeders are developing new forage-type tall fescue cultivars with softer texture or reduced fiber for improved livestock performance, and soft-textured turf-type tall fescues also are available. These softer grasses lack the tiny abrasive spines (edge spines) along leaf margins and rough trichomes on the upper leaf surface, and have fewer tough structural fibers. Grass-feeding caterpillars such as armyworms, cutworms, and sod webworms seemingly would also be better able to chew and digest grasses with softer texture or reduced fiber, so determining if greater use of such cultivars could facilitate insect damage to pastures or turf is important.

We compared survival, growth, and development of the true armyworm (TAW), *Pseudaletia unipuncta* (Haworth), an irruptive pest that causes extensive damage to pastures during outbreak years, when fed grass clippings from one *Festuca* and 12 *Lolium* cultivars differing in texture (soft vs. standard), ecotype (northern European vs. Mediterranean), environmental use (pasture vs. turf-type), or provenance to clarify how modifying the texture (edge spines, trichomes, cellulose margin), thickness, toughness, and forage quality (dry matter, fiber, ash, nitrogen) of pasture grasses affects their resistance to grass-chewing insects.

Although the foliage differed markedly in texture and forage quality, TAW generally grew equally well on all groups of grasses regardless of texture, ecotype, environmental use, or provenance. TAW was surprisingly unaffected by sharp edge spines, trichomes, or broad cellulose margins on the tougher, spinier fescue grasses. One way they compensated when feeding on such grasses was to switch from edge-feeding to "window-feeding", i.e, scraping away the leaf tissues from the surface while avoiding the sawlike edge. Likewise, TAW tolerated a range of fiber and ash contents, and those factors were not correlated with any measurable reduction in caterpillar performance.

Summary Points:

1. Genetic modification of pasture grasses for softer texture and improved livestock performance is unlikely to result in any greater damage from TAW, but….

2. Coarse-textured fescues with edge spines are not resistant.

3. TAW's ability to exploit a wide range of fescue grasses of differing structural characteristics and forage quality facilitates its importance as a pasture pest.

Biological Control of Black Cutworms on Golf Courses Using a Baculovirus and Natural Enemies

Andrea J. Bixby and Daniel A. Potter

University of Kentucky

Objectives:

1. Evaluate *Agip*MNPV, a naturally occurring baculovirus, as a bio-insecticide for season-long control of black cutworms (BCW) on golf courses.
2. Compare infectivity and persistence of *Agip*MNPV to BCW on creeping bentgrass putting greens and mixed grass species surrounds.
3. Determine the species, abundance, and natural history of parasitic insects attacking BCW on golf courses.

Biological controls, once established, can provide prolonged suppression of insect pests on golf courses. In 2003 a cutworm-specific virus was found decimating populations of black cutworms (BCW) on Kentucky golf courses. Virus-infected BCW rupture and spread millions of infective virus particles onto foliage and thatch. The virus, identified as *Agrotis ipsilon* multiple nucleopolyhedrovirus (AgipMNPV), was amplified by feeding it to BCW, harvesting their cadavers, and mixing the concentrated virus particles with water. This crude biological insecticide was applied to turf to see if it would infect resident larvae. Testing showed that it quickly killed young larvae, but that larger ones required higher dosages and fed for several days before being killed. When applied to 12 whole tees of two golf courses, the virus gave 78% and 33-41% control of newly hatched larvae after 1 week and I month, respectively, but residual control of larger larvae (45-56%) lasted only about a week.

Golf courses are harsh environments for a virus. Mowing and irrigation, clipping removal, pesticide and fungicide applications, and degradation by solar radiation contribute to inactivation or removal of virus from the system. During summer 2009, virus was applied to paired plots on creeping bentgrass greens and mixed-grass surrounds to compare its residual activity in those habitats. We expected that a reservoir of virus would persist longer in the higher-mowed turf of surrounds. Residual efficacy was determined 3 days, and 2 and 5 weeks after application by implanting mid-sized BCW and determining how many were killed by virus infection. Three day old virus residues provided 50-60% control in both greens and surrounds, but infection dropped to only 10-20% in both settings after two weeks, and was almost nil by five weeks after application. A virus-based insecticide could provide short-term control of BCW on golf courses but it would probably need to be re-applied at regular intervals.

Parasitoids are insects that parasitize other insects. When BCW were implanted on golf course tees, 30% of larvae recovered after 10 d in the field had been parasitized. A survey of BCW parasitoids was initiated in 2009 to provide better understanding of how to conserve and recruit these beneficial insects for biological control. For example, naturalized areas on golf courses could promote this by providing pollen, nectar, alternative hosts, or shelter that can attract and sustain natural enemies of pest insects.

Studies were initiated in 2009 to determine the species, natural history, and impact of parasitoids of BCW in golf course habitats. Sentinel eggs and newly hatched larvae were placed in the field monthly in four locations, tees, fairways, and roughs near or far away from naturalized areas, on three Kentucky golf courses. We hoped to determine how grass height and proximity to naturalized areas affect parasitism, but the study was inconclusive because ants consumed most of the eggs and larvae. In another experiment, parasitoids accounted for similar (12–19%) mortality of BCW in field plots of creeping bentgrass and perennial ryegrass. Two parasitoid species that attack BCW eggs and three others that attack the larvae were identified. The most abundant parasitoid, a tachinid fly (*Bonnetia comta*), was reared to study its biology. The female flies, stimulated by BCW frass (feces), to give birth to maggots which are deposited near the entrance to a BCW burrow. The fly maggot crawls onto the victim's back when it comes out to feed. The maggot burrows in, feeds and kills the BCW in a few days, then emerges from the shriveled victim and forms a pupal case from which a new fly emerges. Planned experiments will explore chemical cues that attract the parasitic flies to golf turf, as well as compatibility of parasitoids with turf insecticides and endophytic turfgrasses.

Summary Points

- A virus-based biological insecticide has potential for short-term control of black cutworms (BCW) on golf courses.
- Five parasitoid species were found suppressing BCW populations on Kentucky golf courses. A study to determine if naturalized areas, which provide resources for beneficial insects, can increase parasitism of BCW was thwarted by high ant predation.
- Biology of a fly that parasitizes BCW was clarified and studies were initiated to evaluate it for augmentative or conservation bio-control.

Miscanthus as a Potential Biofuel

Dr. Tom Voigt, University of Illinois, Champaign-Urbana

This experiment is part of a regional grant program funded by the U.S. Department of Energy through the SUN Grant Program. South Dakota State University administers the SUN Grant Program and contracts with other institutions for research work. This same experiment is being conducted at the University of Illinois at Champaign-Urbana, University of Nebraska, Rutgers University, Virginia Tech, and of course here at UK. This is the third year of a five year study. The treatments in the experiment are application rates of nitrogen. All plots contain the same biotype (public release of the Illinois clone of Miscanthus x giganteous). Nitrogen is applied at once per year at spring green up using urea at 0, 60 and 120 kg N/ha (= 0, 1.2, and 2.4 pounds of N per 1000 sq. feet). As potential responses to applications of N, we measure these parameters:

1. Average *M*x*g* emergence date taken once each year when the first 10 plants in each plot have emerged.
2. Percent survival/coverage taken once each year in June.
3. Any noticeable pests
4. *M*x*g* stem height – Measure the height of the tallest stem in each of 5 randomly selected plants per plot monthly during growing season, March – November.
5. Date of closed canopy reported once each year when there is closed canopy in each plot.
6. Date of full-headed flowering reported once each year when half of the plants in each plot are in full flowered.
7. Harvest date.
8. At harvest:
    a. Phenology and development: Select 5 random plants and for each of these plants (individually):
        1. Record the number of shoots per plant.
        2. Randomly select a total of 10 representative stems from the each of the 5 plants harvested in each plot.
        3. Record the stem diameter by measuring each stem at the center of the first full internode above the ground level of the stem.
        4. Record the stem length measured from cut end to highest node
        5. Record the number of green leaves per stem.
        6. Record the number of nodes per stem
9. Environmental data (soil conditions, precipitation, temperature, etc.).

Summary: To date, there have been no statistically significant differences measured due to applications of N at the UK site. There have been small but significant differences at other sites. Average yield at UK for 2009 was 7.6 tons per acre with a range of 6.2 to 8.6 tons per acre. Additional yield data (expressed as metric tonnes per hectare) as a function of N applications at UK and two other locations:

	0 kg N/ha	60 kg N/ha	120 kg N/ha
Lexington, KY	16.7	17.6	16.8
Mead, NE	16.0	15.5	14.6
Adelphia, NJ	11.0a	14.8b	14.3b

BERMUDAGRASS VARIETY EVALUATIONS 2009

Establishment Date: Seeded: June 29, 2007 Vegetative: July 6, 2007
Cooperator: National Turfgrass Evaluation Program
Site/Location: Native soil (Maury silt loam), Spindletop Research Farm, Fayette County, KY
Design: Randomized complete block, 3 reps, plot size = 5' x 5'; plots separated by 2 ft. alley
Management: Irrigation as needed to prevent stress
Mowing height 0.75 inches

Table 1. Quality* evaluations of bermudagrass varieties established in 2007 and maintained at 0.75 inch mowing height (sorted by descending 3-year quality average).

Entry	Establishment	------------------------ Quality* ------------------------			
Name	**Method**	**3 yr avg**	**2007**	**2008**	**2009**
OKC 1119	V	8.2	8.3	8.2	8.0
Premier	V	8.1	7.9	8.4	8.1
OKC 1134	V	7.9	8.2	8.0	7.6
Tifway	V	7.8	8.2	8.0	7.3
Patriot	V	7.6	8.3	7.5	6.9
Riviera	S	7.1	7.3	6.7	7.2
SWI-1113	S	7.0	7.1	6.9	7.0
Sovereign (SWI-1012)	V	7.0	7.3	6.6	7.0
SWI-1070	S	6.9	7.1	7.0	6.7
PSG 9Y2OK	S	6.9	6.9	6.9	6.9
PKS 2004-2	S	6.9	7.1	6.9	6.7
Hollywood (J-720)	S	6.9	7.2	6.8	6.7
SWI-1057	S	6.9	7.5	6.3	6.8
RAD-CD1	S	6.8	6.6	6.8	6.9
SWI-1122	S	6.7	6.7	6.7	6.7
Midlawn	V	6.7	7.6	6.1	6.3
PSG PROK	S	6.6	7.2	6.2	6.4
Pyramid 2 (IS-CD10)	S	6.6	7.2	6.4	6.2
PSG 91215	S	6.4	6.9	6.2	6.1
IS-01-201	S	6.4	7.7	6.4	5.1
PSG 9BAN	S	6.4	6.8	6.3	6.1
Veracruz	S	6.4	6.7	6.3	6.1
PST-R6FLT	S	6.3	7.1	6.1	5.7
SWI-1083	S	6.3	6.9	6.2	5.7
Quickstand	V	6.2	6.2	6.0	6.5
Princess 77	S	6.2	6.7	6.2	5.8
SWI-1081	S	6.1	7.3	5.6	5.3
Yukon	S	5.9	5.3	6.0	6.5
PSG 94524	S	5.9	6.9	5.4	5.4
SWI-1117	S	5.9	6.9	5.7	5.1
BAR 7CD5	S	5.7	6.0	5.4	5.8
Sunsport	S	5.3	6.3	5.1	4.6
NuMex-Sahara	S	5.3	6.7	5.0	4.1
LSD (P=.05)		----	0.69	0.56	0.8

* Average of monthly ratings during growing season. Visual rating from 1 to 9; 9=overall best turf quality.

Table 2. Visual ratings in 2009 of bermudagrass varieties established in 2007 and maintained at 0.75 inch mowing height (sorted by descending 3-year turf quality as in table 1).

Entry Name	Establish-ment Method	% Ground Cover 11 Jun	Green Up[1] 27 May	Texture[2] 27 Aug	Genetic Color[3] 11 Sep	Density[4] 22 Jun	Post-Frost Color[1] 22 Oct
OKC 1119	V	92	8.3	8.7	7.3	9.0	4.0
Premier	V	79	8.3	8.7	8.3	8.7	3.0
OKC 1134	V	44	7.7	8.3	8.0	8.3	5.0
Tifway	V	37	7.0	9.0	8.3	8.7	6.3
Patriot	V	41	7.7	8.0	9.0	7.3	4.3
Riviera	S	75	8.0	7.3	7.3	8.3	3.0
SWI-1113	S	87	8.0	7.3	8.0	7.7	2.7
Sovereign (SWI-1012)	V	91	8.0	7.3	7.7	8.7	4.3
SWI-1070	S	78	7.3	8.0	7.7	7.7	2.0
PSG 9Y2OK	S	95	9.0	6.7	8.3	8.7	3.3
PKS 2004-2	S	78	7.0	7.3	8.3	7.7	2.3
Hollywood (J-720)	S	83	7.3	6.3	8.3	8.0	2.0
SWI-1057	S	63	7.0	7.0	7.3	7.7	3.0
RAD-CD1	S	100	8.7	7.0	8.0	8.7	2.7
SWI-1122	S	83	7.7	6.0	8.0	8.0	2.7
Midlawn	V	91	8.3	8.0	7.7	7.7	3.3
PSG PROK	S	78	7.7	8.0	8.3	7.3	3.3
Pyramid 2 (IS-CD10)	S	67	7.7	7.0	6.7	7.3	2.3
PSG 91215	S	59	6.0	5.7	8.0	7.7	2.3
IS-01-201	S	36	4.3	6.0	7.7	6.0	2.3
PSG 9BAN	S	55	6.3	7.0	8.0	7.0	2.3
Veracruz	S	55	6.0	7.3	8.0	7.7	2.0
PST-R6FLT	S	68	6.3	6.7	8.0	7.3	2.0
SWI-1083	S	63	5.7	6.3	8.0	6.7	2.3
Quickstand	V	97	8.7	7.0	7.3	8.7	3.3
Princess 77	S	43	5.0	6.3	7.3	7.3	4.3
SWI-1081	S	45	5.3	5.7	8.0	6.0	2.7
Yukon	S	87	8.0	5.7	9.0	8.0	4.0
PSG 94524	S	46	5.7	5.7	7.0	6.3	2.7
SWI-1117	S	29	5.7	6.3	7.7	6.3	2.0
BAR 7CD5	S	73	8.0	5.3	8.3	7.7	4.3
Sunsport	S	28	5.7	5.7	6.7	6.0	1.3
NuMex-Sahara	S	16	3.7	6.0	7.3	4.7	1.3
LSD (P=.05)		27.8	1.6	1.8	1.4	1.2	1.6

[1] Visual rating from 1 to 9; 1=dormant, 9=summer green.
[2] Visual rating from 1 to 9; 1 very coarse, 9=extremely fine texture.
[3] Rating from 1 to 9; 1=light green, 9=dark green color.
[4] Rating from 1 to 9; 1=thin, 9=very dense.

Spring Dead Spot Trial

Elena Prior

Spring dead spot (SDS) is the only serious fungal disease of bermudagrass in the transitional climatic zone. It can be destructive enough to render a bermudagrass turf unacceptable by both aesthetic and/or playability perspectives. The causal agent is a root-infecting fungus. Damage is caused in autumn and spring and becomes evident when green-up occurs.

Dr. Woosley at WKU reported that topdressing and solid-tine aerification could potentially reduce spring dead spot severity and that topdressing alone resulted in quicker spring green-up. Others have reported limited success in controlling the disease with fungicides, but some reduction of disease severity is possible with chemical applications. Dr. Vincelli at UK reported that lowering pH with applications of flowers of sulfur could also reduce disease severity.

This experiment will investigate the effects of combination treatments on SDS disease severity. This autumn, we will test one or two fall-applied solid and hollow tine aerification events, with and without topdressing, with and without fungicide, and with and without flowers of sulfur. This trial area was established in June 2010 where heavy disease severity has been evident for the two previous years including this spring. Treatments will be applied in the last week of September (Dr. Woosley's work) and the repeat treatments 14 days later at the end of the first week of October. Spring dead spot severity will be evaluated in April/May/June of 2011.

Novel N Source for Bermudagrass and Other Species

Elena Prior, UK Department of Plant and Soil Sciences

Ammonium nitrate is a popular source of cold-water soluble nitrogen. It is a very desirable fertilizer for several reasons, being very quickly available to plants and relatively inexpensive. The chemical composition of ammonium nitrate fertilizer defines it as a very strong oxidizing agent which means it can contribute to violent combustions (explosions) when mixed with some other chemicals. For this reason, and due to public safety and homeland security concerns, purchasing ammonium nitrate fertilizer is now regulated and somewhat cumbersome due to required forms and documentation.

