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Cooperative Extension

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DISTRIBUTION OF *SPIROPLASMA KUNKELII* AND *DALBULUS MAIDIS* IN THE SAN JOAQUIN VALLEY, CALIFORNIA—2007.

C.G. Summers, A.S. Newton Department of Entomology, University of California, Davis and Kearney Agricultural Center, and D.C. Opgenorth, California Department of Food and Agriculture.

Key Words: Spiroplasma kunkelii, corn stunt, corn leafhopper, *Dalbulus maidis*, pest distribution

Introduction

The corn leafhopper, *Dalbulus maidis* (DeLong and Wolcott) a significant pest of corn and the vector of the corn stunt spiroplasma, *Spiroplasma kunkelii*, throughout Mesoamerica was first found in California in 1942 (Frazier 1945). *Spiroplasma kunkelii*, the causal agent of corn stunt, was first reported from California (Fresno and Tulare counties) in1982 (Kloepper et al. 1982). It is possible, however, that the spiroplasma was present as early and 1942 since Frazier's description of symptoms match some of those associated with corn stunt. Between 1942 and 1996, outbreaks of both the leafhopper and the disease were sporadic. In addition to Fresno, Kings and Tulare counties, the leafhopper was found in Kern, Riverside and Los Angeles counties and the spiroplasma was also found in Kern County. Following the 1996 outbreak, the leafhopper and the disease were present in significant numbers on a yearly basis (Summers et al. 2004). In a survey conducted in 2002 we recovered corn leafhoppers

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from Madera, Merced, Stanislaus, San Joaquin, Sacramento, Solano and Yolo counties (Summers et al. 2003). Using ELISA, *S. kunkelii* was detected in corn leafhoppers collected in Sacramento County. *Spiroplasma kunkelii* was not detected from any of the other counties either from leafhoppers or plant tissue samples. In 2005, the corn leafhopper was detected in Contra Costa County, but no additional confirmations of the spiroplasma were made.

Materials and Methods

In 2007 another survey was conducted throughout the San Joaquin Valley for the presence of corn leafhopper and *Spiroplasma kunkelii*. Fields were sampled in September and October in Merced, Stanislaus and San Joaquin counties. Due to circumstances beyond our control, no fields were sampled in Madera County. Fields were selected at random, and leafhopper densities determined by visual observation. Plants were sampled for the presence of the spiroplasma by selecting systematic plants and removing either leaves, tassels, or both. Plants were considered systematic if they showed red leaves or red-midribs, common symptoms of corn stunt late in the season (Fig. 1). Plant tissue was placed in self sealing plastic bags and returned to the laboratory where they were refrigerated until tested for the presence of spiroplasma. Spiroplasma determinations were made using PCR techniques described by Wei et al. (2006).

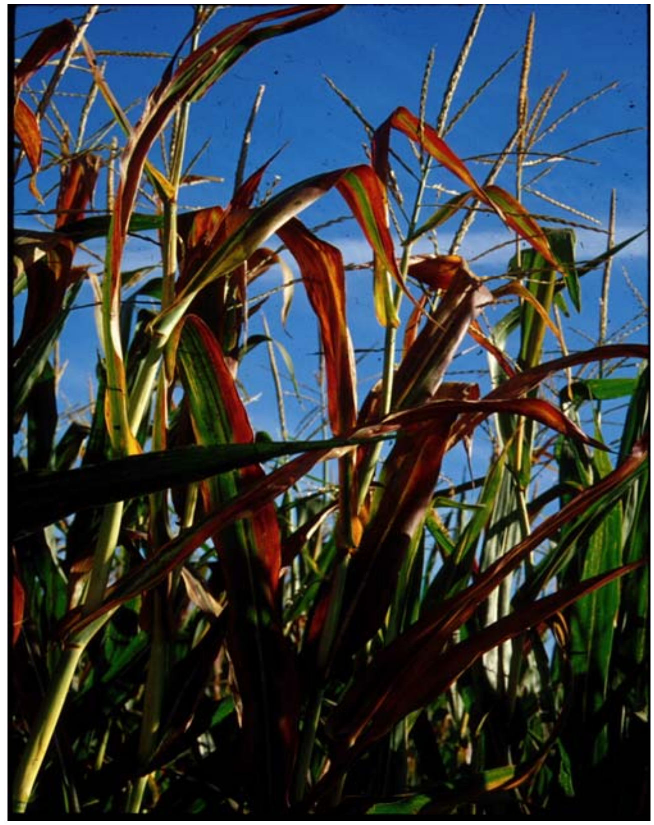

Figure 1. Silage corn plants infected with *Spiroplasma kunkelii* showing typical red leaf symptoms in the fall, following cool nights. Photo by Charles G. Summers.

