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Results of Field Surveys for *Neohydatothrips burungae* in California

New Project: Year 1 of 2

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Benefit to the Industry

To manage foliage and fruit damaging thrips it is imperative to determine how widespread and abundant *N. burungae* is in comparison to *S. perseae*. Field surveys undertaken to delineate the range inhabited by *N. burungae*, its abundance in comparison to *S. perseae*, and its seasonal phenology will greatly aid understanding when assessing the potential pestiferousness of this new invader.

Objectives

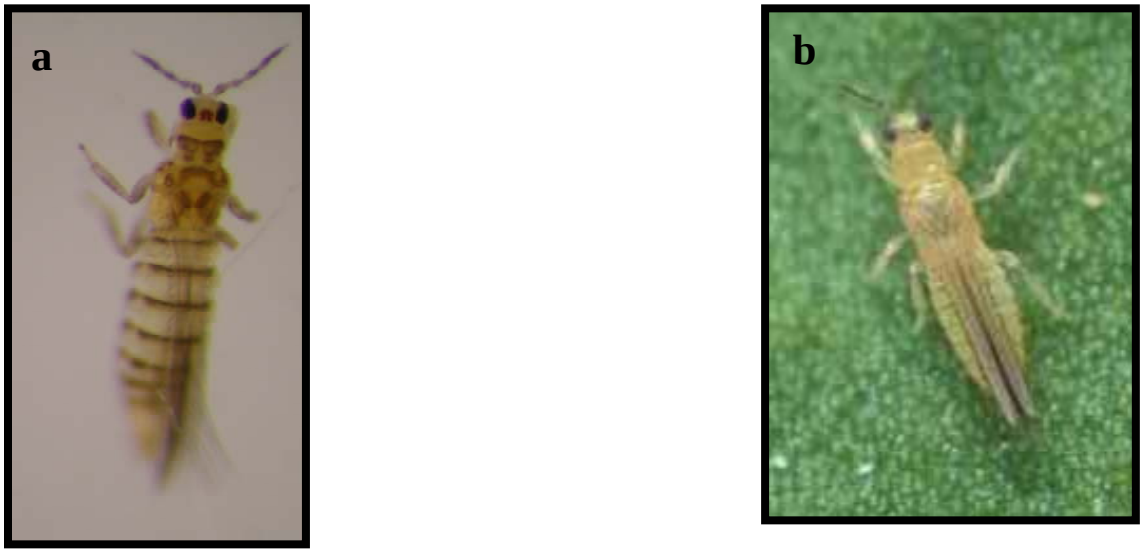
1) Collect specimens for potential future DNA analysis (similar to the completed DNA fingerprinting project for *S. perseae*).
2) Field surveys to delineate *N. burungae* range in California.
3) Determine how common *N. burungae* is in infested areas in comparison to *S. perseae*.
4) Photograph thrips for educational and outreach purposes.

Introduction

In November 2004, a new thrips species was found on avocados in Chula Vista, San Diego County, U.S.A. One female and three male *Neohydatothrips burungae* (Fig. 1a) (Thysanoptera: Thripidae) were collected from a backyard avocado during surveys for avocado lace bug. Follow up surveys by the CDFA indicated that *N. burungae* was present in 9 of 11 sites surveyed and concluded that *N. burungae* was widespread in San Diego County. *Neohydatothrips burungae* can be distinguished from *S. perseae* (Fig. 1b) in several ways: (1) Pronotum is heavily maculated (brown colored) in comparison to *S. perseae* which is lightly mottled. (2) The dorsal abdominal "tiger stripes" on *N. burungae* are very prominent in comparison to *S. perseae*. (3) *Neohydatohrips burungae* lacks "tiger strips" on the ventral side of the abdomen; these stripes are present in *S. perseae*. (4) S4 setae on the corner of the prothorax are very long in *N. burungae* and can not be easily seen in *S. perseae*. (5) The forewing of *N. burungae* has continuous line of stout setae near the middle of the forewing. In *S. perseae* this line of setae is discontinuous with obvious gaps in the line. There is a lot of variation in maculation and body size in *S. perseae*. Darker "than normal" maculation can be confusing when sight identifying *N.*

burungae, but the stripes on the underside of the abdomen, verified by the long S4 setae on the pronotum and the continuous line of setae in the middle of the forewing can quickly confirm the species be examined. Accurate identifications will be very hard to make confidently when examining live adults on leaves with a hand lens. A dissecting microscope may be needed to examine dead thrips collected from avocado orchards to determine the thrips species composition.

Fig. 1. a) *Neohydatothrips burungae* and b) *Scirtothrips perseae*.



Neohydatothrips burungae is known from avocados in Mexico and Guatemala having been detected during surveys for avocado thrips, *Scirtothrips perseae*. There is some taxonomic uncertainty about the "true" identity of *N. burungae* which was originally described from a series of specimens collected from an unidentified host plant in Panama (Mound and Marullo 1996). Some taxonomists (e.g., S. Nakahara, USDA) consider *N. burungae* a valid species being discernible from a closely related species, *N. signifer* by stable leg coloration. Conversely, variation in leg coloration may not be stable and strongly influenced by host plant and temperature and given the overwhelming morphological similarity between *N. burungae* and *N. signifer*, *N. burungae* should be synonomized with *N. signifer* (Mound and Marrullo 1996). Given earlier work by Hoddle et al., 2003 where *N. burungae* was identified from avocados in Mexico by S. Nakahara, *N. burungae* is being used for consistency with earlier published work on this thrips collected from avocados. Molecular analyses may be needed to resolve the issue of synonomy between *N. burungae* and *N. signifier*.

