Sacramento Valley Walnut News

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Submitted by:

Janine Hasey
UCCE Farm Advisor
Sutter, Yuba and Colusa Counties

New Website Resource for Sac Valley Tree Crop Production

Dani Lightle, UCCE Farm Advisor, Glenn/Butte/Tehama Counties

The UC Cooperative Extension orchard crop advisors in the Sacramento Valley are excited to announce the launch of our new website – the Sacramento Valley Orchard Source! This site will bring together the wealth of information we provide in one location, including:

- Timely newsletter articles through our Blog *(we'll continue to send email and hard copies of the whole newsletter for those who prefer it that way)*.
- Weekly Soil Moisture Loss (ET) Reports for the Northern and Southern Sacramento Valley
- Pest Catch Reports based on weekly scouting in the Northern Sacramento Valley
- Crop-specific production and management information for almonds, prunes and walnuts
- Calendar of area Cooperative Extension meetings & events

We've built this site for you, the growers, PCAs, managers and allied industries. Please let us know what you think so we can continue to improve it.

Visit us at http://www.sacvalleyorchards.com/ to check it out!

In-Season Walnut Production Considerations

Katherine Pope, UCCE Orchard Advisor Yolo, Solano, & Sacramento Cos.

JUNE

✓ *Walnut Husk Fly* (WHF) traps should already be out, 2 traps for every 10 acres on the north side of the tree, hung as high as possible. Monitor traps at least twice weekly until first treatment. Treatment timing can be based on when females with eggs are found, or simply when trap catches increase sharply. For more on monitoring and treatment, see "Walnut Husk Fly Update 2016" in this newsletter.

JULY

✓ *Codling moth* second generation (third flight) occurs in late July to early August (on average, 1100 Degree Days after the second biofix). Check traps to look for the second generation (third flight). If sprays are going to be applied for eggs from the second generation, apply at 300 Degree Days (DD) after the third biofix (200-250 DD if insect growth regulators are used). Treatment decision is based on a combination of factors including previous treatments, number of nuts infested in the previous generation, trap catches, and the ability to harvest early. See http://ipm.ucanr.edu/PMG/r881300211.html for more details.

- ✓ Monitor weekly for *WHF*. If spray residue from the previous spray has run out, harvest is more than 3 weeks away and eggs are present in trapped females, an additional treatment is recommended. For more information, see walnut husk fly article below.
- ✓ Take *July leaf samples* to assess nitrogen, as well as potentially potassium and zinc deficiencies, and boron toxicity, depending on your circumstances. Sample a total of at least 50 terminal leaflets from at least 10 trees on the same rootstock scattered throughout the orchard.
- ✓ Watch for *spider mites* by monitoring weekly through mid-August. Once a week, randomly select 10 trees per orchard, and from each tree take 5 leaflets from low branches and 5 leaflets from high branches. If more than half the leaflets with spider mites do not also have predaceous mites, this is cause for concern. Monitor again in 3-4 days to determine if populations are increasing and treatment is warranted. For more, see http://ipm.ucanr.edu/PMG/r881400111.html.

AUGUST

- ✓ Consider *ethephon* as a way to increase color quality and minimize the chances of multiple shakes in this low price year. Ethephon application should take place when 100% of sampled nuts have reached maturity, as indicated by "packing tissue brown" (PTB). This occurs around mid-August for the earliest varieties and around mid-September for Chandler in most years. For more on sampling to track PTB and ethephon application, see www.sacvalleyorchards.com/walnuts/horticulture-walnuts/ethephon-for-earlier-harvest/.

- ✓ Monitor for *Navel Orangeworm*. Healthy, intact walnuts are only susceptible to NOW damage at and after hull split. Consult with your Pest Control Adviser or crop consultant for monitoring and treatment options, bearing in mind pre-harvest intervals, duration of residual activity, and impacts of materials to your overall IPM program. See www.sacvalleyorchards.com/walnuts/insects-mites-walnuts/navel-orangeworm-in-walnut/ and www.sacvalleyorchards.com/walnuts/insects-mites-walnuts/navel-orangeworm-vs-codling-moth-identification-chart/ for more information.

