RESERVOIRS OF THE SWEETPOTATO WHITEFLY FOR TOMATOES IN WEST-CENTRAL FLORIDA

D. J. SCHUSTER, J. E. POLSTON AND J. F. PRICE
Gulf Coast Research & Education Center
IFAS, University of Florida
Bradenton, FL 34203

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Abstract. To identify possible reservoirs of the sweetpotato whitefly, Bemisia tabaci (Gennadius), for tomatoes (Lycopersicon esculentum Mill.) in west-central Florida, adult populations were sampled in commercial vegetable fields during 1991-92 using yellow sticky traps. Traps were placed in the interiors of fields of each vegetable crop and on the weedy perimeters of tomato fields. Traps were monitored and replaced weekly. Whitefly populations in cabbage (Brassica oleracea L.) and potato (Solanum tuberosum L.) fields, which were planted in the fall and harvested in the spring, were high from Nov. to Apr. when populations in tomato fields were low. The numbers of adult whiteflies trapped in fields of cucumber (Cucumis sativus L.) and squash (Cucumis pepo L.) generally peaked prior to those trapped in tomato. The numbers of whitefly adults trapped in pepper (Capsicum annum L.) fields generally were lower than those in cabbage, potatoes and cherry tomato fields and generally paralleled those in tomato fields. The numbers of whitefly adults trapped in weeds tended to parallel those trapped in tomato fields and declined to very low numbers during the summer off-season. Mortality of sweetpotato whitefly nymphs on weeds due to parasitization and apparent predation ranged from 40 to 90% in the fall of 1991 and from 10 to 70% in 1992.

The sweetpotato whitefly is a recent pest of ornamental and vegetable crops in Florida (Schuster et al., 1989). Losses to tomato during 1990-91 have been estimated at about $125 million (Schuster, unpublished data). These losses included indirect losses due to control costs and direct losses due to a new disorder associated with feeding of the whitefly (Schuster et al., 1990) and a new geminivirus transmitted by the whitefly (Simone et al., 1990; Kring et al., 1991).

The sweetpotato whitefly is known to attack at least 500 host plants (Greathed, 1986) and has been found reproducing on at least 22 weed and 15 crop species in Florida (Schuster et al., unpublished data). Nevertheless, it is unlikely that all host plants are equally important as sources of dispersing whitefly adults.

Table 1. The number of commercial production fields sampled with yellow sticky traps for sweetpotato whitefly adults.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Tomato</td>
<td>26</td>
<td>46</td>
<td>33</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Potato</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Cabbage</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Pepper</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cherry tomato</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Cucumber</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Squash</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1In 1991, fields were sampled in the spring from 18 Feb. to 31 May, in the summer from 3 June to 9 Aug., and in the fall from 12 Aug. to 3 Jan. In 1992, fields were sampled in the spring from 6 Jan. to 2 June, and in the summer from 2 June to 6 Aug.

2Fields sampled in the spring were also sampled in the summer along with some of the fields selected for sampling in the fall.
lar direction but were placed in openings in the weed canopy. Trap sites on weed perimeters were selected to be representative of the known weed hosts of the sweetpotato whitefly. Traps were replaced weekly and the number of sweetpotato whitefly-like adults were counted. Occasionally, adults larger than the sweetpotato whitefly or adults of the bandedwinged whitefly, *Trialeurodes abutilonea* (Haldeman), were trapped but not counted.

Fields sampled were in Hillsborough and Manatee Counties and are listed in Table 1. Trapping was conducted from mid-Feb. 1991 to Aug. 1992. Trapping in fields sampled in the spring was continued through the summer to follow populations after harvest. The weekly counts were averaged over each crop and for all weed sites.

In the fall of 1991 and 1992, foliar samples of known sweetpotato whitefly weed hosts were collected weekly from the perimeters of 5 and 6 tomato fields, respectively. The numbers of apparently healthy nymphs and those either parasitized or apparently dead due to host feeding by parasite females or predators were counted.

### Results and Discussion

Numbers of sweetpotato whitefly adults trapped in cabbage were relatively high from mid-Feb. to Apr. in 1991 and from Mar. to Apr. in 1992 when numbers trapped in tomato were low (Fig. 1). The numbers of adults trapped in potato fields were less than those trapped in cabbage fields but, nevertheless, were relatively high during the same time as in cabbage (Fig. 2). Thus, whiteflies could be forced to move to alternative host plants when these vegetable crops are destroyed following harvest. Although this study does not demonstrate movement of sweetpotato whitefly adults from cabbage or potato fields to tomato fields, the data do indicate these vegetable crops may serve as overwintering hosts and, therefore, as reservoirs of the sweetpotato whitefly for spring-planted tomato fields.

The numbers of sweetpotato whitefly adults trapped in cherry tomato fields in 1991 and 1992 peaked later than those in cabbage fields, preceding similar peaks in tomato fields by 2-3 weeks (Fig. 3). Cherry tomatoes in west-central Florida generally are planted earlier in the fall than large fruited tomatoes and the former are harvested for a longer period. This vegetable, unlike cabbage and potato, is a host of tomato mottle virus (TMoV), a new geminivirus devastating tomato in many areas of Florida (McGovern et al., 1991). Thus, cherry tomato fields may serve not only as reservoirs of the sweetpotato whitefly but also as reservoirs of TMoV and, therefore, may be important in the epidemiology of TMoV.