The association of *N. burungae* and *S. perseae* with avocados appears to be strongly influenced by altitude and corresponding temperature regimens. For example, at high altitudes (presumably areas with lower average temperatures and humidities) 1,500-2,000m, *S. perseae* co-exists with *N. burungae* on avocados (e.g., Coatepec-Harinas, Mexico). In these areas where both thrips co-exist *N. burungae* (35% of collected thrips) is almost as common as *S. perseae* (42% of collected thrips) on avocados. While at low

altitudes ~500m with hot humid conditions *N. burungae* is the dominant thrips with no *S. perseae* being present (e.g., Tepic, Nayarit, Mexico). In Tepic, *N. burungae* was collected from young flush growth on mangoes. Mangoes (native to the Indian sub-continent) and avocados (native to Central America) are not closely related suggesting that *N. burungae* may be polyphagous, being able to feed and reproduce on a variety of different host plants. *Scirtothrips perseae* on the other hand appears to be restricted to avocados. A broad host plant range may have very important implications for managing this thrips should it become a major avocado pest in California.

To better understand the distribution of *N. burungae* in California a survey was undertaken to determine how far north of San Diego County this thrips has spread and whether it is more prevalent in avocados in either coastal orchards experiencing cool to moderate temperatures or in orchards in more interior regions where conditions are hotter and more arid. Additionally, surveys would reveal how common *N. burungae* is in comparison to *S. perseae*. To address these three issues: (1) determination of the extent of the northward invasion, (2) coastal vs. inland distribution, and (3) abundance relative to *S. perseae*, surveys for *N. burungae* in San Diego, Riverside, Ventura, Carpinteria, Santa Barbara, and San Luis Obispo Counties were undertaken in August 2005.

Materials and Methods

Thrips were surveyed in avocado orchards were sampled by randomly selecting trees with flush foliage by beating branches onto a white plastic tray. Thrips were collected from trays with a fine paintbrush moistened with ethanol and placed in labeled 5 ml centrifuge vials containing 95% ethanol. Two-four sites were sampled within surveyed orchards. Coastal and interior orchards were surveyed. Data on location, GPS coordinates, altitude, avocado cultivar, collector, and date were recorded for each labeled vial. Orchards for surveys were selected via consultation with PCA's and grove managers. Dave Machlitt and Tom Roberts assisted with access to orchards in Ventura County. Rick Shade and Frank Alegria provided assistance with collections from orchards in Carpinteria and San Luis Obispo Counties. Len Francis assisted with access to orchards in Riverside County. Scott Scarbrough, Nile Peterson, Gary Bender, and Wayne Brydon assisted with access to orchards in San Diego County. All collected material was examined under a dissecting microscope at UC Riverside for *S. perseae* and *N. burungae* and numbers of each species for each location and sample number were recorded. Ambiguous specimens were either mounted into Hoyers for rapid identification under high magnification, or mounted permanently in balsam after clearing and dehydrating.

Results

A total of 3979 "suspect" thrips were collected in Ventura County northwards. Numerous *Franklinothrips orizabensis Aeolothrips* spp. and *Frankliniella* spp. were collected, from 26 orchards (9 in Ventura; 4 in Carpinteria; 6 in Santa Barbara; 6 in San Luis Obispo Counties). No *N. burungae* were collected in Ventura northwards.

In San Diego county 30 sites were surveyed and 406 *S. perseae* (29/30 sites infested) and 46 *N. burungae* were collected (15/30 sites infested). *N. burungae* numbers were typically lower than *S. perseae* when these two thrips were found together.

In Riverside County, 10 sites were surveyed and 1 had *N. burungae*.

A grand total of 4,932 *S. perseae* and 58 *N. burungae* (1% of total thrips) were collected.

Discussion

Survey results indicate that *N. burungae* is most probably not present in Ventura, Carpinteria, Santa Barbara, or San Luis Obispo Counties at time of this survey. If *N. burungae* is present in these surveyed counties it is either at very low densities which fall below the detection threshold employed with the current survey technique, present in orchards that were not surveyed, or were mis-identified by the author (this is unlikely using a dissecting microscope).

Given the ease of collection of *N. burungae* in San Diego County, rarity in Riverside Country and the lack of detection in Ventura and counties north of Ventura strongly suggests that *N. burungae* is still mainly confined to San Diego County. The next step is to survey additional host plants adjacent to infested avocados for *N. burungae* in an attempt to develop a host plant list for this thrips in California.

The results of these surveys are difficult to interpret. It may be that the invasion of California by *N. burungae* has just begun and its range and population density are still increasing. Alternatively, if *N. burungae* has been present in California for several years the survey results may be indicative of its final range and abundance. Either of these two scenarios can only be verified by long-term monitoring of infested and uninfested areas.

One issue of potential concern; *N. burungae's* mouth cone on the females is about 15% bigger than *S. perseae*. This may indicate that if *N. burungae* does become a pest it may be able to feed and damage avocados of an older age than *S. perseae* because of its bigger/stronger mouth parts. The effect of this potential difference in feeding, if it does happen, may mean more fruit damage and possibly a longer window of vulnerability for fruit over which pesticidal control will be needed to reduce damage. At this stage, the importance of a larger mouth cone and potential fruit damage is speculative.

Thrips collection packages (20 vials with 95% ethanol, data sheet, paintbrush, beating tray, and self-addressed FedEx envelope for mailing to UCR) were left with some cooperators for collecting thrips from orchards not covered in this survey.