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Eastern Gamagrass
Texas Bluegrass

Susceptibility of Texas, Kentucky, Canada, and Selected Hybrid Bluegrasses to Greenbug Biotypes 'E' and 'F'.

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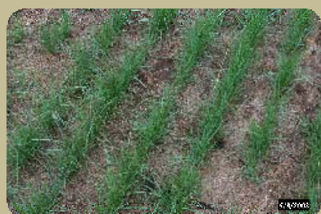
Introduction

The greenbug, *Schizaphis graminum* (Rondani), infests many graminaceous plants throughout the world and the identification of various biotypes has complicated a description of its host-plant range. Biotype E is the predominant biotype in the southern Great Plains of the USA infesting winter wheat (*Triticum aestivum* L.) and sorghum [*Sorghum bicolor* (L.) Moench]. Biotype F is known as the 'bluegrass' biotype and was observed infesting Kentucky bluegrass (*Poa pratensis* L.) lawns in early autumn in eastern Nebraska and central Ohio. Kindler and Hays (1999) reported that biotype F greenbugs reared on Canada bluegrass (*P. compressa* L.) produced significantly more offspring than other biotypes tested. It has been suggested that greenbug biotype development is driven by the greenbugs' long-standing interaction with native grasses. The origin and evolution of greenbug biotypes are still controversial subjects.

Texas bluegrass (*P. arachnifera* Torr.) is a highly rhizomatous, dioecious, perennial, cool-season grass native to southern Kansas, Oklahoma, western Arkansas and most of Texas. Because of its heat tolerance and persistence under extreme environmental conditions of the southern Great Plains, this species is of particular interest for development as a quality forage plant. Using Texas bluegrass, in lieu of winter wheat, for pasture has the potential of reducing establishment costs while providing better soil stabilization. In central and eastern Texas, forage production and quality of Texas bluegrass was similar to winter wheat (Read *et al.* 2000).

Very limited information is available on the greenbugs interaction with native grasses and none specifically with Texas bluegrass. Knowledge of the host potential of Texas bluegrass genotypes to known greenbug biotypes should be beneficial in determining if Texas bluegrass is a potential native source for greenbug biotype development and for selecting resistant breeding material. The objective of this study was to evaluate the population dynamics of biotypes E and F greenbug on Texas, Kentucky, and Canada bluegrass genotypes and selected Texas bluegrass interspecific hybrids.


Texas bluegrass spaced plant evaluation nursery - Woodward OK


No-till drilled Texas bluegrass seed - Woodward OK

Materials & Methods

Greenbug biotypes E and F were obtained from the USDA-ARS Wheat, Peanut and, Other Field Crops Research Unit, Stillwater, OK and colonies were maintained on 'Aberdine 812' barley (*Hordeum vulgare* L.)

Plant material screened included an assortment of Texas bluegrass genotypes mostly collected from private, overgrazed rangeland in Northwest Oklahoma, along with a Canada bluegrass genotype, three Kentucky bluegrass genotypes, a Texas Canada (T Ca) hybrid and two Texas Kentucky (T K) hybrids (Table 1).

Each plant entry (genotype) was replicated 4 to 7 times in a completely random design per biotype trial.

Each bluegrass entry was infested with 10 late-instar greenbugs placed at the base of the plant and then caged with a ventilated clear cellulose tube (30.0 by 3.8 cm).

Cone-tainers were placed in supportive holders and kept in trays filled with water after greenbug inoculation. Susceptible checks (barley, wheat, sorghum) we included in experiments to insure conditions for greenbug growth and reproduction were met.

Ten days after greenbug infestation, cages were removed and the total number of greenbugs per plant was counted. Population growth data for each greenbug biotype were separately analyzed using a mixed model analysis of variance where replicates within experiment and experiment run were treated as random effects.

Greenbug
Scientific name: *Schizaphis graminum* (Rondani)
(Homoptera: Aphididae)


Photo credit: Extension Entomology, Texas A&M University


Native Texas bluegrass pasture – Ft. Supply, OK (near Woodward OK)

Replicated bluegrass genotypes in sealed cone-tainers inoculated with greenbug aphids.

Results

Biotype E greenbug

Significant differences ($P < 0.05$) in biotype E greenbug population dynamics were detected among plant entries (Table 1). Barley, wheat, and sorghum supported significantly higher populations of greenbugs as compared with bluegrass entries and significant feeding damage was visually observed on checks and bluegrass genotypes with > 40 aphids.

