

Zoysiagrass Genotypes Differ in Susceptibility to Bluegrass Billbug

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Abstract

Zoysiagrass has few insect pest problems, but may suffer significant injury from bluegrass billbug (*Sphenophorus parvulus* Gyllenhal) infestations. In this study, Meyer and DALZ 0102 zoysiagrass (both *Zoysia japonica* Steud.) and 18 experimental zoysiagrass progeny, which included crosses between *Z. japonica* x *Z. matrella* (L.) Merr. or *Z. japonica* x Emerald (*Z. japonica* x *Z. tenuifolia* Willd.), were arranged in a randomized complete block design with three replicates per zoysiagrass progeny. The zoysiagrass plots were maintained under golf course fairway conditions and experienced a natural infestation of bluegrass billbugs in 2009 and 2010 with injury evident in June and continuing throughout the remainder of the growing season. Overall, Meyer suffered the highest level of injury on each of six rating dates, ranging from 17% to 38% of the plot area affected. Among the zoysiagrass progeny, damage ranged from 0% to 35%, with a majority less than 15%. Zoysiagrass progeny from the crosses associated with *Z. japonica* x *Z. matrella* or *Z. japonica* x Emerald tolerated bluegrass billbug better than Meyer.

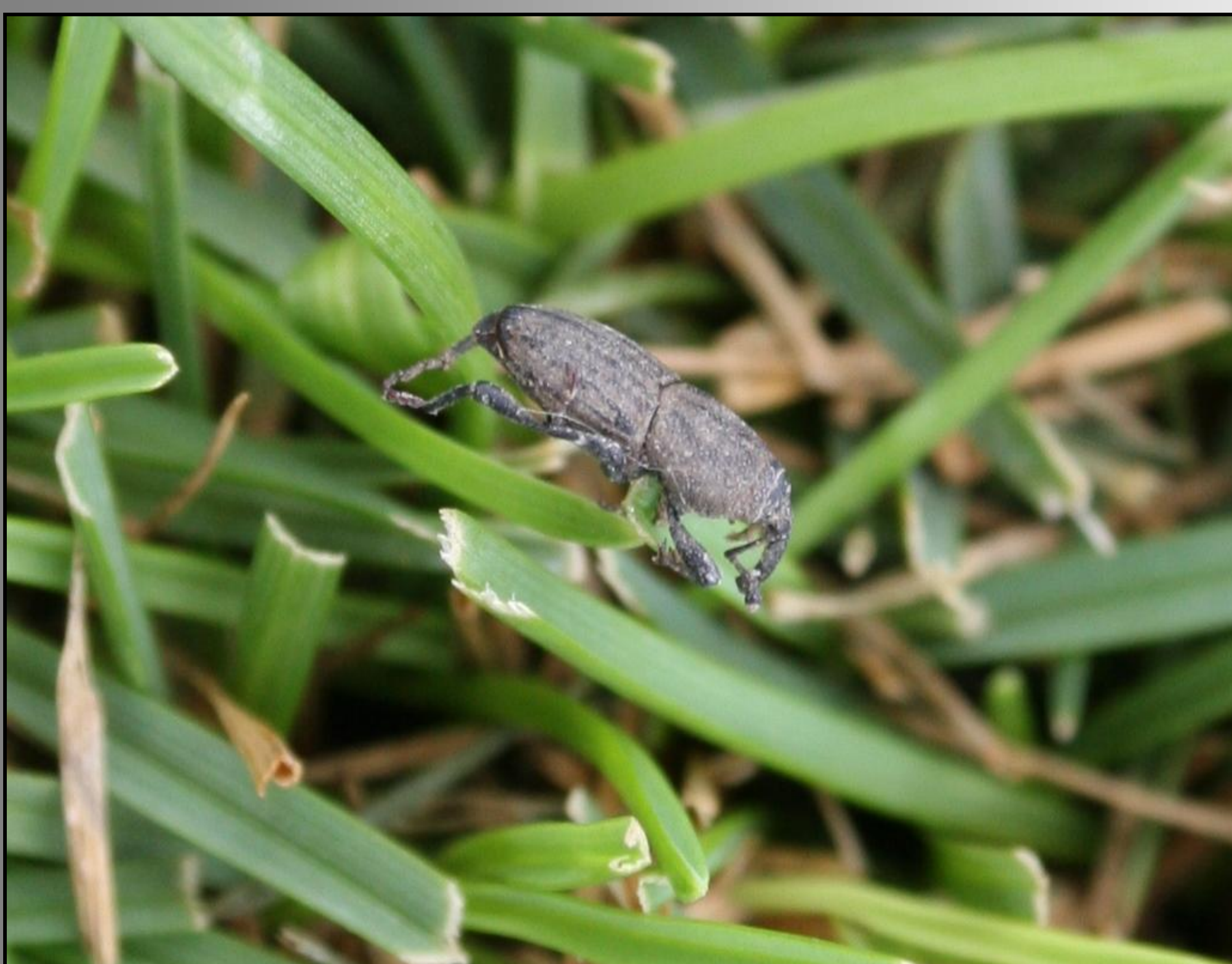


Figure 1. Bluegrass billbug (*Sphenophorus parvulus*) adult.

