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In this June issue of the Postings from the Palo Verde I cover several topics and have included some guest writers as well.

- ***Verticillium* Wilt of Alfalfa -** Vonny Barlow, Entomology Advisor, UCCE Riverside County
- **Herbicide Spray Drift and Management Considerations -** Kurt Hembree, Farm Advisor, UCCE, Fresno County
- **Wild Bee Pollinators in Seedless Watermelon –** D. Michael Ramos & Jacob M Cecala, Cal Poly at Pomona, Edits by Vonny Barlow, Entomology Advisor, UCCE Riverside County
- **Invasive Insects That Threaten California -** Vonny Barlow, Entomology Advisor, UCCE Riverside County
- **$1+ Cotton? New Thresholds? -** Peter C. Ellsworth, Lydia Brown, Al Fournier (University of Arizona) & Steven Naranjo (USDA-ARS, ALARC)

Regards:

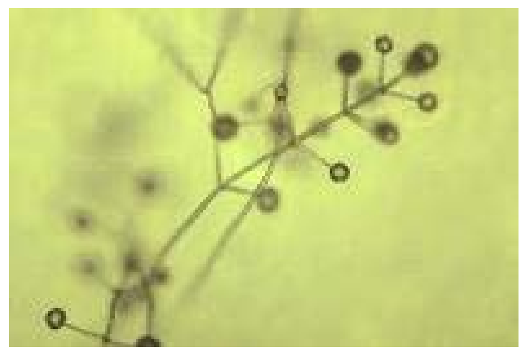
Vonny M. Barlow

Vonny M. Barlow, Ph.D.

Verticillium Wilt of Alfalfa

Vonny Barlow, Entomology Advisor, UCCE Riverside County

Verticillium wilt disease of alfalfa is relatively new to California, having first been found in isolated fields in Humboldt and Monterey counties in 1985. *Virticilium* wilt is a disease caused by *Verticillium albo-atrum* alfalfa strain. This *Verticillium* strain is different than the *V. albo-atrum* strain that infects potatoes and will not infect alfalfa. (alfalfa and potato isolates are genetically distinct). *Verticillium* wilt is the most serious disease problem of alfalfa in the north-temperate areas of the United States, Canada, and Europe. *Verticillium* wilt of alfalfa was discovered in the Pacific Northwest in 1967 and first reported in the United States in 1977. *Verticillium albo-atrum* has become prevalent in all alfalfa-growing areas of Washington state, Oregon, Idaho, and northern Utah where it was first found in 1985. In southern California the *V. albo-atrum* alfalfa strain was found in 28 of 52 fields sampled in Riverside and San Bernardino counties.



Verticillium albo-atrum has a limited host range. The most important hosts of this pathogen include hops, alfalfa and cotton. The pathogen infects the host and causes yellowing and wilting adversely affecting the host plants fitness and yield and ultimately reducing the economic value of the crop. Verticilliurn albo-atrum is systemic in alfalfa, colonizing the water-conducting tissue (xylem) and producing a toxin that causes yellowing of leaves and death of stems. Since the fungus colonizes the xylem tissue, it continues to live in a dormant state in dry hay. In Canada, it has been shown to live for 3 years in dry stems. It does not survive in the soil for more than a year in the absence of a suitable host.

Symptoms of Verticillium wilt of alfalfa include bunchy top, short internodes, and upward curling of leaves on stem compared with healthy stem. Leaves may be wilted and pinkish to yellow on one side of stem. Compared with healthy leaf, diseased leaves show marginal and veinal yellowing. *Verticillium* wilt kills plants and severely reduces expected stand life. The disease is usually not detected until after the third year. The Disease can spread rapidly and yields can be reduced as much as 50% by the third or fourth year. The life of the stand can be reduced from the normal 6 or 7 years to 3 or 4 years. Other cultural or disease problems can be confused with *Verticillium* wilt. At this time there is no evidence of Verticillium wilt in California's major seed producing areas (west side of the San Joaquin Valley, Palo Verde Valley or Imperial Valley).

CONTROL

1. Prevent introduction into areas free of the disease.

- Seed should be of high quality and preferably certified. There is currently no certification for freedom from *Verticillium*.
- Do not feed hay from affected areas on alfalfa fields because the fungus survives for at least one year in dry hay.
- Cut young fields first to prevent spreading the disease on equipment from old established fields to new fields. Clean equipment thoroughly after cutting an infested field.

2. Plant varieties that are resistant to *Verticillium* as well as other diseases present in your area.

- Resistance to *Verticillium* has been incorporated into many new varieties. This is the most effective way to control the disease.

3. A rotation out of alfalfa for at least one year with a non-host crop such as wheat, barley, corn, or grass pasture will reduce the soil inoculum. The pathogen survives in the soil for less than one year but will survive longer on some weeds or volunteer alfalfa plants.

4. Eradicate infected plants if present in small numbers or limited areas.

The disease spreads from localized spots and can be kept in check by thoroughly inspecting fields. Most infections show up first near entry points. Destroy infected plants and any adjacent plants. The affected areas should be clearly marked and inspected periodically to insure eradication.