The Honeywell Corporation is testing a novel form (ammonium sulfate nitrate) which has some of the direct benefits of ammonium nitrate but is not as strong an oxidizing agent, and hence would not be regulated as heavily as is ammonium nitrate. This study was designed to compare the effects of applications of urea, ammonium sulfate, ammonium nitrate, and the new ammonium sulfate nitrate on mature bermudagrass turf grown as a sports field or golf fairway. The treatment structure and response variables are:

ASN applied at 0.5 #N/M once every two weeks beginning 15 May through 15 August.
ASN applied at 1.0 #N/M once every month beginning 15 May through 15 August.
ASN applied at 1.5#N/M once every 45 days beginning 15 May through 15 August.
AS applied at 0.5 #N/M once every two weeks beginning 15 May through 15 August.
AS applied at 1.0 #N/M once every month beginning 15 May through 15 August.
AS applied at 1.5#N/M once every 45 days beginning 15 May through 15 August.
AN applied at 0.5 #N/M once every two weeks beginning 15 May through 15 August.
AN applied at 1.0 #N/M once every month beginning 15 May through 15 August.
AN applied at 1.5#N/M once every 45 days beginning 15 May through 15 August.
Urea applied at 0.5 #N/M once every two weeks beginning 15 May through 15 August.
Urea applied at 1.0 #N/M once every month beginning 15 May through 15 August.
Urea applied at 1.5#N/M once every 45 days beginning 15 May through 15 August.
Untreated control

Response variables:

Collect clippings to measure yield (expressed in dry weight) once per month (15 June, 15 July, 15 August, and 15 Sept.).
Visual evaluation of turf quality and turf color rated once every two weeks (opposite of the bi-weekly application schedule).
Digital evaluation of turf color using a CM -1000 handheld chlorophyll meter (Spectrum technologies, Plainfield, IL) every two weeks opposite of the bi-weekly application schedule and concurrently with visual evaluations.
Visual estimation of phytotoxicity or burn the day following each application.

Summary: To date, there have been no significant differences among these treatments, but the trial will continue into autumn of this year with weekly evaluations.

PGR Traffic Trial

D. W. Williams

Previous research has shown that that trinexapac-ethyl (Primo) can enhance the tolerance of bermudagrass to simulated athletic traffic when grown in native soils. Additional work in a sand-based system found no effect of Primo on the tolerance to simulated athletic traffic. However, in both of the aforementioned studies, there were always highly significant differences among cultivars of bermudagrass in their tolerance to simulated traffic.

In this study, Yukon was seeded on 22 June 2010 at 0.25 # of PLS per 1000 sq. feet in a native Maury silt loam soil. Yukon has always exhibited relatively poor tolerance to simulated athletic traffic in all previous work. The plant growth regulators Primo (trinexapac-ethyl), Trimmit (paclobutrazol) and Cutless (flurprimidol) will be applied at label rates every three weeks beginning at first mowing and continuing until 1 September and will be compared to an untreated control receiving nitrogen only. Nitrogen as urea was applied at 0.50 #N per 1000 sq. feet every two weeks beginning at seeding and will continue until 1 September. Traffic will be applied with a Brinkman Traffic Simulator weekly beginning 1 September to approximate the damage from three football games per week until late October or early November. The percentage of bermudagrass cover will be visually rated weekly after traffic treatments begin and throughout the football season.

Seeded Bermudagrass Establishment Study

Michael Deaton, Ph.D. Candidate
Plant and Soil Science Department

Bermudagrass [*Cynodon dactylon* L. (Pers.)] cultivars are becoming more prevalent in almost all turf applications, especially in sports turf. With this constant increase in use, it is important to ensure the cultivar of choice is one that will meet the needs of the application. With multiple commercially available seeded cultivars, the field portion of this experiment will quantify the differences in days to germination, first tiller, first stolon, and to complete cover of the plot area. With this information, a more informed choice will be possible for the best cultivar for the application.

The statistical analysis for the field portion of the study will use a completely randomized design with four replications. The single treatment for the study will be cultivar. There are 19 commercially available cultivars, taken from the NTEP website, that had seed material available for purchase entered into the study. The sampling unit or plot size is five by five feet. Nitrogen (N) in the form of urea (46-0-0) was applied at a rate of one pound of N per 1000 square feet and raked into the seedbed prior to seeding. The bermudagrass cultivars were seeded at a rate of ¼ lb. pure live seed per 1000 square feet and lightly raked to ensure adequate seed-soil contact. The entire test area was covered with a poly-spun fabric cover to aid in germination and to deter plot contamination by irrigation and/or rainfall. Irrigation was applied as needed to keep the soil surface moist and aid in germination.

At this time we do not have enough data to make inferences as to which cultivars establish most rapidly. This study will be repeated in the late spring of 2011 to validate conclusions from 2010.

The field portion of this experiment is a small portion of my Ph.D dissertation work. The main objectives of the overall experiment are to investigate the reason(s) that cause some cultivars to germinate much slower than many others. The remaining portions of the study will consist of laboratory investigations of the mechanisms causing differences in germination rates (e.g., seed coats and waxy layers, applied seed coatings, hulled vs. unhulled, temperature effects, etc.).

Seeded bermudagrass germplasm evaluation and improvement

Dr. Modan Das

Much work is underway on improving several characteristics of seeded bermudagrasses. The current NTEP bermudagrass trial has 31 total entries; 25 of which are seeded, leaving only 6 vegetative entries. Beyond that, 3 of the vegetative entries are standard entries, leaving only three experimental vegetative entries. In short, there are 22 experimental seeded entries and 3 experimental vegetative entries, which clearly indicates that breeders and grass production companies (seed companies in particular) are moving rapidly towards seeded bermudagrasses and away from vegetative bermudagrasses.

UK has been participating in proprietary germplasm evaluations for over 12 years. These experiments are multi-year (4-6 years long) and are aimed at accurately defining differences among entries in the characteristics that breeders are most interested in. For example, in Kentucky, entries that maintain green color later into the autumn and green up earlier in the spring are very desirable. These same traits (late autumn color and early spring green-up) also have positive relationship with general cold tolerance. So, entries in these trials that exhibit these traits will likely be used in breeding programs to improve cold tolerance in new seeded bermudagrass cultivars. Breeders may cross a germplasms with high turf quality (fine texture, dark green color, high tiller density) and poorer cold tolerance with another germplasm exhibiting lower turf quality but excellent fall and spring color and eventually produce a cold-tolerant cultivar with improved turf quality characteristics (e.g., Riviera, Soverign).

The turf group at UK is very happy and excited to continue participating in this work. We have made major contributions to improving the cold tolerance of new seeded cultivars through these trials, and we continue to contribute through our current trials. Although there are no direct, take-home messages from this experiment, you can know that UK is continuing to make major contributions to new cultivars.

CREEPING BENTGRASS (*Agrostis palustris* 'Penncross')
Brown patch; *Rhizoctonia solani*

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Efficacy of fungicides for control of brown patch of creeping bentgrass on a sand-based green, 2009.

The test was conducted on a sand-based green located at the University of Kentucky Turf Research Center near Lexington. The turf was maintained at a 0.188-in. mowing height, and fertilized with urea (46-0-0) at the rate of 1.5 lb N/1000 sq ft on 6 Nov 08, and 1.5 lb N/1000 sq ft on 18 Mar, 13 May and 1.0 lb N/1000 sq ft on16 Jun 09 to promote brown patch development. Irrigation was applied twice daily to promote brown patch development beginning 16 Jun. Plots measured 3 ft x 3 ft with 1.5-ft borders, and were arranged in a randomized complete block design with three replications. Fungicide sprays were applied using a CO_2-pressurized hand-held sprayer fitted with Spraying Systems 8003E flat-fan nozzles delivering 1.5 gal/1000 sq ft. Treatments were first applied on 5 May, before brown patch was observed, with remaining applications made thereafter according to the schedules indicated in the tables (final application on 12 Aug). Brown patch assessments were based on percent plot affected and ratings of verdure loss within patches (verdure is plant vigor measured by percent green foliage within diseased patches). Visual estimates of turf quality were taken once and included leaf necrosis from brown patch and several abiotic factors. The level of infestation by *Poa annua* was visually estimated on 1 May, when color differences between the two grass species and the presence of *P. annua* seed heads facilitated discrimination. The amount of *P. annua* per plot averaged 33.5 percent and did not differ significantly between treatments. Data for brown patch were transformed (arcsine) and analyzed using ANOVA (alpha=0.05) and Waller-Duncan k-ratio t-test, (*k*=100). Although statistics provided are based on analysis of arcsine- transformed data, arithmetic means are presented in order to provide a better indication of the level of disease control provided by each treatment as well as the overall disease pressure in the trial.

Weather was generally favorable for brown patch, and disease pressure was moderate from mid-Jun through mid-Aug. All treatments effectively controlled brown patch, with an exception of Actigard mixed with a low rate of Daconil, and Emerald on some assessment dates. No phytotoxicity or growth regulator effects were noted.

		Brown patch[z]			
Treatment and rate/1000 sq ft	Spray interval (wk)	% plot affected 22 Jun	Verdure loss rating[y] 22 Jun	% plot affected 29 Jun	Verdure loss rating[y] 29 Jun
Water	2	30.0 a	1.3 a	43.3 a	2.0 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[x]	0 b	0 b	0 d	0 d
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[x]	0 b	0 b	0 d	0 d
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	0 b	0 b	0 d	0 d
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	0 b	0 b	23.3 b	1.0 b
Daconil Ultrex 82.5WDG 1.6 oz	2	0 b	0 b	0 d	0 d
Daconil Ultrex 82.5WDG 3.2 oz	2	0 b	0 b	0 d	0 d
Insignia 20WG 0.9 oz	2	0 b	0 b	0 d	0 d
Emerald 70WG 0.13 oz	2	0 b	0 b	16.7 c	0.7 c
Trinity 1.67SC 1.0 fl oz	2	0 b	0 b	0 d	0 d
Honor 28WG 0.7 oz	2	0 b	0 b	0 d	0 d
Honor 28WG 1.1 oz	2	0 b	0 b	0 d	0 d
	INT[w] 2	DAT[v] 5	DAT 5	DAT 13	DAT 13

[z] Means within the same column followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on arcsine-transformed data.
[y] Verdure loss within patches (0-4 scale, where 4= 70% or more verdure loss).
[x] One of the two tank-mixes was applied alternately on a 2-wk interval between 5 May and 12 Aug.
[w]INT= spray interval (in weeks).
[v]DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Brown patch[z] % plot affected 2 Jul	Verdure loss rating[y] 2 Jul	% plot affected 6 Jul	Verdure loss rating[y] 6 Jul
Water	2	50.0 a	2.0 a	26.7 a	1.0 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[x]	0 d	0 d	0 b	0 b
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[x]	0 d	0 d	0 b	0 b
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	3.3 cd	0.3 cd	0 b	0 b
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	20.0 b	1.0 b	0 b	0 b
Daconil Ultrex 82.5WDG 1.6 oz	2	6.7 c	0.7 bc	0 b	0 b
Daconil Ultrex 82.5WDG 3.2 oz	2	0 d	0 d	0 b	0 b
Insignia 20WG 0.9 oz	2	0 d	0 d	0 b	0 b
Emerald 70WG 0.13 oz	2	23.3 b	1.7 a	0 b	0 b
Trinity 1.67SC 1.0 fl oz	2	1.7 cd	0.3 cd	0 b	0 b
Honor 28WG 0.7 oz	2	1.7 cd	0.3 cd	0 b	0 b
Honor 28WG 1.1 oz	2	0 d	0 d	0 b	0 b
	INT[w] 2	DAT[v] 2	DAT 2	DAT 6	DAT 6

[z] Means within the same column followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on arcsine-transformed data.
[y] Verdure loss within patches (0-4 scale, where 4= 70% or more verdure loss).
[x] One of the two tank-mixes was applied alternately on a 2-wk interval between 5 May and 12 Aug.
[w]INT= spray interval (in weeks).
[v]DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Brown patch[z] % plot affected 14 Jul	Verdure[y] loss rating 14 Jul	% plot affected 21 Jul	Verdure[y] loss rating 21 Jul	Turf[x] quality 21 Jul
Water	2	36.7 a	1.7 a	13.3 a	1.0 a	4.7 g
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[w]	6.7 c	0.7 abc	0 b	0 b	6.0 ef
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[w]	0 d	0 c	0 b	0 b	9.0 a
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	5.0 cd	0.7 abc	0 b	0 b	7.7 bc
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	16.7 b	1.0 ab	0 b	0 b	5.3 fg
Daconil Ultrex 82.5WDG 1.6 oz	2	6.7 c	0.7 abc	0 b	0 b	6.3 def
Daconil Ultrex 82.5WDG 3.2 oz	2	0 d	0 c	0 b	0 b	9.0 a
Insignia 20WG 0.9 oz	2	0 d	0 c	0 b	0 b	7.3 cd
Emerald 70WG 0.13 oz	2	3.3 cd	0.3 bc	0 b	0 b	7.0 cde
Trinity 1.67SC 1.0 fl oz	2	3.3 cd	0.3 bc	0 b	0 b	7.3 cd
Honor 28WG 0.7 oz	2	0 d	0 c	0 b	0 b	8.0 abc
Honor 28WG 1.1 oz	2	0 d	0 c	0 b	0 b	8.7 ab
	INT[v] 2	DAT[u] 14	DAT 14	DAT 6	DAT 6	DAT 6

[z] Means within the same column followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on arcsine-transformed data.
[y] Verdure loss within patches (0-4 scale, where 4= 70% or more verdure loss).
[x]Turf quality rating scale 1-9 with 9=excellent quality. Ratings based on brown patch and other physiological effects.
[w] One of the two tank-mixes was applied alternately on a 2-wk interval between 5 May and 12 Aug.
[v]INT= spray interval (in weeks).
[u]DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Brown patch[z] % plot affected 28 Jul	Verdure loss rating[y] 28 Jul	% plot affected 8 Aug	Verdure loss rating[y] 8 Aug
Water	2	36.7 a	1.7 a	26.7 a	2.0 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[x]	0 c	0 c	0 c	0 c
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[x]	0 c	0 c	0 c	0 c
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	0 c	0 c	0 c	0 c
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	13.3 b	1.0 ab	1.7 b	0.3 b
Daconil Ultrex 82.5WDG 1.6 oz	2	0 c	0 c	0 c	0 c
Daconil Ultrex 82.5WDG 3.2 oz	2	0 c	0 c	0 c	0 c
Insignia 20WG 0.9 oz	2	0 c	0 c	0 c	0 c
Emerald 70WG 0.13 oz	2	3.3 c	0.3 bc	0 c	0 c
Trinity 1.67SC 1.0 fl oz	2	0 c	0 c	0 c	0 c
Honor 28WG 0.7 oz	2	0 c	0 c	0 c	0 c
Honor 28WG 1.1 oz	2	0 c	0 c	0 c	0 c
	INT[w] 2	DAT[v] 13	DAT 13	DAT 11	DAT 11

[z] Means within the same column followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on arcsine-transformed data.
[y] Verdure loss within patches (0-4 scale, where 4= 70% or more verdure loss).
[x] One of the two tank-mixes was applied alternately on a 2-wk interval between 5 May and 12 Aug.
[w]INT= spray interval (in weeks).
[v]DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Brown patch[z] % plot affected 12 Aug	Verdure loss rating[y] 12 Aug	% plot affected 17 Aug	Verdure loss rating[y] 17 Aug
Water	2	50.0 a	2.0 a	56.7 a	2.0 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[x]	0 c	0 c	0 c	0 c
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[x]	0 c	0 c	0 c	0 c
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	0 c	0 c	1.7 bc	0.3 bc
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	3.3 b	0.3 b	5.0 b	0.7 b
Daconil Ultrex 82.5WDG 1.6 oz	2	0 c	0 c	0 c	0 c
Daconil Ultrex 82.5WDG 3.2 oz	2	0 c	0 c	0 c	0 c
Insignia 20WG 0.9 oz	2	0 c	0 c	0 c	0 c
Emerald 70WG 0.13 oz	2	0 c	0 c	3.3 bc	0.3 bc
Trinity 1.67SC 1.0 fl oz	2	0 c	0 c	3.3 bc	0.3 bc
Honor 28WG 0.7 oz	2	0 c	0 c	0 c	0 c
Honor 28WG 1.1 oz	2	0 c	0 c	0 c	0 c
	INT[w] 2	DAT[v] 15	DAT 15	DAT 5	DAT 5

[z] Means within the same column followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on arcsine-transformed data.
[y] Verdure loss within patches (0-4 scale, where 4= 70% or more verdure loss).
[x] One of the two tank-mixes was applied alternately on a 2-wk interval between 5 May and 12 Aug.
[w]INT= spray interval (in weeks).
[v]DAT= number of days after treatment the data were taken.

CREEPING BENTGRASS (*Agrostis palustris* 'Penncross')
Dollar spot; *Sclerotinia homoeocarpa*

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Efficacy of fungicides for control of dollar spot of creeping bentgrass on a sand-based green, 2009.

The test was conducted on a sand-based green located at the University of Kentucky Turf Research Center near Lexington. The turf was maintained at a 0.188-in. mowing height, and fertilized with urea (46-0-0) at the rate of 1.5 lb N/1000 sq ft on 6 Nov 08, 18 Mar, 13 May, and at 1.0 lb N/1000 sq ft on 16 Jul 09. Plots measured 3 ft x 3 ft with 1.5-ft borders and were arranged in a randomized complete block design with three replications. Fungicide sprays were applied using a CO_2-pressurized hand-held sprayer fitted with Spraying Systems 8003E flat-fan nozzles delivering 1.5 gal/1000 sq ft. Treatments were first applied on 5 May, a few days after dollar spot was observed, with remaining applications made thereafter according to the spray interval indicated in the tables (final application on 12 Aug). The first application of Insignia was missed and was first sprayed on 11 May. Visual counting of dollar spot infection centers was performed weekly. The level of infestation by *Poa annua* was visually estimated on 1 May, when color differences between the two grass species and the presence of *P. annua* seed heads facilitated discrimination. The amount of *P. annua* per plot averaged 33.5% and did not differ significantly between treatments. Data for dollar spot were transformed (log_{10}) and analyzed using ANOVA (alpha=0.05) and Waller-Duncan k-ratio t-test (*k*=100). Although statistics provided are based on analysis of log_{10} transformed data, arithmetic means are presented in order to provide a better indication of the level of disease control provided by each treatment as well as the overall disease pressure in the trial. This reporting approach may lead to discrepancies between the rankings of treatments based on the arithmetic means and those based on the statistics provided in the table.

