

## Understanding a Major Pest Problem in the Mid-Atlantic - A Survey for Thrips

**Introduction:** Thrips are a major problem for vegetable and flower growers throughout the United States. In the past 10 years, some species (in particular, western flower thrips (WFT)) have caused increasing problems. Symptoms of thrips damage include scarring and/or deformation of the leaves and fruit (Figs. 1-3). Additionally, certain thrips species can damage vegetables by vectoring viruses such as Tomato Spotted Wilt Virus (Figs. 4-5). However, some symptoms that appear to be thrips-induced can be caused by environmental or varietal factors and this can lead to increased applications of pesticides when they were not necessary.

Little is known as to the behavior of thrips in Maryland, and such questions as: what crops they prefer, when and where in the state are they most abundant, what type of damage is associated with their presence in different vegetable crops and many others are still unanswered. One of the most elemental questions-what species do we have in the state-is still not known. It is very difficult to distinguish between thrips species. Color and size are not reliable indicators for identification. Information on thrips species in the state is key to understanding what potential problems these pests hold for the vegetable industry.

Figs. 1-3. Thrips ovipositioning damage on tomato caused by WFT and thrips feeding damage on cucumber and on pepper leaves.



Figs. 4-5. Tomato fruit infected by tomato spotted wilt virus vectored by several thrips species, most notably western flower thrips.



**Methods:** A survey of weeds and vegetable crops for thrips was undertaken in 2006 and more extensively in 2007 throughout Maryland and in the border areas of neighboring states of PA, DE and VA. Vegetable leaves, stems and flowers (when available) were sampled by placing plant parts in a one-gallon plastic Ziploc bag with 20 ml of 90% alcohol. Plant parts were shaken within the bag and then discarded. The washings from the bag were examined in the lab for numbers and species of thrips found. Grateful acknowledgement is made of financial support of the Northeast IPM Center towards the expenses incurred in this survey.

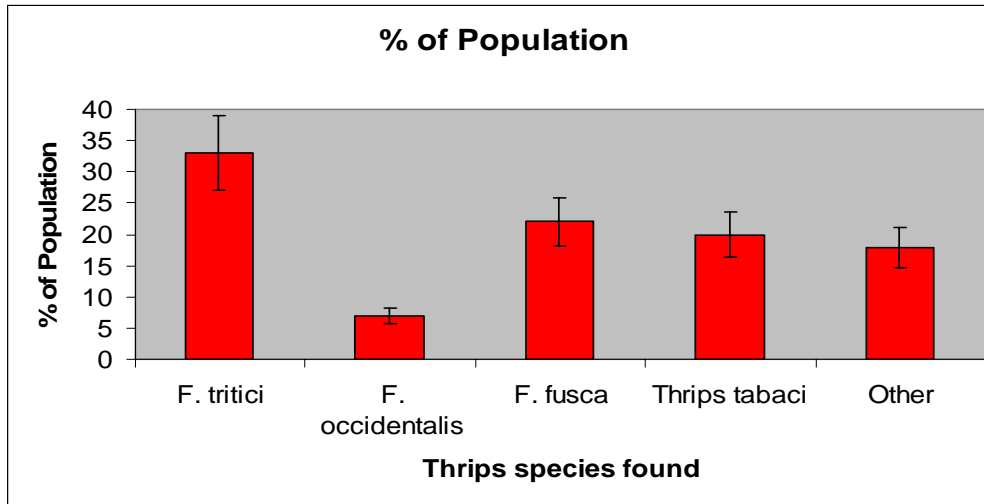
**Preseason survey:** Winter annuals and other weed species (i.e., henbit, chickweed, marestalk, wild mustards and radishes) located in and around vegetable fields were sampled in 12 locations in Maryland, Delaware, Virginia and Pennsylvania, in December through April (Figs 6-9).

Figs. 6-9. Winter annuals and other weeds sampled in Dec-April for thrips in growers' fields in 2006-2007.