Figure 2. Corn leafhopper adult getting ready to fly. Notice the two dark spots between the eyes. This is a good distinguishing feature of this leafhopper and can be used to distinguish it from other leafhoppers found in corn of a similar size and appearance. Photo by Jack Kelly Clark.

Results

Leafhoppers Populations: Leafhoppers (Fig. 2) were abundant in all fields sampled. Since it was late in the year and most of the corn had been harvested, leafhoppers tended to concentrate in the remaining fields. Populations were considerably higher than when fields in the same areas were sampled in 2002. Figure 3 shows the current distribution of *Dalbulus maidis* in California.

Spiroplasma Detection: Plants showing corn stunt symptoms, red leaves and midribs, ranged from 25 to 75 % in the fields sampled. It should be remembered that not all plants expressing red leaves do so as the result of an infection with *S. kunkelii*. Red leaves may be the result of other

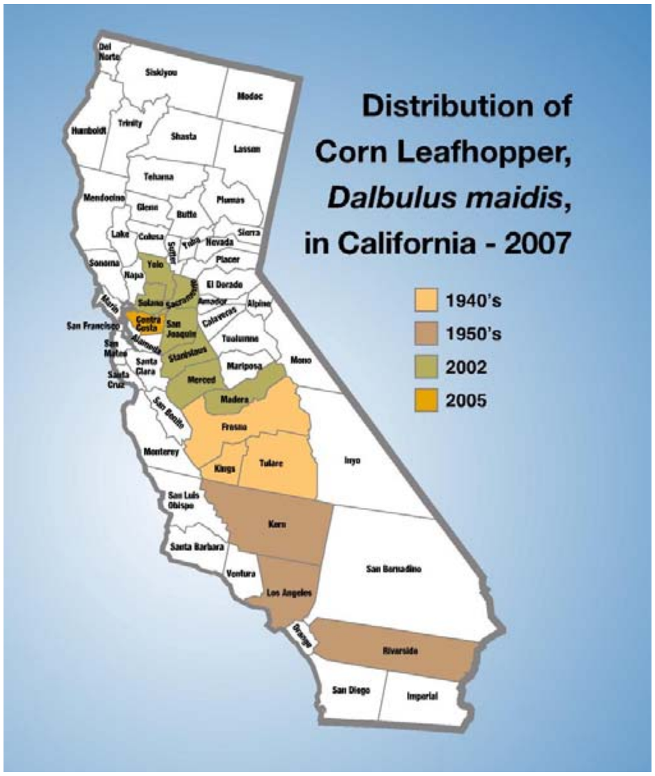

Figure 3. Distributions of the corn leafhopper, *Dalbulus maidis*, in California, December 2007

diseases, mineral imbalances, water relationship or environmental factors. They are, however, a good starting point if stunt is known to occur or is expected. Other commonly observed symptoms include stunted plants, shortened internodes and multiple ears that fail to fully fill with grain (Fig. 4). Plant samples (leaves and tassels) from Merced, Stanislaus and San Joaquin counties tested positive for the presence of spiroplasma using PCR techniques. These constitute new county records for the spiroplasma in California. Samples testing positive for *S. kunkelii* in Merced county came from an area five miles west of highway 99 ca. two miles NE of Hilmar. In Stanislaus county, positive samples came from five miles west of highway 99 ca. six miles SW of Modesto and in San Joaquin county six miles west of highway 99 south of Manteca. GPS coordinates for all locations are available on request. Although we did not sample for *S. kunkelii* in Madera County, it is more than likely present since it is found in both Fresno to the south and Merced to the north. Figure 5 shows the current distribution of *Spiroplasma kunkelii* in California.

Fig. 3. Corn plant infected with corn stunt spiroplasma. Symptoms include short stature, compressed internodes, multiple ears and red leaves. Photo by Charles G. Summers.

Future Projections

Presently, populations of the corn leafhopper and the incidence of corn stunt disease in counties north of Fresno are similar to what we observed in Fresno, Kings and Tulare counties in 2002-03. Since that time, leafhopper populations and the incidence of corn stunt have increased significantly.

