CORNELL UNIVERSITY TURFGRASS TIMES

CUTT

2008 Issue 4 • Volume 19 • Number 4

Does Late Season Potassium Increase Snow Mold?

This study was conducted from June 28, 2007 to April 1, 2008. Except for August, monthly precipitation was above normal. Precipitation was such that supplemental irrigation was not required on a regular basis.

Experimental plots were established at the Cornell University Turfgrass and Landscape Research and Education Center in Ithaca, NY on a mixed stand of creeping bentgrass (70%) annual bluegrass (30%) (*Agrostis palustris/Poa annua*) sand-based putting green (avg. pH = 6.9).

The research area was maintained to championship conditions, with light frequent sand topdressing applied every one to two weeks depending on growth and performance.

Fertilizer treatments were made on a weekly basis, starting June 28 (Table 1). The final fertilizer treatments were made on November 21 (Table 2).

Applications were made with a handheld CO2 sprayer at 40 psi fitted with TeeJet XR8015 nozzles calibrated to deliver 2 gallons of water per 1,000 ft2.

Data were collected for turf quality, dollar spot occurrence, soil nutrients during the growing season and snow mold incidence and clipping yield in Spring 2008.

Results

Soil Analysis

Soil samples were taken on November 19 (2/plot, 6/treatment, combined for a total of 15 composite samples), to a depth of approximately 4 inches. Analysis was performed by Brookside Laboratories; results in Table 3.

The soil nutrient analysis indicates that most of the plots are well below the recommended sufficiency range published in the literature for both creeping bentgrass and annual bluegrass. There were significant differences for potassium levels but only at the 6 lb. annual rate.

Turf Quality (2007 Season)

Turf quality was assessed on seven occasions using a scale of 1 to 9; where 1 = poor quality, 9 = excellent quality, and 6 = acceptable quality. With the exception of 20-Aug, there were no significant differences in turf quality among the treatments (Table 4).

In spite of the low potassium levels measured in the treatments there was no effect of potassium fertilizer applications on turfgrass quality ratings during the growing season. The lack of effect on turfgrass quality is consistent with previous potassium research conducted at Cornell University. This continues to suggest

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This Times

NEW YORK STATE TURFGRASS ASSOCIATION

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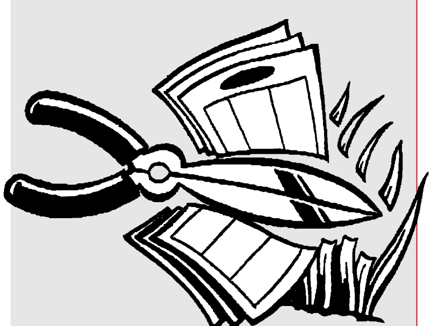
CUTT

Clippings

The Professional Grounds Management Society (PGMS) recognized the Baker Field Athletic Complex in New York, New York with an Honor Award in the Society's 2008 Green Star Awards competition.

The New York Farm Viability Institute named Leonard DeBuck a Producer of the Year Award recipient. The award is based on a producer's willingness to promote farm-based/producer-driven research projects and share ideas and results of research



PGMS Salutes Baker Field Athletic Complex for Grounds Management Excellence

The Professional Grounds Management Society (PGMS) recognized the Baker Field Athletic Complex in New York, New York with an Honor Award in the Society's 2008 Green Star Awards competition. The award was given in the Athletic Fields category for exceptional grounds maintenance. Winners were honored during the Society's 2008 School of Grounds Management held in conjunction with the GIE+EXPO in Louisville, Kentucky, October 22-25.

Located in New York City, Baker Field is a six acre sports complex, home to Columbia University's sports teams that includes a stadium and track, field hockey, baseball and soccer fields as well as a boat house with a floating dock. Managing an array of landscape varieties, the grounds crew of 10 was recently put to the test as they had the challenging task of installing new synthetic surfaces to replace the natural grass fields for the baseball, soccer and field hockey fields.

NYSTA member, Frank Molina, Supervisor of Grounds at Columbia University (left), accepts the 2008 Green Star Award from PGMS Past President, Greg Nichols.

