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Monitoring and Phenology of Thrips in Southern Highbush Blueberries

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Flower thrips damage floral tissues and reduce yield in southern highbush blueberries, but information on species complex and phenology is limited. During 2004 and 2005, we studied thrips species complex and phenology on two 1-ha commercial southern highbush blueberry farms. White sticky traps and blueberry flowers were used as our sampling units. Ten traps were placed randomly ~31 m apart throughout each 1-ha farm located in south-central and north-central Florida, respectively. Traps were collected weekly from flower opening to fruit set and thrips were removed and individually slide mounted for identification. Similarly, five flower-clusters (about five flowers per cluster) were collected weekly from the same bushes where the traps were deployed. The thrips were removed from the flowers and preserved in 50% alcohol before being slide-mounted for identification. Voucher specimens from traps and flowers were sent to the Florida State Collection of Arthropods (FSCA) in Gainesville, FL. Among the thrips species recorded at both sites, the Florida flower thrips [*Frankliniella bispinosa* (Morgan)] was the most commonly encountered species, accounting for >65% of the thrips in flowers and >83% of the thrips on sticky traps. Other species recorded included *F. fusca*, *F. occidentalis,* and *Thrips hawaiiensis,* which individual species accounted for less than 13% of the thrips found in flowers and on sticky cards. Sporadic catches (fewer than two specimens) included *Haplothrips victoriensis*, *F. kelliae*, and *F. schultzei*. Overall thrips abundance was highly correlated with flower development.

Fig. 1. Flower thrips, *Frankliniella bispinosa*, a major pest of southern highbush blueberries.

Flower thrips is an important pest of southern highbush blueberries (Fig. 1). They damage floral tissues including the gynoecium and pollen, which ultimately can affect yield (Liburd and Arévalo, 2005). Characterizations of thrips species in selected crops, including citrus, tomatoes, and peppers, have been conducted and information on phenology, damage and species complex for those crops is available. In southern highbush blueberries, information on thrips species complex and phenology is recent and fairly limited.

Childers and Nakahara (2006) sampled seven citrus orchards in central and south-central Florida and identified 36 species of thrips from 2979 specimens collected from within citrus tree canopies. In tomatoes, Reitz (2002) found that the most commonly encountered species in northern Florida was the western flower thrips [*Frankliniella occidentalis* (Pergande)]; however, during spring and fall, the eastern flower thrips [*F. tritici* (Fitch)] was the most abundant species. In other studies, Toapanta et al. (1996) determined the abundance of *F. occidentalis* and tobacco thrips, *F. fusca* on winter and spring host plants, and found that up to five generations of thrips (of various species) were capable of developing on hairy vetch (*Vicia villosa* Roth) during that season. In addition, they reported that crimson clover, *Trifolium incarnatum* L., was a poor host of *F. occidentalis* and *F. fusca*.

Our goal was to identify and examine the species of thrips common in southern highbush blueberries. In addition, we aimed at reporting on thrips phenology in southern highbush blueberries.

Materials and Methods

Study sites were established at two commercial blueberry farms in south-central and north-central Florida during 2004 and 2005, respectively. Each site consisted of a 1-ha block of southern highbush blueberry. Bushes were approximately 1.3–1.5 m tall of mixed cultivars (‘Star’, ‘Jewel’, ‘Emerald’, and ‘Millennia’) and planted 0.9 m apart on double-row 2.5-m beds. All bushes were mulched with pine-bark. Ten white sticky traps (Great Lakes IPM, Vestaburg) were placed randomly and evenly ~31 m apart throughout each hectare of blueberry bushes. The traps were collected weekly from flower opening to fruit set. Five flower-clusters (abut five flowers per cluster) were collected weekly from the same bushes where the traps were

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deployed. Traps and flowers were brought back to the Small Fruit and Vegetable IPM Laboratory at the University of Florida in Gainesville for analysis.

A sample of 100 thrips per week was removed from sticky traps to determine the thrips species composition present at each of the sampling sites. To detach the thrips from the sticky traps, we submerged the traps into 500 mL of CitroSolv™ (Fisher Scientific, Pittsburgh, PA) for 4 d. When the traps were removed from the container with CitroSolv™, they were rinsed with CitroSolv™ using a squirt bottle to remove any thrips that were still attached. The CitroSolv™ along with the thrips were then filtered through a basket-style coffee filter (Publix Supermarkets. Lakeland, FL). Thrips were allowed to air-dry at room temperature and then rehydrated using deionized water. Finally, thrips were individually slide-mounted using CMC-10 media (Masters Chemical Company, Elk Grove, IL) for identification.

The thrips collected from the flowers were initially preserved in 50% alcohol and then slide-mounted similar to those collected from traps (using CMC-10 media) for identification. Voucher specimens from traps and flowers were sent to the Florida State Collection of Arthropods (FSCA) in Gainesville, FL.

Data were collected on flower initiation (beginning of bloom), fully opened flower (peak bloom), and petal fall (end of bloom) by visually observing five flower clusters when flowers were collected for thrips. Data from thrips specimen were divided into mature and immature. Mature thrips were then identified to species using taxonomic keys (Moritz et al., 2004; Mound and Marullo, 1996; Edwards, unpublished data). The percentage of thrips of each species was tabulated for comparison. Finally, a regression analysis was conducted to correlate thrips population with flowering period (SAS 2003 version 9.1).

