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ARTICLE

## Comparison of Field Performance of Georgia-16HO and Florunner Cultivars in the Presence of Tomato Spotted Wilt

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ABSTRACT

Field experiments were conducted at Tifton, Georgia from 2019 to 2020 to compare the effects of new peanut (*Arachis hypogaea* L.) cultivar 'Georgia-16HO' with the former industry standard cultivar 'Florunner', and in-furrow applications of phorate or imidacloprid insecticides on severity of tomato spotted wilt (TSW) caused by *Tomato spotted wilt virus* (TSWV), resultant yield, and crop value. Incidence of TSW was much lower for Georgia-16HO than for Florunner in both years, with differences more obvious in 2019 when the virus pressure was higher. Yield was greater for Georgia-16HO than Florunner in both years with greater differences when disease pressure was higher. Across all treatments, adjusted crop value for Georgia-16HO was ~\$1450 /ha greater than for Florunner in 2019 and ~\$839 /ha greater in 2020.

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## INTRODUCTION

The peanut (*Arachis hypogaea* L.) cultivar Florunner was released by the University of Florida in 1969 (Norden *et al.* 1969). Florunner soon became the predominant cultivar grown in the southeastern U.S. and the predominant runner-type cultivar grown throughout the U.S. (Gorbet 1999, Sholar *et al.* 1995). During the late 1970s, Florunner was grown on over 98% of the peanut area in the southeastern U.S. (Gorbet 1999). In 1985, over 84% of the runner peanut production area in the entire U.S. was planted to Florunner (Sholar *et al.* 1995). In the late 1980s, tomato spotted wilt (TSW), caused by *Tomato spotted wilt virus* (TSWV) was reported in Alabama, Georgia,

and Florida (Hagan *et al.* 1990, Culbreath *et al.* 2003). Although the virus was new to the area, tobacco thrips (*Frankliniella fusca* Hinds) were already endemic in peanut, and proved to be a competent vector for TSWV (Todd and Culbreath 1995, Todd *et al.* 1995). Florunner was very susceptible to TSWV (Culbreath, *et al.* 1992a, Culbreath *et al.* 1992b), and between 1989 and 1997, incidence of TSW and losses to the disease in peanut increased dramatically (Culbreath and Srinivasan 2011). Although TSW was a new problem in peanut in the southeastern U.S., it was discovered that the cultivar Southern Runner (Gorbet *et al.* 1987) had a moderate level of field resistance to TSWV (Black and Smith 1987). Southern Runner was never planted on a large portion of the peanut hectareage, but it was used as a parent in breeding

programs seeking to develop cultivars with resistance to TSWV (Culbreath and Srinivasan 2011). By 1996, the cultivar Georgia Green was released (Branch 1996). Georgia Green had field resistance similar to that of Southern Runner (Culbreath *et al.* 1996), which was one of its parents (Branch 1996), but was more acceptable for peanut production than Southern Runner. It displaced Florunner as the predominant peanut cultivar in the southeastern U.S. as soon as the seed supply allowed (Culbreath *et al.* 2003). Georgia Green was the predominant peanut cultivar grown in the southeastern U.S. from 1997 until 2007 (Culbreath and Srinivasan 2011). Georgia Green was a critical component of the TSW management system, but the level of field resistance in Georgia Green is not sufficient to provide adequate control of TSW when the potential for development of epidemics is high (Culbreath and Srinivasan 2011). Thus, it was desirable, if not essential, to use as many other suppressive factors as possible with that cultivar (Culbreath and Srinivasan 2011).

Several new cultivars with higher levels of field resistance to TSWV than Georgia Green have been developed (Culbreath and Srinivasan 2011, Culbreath *et al.* 2016). Planting these cultivars has improved levels of control of TSW in general, and allowed more flexibility with other factors in the TSW management programs (Culbreath *et al.* 2008, Culbreath *et al.* 2010, Culbreath *et al.* 2012, Culbreath *et al.* 2013, 2016, Tubbs *et al.* 2011) than was possible with Georgia Green.