5. Testing for V. albo-atrum.

Verticillium albo-atrum is a poor competitor with other saprophytic bacteria (agonists) in the soil. As a result no effective soil test is available for *V. albo-atrum*. PCR-based tests are being developed, but these are not yet validated for practical use. Reviewing the literature on *Verticillium albo-atrum indicates that the best way to detect for this pathogen* is to take stem samples and not soil samples.

Hay field sampling:

- Out of every 5 acres take 10 random 1" stem cuttings from low on the alfalfa crown (as close to the soil surface as possible).
- Clean cutting device between each cutting.
- For each 5 acre sample compile all of the 10 1" stem pieces into a labeled zip-lock bag.

  I have spoken with the people at Western Laboratories and they confirm that they can test for *Verticillium albo-atrum*.

Send samples to:
Western Laboratories, Inc.
PO Box 1020
211 HWY 95
Parma, ID 83660
http://www.westernlaboratories.com/

Herbicide Spray Drift and Management Considerations

Kurt Hembree, Farm Advisor, UCCE, Fresno County

Herbicides play a vital role in weed control efforts in California. When herbicides are used according to label directions, they give us the weed control we expect without damaging desired vegetation and with minimal impact on the environment. When spraying herbicides or other pesticides, it's important to understand that the primary goal is to deliver the correct dose of carrier (water), herbicide(s), and spray additive(s) to the target area accurately, uniformly, and efficiently. When this goal is achieved *and* the correct herbicides are selected for the weeds targeted *and* other conditions are met to promote herbicide activity, cost-effective weed control will likely be reached. Hence, a lot of factors must be considered *before* spraying for weeds. Off-site herbicide movement (or spray drift) is an important factor that needs to be considered. Spray drift not only influences the health of people, surrounding vegetation, and the environment, but also affects spray coverage and weed efficacy.

Spray drift is defined as "the physical movement of a pesticide from an intended target area of application to an area where the pesticide is not intended". Most drift is from droplet drift, where spray droplets are carried from the application site downwind and deposited onto an area not intended to be treated. This may be several feet to a mile or more away. Vapor drift and particle drift can also occur, but are much less common, so are not discussed. Keep in mind, as spray drift is reduced, more of the spray solution is likely to reach the target weeds, increasing spray coverage and weed control.
Spray droplet size directly affects spray drift potential. Spray droplets <200 microns in diameter are light, remain airborne a long time, and are the most susceptible to drift. Droplets <200 microns in size are referred to as "fine" or "very fine" (table 1). While droplets of this size aid spray coverage, they are readily affected by wind speed, travel speed, and sprayer pressure, and are discouraged for weed sprays. "Medium" and larger-sized droplets are heavier and less likely to drift, so are recommended for herbicide sprays. Figure 1 illustrates the difference in drift potential between fine and medium-sized spray droplets.

Other factors influencing spray drift include environmental conditions, spray height, and herbicide volatility (figs. 2 and 3).

Spray droplet diameter (µm)	Spray droplet category	Example
10	---	Dry fog
<145	Very fine (VF)	Wet fog
145 – 225	Fine (F)	Fine mist/drizzle
226 – 325	Medium (M)	Very fine rain
326 – 400	Coarse (C)	Fine rain
401 – 500	Very coarse (VC)	Light rain
>500	Extremely coarse (XC)	Medium rain
1000	---	Heavy rain

Table 1. Spray droplet size by category

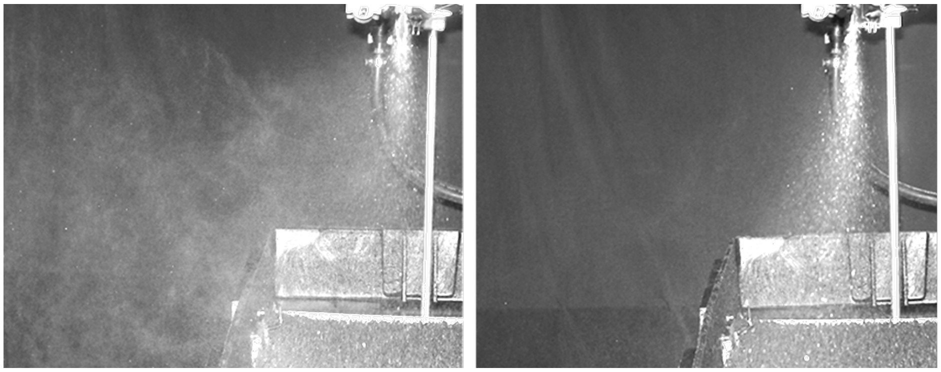


Fig. 1. Spray drift from fine-sized droplets (left) and medium-sized droplets (right).