SEPTEMBER

- ✓ *Collect a sample* of at least 100 nuts at harvest for each block and freeze them. Compare them after harvest with grade sheet to evaluate different potential sources of damage and how to improve your IPM program for next year. For help evaluating the source of damage see photos and notes at http://ipm.ucanr.edu/PMG/C881/m881hppests.html.

Walnut Husk Fly Update 2016

Emily J. Symmes, UCCE Area IPM Advisor, Sacramento Valley
Bob Van Steenwyk, UCCE Entomology Specialist, UC Berkeley
Bill Coates, UCCE Farm Advisor Emeritus, San Benito County
Janine Hasey, UCCE Farm Advisor, Sutter-Yuba and Colusa Counties

Walnut husk fly (WHF) continues to plague walnut production in many areas, often requiring multiple insecticide applications each growing season to achieve adequate control. This pest provides particular challenges to an integrated pest management program due to the nature of its life cycle (one generation per year with a long emergence period) and lack of natural enemies. As a result, best practices for management rely heavily on monitoring and insecticide treatments. Precise timing based on monitoring method and rotation of chemistries to minimize resistance risk are keys to successful long-term control of this pest.

Monitoring should begin earlier than the June 15 historical guideline (no later than June 1 in the Central Valley is the more recent recommendation). Some reports of late May catches in 2016 further support the "earlier-is-better"

practice – there is little harm in counting zeroes for a few weeks. Traps should be hung high in the canopy (minimum 2 per 10 acres) in dense foliage on the north side of trees and checked 2 to 3 times per week. Each orchard should be monitored individually for WHF activity to best determine if and when to treat. A summary article regarding the efficacy of available traps/lures for WHF monitoring was published in 2014 (http://www.sacvalleyorchards.com/walnuts/insects-mites-walnuts/walnut-husk-fly-trap-and-low-volume-spray-study/).

Treatment timing can be based on one of three monitoring methods (the first two have typically been most effective).

(1) **Detection of eggs in trapped females.** This is a simple process that requires slightly more time than counting overall trap catches. Females can be distinguished from males by the shape of the abdomen (pointier in females) and color of the front leg (female leg is entirely yellow, male leg is black close to the body) (Photo 1). After females are identified, gently squishing the female abdomen will squeeze out eggs if they are present. Eggs resemble small grains of rice (Photo 2).
   - Treat when the first female with eggs is found (unless using GF-120® – see below). Although past guidelines have stated that the treatment window is one week after egg detection, in practice there is often a lag time in getting the treatments out and trap checks (even 2 to 3 checks per week) may not be frequent enough to represent initial egg development in the female population. Therefore, treating as soon as possible after eggs are detected is the best option to minimize infestation.

(2) **Overall trap catches.**
   - In low- to moderate-pressure orchards, treat when a sharp increase occurs in traps.
   - In high pressure orchards or if using GF-120®, treat when any flies are detected rather than waiting for a sharp increase in catches.

(3) **Stings on nuts** (Photo 3) is the least preferred method, as damage has already occurred. However, examining nuts for stings can provide indication of efficacy of your spray program.
   - Treat at first sting. If using the sting method, full cover neonicotinoid materials that have some ovicidal activity (e.g. Belay® or Admire Pro®) mixed with an adulticide will provide best control.

Continue monitoring throughout the season. After emergence, it takes two weeks for females to mate and develop eggs before they begin laying. Short-residual insecticides plus bait will generally kill WHF for 7 to 10 days. Target subsequent applications at 2 to 4 week intervals based on the efficacy of the previous spray. Clean traps the day after application and check 3 to 4 days later. If the number of flies drops to near zero, the spray was highly effective and a longer treatment interval may be used. If post-treatment catches increase or eggs are detected in trapped females, and the residual period of the previous treatment has elapsed, additional treatments may be required if harvest is more than three weeks away.