NYFVI Names DeBuck Producer of the Year

The New York Farm Viability Institute named Leonard DeBuck a Producer of the Year Award recipient. The award is based on a producer's willingness to promote farm-based/producer-driven research projects and share ideas and results of research studies. DeBuck owns and operates DeBuck's Sod Farm in Pine Island, New York, with his wife Valerie and son Greg.

DeBuck got involved in a two-year experiment with sod production via a NYFVI-funded Cornell University study examining production methods that will grow sod at a faster rate, thus decreasing production costs. The research trials at DeBuck's farm focus on decreasing time to harvest by using different levels of nitrogen, potassium and phosphorus. Another growing method under examination is voluntary regrowth after harvesting a field. Martin Petrovic, Ph.D., a horticultural professor with Cornell, is working with the DeBucks on the project. Results of the study will be available in late 2008.

A Letter to NYSTA Members

Dear NYSTA Members:

On behalf of the Board of Directors of the New York State Turfgrass Association, welcome to the second annual NYSTA funded research issue of CUTT. It is your generous support over the years that has made this research possible. In this issue, we are highlighting several studies that are being conducted.

In addition to providing nearly $50,000 per year in direct support for research through the New York Turfgrass Foundation, NYSTA has been instrumental is securing funds from other sources. The association has given researchers access to more than $300,000 through programs such as the Environmental Stewardship Fund (ESF) and the New York Farm Viability Institute (NYFVI).

Most recently, we have been working with the Cornell University Department of Horticulture to fill the vacant Weed Science position. This appointment, which will strongly focus on turfgrass and landscape issues, has been made possible through ESF funding. We have also learned that a Turfgrass Pathology position has been approved but the search process has been postponed due to a hiring pause across Cornell University. These two positions will expand the scope of turfgrass education, research and outreach in New York State.

Beyond research, NYSTA provided more than $50,000 in educational funding for publications such as CUTT, ShortCUTT, the new Sports Field Management manual, and the pesticide management software, TracTurf. Our broad-based commitment to providing the most accessible education programs in the green industry are also demonstrated through our regional conferences and leadership with the Empire State Green Industry Show (ESGIS).

There is little question we are facing some challenging times with changes in political leadership in New York, patchwork environmental regulations across the state, and a struggling economy. Your Board of Directors is mindful of these challenges and is regularly working to streamline our efforts, while maintaining credibility and visibility with our legislative partners.

We strive every day to add value to your NYSTA membership and look forward to another exciting year of programs with the ESGIS debuting its new January dates, another year of ShortCUTT and, of course, more significant research designed to help you be more environmentally compatible and profitable in the years to come.

Thank you for your support.

Sincerely,

President

CUTT

Feature Story

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The soil nutrient analysis indicates that most of the plots are well below the recommended sufficiency range published in the literature for both creeping bentgrass and annual bluegrass. There were significant differences for potassium levels but only at the 6 lb. annual rate.

Table 1. Annual fertilizer rates for the treatments applied in weekly intervals during the season.

Trt#	N Rate	K Rate	Interval
1	3	0	7d
2	3	0	7d
3	3	0	7d
4	3	0.75	7d
5	3	0.75	7d
6	3	0.75	7d
7	3	1.5	7d
8	3	1.5	7d
9	3	1.5	7d
10	3	3	7d
11	3	3	7d
12	3	3	7d
13	3	6	7d
14	3	6	7d
15	3	6	7d

the inefficiency associated with regular potassium fertilizer applications.

Table 2. Late season fertilizer treatments applied November 21.

Trt#	N Rate	K Rate
1	0.5	0
2	0.5	0.125
3	0.5	0.25
4	0.5	0
5	0.5	0.25
6	0.5	0.5
7	0.5	0
8	0.5	0.5
9	0.5	1
10	0.5	0
11	0.5	1
12	0.5	2
13	0.5	0
14	0.5	2
15	0.5	4

Dollar Spot

Dollar spot infestation was assessed twice during the study by counting the number of spots per plot. There were no significant differences among treatments on either date, nor when averaged over both dates. (Table 5). The two infestations of dollar spot did not appear to be associated with potassium treatment. However there appeared to a trend of increasing dollar spot as potassium was added.

