Effect of plant Growth Regulators on Blissus insularis (Hemiptera: Blissidae)

Authors: Kaur, Navneet, Gillett-Kaufman, Jennifer L., and Buss, Eileen A.

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Effect of plant growth regulators on *Blissus insularis* (Hemiptera: Blissidae)

Navneet Kaur[1,], Jennifer L. Gillett-Kaufman[2], and Eileen A. Buss[2]*

Use of plant growth regulators is a common practice by turfgrass managers to regulate grass canopy heights and reduce mowing frequency (Watschke et al. 1992). Plant susceptibility to insect herbivory can be manipulated by using plant growth regulators to change a plant's physical or biochemical properties (Singer & Smith 1976; Coffelt & Schultz 1988; Campbell 1998; Turgeon 1999). In this study, we sought to investigate the indirect effect of 2 plant growth regulators on turf physiology and *Blissus insularis* Barber (Hemiptera: Blissidae) abundance in St. Augustinegrass, *Stenotapharum secundatum* Kuntze (Poaceae).

A field experiment was established in summer 2013 using 'Floratam' St. Augustinegrass plots (2 × 2 m) with buffer zones (1 × 1 m) in randomized complete block design with 5 replicates consisting of 2 plant growth regulator treatments and untreated water control at the University of Florida (UF) Plant Science Unit in Citra, Florida. We hypothesized that plant growth regulators would influence *B. insularis* abundance by altering habitat suitability by changing the chemical and morphological characteristics of the St. Augustinegrass. To ensure a baseline number of insects in each plot, 30 *B. insularis* individuals (a mixture of 4th and 5th nymphal instars, and unsexed adults from an established laboratory colony maintained according to Vázquez' [2010] protocol on St. Augustinegrass plugs and yellow corn, respectively) were released in the center of each plot on 6 May 2013. Trinexapac-ethyl (Primo Maxx®, Syngenta Crop Science, Raleigh, North Carolina) and mefluidide (Embark®, Gordon Corporation, Kansas City, Missouri) were applied on 5 Jun, 3 Jul, and 5 Aug 2013 at the rate of 0.45 and 0.17 L active ingredient (a.i.) per ha, respectively, by using a 4 nozzle, 1.8 m boom connected to a 35 psi CO_2 pressurized backpack sprayer.

To evaluate treatment effects, the center of each plot (700 cm^2 area) was vacuum sampled for 30 s by using a TroyBilt TB320BV blower vacuum (TroyBilt, Cleveland, Ohio) (Crocker 1993; Nagata & Cherry 1999) on 12 Jun, 12 Jul, and 12 Aug 2013 between 1000 and 1400 h. Insects were collected in a white bucket and counted (in the field if ≤20 or in the laboratory if >20) and returned to their respective plots within 24 h. Turf management practices like irrigation and fertilization can play a significant role in altering the habitat's properties like moisture, nutrition, and thatch thickness to influence insect abundance. We measured turf parameter readings on each sampling date to account for the influence of plant growth regulator applications on habitat suitability characteristics of turf. Thatch thickness was determined by inserting a 2 cm diameter soil probe into the plot, and the layer between the soil and living plant tissue of the core was measured with a ruler (cm). Turf color and chlorophyll index were determined using a FieldScout TCM 500 NDVI Turf Color Meter (Spectrum Technologies, Inc., Plainfield, Illinois) and FieldScout CM-1000 Normalized Difference Vegetative Index (NDVI) (Spectrum Technologies, Inc., Plainfield, Illinois), respectively. Soil moisture was measured with a TDR 300 Soil Moisture Probe (Spectrum Technologies, Inc., Plainfield, Illinois). Total Kjeldahl nitrogen concentration (TKN) was estimated by clipping 10 turf sprigs (about 5 g), which were oven dried at 70 to 80 °C for ≥48 h, weighed, ground, and analyzed by the UF Institute of Food and Agricultural Sciences Analytical Research Laboratory. Sampling data were analyzed using mixed model analyses (PROC MIXED, SAS Version 9.3, SAS Institute, Inc., Cary, North Carolina). Effects with $P \leq 0.05$ were considered significant. When appropriate, means were separated using Tukey's HSD test. Thatch thickness, turf color, turf chlorophyll content, soil moisture, and TKN concentration were included in the linear mixed model to identify the most significant factor associated with *B. insularis* density.

