

THRIPS ON STONE FRUITS: FORMATIVE STAGE OF PEST MANAGEMENT

Jerry A. Payne, Carroll E. Yonce, Ramona J. Beshear¹,
and Dan L. Horton²

U.S. Department of Agriculture, Agricultural Research Service
Southeastern Fruit and Tree Nut Research Laboratory
Byron, Georgia USA

Abstract

Thrips populations and injury attributed to their feeding on nectarine and peach fruit surfaces were monitored in sprayed and unsprayed orchards in central Georgia from 1983-1988. *Frankliniella tritici* (Fitch), the eastern flower thrips; *F. occidentalis* (Pergande), the western flower thrips; and *Neohydatothrips* (= *Sericothrips*) *variabilis* (Beach), the soybean thrips; were the most abundant of the 31 thrips species recovered from the orchards. Their relative abundance changed each year. The western flower thrips appears to be most damaging in causing russetting on nectarine surfaces. Silvering injury to peaches and nectarines was caused by either or both of the flower thrips and coincided with peak populations of adults at or near final fruit swell on early ripening cultivars. Soybean thrips caused little or no injury to fruit. None of the above mentioned flower thrips species were recovered from various weed and grass species in and near the nectarine orchard during two years of overwintering studies. Control strategies are based on sampling for thrips adults and larvae.

¹ Project Coordinator, Department of Entomology, Univ. of Georgia, College of Agriculture, Georgia Station, Griffin, Ga. 30223-1797.

² Associate Professor and Extension Entomologist, Extension Entomology Dept., Univ. of Georgia, Athens, Ga. 30602.

Introduction

Peaches are a valued fresh fruit crop in the southeastern United States. Georgia and South Carolina produced and shipped 217.4 million kg (480 million pounds) with a gross value in excess of \$80.1 million in 1988 (Ga. Agric. State Service 1989).

Although peaches are by far the major stone fruit in the Southeast, nectarines appear to have potential for future markets in this area. Recently there has been new interest in developing nectarine cultivars adapted to the Southeast (Okie et al. 1985). Insect control strategies for peaches have been relatively static for several years with no major emphasis on thrips control, simply because thrips injury has been a minor problem. However, this strategy may change due to the recent introduction of the western flower thrips, *Frankliniella occidentalis* (Pergande). At present, we have no spray guide specifically for nectarines. Comments are made in the peach spray guide advising those growers (limited number) who produce nectarines as to modifications in the peach pest practices which are necessary or appropriate for nectarines (Bertrand et al. 1988). Reports from California have noted that thrips injury due to *F. occidentalis* is a problem in certain California nectarine producing areas (LaRue et al. 1972) and to a lesser degree on peaches (Weldon 1921). Indications are that southeastern nectarine producers will face similar problems.

Thrips Threat to Nectarines and Peaches

In 1980, the western flower thrips was first reported to be damaging cotton in the Southeast and in 1981 it was reported as a new pest on peanuts in Georgia (Beshear 1983). Also, the species has been shown to be a vector of tomato spotted wilt virus on tomatoes and peanuts (McRitchie 1986, Hagan et al. 1987). Until 1983, very little information was available on thrips and their association with peaches and nectarines in the Southeast. During 1983 and 1984, we regularly surveyed for thrips in non-sprayed peaches and sporadically sampled in sprayed peach orchards in 1984 and 1986. In 1986-88 we concentrated on non-sprayed nectarines in order to gather basic life

history data on damaging thrips species (Yonce et al. 1988). In 1988 we further expanded our studies to sprayed peaches (Horton et al. 1988). We needed to determine which thrips species were important, their seasonal distribution patterns, and if the western flower thrips was becoming established on nectarines and peaches in the Southeast.