Snow Mold

Gray and pink snow mold infestation was assessed twice during spring 2008 by estimating the percent area per plot infected. As observed in previous seasons, the incidence of snow mold was increased at increasing potassium application rates. In fact there was a significant effect of the

Table 3. End of growing season soil nutrient analysis.

Trt	pH	%OM	P ppm	Ca ppm	Mg ppm	K ppm	Na ppm	B ppm	Fe ppm	Mn ppm	Cu ppm	Zn ppm	Al ppm
1	7.1	2.11	83	1494	127	**62**	37	0.25	178	38	1.22	2.93	704
2	6.8	2.13	95	2054	135	**72**	34	0.35	186	33	1.10	6.33	688
3	7.1	2.07	83	1442	119	**64**	30	0.28	189	33	1.15	2.61	629
4	6.9	2.13	87	1895	122	**63**	33	0.34	197	37	1.07	6.67	645
5	7.1	2.03	81	1402	116	**69**	31	0.25	180	35	0.98	7.05	610
6	6.8	2.04	84	1572	119	**65**	34	0.33	201	39	0.98	2.95	692
7	7.2	2.23	80	1550	127	**82**	32	0.30	184	33	1.05	6.18	602
8	6.9	2.07	89	1445	123	**74**	32	0.29	185	31	0.97	4.46	658
9	7.2	2.18	85	1462	122	**75**	30	0.31	187	33	1.15	5.15	633
10	6.9	2.24	86	1693	126	**79**	36	0.78	178	34	1.05	13.40	636
11	7.1	1.89	83	1457	128	**78**	41	0.42	175	31	0.87	5.95	646
12	6.8	1.93	90	1206	102	**76**	21	0.29	190	36	0.85	4.97	663
13	7.3	2.15	83	1928	113	**106**	19	0.29	195	43	1.15	5.04	666
14	7.0	2.38	97	1713	121	**122**	25	0.26	192	38	1.16	10.86	625
15	7.2	2.02	75	1351	121	**107**	33	0.28	181	34	0.96	5.39	627

Table 4. Effect of nitrogen/potassium fertility on turf quality.

Seasonal Rates		Late Season Rates		Turfgrass Quality Ratings						
N	K	N	K	5-Jul	17-Jul	6-Aug	20-Aug	30-Aug	8-Sept	27-Sept
3	0	0.5	0	6.7	6.8	6.7	6.2	7.2	7.0	6.2
3	0	0.5	0.125	6.6	6.8	6.7	6.6	7.3	7.0	6.5
3	0	0.5	0.25	6.9	7.0	6.9	6.5	7.2	7.0	6.5
3	0.75	0.5	0	6.8	6.9	6.7	6.2	7.3	7.0	6.3
3	0.75	0.5	0.25	6.8	6.5	6.4	5.9	7.2	7.0	6.1
3	0.75	0.5	0.5	7.0	6.8	6.8	6.5	7.3	6.9	6.2
3	1.5	0.5	0	6.4	6.6	6.2	6.0	7.5	6.9	5.7
3	1.5	0.5	0.5	6.4	6.7	6.3	5.9	7.1	6.7	5.6
3	1.5	0.5	1	7.1	6.9	7.1	6.4	7.3	6.9	6.3
3	3	0.5	0	6.6	6.7	6.6	6.0	7.1	6.8	5.4
3	3	0.5	1	6.4	6.7	6.5	5.8	7.1	6.9	5.8
3	3	0.5	2	6.7	6.9	6.7	5.9	7.3	6.9	6.3
3	6	0.5	0	7.0	6.8	6.9	6.1	7.2	6.9	6.5
3	6	0.5	2	6.3	6.7	6.8	6.3	7.1	6.8	5.6
3	6	0.5	4	6.3	6.8	6.9	5.8	7.4	6.9	5.9
			LSD (0.05)	NS	NS	NS	NS	NS	NS	NS

late season potassium rate on snow mold incidence, i.e., as late season rate increased snow mold incidence increased. There was also an obvious reduction in recovery associated with high seasonal and late season potassium applications.

Clippings

Clippings were collected on April 21, 2008. Fresh weights and dry weights were recorded. Dry weight data are presented here. There were no significant differences among the treatments (Table 7).