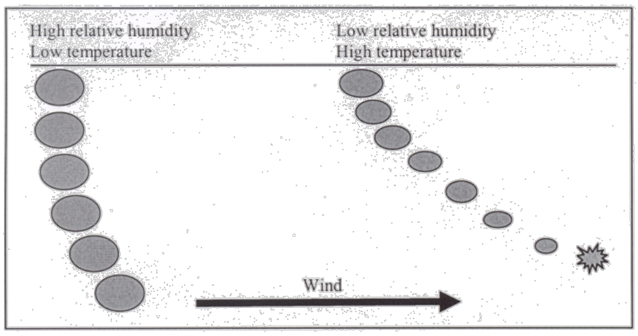


Fig. 2. Affects of environmental conditions on drift (OSU)

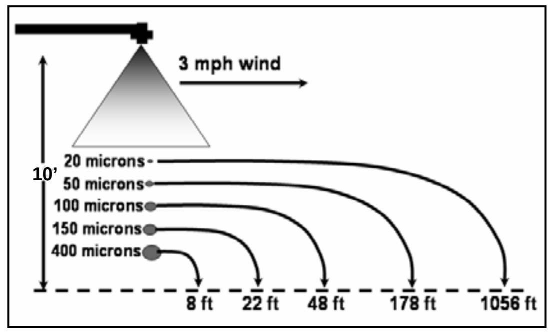


Fig. 3. Affect of boom height on drift (OSU)

The only sure-fire way to stop drift from occurring is not to spray. Obviously, this is not a practical solution. There are, however, several steps that can be taken to minimize the risk of spray drift when using herbicides (or other pesticides), regardless of where or what you are spraying. These include:

1. Follow label recommendations: Read and follow the pesticide's label directions. Many labels give specific recommendations on spray nozzle selection, travel speed, environmental conditions, and other useful ways to minimize spray drift and improve spray coverage.

2. Treat small weeds: Small succulent weeds are easier to wet and control with burndown herbicides than larger weeds. Treating small weeds also allows us to lower the spray boom or spray nozzle height, reducing the risk of spray drift.

3. Use spray shields: Spray shields or shrouds can be used to reduce spray drift by 75% or more.

4. Use appropriate spray nozzles: Spray nozzle choice *directly affects* droplet size, spray uniformity, coverage, and drift potential, which *directly impacts* weed control, economics, and environmental quality. Spray nozzles used for herbicides and drift management are shown in table 2. As a rule, operate spray tips at a low enough spray pressure that will produce large enough spray droplets (at least medium-sized) to resist drift, while providing proper coverage for the herbicide type (preemergent, contact, or systemic).

   Extended range (XR) flat fan spray tips are the most commonly used, but only reduce spray drift by about 82%. For drift management, they need to be operated at a spray pressure of <30 psi, which may not be sufficient for penetrating dense weed foliage. Other spray nozzle designs are available to help reduce drift by 94 to 99% at higher operating pressures, including *chamber design* (like Turbo), *venture design II* (like Air Mix and Air Induction XR), and *venture design I* (like Air Induction and Turbo Drop). Money spent on selecting appropriate nozzles for a good spray job is cheap compared to all other application expenses.

Additional factors to consider when using spray nozzles include:

- In general, as spray discharge angle decreases, droplet size increases (drift potential decreases). For example, an XR8003 (80°, size 03) produces medium droplets at 30 psi, compared to an XR11003 (110°, size 03), which produces fine droplets.

- Don't make large changes in the spray pressure. Instead, select a nozzle size to meet the flow rate requirement. Keep in mind; it takes a 4-fold increase or decrease in spray pressure to equal a 2-fold increase or decrease in flow rate.

- Use a spray nozzle size of >02 for larger droplets and to prevent plugging from sand or other debris. Never use knives, wire, or other metal items to unplug nozzles; use a stiff-bristled brush. Visually inspect each nozzle to make sure the spray pattern is uniform.

5. Spray when conditions are favorable: The person spraying should demonstrate care, attitude, and skill when it comes to application technique and recognizing favorable environmental conditions that minimize the risk of drift (table 3).

6. Slow down: Spray at a travel speed of 2 to 6 mph for better pesticide coverage. A spraying travel speed of more than 6 mph can lead to wind-sheer of droplets and increase risk of drift.

Table 2. Examples of spray nozzles used for drift management and different herbicide types

Spray nozzle type	PSI Range	Droplet Size*	Drift Rating	Herbicide preemergent	Herbicide systemic	Herbicide contact
Extended Range (XR)	15 - 60	VF - C	Very good (<30 psi)	Excellent	Very Good (<30 psi)	Excellent (>30 psi)
Drift Guard	30 - 60	F - C	Very good	Very good	Very good	Good
Turbo TeeJet	15 - 90	F - XC	Very good	Good (<30 psi)	Excellent (<30 psi)	Very good (>30 psi)
Turbo TeeJet Induction	15 - 100	XC	Excellent	Excellent	Excellent	Poor
Air Induction	30 - 100	C - XC	Excellent	Very good	Excellent	Good
Air Induction XR	15 - 90	M - XC	Excellent	Excellent	Excellent	Very Good
TwinJet	30 - 60	F - C	Poor	Good	Good	Excellent
Drift Guard TwinJet	30 - 60	F - C	Very good	Very good	Excellent	Very good
Turbo TwinJet	20 - 90	M - XC	Excellent (<30 psi, >04 size)	Very good (<30 psi)	Excellent	Excellent (>30 psi)
Turbo TeeJet Duo	15 - 90	F - XC	Excellent (<30 psi)	Very good	Excellent (<30 psi)	Excellent (>30 psi)
Turbo floodjet	10 - 40	XC	Excellent	Very good	Very good	Poor
Turfjet	25 - 70	XC	Excellent	Very good	Excellent	Poor
Off-Center	30 - 60	M - VC	Very good	Very good	Good	Poor