Similarly, these cultivars have allowed more flexibility with insecticides used for control of thrips on the young plants. TSWV is transmitted by thrips, but use of most insecticides for control of tobacco thrips (*Frankliniella fusca*), the primary thrips species associated with direct damage and spread of TSWV in peanut in the southeastern U.S., generally has not resulted in reductions in incidence of TSW (Culbreath *et al.* 2003, Culbreath and Srinivasan 2011). Phorate is the only insecticide that has provided suppression of TSW in peanut (Culbreath *et al.* 2003, Todd *et al.* 2005, Culbreath and Srinivasan 2011), and it has been an important component of an integrated management system for TSW in peanut. Culbreath and colleagues (2008) reported much lower incidence of TSW in new cultivars Florida-07 (Gorbet and Tillman 2009) and Tifguard (Holbrook *et al.* 2008) than in Georgia Green, regardless of whether they were treated with phorate. In most cases, there was less response to phorate in those cultivars for suppressing TSW than in Georgia Green (Culbreath *et al.* 2008). The insecticide imidacloprid is commonly used for thrips control. However, it was reported to increase incidence of spotted wilt in susceptible cultivars (Todd *et al.*, 1994, Culbreath and Srinivasan 2011).

Georgia-16HO is a runner-type cultivar released by the Georgia Agricultural Experiment Station in 2016 (Branch 2017). It has field resistance to TSWV and good yield potential. However, response of new cultivars such as Georgia-16HO to applications of phorate or imidacloprid have not been compared to that of Florunner. The primary objective of this study was to make direct comparison of Georgia-16HO to the previous standard but TSWV-susceptible cultivar Florunner for effects on spotted wilt epidemics, yield, and crop value. This was intended to provide an indication of the value of improved resistance to TSWV in a recently released cultivar compared to the standard cultivar grown before spotted wilt emerged as a problem. Another objective was to compare the effects of in-

furrow application of phorate and imidacloprid insecticides on those same variables in Florunner and Georgia-16HO.

## MATERIALS AND METHODS

### Experimental design, field layout and treatment structure

Field experiments were conducted at the University of Georgia Coastal Plain Experiment Station Lang-Rigdon Farm, Tifton GA in 2019-2020. Soil type in both fields was a Tifton sandy loam (fine-loamy, kaolinic, thermic Plinthic Kandiudult). The fields used in both years had a history of severe epidemics of TSW in previous years when peanut had been grown.

In both experiments, experimental design was a randomized complete block with six replications. In each year, six treatments consisted of two cultivars, Florunner and Georgia-16HO in factorial arrangement with: i) in-furrow application of phorate (Thimet 20 G, AMVAC Chemical Corporation, Los Angeles, CA) at 1.12 kg ai/ha; ii) in-furrow application of imidacloprid (Admire Pro 4.6, Bayer, Research Triangle Park, NC) at 0.40 kg ai/ha; and iii) nontreated control. Planting dates were 16 April 2019 and 8 May 2020. Plots were 1.8 m wide and contained two single rows 91.4 cm apart. Plot length was 8.8 m in 2019 and 9.1 m in 2020. Seeding rates were 14.8 seed/m of row in each of the two single rows.

Plots were maintained according to University of Georgia Extension recommendations. Calcium sulfate was applied as gypsum at 1570 kg/ha 75 days after planting (DAP) in 2019 and 2240 kg/ha 73 DAP in 2020. Fungicides were applied at approximate 14-day intervals throughout each season for control of foliar and soilborne fungal diseases.

### Inoculum and thrips vectors

Development of TSW epidemics was reliant upon inoculation by resident viruliferous thrips vectors (*Frankliniella fusca* and *Frankliniella occidentalis* Pergande). The immediate source of virus and vector was not identified.

### Thrips injury assessment

Injury caused by feeding of tobacco thrips larvae was assessed for each plot using an ordinal scale of 0 to 10 adapted from Herbert and colleagues (2007) where: 0 = no injury, 1 = 10% leaves injured, 2 = 20% leaves injured, 3 = 30% leaves injured, 4 = 40% leaves injured, 5 = >50% of leaves injured and < 5% terminals injured, 6 = > 50% of leaves injured and < 25% terminals injured, 7 = >50% of leaves injured and < 50% terminals injured, 8 = >50% of leaves injured and < 75% terminals injured, 9 = >50% of leaves injured and < 90% terminals injured, and 10 = dead plants. Injury ratings were taken 20 DAP in 2019 and 22 DAP in 2020.

### Disease assessment

Spotted wilt was evaluated for each plot at 62, 83, 112, and 125 DAP in 2019, and 61, 75, 99, and 119 DAP in 2020. Incidence of TSW was determined by counting the number of 0.3-m portions of row containing severely stunted, chlorotic, wilted or dead plants for each plot and converting that number to a percentage of total row length (Culbreath *et al.* 1997). Area under the disease progress curve (AUDPC) for incidence of

TSW was calculated for each plot as described by Shaner and Finney (1977).