Weather was moderately favorable for dollar spot activity during the test period, and disease pressure was moderate throughout the test. Most treatments provided acceptable control of dollar spot for most of the duration of the test, with the exception of the early part of the test when initial applications were made on a curative basis. Insignia 20WG and Daconil Ultrex 82.5WDG at 1.6 oz alone or in combination with other products, provided less than complete control on several assessment dates. No phytotoxicity or growth regulator effects were noted.

Treatment and rate/1000 sq ft	Spray interval (wk)	Number of dollar spot infection centers/plot[z] 6 May	15 May	20 May	27 May
Water	2	12.3 a	29.0 ab	35.0 a	55.7 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[y]	10.7 a	11.0 c	13.3 c	9.7 d
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz *alternate* Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[y]	14.0 a	15.3 abc	17.7 abc	7.3 cd
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	8.7 a	16.7 abc	12.7 c	13.3 bcd
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	8.0 a	15.3 abc	14.0 bc	13.3 bcd
Daconil Ultrex 82.5WDG 1.6 oz	2	6.7 a	11.7 bc	14.3 abc	12.0 bcd
Daconil Ultrex 82.5WDG 3.2 oz	2	7.7 a	13.0 abc	13.0 c	11.7 bcd
Insignia 20WG 0.9 oz	2	15.3 a	33.3 a	30.0 ab	25.0 ab
Emerald 70WG 0.13 oz	2	6.3 a	13.3 abc	17.7 abc	17.0 bc
Trinity 1.67SC 1.0 fl oz	2	8.7 a	18.0 abc	16.0 abc	18.3 bc
Honor 28WG 0.7 oz	2	5.7 a	10.3 bc	10.0 c	8.0 cd
Honor 28WG 1.1 oz	2	5.3 a	10.0 bc	12.0 c	10.0 cd
	INT[x] 2	DAT[w] 1	DAT 8	DAT 14	DAT 7

[z] Means within the same column followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on log_{10} transformed data.
[y] One of the two tank-mixes was applied alternately on a 2-wk interval between 5 May and 12 Aug.
[x]INT= spray interval (in weeks).
[w]DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Number of dollar spot infection centers/plot[z]			
		5 Jun	10 Jun	15 Jun	22 Jun
Water	2	48.3 a	54.7 a	45.7 a	33.3 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[y]	3.7 de	1.7 de	1.3 de	0.7 d
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz *alternate* Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[y]	2.3 cde	0.0 e	0.7 e	0.0 d
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	6.7 bc	10.0 bc	8.0 b	9.3 b
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	9.0 b	11.7 b	6.3 b	12.3 b
Daconil Ultrex 82.5WDG 1.6 oz	2	9.3 b	11.7 b	8.7 b	10.7 b
Daconil Ultrex 82.5WDG 3.2 oz	2	2.7 cde	3.0 cd	1.3 de	0.7 d
Insignia 20WG 0.9 oz	2	11.0 b	12.0 b	5.7 bc	3.0 c
Emerald 70WG 0.13 oz	2	3.0 cde	2.0 de	0.7 de	0.0 d
Trinity 1.67SC 1.0 fl oz	2	4.0 bcd	3.0 d	2.0 cd	0.7 d
Honor 28WG 0.7 oz	2	1.3 e	0.0 e	0.0 e	0.0 d
Honor 28WG 1.1 oz	2	1.0 e	0.7 de	0.0 e	0.0 d
	INT[x] 2	DAT[w] 15	DAT 5	DAT 10	DAT 5

[z] Means within the same column followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on $\log_{10}$ transformed data.
[y] One of the two tank-mixes was applied alternately on a 2-wk interval between 5 May and 12 Aug.
[x]INT= spray interval (in weeks).
[w]DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Number of dollar spot infection centers/plot[z]			
		6 Jul	14 Jul	21 Jul	28 Jul
Water	2	7.0 a	3.3 ab	5.0 a	23.7 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[y]	0 c	3.7 ab	0 b	0 e
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz *alternate* Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[y]	0 c	0 b	0 b	0 e
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	1.0 bc	9.0 ab	0 b	3.3 c
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	1.7 b	1.0 ab	0 b	0.7 d
Daconil Ultrex 82.5WDG 1.6 oz	2	2.0 b	8.7 ab	0 b	3.3 c
Daconil Ultrex 82.5WDG 3.2 oz	2	0 c	0 b	0 b	0 e
Insignia 20WG 0.9 oz	2	0 c	8.7 a	0 b	10.7 b
Emerald 70WG 0.13 oz	2	0 c	0 b	0 b	0 e
Trinity 1.67SC 1.0 fl oz	2	0 c	0.7 b	0 b	3.3 c
Honor 28WG 0.7 oz	2	0 c	0 b	0 b	0 e
Honor 28WG 1.1 oz	2	0 c	0 b	0 b	0 e
	INT[x] 2	DAT[w] 7	DAT 14	DAT 6	DAT 13

[z] Means within the same column followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on $\log_{10}$ transformed data.
[y] One of the two tank-mixes was applied alternately on a 2-wk interval between 5 May and 12 Aug.
[x]INT= spray interval (in weeks).
[w]DAT= number of days after treatment the data were taken.

CREEPING BENTGRASS (*Agrostis palustris* 'Penncross')
ANNUAL BLUEGRASS (*Poa annua*)
Dollar spot; *Sclerotinia homoeocarpa*

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Efficacy of fungicides for control of dollar spot in a mixed creeping bentgrass/*Poa annua* soil-based green, 2009.

The test was conducted on a Maury silt loam located at the University of Kentucky Turf Research Center near Lexington. The turf was maintained at 0.188-in. mowing height and fertilized with urea (46-0-0) at the rate of 1.5 lb N/1000 sq ft on 6 Nov 08 . Plots measured 4 ft x 4 ft with 2-ft borders, and were arranged in a randomized complete-block design with three replications. Fungicide sprays were applied using a CO_2-pressurized hand-held sprayer fitted with Spraying Systems 8003E flat-fan nozzles delivering 1.5 gal/1000 sq ft. Treatments were first applied on 12 May, after dollar spot was first detected, with the remaining treatments applied according to the spray intervals indicated in the table (final application on 21 Jul). Where tank-mixes were alternated, sprays were applied every two weeks, with each tank-mix being applied once every four weeks. Visual counting of dollar spot infection centers was performed weekly. Selected, representative data are provided due to space constraints. The level of infestation by *Poa annua* was visually estimated on 1 May, when color differences between the two grass species and the presence of *P. annua* seed heads facilitated discrimination. The amount of *P. annua* per plot averaged 51.5% and did not differ significantly between treatments. Transformed data (log_{10}) were analyzed using ANOVA (alpha=0.05) and Waller-Duncan k-ratio t-test (*k*=100). Although statistics provided are based on analysis of transformed data, arithmetic means are presented in order to provide a better indication of the level of disease control provided by each treatment as well as the overall disease pressure in the trial. This reporting approach may lead to discrepancies between the rankings of treatments based on the arithmetic means and those based on the statistics provided in the table.

Disease pressure was low to moderate in this test. Most treatments provided acceptable control of dollar spot for most of the duration of the test, with the exception of Disarm throughout the trial. The addition of Rhapsody biological fungicide to the Daconil Ultrex 1.6 oz treatment did not significantly improve dollar spot control. The A176929 and A176930 at both rates and the Prophesy at the high rate caused a darker green turf along with some bronzing on at least four evaluation dates.

Treatment and rate/1000 sq ft	Spray interval (wk)	Number of dollar spot infection centers/plot[z]				
		12 May	20 May	27 May	5 Jun	8 Jun
Water	2	19.7 a	16.3 a	21.0 a	14.7 a	20.0 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[y]	9.0 a	5.0 a	1.7 b	0.0 e	0.0 e
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[y]	11.7 a	9.7 a	4.3 b	1.0 de	1.0 de
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	5.7 a	7.0 a	7.0 ab	4.0 bcd	5.7 bc
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	10.7 a	10.3 a	10.7 ab	5.7 abc	6.0 cd
Daconil Ultrex 82.5WDG 1.6 oz	2	3.7 a	2.7 a	1.7 b	1.7 cde	7.0 bc
Daconil Ultrex 82.5WDG 3.2 oz	2	6.7 a	3.0 a	1.0 b	1.3 de	2.0 de
A17629 1.16%G 48 oz	2	9.7 a	12.7 a	5.0 ab	2.0 cde	0.7 e
A17629 1.16%G 64 oz	2	6.0 a	4.0 a	1.0 b	0.0 e	0.0 e
A17630 0.96%G 48 oz	2	10.0 a	7.6 a	2.3 b	0.0 e	0.0 e
A17630 0.96%G 64 oz	2	8.3 a	7.3 a	1.0 b	0.0 e	0.0 e
Headway 1.39MEC 1.5 fl oz	2	9.7 a	6.3 a	1.7 b	0.0 e	0.3 e
Disarm 0.25G 36.8 oz	2	13.3 a	19.0 a	17.7 a	10.0 ab	19.3 ab
Prophesy 0.72% G 48 oz	2	11.7 a	13.3 a	2.3 b	0.0 e	0.0 e
Prophesy 0.72% G 64 oz	2	15.3 a	9.7 a	2.3 b	0.0 e	0.0 e
	INT[s] 2	DAT[r] 0	DAT 8	DAT 15	DAT 8	DAT 11

[z] Means within the same column followed by the same letter are not significantly different, based upon Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on log_{10} transformed data.
[y] One of the two tank-mixes was applied alternately at 2-wk intervals between 12 May and 21 Jul.
[x]INT= spray interval (in weeks).
[w]DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Number of dollar spot infection centers/plot[z] 15 Jun	22 Jun	29 Jun	6 Jul	14 Jul
Water	2	45.7 a	54.0 a	25.0 ab	11.3 a	9.7 b
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2 [y]	0.0 d	0.3 f	0.7 e	0 e	0.7 de
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[y]	0.0 d	2.7 c-f	4.7 de	0 e	0 e
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	2.0 bc	7.3 cd	17.0 abc	4.3 ab	5.0 bc
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	1.7 bc	2.0 def	3.3 de	2.0 bcd	2.0 cd
Daconil Ultrex 82.5WDG 1.6 oz	2	3.7 b	12.7 bc	17.3 a-d	4.7 abc	2.7 cd
Daconil Ultrex 82.5WDG 3.2 oz	2	0.7 cd	3.0 def	4.7 cde	2.3 bcd	1.3 de
A17629 1.16%G 48 oz	2	1.7 bc	5.3 cde	6.0 b-e	1.3 de	1.3 de
A17629 1.16%G 64 oz	2	0.7 cd	2.3 def	2.7 de	0.7 de	1.0 de
A17630 0.96%G 48 oz	2	0.7 cd	2.3 def	2.7 de	0 e	2.0 d
A17630 0.96%G 64 oz	2	0.7 cd	1.3 def	5.0 b-e	0 e	1.3 de
Headway 1.39MEC 1.5 fl oz	2	0.0 d	3.0 c-f	3.3 de	0 e	0 e
Disarm 0.25G 36.8 oz	2	32.7 a	50.7 ab	37.7 a	9.3 a	24.7 a
Prophesy 0.72% G 48 oz	2	1.7 bc	4.0 c-f	5.0 de	1.3 cde	0 e
Prophesy 0.72% G 64 oz	2	0.0 d	0.7 ef	1.3 e	0 e	0 e
	INT[s] 2	DAT[r] 7	DAT 13	DAT 6	DAT 14	DAT 7

[z] Means within the same column followed by the same letter are not significantly different, based upon Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on log_{10} transformed data.
[y] One of the two tank-mixes was applied alternately at 2-wk intervals between 12 May and 21 Jul.
[x]INT= spray interval (in weeks).
[w]DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Number of dollar spot infection centers/plot[z]				
		21 Jul	28 Jul	6 Aug	11 Aug	17 Aug
Water	2	6.7 b	5.7 b	1.0 a	7.3 cde	4.0 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2 [y]	2.7 bc	0.3 de	2.3 a	26.0 a	10.7 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[y]	0.3 e	0.7 de	1.3 a	19.0 abc	6.0 ab
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	6.0 b	1.3 cde	1.7 a	13.0 abc	6.7 ab
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	0 e	2.0 cde	2.0 a	6.0 cde	3.0 ab
Daconil Ultrex 82.5WDG 1.6 oz	2	3.7 bcd	2.3 bcd	1.7 a	12.0 a-d	3.7 ab
Daconil Ultrex 82.5WDG 3.2 oz	2	0 e	0 e	1.7 a	18.0 abc	7.3 ab
A17629 1.16%G 48 oz	2	0.7 e	4.7 bc	2.7 a	9.0 bcd	1.3 ab
A17629 1.16%G 64 oz	2	1.0 de	1.3 cde	0.7 a	3.7 de	0 b
A17630 0.96%G 48 oz	2	2.7 bc	4.0 bc	4.0 a	9.3 a-d	8.0 ab
A17630 0.96%G 64 oz	2	1.3 cde	2.7 bcd	3.3 a	9.7 a-d	4.0 ab
Headway 1.39MEC 1.5 fl oz	2	0 e	0 e	2.0 a	15.7 cde	11.0 a
Disarm 0.25G 36.8 oz	2	23.3 a	23.3 a	2.7 a	24.3 ab	8.7 ab
Prophesy 0.72% G 48 oz	2	0 e	0 e	1.7 a	2.0 ef	0 b
Prophesy 0.72% G 64 oz	2	0.3 e	0 e	1.0 a	0.3 f	0 b
	INT[s] 2	DAT[r] 14	DAT 7	DAT 16	DAT 21	DAT 27

[z] Means within the same column followed by the same letter are not significantly different, based upon Waller-Duncan k-ratio t-test (*k*=100). Arithmetic means are presented with statistical groupings based on log_{10} transformed data.
[y] One of the two tank-mixes was applied alternately at 2-wk intervals between 12 May and 21 Jul.
[x]INT= spray interval (in weeks).
[w]DAT= number of days after treatment the data were taken.

CREEPING BENTGRASS (*Agrostis palustris* 'Penncross')
ANNUAL BLUEGRASS (*Poa annua*)
Anthracnose; *Colletotrichum cereale*
Brown patch; *Rhizoctonia solani*

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Influence of fungicide spray programs on turf quality in a mixed creeping bentgrass/*Poa annua* soil-based green, 2009.

The test was conducted on a Maury silt loam located at the University of Kentucky Turf Center near Lexington. The turf was maintained at 0.188-in. mowing height and fertilized with urea (46-0-0) at the rate of 1.5 lb N/1000 sq ft on 6 Nov 08. Plots measured 4 ft x 4 ft with 2-ft borders, and were arranged in a randomized complete block design with three replications. Fungicide sprays were applied using a CO_2-pressurized hand-held sprayer fitted with Spraying Systems 8003E flat-fan nozzles delivering 1.5 gal/1000 sq ft. Treatments were first applied on 12 May, after dollar spot was first detected, with the remaining treatments applied according to the schedules indicated in the table (final application on 21 Jul). Where tank-mixes were alternated, sprays were applied every two weeks, with each tank-mix being applied once every four weeks. Visual estimates of turf quality were taken on several occasions and included deterioration of leaf color and density as well as developing leaf necrosis from brown patch, anthracnose, and several abiotic factors. Selected, representative data are provided because of space constraints. The level of infestation by *P. annua* was visually estimated 1 May, when color differences between the two grass species and the presence of *P. annua* seed heads facilitated discrimination. The amount of *P. annua* per plot averaged 51.5 percent and did not differ significantly between treatments. Data were analyzed using ANOVA (alpha=0.05) and Waller-Duncan k-ratio t-test (*k*=100).

Weather was moderately favorable for disease development. Factors affecting turf quality in the plots included brown patch, anthracnose, drought stress, fairy ring, and turf color and texture. Damage from dollar spot was not included in turf quality assessments. Most of the fungicides and spray programs consistently produced a higher quality turf than the control. There were growth regulator effects seen in the plots. The A176929 and A176930 at both rates and the Prophesy at the high rate caused a darker green turf along with some bronzing on at least four evaluation dates.

Treatment and rate/1000 sq ft	Spray interval (wk)	Turf quality[z] 29 Jun	9 Jul	14 Jul	21 Jul
Water	2	4.0 e[y]	4.3 c	4.0 d	3.3 e
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[x]	7.5 a	7.7 a	7.8 a	8.0 a
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[x]	7.5 a	7.8 a	8.0 a	8.0 a
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	5.3 cd	4.7 c	5.3 bcd	4.3 de
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	4.7 de	5.0 bc	5.2 cd	4.7 de
Daconil Ultrex 82.5WDG 1.6 oz	2	6.2 bc	5.7 bc	6.0 bc	5.3 bcd
Daconil Ultrex 82.5WDG 3.2 oz	2	6.2 bc	6.3 ab	6.0 bc	7.0 ab
A17629 1.16%G 48 oz	2	5.3 cd	5.7 bc	5.0 cd	5.3 bcd
A17629 1.16%G 64 oz	2	5.3 cd	5.7 bc	5.0 cd	5.0 cde
A17630 0.96%G 48 oz	2	6.0 bc	6.3 ab	5.8 bc	5.7 bcd
A17630 0.96%G 64 oz	2	6.5 abc	5.3 bc	5.0 cd	5.3 bcd
Headway 1.39MEC 1.5 fl oz	2	6.7 ab	6.3 ab	6.7 ab	6.7 abc
Disarm 0.25G 36.8 oz	2	5.7 bcd	4.7 c	5.3 bcd	6.7 abc
Prophesy 0.72% G 48 oz	2	5.3 cd	6.3 ab	5.0 cd	4.7 de
Prophesy 0.72% G 64 oz	2	5.8 bcd	5.7 bc	5.3 bcd	4.7 de
	INT[w] 2	DAT[v] 6	DAT 2	DAT 7	DAT 14

[z] Turf quality rating scale 1-9 with 9=excellent quality.
[y]Means within the same column followed by the same letter are not significantly different, based upon Waller-Duncan k-ratio t-test (*k*=100).
[x]One of the two tank-mixes was applied alternately at 2-wk intervals between 12 May and 21 Jul.
[w] INT= spray interval (in weeks).
[v] DAT= number of days after treatment the data were taken.