Among Texas bluegrass entries, M1-4 from Ellis Co. OK supported the highest counts of biotype E greenbug but it was not significantly different from Texas bluegrass entries JM2-2, WL-29, C1-3, Syn1-1, or D1-4. After a 10 d feeding period, nine Texas bluegrass entries averaged less than the initial population of 10 aphids.

None of the interspecific hybrids with Texas bluegrass (TK-24, TK-44, TC-21) were significantly different from each other although TK-44 contained a considerably higher mean aphid count (TK-44 = 32, TC-21 = 4, TK-24 = 2).

Biotype F greenbug

Similar to biotype E, significant differences ($P < 0.05$) in greenbug biotype F population dynamics were detected among entries (Table 2). Ranking among entries was: Kentucky bluegrass (3 genotypes averaged 35 aphids), Canada bluegrass (1 genotype averaged 35 aphids), grain checks (2 cultivars averaged 18 aphids), T × K bluegrass hybrids (2 genotypes averaged 16 aphids), Texas bluegrass (22 genotypes averaged 8 aphids) and T × Ca bluegrass hybrid (1 genotype averaged 1 aphid).

Among Texas bluegrass entries, WL-42 supported the highest counts of biotype F greenbug. Thirteen Texas bluegrass entries averaged less than the initial population of 10 aphids after a 10 d feeding period.

Differences in host suitability between biotypes were noted where the Canada bluegrass genotype did not support biotype E but enabled high reproductive rates with biotype F and the Kentucky genotypes were suitable for greenbug population growth with biotype F and varied in their host suitability to biotype E.

Table 1 Mean ± SEM number of **biotype E** greenbugs on Texas, Kentucky, Canada, and selected hybrid bluegrasses after a 10 d feeding period. The initial infestation was 10 late-instar aphids per replication.

Entry	Type	Origin	Aphids count (Mean ± SEM)
Barley cv. Aberdine 812	Check	Commercial	393.5 ± 12.90 a †
Wheat cv. Longhorn	Check	Commercial	317.1 ± 12.90 b
Sorghum cv. Honey	Check	Commercial	245.8 ± 14.90 c
M1-4	Texas	Ellis Co. OK	91.4 ± 20.00 d
JM2-2	Texas	Woodward Co. OK	80.0 ± 16.90 de
Kypi (PI 206734)	Kentucky	GRIN	52.9 ± 13.48 def
WL-29	Texas	Woodward Co. OK	49.0 ± 12.90 defg
C1-3	Texas	Harper Co. OK	47.9 ± 18.25 defghi
Syn1-1	Texas	Woodward Co. OK	46.0 ± 12.90 defgj
D1-4	Texas	Woodward Co. OK	42.7 ± 16.89 defghik
D4-14	Texas	Dewey Co. OK	41.9 ± 13.48 efgh
'Chateau'	Kentucky	Commercial	40.6 ± 19.99 defghik
WL-27	Texas	Woodward Co. OK	37.9 ± 15.80 efghik
C1-2	Texas	Harper Co. OK	36.6 ± 12.40 fghik
M2-1	Texas	Ellis Co. OK	33.4 ± 17.00 efghik
TK-44 (WL-7 × AJC-524)	T × K	Woodward - ARS	32.2 ± 12.40 fghik
WL-34	Texas	Woodward Co. OK	27.9 ± 12.90 fghik
LQ-7	Texas	Woodward Co. OK	25.2 ± 18.25 fghik
WL-43	Texas	Woodward Co. OK	23.4 ± 16.90 fghik
WL-19 (PI 632500)	Texas	GRIN	15.5 ± 18.25 fghik
D4-20	Texas	Dewey Co. OK	14.8 ± 14.90 fghik
WL-42 (PI 632539)	Texas	GRIN	11.8 ± 18.25 fghik
AJC-524 (PI 539061)	Kentucky	GRIN	9.9 ± 18.25 fghik
WL-7	Texas	Woodward Co. OK	6.2 ± 13.48 hik
TC-21	T × Ca	Woodward – ARS	4.4 ± 12.40 ik
WL-4	Texas	Woodward Co. OK	4.2 ± 16.90 hijk
D1-2	Texas	Woodward Co. OK	3.6 ± 19.99 ghik
WL-11	Texas	Woodward Co. OK	3.4 ± 14.13 ik
J1-4	Texas	Woodward Co. OK	3.4 ± 18.25 hijk
WL-20	Texas	Woodward Co. OK	2.6 ± 18.25 hijk
TK-24 (WL-11 × Kypi)	T × K	Woodward – ARS	2.5 ± 16.90 hik
D2-2	Texas	Woodward Co. OK	2.0 ± 12.90 k
PC-2	Texas	Woodward Co. OK	0.5 ± 20.00 hijk
J1-15	Texas	Woodward Co. OK	0.2 ± 18.25 hik
CA-22 (PI 440599)	Canada	GRIN	0.1 ± 14.90 k

† Means followed by the same letter are not significantly different using adjusted Tukey test at $P = 0.05$.