Losses have continued to escalate. It is not known what will occur in these northern San Joaquin Valley counties, but they too will likely see an increase in the occurrence of both the leafhopper

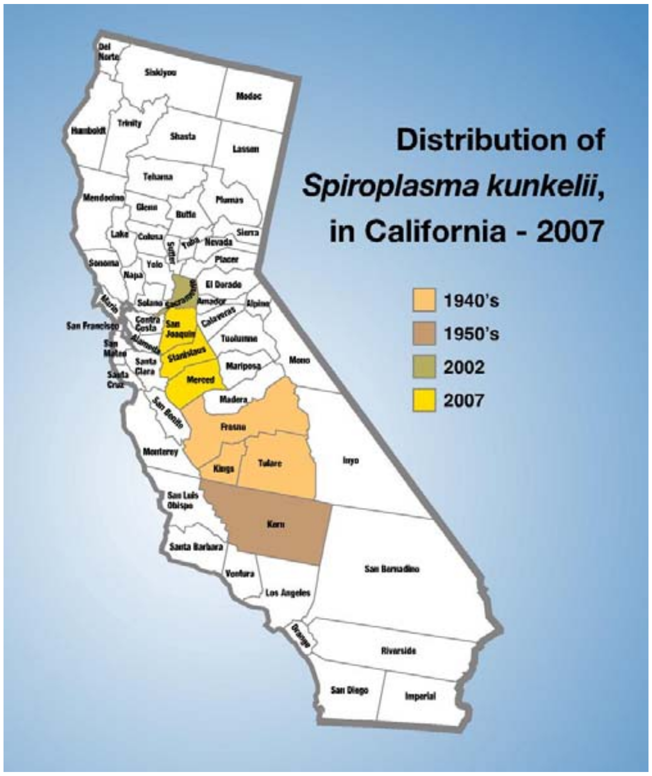

Figure 5. Distribution of the corn stunt spiroplasma, *Spiroplasma kunkelii*, in California, December 2007

and corn stunt. One reason for the increase in the southern counties has been an increase in corn acreage and the tendency to plant both earlier and later into the season (Summers et al. 2004). If similar trends follow in the northern counties, the likelihood is that the incidence of both vector and disease will increase as well, and we could see a significant increase in yield and quality losses. Given the current demand for forage and fodder in California, decreases in silage yields or quality could present considerable problems. Since ears on plants infected with corn stunt tend not to fill adequately with grain, this could seriously effect the ethanol industry in California as well.

Growers and PCAs are advised to begin monitoring for the presence of the leafhopper, using yellow sticky cards, as soon as corn is planted in the spring. Contact the authors or your local Farm Advisor for more detailed information

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REPLANTING VINEYARDS WITHOUT SOIL FUMIGATION. *M. V. McKenry, T. Buzo and S. Kaku, UC Riverside, Dept. of Nematology, and Kearney Agricultural Center.*

Reprinted from 2007 Methyl Bromide Alternatives Conference Proceedings.

We have previously described procedures for replanting stone fruits without soil fumigation (McKenry et al, 2006). Our procedures involved a five-step program of killing roots of the previous crop, waiting one full year and then replanting on a rootstock of different parentage plus attention to prevailing soil pests and the nutrient needs of young rootings. We recently simplified our procedures by referring to these five separate steps as: “*starve the old soil ecosystem then replant with different rootstock parentage*”. Root leachates are the primary energy source for the old soil ecosystem. Successful trunk treatment with a systemic herbicide can kill entire root systems in 60 days if the plant is *Prunus* or *Juglans* but such treatments have not been effective with vineyards of *Vitis*.

In 2006-07 we established a microplot experiment to evaluate applications of glyphosate to cut trunks of *Vitis* during winter months. This timing is something we had never before attempted but we observed almost complete root kill following such a treatment in adjacent Ruby Seedless and Thompson Seedless vineyards. This success prompted more definitive testing. In our test site we treated 100 five-year-old pinot noir vines on freedom and 420A rootstocks in a completely randomized block. In February 2007, 20 vines were left untreated and 80 received a trunk painting of 25 ml glyphosate plus 25 ml of MorAct spreader. Sixty of the treated trunks had been cut above the graft union while 20 were cut below the graft union leaving trunks that had been disbudded at the time of bench-grafting. By August 2007 re-growth had occurred with all vines that did not receive glyphosate. Re-growth from disbudded trunks was completely absent. Re-growth from the 60 vines having a partial scion occurred in 2 vines compared to 58 that showed no new growth. After a dozen years of searching we believe we finally have a procedure for starving old soil ecosystems in vineyards. Our procedure will be to apply glyphosate to cut trunks in February-March. As needed, we will then drench low VOC nematicidal agents including fosthiazate, NatureCur, Enzone or metam sodium applied via drip in summer. In spring of the following year we will replant on rootstocks having broad nematode resistance plus tolerance to the rejection component of the replant problem where available (McKenry, 2006).