Treatment and rate/1000 sq ft	Spray interval (wk)	Turf quality[z] 28 Jul	30 Jul	8 Aug	17 Aug
Water	2	4.0 f[y]	2.7 f	3.8 g	4.7 d
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz	2[x]	7.3 ab	8.0 a	7.5 ab	7.2 ab
Signature 80WG 4 oz + Chipco 26GT 2SC 4 fl oz *alternate* Signature 80WG 4 oz + Daconil Ultrex 82.5WDG 3.2 oz Signature 80WG 4 oz + Tartan 2.4SC 1.5 fl oz	2[x]	7.7 a	8.0 a	7.8 a	7.7 a
Rhapsody 60EC 5.0 fl oz + Daconil Ultrex 82.5WDG 1.6 oz	2	6.0 b-e	5.0 b-e	5.5 c-f	5.8 bcd
Actigard 50W 0.3 oz + Daconil Ultrex 82.5WDG 1.6 oz	2	5.3 def	4.0 def	5.5 c-f	4.7 d
Daconil Ultrex 82.5WDG 1.6 oz	2	5.7 cde	5.7 bcd	6.3 b-e	5.3 cd
Daconil Ultrex 82.5WDG 3.2 oz	2	7.5 abc	6.3 ab	6.7 abc	6.7 abc
A17629 1.16%G 48 oz	2	5.3 def	4.3 c-f	5.0 fg	6.0 bcd
A17629 1.16%G 64 oz	2	4.7 ef	3.7 ef	5.0 fg	5.5 cd
A17630 0.96%G 48 oz	2	5.3 def	4.3 c-f	5.2 ef	5.7 cd
A17630 0.96%G 64 oz	2	5.3 def	4.7 b-e	5.3 def	5.7 cd
Headway 1.39MEC 1.5 fl oz	2	7.0 abc	6.3 ab	6.7 abc	6.7 abc
Disarm 0.25G 36.8 oz	2	6.8 a-d	6.0 bc	6.5 bcd	6.3 abc
Prophesy 0.72% G 48 oz	2	5.3 def	4.7 b-e	5.7 c-f	6.3 abc
Prophesy 0.72% G 64 oz	2	5.3 def	4.7 b-e	5.2 ef	5.5 cd
	INT[w] 2	DAT[v] 7	DAT 9	DAT 18	DAT 27

[z] Turf quality rating scale 1-9 with 9=excellent quality.
[y]Means within the same column followed by the same letter are not significantly different, based upon Waller-Duncan k-ratio t-test (*k*=100).
[x]One of the two tank-mixes was applied alternately at 2-wk intervals between 12 May and 21 Jul.
[w] INT= spray interval (in weeks).
[v] DAT= number of days after treatment the data were taken.

Poa annua Control using Herbicides and PGRs 2009-2010

A study was initiated in April 2009 at Spindletop Hall, Fayette County, KY on a modified sand-based bentgrass green to evaluate several plant growth regulator compounds and herbicide combinations for the control of annual bluegrass. The ‘Penncross’ bentgrass green is mowed at 3/16 inch. All treatments are applied every 3 weeks mid-April through early November.

Trt	Treatment					Bentgrass Phyto*		---------% Poa annua cover---------		
No.	Name	Formulation		Rate		6/22/2009	6/28/2010	4/20/2010	5/3/2010	5/7/2010
1	Untreated Check					1.0	1.0	63	40	35
2	Velocity	17.6	SG	2	OZ/A	3.3	3.3	18	23	17
3	Trimmit	2	SC	16	OZ/A	1.3	1.0	18	22	25
4	Primo	1	EC	11	OZ/A	1.3	1.0	77	23	43
5	Cutless	1.3	ME	16	FL OZ/A	1.7	1.0	20	23	32
6	Legacy		SC	14.5	OZ/A	1.7	2.3	32	37	45
7	Trimmit	2	SC	16	OZ/A	2.7	5.3	18	15	8
	Velocity	17.6	SG	2	OZ/A					
8	Cutless	1.3	ME	16	FL OZ/A	3.0	3.3	17	17	17
	Velocity	17.6	SG	2	OZ/A					
9	Legacy		SC	14.5	OZ/A	3.7	2.3	18	13	8
	Velocity	17.6	SG	2	OZ/A					
10	Primo	1	EC	11	OZ/A	2.7	3.3	18	13	18
	Velocity	17.6	SG	2	OZ/A					
	LSD (P=.05)					0.8	1.9	15	16	18

* Bentgrass phytotoxicity rated from 1 to 9; 1=no phyto, 9=maximum discoloration.

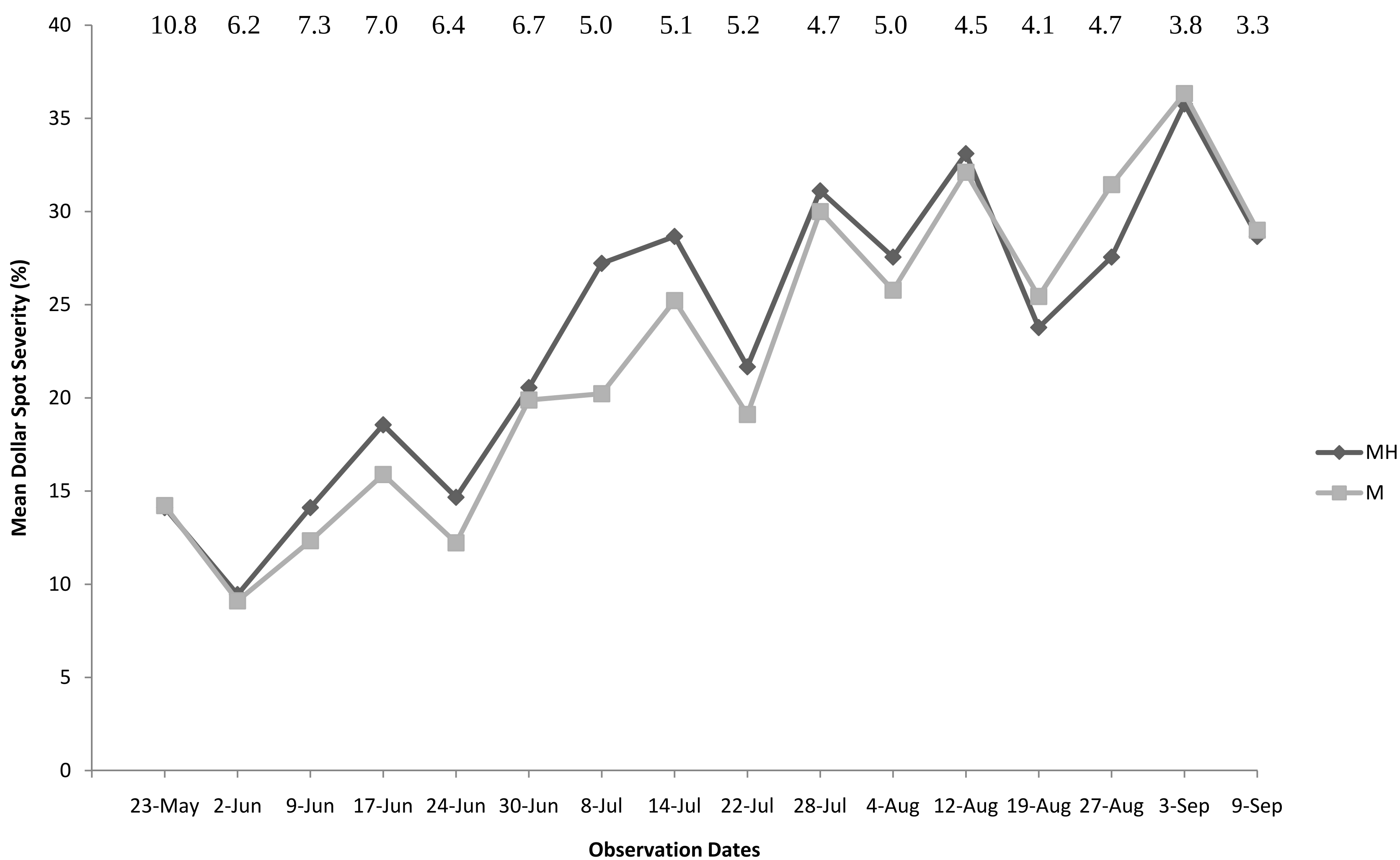
TOWARDS REDUCING FUNGICIDE USE IN THE CONTROL OF DOLLAR SPOT (*SCLEROTINIA HOMOEOCARPA* F.T. BENNETT) DISEASE ON CREEPING BENTGRASS (*AGROSTIS STOLONIFERA* L.)

Kenneth Cropper, Ph.D. Candidate
Plant and Soil Science Department

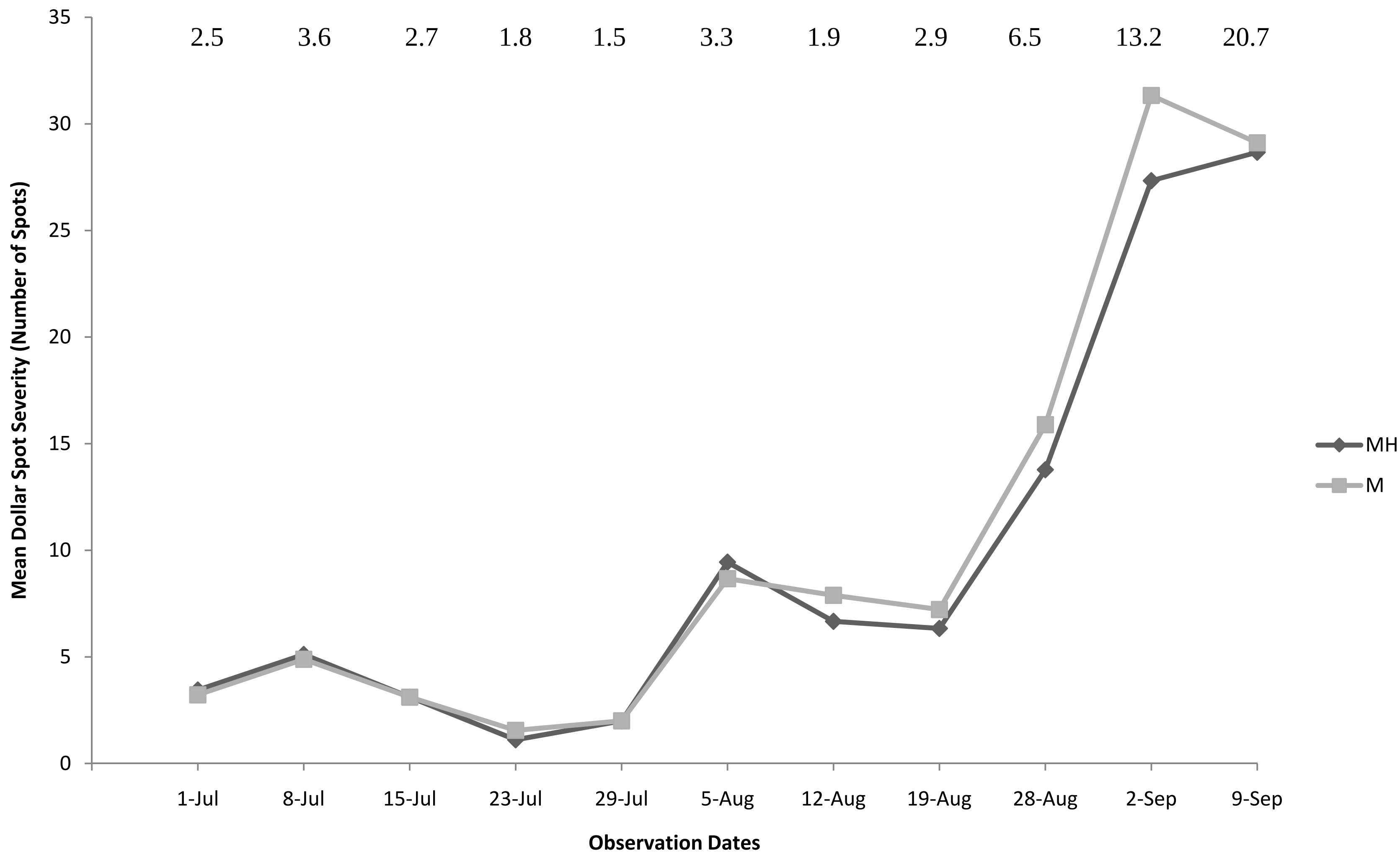
Creeping bentgrass (*Agrostis stolonifera* L.) is commonly used on golf course greens and fairways in cool-humid regions but is plagued by numerous fungal diseases, one of which is dollar spot disease (*Sclerotinia homoeocarpa* F. T. Bennett). Dollar spot occurs frequently throughout the growing season requiring biweekly fungicide applications for complete control. The objective of this study was to investigate methods of reducing the number of fungicide applications needed to maintain dollar spot at acceptable levels through dew removal and potential mechanisms of resistance in bentgrass. In the first study, a combination of mowing three times a week and dragging by hose the remaining four days to remove dew was used in an attempt to reduce disease severity. The main effect of this combination treatment was not significant ($p>0.05$) and did not reduce the number of fungicide applications compared to normal mowing three times a week. However, dollar spot was managed curatively with 20-80% fewer applications compared to a normal preventative fungicide program. In the second experiment, two experimental germplasms with varying disease resistance were tested for the possible production of antifungal compounds known as phytoanticipins. Preliminary results indicate the resistant line may contain compounds not present in the susceptible line.

Ph.D. Research 2010-11:

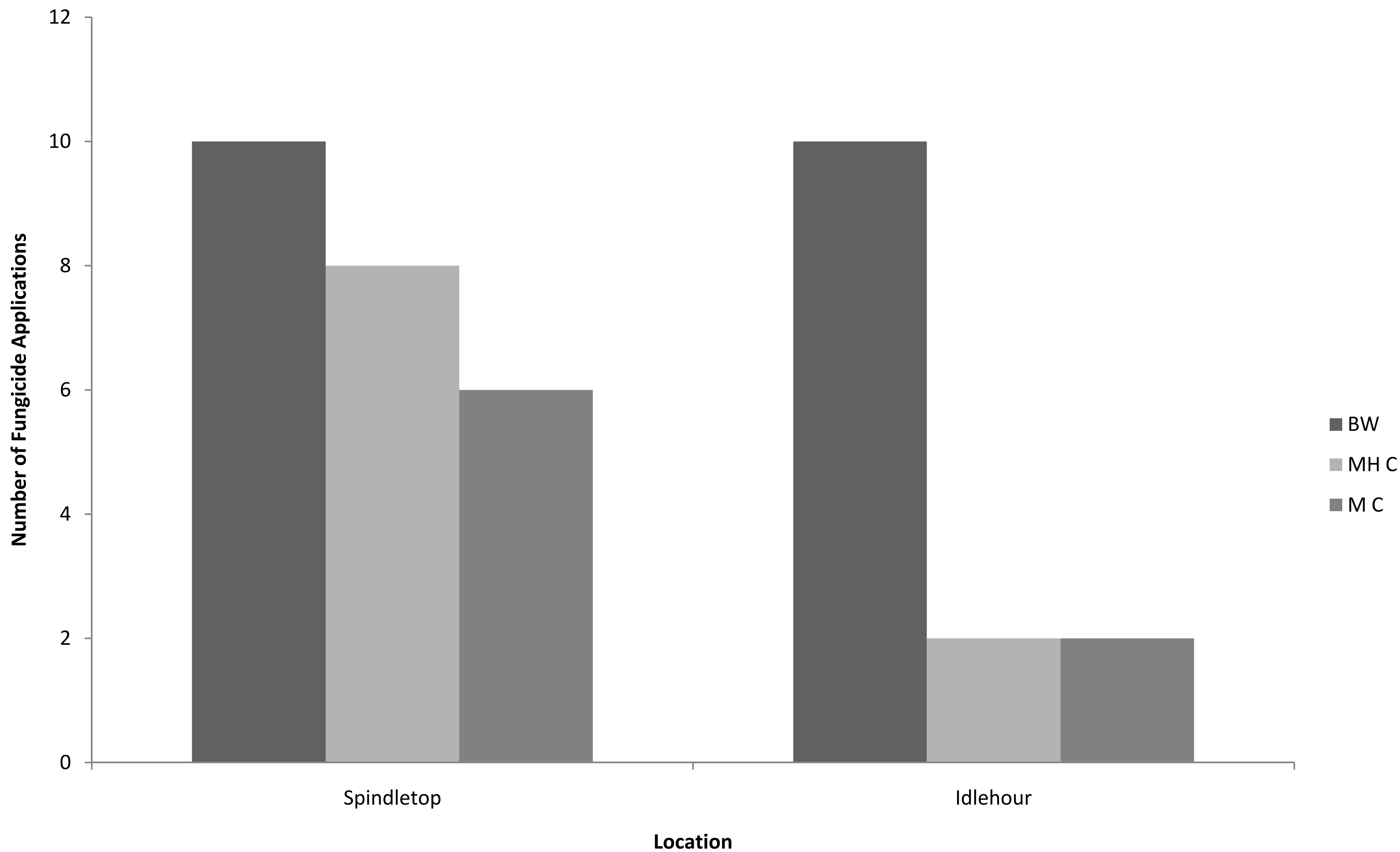
Based on the results obtained from initial investigations into dollar spot disease resistance mechanisms in creeping bentgrass, a more thorough analysis will be conducted over the next two years. To begin the study, ‘Crenshaw’ and ‘L-93’ cultivars of creeping bentgrass will be grown hydroponically and in natural soil to examine disease response to the dollar spot pathogen. If the hydroponic plants are shown to exhibit the same disease response as the bentgrass plants grown in natural soil, then additional hydroponic samples of the two cultivars will be grown out and the solution the plants are grown in as well as the plants themselves will be analyzed for the presence of any antifungal compounds which could contribute to the reported differences in disease resistance between cultivars such as Crenshaw and L-93. Determining the cause(s) of varying levels of dollar spot disease resistance in creeping bentgrass cultivars would assist breeders in working to create better culitvars of dollar spot resistant creeping bentgrass in the future.