*VF (very fine), F (fine), M (medium), C (Coarse), XC (extremely coarse)

Nozzle tip wear: nozzle tip wear depends primarily on tip material:
(most wear) brass > polyacetyl > stainless steel > ceramic > carbide (least wear)

Table 3. Application and environmental factors influencing spray drift

Application factor	More drift	Less drift
Droplet size	Very fine and fine (<200 µm)	Medium and larger (>200 µm)
Nozzle orifice size	≤02	≥03
Spray height	Higher	Lower
Nozzle spray angle	110° or more	80° or less
Spray pressure	>30 psi	<30 psi
Travel speed	>6 mph	2 to 6 mph (better coverage)
Environmental factor	More drift	Less drift
Wind speed	0 to <3 mph, >7 mph	3 to 7 mph
Air temperature	>85 °F	<85 °F
Relative humidity	Lower	Higher
Air stability	No vertical mixing, inversion layer	Vertical mixing

Wild Bee Pollinators in Seedless Watermelon

D Michael Ramos & Jacob M Cecala, Cal Poly at Pomona
Edits by Vonny Barlow, Entomology Advisor, UCCE Riverside County

Agricultural crops, such as seedless watermelon can be pollinated by native wild bees and honey bees. Recent studies indicate that pollination services provided by wild bees alone can be sufficient for production watermelon fruit set. Studies in this area are of particular importance because of the recent decline in commercial honey bee populations. Previous studies measured the deposition abilities of bee fauna by quantifying primary pollen transfer and using this as an indication of efficiency. Work done here was to assess whether bee pollinators of seedless watermelon can provide sufficient pollination services through the mechanism of secondary pollen transfer.

Two previous studies have looked at secondary pollen transfer in laboratory conditions. The first study in 2003 confirmed that pollen grains can be lifted from petals (pollen remobilization), and secondarily deposited on the stigma of a particular type of lily. The second study in 2006 indicates that small amounts of secondary pollen transfer does occur in canola. No studies in watermelon crops or any other commercial crop have been conducted to date.

Methods & Initial Results

We have conducted experiments at two sites in Southern California. The first site is located in the Spadra Ranch Region of Cal Poly Pomona University where conventional agriculture practices are used in fields surrounded by developed land. The second site is at Tanaka Farms in Irvine, CA an organic farm surrounded by undeveloped land. This year we have just completed a second year of research in Blythe, Ca on watermelon planted on UCCE experimental land.

We collected pollinating specimens throughout the season from all sites, which are then later in the laboratory. All pollen was collected and counted from the petals of open control female flowers at noted times to establish a petal pollen accumulation curve. We measured secondary pollen transfer by tracking pollen movement from petal to stigma of the same female flower using stained watermelon pollen grains. Flowers were marked with stained pollen grains and placed in the center of an array, surrounded by four unmarked male flowers. We allowed visits for 30 & 180 minute time intervals between 8:00am & 12:00pm. Pollen grains were counted in the laboratory at the end of the time periods. At the Spadra Ranch location (Pomona, CA), 32% of pollen grains placed on the petals were remobilized by insect visitors during the 30 minute arrays and 88% were remobilized during the 180 minute arrays. During the 30 minute arrays 34% of pollen grains were secondarily transferred to the stigma and when array time was increased to 180 minutes 21% of pollen grains were transferred. At

Tanaka Farms (Irvine, CA), 46% of pollen grains placed on the petals were remobilized and 42% of pollen grains were secondarily transferred to the stigma during the 30 minute arrays. Results indicate that this previously speculated mechanism of pollination does occur and may provide a significant amount of pollen necessary for marketable sized fruit development.

Data from the Blythe, Ca field site is still being analyzed and will be made available soon. However, at a preliminary glance we are able to conclude that this mechanism of pollen transfer is also occurring in this conventional triploid watermelon field. Furthermore, because of video surveillance we are able to attribute this work to both honey bee and native bee species.

Diversity of wild bees at the sites include Carpenter bees, Sweat Bees, Leafcutter Bees, some parasitic bees and many more types yet to be identified. Family, Genera and species (if possible) of the bee voucher specimens is currently being compiled in a database back at Cal Poly Pomona University.

Related studies in Yolo County, CA found that organic farms close to uncultivated, wild areas had sufficient numbers of native bees to provided pollination watermelon crops. On farms not close to wild areas, native bee diversity was lower and consequently, native bee populations were unable to fully pollinate seedless watermelon. We confirmed this with our observations in Blythe, CA, which showed that seedless watermelon fields near untilled wild areas appeared to have greater numbers of native bees than fields isolated from wild habitats.