In an adjacent experiment involving 170 Ruby Seedless vines only 3 vines succumbed to a July 2004 application of 4% glyphosate followed by 2 years of leaf/cane removal and non-irrigation. In this experiment the population of *Meloidogyne incognita* juveniles had declined from 800 to <2 / 250cm3 soil during the two-year clean fallow period. In May 2006 all vines received irrigation in an attempt to rejuvenate their growth plus nematicides to kill nematode eggs and maintain a low incidence of *M. incognita* within the new root system. The most striking nematicidal treatment was two applications of 1 kg/ha fosthiazate that maintained population levels at 18% of those that were not treated. Reductions of infective juveniles due to lack of feeding plus reduction of egg stages with a nematicide can conserve nematode resistance mechanisms within nematode resistant rootstocks. Nematode reductions are imperative in those field settings having high nematode incidence. Applications of *Paecilomyces lilacinus* or Bayer Exp. did not provide adequate nematicidal value in this experiment. We now have an example of a “*starve the old soil ecosystem then switch rootstock parentage*” treatment that is worthy of evaluation in commercial vineyards. Specifically we will trunk-treat with glyphosate in late winter, apply a nematicide such as fosthiazate via drip to the new planting sites and then replant the following spring on 10-17A, RS-3 or RS-9 rootstocks depending on prevailing soil conditions. This program is suggested as an alternative to use of soil fumigants, including methyl bromide, but any such evaluations should be conducted in replicated trials with a fumigant comparison to identify any inadequacies associated with the proposed treatment.

These findings coupled with earlier findings in grapes (McKenry, 2006) plus similar findings with stone fruits (McKenry et al, 2006) lead us to the conclusion that the replant problem can be mitigated without a fumigant. Key to its mitigation is recognition that there can be four components to the replant problem and the "rejection component" involves kill or starvation of the remnant soil ecosystem. The rejection component of the replant problem occurs among various perennial crops but exhibits differing intensity levels depending on the region and the cultivars replanted. The intensity of the rejection component likely depends on the extent of root leakage. We need to know more about the entire soil ecosystem and any differences from plant to plant down each planting row (McKenry, 1999). In many cases the impact of individual pathogens has already been carefully measured in greenhouse and field settings. Root and above-ground biomass differences in the first year of growth can commonly be 7-fold when compared to planting into fumigated soil. The intensity of the rejection component then declines to nothing sometime during the second year after replanting (McKenry, 1999). Inadequate root system development in the first-year can magnify the importance of any additional damage attributable to known root pests including nematodes.

In the attached chart (Fig.1) we depict the impact of fosthiazate on growth of Ruby Seedless, and nematode control. Ten years ago the senior author

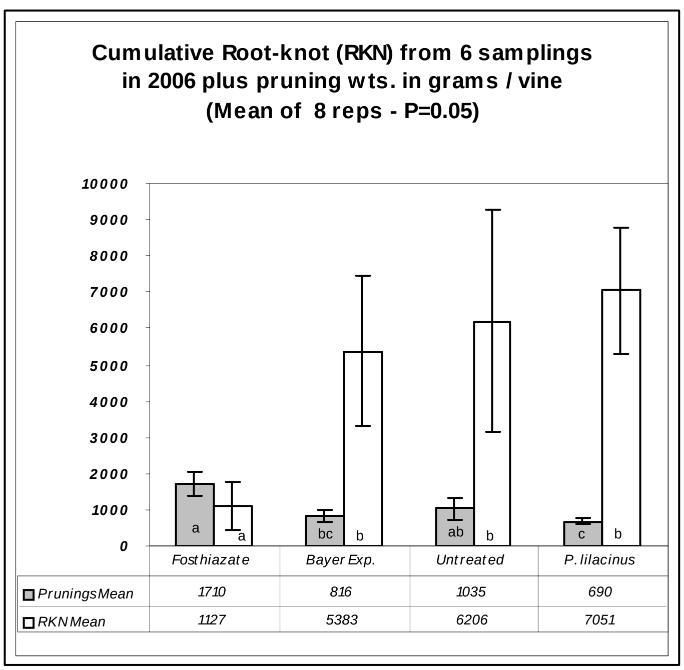

Figure 1. First-year performance of three nematicides applied to ruby seedless vines during the first year of their rejuvenation process.

notified the EPA of our need for registration of this organophosphate. We now know that the needed rate is 4 lb/acre applied over 1–2 years as a pre-plant or as an application to non-bearing acreage.