### Pod yield, grade and value

In 2019, due to severity of late season spotted wilt and severe vine decline, plots of Florunner were inverted early, 133 DAP, whereas plots of Georgia-16HO were inverted 142 DAP. Plots of both cultivars were inverted 136 DAP in 2020. Pods were harvested mechanically 5 to 10 days after plants were inverted, and were dried. Yields were adjusted to 10% wt/wt moisture.

Grades were determined using commercial grading equipment according to official Federal-State Inspection Service methods (USDA-FSA 2019). A sample of 1000 g of harvested pods was collected from each plot. Loose shelled kernels and non-pod materials (foreign material) were removed from the sample and weighed. Percent foreign material and loose shelled kernels were calculated for each 1000 g sample. One 500 g sample was taken from the cleaned pods of each sample. The pods were shelled using a grade sheller, and kernels were classified as sound mature kernels, other kernels and damaged kernels. Pod grades were defined as percent total sound mature kernels (TSMK).

### Seed costs

Since seed are sold on a per weight basis, the price per hectare for seed costs is greater for larger seeded cultivars even if the price/kg of seed is the same. Seed cost ( $\gamma$ ) was computed using the following equation:

$$\gamma = (164,444/\alpha) \times \beta$$

Where  $\gamma$  is the seed cost in \$/ha,

$\alpha$  is the number of seed/kg, and

$\beta$  is the seed price/kg.

Estimates of the number of seed/kg were 1628.11 and 1726.22 for Georgia-16HO and Florunner, respectively. Estimates of seed weights were 101.00 kg/ha and 95.26 kg/ha for Georgia-16HO and Florunner, respectively, using row spacing of 0.9 m and 14.8 seeds/m. Estimates of seed prices were obtained from three seed suppliers in each year. Average prices of seed were \$1.79/kg in 2019 and \$1.91/kg in 2020. Since Florunner is no longer available for commercial seed, the same price per kg was used as for Georgia-16HO. Estimates of seed costs were \$192.92/ha for Georgia-16HO and \$181.95/ha for Florunner.

### Insecticide costs

Estimates of the prices of the imidacloprid and phorate insecticides were obtained from a confidential survey of several input suppliers in the peanut growing region of Georgia. An average price calculated from the aggregated prices provided was used for calculation of treatment costs in this study. For the rates used in this study, costs were \$34.59/ha for imidacloprid and \$40.77/ha for phorate. Since each was applied in-furrow at planting, no additional cost of application was included.

### Crop value calculations

For crop value comparisons, price (\$ U.S./metric ton) was estimated for each plot using the following formula derived from the 2019 pod price schedule (USDA-FSA 2020).

$$\text{\$U.S. metric ton} = [\%TSMK \times \$5.35 + \%OK \times \$1.54] - [(\%FM - 4) \times \$1.10] - (\%DD)$$

where TSMK is total sound mature kernels,

OK is other kernels,

FM is foreign material, and

DD is damaged deduction.

There was no deduction for damaged kernels if the level was below the threshold of 2% damaged kernels. There was a deduction of \$3.75 per metric ton for each 1% incremental increase in damaged kernels above 2%. Total revenue/ha was calculated by multiplying the price per metric ton by yield in metric tons/ha. Adjusted revenue was calculated for each plot by subtracting seed cost and insecticide cost estimates for each cultivar-insecticide combination and estimated drying costs from the total revenue/ha.

### Statistical analysis

Data were analyzed using SAS v.9.3 software (SAS Institute, Cary, NC). A mixed model procedure was used with maximum likelihood estimation of variance components (PROC MIXED). The Satterthwaite method was used for computing the denominator degrees of freedom ("ddfm=satterth" in the model statement). Since epidemics differed greatly between years, analysis of all variables was made independently for each year. Replication was considered a random effect, and insecticide, cultivar, and insecticide by cultivar interactions were considered fixed effects. Effects were considered significant when  $P < 0.05$ . Fisher's least significant difference (LSD) values were computed using standard errors and t-values of adjusted degrees of freedom.

## RESULTS

### In furrow insecticide effects

Marginal chlorosis and necrosis on leaves of young plants were observed on both cultivars treated with phorate in both years. Severity of the phytotoxic effect was not assessed for each plot, but there were no indications of variability in response between the cultivars evaluated in either experiment.