The lack of effect on clipping yield was not expected as there appeared to be much less recovery on plots treated with higher rates of seasonal and late season potassium. It is possible that areas that were not infected were able to produce significant

Table 5. Effect of nitrogen/potassium fertility on dollar spot incidence.

Seasonal Rates		Late Season Rates		# Dollar Spots/ Plot	
N	K	N	K	12-Sept	27-Sept
3	0	0.5	0	6.3	12.0
3	0	0.5	0.125	4.3	7.3
3	0	0.5	0.25	2.0	6.3
3	0.75	0.5	0	2.3	11.3
3	0.75	0.5	0.25	4.0	15.0
3	0.75	0.5	0.5	7.7	13.7
3	1.5	0.5	0	5.0	16.0
3	1.5	0.5	0.5	7.3	21.3
3	1.5	0.5	1	4.7	12.3
3	3	0.5	0	5.7	21.3
3	3	0.5	1	4.3	14.7
3	3	0.5	2	4.7	14.0
3	6	0.5	0	3.7	9.0
3	6	0.5	2	5.0	16.0
3	6	0.5	4	5.3	17.0

Table 6. Effect of nitrogen/potassium fertility on snow mold incidence.

Seasonal Rates		Late Season Rates		% plot infected with Snow Mold	
N	K	N	K	30-March	15-April
3	0	0.5	0	0	0
3	0	0.5	0.125	0	0
3	0	0.5	0.25	5	0
3	0.75	0.5	0	5	1
3	0.75	0.5	0.25	12	5
3	0.75	0.5	0.5	17	7
3	1.5	0.5	0	5	0
3	1.5	0.5	0.5	10	2
3	1.5	0.5	1	12	7
3	3	0.5	0	10	10
3	3	0.5	1	15	12
3	3	0.5	2	20	14
3	6	0.5	0	12	10
3	6	0.5	2	30	15
3	6	0.5	4	40	22
			LSD (0.05)	4.5	3.2

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The lack of effect on turfgrass quality is consistent with previous potassium research conducted at Cornell University. This continues to suggest the inefficiency associated with regular potassium fertilizer applications.

The two infestations of dollar spot did not appear to be associated with potassium treatment. However there appeared to a trend of increasing dollar spot as potassium was added.

The first year of this three year study has confirmed some initial observations associated with increased potassium fertilization from previous potassium research at Cornell University.

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In fact there was a significant effect of the late season potassium rate on snow mold incidence, i.e., as late season rate increased snow mold incidence increased. There was also an obvious reduction in recovery associated with high seasonal and late season potassium applications.

Feature Story

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amounts of top growth that might have confounded the data.

Summary

The first year of this three year study has confirmed some initial observations associated with increased potassium fertilization from previous potassium research at Cornell University. There continues to be a lack of a significant effect from regular potassium fertilization and in some cases increased incidence of snow mold.

One previous observation that was not confirmed is the reduced spring growth associated with elevated potassium application rates. There could have been an early reduction that our data collected in April did not detect. We are currently conducting several basic studies attempting to further understand the relationship among potassium fertilization, potassium uptake and snow mold.

Frank S. Rossi, Ph.D. and
Mary C. Thurn

Table 7. Effect of nitrogen/potassium on clipping dry weights.

Treatment	Dry Wt. grams
	21-Apr
1	9.7
2	9.4
3	10.7
4	10.5
5	8.5
6	8.0
7	9.8
8	8.6
9	8.3
10	9.6
11	9.0
12	7.7
13	9.6
14	9.6
15	7.7
LSD (p=0.05)	NS

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- For More Information regarding the Cornell Turfgrass Short Course contact Maxine Welcome at MW45@cornell.edu or by calling 607-255-5439

Searching for Annual Bluegrass Weevil Resistant *Poa Annua*

Abstract

Impact from damaging infestations of the annual bluegrass weevil (ABW) is expanding dramatically in golf courses across the Northeast and Mid-Atlantic. Lack of control alternatives has led to reliance on pyrethroid insecticides, which are failing as a likely consequence of pesticide resistance. More durable management strategies are needed. Because improved annual bluegrass (*Poa annua*) cultivars are being developed at Penn State, we have an opportunity to assess host plant resistance. The susceptibility of these materials to insects is completely unknown. Here we propose to make the first screening of these materials with the goal of detecting and measuring any genetic variation in the performance of ABW or in the expression of injury.