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ABSTRACTS

2007 ENTOMOLOGICAL SOCIETY OF AMERICA, PACIFIC BRANCH, March 25-28, Portland, Oregon.

Effects of *Xylella fastidiosa* group, almond cultivar, and climate on the establishment and persistence of almond leaf scorch. *C.M. Wistrom, U.C. Berkeley, ESPM, Div. of Insect Biology, B. Kirkpatrick, U.C. Davis Plant Pathology, and K.M. Daane, U.C. Berkeley, ESPM, Div. of Insect Biology and Kearney Agricultural Center.*

Xylella fastidiosa infections must survive multiple winters in an almond tree to reach sufficient populations for vector acquisition and economic impact in the orchard. The effects of cold temperatures on the establishment and persistence of *X. fastidiosa* infections were measured in field and greenhouse-grown almond trees, with multiple *X. fastidiosa* strains, and almond leaf scorch

(ALS)-resistant and susceptible tree varieties. Potted trees infected with *X. fastidiosa* were over wintered outside, or in cold rooms at 1.7ºC or 7ºC, for 1, 2, or 4 months. Cold exposure time negatively influenced potted tree recovery from *X. fastidiosa* infection, while cold intensity did not: 21% of trees recovered after 1 month, 13% after 2 months, and 7% after 4 months. In the field, trees at UC Davis (UCD) and Intermountain Research and Extension Center in Tulelake (IRC) inoculated with either grape or almond-strain *X. fastidiosa* had similar initial infection rates and bacterial populations, but ALS symptoms were much more severe at UCD, especially in 'Peerless' trees. At UCD, 10% of trees with almond-strain, and 78% of trees inoculated with grape-strain *X. fastidiosa* were infected. Both strains initially infected trees at equal rates at IRC (64% almond, 40% grape). Winter conditions killed all *X. fastidiosa* infections at IRC and all but one at UCD. These results partially support the hypothesis that almond-strain *X. fastidiosa* is common in northern California almond orchards because almond strains initially infect trees at low rates, but survive the winter more frequently than grape strains to cause persistent ALS. Grape and almond strains initially infected field-grown trees similar to previously-reported infection rates. However, no almond infections and only one grape *X. fastidiosa* infection over wintered in the field, even when the winter was mild. Previous studies found that almost all almond strain infections survived the winter, and 88 to 42% of grape-strain infections over wintered in field grown trees. Field inoculations at UCD, and potted tree inoculations were repeated in 2007, to get more data on initial infection establishment and over wintering rates.

2nd INTERNATIONAL LYGUS BUG SYMPOSIUM, April 15 to 19, 2007, Pacific Grove, California

Measuring localized movement of *Lygus* into cotton. *P.B. Goodell, UC Statewide IPM Program, Kearney Agricultural Center.*

Species: *Lygus hesperus*

Lygus hesperus populations develop both externally and internally to the San Joaquin Valley in California. In certain years, weed hosts are favored by precipitation patterns and these can provide extended habitat on which *Lygus* populations can build. In 2005, tarweed, *Hemizonia kelloggii*, was found in high density bordering cotton fields. *Lygus* populations were sampled weekly from tarweed on uncultivated rangeland and in the adjoining cotton. Both Pima and Acala upland cottons were sampled. In addition to tarweed, almonds (bearing and non-bearing), pistachios, onions and highway frontage were bordering cotton. Tarweed allowed population development into July before soil moisture was depleted and the majority of the tarweed population senesced. Cotton bordering tarweed did not show a *Lygus* population increase until this time. Other bordering crops acted as substantial sources for *Lygus* adults during earlier periods of time. Discussion will be presented contrasting internal crop sources of *Lygus* to external non-crop sources.

Landscape modeling of *Lygus hesperus* populations. *J.S. Bancroft, USDA-ARS, Western Integrated Cropping Systems, and P.B. Goodell, UC Statewide IPM Program, Kearney Agricultural Center.*

Species: *Lygus hesperus*

Lygus is a key pest in several of the 200 crops grown in the geographically distinct San Joaquin Valley. Spring weather patterns drive population build-up on host-plants. Habitat maps were created from survey sites in cropping regions of Kern County, CA. Population simulations were used to predict abundance and movement among the mosaic of landcover types. The results provide estimates of pest pressure in target areas. General conclusions about risk from landscape configuration may be used in other contexts.