To set a marketable fruit, it is estimated that a pistillate watermelon flower must receive roughly 1,000 pollen grains (from staminate flowers) deposited to its stigmatic surface through visitation by insects. Our work from previous years at various other sites demonstrates that both honey bees and native Californian bees deposit pollen not only on the stigma but on the surface of the petals as well. Both honey bees and native bees were found to deposit similar amounts of pollen on the flower, in the range of 60 to 80 grains per single visit. This translates into approximately 14 bee visits to a single flower to produce a marketable fruit. Results of our secondary pollen transfer experiments, which were continued in Blythe this year, suggest that pollen from the petals of pistillate flowers are transferred to the same flower's stigma through successive bee visits. As a consequence, intrafloral pollination can be an important secondary mechanism by which pollen is deposited onto the stigmatic surface.

Invasive Insects That Threaten California

Vonny Barlow, Entomology Advisor, UCCE Riverside County

The California Invasive Species Advisory Committee (CISAC) has created a list of invasive species that threaten California. The list currently includes over 1,700 species of all taxonomic types— vertebrate, invertebrate, plant, and disease—and includes not only those damaging organisms already in the state but also those that could conceivably be introduced and become problems in the future. Since March of 2010 over 100 experts (including Vonny Barlow, Entomology Advisor, UCCE Riverside County) have contributed to CISAC to form this list and it forms the foundation for development of a strategic action plan. Currently the insects of concern to California are listed here;

ARTHROPODS (current extent in CA)

Bees/wasps
Apis mellifera scuttellata Africanized honeybee (limited)
Solenopsis geminata tropical fire ant (not present)
Solenopsis invicta red imported fire ant (limited)
Solenopsis richteri x
Solenopsis invicta hybrid hybrid fire ant (not present)
Solenopsis saevissima red imported fire ant (not present)

Beetles
Acalymma vittatum striped cucumber beetle (not present)
Agrilus coxalis golden spotted oak borer (limited)
Agrilus planipennis emerald ashborer (not present)
Anomala orientalis Oriental beetle (not present)
Anoplophora glabripennis Asian longhorned beetle (not present)
Anthonomus grandis grandis boll weevil (not present)
Conotrachelus retentus black walnut curculio (not present)
Curculio caryae pecan weevil (not present)
Cylas formicarius elegantulus sweetpotato weevil (not present)
Diabrotica virgifera virgifera western corn rootworm (not present)
Diaprepes abbreviatus diaprepes root weevil (limited)
Diaprepes sp. exotic weevil (not present)
Epilachna varivestis Mexican bean beetle (not present)
Leptinotarsa decemlineata Colorado potato beetle (not present)
Oulema melanopus cereal leaf beetle (not present)
Popillia japonica Japanese beetle (not present)
Tomicus piniperda pine shoot beetle (not present)
Trogoderma granarium khapra beetle (not present)
Xyleborinus andrewesi Asian ambrosia beetle (not present)
Xyleborus glabratus Redbay ambrosia beetle (not present)

Butterflies/moths
Cactoblasis cactorum cactus moth (not present)
Chilo suppressalis Asiatic rice borer (not present)
Choristoneura fumiferana spruce budworm (not present)
Epiphyas postvittana light brown apple moth (limited)
Heliocoverpa armigera (Hübner) cotton bollworm (not present)
Laspeyresia spp. Laspeyresia spp. (not present)
Lobesia botrana European grapevine moth (limited)
Lymantria dispar Gypsy moth (not present)
Mamestra brassicae cabbage moth (not present)
Ostrinia nubilalis European corn borer (not present)
Pectinophora gossypiella pink bollworm (limited)
Rhyacionia buoliana European pine shoot moth (not present)
Sannina uroceriformis persimmon borer (not present)
Spodoptera littoralis Egyptian cottonworm (not present)
Thaumatotibia leucotreta false codling moth (not present)

Flies
Anastrepha ludens Mexican fruit fly (limited)
Anastrepha obliqua West Indian fruit fly (not present)
Anastrepha striata guava fruit fly (limited)
Anastrepha suspensa Caribbean fruit fly (not present)
Bactrocera albistrigata white striped fruit fly (not present)
Bactrocera correcta Guava fruit fly (not present)
Bactrocera cucurbitae melon fly (not present)
Bactrocera dorsalis Oriental fruit fly (limited)
Bactrocera scutellata striped fruit fly (not present)
Bactrocera zonata peach fruit fly (not present)
Ceratitis capitata Mediterranean fruit fly (limited)
Cochliomyia hominivorax screwworm (not present)
Rhagoletis cerasi European cherry fruit fly (not present,)

Mites
Tropilaelaps clareae honeybee mite (not present)

Scales/aphids
Acutaspis albopicta albopicta scale (not present)
Aspidiotus destructor coconut scale (not present)
Bagrada hilaris bagrada bug (limited)
Ceroplastes ceriferus Indian wax scale (not present)
Diaphorina citri Asian citrus psyllid (limited)
Ferrisia gilli Gill's mealybug (limited)
Homalodisca vitripennis glassy-winged sharpshooter (limited)
Maconellicoccus hirsutus pink hibiscus mealybug (limited)
Nilotaspis halli Hall scale (not present)
Parlatoria theae tea paralatoria scale (not present)
Planococcus ficus vine mealybug (limited)
Planococcus minor (Maskell) passionvine mealybug (not present)
Toxoptera citricida brown citrus aphid (not present)