Introduction

Listronotus maculicollis, widely known as the "annual bluegrass weevil (ABW)" is a burgeoning pest of turfgrass in the northeastern U.S. This native beetle is most prevalent and injurious in low-cut, high maintenance turf such as golf course greens, tees and fairways. The insect was first reported damaging turfgrass in Connecticut as early as 1931. Until the last 20 years or so, damage has been concentrated in the metropolitan New York area. Severe infestations, however, are now experienced across the Northeast and into the Mid-Atlantic, including north to Quebec and Maine, west to Pennsylvania and Ontario, and south to Maryland. It has also been identified within the last three years from Delaware, West Virginia and Virginia, and infestations observed in 2007 are the first reports for Ohio.

Larvae and adults feed primarily on annual bluegrass (*Poa annua*), a major component of many golf course playing surfaces. As an aggressive invader of new stands of creeping bentgrass, annual bluegrass was historically regarded as a weed by golf course superintendents. When it becomes the dominant grass species, however, superintendents resort to managing it, rather than eliminating it. Most impact is attributed to the larvae that bore into the stem when they are young and later reside at the soil surface where they feed on the crowns. ABW injury is generally expressed as growing areas of yellow and brown patches usually first noticed around the collar and perimeter of the greens, tees or fairways. High populations will cause substantial areas of dead turf that affect both the visual and functional quality of golf course turf.

Ideally, management is achieved through a well-timed perimeter application of an insecticide that targets adults as they reinvade short-mown turf from overwintering sites in the spring. Nevertheless, more and more courses end up making 3-5 applications in a season. One problem is asynchrony in population development that makes it difficult or impossible to interpret timing of the generation and to decide when to apply controls. Other limitations are the shortage of efficacious products labeled for larvae, and the overwhelming reliance on one class of insecticides (pyrethroids). Further complicating a successful control program is recent evidence showing that resistance to pyrethroids has emerged in some ABW populations in the Northeast, and that this may be linked to control failures. There are currently no non-chemical alternatives that can be recommended for

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Because improved annual bluegrass (Poa annua) cultivars are being developed at Penn State, we have an opportunity to assess host plant resistance. The susceptibility of these materials to insects is completely unknown. Here we propose to make the first screening of these materials with the goal of detecting and measuring any genetic variation in the performance of ABW or in the expression of injury.

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Our overall goal is to detect and measure variations of ABW performance across P. annua cultivars. This proposal is technically feasible because we have recently established improved opportunities for maintaining and manipulating ABW under controlled conditions. The objective of this study was to detect and measure variation across improved Poa annua varieties in the performance and impact of its specialist herbivore, the annual bluegrass weevil

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ABWcontrol.

Since 1994, the turfgrass breeding program of Dr. David Huff at Penn State has been conducting research to develop improved cultivars of *P. annua*. Initial breeding has improved qualities related to shoot density, color, uniformity and tolerance to diseases and abiotic stress. As a result, a selection of 12 top cultivars is being evaluated in multilocational trials around the world. To date, however, none of these materials has been explicitly examined for resistance to insect pests. It would be a disservice to promote the adoption of any improved variety without some information on its susceptibility to ABW.

Our overall goal is to detect and measure variations of ABW performance across *P. annua* cultivars. This proposal is technically feasible because we have recently established improved opportunities for maintaining and manipulating ABW under controlled conditions. The objective of this study was to detect and measure variation across improved *Poa annua* varieties in the performance and impact of its specialist herbivore, the annual bluegrass weevil. Our specific objectives were to (1) establish screening protocols using overwintering adults, (2) measure variation in ABW performance across grass species and confirm protocols and (3) screen select *P. annua* cultivars for variation in ABW performance. If genetic variation is identified, ABW resistance.

Methods:

Natural field infestations. In 2005, a natural outbreak of *L. maculicollis* infested research plots at Cornell's Turf and Landscape Research Center, Ithaca, NY. This gave us an opportunity to collect data on their incidence across 20 cultivars and/or combinations that were maintained at greens height in replicated plots. Abundance of ABW life stages was measured across these plots in two ways.