Disease progress curves of dollar spot in response to dew treatments at the Spindletop Farm site in 2008. Numbers above curves represent F-protected Fisher's LSD values (p=0.05). Mower-hose and mower treatments are denoted MH and M, respectively.



Disease progress curves of dollar spot in response to dew treatments at the Idlehour Country Club site in 2008. Numbers above curves represent F-protected Fisher's LSD values (p=0.05). Mower-hose and mower treatments are denoted MH and M, respectively.



Total number of curative (C) and biweekly (BW) fungicide applications made for each of the dew removal treatments at the Spindletop Farm and Idlehour Country Club sites in 2008. Mower-hose and mower treatments are denoted MH and M, respectively.

BENTGRASS VARIETY EVALUATIONS 2009

GREENS HEIGHT TRIAL

Establishment Date: 23 April 2009
Cooperator: National Turfgrass Evaluation Program
Site/Location: Sand, Spindletop Research Farm, Fayette County, KY
Design: Randomized complete block, 3 reps, plot size = 5' x 5'
Management: Irrigation as needed to prevent stress
Mowing height 3/16 inches

Entry No.	Variety	2009 Quality*	Seedling Vigor** 5/26/09	% Ground Cover 6/23/09	% Ground Cover 8/25/09	% Dollar Spot 9/22/09	Spring Green Up*** 3/19/10
1	Penncross	6.2	7.0	93	100	16	4.7
2	Penn A-1	6.8	7.0	75	93	15	6.7
3	SR 7200	5.9	5.0	83	95	7	9.0
4	Declaration	7.5	6.7	93	99	7	8.0
5	LTP-FEC	7.0	6.0	84	96	11	6.7
6	L-93	6.9	6.3	88	100	17	6.3
7	T-1	6.9	6.0	92	99	18	5.7
8	Alpha	6.6	5.0	84	95	19	4.7
9	Penn A-2	6.0	5.0	80	93	15	6.7
10	MVS-AP-101	6.9	5.7	82	94	11	7.0
11	A08-TDN2	7.1	5.7	90	95	12	7.3
12	AFM	6.7	7.3	87	91	12	7.3
13	Authority	6.7	6.7	84	96	14	7.0
14	SRP-1GMC	6.8	5.7	80	93	11	6.3
15	SRP-1BLTR3	6.5	5.7	77	87	21	7.3
16	PST-OJO	6.6	6.7	91	93	20	5.7
17	V8	6.7	6.3	82	92	12	4.0
18	HTM	6.7	5.7	76	85	13	7.0
19	Villa	5.7	5.3	81	90	8	9.0
20	L-93	6.3	6.0	68	89	12	4.7
LSD (P=.05)		0.7	1.7	19	13	6	1.5

* Average of monthly visual ratings from 1 to 9. 9=overall best turf quality.
** Visual rating from 1 to 9; 9=most vigorous seedling.
*** Visual rating from 1 to 9; 1=brown, dormant, 9=darkest green.

FAIRWAY HEIGHT TRIAL

Establishment Date: 11 September 2008
Cooperator: National Turfgrass Evaluation Program
Site/Location: Native Soil (Maury Silt Loam), Spindletop Research Farm, Fayette County, KY
Design: Randomized complete block, 3 reps, plot size = 5' x 5'
Management: Irrigation as needed to prevent stress
Mowing height 0.75inches

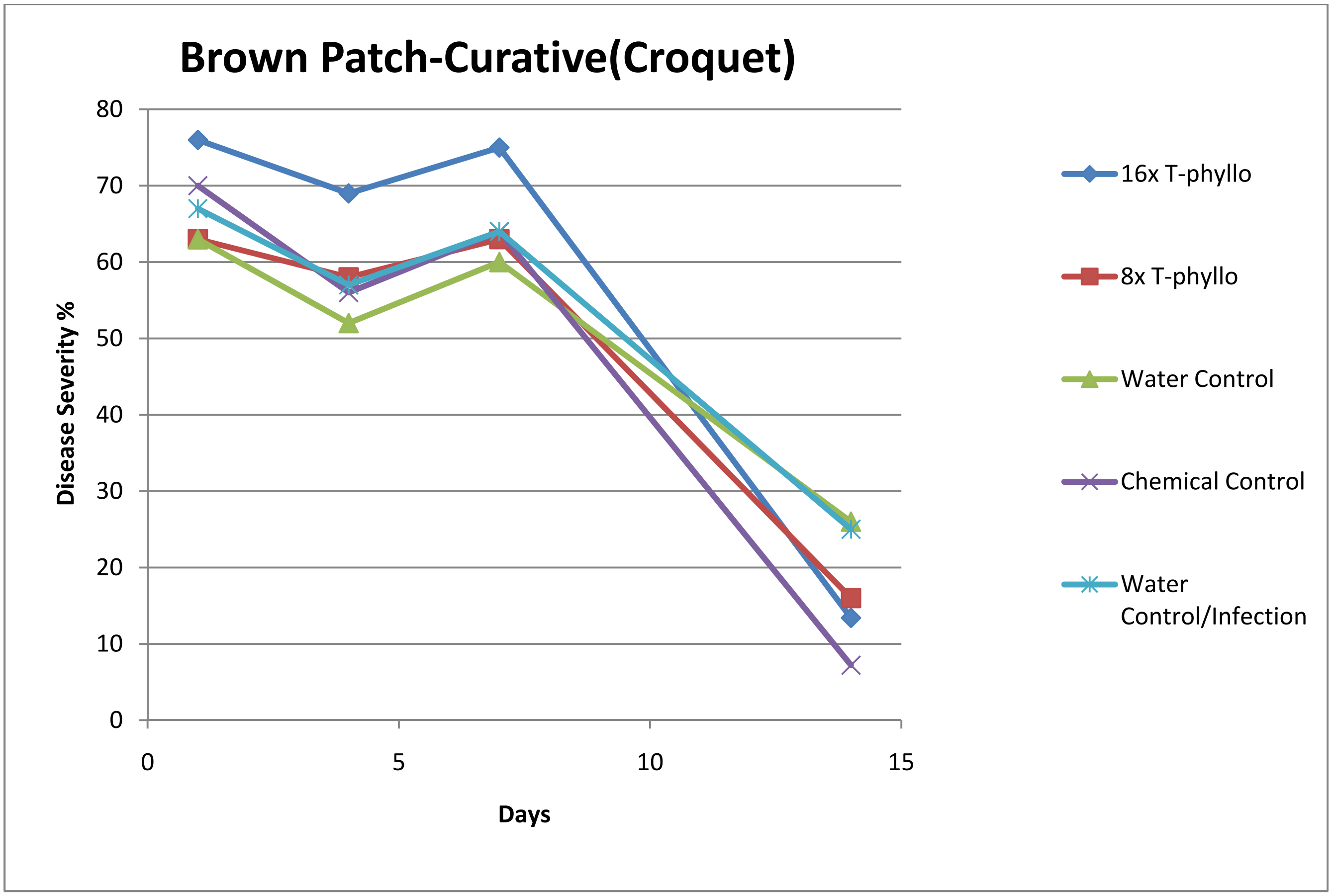
Entry No.	Entry Name	Average Quality* 2009	Green Up** 3/8/2010	---------- % Dollar Spot ---------- 6/23/2009	7/27/2009	8/21/2009
1	Penncross	5.7	1.0	12	37	27
2	Crystal Bluelinks	6.8	4.3	16	35	13
3	Benchmark DSR	7.2	3.0	12	17	8
4	Declaration	6.9	1.7	3	14	11
5	LTP-FEC	7.1	1.0	10	15	17
6	L-93	6.7	3.0	13	47	12
7	T-1	6.8	1.0	18	32	8
8	Authority	6.9	1.7	13	22	10
9	CY-2	6.8	3.7	15	37	14
10	MVS-Ap-101	7.1	1.0	13	12	7
11	Memorial	7.0	2.3	8	19	12
12	A08-EBM	6.9	4.3	4	3	0
13	A08-TDN2	6.6	1.7	16	30	21
14	A08-FT12	7.5	5.3	1	4	0
15	SRP-1WM	7.1	1.0	10	23	7
16	007	6.5	1.7	14	27	22
17	PST-0JD	6.6	2.3	13	27	14
18	PST-R9D7	6.7	8.7	3	4	0
19	Princeville	5.7	2.3	15	37	25
20	HTM	6.6	2.3	17	28	19
21	BCD	7.6	5.7	8	9	0
22	Tiger II	7.3	5.7	10	9	0
23	Greentime	7.4	5.7	4	0	0
	LSD (P=.05)	0.5	3.0	7	14	12

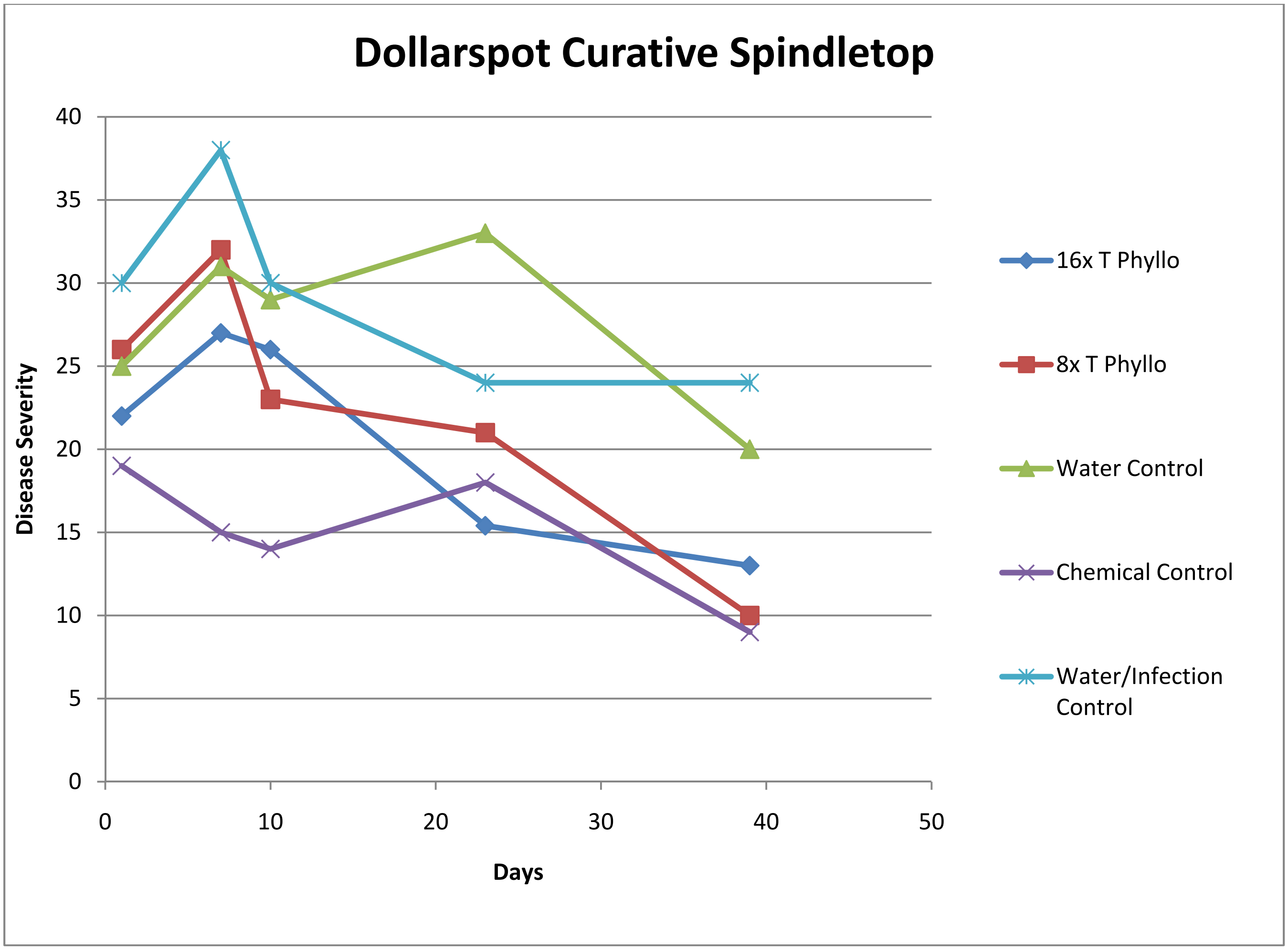
* Average of monthly ratings from 1 to 9; 9=overall best turf quality.
** Visual rating from 1 to 9; 1=dormant, 9=summer green.

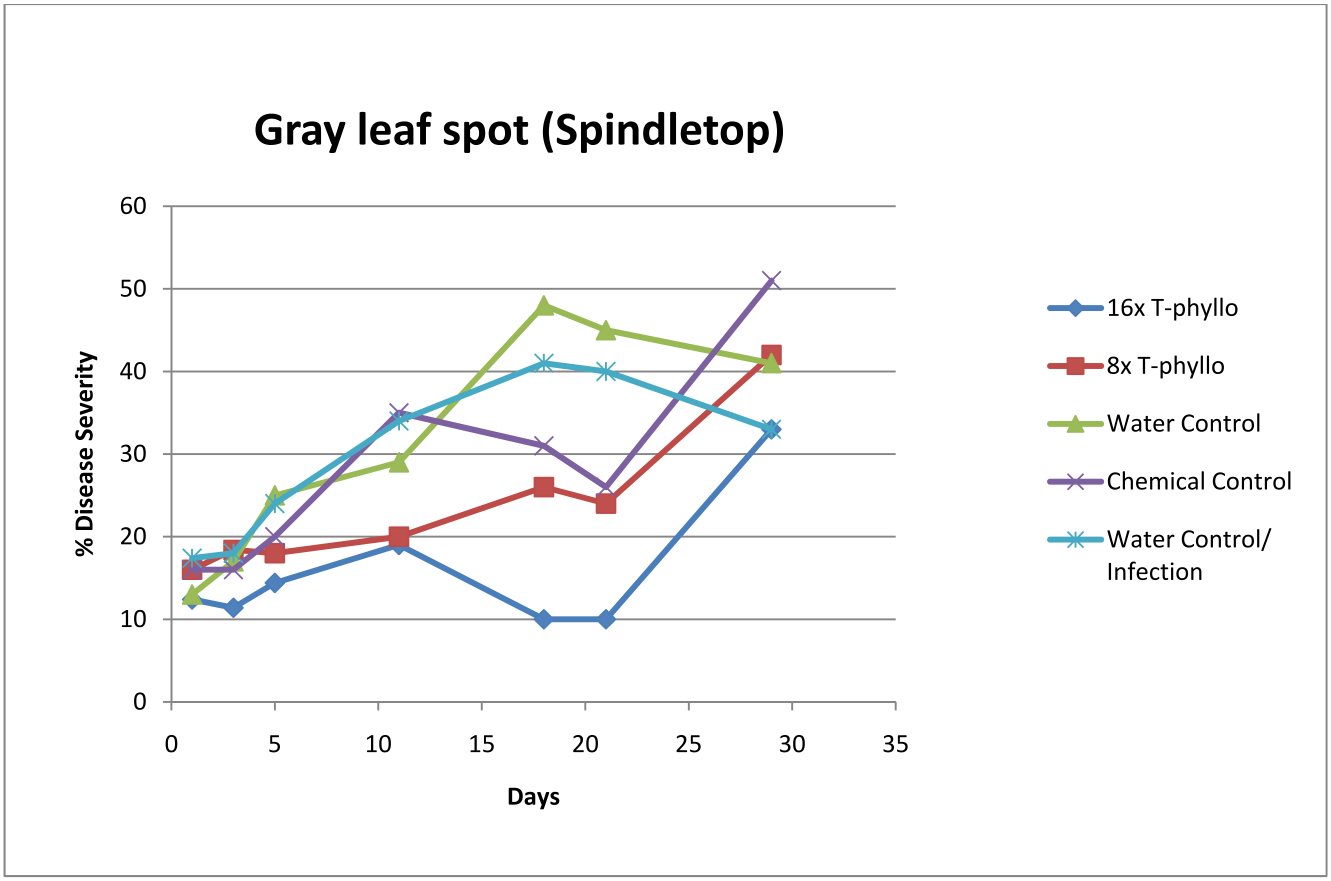
Fungal disease control with plant-generated compounds

Brian King, PhD student
Plant and Soil Science Department

Gray leaf spot disease of perennial ryegrass, and brown patch and dollar spot diseases of creeping bentgrass are yearly problems for turf managers in Kentucky. Both diseases are prevalent and quite expensive to prevent or to cure. Recently, it has been shown that there is resistance to commonly used chemicals developing in gray leaf spot. Due to the high expense of commercial fungicides and a growing resistance to these fungicides, research involving antimicrobial peptides (proteins) have taken off. Phylloplanins are naturally occurring secondary metabolites which are produced on the plant leaf surface (phyllo=plant, planin=surface) of tobacco plants and have been found in varying amounts and efficacy on a number of other plant species. Last year experimental testing of phylloplanins in laboratory tests, and field trials showed that tobacco phylloplanin was an effective treatment for controlling gray leaf spot, brown patch and dollar spot. This year, trials are being done at Spindletop farm, the Marriott golf course, and the Idlehour golf course to test the efficacy of different concentrations of tobacco phylloplanins against infection from the aforementioned pathogens. These field tests will provide real-world evidence to the effectiveness of phylloplanins as antimicrobial peptides when compared to some the top commercially available fungicides. Preliminary data from 2009 is shown below.