There are several materials effective against WHF. All materials should be applied with a bait (except GF-120® which contains its own bait), except in high population orchards with extensive previous damage. In this case, full coverage sprays may be required to achieve adequate control. Keep in mind that rotation of chemistries (based on IRAC Mode of Action classification) is critical to minimize resistance development for pests that are treated multiple times each season. Proper aphid management can also help limit movement of WHF within and between orchards by reducing honeydew accumulation (a food source for adult WHF). Additional details on monitoring methods and treatment guidelines are available at: http://ipm.ucanr.edu/PMG/r881301211.html.

The table below represents a summary of insecticide efficacy data for WHF from over 10 years of research conducted by UCCE Entomology Specialist Bob Van Steenwyk and UCCE Farm Advisor Emeritus Bill Coates. Trials took place in a high WHF pressure Hartley orchard in San Benito County, CA. Treatments were applied with a hand-gun orchard sprayer operated at 200 psi with a final spray volume of 300 gal/acre. Three to four applications were applied (depending on year) timed according to UC IPM Guidelines based on trap catches (mid- to late-July, mid-August, late August, and/or early September). Trials consisted of four single-tree replicates each year. All applications included NuLure® bait and an adjuvant (Dyne-Amic®, Latron-B®, or Exit®) at label rates. Efficacy ratings are based on WHF infestation of nuts (125 nuts

per replicate) before commercial harvest (mid-September). Detailed annual reports are available in the Walnut Research Reports Database at: http://ucanr.edu/sites/cawalnut/category/WalnutHuskFly/.

Photo 1. Adult male (left) and female (right) walnut husk fly.

Photo 2. Female walnut husk fly with eggs.

Photo 3. Walnut with walnut husk fly oviposition sting.

THESE DATA ARE BASED ON RESEARCH TRIALS SPANNING OVER 10 YEARS.

ALWAYS CHECK CURRENT LABEL FOR REGISTRATION STATUS, ALLOWABLE RATES, AND OTHER RESTRICTIONS.

Trade Name	Active Ingredient	IRAC Group	Rate/Acre	Efficacy Rating*
Altacor®	chlorantraniliprole	28	4.0 oz	---
Assail®	acetamiprid	4A	6.0 oz	++++
			4.0 oz	+++
Athena® + Brigadier®	bifenthrin and avermectin + zeta-cypermethrin and chlorpyrifos	3A, 6 + 3A, 1B	20.0 fl. oz + 12.8 fl. oz	+++
Athena®	bifenthrin	3A	20.0 fl. oz	++
Baythroid®	beta-cyfluthrin	3A	2.8 fl. oz	+++
Belay®	clothianidin	4A	6.0 fl. oz	+++
			3.0 fl. oz	++
Bexar®	tolfenpyrad	21A	27.0 fl. oz	---
Brigade® + Brigadier®	bifenthrin + zeta-cypermethrin and chlorpyrifos	3A + 3A, 1B	16.0 oz + 12.8 fl. oz	++++
Cyclaniliprole	cyclaniliprole	28	16.4 fl. oz	++
Danitol® + Belay®	fenpropathrin + clothianidin	3A + 4A	21.3 fl. oz + 6 fl. oz	++++
Danitol®	fenpropathrin	3A	21.3 fl.oz	+++
Delegate®	spinetoram	5	3.2 oz	++
Exirel®	cyantraniliprole	28	20.5 fl.oz	+
Intrepid Edge®	spinetoram and methoxyfenozide	5, 18	12.75 fl. oz	++
Leverage 360®	beta-cyfluthrin and imidacloprid	3A, 4A	2.8 fl. oz	++++
Malathion	malathion	1B	64.0 fl. oz	---
Provado®	imidacloprid	4A	7.0 fl.oz	+++
Stallion® + Brigadier®	bifenthrin and imidacloprid + zeta-cypermethrin and chlorpyrifos	3A, 4A + 3A, 1B	11.8 fl. oz + 12.8 fl. oz	++++
Temitry®	malathion and gamma-cyhalothrin	1B, 3A	14.0 oz	+++
Warrior®	lambda-cyhalothrin	3A	2.56 fl. oz	++