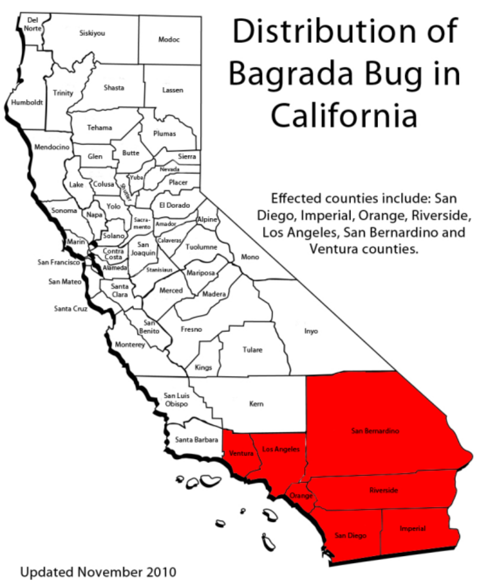
Thrips
Liothrips oleae olive thrips (not present)
Scirtothrips dorsalis (Hood) Chilli thrips (not present)
Thrips florum banana flower thrips (not present)
Thrips palmi melon thrips (not present)

This list is by no means comprehensive and does not include some of the newer invasive insects that we have been seeing. Some examples of recent insects are below;

Distribution: The Red Palm Weevil is native to Southeast Asia and is known from the following regions:

- Asia: Red Palm Weevil has been recorded in Bangladesh, Cambodia, China (Guangdong, Taiwan), Pakistan, India, Indonesia, Japan, Laos, Malaysia (Sabah, Sarawak), Myanmar, Philippines, Singapore, Sri Lanka, Thailand, and Vietnam.
- Africa: Algeria, Egypt, Libya, Madagascar, Malta, Morocco.
- Middle East: Bahrain, Georgia Palestine, Syria, Iran, Iraq, Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.
- Europe: Cyprus, France, Greece, Italy, Spain, Portugal, and Turkey.
- Oceania: Australia, Papua New Guinea, Samoa, and the Solomon Islands.
- The Caribbean: Aruba.
- The United States: Laguna Beach, Orange County, California

Bagrada bug, *Bagrada hilaris*



Distribution: Bagrada bug is found in East and Southern Africa, Egypt, Zaire and Senegal. The global distribution of this pest also includes southern Asia and southern Europe (Malta and Italy). This pest is only known from southern California and southern Arizona in the USA.

Research: Very little is known about the identity and impact of biological control agents, in particular parasitoids, that attack eggs, nymphs, and adult Bagrada bugs. Despite the importance of this pest in many countries the biology, ecology, and population dynamics of this insect are not very well understood.

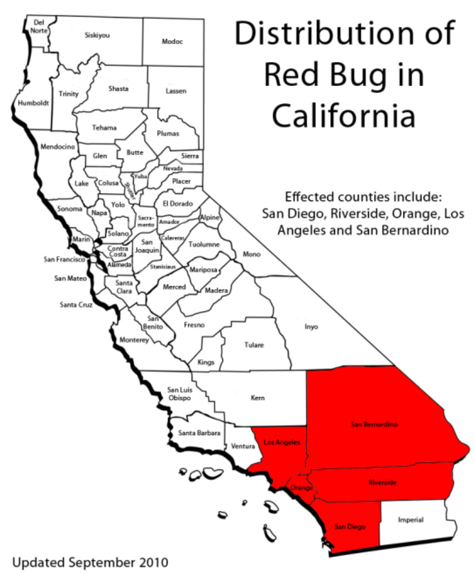
Spotted wing drosophila, *Drosophila suzukii*

Originally from Southeast Asia, this small fly is a pest of berry and stone fruits. It was first detected in North America in August 2008 in Santa Cruz County. This fly has become a significant pest of berry, cherry, strawberries and caneberries with a combined farmgate value of $1.9 billion. In May 2009, additional infestations were detected in cherry orchards along California's Central Coast, in the Santa Clara Valley, and from Yolo to Stanislaus Counties. Further trapping and identification efforts confirmed the presence of spotted wing drosophila (SWD) over a wide geographic range, extending the entire length of California's coastal counties north into British Columbia. SWD has been found on a variety of commercial and backyard host crops in these areas, including apples, blackberries, blueberries, cherries, grapes, nectarines, peaches, pears, plums, raspberries, and strawberries. The potential for its further expansion to additional softskinned fruit and vegetable hosts is unknown.

Red bug, *Scantius aegyptius*

Damage: The literature contains very little information regarding the biology of *S. aegyptius* and *Scantius* species in general are not considered to be economically important species. In California, *Scantius* has been observed feeding on the developing seeds and stems of Knotweed (*Polygonum* spp.) and Malva (*Malva parviflora*). It is likely that *S. aegyptius* will feed on the seeds of several species of annual herbaceous plants.