Thrips Sampling Procedure

Sampling was done with a modification of a unique sampling device designed and originally built for sampling pecan arthropods (Teddars 1983). Two aluminum trays (117 x 76 cm) were placed under the canopy of a tree designated for sampling, and the limbs above were then sprayed with a short residue, knockdown insecticide (6% pyrethrin plus 60% piperonyl butoxide). Application was made with a small battery powered Porta-Jet[®] sprayer (Fig. 1). After 30 min. trays were picked up and placed on a supporting framework, and arthropods were washed with water into a trough through a funnel into sheer cloth bags after which they were removed and placed in 70% ethanol. Thrips were later separated and identified by methods described by Allen & Broadbent (1986), Sakimura (1986), Stannard (1968) and Moulton (1948). Voucher specimens were sent to S. Nakahara (USDA-Insect Identification Lab., Beltsville, Md. 20705) for verification. Sampling was begun at bud swell and continued at weekly intervals until harvest, then every two weeks until 1 September.

Fruit Injury Damage Types

There are two types of injury to fruit. Russetting is a rough textured, tan-colored blemish that may result in cullage (Fig. 2). At bloom time, adult flower thrips enter the flower and lay eggs in tender flower parts near the ovary. Subsequently, eggs hatch and the young larvae remain inside the flower. Oviposition wounds and feeding by small larvae on the young embryonic fruit produce injury that is greatly magnified on the mature fruit at harvest time. The appearance is often referred to as "buckskin." Silvering, the other type of injury, is less severe and results in a benign, light-colored blemish (Fig. 3). It seldom produces cullage of fruit in the commercial market. It is caused by adult

and immature thrips feeding on outer layers of pigment-containing cells and results in bleaching and speckling of the red blush when fruit begins final swell. Silvering seems to be more common on cultivars that ripen when adult flower thrips populations are peaking.



Figure 1. Handgun application of pyrethrin-piperonyl butoxide insecticide mix to sample thrips populations in peaches. Thrips are collected in white trays placed on the ground.

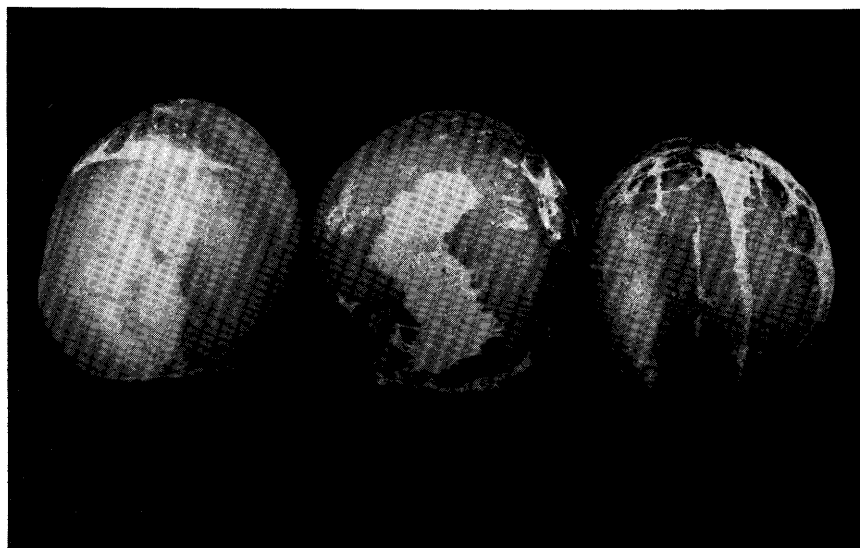


Figure 2. Nectarines with moderate and severe russeting from thrips feeding.