***Rating scale:** ++++ Excellent Efficacy (95-100% control), +++ Good Efficacy (75-95% control), ++ Moderate Efficacy (50-75% control),

+ Little Efficacy (20-50% control), --- No efficacy (0-20% control)

Tipping the Scales to Favor Walnut Quality

Richard P. Buchner, UCCE Farm Advisor Tehama, Glenn and Butte Counties

In years when walnuts have a lower value, it is important to produce quality, light-colored kernels to maximize profitability. Here are some suggestions for producing high quality nuts.

Irrigation management

Water management is a key element to producing good yields of high quality walnuts. Excessive tree stress from either over or under irrigation has a direct effect on crop quality. Farm advisors Allan Fulton and Richard Buchner (2003 to 2005) investigated three irrigation treatments: 1) little to no trees stress with trees maintained at - 6 bars, 2) mild water stress increasing to about - 9 bars at harvest and 3) moderate water stress increasing to about - 12 bars at harvest. We found that water stress reduces walnut yield and impacts quality by favoring darker kernels. Many tools, from soil based to climate based to plant based are available to help with water management decisions. Additional information is available from Allan Fulton at the Tehama Website http://cetehama.ucanr.edu/WaterIrrigationProgram/. Using pressure chamber technology for walnut, almond and prune irrigation can be found at http://ucanr.edu/datastoreFiles/391-761.pdf or by googling ANR publication 8503.

Insect damage

Insects and mites all have a large impact on walnut quality. Leaf feeding by spider mites causes leaves to desiccate and drop. Defoliation early in the season greatly reduces nut yield and quality. Defoliation late in the season interferes with harvest. Aphid feeding can reduce tree vigor, nut size, yield and quality. In addition, aphids excrete honeydew which turns the husk surface black. Sooty mold also develops on the honeydew on the husk increasing the chance for sunburn. High populations of aphids may cause leaves to drop exposing more nuts to sunburn which darkens or shrivels kernels. Scale insects feed on phloem sap, weakening or killing fruit wood and are associated with Botryosphaeria which infects wood, spurs and nuts reducing yield and killing next year's buds. Codling moth and navel orangeworm directly damage kernels through feeding and provide good entry points for additional kernel damage. Finally, walnut husk fly infestation early in the season (late July to mid-August) leads to shriveled and darkened kernels or may induce mold growth. Late infections tend not to damage the kernel but may result in shell staining.

Managing sunburn with kaolin particle films

Kaolin particles form a protective white film that reflects the sun resulting in cooler trees and less sunburn. Studies conducted by Farm Advisor Kathy Kelley Anderson over a four-year period in Stanislaus County compared untreated and kaolin treated trees (three applications of Surround at 50 lbs in 200gal of water /acre) in well managed Vina, Howard, Tulare, and Chandler orchards. The quality of harvested nuts was evaluated by Diamond Foods and showed that the white coating increased the relative kernel value in some varieties. Quality and value increases were consistently seen in Vina. Improvements in Howard and Tulare were more variable while Chandler value was not increased in any of the years. Beware, the material and application costs of multiple full canopy sprays can exceed the increase in crop value when calculated on a 60 cent per pound basis. Feasibility improves with increasing nut prices. Kaolin usually needs to be applied early enough in June, before high heat, to have the best results.

Walnut mold

Walnut mold can be caused by about 50 species of fungi but most often, Aspergillis, Penicillium, Alternaria, and Rhizopus are associated with moldy nuts. These mold causing fungi are extremely common, occurring in soil, air and decaying vegetation. Mold incidence varies from year to year depending upon environmental conditions. High temperatures and high humidity favor mold growth. Abnormally hot and dry summers cause the hulls to shrivel around the shell providing an ideal place for mold to grow and infect the kernel. Mold also increases when nuts remain too long on moist ground. To minimize mold damage:

1) Avoid, as much as possible, pre-harvest hull damage and moisture stress.