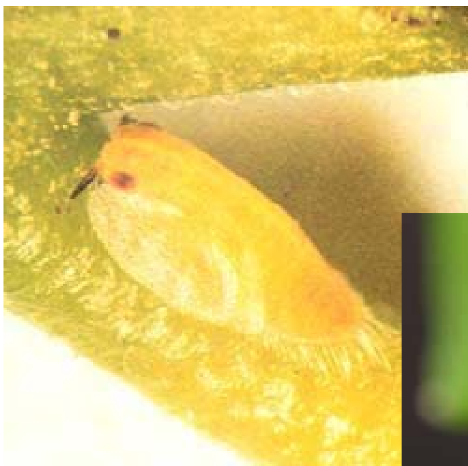
The most noticeable impact of *S. aegyptius* in California will likely be the presence of large numbers of nymphs and adults migrating from drying annual weeds into adjacent developed areas. These migrations consisting of thousands of individuals can be very conspicuous and lead to large aggregations on small patches of host plants causing concern to local residents who notice these obvious aggregations



Distribution: *Scantius aegyptius* is established in Orange County, adjacent portions of Los Angeles and San Bernardino Counties, and possibly Riverside County.

The Asian citrus psyllid (AsCP), *Diaphorina citri* Kuwayama,

Description: Adults are about the size of aphids, 2-3 mm (0.08-0.12 inches) long; the body is mottled brown; head light brown; the wings have distinct bars on the top and bottom, giving the insect a flattened x-pattern when viewed from the side; antennae with black tip; living insect covered with whitish, waxy secretion, making it appear dusty. Nymphs are small and difficult to see, 0.25-1.7 mm long; color generally green to yellowish-orange with no abdominal spots; may resemble the green scale, but psyllid nymphs have large wing pads. Eggs are 0.3 mm long, elongated, football shaped; being deposited on new flush with the long axis vertical to surface. Color ranges from pale to yellow to orange as they reach maturity. The Asian citrus psyllid is a vector of Candidatus L. asiaticus which causes Huanglongbing (HLB).



Life History: Eggs hatch in about 2-4 days. A female lays up to 800 eggs during her lifetime of several months. There are five nymphal instars. The complete life cycle ranges from 15 to 47 days depending upon food and temperature.

Dispersion: AsCP are weak fliers and are spread long distances primarily by wind and man.

The disease – Citrus Greening Disease: The pathogen that causes Citrus Greening Disease or Huanglongbing (HLB) is a phloem-limited bacterium called Candidatus *L. asiaticus* (Asian HLB). Asian HLB causes symptoms under both cool and warm (up to 35°C) conditions. HLB is a bacterial plant disease that destroys the production, appearance and economic value of citrus trees and the taste of the fruit and juice. It is the most serious citrus plant disease in the world. Huanglongbing has not been found in a California citrus trees yet.

ASIAN CITRUS PSYLLID PARTIAL HOST LIST

COMMON NAME	SCIENTIFIC NAME
Bael fruit	Aegle marmelos
Chevalier's aeglopsis	Aeglopsis chevalieri
	Afraegle gabonensis
	Afraegle paniculata
	Atalantia spp.
Uganda powder flask	Balsamocitrus dawei
Curry leaf	Bergera koenigii
Cape chestnut	Calodendrum capense
Calamondin	Citrofortunella microcarpa
Citrange	Citroncircus webberi
African cherry orange	Citropsis schweinfurthii
Citrus	Citrus spp.
	Clausena anisum-olens
Pink wampee	Clausena excavata
Clausena	Clausena indica
Wampee	Clausina lansium
Desert lime	Eremocitrus glauca
	Eremocitrus hybrid
Kumquat	Fortunella spp.
Wood apple	Limonia acidissima
	Merrillia caloxylon
Finger lime	Microcitrus australasica
Round lime	Microcitrus australis
	Microcitrus papuana
	Microcitronella sydney.
Mock orange	Murraya spp.
	Naringi crenulata
	Pamburus missionis

Be aware of insects you have never seen before and bring them to the attention of UCCE personal in your area for identification and possible management recommendations.

Steve Sutterfield a PCA for Wilbur Ellis brought this small metallic blue-green weevil to me that he found on cotton. It was sent to CDFA for identification and was identified to be a weevil that feeds on saltcedar (Tamarisk) called *Coniatus tamarisci* . It was only found in Arizona and Nevada and now it is in California. It is considered only as an incidental pest of cotton.

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ARIZONA COOPERATIVE EXTENSION
THE UNIVERSITY OF ARIZONA • COLLEGE OF AGRICULTURE AND LIFE SCIENCES

$1⁺ Cotton? New Thresholds?

Peter C. Ellsworth, Lydia Brown, Al Fournier (University of Arizona) & Steven Naranjo (USDA-ARS, ALARC)

With historically high cotton prices, many farmers wonder if thresholds for insect control should be adjusted downward. As "economic" thresholds, this is an astute question! The answers are in the research that supports our threshold systems and are insect-specific. For *Lygus*, the original research that supports a threshold of ***15 total Lygus with at least 4 nymphs per 100 sweeps*** is based on the yield and revenue curves (Fig. 1). As it turns out, the '15:4' threshold is close to the apex of the curve, where we make the most money. These curves were developed when cotton was worth just 50–75¢ per lb. However, examine our attempts to maximize yield by controlling *Lygus* below the 4 nymphs level (Fig. 1A). We were unable to increase yields with nearly double the number of sprays. The <u>current *Lygus* threshold is appropriate for the new economics in play</u>. In fact research supports thresholds as high as '15:8'.