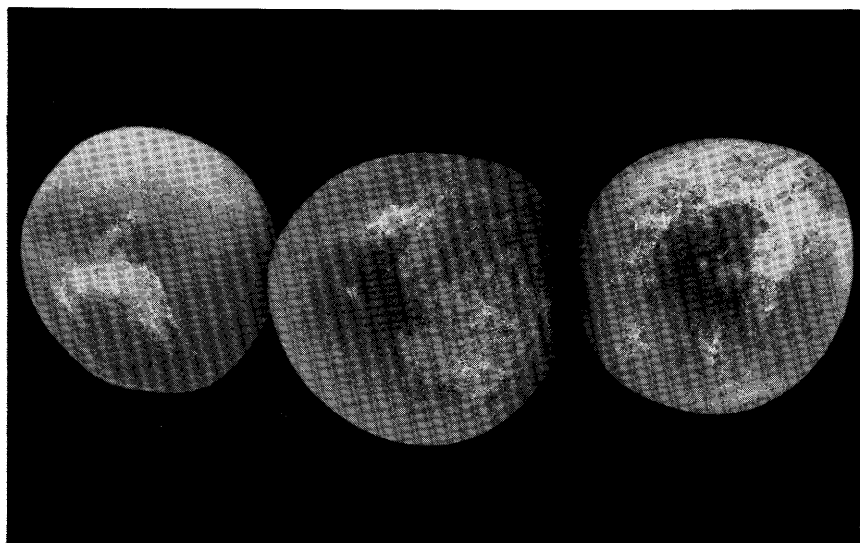


Figure 3. Peaches with light and moderate silvering injury from thrips feeding.

Results and Discussion

Orchard Experiments

In 1983 and 1984, our sampling in non-sprayed peach orchards at Byron, Ga. revealed the presence of 31 species of thrips (Table 1). The majority of captures were the eastern flower thrips, *Frankliniella tritici* and the soybean thrips, *Neohydatothrips* (= *Sericothrips*) *variabilis*. Captures of other species were much less common; half of the species were incidentals and a few were captured only once or twice during the entire two-year period.

Limited sampling was done concurrently in commercial sprayed peach orchards in 1984. Thrips captures in these orchards were not different from captures in non-sprayed orchards. This was the first circumstantial evidence that thrips populations were virtually unaffected by standard insecticidal control strategies that rely almost exclusively on ethyl parathion. During a three-year study (1986-88) of intense sampling for thrips in non-sprayed nectarine plantings, the western flower thrips, *F. occidentalis*, became noticeably more abundant. In 1986 western flower thrips were considerably more common than they had been in the two previous years' sampling in peaches. In 1987 this trend reversed; western flower thrips was almost nonexistent, the eastern flower thrips, *F. tritici*, captures were very few, while the soybean thrips were quite prevalent. Conversely, in 1988 the western flower thrips were more abundant than all the other species.

Sampling in commercial peach orchards during 1988 revealed a high incidence of silvering on some peach cultivars that ripened during the time when western flower thrips populations were peaking. However, the soybean thrips appeared to contribute very little to russetting or silvering injury. Damage to fruit was low during 1987 when the soybean thrips population was dominant over flower thrips. In one experiment, the number of soybean thrips recovered from nectarine trees without fruit was equal to the number of soybean thrips recovered from trees with fruit. This was further evidence confirming that soybean thrips are unimportant in causing fruit injury to nectarines.

Table 1. Thrips species captured in unsprayed "Redskin" and "Redglobe" peach orchards in 1983 and 1984. USDA Fruit and Tree Nut Research Laboratory, Byron, Ga.

SUBORDER TEREBRANTIA

Aeolothripidae Uzel (1895)

Aeolthrips bicolor Hinds

Aeolothrips melaleucus Haliday

Heterothripidae Bagnall (1912)

Heterothrips quercicola Crawford, J.C.

Thripidae Stephens (1829)

Bregmatothrips gracilis Hood & Williams

Bregmatothrips venustus Hood

Caliothrips nr. phaseoli (Hood)

Chirothrips mexicanus Crawford, D. L.

Frankliniella bispinosa (Morgan)

Frankliniella fusca (Hinds)

Frankliniella occidentalis (Pergande)

Frankliniella tritici (Fitch)

Limothrips cerealium (Haliday)

Microcephalothrips abdominalis (Crawford, D. L.)