Table 2 Mean SEM number of **biotype F** greenbugs on Texas, Kentucky, Canada, and selected hybrid bluegrasses after a 10 d feeding period. The initial infestation was 10 late-instar aphids per replication.

Entry	Type	Origin	Aphids count (Mean ± SEM)
Kypi (PI 206734)	Kentucky	GRIN	49.7 ± 3.55 a †
CA-22 (PI 440599)	Canada	GRIN	34.6 ± 3.37 b
AJC-524 (PI 539061)	Kentucky	GRIN	33.4 ± 4.77 bc
WL-42 (PI 632539)	Texas	GRIN	32.3 ± 6.16 bc
TK-44 (WL-7 × AJC-524)	T × K	Woodward – ARS	27.7 ± 4.35 bcd
'Chateau'	Kentucky	Commercial	22.3 ± 3.77 cde
Wheat cv. Longhorn	Check	Commercial	22.0 ± 4.03 cde
LQ-7	Texas	Woodward Co. OK	17.4 ± 4.03 def
WL-43	Texas	Woodward Co. OK	14.6 ± 4.03 efgh
WL-34	Texas	Woodward Co. OK	14.5 ± 3.37 efg
Sorghum cv. Honey	Check	Commercial	14.2 ± 4.03 efghi
WL-27	Texas	Woodward Co. OK	14.2 ± 4.03 efghi
D1-4	Texas	Woodward Co. OK	13.8 ± 5.33 efghijk
C1-2	Texas	Harper Co. OK	13.2 ± 4.35 cdefghijklm
C1-4	Texas	Harper Co. OK	12.0 ± 10.66 cdefghijklm
WL-20	Texas	Woodward Co. OK	11.3 ± 4.35 efghijkl
JM2-2	Texas	Woodward Co. OK	8.8 ± 3.10 fghijklm
WL-7	Texas	Woodward Co. OK	8.3 ± 3.77 fghijklm
Syn1-1	Texas	Woodward Co. OK	7.0 ± 3.55 fghijklm
C1-3	Texas	Harper Co. OK	5.8 ± 4.77 fghijklm
PC-2	Texas	Woodward Co. OK	5.1 ± 4.77 ghijklm
TK-24 (WL-11 × Kypi)	T × K	Woodward – ARS	4.5 ± 2.85 ijklm
J1-15	Texas	Woodward Co. OK	3.5 ± 4.03 hijklm
WL-11	Texas	Woodward Co. OK	3.4 ± 4.35 hijklm
WL-4	Texas	Woodward Co. OK	2.2 ± 4.77 ijklm
WL-29	Texas	Woodward Co. OK	2.9 ± 4.77 jklm
D4-14	Texas	Dewey Co. OK	1.7 ± 4.77 jklm
D4-20	Texas	Dewey Co. OK	1.2 ± 4.03 klm
TC-21 (PC-2 × CA-22)	T × Ca	Woodward – ARS	1.0 ± 3.08 lm
J1-4	Texas	Woodward Co. OK	0.7 ± 3.08 m
D2-2	Texas	Woodward Co. OK	0.1 ± 4.35 lm

† Means followed by the same letter are not significantly different using adjusted Tukey test at $P = 0.05$.

Summary

Results from this preliminary study suggest that greenbug biotypes E and F are able to reproduce on plants of Kentucky and Texas bluegrass and their hybrids.

Although plant damage data was not collected, many of the Texas bluegrass entries did not support greenbug population growth.

With biotype E, Texas entries with a mean > 40 aphids tended to display visual damage and with biotype F most entries did not display any visual damage which indicates that Texas bluegrass could serve as a native grass alternate host for greenbug survival in the southern Great Plains and possibly as a source for greenbug biotype development.

Kindler SD, Hays DB (1999) Susceptibility of cool-season grasses to greenbug biotypes. *J Agric Urban Entomol* 16: 235-243.

Read, JC, Sanderson MA, Evers GW, Voigt PW, Reinert JA (2000) Forage production potential of *Poa arachnifera* Torr. in semi-arid climates [Online]. Proceeding Northeast Texas Forage Field Day. Texas A&M University, Commerce. Available at http://www7.tamu-commerce.edu/agscience/events/ffd/read.pdf.