Controlled laboratory studies. Two experiments have been conducted to date, each focusing on infestations made with adults weevils. The source of adults were collections made on infested fairways at the Robert Trent Jones Golf Course, Ithaca, NY. Adults were collected by hand or with an aspirator after using a soapy disclosing solution to drive them to the top of the sward where they could be seen and captured.

In the first experiment we compared the performance and impact of weevils on annual bluegrass, velvet bentgrass and creeping bentgrass.

In the second experiment, we compared the performance and impact of weevils across 10 varieties of greens-type turfgrass. These were obtained from replicated field plots maintained by the turfgrass breeding program of Dr. David Huff at Pennsylvania State University, State College, NY. These varieties were selected to represent a range of morphologies, geographic origin and susceptibility to anthracnose disease. Among these were eight accessions of annual bluegrass, a wild type annual bluegrass and PennCross creeping bentgrass.

In both experiments, ABW performance was measured in terms of adult survival (number of adults alive after infestation period) and number of larvae (number of larvae recovered 1 month after infestation). The impact of ABW on the host variety was measured in terms of chlorophyll index, grass height and area of green coverage (1 month after infestation).

Results and Discussion:

Natural field infestations. A total of 18 larvae, 36 pupae, 16 callows and 5 adults were recovered from soil core samples, yielding an overall density of 124 individuals/m2. A total of 345 adults and 2 callows were recovered from the soap flushes, yielding an overall density of 168 adults/m2. Because these densities were well below the commonly used damage thresholds of 320-860 adults/m2, no attempt was made to assess variation in the expression of injury.

For the soil core extractions, results showed a significant effect of variety on the abundance of pooled life stages (ANOVA; df = 19, 59; F = 2.22; P = 0.016). Abundance varied from 0 to 395 individuals/ft2 (Fig. 1). For the soap flushes, results also showed a significant effect of variety on adults (ANOVA; df = 19, 59; F = 2.21; P = 0.018). Abundance varied from 6.3-27.8 adults/ft2. Correlations between larval and adult densities have not yet been assessed. This is relevant because given differences in resource requirements and mobility, larval densities may be more tightly linked to variety than adult density.

Controlled laboratory studies. No larvae were recovered from any of the experimental evaluation units. This may be attributed to the high adult densities and the degree of injury they caused. Therefore under these experimental conditions, adults did not lay eggs, or the larvae all perished, making it impossible to assess ABW's establishment success across the varieties evaluated.

In the first experiment, there was no difference in adult survivorship among annual bluegrass, velvet bentgrass or creeping bentgrass. Survival rates ranged from 70.0 to 88.0% across the two trials and three varieties. The chlorophyll index declined with infestation level, confirming the visual injury caused by adults (Fig. 3). In the second experiment, there was a significant difference in adult survivorship among varieties (Fig. 4). Survival rates varied from 50 to 95%. A significant effect of infestation on the chlorophyll index was only detected for two varieties. As above, height and cover data confirm that result but have not yet been finalized.

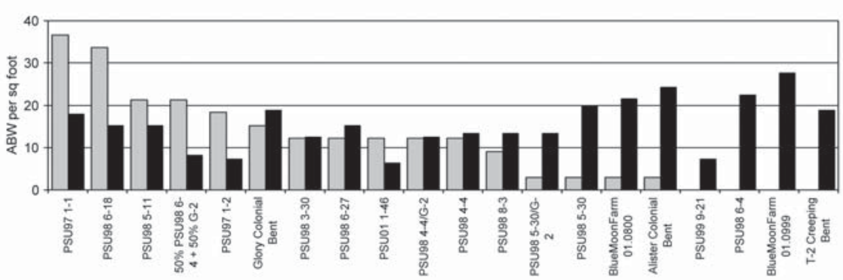
For both experiments, initial analyses of data on plant height and cover also confirm that adult ABW cause significant damage to foliage results. A full assessment of those data has not yet been made. Plant health measures were made about a month after the end of infestation, because they were not contemplated before that point given our main interest in examining larval survival. If measurements had been made immediately after the infestation period (before any recovery of the grass), we anticipate that the plant health parameters would have revealed much more pronounced differences among the infestation levels.