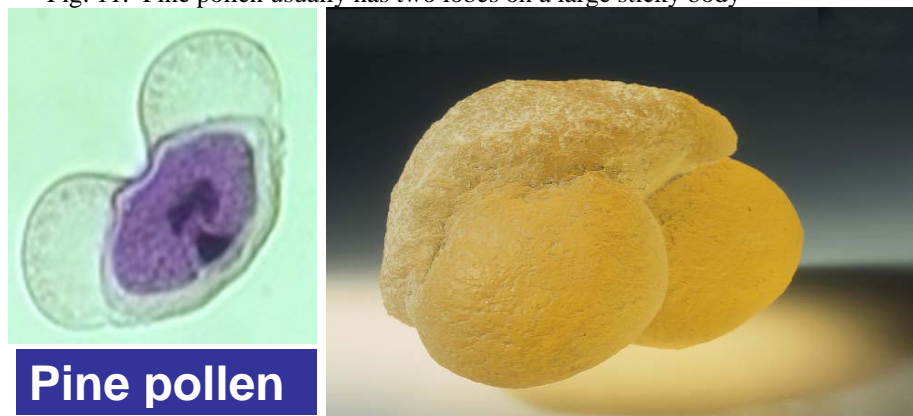
**Preseason Survey results:** No thrips were found at seven of the twelve sites. At five of the sites, thrips were found in December and January on winter annuals. At two sites thrips were found in March as well. The site with the highest populations had 15% of the winter annual weeds with at least one female thrips. Over 73% of the thrips found were female adults, 21% were males and 6% were immatures or pupae. Chickweed was found to harbor 70% of all thrips species that were detected. Sampling-sites near high tunnels or woods had a greater probability of containing thrips than sites in fields. *Frankliniella tritici* (Eastern flower thrips) made up almost 35% of the population of thrips found (Fig. 10). And while *Frankliniella occidentalis* (western flower thrips, WFT) made up only a little over 5% of the population, these results show that this species overwinters in MD, VA and DE., but WFT was not found in PA in two years of preseason sampling.

Fig.10 Percentage of thrips species found on weeds during a pre-season survey in 2006-2007



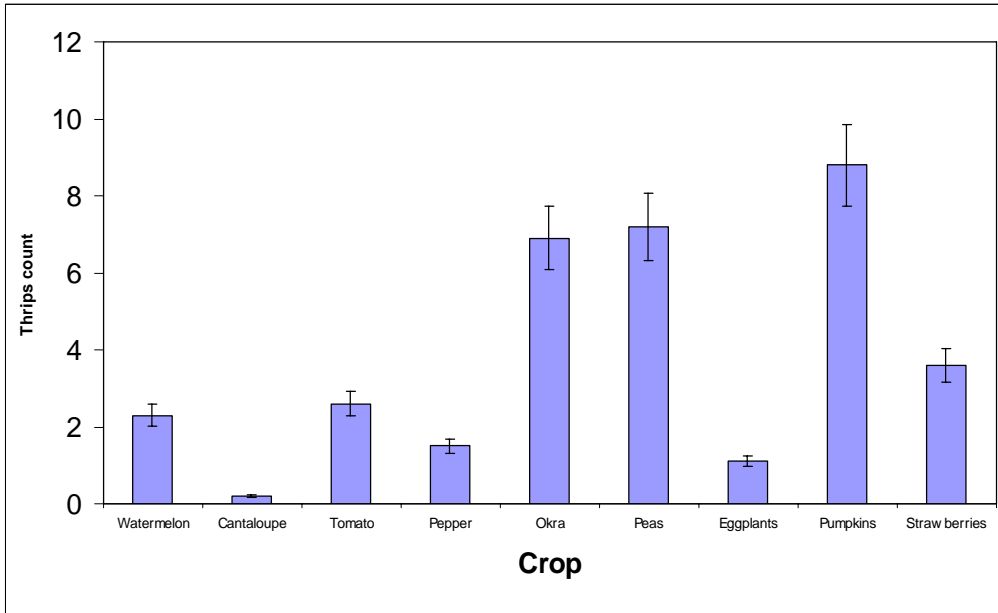
**Early season survey results:** Early season (pre-bloom) vegetable sampling showed that thrips were found not only on leaves that showed feeding damage, but also on leaves that showed no injury at all. At times, 8-15 thrips would be found on the underside of a tomato or cucurbit leaf with no feeding apparent on that leaf. The question arises as to what are the thrips doing there and what are they feeding on? They were found to be feeding on pollen, not vegetable pollen, but pine pollen (Fig. 10). Pine trees shed a lot of pollen during the early spring and when there is little rain the pollen, which is large and sticky, tends to stay on leaf surfaces and the thrips then follow the pollen. What this early season thrips presence means for later on in the season is not clear at this time. It is conceivable that a large build up of thrips on pine-pollen loaded vegetable leaves may facilitate outbreaks later in the season.