Intercept traps for monitoring *Lygus* flux between fields. *J.S. Bancroft, USDA-ARS Western Integrated Cropping Systems Research Unit, and P.B. Goodell, UC Statewide IPM Program, Kearney Agricultural Center.*

Species: *Lygus hesperus*

Window pane traps have been used to monitor the movement of insects. The small glass or Plexiglas frames intercept insects in flight, causing them to fall into a collecting reservoir. We have modified this idea by increasing the size of the interception area in order to detect the movement of *Lygus hesperus* from alfalfa to cotton. This intercept trap is 1 x 2 meters and is easily constructed. The trap consists of aluminum T-bar with wooden slates which form the frame. Plastic pallet wrap is used as the clear "window". Inexpensive plastic rain gutters provide the collecting reservoir when filled with antifreeze. This trap provided good evidence of *Lygus* movement from swathed alfalfa to cotton when it was placed between the two fields. Maximum movement peaked at 48 hours after cutting and dropped off rapidly after that. While this tool does not provide explicit quantification of numbers, it does provide comparative numbers of movement and the direction of movement based on which side of the trap was struck and therefore, into which gutter the insect fell.

Managing *Lygus* in seed alfalfa. *S.C. Mueller, UCCE Fresno County, and P.B. Goodell, UC Statewide IPM Program, Kearney Agricultural Center.*

Species: *Lygus hesperus, Lygus elisus*

In the San Joaquin Valley of California, *Lygus* bugs are a pest throughout the season, shifting between crops within the landscape, as plants become unsuitable hosts due to maturity or harvest. *Lygus* are the key insect pest and by far the most difficult insect to manage in alfalfa seed fields, and when present in high numbers, may completely destroy the crop. Both adults and nymphs feed on the alfalfa plant, attacking reproductive parts, and causing premature drop of buds and flowers (stripping), seed deformation, and reduced seed viability. Control of *Lygus* bug is critical to the economic production of alfalfa seed. Action thresholds vary with the stage of crop development. The greatest period of *Lygus* bug activity is from June through August. Degree-days can be used to forecast seasonal *Lygus* development, especially hatch and migration dates. Pesticide applications should be timed to coincide with the hatching of *Lygus* broods. Treatment can be delayed until egg hatch is complete, but should take place before the nymphs reach the fourth and fifth instar since these older instars and adults are more difficult to control with insecticides than younger instars. Few insecticides are available for the control of *Lygus* in alfalfa seed fields. Because options are limited, and there is a high potential for the development of resistance, it is critical to maintain and preserve the efficacy of currently registered chemicals. Key components in the ability of *Lygus* to develop resistance to insecticides include short life cycle with many generations per year, a wide host range, and exposure to many insecticide applications each year, not only in seed alfalfa but in other susceptible crops as well. The best insurance against development of insecticide resistance is rotating chemical controls and maintaining the insects' natural enemies in the field. Research continues to develop alfalfa germplasm with resistance to *Lygus*.

2007 ECOLOGICAL SOCIETY OF AMERICA MEETING, August 5-10, San Jose, California

Movement of a food resource by Argentine ants in vineyards. *E.H. Nelson, UC Berkeley, ESPM, Div. of Insect Biology, and K.M. Daane, UC Berkeley, ESPM, Div. of Insect Biology, and Kearney Agricultural Center.*

The foraging range of Argentine ants is difficult to infer from visual observation of ant trails because of their diffuse and fluid colony structure. We studied the movement of ant food resources in California vineyards by providing ants with a source of protein-labeled sugar water. After six days, ants were collected at various distances from the sugar source and tested for the protein marker using ELISA. As distance from the sugar source increased, the percentage of ants marked with the protein decreased.

2007 AMERICAN SOCIETY OF AGRONOMY, CROP SCIENCE SOCIETY OF AMERICAN, SOIL SCIENCE SOCIETY OF AMERICA COMINBED ANNUAL MEETING, November 5-8, New Orleans, Louisiana.