Brown Patch-Curative(Croquet)
80
70
60
50
40
30
20
10
0
Disease Severity %
0
5
10
15
Days
16x T-phyllo
8x T-phyllo
Water Control
Chemical Control
Water Control/Infection


Dollarspot Curative Spindletop
Disease Severity
Days
0
5
10
15
20
25
30
35
40
0
10
20
30
40
50
16x T Phyllo
8x T Phyllo
Water Control
Chemical Control
Water/Infection Control


Gray leaf spot (Spindletop)
% Disease Severity
60
50
40
30
20
10
0
0
5
10
15
20
25
30
35
Days
16x T-phyllo
8x T-phyllo
Water Control
Chemical Control
Water Control/
Infection

Wild Violet Control Using MAT28 (Imprelis) 2009

A study was initiated on May 20, 2009 to evaluate several formulations of an experimental DuPont herbicide, DPX-MAT28, compared to standard herbicides for the control of wild violets in established turf. An established Kentucky bluegrass (unknown variety) stand with broadleaf weeds, primarily wild violet and ground ivy, was chosen for this trial. Treatments were applied on individual 6' x 10' plots with three replications. Granular products were applied by hand. Liquid products were applied using a CO_2 hand-held sprayer delivering 52 GPA. Wild violet ratings are summarized in the following table.

Treatment					----------------------% Violet Cover----------------------			
Name	Formulation		Rate		6/19/2009	6/30/2009	9/15/2009	4/7/2010
Untreated Check					25	11	12	10
DPX-MAT28	2	SL	3	oz/A	5	3	4	2
DPX-MAT28	2	SL	4.5	oz/A	4	1	3	1
DPX-MAT28	50	SG	2.25	oz wt/A	2	1	0	1
DPX-MAT28	2	SL	6	oz/A	4	1	1	0
Trimec Classic	1.36	EC	4	pt/A	14	19	20	12
DPX-MAT28-070	0.05	GR	150	lb/A	5	6	6	3
DPX-MAT28-070	0.05	GR	175	lb/A	6	4	10	9
DPX-MAT28-070	0.05	GR	200	lb/A	3	1	5	2
DPX-MAT28-071	0.05	GR	150	lb/A	6	2	5	3
DPX-MAT28-071	0.05	GR	175	lb/A	7	4	9	10
DPX-MAT28-071	0.05	GR	200	lb/A	7	3	6	4
Momentum Force		GR	156.8	lb/A	9	14	13	7
DPX-Q9T28-001		GR	150	lb/A	8	5	11	5
LSD (P=.05)					7	4	8	6

BEMUDAGRASS/RYEGRASS TRANSITION WITH HERBICIDES 2010

A study was initiated on May 20, 2010 to evaluate several sulfonylurea herbicides for ryegrass removal in an overseeded bermudagrass situation. Treatments were applied in 52 GPA to individual 6' x 10' plots with three replications. Mowing height was 0.625 inches. Evaluations are summarized in the following table.

Trt No.	Treatment Name	Formulation		Rate		% Ryegrass Control 6/4	6/7	6/18	Bermuda Quality** 6/4	% Bermuda Phytotoxicity 6/7	6/18
1	Untreated Check					0	0	7	6.7	0	3
2	MSM*	60	DF	0.25	OZ/A	63	75	2	3.7	37	20
3	MSM*	60	DF	0.5	OZ/A	57	73	53	4.7	27	20
4	QP Rimsulfuron*	25	DF	0.5	OZ/A	70	85	58	4.3	13	10
5	QP Rimsulfuron*	25	DF	1	OZ/A	67	83	85	3	30	18
6	MSM*	60	DF	0.25	OZ/A	73	88	72	3.0	43	18
	QP Rimsulfuron	25	DF	0.5	OZ/A						
7	MSM*	60	DF	0.25	OZ/A	59	85	87	3.0	53	22
	QP Rimsulfuron	25	DF	1	OZ/A						
8	MSM*	60	DF	0.5	OZ/A	67	80	72	3.7	33	18
	QP Rimsulfuron	25	DF	0.5	OZ/A						
9	MSM*	60	DF	0.5	OZ/A	73	93	90	3.7	30	12
	QP Rimsulfuron	25	DF	1	OZ/A						
10	Monument*	75	WG	0.35	OZ/A	80	82	60	3.0	24	37
11	Revolver	0.19	SC	17	FL OZ/A	73	85	48	5.0	23	17
12	Katana*	25	DF	1.5	OZ/A	77	87	92	3.7	57	33
13	Revolver	0.19	SC	17	FL OZ/A	70	80	78	4.3	7	7
	MSO	100	SL	0.25	% V/V						
LSD (P=.05)						29	16	34	2.2	36	16

* Non-ionic surfactant added at 0.25 % v/v

**Visual rating from 1 to 9; 9=overall turf quality

New Work on *Poa annua* Biotypes

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Annual bluegrass (*Poa annua*) is an aggressive invader in intensively managed turf. As the intensity of golf course management increases, so do populations of perennial strains of annual bluegrass. Annual bluegrass patches, which may represent different biotypes, are commonly observed to differ in regards to color, texture and height of flowers. It is not known whether these visual differences are genetically controlled, are more due to management, or whether apparently dissimilar suspected biotypes might react differently to chemical treatments used to manage annual bluegrass populations.

Annual bluegrass plugs were collected from various greens at three Lexington golf courses (Lexington Country Club, Picadome Golf Course, and The University Club of Kentucky). Seventy-six plugs were randomly planted into an existing stand of 'L-93' creeping bentgrass on a native soil (Maury silt loam). Mowing height is 0.625 inch. Herbicide and plant growth regulator treatments (see table below) were applied to the plugs to investigate potential differential responses among the biotypes to the treatments.

Treatment

Treatment	Formulation	Rate	Application Timing
Untreated			
Trimmit	2SL	16 oz/A	Ea 3 wk
Trimmit	2SL	32 oz/A	Ea 3 wk
Cutless	1.3 MEC	49 oz/A	Ea 3 wk
Velocity	17.6 SG	2 oz/A	TBD
HM9930 (Helena)	L	3 oz/1000 ft^2	TBD

These same annual bluegrass biotypes are also being grown in the greenhouse for additional testing under more precise conditions than possible in field studies. These plants will be used to further investigate potential differences in responses among the biotypes to chemicals for annual bluegrass control, and also to investigate whether morphological differences persist while under the same management regime. These plants will also be used to investigate the genetic diversity of the biotypes collected both within and among the three golf courses.

KNOTWEED CONTROL IN BERMUDAGRASS

A study was initiated on May 5, 2010 to evaluate erect knotweed (Polygonum erectum) control using various sulfonylurea herbicides. Erect knotweed, a summer annual, can be a problem in non-crop sites and thrives in dry, compacted soil. This can be a problem in traffic-damaged nad compacted areas of bermudagrass sports fields. Treatments in 52 GPA were applied to individual 6' x 10' plots with three replications. Mowing height was 2.5 inches. Evaluations are summarized in the following table.

Trt No	Treatment Name	Formulation		Rate		Knotweed Phytotoxicity** 5/12/2010	% Knotweed Cover 5/20/2010	% Knotweed Control 5/20/2010
1	Untreated Check					1.0	93	0
2	MSM*	60	DF	0.25	OZ/A	5.0	45	73
3	MSM*	60	DF	0.5	OZ/A	5.0	38	80
4	QP Rimsulfuron*	25	DF	0.5	OZ/A	2.3	83	0
5	QP Rimsulfuron*	25	DF	1	OZ/A	2.7	85	0
6	MSM*	60	DF	0.25	OZ/A	4.3	42	77
	QP Rimsulfuron	25	DF	0.5	OZ/A			
7	MSM*	60	DF	0.25	OZ/A	5.3	37	87
	QP Rimsulfuron	25	DF	1	OZ/A			
8	MSM*	60	DF	0.5	OZ/A	5.0	22	83
	QP Rimsulfuron	25	DF	0.5	OZ/A			
9	MSM*	60	DF	0.5	OZ/A	5.7	18	92
	QP Rimsulfuron	25	DF	1	OZ/A			
10	Monument*	75	WG	0.35	OZ/A	2.7	75	0
11	Revolver	0.19	SC	17	FL OZ/A	2.0	75	0
12	Katana*	25	DF	1.5	OZ/A	5.3	53	72
13	Revolver	0.19	SC	17	FL OZ/A	2.0	95	0
	MSO	100	SL	0.25	% V/V			
LSD (P=.05)						1.3	32	23

* Non-ionic surfactant added at 0.25% v/v

** Knotweed phytotoxicity rated on a scale of 1 to 9; 9=brown.

KNOTWEED CONTROL USING IMPRELIS (DPX MAT28)

A study was initiated on May 5, 2010 to evaluate erect knotweed control using Imprelis (DPX MAT28). Treatments were applied to individual 6' x 10' plots in 3 replications. Mowing height was 2.5 inches. Evaluations are summarized in the following table.

Trt No	Name	Formu- lation		Rate		Applic. Timing	Knotweed Phytotoxicity* 5/12/2010	% Knotweed Cover 5/20/2010	% Knotweed Control 5/20/2010
1	Untreated						1.0	95	0
2	DPX MAT28	2	SL	0.75	FL OZ/A	initiation	3.3	85	10
3	DPX MAT28	2	SL	0.75	FL OZ/A	initiation	2.0	87	8
	DPX MAT28	2	SL	0.75	FL OZ/A	4wks			
4	DPX MAT28	2	SL	3	FL OZ/A	initiation	4.7	80	47
5	DPX MAT28	2	SL	3	FL OZ/A	initiation	5.7	80	57
	DPX MAT28	2	SL	3	FL OZ/A	4wks			
6	Trimec Classic		SL	4	PT/A	initiation	7.7	77	82
LSD (P=.05)							0.8	12	22

* Rating from 1 to 9; 9=most knotweed phytotoxicity.

Goosegrass Control using Dismiss/Revolver Tank Mix 2010

A study was initiated on July 25, 2010 to evaluate Dismiss and Revolver alone and tank mixed for postemergence control of goosegrass. This trial was established in a prepared seed bed in which goosegrass had germinated. Treatments were applied using a hand-held CO^2 sprayer to individual 5' x 10' plots in three replications. Mowing height was maintained at 0.625 inch.

Preliminary evaluations appear in the following table.

Trt No.	Treatment	Formulation		Rate		Application Description	% Goosegrass Control 6/26	6/28	7/2
1	Untreated						0	0	0
2	Dismiss	4	SC	8	FL OZ/A	1-4 tiller	88	63	55
3	Dismiss	4	SC	12	FL OZ/A	1-4 tiller	93	80	73
4	Dismiss	4	SC	8	FL OZ/A	1-4 tiller	92	73	68
	Dismiss	4	SC	4	FL OZ/A	14days			
5	Dismiss	4	SC	8	FL OZ/A	1-4 tiller	88	78	70
	Revolver	0.19	SC	17	FL OZ/A	14days			
6	Revolver	0.19	SC	17	FL OZ/A	1-4 tiller	27	83	95
7	Revolver	0.19	SC	26	FL OZ/A	1-4 tiller	22	82	98
8	Revolver	0.19	SC	17	FL OZ/A	1-4 tiller	47	78	97
	Revolver	0.19	SC	17	FL OZ/A	14days			
9	Dismiss	4	SC	8	FL OZ/A	1-4 tiller	98	95	92
	Revolver	0.19	SC	17	FL OZ/A	1-4 tiller			
10	Dismiss	4	SC	8	FL OZ/A	1-4 tiller	99	93	90
	Revolver	0.19	SC	12	FL OZ/A	1-4 tiller			
11	Dismiss	4	SC	8	FL OZ/A	1-4 tiller	97	90	85
	Revolver	0.19	SC	10	FL OZ/A	1-4 tiller			
12	Dismiss	4	SC	8	FL OZ/A	1-4 tiller	94	88	78
	Revolver	0.19	SC	8	FL OZ/A	1-4 tiller			
13	MSMA	6	EC	2	FL OZ/1000 FT^2	1-4 tiller	60	73	83
14	MSMA	6	EC	2	FL OZ/1000 FT^2	1-4 tiller	60	77	82
	MSMA	6	EC	2	FL OZ/1000 FT^2	14days			
LSD (P=.05)							21	10	10

Bermuda Tolerance to Dismiss/Revolver Tank Mix – 2010

A study was initiated on July 25, 2010 to evaluate bermudagrass tolerance to Dismiss and Revolver alone and in tank mixes. A mature stand of 'Sovereign' bermudagrass was chosen for this study. Treatments were applied using a hand-held CO^2 sprayer to individual 6' x 10' plots in three replications. Mowing height was maintained at 0.625 inch.

Preliminary results appear in the following table.

Trt No.	Treatment	Formulation		Rate		Application Description	Bermuda Injury* 6/26	6/28	7/2
1	Untreated						1.0	1.0	1.0
2	Dismiss	4	SC	8	FL OZ/A	25 Jul	1.3	2.0	1.3
3	Dismiss	4	SC	12	FL OZ/A	25 Jul	1.7	2.0	1.7
4	Dismiss	4	SC	8	FL OZ/A	25 Jul	1.7	1.7	1.0
	Dismiss	4	SC	4	FL OZ/A	+14days			
5	Dismiss	4	SC	8	FL OZ/A	25 Jul	1.3	2.0	1.0
	Revolver	0.19	SC	17	FL OZ/A	+14days			
6	Revolver	0.19	SC	17	FL OZ/A	25 Jul	1.3	3.0	2.0
7	Revolver	0.19	SC	26	FL OZ/A	25 Jul	1.0	3.3	1.7
8	Revolver	0.19	SC	17	FL OZ/A	25 Jul	1.3	3.0	2.0
	Revolver	0.19	SC	17	FL OZ/A	+14days			
9	Dismiss	4	SC	8	FL OZ/A	25 Jul	3.0	2.7	1.7
	Revolver	0.19	SC	17	FL OZ/A	25 Jul			
10	Dismiss	4	SC	8	FL OZ/A	25 Jul	2.7	2.3	1.3
	Revolver	0.19	SC	12	FL OZ/A	25 Jul			
11	Dismiss	4	SC	8	FL OZ/A	25 Jul	3.0	2.0	1.3
	Revolver	0.19	SC	10	FL OZ/A	25 Jul			
12	Dismiss	4	SC	8	FL OZ/A	25 Jul	2.7	2.0	1.0
	Revolver	0.19	SC	8	FL OZ/A	25 Jul			
13	MSMA	6	EC	2	FL OZ/1000 FT^2	25 Jul	1.7	5.0	3.0
14	MSMA	6	EC	2	FL OZ/1000 FT^2	25 Jul	1.3	5.0	3.0
	MSMA	6	EC	2	FL OZ/1000 FT^2	+14days			
LSD (P=.05)							1.0	0.5	0.7

* Rating from 1 to 9; 1=no injury, 9=maximum injury to bermudagrass.

Poa annua Control using Herbicides and PGRs 2009-2010

This test was initiated in April 2009 at the University Club of Kentucky, Fayette County, KY on a soil-based 'L-93' bentgrass nursery to evaluate several plant growth regulator compounds and herbicides for the control of annual bluegrass. The bentgrass nursery is mowed daily Monday through Friday at 0.125 inch. Approximately 3.0 lbs nitrogen per 1000 square feet/yr is applied annually. Treatment applications are described in the following table and a brief summary of ratings in the second table.

Poa annua control treatments.