Results and Discussion

Among the thrips captured from both sites, *F. bispinosa* was the most commonly encountered species. During 2004, 67% and 72% of the thrips found in the flowers at the south-central and north-central Florida sites were *F. bispinosa* (Table 1). Similarly in 2005, 61% and 67% percent of the thrips recorded in flowers at both sites, respectively, were *F. bispinosa*. Previous research has documented a high correlation between the number of thrips (*F. bispinosa*) per flower and yield per blueberry bush (Arévalo and Liburd 2007). Generally, the higher the number of thrips per flower the lower yield is expected per bush.

Our findings indicate that higher numbers of thrips were recorded on traps compared to those found in the flowers. In 2004, 83% and 93% percent of the thrips recorded on sticky traps at the southern and northern sites respectively, were *F. bispinosa* (Table 1). Similarly in 2005, 82% and 95% percent of the thrips recorded on sticky traps from southern and northern sites respectively, were *F. bispinosa*. The findings were similar to those of Childers et al. (1990, 1994), where most of the thrips (80% to 95%) recorded in citrus were *F. bispinosa*. Other species found were tobacco *F. fusca*, which ranged between 6% to 8% for flowers in the southern sites and 3% to 9% for northern sites. Again, catches on sticky traps were a little higher than on flowers in 2004, and ranged from 10% to 12% for 2004 and 2005 respectively, for the southern site. In 2005 we recorded only 3% *F. fusca* from sticky traps in our northern site, slightly lower than the number recorded in flowers (8 vs. 3) (Table1). Other species of thrips recorded on sticky traps and flowers were *F. occidentalis* and *T. hawaiiensis*. Fewer than two specimens of *Haplothrips victoriensis*, *F. kelliae*, and *F. schultzei* were collected from flowers and traps.

Thrips abundance correlated with flower opening or bloom (Fig. 2). At the beginning of flowering period, when very few flowers were opened, very few thrips were recorded (Fig. 2). However, as flowering peaked, ~13 d after the beginning of bloom, almost 200 thrips per trap were recorded (Fig. 2). At the end of flowering (petal fall), 23 d after the beginning of bloom, very few thrips were recorded in the field. Since thrips numbers correlated with the number of flowers that are opened a management program can be designed based on the percentage of flowers that are opened at any given time.

Our research has identified the most abundant flower thrips species in southern highbush blueberries, *F. bispinosa*, as well as other notable thrips species that infest the crop. We have also determined that the flowering period is highly synchronized with the abundance of thrips in the field.

Table 1. Distribution of the thrips species complex in Florida.

		Percentage of thrips captured per season			
		2004		2005	
Farm	Species	Flowers	Sticky traps	Flowers	Sticky traps
Farm 1[z]	Immature	20.4	0.0	23.0	0.0
S. Florida	*F. bispinosa*	67.2	83.6	61.2	82.4
	F. fusca	6.6	10.4	8.4	12.2
	F. occidentalis	4.4	5.8	5.8	3.6
	T. hawaiiensis	1.0	0.0	1.6	1.2
	Other species	0.4	0.2	0.0	0.6
Farm 2[z]	Immature	18.5	0.0	14.7	0.3
N. Florida	*F. bispinosa*	72.5	93.3	67.3	95.2
	F. fusca	3.7	5.0	8.5	3.0
	F. occidentalis	4.7	1.3	9.5	1.0
	T. hawaiiensis	0.5	0.2	0.0	0.3
	Other species	0.0	0.3	0.0	0.3

[z]S. Florida = South-central Florida; N. Florida = North-central Florida.

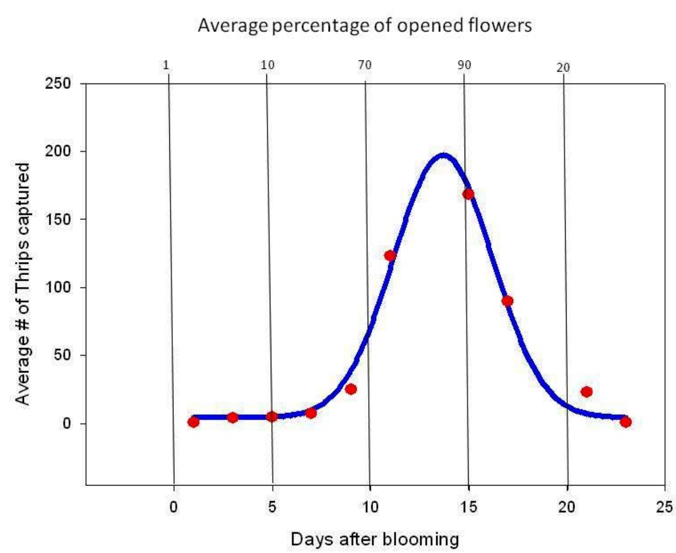

Fig. 2. Mean number of thrips captured per trap correlated with days after the beginning of bloom.

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