Row spacing and plant population as IPM tools for no-till silage corn in central California. *A. Shrestha, UC Statewide IPM Program and Kearney Agricultural Center, C.A. Frate, UCCE Tulare County, and C.G. Summers, UC Davis, Entomology and Kearney Agricultural Center.*

Silage corn (*Zea mays* L.) has traditionally been planted on 76- or 96-cm beds in central California to enable furrow irrigation, inter-row cultivation, and pesticide applications. However, with border flood irrigation in the no-till systems and the use of aerial pesticide applications, the distance between rows can be narrowed. Narrower rows may help suppress pests compared to wider rows because of earlier canopy development and associated shading under the corn canopy. An on-farm study was conducted in Tipton, CA in 2004 and 2005 to evaluate the effect of two row spacings (38- vs 76-cm) and three populations (69000, 86000, and 104000 plants ha^{-1}) on weeds, insect, and crop yield. Corn 'cv. DK C66-80' (glyphosate-tolerant) was no-till planted in May. Glyphosate was applied in June @ 2 l ha^{-1}. Weed and insect (corn leafhopper, aphid, and leafminer) populations were sampled. Light interception by the corn canopy was measured weekly. In both years, the 38-cm rows intercepted more light earlier in the growing season and closed canopy about 6-13 days earlier than the 76-cm rows. Weed densities were similar between the 38- and 76-cm rows in 2004. In 2005, weed densities were greater in 76- than 38-cm rows. In both years, weed biomass was greater in the 76- than in the 38-cm rows. Plant population generally had no effect on weed densities or biomass. An inverse relationship existed between insect density and row spacing/plant density throughout the growing season. Aphid densities in plots with the highest plant density failed to reach treatable levels. In both years corn stalk diameter was larger, for the same population, in the 38- than in the 76-cm rows. Corn yield (adjusted to 70% moisture) was similar for 38- and 76-cm rows. This study showed that row spacing/plant density could be used as IPM tools in corn production.

2007 ALMOND BOARD OF CALIFORNIA ANNUAL MEETING, December 5-6, Modesto, California

Almond leaf scorch: The role of insects and weeds. *K.M. Daane, UC Berkeley, ESPM, Div. of Insect Biology, and Kearney Agricultural Center; C. Wistrom, G. Yokota, E. Shapland, U.C. Berkeley, ESPM, Div. of Insect Biology, R. Duncan, U.C. Cooperative Extension Stanislaus County, J. Connell, U.C. Cooperative Extension Butte County, and M. Viveros, U.C. Cooperative Extension Kern County.*

Xylella fastidiosa is the xylem-limited bacterium that causes almond leaf scorch (ALS), Pierce's disease (PD) of grapevines, and other plant diseases. To better understand the epidemiology of *X. fastidiosa* and biology of its insect vectors, six ALS-infected almond orchards in the northern, central, and southern San Joaquin Valley were surveyed for *X. fastidiosa* in vegetation and Cicadomorph insects over two years. Sixty-three of 1369 samples contained *X. fastidiosa*, detected by immunocapture PCR. Positive samples found between November and March, and 11 of 38 species of common weeds tested were positive, including shepherd's purse, filaree, cheeseweed, burclover, annual bluegrass, London rocket, and chickweed.

4.9% of <42,000 cicadomorph insects (leafhoppers, spittlebugs, planthoppers and treehoppers) collected were xylem feeders, mostly green sharpshooters, *Draeculacephala minerva*. Insect populations were highly seasonal, with few vectors collected from December to mid-April, populations increasing in late April, and peaking from mid-June through mid-July. Green sharpshooters (GSS) were eliminated inside the orchard when vegetation was removed for almond harvest in mid to late July, although they were still found in adjacent intact vegetation into September. Sites in Butte and Glenn counties had much higher GSS populations (2.49 and 8.77 GSS/100 sweeps) than sites in Stanislaus (0.66 GSS/100 sweeps) or Kern counties (0.08 GSS/100 sweeps). GSS were collected more frequently at the margins (8.4/100 sweeps), compared to >10m inside (1.5/100 sweeps) and >10m outside the almond orchards (3.3/100 sweeps). Roughly the same GSS populations were found on riparian habitat, orchard floor vegetation, and weeds near roadsides. 1.1% of GSS tested carried *X. fastidiosa*. Positive insects were collected between May and July on orchard weeds. Bacterial strains in sharp-shooters matched strains isolated from ALS-infected trees and weeds at the same sites.

Both ground vegetation and almond trees were most commonly infected with the almond strain of *X. fastidiosa*. ALS-infected almond samples had bacterial titers within previously reported ranges (1.84 x 106 - 2.15 x 107 CFU/g). Between 1.9 and 0.17% of almond trees at the study sites had ALS in 2004. An insecticide spray applied to almond orchard floor vegetation in January at one of the study sites did not suppress GSS populations or populations of cicadomorphs in general for the following growing season.