Month	Day	Applic. Code	Velocity	Velocity	HM9930	Trimmit	Cutless	Legacy	Primo
Apr	15	A			3 oz/M	8oz/A	8oz/A	10 oz/A	11 oz/A
Apr	22	B							
Apr	29	C				8oz/A	8oz/A	10 oz/A	11 oz/A
May	6	D							
May	13	E				8oz/A	8oz/A	10 oz/A	11 oz/A
May	27	G	1 oz/A			8 oz/A	16 oz/A	10 oz/A	11 oz/A
June	10	I	1 oz/A			16 oz/A	16 oz/A	10 oz/A	11 oz/A
June	24	K	1 oz/A			16 oz/A	16 oz/A	10 oz/A	11 oz/A
July	8	M	1 oz/A			16 oz/A	16 oz/A	10 oz/A	11 oz/A
July	22	O	1 oz/A			16 oz/A	16 oz/A	10 oz/A	11 oz/A
Aug	5	Q	1 oz/A		3 oz/M	8oz/A	16 oz/A	10 oz/A	11 oz/A
Aug	12	R		2 oz/A					
Aug	19	S	1 oz/A	2 oz/A		8 oz/A	16 oz/A	10 oz/A	11 oz/A
Aug	26	T		2 oz/A					
Sep	2	U	1 oz/A	2 oz/A		8 oz/A	8 oz/A	10 oz/A	11 oz/A
Sep	16	W				8 oz/A	8 oz/A	10 oz/A	11 oz/A

Poa annua control evaluations the University Club of Kentucky beginning in 2009 and continuing in 2010.

Trt No.	Treatment			Rate		Application Code*	% Poa annua Cover 4/23/2009	5/20/2009	6/26/2009	4/19/2010	5/29/2010	6/18/2010
1	Untreated						6	5	6	20	20	15
2	Velocity	17.6	SG	1	OZ WT/A	GIKMOQSU	6	5	5	7	7	13
3	Velocity	17.6	SG	2	OZ WT/A	RSTU	10	9	5	12	7	12
4	HM9930		L	3	FL OZ/1000 FT^2	AQ	6	5	6	2	3	7
5	Trimmit	2	SC	8	FL OZ/A	ACEGQSUW	10	6	8	13	16	18
	Trimmit	2	SC	16	FL OZ/A	IKMO						
6	Cutless	1.3	ME	8	FL OZ/A	ACEUW	5	3	4	7	10	13
	Cutless	1.3	ME	16	FL OZ/A	GIKMOQS						
7	Legacy	1.51	EC	10	FL OZ/A	ACEGIKMOQSUW	10	7	7	17	20	17
8	Primo	1	EC	11	FL OZ/A	ACEGIKMOQSUW	6	3	4	8	22	12
LSD (P=.05)							9	6	7	7	10	9

* Refer to previous table for application date

POA ANNUA CONTROL ON 'PENNCROSS' BENTGRASS ON SOIL-BASED GREEN

This test was initiated in April 2006 on an established 'Penncross' soil green at the University of Kentucky's Spindletop Research Farm. Treatments were applied each three weeks April through October from 2006 through 2009 to individual 6' x 10' plots in three replications. The mowing height was maintained at 3/16". Poa annua ratings for the past two years appear in the following table.

Trt	Treatment					--- % Poa annua Cover ---					
No.	Name	Formulation		Rate		4/15/2009	4/30/2009	5/1/2009	4/15/2010	5/7/2010	5/3/2010
1	Untreated					31	55	52	19	57	52
2	Cutless*	50	WP	8	OZ/A	10	11	17	10	25	20
3	Legacy	1.51	L	14.7	FL OZ/A	14	32	32	13	45	30
4	Trimmit	2	SL	16	OZ/A	3	7	10	12	27	19
5	Primo Maxx	1	EC	11	OZ/A	23	43	43	19	53	50
6	Velocity	17.6	SG	10	G A/A	1	3	4	4	18	14
	Trimmit	2	SL	8	OZ/A						
7	Velocity	17.6	SG	10	G A/A	4	6	5	1	12	4
	Cutless	50	WP	8	OZ/A						
LSD (P=.05)						12	11	14	9	19	9

* Urea (0.25#N/1000ft^2) was added to all treatments each application.

KENTUCKY BLUEGRASS VARIETY EVALUATIONS

Establishment Date: 6 September 2005
Cooperator: National Turfgrass Evaluation Program
Site/Location: Maury silt loam, Spindletop Research Farm, Fayette Co., KY
Design: Randomized complete block, 3 reps, 5' x 5' plots
Management: Irrigation as needed to prevent stress
Mowing height 2.25 inches
3.0 lb N/1000 ft^2/year applied in the fall

Quality* of Kentucky bluegrass varieties established in 2005 and maintained at 2.25 inch mowing height (sorted by descending 4-yr turf quality).

	---------------- Quality* ----------------				
Variety	**4-yr avg**	**2006**	**2007**	**2008**	**2009**
Granite (J-1326)	7.7	7.9	7.7	7.5	7.7
Midnight	7.6	7.7	7.6	7.8	7.6
Nuchicago (J-1466)	7.6	7.6	7.6	8.0	7.2
J-3429	7.6	7.9	7.8	7.4	7.5
J-1334	7.5	7.3	7.6	7.6	7.7
Solar Eclipse (J-2399)	7.5	7.4	7.6	7.5	7.5
NuGlade	7.5	7.4	7.3	8.0	7.6
Zinfandel (LTP 2949)	7.5	7.5	7.8	7.2	7.4
Bewitched	7.4	8.0	7.3	7.2	7.4
J-2024	7.4	7.4	7.2	7.7	7.4
Everglade	7.4	7.5	7.3	7.7	7.4
Nu Destiny	7.4	7.3	7.1	7.7	7.5
Excursion	7.4	7.5	7.6	7.2	7.4
Rhythm	7.4	7.3	7.1	7.8	7.6
Emblem (PST-2YK-169)	7.4	7.7	7.8	7.5	6.8
J-2502	7.3	7.5	7.7	6.8	7.3
Everest	7.3	7.5	7.1	7.3	7.3
Award	7.3	7.1	7.2	7.3	7.5
Impact	7.3	7.0	7.4	7.7	7.4
Barrister	7.3	6.8	7.2	8.0	7.4
Hampton (Bd 03-159)	7.2	7.6	7.6	6.7	6.6
Alexa II (J-2404)	7.2	7.0	7.1	7.6	7.3
Sudden Impact (J-2870)	7.2	7.4	7.5	6.8	7.3
A00-1400	7.2	7.1	7.5	6.8	7.5
Blue Note (A01-349)	7.2	7.0	7.3	7.5	6.9
Skye	7.2	7.3	7.0	7.0	7.7
Prosperity	7.2	7.0	7.7	7.2	7.2
Bd 03-84	7.1	7.4	7.4	6.3	7.5
Bd 99-2103	7.1	7.0	7.0	7.2	7.3
DP 76-9066	7.1	7.0	7.1	7.3	7.1
Beyond	7.1	6.9	7.2	7.3	7.3
NA-3257	7.1	7.1	7.8	6.5	6.9
A97-1287	7.1	6.9	7.2	7.2	6.9

		---------------- Quality* ----------------			
Variety	**4-yr avg**	**2006**	**2007**	**2008**	**2009**
Empire (A01-299)	7.1	7.2	7.4	6.5	7.3
Shiraz (LTP-73)	7.1	7.3	7.3	6.6	7.1
Diva	7.1	7.1	7.0	7.0	7.0
Bluestone	7.0	7.0	7.0	7.2	6.8
Blueberry	6.9	7.3	6.8	7.0	6.7
4 Season (J-2791)	6.9	7.1	6.9	6.8	6.9
Glenmont	6.9	6.7	6.8	6.7	7.5
A00-247	6.9	6.7	7.1	6.7	6.9
Avid	6.9	7.0	6.8	6.7	7.1
Pinot (LTP-149)	6.9	7.0	6.9	6.3	7.3
Arrowhead (NA-3261)	6.8	7.1	7.5	6.3	6.3
Yankee (NA-3271)	6.8	6.6	7.2	7.1	6.5
Bd 98-2108	6.8	7.0	7.1	6.0	6.7
PSG 366	6.8	6.8	6.8	6.5	7.0
A99-2559	6.8	7.0	7.0	6.3	6.5
STR 2553	6.8	7.2	7.0	6.4	6.6
AKB449	6.8	7.2	6.8	6.5	6.8
MSP 3723	6.7	7.1	6.8	6.0	6.7
Aries (A98-948)	6.7	6.7	6.8	6.2	7.0
Argos	6.7	7.0	7.0	6.0	6.7
Rugby II	6.7	6.8	6.7	6.5	6.8
1QG-38	6.7	6.9	7.0	6.3	6.7
Moonlight SLT (PST-101-390)	6.7	7.5	6.6	6.2	6.3
PSG 711	6.7	6.7	7.0	5.9	7.0
Corsair (NA-3249)	6.6	7.3	7.5	5.8	5.9
RAD-762	6.6	6.9	6.8	6.0	6.6
Washington	6.6	6.7	7.0	6.2	6.6
A99-3119	6.6	6.9	6.8	6.1	6.8
Touche (STR 23180)	6.6	6.6	7.0	6.3	6.5
NA-3248	6.6	7.1	6.9	6.0	6.4
H98-701	6.6	6.4	6.5	6.4	7.3
A98-689	6.5	6.6	6.5	6.1	6.8
A95-410	6.5	6.7	6.4	6.3	6.7
Belissimo	6.5	6.8	6.5	5.9	6.5
Starburst (STR 2703)	6.5	6.8	6.3	5.9	7.0
STR 2485	6.5	6.7	6.8	6.0	6.5
PST-101-73	6.5	6.3	6.6	6.3	6.9
Aviator (NA-3259)	6.5	6.7	6.5	6.1	6.7
America	6.5	6.7	6.6	6.3	6.5
SW AG 514	6.4	6.6	6.3	5.9	7.0
Juliet (Bd 95-1930)	6.4	6.4	6.5	5.8	6.5
MSP 3722	6.4	6.3	6.6	6.0	6.8
MSP 3724	6.4	6.6	6.4	6.0	6.6
Volt (A98-999)	6.4	6.8	6.7	5.6	6.2
RAD-504	6.4	6.5	6.0	6.2	6.7
SPTR 2959	6.4	6.6	6.3	6.3	6.6

Variety	Quality* 4-yr avg	2006	2007	2008	2009
Mystere	6.4	6.9	6.4	5.7	6.4
Shamrock	6.3	6.7	6.8	5.5	6.0
Gaelic (Bd 98-1385)	6.3	6.7	6.7	5.6	6.0
RAD-343	6.3	6.1	6.7	6.4	6.0
Wild Horse (A97-890)	6.2	6.4	6.1	5.9	6.2
Julia	6.2	6.0	6.5	6.2	6.0
RAD-0AN64	6.2	6.4	6.3	5.8	6.4
Harmonie	6.2	6.3	6.3	5.8	6.5
Baron	6.2	6.0	5.9	6.7	6.5
BAR VV 9634	6.2	6.3	6.3	5.7	6.5
BAR VV 9630	6.2	6.3	6.0	6.0	6.5
POPR 04594	6.2	6.0	6.5	6.0	6.3
CPP 822	6.1	6.6	5.9	5.7	6.2
CP 76-9068	6.1	6.2	6.2	5.9	6.0
Dynamo	6.1	6.3	6.5	5.5	6.1
PST-109-752	6.1	6.2	6.4	5.6	6.0
Bariris	6.1	6.0	6.5	6.0	6.0
BAR VV 0709	6.1	6.6	6.0	5.5	6.5
CPP 821	6.0	6.1	5.7	6.0	6.4
BAR VV 8536	5.9	5.8	5.5	5.8	6.8
H94-305	5.9	6.1	5.9	5.6	6.0
CPP 817	5.8	6.3	6.0	5.2	5.5
PST-1A1-899	5.8	6.6	6.2	5.1	5.3
BAR VV 0710	5.8	5.6	6.0	5.4	6.3
A00-1254	5.6	6.0	5.6	5.0	5.7
DLF 76-9075	5.5	5.8	5.5	5.1	5.4
Bandera (SPTR 2LM95)	5.5	5.6	5.6	5.4	5.8
DP 76-9081	5.2	5.7	4.8	4.8	5.4
BAR VV 0665	5.1	6.3	5.5	4.0	4.4
Kenblue	4.7	5.2	4.5	4.0	4.8
Reveille	4.5	4.9	3.9	4.3	5.4
LSD (P=.05)	0.4	0.5	0.6	0.8	0.7
CV	3.84	4.73	5.65	8.31	6.31

* Average of monthly visual ratings from 1-9; 9=overall best turf quality.

TALL FESCUE VARIETY EVALUATIONS 2009

Establishment Date: 6 October 2006
Cooperator: National Turfgrass Evaluation Program
Site/Location: Native soil (Maury silt loam), Spindletop Research Farm, Fayette County, KY
Design: Randomized complete block, 3 reps, plot size = 5' x 5'
Management: Irrigation as needed to prevent stress
Mowing height 2.5 inches
3.0 lb N/1000 ft^2/year applied in the fall

Evaluation of tall fescue varieties established in 2006 and maintained at 2.5 inch mowing height (sorted by descending turf quality for 3-year average).

	--------------------Quality*--------------------			
Variety	**3 Yr Avg**	**2007**	**2008**	**2009**
Cochise IV (RKCL)	7.8	7.8	7.8	7.7
Falcon V (ATM)	7.7	7.5	7.7	7.8
Shenandoah III (RK 6)	7.7	7.8	7.8	7.3
Jamboree (IS-TF-128)	7.6	7.4	7.7	7.6
Firecracker LS (MVS-MST)	7.5	7.9	7.4	7.3
Faith (K06-WA)	7.5	7.7	7.7	7.3
IS-TF-159	7.4	7.3	7.3	7.5
Catelyst (NA-BT-1)	7.4	7.2	7.7	7.3
Monet (LTP-610 CL)	7.4	7.4	7.7	7.2
Sidewinder (IS-TF-138)	7.4	7.6	7.3	7.2
KZ-1	7.4	7.5	7.8	6.9
Turbo	7.3	7.5	7.0	7.3
Rocket (IS-TF-147)	7.3	7.3	7.2	7.3
Rhambler SRP (Rhambler)	7.3	7.2	7.3	7.3
SC-1	7.3	7.5	7.4	7.1
Bullseye	7.3	7.4	7.3	7.1
Spyder LS (Z-2000)	7.3	7.3	7.6	6.9
AST9001 (AST-3)	7.3	7.7	7.3	6.8
Terrier (IS-TF-135)	7.3	7.8	7.3	6.7
RK 5	7.2	7.2	7.1	7.3
Essential (IS-TF-154)	7.2	7.0	7.4	7.3
Wolfpack II (PST-5WMD)	7.2	7.1	7.1	7.3
Raptor II (MVS-TF-158)	7.2	7.3	7.2	7.1
Toccoa (IS-TF-151)	7.2	7.5	7.2	7.0
Talladega (RP 3)	7.2	7.4	7.3	7.0
Reunion (LS-03)	7.2	7.6	7.1	6.8
RNP	7.2	7.5	7.3	6.8
Corona (Col-M)	7.2	7.7	7.1	6.7
Shenandoah Elite (SH 3)	7.1	7.0	7.1	7.2
Millennium SRP	7.1	7.2	7.0	7.1
Van Gogh (LTP-RK2)	7.1	7.0	7.2	7.0
RK 4	7.1	7.2	7.3	7.0

Variety	--------------------Quality*-------------------- 3 Yr Avg	2007	2008	2009
Mustang 4 (M4)	7.1	7.1	7.0	7.0
Firenza	7.1	7.4	7.1	7.0
Cannavaro (DP 50-9440)	7.1	7.1	7.3	6.8
BAR Fa 6253	7.1	7.3	7.2	6.8
AST9002 (AST-2)	7.1	7.4	7.0	6.8
Braveheart (DP 50-9407)	7.0	7.2	6.8	7.0
Hemi	7.0	7.0	7.1	7.0
Finelawn Xpress (RP2)	7.0	7.0	7.1	7.0
JT-45	7.0	7.2	7.0	6.9
Traverse SPR (RK-1)	7.0	7.1	7.0	6.9
AST1001 (AST-4)	7.0	7.3	7.0	6.8
AST9003 (AST-1)	7.0	7.5	6.8	6.8
BGR-TF1	7.0	7.5	7.0	6.5
Greenbrooks (TG 50-9460)	6.9	6.9	6.6	7.1
Speedway (STR-8BPDX)	6.9	6.6	7.2	6.9
PSG-82BR	6.9	7.1	6.9	6.8
Trio (IS-TF-152)	6.9	7.0	6.9	6.7
Cezanne Rz (LTP-CLR)	6.9	7.0	7.1	6.6
Col-1	6.9	7.3	6.8	6.6
SR 8650 (STR-8LMM)	6.9	7.0	7.0	6.6
Fat Cat (IS-TF-161)	6.8	6.7	6.9	6.9
AST 7002	6.8	7.0	6.8	6.8
BGR-TF2	6.8	7.2	6.5	6.7
Hudson (DKS)	6.8	6.9	6.6	6.7
GWTF	6.8	7.0	6.8	6.7
Aggressor (IS-TF-153)	6.8	6.9	6.9	6.6
JT-36	6.8	6.9	6.9	6.5
Gazelle II (PST-5HP)	6.8	6.8	7.2	6.5
Compete (LS-06)	6.8	7.5	6.9	6.0
AST 7003	6.7	7.0	6.3	6.8
STR-8BB5	6.7	6.7	6.7	6.6
Tulsa Time (Tulsa III)	6.7	7.0	6.6	6.5
JT-41	6.7	7.2	6.5	6.3
Darlington (CS-TF1)	6.7	7.1	6.8	6.3
KZ-2	6.7	7.2	6.7	6.3
Titanium LS (MVS-BB-1)	6.6	6.5	6.7	6.7
Falcon NG (CE1)	6.6	6.7	6.6	6.6
Pedigree (ATF-1199)	6.6	6.6	6.5	6.6
Crossfire 3 (Col-J)	6.6	7.1	6.4	6.5
ATF 1328	6.6	6.7	6.8	6.4
0312	6.6	7.0	6.5	6.3
J-140	6.6	7.1	6.4	6.3
J-130	6.6	7.2	6.5	6.0
Escalade	6.5	6.5	6.3	6.8
Honky Tonk (RAD-TF17)	6.5	6.5	6.2	6.8

Variety	3 Yr Avg	2007	2008	2009
	--------------------Quality*--------------------			
Renovate (LS-11)	6.5	6.5	6.3	6.7
PSG-85QR	6.5	6.7	6.3	6.6
GE-1	6.5	6.7	6.3	6.4
Hunter	6.5	6.8	6.3	6.4
Umbrella (DP 50-9411)	6.5	6.8	6.5	6.3
Stetson II (NA-SS)	6.5	6.7	6.4	6.3
JT-42	6.5	6.8	6.5	6.3
Justice	6.5	6.8	6.5	6.3
AST 7001	6.5	6.9	6.3	6.2
JT-33	6.5	6.9	6.4	6.1
Turbo RZ (Burl-TF8)	6.4	6.3	6.2	6.7
STR-8GRQR	6.4	6.4	6.1	6.7
Ninja 3 (ATF 1247)	6.4	6.4	6.1	6.6
Skyline	6.4	6.6	6.2	6.3
MVS-1107	6.4	6.4	6.5	6.3
06-DUST	6.4	6.4	6.5	6.3
06-WALK	6.4	6.8	6.2	6.2
PSG-TTST	6.3	6.3	6.3	6.3
Padre	6.3	6.4	6.3	6.3
Tahoe II	6.3	6.3	6.4	6.3
PSG-RNDR	6.3	6.5	6.4	6.0
PSG-TTRH	6.3	6.4	6.6	6.0
Falcon IV	6.3	6.4	6.5	6.0
MVS-341	6.2	6.2	6.0	6.4
GO-1BFD	6.2	6.2	6.1	6.3
Rebel IV	6.2	6.3	6.0	6.3
Einstein	6.2	6.5	6.0	6.1
Magellan	6.1	5.9	5.8	6.4
Rembrandt	6.1	6.4	5.9	5.9
Biltmore	6.1	6.5	6.0	5.7
Plato	5.9	6.0	6.0	5.8
Aristotle	5.8	5.8	5.8	5.9
BAR Fa 6363	5.8	6.1	5.6	5.8
Lindbergh	5.8	6.3	5.5	5.7
Silverado	5.3	5.5	5.0	5.5
KY-31	4.1	4.1	4.3	4.0
LSD (P=.05)	---	0.6	0.8	0.6
CV	---	5.6	7.5	5.6

* Visual rating from 1 to 9; 9=overall best turf quality.