Neohydatothrips variabilis (Beach)

Plesiothrips perplexus (Beach)

Pseudothrips inequalis (Beach)

Salpingothrips aimotofus Kudo

Scolothrips pallidus (Beach)

Sericothrips cinqualatus Hinds

Thrips hawaiiensis (Morgan)

Thrips trehernei Priesner

SUBORDER TUBULIFERA

Phaeothripidae Uzel (1895)

Elaphrothrips armatus (Hood)

Elaphrothrips coniferarum (Pergande)

Haplothrips (K.) *graminis* Hood

Haplothrips (K.) *harti* (Hood)

Hoplandrothrips microps Hood

Hoplandrothrips japonicus Karny

Leptothrips mali (Fitch)

Megalothrips spinosus Hood

Neurothrips magnafemoralis (Hinds)

Plectothrips antennatus Hood

Control Status

At present, our efforts to control thrips injury on nectarines and peaches in the Southeast are less than satisfactory, particularly with respect to russetting injury on nectarines. Although we have managed to suppress russetting in some of our control experiments, it appears that timing of insecticide applications is most important. There is also a need to screen chemicals to find something better than those presently recommended. Early season migration of flower thrips into the orchards needs to be studied more thoroughly. Possibly, pre-bloom spraying or some type of orchard management to destroy overwintering hosts might intercept or disrupt thrips movement into the flowers before they oviposit. Silvering, on the other hand, can be controlled more easily with chemicals since we now have predictable seasonal distribution patterns that allow us to look for thrips and injury on cultivars that ripen when our flower thrips populations peak (15 May-1 June).

Pest Management

Thrips pest management in southeastern stone fruits is, as our title implies, in infancy. The recently established presence of western flower thrips seems to have heightened the pest potential of this group. Nectarines and probably plums are more at risk for thrips injury than peaches.

We lack adequate early season sampling techniques that might help in timing insecticide applications. Berlese funnels are currently in use to refine our knowledge of when flower thrips move to stone fruit to lay eggs and feed. Detailed chemical exclusion studies aimed at refining our excessively broad early-season control windows are to be conducted this season. White sticky traps may be used after more detailed information on thrips movement into orchards is obtained. Preliminary trials with white traps were discouraging, as heavy early-season orchard traffic tends to litter the traps with debris and limit their usefulness. Current recommendations for nectarines suggest preventive application of formetanate hydrochloride (Carzol) at pink bud and petal

fall. This is a provisional recommendation based on materials and timing recommended in California, France, Italy, and Greece (Rice, personal communication, University of California; Bournier 1973; Cravedi et al. 1983; Kourmadas et al. 1982; Cravedi & Molinari 1984). Further refinements are obviously needed in these russet prevention sprays. Silvering as previously noted is much less damaging. Current recommendations simply require careful observation. Spraying may be necessary if abundant thrips and/or injury are detected during final fruit swell. Correlation of thrips numbers to injury in susceptible cultivars is a future research goal.

Summary

After 5 years of seasonal thrips sampling in both peach and nectarine orchards, the following points are noteworthy:

1. The western flower thrips is well established in central Georgia and appears to be more damaging to fruit than the eastern flower thrips.
2. Russetting injury occurs very early in fruit development and could require an insecticide as early as pink bud. Lack of sampling techniques prevents spraying as needed. We hope to narrow the treatment window as our knowledge of thrips biology on southeastern stone fruit improves.
3. Silvering occurs near final swell of fruit when peaches and nectarines begin to show a substantial amount of red blush before ripening. Silvering is more prominent on peach cultivars such as "Sunbrite" and "Empress" and nectarine cultivars such as "Sunfre" and "Armking" that ripen when adult populations of flower thrips are peaking. In central Georgia, this occurrence is obvious from 15 May to 1 June. Cultivars ripening mid- and late season are unlikely to have silvering problems. Thresholds are desired that would allow spraying of nectarines as needed to prevent excessive silvering injury.
4. Soybean thrips, *N. variabilis*, contribute very little, if any, feeding injury to peach and nectarine fruit.

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