2) Harvest as close to hull split as possible. 80% nut removal with 95% hullable is considered an economic harvest. A second shake will recover the remaining nuts. Ethephon is often used to promote early or once over harvest. Do not apply Ethephon to stressed trees.
3) Once harvest begins, pick up, hull and dry nuts as soon as possible. Most loss of quality occurs during the first nine hours after shaking. This is particularly true if air temperatures are high at harvest or nuts are in direct sunlight. Walnuts left on damp ground are more susceptible to mold damage.
4) Drying nuts quickly after pick-up also helps to reduce kernel mold.

Double shake may be an option

Harvesting near the beginning of hull split increases the percentage of light-colored kernels and decreases the incidence of insect and mold damage. Since hull split does not occur at the same time throughout the tree or orchard, one solution is to double shake. The first shake will harvest the high quality early nuts and a second shake 7-10 days later will get the remaining crop. Not everyone has the equipment or harvest plan that allows for a two shake harvest. Individual growers need to decide if the higher quality equals or exceeds the cost of the second shake.

Harvest aid

In the Sacramento Valley walnut kernels are mature and at their highest quality several weeks prior to hull split. Unfortunately, commercial harvest is delayed until adequate hull split allows good crop removal. Walnut kernels are lightest in color and of highest quality when the packing tissue around the kernel halves just turns brown (packing tissue brown or PTB). Applying ethephon, a synthetic version of the plant growth regulator ethylene, shortens the time between optimum kernel maturity and hull split. Ethephon is an ethylene based plant growth regulator applied to accelerate hull split. Many walnut growers successfully apply ethephon (Ethrel) to manipulate harvest timing. One approach for ethephon use involves applying ethephon at 100% PTB. This promotes harvest about 14 to 23 days after application, 7 to 10 days ahead of normal harvest. Nut removal is about 90 percent. A second harvest is often economical. Another way of using ethephon involves applying it about 10 days prior to the normal harvest date. This increases the proportion of harvested nuts and hull removal so that a second harvest is usually not economical. Good results with ethephon requires experience. Additional information is available at the new Sacramento Valley website http://www.sacvalleyorchards.com/walnuts/horticulture-walnuts/ethephon-for-earlier-harvest/

Selecting the Right Clonal Rootstock for Managing Soil and Pest Problems

Janine Hasey, UCCE Farm Advisor, Sutter, Yuba, and Colusa Counties

Why are clonal Paradox walnut rootstocks important to growers? Paradox clones provide options to manage orchard site specific problems or issues. Many growers are already quite familiar with the clonal walnut rootstock attributes since thousands of acres have been planted over the last seven years. Commercially available Paradox clones include Vlach, VX211, and RX1. Vlach has been available since 1999 and came from a vigorous Paradox tree in Stanislaus County. Originally identified as superior seedlings and then cloned, VX211 and RX1 were released by UC and USDA in 2007 after years of evaluation for vigor, resistance to nematodes, crown gall, and *Phytophthora*. These clonal Paradox rootstocks are readily available through the walnut nursery trade and sold either as potted rootstock that is fall budded or spring grafted in the field, or as a June budded or nursery grafted bare root tree.

Which are the preferred clonal rootstocks for problem situations? As we have more years to observe walnut rootstock research trials, screening trials, and commercial clonal rootstock plantings, we changed our ratings for crown gall and *Phytophthora* resistance. Some of the research trials that contributed to updating our original recommendations include (see also Table 1):

- *Crown gall:* Several rootstock field trials surveyed 2012-14 for crown gall caused by *Agrobacterium tumefaciens*, (reporting on two below).
    - In a trial in Tehama County, RX1, VX211, and Vlach had significantly lower incidence of crown gall and galls were smaller than Paradox seedling trees. There was no crown gall found on RX1.
    - In a trial in Stanislaus County planted in 2000, Vlach (the only commercial Paradox clone available) had significantly lower crown gall incidence and galls were smaller than Paradox seedling trees.
    - In more recent greenhouse screening trials, RX1 had the lowest incidence of crown gall.
- *Phytophthora:* In a trial in San Joaquin County where *Phytophthora cinnamomi,* a cause of root and crown rot, was present, all the trees on RX1 survived but there was extensive mortality of seedling Paradox trees.