Introduction

Zoysiagrass (*Zoysia* spp.) may be susceptible to bluegrass billbug (Fig. 1 and 2). Cultivars of *Z. matrella* and the cultivar Emerald are recognized for their high quality, but lack freezing tolerance; whereas, cultivars of *Z. japonica* have better freezing tolerance, but are generally coarser in texture and lack the quality of *Z. matrella* cultivars and Emerald (Fry and Huang, 2004). Since 2004, researchers at Kansas State University (Manhattan, KS) and Texas AgriLife Research-Dallas (Dallas, TX) have evaluated zoysiagrass progeny associated with crosses between *Z. japonica* x *Z. matrella*, or *Z. japonica* x Emerald for quality characteristics and freezing tolerance. A significant number of these, including those we are reporting on herein, have demonstrated superior freezing tolerance compared to *Z. matrella* cultivars or Emerald, and have improved quality characteristics compared to *Z. japonica* cultivars, including Meyer (Okeyo, 2010). Fortuitously, an infestation of bluegrass billbugs occurred in 2009 and 2010 on the experimental areas where these zoysiagrasses are under evaluation.

Objective

Compare susceptibility of new freezing tolerant zoysiagrass progeny with Meyer to the bluegrass billbug.



Figure 2. Bluegrass billbug larvae.

Materials and Methods

Meyer (*Z. japonica*), DALZ 0102 (experimental *Z. japonica*), and 31 zoysiagrass progeny resulting from crosses between 'Emerald' x *Z. japonica* or *Z. matrella* x *Z. japonica* were evaluated for bluegrass billbug larval injury in separate, adjacent experiments. *Z. matrella* types included were 8507, Cavalier, 8501, or Diamond. *Z. japonica* types included were Meyer, Chinese Common, or Zenith. Parents of progeny are presented in Tables 1 and 2. Families under a particular parental cross were assigned a code prefix (e.g., 5311 is Cavalier x Chinese Common) and individual progeny were assigned numbers indicated after the hyphen (e.g., 5311-26).

Experiment 1 included 18 zoysiagrass progeny; Experiment 2 included 13 zoysiagrass progeny. Grasses were planted as 3-cm diam. plugs on 30-cm centers during the summer of 2007 into 1.5 m by 1.5 m plots at the Rocky Ford Turfgrass Research Center, Manhattan, KS. Plots were arranged in a randomized complete block design with three replications per zoysiagrass progeny. In September, 2007, the experimental areas were maintained similar to golf course fairways. In 2009 and 2010, in-ground irrigation was used to three days weekly to provide approximately 2.5 cm water per week. Plots were mowed to 1.3 cm in height using a reel mower and clippings were returned. Urea was applied to provide N at 37 kg ha⁻¹ on 21 July and 19 Aug. 2009, and 20 July and 12 Aug., 2010.

Each plot was rated for percentage bluegrass billbug larval injury on three dates in 2009 and 2010. Monthly sampling randomly across the experimental area confirmed the presence of bluegrass billbugs in July of each year. Data were subject to arcsin square root transformation prior to analysis and subject to analysis of variance with the GLIMMIX procedure of SAS (Statistical Analysis System). Means were separated using Fisher's LSD ($P \leq 0.05$), and back-transformed for presentation.

Results

Meyer was consistently among those grasses exhibiting the highest levels of bluegrass billbug larval injury, with ratings ranging from 16.7 to 38.3% (Tables 1 and 2; Fig. 3). In Experiment 1 on 6 July and 3 August, only the progeny from Meyer x Diamond (5327-19) had a level of injury similar to Meyer (Table 1). Others exhibiting bluegrass billbug larval injury higher than those grasses exhibiting no injury on one or more rating dates in 2009 included 5311-26 (Cavalier x Meyer), 5321-48 (Emerald x Meyer), and 5324-27 (8501 x Meyer). Bluegrass billbug injury in 2010 was lower than in 2009 (0 to 19%), but Meyer, 5321-48, and 5327-19 had > 15% injury on one or more rating dates.

In Experiment 2, differences among grasses associated with bluegrass billbug injury occurred on the first two rating dates of each year (Table 2). Progeny from Emerald x Meyer (5321-9 and 5321-18) and Zorro x Meyer (5313-34) were similar to Meyer on these dates. In 2010, Meyer had the highest bluegrass billbug larval injury on each date. The only other progeny that had a higher level of damage compared to those experiencing no injury was 5321-9 (Emerald x Meyer).

Table 1. Bluegrass billbug (*Sphenophorus parvulus*) larval injury on zoysiagrass progeny in Experiment 1 at Manhattan, KS in 2009 and 2010.