The numbers of sweetpotato whitefly adults trapped in pepper fields generally were lower than those in cabbage, potatoes and cherry tomato fields and generally paralleled those in tomato fields (Fig. 4). Pepper generally is planted when tomatoes are being transplanted or when tomatoes

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**Fig. 1.** The number of sweetpotato whitefly adults captured on yellow sticky traps in commercial cabbage and fresh market tomato fields during 1991-92 in west-central Florida.

**Fig. 2.** The number of sweetpotato whitefly adults captured on yellow sticky traps in commercial potato and fresh market tomato fields during 1991-92 in west-central Florida.
are already present but appears to be less important as a potential reservoir of the sweetpotato whitefly. The numbers of adults trapped in cucumber and squash fields generally peaked prior to those trapped in tomato fields (Fig. 4). These cucurbit crops normally are planted at or near the same time as tomato in the fall but are shorter season crops than tomato. Therefore, whitefly adults could be forced to move to alternative host plants like tomato as cucumber and squash crops decline in the fall. Pepper and cucurbit crops are not hosts of TMoV (McGovern et al., 1991).

The number of sweetpotato whitefly adults trapped in weeds bordering tomato fields generally paralleled the number trapped in tomato fields (Fig. 5). This suggests that the weeds were not serving as a potential reservoir for large numbers of the sweetpotato whitefly, particularly following the summer, since there was no time delay in peaks in tomato following peaks in weeds. On the contrary, densities in tomato fields appeared to influence densities in the neighboring weeds since an increase in trap captures in tomato fields was followed by a decline in percent natural mortality in the weeds (Fig. 6).

Natural mortality of the sweetpotato whitefly ranged from 40-90% in the fall of 1991 but ranged only from 10 to 70% in the fall of 1992. Therefore, even though weeds may serve as sources of sweetpotato whitefly adults for fall-planted tomatoes, they also may serve as reservoirs of natural enemies of the sweetpotato whitefly. Some weeds such as primrose willow, (Ludwigia octovalis (Jacq.) Raven, may be more important as reservoirs of natural enemies than other weeds such as hairy indigo (Indigofera sp.), spurge (Chamaesyce sp.) and sickle pod (Cassia obtusifolia L.) (Table 2). At least 12 species of hymenopterous parasites (Greg Evans, personal communication) and 11 species of predators (David Dean, personal communication) have been observed attacking the sweetpotato whitefly in Florida.

Table 2. Seasonal mortality of sweetpotato whitefly nymphs on weeds adjacent to commercial tomato crops in the fall in west-central Florida.

<table>
<thead>
<tr>
<th>Host plant</th>
<th>Nymphs (no.)</th>
<th>Parasitized (%)</th>
<th>Dead (%)</th>
<th>Total mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1991</td>
<td>1992</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primrose willow</td>
<td>2718</td>
<td>8841</td>
<td>16</td>
<td>68</td>
</tr>
<tr>
<td>Hairy indigo</td>
<td>380</td>
<td>408</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Spurge</td>
<td>197</td>
<td>255</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

*Mortality due to apparent predation and other unknown causes.*
Data from this study suggest that fall-planted tomatoes in west-central Florida should not be planted near or adjacent to cucurbit crops and that spring-planted tomatoes should not be planted near cabbage, potatoes, or cherry tomatoes. This is particularly true of cherry tomato since this crop may harbor TMoV. Since it is uncertain how far sweetpotato whitefly adults may migrate in search of alternative host plants, no specific recommendation on spatial separation can be made. However, it is likely that the greater the distance the less the interactions would be.

The data further suggest that weeds on field perimeters may be sources of low numbers of sweetpotato whitefly adults, especially for fall-planted tomatoes. However, in 1988-90, when sweetpotato whitefly populations were very high in tomatoes, large numbers of the sweetpotato whitefly also were observed on weeds on field perimeters, particularly after field destruction. In addition, in the present study more whitefly nymphs were observed on the foliage of weeds in the fall of 1992 compared to the fall of 1991. Therefore, growers should inspect the weeds on the perimeters of their fields to determine the extent of sweetpotato whitefly populations and natural mortality before making decisions regarding management of these weeds. Routine scouting within pest management programs should include periodic sampling of weeds, before, during, and after tomato production within specific fields.

Fig. 5. The number of sweetpotato whitefly adults captured on yellow sticky traps in fresh market tomato fields and in the weeds bordering the fields during 1991-92 in west-central Florida.

Fig. 6. The number of sweetpotato whitefly adults captured on yellow sticky traps in fresh market tomato fields and percent natural mortality of immature stages of the whitefly on foliage of weeds bordering the tomato fields during 1991-92 in west-central Florida. Trapping in 1992 was discontinued on 4 Sept.

Literature Cited