Although no significant differences existed between treatment and control plots during 2 sampling dates (Fig. 1), when data were pooled for all 3 dates evaluated, significantly fewer *B. insularis* individuals (F = 15.54; df = 2,8; P = 0.0018) were recovered in plots treated with a plant growth regulator (mefluidide = 7.0 ± 1.7; trinexapac-ethyl = 5.9 ± 1.3) compared with the control plots (12.6 ± 1.3) (Fig. 1). Turf TKN concentration was significantly and positively associated with *B. insularis* densities (Table 1) (F = 9.09; df =1,16; P = 0.008). Turf TKN represents a total nitrogen concentration and in plant growth regulator treated plots, re-

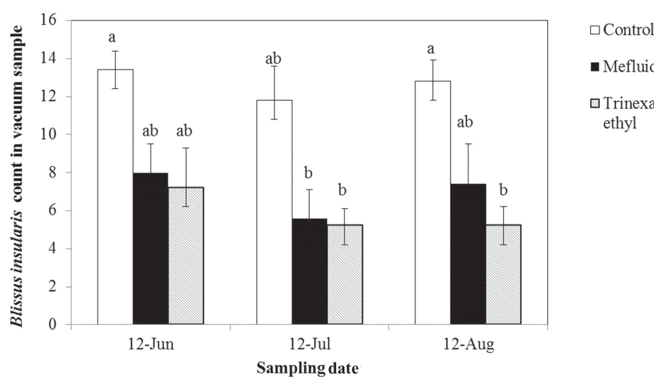

Fig. 1. Mean *Blissus insularis* densities (± SE) in St. Augustinegrass, *Stenotaphrum secundatum*, treated with mefluidide, trinexapac-ethyl, or untreated control. Means with the same letter within a sampling date did not differ statistically (ANOVA, P > 0.05); there were 5 replicates per treatment.

[1]Hermiston Agricultural Research and Extension Center, Oregon State University, 2121 South First Street, Hermiston, Oregon 97838, USA;
E-mail: navneet.kaur@oregonstate.edu (N. K.)
[2]Entomology and Nematology Department, University of Florida, 1881 Steinmetz Hall, Gainesville, Florida 32611-0620, USA; E-mail: gillett@ufl.edu (J. L. G.-K.), eabuss@ufl.edu or turfbug1@gmail.com (E. A. B.)
*Corresponding author; E-mail: navneet.kaur@oregonstate.edu (N. K.)

Table 1. Turf health parameters influencing *Blissus insularis* densities in 'Floratam' St. Augustinegrass, *Stenotaphrum secundatum*, from 12 Jun to 12 Aug 2013.

	Mean ± SEM[a]				
Effect	Mefluidide	Trinexapac-ethyl	Control	*F* value	*P* > *F*
Thatch thickness (cm)	2.4 ± 0.1	2.2 ± 0.2	3.4 ± 0.2	0.67	0.4254
Turf color (NDVI)	5.4 ± 0.1	5.5 ± 0.1	5.6 ± 0.2	1.59	0.2255
Turf chlorophyll (NDVI)	6.4 ± 0.9	6.4 ± 1.3	6.7 ± 1.2	3.18	0.0939
Soil moisture (NDVI)	22.3 ± 3.7	26.0 ± 4.8	14.3 ± 2.1	0.34	0.5658
TKN concentration (%)	1.3 ± 0.8	1.5 ± 0.3	1.7 ± 0.5	9.09	0.0082*

[a]Data were pooled across 3 sampling dates because the time effect was non-significant. *Significant $P < 0.05$.

duced nitrogen availability may have impacted insect abundance. The plant growth regulator application did not affect thatch thickness or turf quality among treatments, possibly due to short test duration.

Honeyborne (1969) and Coffelt & Schultz (1988) indicated that mefluidide slowed the development of azalea lace bug, *Stephanitis pyrioides* (Scott) (Hemiptera: Tingidae) on *Rhododendron* sp. (Ericaceae) because of reduced nutrient availability. Tsagkarakis et al. (2012) found that *Diaphorina citri* Kuwayama (Hemiptera: Liviidae) adults reared on *Citrus volkameriana* (Rutaceae) trees treated with prohexadione calcium and mefluidide showed significant reductions in both fecundity and survivorship. However, no effect of plant growth regulator use on the suitability of creeping bentgrass against black cutworms, *Agrotis ipsilon* Hufnagel (Lepidoptera: Noctuidae), and sod webworms (Lepidoptera: Pyralidae) was evident (Rogers et al. 2001). We suggest further testing with plant growth regulators to provide more robust recommendations for *B. insularis* management.

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Summary

Plant growth regulators are known to influence a plant's characteristics and therefore can be used as an alternative strategy in making *Blissus insularis* Barber (Hemiptera: Blissidae) habitat unfavorable for this insect's survival. The reduction of *B. insularis* population densities following the application of mefluidide and trinexapac-ethyl in field plots indicated the indirect effect of plant growth regulator application on *B. insularis* for its management in St. Augustinegrass.

Key Words: St. Augustinegrass; pest management; southern chinch bug

Sumario

Los reguladores del crecimiento en plantas son conocidos por influir en las características de las plantas y por lo tanto se pueden utilizar como una estrategia alternativa para hacer el hábitat desfavorable para la sobrevivencia de *Blissus insularis* Barber (Hemiptera: Blissidae). La reducción de la densidad de la población de *B. insularis* tras la aplicación de mefluidida y trinexapac-etilo en parcelas de campo indica el efecto indirecto de la aplicación del regulador del crecimiento de plantas sobre *B. insularis* por su manejo en pasto San Agustín.

Palabras Clave: pasto de San Agustín; control de plagas; chinche de sur

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