Fig. 11. Pine pollen usually has two lobes on a large sticky body



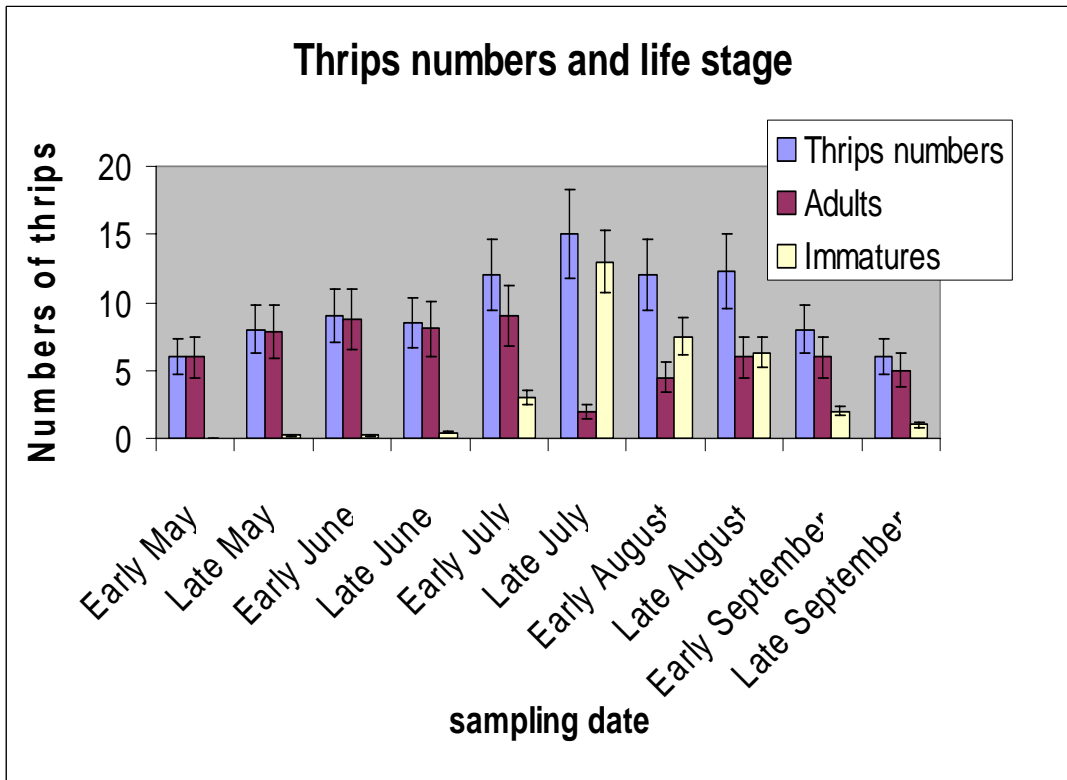
**Seasonal Survey results:** Thrips were found on every vegetable crop grown in Maryland throughout the summer. Some vegetable species had only a few thrips in flowers and others had many thrips (Fig 12). Okra, pumpkins and peppers were three of the most heavily infested vegetables followed by peas, tomatoes, cantaloupe and watermelon. High tunnels and greenhouses had greater thrips infestations on farms where thrips were found overwintering than where thrips were not found overwintering.

Fig. 12. Mean number of thrips/day found in various vegetable flowers throughout June-September



Thrips numbers were greatest in July and August throughout Maryland, with a slow decrease through September and October. Immature thrips were most abundant from late July through August with more than 80% of the population consisting of immatures in late July (Fig 13).

Fig. 13. Total thrips numbers (blue bar) and the number of adults and immatures that make up that total.



*F. tritici* (Eastern flower thrips, EFT) was the most common species in Maryland for most of the sampling dates and locations. *F. fusca* (tobacco thrips) and *Thrips tabaci* (onion thrips) were commonly found on farms throughout the state, and not just on farms growing tobacco or onions. In some areas of MD, PA, DE and especially VA there was a “switching” in thrips species (from *F. tritici* to *F. occidentalis*) starting in late July (Fig. 14). There may have been an influx of western flower thrips (WFT) from the south that added to the eastern flower thrips, but if this was the case one would have expected just a large increase in total thrips numbers and not a replacement of EFT with WFT in such a short time, i.e., 2 weeks. In addition, the switch did not occur only in the southern most part of the state, but all over the state in selected fields or, in some cases, entire farms (Fig. 15). What triggers this species switch and what it means is still not clear. It is possible that this phenomenon may have been an unusual event, and surveys in additional years are needed to determine how often this occurs. However, in southern Maryland in August over the last 5-7 years there has been a large increase in the number of reports of TSWV infections in tomatoes and WFT is a good vector of this virus.