Implications. Our results reveal that there may be meaningful variation across varieties in the survival of adult ABW. They also reveal that injury caused by adult ABW to host plants may be much more significant to grass health than previously recognized. We will therefore repeat these studies in the spring to confirm results of a varietal effect on adult survival. In addition, we will make a more detailed examination of adult injury to grass and

Correlations between larval and adult densities have not yet been assessed. This is relevant because given differences in resource requirements and mobility, larval densities may be more tightly linked to variety than adult density.

Figure 1

Variation in the incidence of natural annual bluegrass weevil populations across experimental field plots (4 replicates) of greens-type cultivars and combinations of *Poa annua* in 2005.



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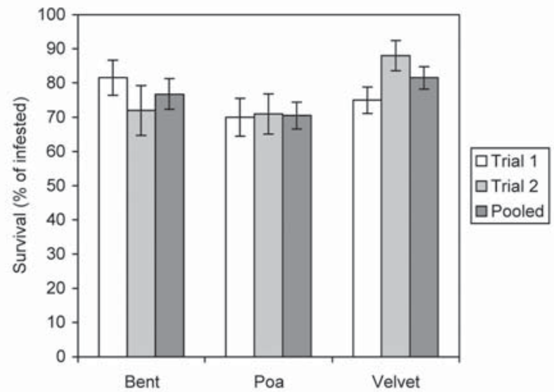
thereby strengthen our understanding of how this insect can impact annual bluegrass and other short-mown turf varieties. Although we have not yet been successful in examining the performance of ABW larvae across grass varieties, we are currently refining protocols for an artificial diet that will serve as an important tool for those studies. Overall, given the success of breeding for greens-type varieties, and the high degree of expected adoption for some cultivars, Poa annua's susceptibility to its specialist insect herbivore must be ascertained. If evidence for resistance were to be found, it could be exploited as a desirable trait for selection criteria. On the other hand, if a close examination reveals that *Poa annua* varieties harbor no biologically relevant variation in resistance to the annual bluegrass weevil, then we can more confidently promote their adoption.

Figure 3

Survivorship of adult ABW after a 7-day infestation on three grass varieties

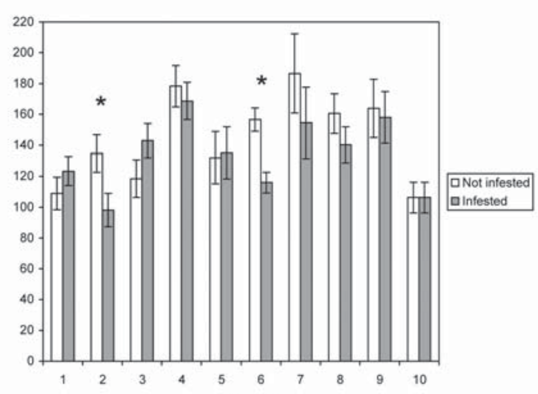


We do not yet know if *P. annua* cultivars harbor biologically relevant variation in resistance to ABW. Nevertheless, given the success of breeding for greens-type varieties, and the high degree of expected adoption for some cultivars, *P. annua's* susceptibility to its specialist insect herbivore must be ascertained. More importantly, if evidence for resistance were to be found, it could be incorporated as an additional selection criteria and thereby open the door to enormous environmental and economic rewards for golf courses and the communities in which they reside.

Daniel C. Peck, Ph.D., Masanori Seto and Dan Olmstead

Figure 5

Injury of ABW adults on 10 varieties of greens-type turfgrass one-month after a 7-day infestation period.



Healthy Ecosystem

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each treatment were included for each site. Starting in 2005, half of each P and K plot was also fertilized with 4 lbs N/1000 sq.ft./yr. Turf performance was evaluated monthly by standard measurements of turf quality, density, pest infestation when evident and other special methods based on turf use. Quality is based on percent of weeds, bare, and turfgrass, along with overall appearance. Soil nutrient levels, clipping yield and tissue samples were collected two times (summer and fall) during the year. Soils and clippings will be analyzed at the Cornell Nutrient Analysis Laboratories for analysis of N, P and K (and 15 other elements for the foliar analysis). Turf performance versus soil and tissue nutrient values will be correlated to determine the optimum performance based on soil test levels. This will require evaluating 1,800 soil sample results (for K and P), 1,800 clipping samples results for 17 elements, 1,800 clipping yield values and about 4,100 turf quality values. This will be accomplished over the winter of 2008-2009 with anticipation of making changes to the Cornell Nutrient Analysis Laboratories turfgrass recommendations in 2009.