Progeny	Bluegrass billbug larval injury (%) ¹					
	2009			2010		
	6 July	3 Aug.	28 Aug.	30 June	15 July	31 July
8507 x Meyer (5283-27)	5.7cd ²	6.7bc	11.0cde	3.3b	0.7b	2.0b
<u>Cavalier x Chinese Common</u>						
5311-3	0.0d	0.0c	0.0e	0.0b	0.0b	0.0b
5311-8	0.0d	0.0c	3.3de	1.0b	0.7b	0.0b
5311-22	2.3cd	0.0c	0.0e	1.3b	0.0b	0.0b
5311-26	15.0bc	12.3bc	15.0bc	8.3ab	1.0b	0.0b
5311-27	11.7bcd	10.0bc	10.0cde	5.7b	1.3b	0.0b
5311-32	8.3cd	3.3c	6.7cde	2.0b	0.0b	0.0b
<u>Zorro x Chinese Common</u>						
5312-36	1.7d	0.0c	0.0e	0.7b	0.0b	0.0b
5312-49	1.7d	3.3c	3.3de	0.0b	1.0b	0.0b
<u>Emerald x Meyer</u>						
5321-3	1.7d	2.0c	6.0cde	0.7b	0.0b	0.7b
5321-24	8.3cd	8.7bc	7.3cde	0.0b	0.0b	0.7b
5321-45	0.0d	1.3c	3.3de	0.0b	0.0b	0.0b
5321-48	21.7b	16.7b	15.0bc	15.0a	18.3a	15.3a
<u>8501 x Meyer</u>						
5324-18	10.0bcd	5.3bc	2.0de	4.3b	1.0b	0.0b
5324-27	1.7d	6.7bc	12.0cd	0.3b	0.0b	0.0b
5324-52	11.7bcd	2.0c	5.3cde	1.3b	3.3b	4.0b
5324-53	3.3cd	3.3c	5.0cde	1.7b	0.3b	0.0b
Meyer x Diamond (5327-19)	35.0a	33.3a	28.3a	16.7a	13.3a	6.0b
DALZ0102	0.0d	0.0c	0.0e	0.0b	0.0b	0.0b
Meyer	35.0a	35.0a	25.0ab	16.7a	19.3a	18.3a

¹ Billbug larval injury was rated visually on a 0 to 100% scale.

² Means in a column followed by the same letter are not significantly different ($P \leq 0.05$) according to Fisher's LSD.

Table 2. Bluegrass billbug (*Sphenophorus parvulus*) larval injury on zoysiagrass progeny in Experiment 2 at Manhattan, KS in 2009 and 2010.

Progeny	Bluegrass billbug larval injury (%) ¹					
	2009			2010		
	6 July	3 Aug.	28 Aug.	30 June	15 July	31 July
Cavalier x Chinese Common (5311-16)	0.0b ²	0.0c	0.7	1.3c	4.7bc	3.3
Zorro x Chinese Common (5312-55)	0.0b	0.7c	0.7	0.0c	0.0c	0.0
<u>Zorro x Meyer</u>						
5313-23	0.0b	2.0c	0.7	0.0c	0.0c	0.0
5313-34	15.0a	20.0a	19.0	0.0c	6.7bc	4.7
5313-71	3.3b	3.3bc	6.7	0.0c	0.0c	0.0
5313-46	0.3b	0.0c	3.3	0.0c	5.0bc	5.0
<u>Emerald x Meyer</u>						
5321-9	15.0a	11.7ab	19.0	18.3b	16.7ab	8.0
5321-18	20.0a	20.0a	19.3	7.0bc	10.7bc	12.7
<u>8501 x Meyer</u>						
5324-26	1.7b	0.0c	16.7	5.0c	8.0bc	6.7
5324-32	3.3b	1.7c	9.3	1.7c	0.0c	0.0
Meyer x 8508 (5325-11)	1.7b	0.0c	2.7	0.3c	0.0c	0.7
Meyer x Diamond (5327-67)	0.0b	0.0c	3.3	0.0c	0.0c	0.0
Emerald x Zenith (5334-59)	3.3b	5.3bc	6.3	0.0c	6.7bc	1.7
DALZ 0102	0.0b	0.0c	4.7	0.0c	0.0c	0.0
Meyer	18.3a	18.3a	21.3	30.0a	38.3a	21.3

¹ Billbug larval injury was rated visually on a 0 to 100% scale.

² Means in a column followed by the same letter are not significantly different ($P \leq 0.05$) according to Fisher's LSD. No differences occurred on 28 Aug., 2009 or 31 July, 2010.



Figure 3. Meyer zoysiagrass (foreground) is susceptible to the bluegrass billbug; whereas, some experimental progeny (background) show greater resistance.

References

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Acknowledgments

Thanks are extended to the Kansas Turfgrass Foundation, Kansas Golf Course Superintendents Association, and Heart of America Golf Course Superintendents Association for supporting this research. We thank Cole Thompson for help with data analysis and poster construction.