Fig. 14. Total numbers of thrips (red bar) and the numbers of western (FO) and eastern (FT) and other flower thrips that made up the total population.

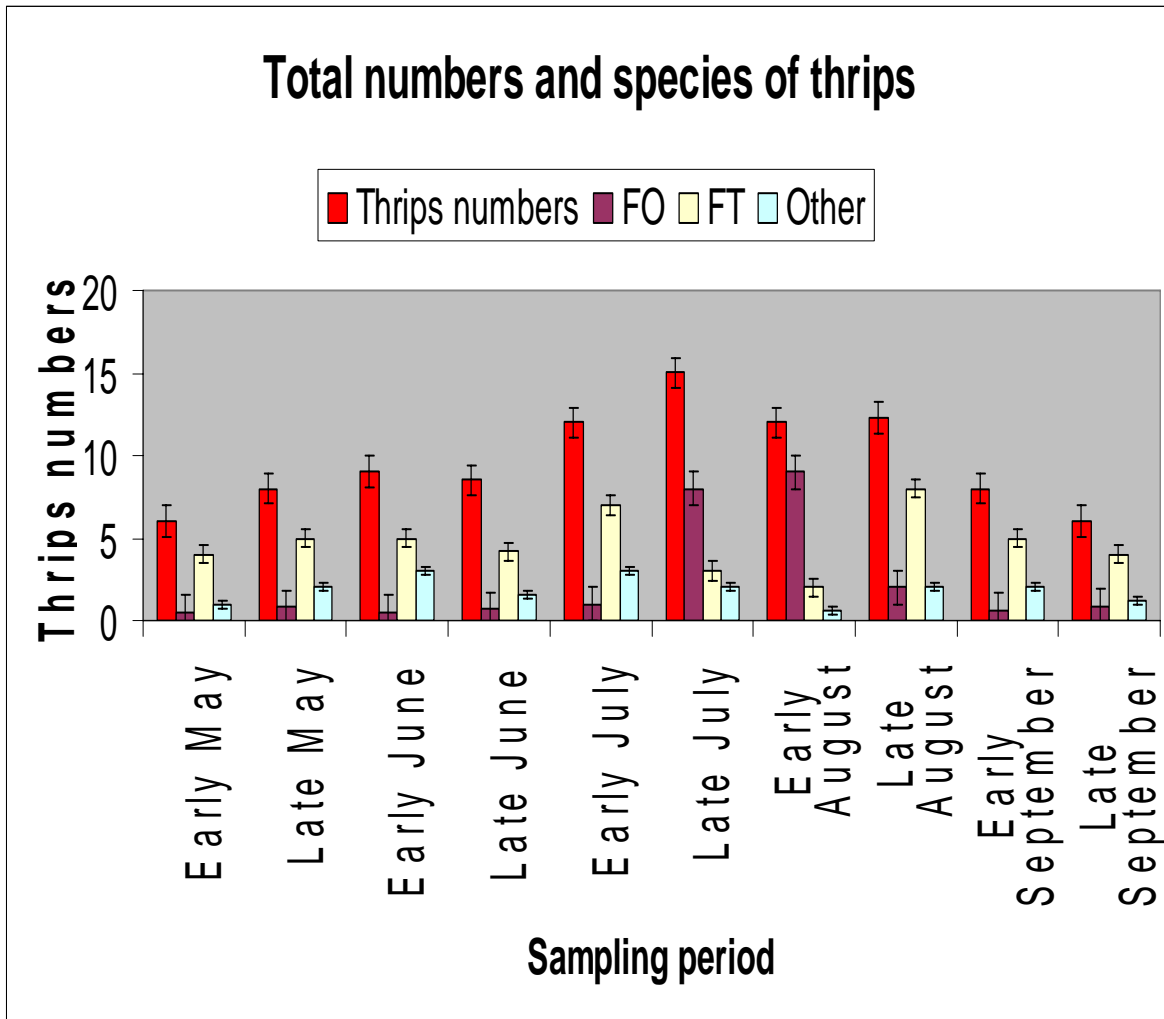
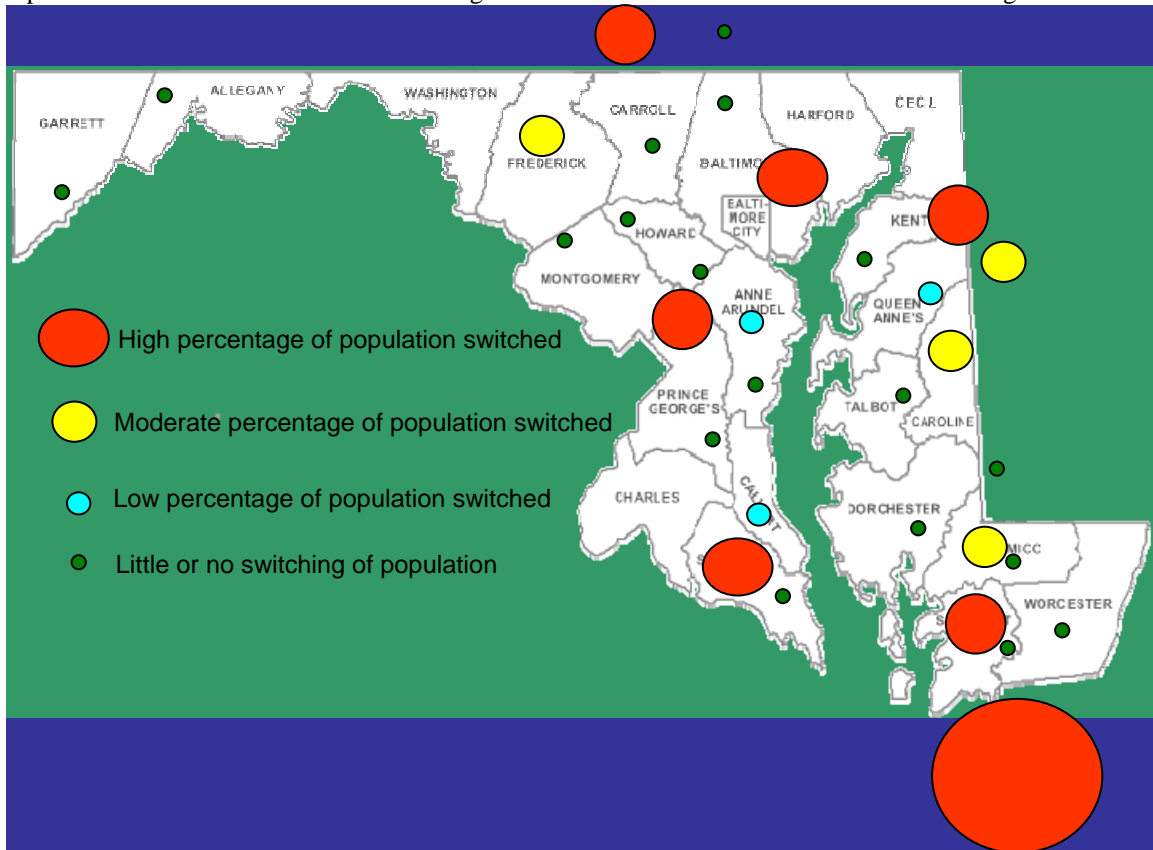


Fig. 15. Circles represent the sampling site(s) where thrips switching from EFT to WFT was found to occur by a large amount (red circles) or a very small amount (green circles). Large red circle south of MD map represents fields on the eastern shore of Virginia where all fields were found to have switching.



**Survey Summary:** A great deal of information was found in this survey that will help manage thrips pests over the next few years. Western flower thrips do overwinter in Maryland, Delaware and Virginia; with PA still not clear yet. Many other thrips species besides WFT are active throughout the winter on weeds present in and around growers' fields. This "starter" population may serve as a reservoir for mid-summer infestations. Numbers of immature thrips greatly increase in late July through August and are difficult to see on leaves, flowers or fruit of vegetables because of their small size and often translucent bodies. Therefore growers may be missing this potential build-up of pests. This may be where the surge and switching of the population of thrips in late July and August originates. It could be possible that more WFT eggs are oviposited at this time of the season compared with EFT, or that WFT are better able to compete with EFT and other species for the flower niche and so they dominate the population for several weeks. To know for sure further study is needed, but this survey gives vegetable workers and growers a good start.