The biology of GSS, the main ALS vector, is much different from the biology of the main PD vectors, the blue-green sharpshooter or the glassy-winged sharpshooter. GSS feed and breed on common ground vegetation species that can harbor *X. fastidiosa* on the almond floor. They have multiple generations per year, with generation times between 28 and 49 days in lab tests. While the proportion of almond trees, insects, and alternate weedy hosts with *X. fastidiosa* is low, GSS populations can be high, and ground cover extensive in orchards with sprinkler or flood irrigation, or in areas with abundant winter rainfall. In orchards with ALS-susceptible varieties, sampling to determine ALS prevalence and GSS occurrence, and a spring-summer weed control program may assist in ALS management.

2007 CDFA PIERCE'S DISEASE/GLASSY-WINGED SHARPSHOOTER RESEARCH SYMPOSIUM, December 12-14, San Diego, California.

Host plant preference and natural infectivity of insect vectors of *Xylella fastidiosa* on common weeds and crop plants in the southern San Joaquin Valley. *C.M. Wistrom, U.C. Berkeley, ESPM, Div. of Insect Biology, M.P. Pryor, J. Hashim, U.C. Cooperative Extension Kern County, and K.M. Daane, U.C. Berkeley, ESPM, Div. of Insect Biology.*

H. vitripennis and *Spissistilus festinus* populations were surveyed bi-monthly in Kern County at agricultural sites with a variety of potential feeding and breeding hosts. Glassy-winged sharpshooter (GWSS) transmits the plant pathogenic bacterium *Xylella fastidiosa* when it feeds on susceptible hosts such as almonds and grapes. Three-cornered hopper (TCAH; *Spissistilus festinus*) populations are increasing in the San Joaquin Valley. While previous studies showed that TCAH normally feed in phloem tissue, its polyphagous feeding habits may be of concern to those worried about the spread of *X.*

fastidiosa. GWSS and TCAH populations were surveyed bi-monthly by sweeps and sticky traps in Kern County at five agricultural sites with a variety of potential feeding and breeding hosts. Insects were tested for *X. fastidiosa* with vacuum-extraction PCR. This project will provide information for control decisions by investigating the importance of vegetation management and targeted monitoring to reduce insect populations and inoculum potential.

430 GWSS and 381 TCAH total were collected from the sites. TCAH were unexpectedly high throughout the year and occurred on the same hosts at roughly the same populations as GWSS. The largest average populations of TCAH were on alfalfa and of GWSS were on willow and eucalyptus. There was greater variability in insect numbers collected by sticky traps than sweeps. While the initial plan was to look at insect populations primarily on weeds, very few weeds were found inside and adjacent to the study sites, and no GWSS were collected on sweeps of those weeds, while TCAH were collected only once. There was no relationship between percent cover of weeds and the number of GWSS. Instead, GWSS and TCAH were consistently collected on perennial crop plants.

Both TCAH and GWSS preferred host plants with mature fruit, compared to immature or none (GWSS: mature = 0.23 per 100 sweeps, none = 0.14, green = 0.04; TCAH: mature fruit = 0.64, no fruit = 0.35, and green fruit = 0.08). Both GWSS and TCAH preferred unpruned plants to recently-pruned plants, and plants with new growth and suckers to mature foliage. The largest GWSS populations were collected in fall 2006, decreasing from mid-December through early February. Populations remained very low through July 2007, rising again in fall 2007, in the same locations and on the same hosts as in fall 2006. TCAH populations collected by sweeps were similar to GWSS populations. No *X. fastidiosa* was detected in any of the 788 adult GWSS or TCAH tested. Pierce's disease symptoms were observed at sites 3 and 5 in fall 2007. Ivy and oleander samples with leaf scorch, collected at site 4 in spring 2006, were negative for *X. fastidiosa*.

GWSS host plant use depends on the type and condition of host plants available as well as the time of year. Sweeps and visual inspection were different in the quantity of insects detected, although they roughly mirrored one another in monitoring trends in TCAH and GWSS populations. Results from this project may help improve control decisions, by investigating the necessity of vegetation management or targeted insecticide sprays to reduce insect populations, and providing some of the information required to develop a treatment threshold for GWSS populations in areas with endemic GWSS populations and Pierce's disease.