We've managed whiteflies for years and perhaps we need a refresher on the threshold levels we use and why. Whiteflies are a potential quality-reducing insect. It takes far fewer whiteflies in the field to impact quality than it does to impact yield (Fig. 2). In fact, it takes 2–4 times the number of whiteflies to impact yield as it does to cause risks for quality reductions. Yield loss does not occur unless >90% of leaves are infested with adults and/or >76% of leaf disks are infested with large nymphs. So here too, <u>there is no need to lower the thresholds for whiteflies</u>. The levels currently in use for Stage I, Fully Selective materials, and for Stage II, Partially Selective materials, are more than sufficient to protect against <u>any</u> yield loss whatsoever, and still ensure high quality cotton by preventing excess whitefly sugars on lint.

Also see:

http://cals.arizona.edu/crops/cotton/insects/lygus/lyg00cr.pdf
http://cals.arizona.edu/crops/cotton/insects/lygus/lygus3.pdf
http://cals.arizona.edu/pubs/crops/az1224/az12247j.pdf
http://cals.arizona.edu/pubs/insects/az1404.pdf

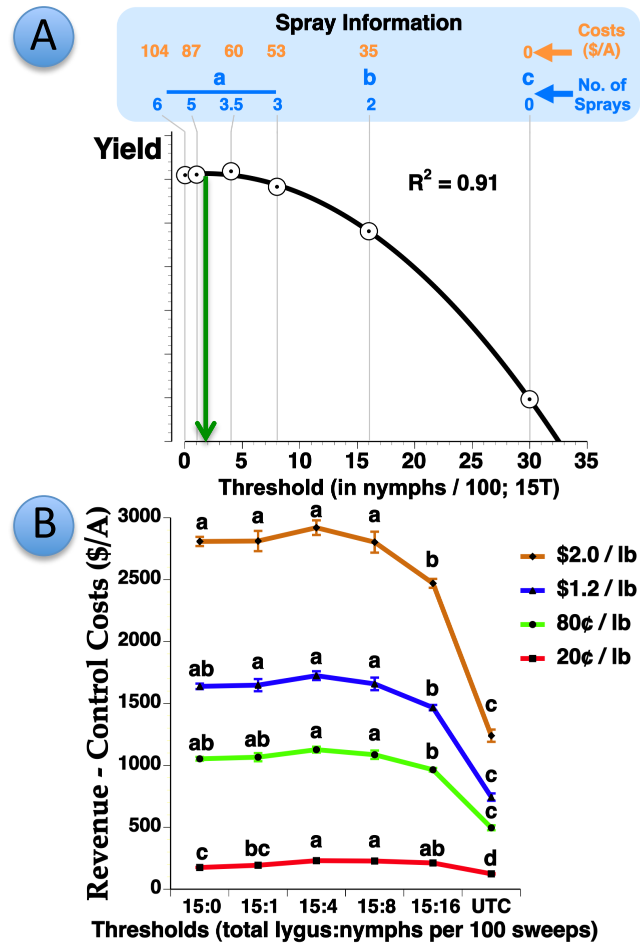

Figure 1. Yield (A, above) & revenue (B) in relation to Lygus densities in nymphs (with at least 15 total Lygus) per 100 sweeps. Maximum yield (A) shown with a green arrow, 1.7 nymphs; however, maximum revenues were measured at 5.2 nymphs for 60¢ cotton (not shown) and 4.8 nymphs for $1.20 cotton. '15:4' (B) gives the best economic outcome, regardless of lint price. Thresholds not sharing a letter are statistically different from each other.

<u>Adult Count Conversion Table</u>

	Number of leaves infested with 3 or more adults	% Infested Leaves	Average per Leaf
Wait; re-sample	1	3.4	0.3
	2	6.7	0.6
	3	10	0.8
	4	13	1.0
	5	17	1.3
	6	20	1.5
	7	23	1.8
See Matrix	8	27	2.1
	9	30	2.3
	10	33	2.6
	11	37	2.9
Use Stage I	12	40	3.2
	13	43	3.6
	14	47	3.9
	15	50	4.3
	16	53	4.7
	17	57	5.1
"Gray" area	18	60	5.5
	19	63	6.0
	20	67	6.5
	21	70	7.1
	22	73	7.7
Use Adulticide	23	77	8.4
	24	80	9.2
	25	83	10.2
	26	87	11.3
	27	90	12.8
Yield Loss Possible	28	93	14.9
	29	97	18.4
	30	100	34.9

ARIZONA PEST MANAGEMENT CENTER

<u>Large Nymph Count Conversion Table</u>

Number of disks infested with live large nymphs	% Infested Disks	Average per Disk
4	13	0.2
8	26	0.5
12	40	1.0
16	52	1.5
18	60	2.0
20	67	2.5
22	72	3.0
23	76	3.5
Yield Loss Possible		
24	80	4.0
25	83	4.5
26	85	5.0

Figure 2. Thresholds for whitefly control that prevent reductions in quality based on 30-leaf samples. E.g., apply Stage I materials when 40% of leaves have 3 or more adults <u>and</u> 40% of leaf disks have 1 or more live, large nymphs (green zone).