Results for the first part of the study found that application of P and K at all sites did not affect turfgrass quality while the application of N improved turfgrass quality. Soil P levels (4.2 lbs/acre) were identified below which a tissue P content or quality response is likely. These levels were in line with current soil test recommendations (though twice as high). Similar levels for soil K were not identified indicating that soil K was adequate (although deemed low by current soil test interpretation). The application of N increased tissue K content, but application of K alone did not. Tissue levels of N, P, and K content were not well correlated with quality. The results of this study suggest current soil test K and P interpretations are too high and should be re-evaluated, and P and K application recommendations may need to be based on N application amount. The additional data will allow us to make substantial improvements to the fertilizer recommendation for turf in New York.

Results for in the first part of the study found that application of P and K at all sites did not affect turfgrass quality while the application of N improved turfgrass quality.

New York State Turfgrass Association

Calendar of Events

2009

January 7-9	**Empire State Green Industry Show** Rochester Riverside Convention Center, Rochester, NY
January 19-23	**Cornell Turfgrass Short Course** Cornell University Campus, Ithaca, NY
February 23-25	**Cornell Turgrass Advanced Short Course** Cornell University Campus, Ithaca, NY
February 24-25	**Southeast Regional Conference** Holiday Inn Suffern, Suffern, NY
March 2	**Western Regional Conference** The Millennium Hotel, Buffalo, NY
March 11	**2009 Turfgrass Advocacy - NYSTA's Lobby Day** Empire State Plaza, Albany, NY
March 19	**Adirondack Regional Conference** Crowne Plaza Lake Placid Resort, Lake Placid, NY

2010

January 6-8	**Empire State Green Industry Show** Rochester Riverside Convention Center, Rochester, NY

CUTT

Healthy Ecosystem

The purpose of the project is to improve the Cornell University fertilizer recommendations made by the Cornell Nutrient Analysis Laboratory by conducting soil test-turf response studies with newer varieties managed under various management practices on several sites across New York.

Improving Soil Test Recommendations for Turfgrass

Summary report on the project for 2008

Purpose of Project:

Soil testing can be one of the most useful ways to determine the amount of nutrient (phosphorus, potassium, calcium and magnesium) and pH modification that is needed to produce a healthy turfgrass stand. Soil testing may also be a best management practice used to reduce the risk of phosphorus runoff. Fertilizer recommendations based on soil testing are developed from years of turf performance-soil test calibration research. Making nutrient recommendations base on soil test calibration research requires that around 20 sets of data are collected, a set being one location for one year. There has been a lack of current soil test calibration studies especially when one considers newer varieties and contemporary fertilization practices. Thus, the purpose of the project is to improve the Cornell University fertilizer recommendations made by the Cornell Nutrient Analysis Laboratory by conducting soil test-turf response studies with newer varieties managed under various management practices on several sites across New York.

2008 Update

This is the seventh year of this long-term research and extension project. Three study sites included the Robert Trent Jones Golf Course at Cornell University and two other locations around New York (Bethpage golf course on Long Island, and Lake Placid Resort Club in the Adirondacks,). The study at each site involves the cooperation of the investigators with extension field staff and on-site cooperators.

Sites were selected because they initially had both a low level of phosphorus and potassium. The sites have different soil textures (sandy to silt loams) but the same turfgrass species/varieties. All sites were seeded with a mixture of 70 % Kentucky bluegrass, 20 % perennial ryegrass and 10% fine fescue, seeded at a rate of 4-lbs/1000 sq.ft. To create a wide range of soil nutrient levels at each site, 3 levels of phosphorus (P) and potassium (K) (1/2 X, 1X and 2X the soil test recommendation) were applied coupled with 3 different nitrogen levels (2, 4, 8 lbs N/1000 sq.ft./yr), an unfertilized control and a high rate of N, P, and K. Three repetitions of

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