### Effect on thrips feeding injury

In 2019, insecticide ( $P < 0.0001$ ) effects on thrips feeding injury were significant, but neither cultivar ( $P > 0.23$ ) nor cultivar  $\times$  insecticide ( $P > 0.45$ ) effects were (Table 1). Across cultivars, thrips feeding injury ratings were lowest in the imidacloprid treatment and highest in the nontreated control (Table 1). Across insecticide treatments, thrips injury ratings were similar for the two cultivars (Table 1). In 2020, insecticide ( $P < 0.0001$ ) and cultivar ( $P < 0.0001$ ) effects were significant, but insecticide  $\times$  cultivar ( $P > 0.06$ ) was not. Across cultivars, thrips injury ratings were lower for both insecticide treatments than the nontreated control, and ratings were lowest in the phorate treatment (Table 1). Across insecticide treatments, injury ratings were lower for Georgia-16HO than for Florunner (Table 1).

### Effects on tomato spotted wilt epidemics

For final incidence of spotted wilt in 2019, cultivar main effects were significant ( $P < 0.0001$ ), but insecticide ( $P > 0.15$ ) and cultivar  $\times$  insecticide ( $P > 0.33$ ) were not (Table 2). Across insecticide treatments, final incidence in Florunner was higher than in Georgia-16HO (Table 2). For AUDPC, cultivar ( $P <$

$0.0001$ ), insecticide ( $P = 0.001$ ) and cultivar  $\times$  insecticide ( $P = 0.006$ ) effects were significant. On Florunner, AUDPC was lowest for the phorate treatment, and AUDPC did not differ for the other two treatments (Table 2). On Georgia-16HO, AUDPC did not differ among the three insecticide treatments (Table 2). AUDPC was lower for Georgia-16HO than for Florunner within each of the insecticide treatments (Table 2).

**Table 1. Effect of Florunner (FR) and Georgia-16HO (GA-16) peanut cultivars and in-furrow insecticide treatment on injury by thrips, Tifton, GA 2019-2020.**

Treatment	Thrips injury rating (0-10) <sup>a</sup>					
	2019			2020		
	FR	GA-16	Mean <sup>b</sup>	FR	GA-16	Mean <sup>b</sup>
Nontreated	8.1	8.3	8.2	6.8	5.2	6.0
Imidacloprid	4.8	4.8	4.8	3.9	2.8	3.3
Phorate	5.8	6.6	6.2	2.8	2.2	2.5
LSD ( $P = 0.05$ )	-	-	0.6	-	-	0.4
Cultivar mean	6.2	6.5		4.5	3.4	
LSD ( $P = 0.05$ )	NS <sup>c</sup>			0.3		

<sup>a</sup> Thrips injury rating as described by Herbert et al. (2007), where 0 represents no injury, and 10 represents dead plants.

<sup>b</sup> There was no significant cultivar  $\times$  insecticide interaction ( $P > 0.05$ ), so comparisons of insecticide and cultivar were made using data pooled across the other factor.

<sup>c</sup> There was no significant cultivar effect ( $P > 0.23$ ), therefore, no LSD was calculated.

In 2020, cultivar main effects ( $P < 0.0001$ ) were significant for both final spotted wilt incidence and AUDPC, but neither insecticide nor cultivar  $\times$  insecticide were significant for either variable ( $P > 0.63$ ). Across insecticide treatments, final incidence of spotted wilt and AUDPC were lower for Georgia-16HO than for Florunner (Table 2).

### Effects on yield, grade, and crop value

In 2019, cultivar ( $P < 0.0001$ ) and insecticide ( $P = 0.0014$ ) main effects were significant on yield, but cultivar  $\times$  insecticide ( $P = 0.42$ ) was not (Table 3). Across insecticide treatments, yield was greater for Georgia-16HO (Table 3). In 2020, only cultivar main effects were significant ( $P < 0.0001$ ) on yield. Across insecticide treatments, yield was greater for Georgia-16HO than Florunner (Table 3).