Table 1. Preferred rootstocks for problem situations[1]

Clonal Paradox Rootstock	Rootstock Vigor [2]	Site Problems		
		Crown Gall	Nematodes	Phytophthora / wet conditions
VX211	Highly vigorous	Low resistance	Some tolerance	Low resistance
RX1	Moderate vigor	Moderate resistance	Intolerant	Moderate to high resistance[3]
Vlach	Vigorous	Low resistance	Intolerant	Low resistance

[1]Based on data from ongoing UC and USDA-ARS trials. The disease resistance indicated is only a comparison between the three clonal Paradox rootstocks and is not necessarily the level of disease resistance when compared to seedling black or seedling Paradox.
[2]In field trials with grafted trees, the vigor of the rootstock isn't necessarily reflected in the vigor of the scion, e.g. sometimes grafted trees on RX1 and Vlach are more vigorous than on VX211.
[3] Level of resistance depends on *Phytophthora* species.

For more information on disease resistance ratings and mechanisms of the Paradox clones, see the bulletin on walnuts in the nursery trade, how they are propagated and understanding the terminology, on the web at http://www.sacvalleyorchards.com/walnuts/horticulture-walnuts/walnut-trees-in-the-nursery-trade/

Managing vigor during training on clonal Paradox rootstocks. Where clonal Paradox is being planted and conditions will likely lead to excessive vigor (for example, virgin tree ground, deep loamy soils or high nitrate irrigation water), avoid pushing the growth by over irrigating or fertilizing. Overly-vigorous growth has led to serious management and training problems in many new orchards recently. Nitrogen, in addition to what may be in irrigation water, may not be needed on first or even second leaf walnut trees on clonal Paradox. This can be confirmed by taking a July leaf sample. Use stem water potential monitoring to keep trees growing at a reasonable pace by making sure trees are not at or wetter than the baseline at any time. To slow trunk growth where excessive, keep side shoots longer during the summer.

Standard seedling rootstocks:

1) Paradox. Many growers still prefer seedling Paradox although they are very susceptible to crown gall disease. USDA/UC researchers developed methods for nurseries to use to prevent infection by the bacterium during the seed collection phase and other practices which can alleviate crown gall from developing. See the article "Points to Consider in the Prevention of Crown Gall" at http://www.sacvalleyorchards.com/walnuts/diseases-walnuts/preventing-crown-gall/http://fruitsandnuts.ucdavis.edu

2) Black walnut. Many growers have planted black walnut in recent years because it is less susceptible to crown gall than Paradox seedling rootstock. However, vigor is only moderate especially on poorer soils, and in UC trials, yields

were lower compared to trees on Paradox rootstocks. Black walnut rootstocks have a place where there are salt problems because they are more tolerant than Paradox seedlings or clones.

Potential new clonal walnut rootstocks with disease resistance. Over the last four years, USDA and UC researchers have developed several new clones with potential resistance to crown gall, nematodes, or *Phytophthora*. Field performance is being tested and compared to the standard Paradox clones VX211, RX1, and Vlach in five trials with the local UCCE farm advisors in Tulare, Sutter, Lake, Glenn and Solano Counties. Stay tuned.

Are You Pushing Out a Chandler Orchard in the Next Year? Call Kat!

Are you planning on pushing out an old Chandler or Tulare orchard this fall or next spring? We could use your help filling in one of the final pieces of the walnut nitrogen budget puzzle. We need to know how much biomass and nitrogen is in the woody tissue of grown walnut trees. As you're all aware, nitrogen use is coming under increasing scrutiny. We need precise, replicated measurements to justify how much nitrogen to budget for tree growth every year. If you might be willing to allow us to remove a few trees before you pull the rest of an orchard you are removing, please call Kat Pope at (530) 377-9528 or send an email to kspope@ucanr.edu.