Mowing Methods Trial

Turf is often “striped” during mowing either for practical or aesthetic purposes. Sometimes striping is necessary due to the type of turf and mowing equipment. For example, it is not practical or allowable to make turns with mowing equipment on putting greens or the turf will be torn and ripped thus disrupting the surface and destroying playability. Putting greens are mowed back and forth with all turns made off of the putting surface thus creating stripes. This has been standard protocol for as long as powered putting green mowers have existed.

Striping of other types of turf areas is more current. Again, these practices tend to begin on golf courses (e.g., tees and fairways depending on the mowing equipment used) and then become evident in other types of turf (e.g., many commercial lawns and even roadsides). Striping of athletic turf has become a true art as is evidenced by the extremely intricate patterns mowed and/or rolled into professional sports venues and often seen during televised events. However, mowing general utility turf such that stripes are created may not be the most efficient use of manpower, equipment, or fuel. Turf areas that are more utilitarian than visually valuable might be much closer to truly sustainable. If all efforts are made to reduce inputs related to maintenance of turf areas that are more sustainable, this will provide significant benefits to all involved (manager, owner, user) in many ways.

This study was designed to quantify the effects of striping versus other methods of mowing on total time to mow and fuel efficiency per unit area (per acre, per 1000 sq. feet, etc.). Different types of areas were chosen (open and regularly shaped, regularly shaped but less open with trees and other obstacles, irregularly shaped with and without obstacles). These areas were mowed ten times each using two methods, one to create striping and one in what was deemed the most efficient path in that fewer turns are made while not actually cutting grass as is the case at the end of each striping pass. Time to mow and the exact amount of fuel used will be measured and recorded.

Additional plans will include evaluation of mowing golf fairways by striping or by what might be deemed more efficient methods. If significant savings in time and fuel can be achieved, perhaps even golf turf (the least “sustainable” turf of all types) might make a step in the direction of less input while maintaining playability and utility.

PERENNIAL RYEGRASS VARIETY EVALUATIONS 2009

Establishment Date: September 2004
Cooperator: National Turfgrass Evaluation Program
Site/Location: Native soil (Maury silt loam), Spindletop Research Farm, Fayette Co., KY
Management: Irrigation as needed to prevent stress
Mowing height 0.75 inches
3.0 lb N/1000 ft^2 applied in the fall

Quality* of perennial ryegrass varieties established in 2004 and maintained at a 0.75 inch mowing height. (Sorted by descending 5-year average)

	---------------------------- Quality* ----------------------------					
Variety Name	**5 Yr Avg**	**2005**	**2006**	**2007**	**2008**	**2009**
Apple GL (AAZ-B104)	7.2	7.2	7.3	6.9	7.3	7.2
Soprano (DP1)	7.1	7.8	7.4	7.2	6.5	6.6
All*Star 3 (IS-PR 274)	7.0	7.4	7.3	6.5	6.5	7.3
Harrier (SRX 4UP3)	7.0	7.3	7.2	7.1	6.7	6.6
Panther GLS	6.9	6.8	6.8	6.8	7.3	6.9
Exacta II GLSR (LTP-611-GLSR)	6.8	7.4	7.2	6.5	6.8	6.3
SR 4600 (SRX 4SP)	6.8	7.4	6.6	6.8	6.5	6.8
Notable (AF)	6.8	7.1	6.7	6.5	6.6	7.0
Line Drive GLS (APR 1797)	6.7	7.0	7.3	6.6	6.3	6.5
Transformer (D04-1667)	6.7	6.9	7.0	6.7	6.8	6.3
Amazing GS (IS-PR 276)	6.7	7.3	6.8	6.5	6.3	6.6
Silver Dollar	6.7	7.2	7.0	6.3	6.5	6.4
Grand Slam 2 (PST-2GSM)	6.6	6.8	6.4	6.5	6.8	6.7
Secretariat II GLSR (LTP-101-GLR)	6.6	7.1	6.3	6.5	6.7	6.5
Paragon GLR	6.6	7.0	6.3	6.3	6.3	7.1
APR 1670	6.6	6.8	7.0	6.3	6.5	6.3
Homerun (RG3P)	6.5	7.1	5.9	6.1	6.8	6.8
Fiesta 4 (Pick F4)	6.5	7.5	6.6	6.3	5.8	6.4
Gray Fox (PST-2MNG)	6.5	6.9	6.1	6.1	6.8	6.6
Manhattan 5 GLR (PST-2AM)	6.5	6.8	6.7	6.4	6.3	6.2
Dasher 3 (Pick RB-1)	6.5	7.6	6.6	6.0	5.9	6.2
1G Squared (ARR 1664)	6.4	6.9	6.5	6.2	6.3	6.3
Palmer V (RNS)	6.4	6.9	6.2	6.2	6.8	6.1
MMW	6.4	7.3	6.5	6.1	6.0	6.3
Charismatic II GLSR (LTP-PG-GLSR)	6.4	6.8	6.3	6.5	6.5	6.0
Derby Xtreme (IS-PR 268)	6.4	7.0	6.2	5.8	6.3	6.6
Primary (IS-PR 269)	6.3	6.8	6.1	6.3	5.8	6.7
Keystone 2 (IS-PR 312)	6.3	6.8	5.9	5.9	6.1	6.9
Attribute (IS-PR 270)	6.3	7.6	6.0	5.8	5.8	6.4

	---------------------------- Quality* ----------------------------					
Variety Name	**5 Yr Avg**	**2005**	**2006**	**2007**	**2008**	**2009**
Palmer IV	6.3	7.1	6.9	5.8	5.8	6.0
Phenom (APR 1660)	6.3	6.5	7.0	6.4	5.7	6.0
Hawkeye 2 (SRX 4692)	6.3	6.8	6.8	6.3	5.5	6.0
Zoom (LCK)	6.2	6.8	6.0	6.1	5.8	6.3
Citation Fore	6.1	6.6	5.2	6.0	6.7	6.2
Palmer GLS (GL-2)	6.1	6.8	5.4	6.0	6.4	6.0
Uno (D04-11T)	6.1	7.2	6.5	5.5	5.3	5.8
Overdrive	6.1	6.3	5.5	6.1	6.2	6.2
Revenge GLX (JR-348)	6.1	7.1	6.5	5.6	5.2	5.9
Stellar GL (IS-PR 236)	6.0	7.1	6.3	5.6	5.2	6.0
Kokomo II (IS-PR 235)	6.0	6.9	5.5	5.7	5.7	6.1
Dart (APR 1663)	6.0	6.7	6.7	5.6	5.2	5.7
Plateau (PST-2LAN)	6.0	6.6	5.8	5.5	6.0	5.9
Prototype (DCM)	5.9	6.4	5.0	5.8	6.0	6.5
PST-2BLK	5.9	6.0	4.9	5.8	6.5	6.4
Protege GLR	5.9	6.5	5.8	5.9	4.9	6.4
Repell GLS	5.9	6.7	5.6	5.7	5.6	5.7
SRX 4682	5.8	6.8	6.2	5.6	5.1	5.4
Baccarat (RAD-PR8)	5.7	6.8	5.3	5.2	5.3	6.0
Buena Vista	5.7	6.6	5.1	5.3	5.1	6.4
Regal 5 (IS-PR 271)	5.6	6.8	4.9	5.5	5.3	5.7
PST-217	5.6	6.8	5.4	5.5	5.2	5.3
Palace (IS-PR 273)	5.6	6.7	5.2	5.2	5.3	5.7
Defender (D04-UP)	5.6	6.7	6.0	5.0	4.5	5.7
Cabo II (IS-PR 233)	5.6	6.6	5.8	5.5	4.6	5.4
BAR Lp 4317	5.5	5.8	5.0	5.6	5.7	5.6
Pinnacle II	5.5	6.3	4.7	5.4	5.5	5.7
ASP6004 (EXS54)	5.5	6.5	5.4	5.1	4.8	5.6
DP 17-9788	5.5	6.3	5.4	5.3	5.0	5.3
Edge II (AC2)	5.5	6.8	5.0	5.2	4.7	5.6
PST-2AG4	5.4	6.3	5.3	5.2	5.2	5.1
Caddieshack II (JR-163)	5.3	6.4	5.1	5.1	5.0	5.1
Gray Star (PST-2LGL)	5.3	6.6	5.5	4.9	4.5	5.1
Pentium	5.3	5.8	4.6	5.0	5.1	6.0
Accent II (JR-119)	5.3	6.2	4.6	5.1	5.0	5.6
Majesty II (VB77)	5.2	6.1	4.5	5.2	5.1	5.0
Pleasure Supreme (PM 103)	5.2	6.6	5.0	4.5	4.3	5.4
Nexus XR (SNR)	5.0	6.7	4.6	4.5	4.0	5.4
Wind Dance 2 (PWDR)	5.0	6.4	4.7	4.4	4.3	5.2
ES45	5.0	6.2	4.8	4.9	4.0	5.1
Fusion	5.0	6.5	4.6	4.8	4.3	4.8

	---------------------------- Quality* ----------------------------					
Variety Name	**5 Yr Avg**	**2005**	**2006**	**2007**	**2008**	**2009**
FiJi (GPR)	5.0	6.5	4.5	4.7	4.1	5.2
Presidio (CNV)	5.0	6.5	4.8	4.5	4.0	5.1
Brea (04-BRE)	4.9	6.0	4.3	4.8	4.4	5.1
TR47	4.9	6.3	4.9	4.6	4.0	4.8
BAR Lp 4420	4.8	6.0	3.8	4.7	4.5	5.2
VB99	4.8	6.5	4.3	4.3	4.1	4.9
Mach I	4.8	6.4	3.8	4.8	4.3	4.8
E-99	4.7	5.9	4.0	4.0	4.2	5.6
Cutter II (PM 101)	4.7	6.4	2.9	4.4	4.7	5.3
Calypso 3 (MS2)	4.7	6.6	3.8	4.0	4.1	5.2
Top Gun II (JR-324)	4.7	6.2	3.5	4.3	4.2	5.4
APR 1648	4.6	6.1	3.7	4.8	4.0	4.6
Affinity	4.6	4.8	4.2	4.9	4.3	4.9
ASP6001 (RTS)	4.6	6.2	4.5	3.9	3.8	4.6
Firebolt (PRG HS-01-09)	4.6	6.1	4.5	4.3	3.5	4.6
ASP6005 (AJM)	4.6	6.2	4.3	3.9	4.0	4.4
Deleware XL (Pick 01-2)	4.5	6.4	3.2	4.3	3.9	4.9
Palmer III	4.5	5.7	3.1	4.3	4.4	5.2
D04-LP05	4.5	6.0	3.4	3.8	4.0	5.4
La Quinta (JR-255)	4.5	5.6	3.7	4.4	4.2	4.7
Nexus XD (SP4)	4.5	6.3	4.4	4.0	3.3	4.6
Monterey 3 (JR-408)	4.4	6.3	3.8	4.0	3.6	4.5
Inspire	4.4	5.9	3.1	4.1	4.0	5.0
Galatti (DP 17-9502)	4.4	6.2	3.5	4.1	3.8	4.5
Pianist (DP 17-9505)	4.4	5.9	2.8	4.0	4.0	5.1
DP 17-9449	4.3	5.9	2.6	4.1	4.3	4.7
Ringer II (04-BEN)	4.3	6.2	4.2	3.6	3.4	4.2
ASP6006 (LPFG)	4.3	6.2	3.5	3.5	3.7	4.4
ASP6003 (TRS)	4.2	6.3	3.6	3.6	3.7	4.0
Halo (KN42)	4.2	6.2	3.9	3.7	3.2	4.0
Premier II	4.1	5.8	3.4	3.6	3.8	4.1
Headstart 2	4.1	5.8	3.1	3.8	3.5	4.4
Quicksilver	4.1	6.2	4.3	3.3	3.1	3.6
Brightstar SLT	4.1	5.7	3.2	3.1	3.8	4.6
Premier	4.1	4.8	3.3	4.3	3.7	4.2
Wayfarer (L44)	4.0	6.3	3.5	3.5	2.9	3.9
ASP6002 (BPR)	4.0	6.0	3.7	3.3	3.2	3.8
Goalkeeper II (JR-114)	4.0	5.7	3.2	3.3	3.4	4.3
PM 102	3.9	6.1	3.8	3.3	2.9	3.4
Barlennium	3.8	5.2	2.8	3.4	3.5	4.2
Sunshine 2	3.8	5.7	2.5	3.5	3.3	4.1

	Quality*					
Variety Name	**5 Yr Avg**	**2005**	**2006**	**2007**	**2008**	**2009**
Pinnacle	3.8	4.3	3.1	3.8	3.8	4.1
Pizzazz	3.2	5.5	1.7	2.3	3.0	3.6
Pick 02-R	3.1	6.0	2.5	2.2	2.0	3.0
Pacesetter II (PS-2)	3.0	5.3	2.3	2.3	2.3	3.0
Panther	2.8	4.8	1.7	2.3	2.6	2.8
BAR Lp 4920	2.8	5.3	1.6	2.0	2.0	2.9
Manhattan II	2.5	3.0	1.6	2.4	2.2	3.1
LPR 02203	1.9	4.2	1.0	1.1	1.5	1.9
Linn	1.4	2.5	1.1	1.1	1.0	1.3
LSD (P=.05)	----	0.6	1.5	1.3	1.3	1.2
CV	----	6.3	18.6	16.4	16.8	13.7

* Visual rating from 1 to 9; 9=overall best turf quality.

BROADLEAF WEED CONTROL IN INDIGINOUS WHITE CLOVER

Sprayed 9/30/09 with 2,4-D Amine
≈ 14% White Clover Cover

2,4-D Rate (#ai/A)	% White Clover 4/15/2010	% White Clover 6/8/2010	% Broadleaf Weeds 6/8/2010
0	72	70	9
0.25	40	55	11
0.25+0.25 (2 wks)	57	70	7
0.5	48	75	6
0.5 + 0.5 (2 wks)	28	45	7
1.0	72	68	5
1.0 + 1.0 (2 wks)	30	53	5

WHITE CLOVER SEEDING RATE WITH AND WITHOUT INOCULUM

Slit seeded 9/30/2009 into "Midnight" Kentucky bluegrass

# Clover Seed/Acre	Inoculum	% Clover Stand 6/8/2010
0.25	No	7
0.25	Yes	8
0.5	No	7
0.5	Yes	29
1.0	No	43
1.0	Yes	38

WHITE CLOVER SEEDED INTO TURF SPECIES

Slit seeded 9/30/2009

TURF	% White Clover Cover 4/16/2010	% White Clover Cover 6/8/2010	% Micro Clover Cover 4/16/2010	% Micro Clover Cover 6/8/2010
Bermudagrass	90	60		
Fine fescue	30	65	12	65
Perennial ryegrass	20	40		
Tall fescue	16	26		
Bentgrass/Poa annua Fairway	41	40	19	0
Shade weed/Kentucky bluegrass	50	29		
'Midnight' Kentucky bluegrass	32	40	17	47