Cultivar ( $P < 0.0001$ ), insecticide ( $P = 0.0013$ ), and cultivar  $\times$  insecticide ( $P = 0.05$ ) effects were significant for percent TSMK in 2019 (Table 3). Phorate treated plots of Florunner had higher percent TSMK than the other two treatments, whereas percent TSMK did not differ among insecticide treatments in Georgia-16HO (Table 3). TSMK percentages were higher for Georgia-16HO than for Florunner within each insecticide treatment (Table 3). In 2020, cultivar ( $P < 0.0001$ ) effects were significant for percent TSMK, but neither insecticide ( $P = 0.99$ ) nor cultivar  $\times$  insecticide effects ( $P = 0.73$ ) were significant. Across insecticide treatments, percent TSMK was higher for Georgia-16HO than for Florunner (Table 3). There were no differences among insecticide treatments (Table

3). In 2019, cultivar ( $P < 0.0001$ ) and insecticide ( $P < 0.002$ ) main effects were significant for both total crop value and adjusted crop value, but cultivar  $\times$  insecticide ( $P > 0.47$ ) was not significant. Across insecticides, total crop value and adjusted crop value were higher for Georgia-16HO than for Florunner (Table 3). Both total crop value and adjusted crop value were similar for imidacloprid and phorate treatments, and were higher in each than in the nontreated control (Table 3).

In 2020, cultivar ( $P < 0.0001$ ) effects were significant for both total and adjusted crop value, but insecticide ( $P > 0.55$ ) and cultivar  $\times$  insecticide ( $P > 0.95$ ) effects were not significant for either (Table 3). Across insecticide treatments both total crop value and adjusted crop value were greater for Georgia-16HO than Florunner (Table 3). There were no differences among insecticide treatments for either variable.

### DISCUSSION

Results from this study illustrate a large advantage of the cultivar Georgia-16HO over the previous standard runner-type cultivar Florunner for suppression of TSW epidemics, and in yield and crop value when TSW is a factor. The advantage was evident in two years in which severity of spotted wilt epidemics varied greatly, and was most evident in 2019 in which spotted wilt epidemics were more severe. Although comparisons of these two cultivars have not been reported previously, these results corroborate the expectation that could be deduced from a series of previous reports. Branch (2017) reported lower incidence of TSW in Georgia-16HO than in Florida-07, one of

its parents. Culbreath *et al.* (2008, 2016) reported incidence of spotted wilt in Florida-07 that was lower than in the cultivar Georgia Green. Culbreath *et al.* (1996) reported lower incidence of TSW in Georgia Green than in Florunner.

**Table 2. Effect of Florunner (FR) and Georgia-16HO (GA-16) peanut cultivars and in-furrow insecticide treatment on final incidence and area under the disease progress curve (AUDPC) of tomato spotted wilt epidemics, Tifton, GA 2019-2020.**

Treatment	Final incidence (%)			AUDPC		
	FR	GA-16	Mean <sup>a</sup>	FR	GA-16	Mean
<b>2019</b>						
Nontreated	98.5	19.6	59.1	75.5	23.4* <sup>b</sup>	-
Imidacloprid	99.4	14.6	57.0	83.4	15.9*	-
Phorate	92.9	15.2	54.1	61.5	15.3*	-
LSD (P = 0.05)	-	-	5.0	8.9	8.9	
Cultivar mean	92.9	15.2		-	-	
LSD (P = 0.05)	7.2			-		
	FR	GA-16	Mean <sup>a</sup>	FR	GA-16	Mean <sup>a</sup>
<b>2020</b>						
Nontreated	28.1	7.8	17.9	23.7	8.2	16.0
Imidacloprid	28.9	8.3	18.6	27.4	9.1	18.3
Phorate	26.1	6.1	16.1	20.2	6.1	13.1
LSD (P = 0.05)	-	-	NS	-	-	NS
Cultivar mean	27.6	7.4		23.7	7.8	
LSD (P = 0.05)	5.1			3.5		
<sup>a</sup> There was no significant cultivar × insecticide interaction (P > 0.05), so comparisons of insecticide and cultivar were made using data pooled across the other factor.						
<sup>b</sup> There was a significant cultivar × insecticide interaction (P = 0.006), so comparisons of insecticide and cultivar were made within individual treatments of the other factor. An asterisk * indicates a difference between cultivars within that insecticide treatment.						

Similarly, differences between the cultivars in yield and dollar value per hectare were obvious in both years. It is not possible to ascertain exactly how much of the yield and crop value differences are due to field resistance to TSW. Relative yield potential of the two cultivars in the absence of TSW would be difficult to determine in this area. The potential yield of Florunner with fungal disease control comparable to what is available today was not realized in large-scale production. Tomato spotted wilt had emerged as a yield limiting factor before fungicides that provide improved levels of soilborne disease control were labeled for use on peanut in the U.S. (Culbreath and Srinivasan 2011, Culbreath, *et al.* 2018). Therefore, historic reports of average yield in Georgia when the peanut crop was predominantly Florunner compared to yields with current cultivars would include confounding factors from soilborne fungal diseases. However, Culbreath *et al.* (1992c)

reported yields of Florunner of over 7,400 kg/ha in treatments that provided excellent control of foliar and soilborne diseases, so potential yield is substantially greater than was observed in this study. Although other factors besides field resistance to TSWV may also be involved with yield advantages in Georgia-16HO, the greater differences in yield and value of the yields were observed in 2019, when spotted wilt epidemics were much more severe than in 2020. Differences in yield of over 3500 kg/ha in 2019 and 1904 kg/ha in 2020 and resultant differences in adjusted value of \$1451/ha and \$839/ha in 2019 and 2020 respectively illustrate the importance of field resistance to TSWV and serve as an indication of the impact that cultivars with improved field resistance to TSWV can have.

Although both insecticide treatments decreased feeding injury by thrips in both years, the effects of insecticide on epidemics

of spotted wilt and yield were not consistent across the two years. Final incidence of spotted wilt across cultivars was lower in the phorate treatment than the nontreated control in 2019, but did not differ in 2020. AUDPC was lower in the phorate treatment than for the nontreated control on Florunner in 2019 but not on Georgia-16HO in 2019, and the treatments did not differ in 2020. Across cultivars, yield and both revenue/ha

values were higher for imidacloprid and phorate treatments in 2019, but there were no insecticide effects on yield or revenue/ha values in 2020. Although comparisons were not made to determine year effects on yield, it is interesting to note the similarity of yield of the phorate treatment on Georgia-16HO in 2019 to yields of all treatments in that cultivar in 2020.

**Table 3. Effect of Florunner (FR) and Georgia-16HO (GA-16) peanut cultivars and in-furrow insecticide treatment on pod yield, percent total sound mature kernels (TSMK), and crop values, Tifton, GA 2019-2020.**

Treatment	Yield (kg/ha)			TSMK (%)			Total Rev \$ value/ha			Adj Rev \$ value/ha		
	FR	GA-16	Mean <sup>a</sup>	FR	GA-16	Mean	FR	GA-16	Mean <sup>a</sup>	FR	GA-16	Mean <sup>a</sup>
<b>2019</b>												
Nontreated	2541	5905	4223	66.2	72.6 <sup>ab</sup>	-	916	2280	1597	668	2011	1339
Imidacloprid	3412	6810	5111	66.2	73.0 <sup>*</sup>	-	1235	2661	1948	953	2357	1655
Phorate	3306	7332	5319	69.4	73.6 <sup>*</sup>	-	1242	2872	2057	954	2562	1758
LSD (P=0.05)	-	-	566	1.6	1.6	-	-	-	223	-	-	223
Cultivar mean	3086	6682		-	-		1131	2605		858	2309	
LSD (P=0.05)	456						182			182		
	FR	GA-16	Mean <sup>a</sup>	FR	GA-16	Mean <sup>a</sup>	FR	GA-16	Mean <sup>a</sup>	FR	GA-16	Mean <sup>a</sup>
<b>2020</b>												
Nontreated	5039	7047	6043	68.8	72.6	70.7	1899	2781	2340	1658	2517	2087
Imidacloprid	5391	7341	6366	68.7	72.9	70.8	2027	2911	2469	1751	2612	2182
Phorate	5282	7038	6159	68.3	73.3	70.8	1974	2797	2385	1692	2491	2092
LSD (P=0.05)	-	-	NS <sup>c</sup>	-	-	NS <sup>c</sup>	-	-	NS <sup>c</sup>	-	-	NS <sup>c</sup>
Cultivar mean	5238	7142		68.6	72.9		1967	2830		1701	2540	
LSD (P=0.05)	530			1.6			194			194		

<sup>a</sup> There was no significant cultivar × insecticide interaction ( $P > 0.05$ ), so comparisons of insecticide and cultivar were made using data pooled across the other factor.

<sup>b</sup> There was a significant cultivar × insecticide interaction ( $P = 0.05$ ), so comparisons of insecticide and cultivar were made within individual levels of the other factor. An asterisk \* indicates a difference between cultivars within that insecticide treatment.

<sup>c</sup> NS indicates there was no significant insecticide or cultivar × insecticide effect ( $P > 0.05$ ), and no LSD was calculated.

These results demonstrate the strong advantage of the newer field resistant cultivar Georgia-16HO over the previous standard cultivar Florunner in two years that varied widely with regard to severity of TSW epidemics.

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