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ORCHARD FACTS

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Sacramento Valley Walnut Newsletter

Howard Nut Drop

Joseph Connell, UC Farm Advisor, Butte County

During the last week of June and ending about July 1st, young Howard walnut trees experienced nut drop of perhaps as many as 200 nuts per tree. These nuts were full size with the shell beginning to harden. Cutting open an immediately dropped nut, you could see darkening of the inside kernel material and termination of shell development that appears to have been triggered about 10-14 days before the drop was observed. This nut drop, wide spread with the Howard variety, was similarly noted in 2003. Few, if any, nuts are dropping now. Several possible causes are explored in this article.

Lack of Pollination? From studies that have been done on pollination, we know that un-pollinated walnut flowers fall off about 4 or 5 weeks after bloom. We do not believe that pollination is likely to be a limiting factor in walnuts, especially under most typical situations where there are many walnuts in the area and lots of pollen in the air. Further, these dropped nuts were much larger than nutlets aborted due to a lack of pollination or fertilization. There also appeared to be as many dropped nuts from trees near pollenizers as there were from trees farther away. Pollination is not a likely explanation.

Internal walnut blight? There was some speculation that this nut drop was "internal walnut blight". Although walnut blight does progress into the nut it's doubtful this was the case because there were generally no external walnut blight symptoms. Affected orchards were mostly young with little opportunity to have established walnut blight bacterial populations. Older Howard orchards, where blight bacterial populations could be well established generally had little nut drop. Samples sent to the UC plant pathology lab from previous Howard drop events with similar symptoms were unable to detect any evidence of walnut blight bacteria. So, internal walnut blight does not appear to be the problem.

Wet soil? In both 2003 and 2011, spring conditions were wet, and it has been suggested that the wet soils resulted in stress due to saturation. This might have contributed in some cases, but not all soils were saturated yet apparently the nut drop was widespread over several counties. Howard nut drop was also observed on sandy soils that weren't retaining water. If saturated soils were at fault it would seem other cultivars might have been affected in the wettest most saturated areas and this didn't seem to be the case.

Abrupt temperature change? Only Howard was affected with nut drop in 2003 when sudden high temperatures occurred at about the same time of year. A sudden increase in temperature at a critical stage in nut development may have killed the developing kernel resulting in the nut drop. This year, the daily high temperatures from bloom through June 12 were mostly in the low 60s to low 80s°F. These mild temperatures were followed on June 14 and 15 by a sudden rise of temperature to 96°F accompanied by dry north winds while humidity dropped from 72% to 31%. These temperature and humidity fluctuations were also reasons for the mesophyll collapse seen in leaves. An additional temperature/humidity fluctuation was seen between June 28 and July 3 when a daily high temperature of 67°F and over an inch of rain was followed by a return to over 99°F.

Combination of factors? It's been an extremely unusual weather year and it's possible that a sudden increase in temperature coming in saturated soil situations might have contributed. Perhaps Howards are more sensitive to any stress – too much or too little water, sudden temperature extremes, heavy crops, or soil type may be playing a part as well. Environmental stress is the suggested cause and Howard may just be more sensitive to stress than other cultivars. Unfortunately, these are our best guesses as there is no way to do an experiment that will clarify the situation.

We've observed this problem before…so what caused it? The short answer is that no one knows for sure. It may be nothing more than "June drop" on heavily set young Howard trees; perhaps triggered by the sudden rise in temperature and drop in humidity. Perhaps this explains it...even after the drop, the Howard crop still looks pretty good.

Codling Moth – The 2011 Season

Richard Buchner, Tehama County Farm Advisor and

Carolyn Pickel, Sacramento Valley Integrated Pest Management Advisor Emeritus

Each year presents new challenges for timing first codling moth sprays. In years with consistent warm weather during moth emergence, flight activity is better defined making spray predictions more "text book." In years with alternating wet, cool, and warm weather during March and April measuring moth activity is more difficult. Since codling moth relies upon temperature for development, variable weather results in variable trap catch data making it more challenging to predict moth activity. As conditions become more variable, more tools are necessary to follow moth activity with confidence. These include pheromone traps with standard lures or CM-DA "combo" lures if you wish to monitor female activity, tracking and accumulating Degree Days and verifying sunset temperatures above the 62°F threshold for egg laying.

Codling Moth Biology

Codling moth over winters as fully grown larvae in bark cracks on tree trunks and limbs. Over wintering larvae emerge as adult moths in the early spring. The monitoring season begins by hanging codling moth traps in orchards by mid March before the first codling moths emerge. Get traps out early to record several

dates with zero catch so you can monitor first moth catch. University of California Integrated Pest Management defines "biofix" as the first date that moths are consistently found in traps and sunset temperatures have reached 62°F. The first sustained catch of female moths is referred to as the female biofix. Male moths usually emerge first followed by the females. Because of the differing emergence some managers prefer to use "combo" lures and sex moths to identify the female biofix. Male codling moths have claspers at the end of the abdomen. With the help of a low power microscope you can press the abdomen and see the open claspers. Male moths also have darkening on the hind wings. UC advisors can show you how to sex codling moths if you want to follow female activity.

Codling Moth Traps and Lures

The first component of a codling moth monitoring program includes traps. Traps are used to verify flight activity and monitor populations. Unfortunately traps are not good indicators of damage probably because of the many factors that influence trap performance. Traps are hung high in the tree canopy and use pheromones, pear volatiles, or a combination of the two as a lure. Pheromone lures (Codlemone®) attract only male moths and work well in orchards that are not using a pheromone mating disruption (PMD) strategy or do not have neighboring orchards using PMD. "Combo" lures are a combination of Codlemone® and pear volatiles. These lures attract both male and female moths making it possible to follow both male and female flight activity. Combo lures are used in PMD orchards or where neighboring orchards are using PMD because PMD will "shut down" conventional pheromone traps making catch data unreliable. Combo traps with pear volatiles will continue to catch moths in a pheromone environment. Traps placed high in trees catch more moths so high placement is recommended particularly if moth populations are low. If possible, high traps are placed in the upper one third of the canopy. Delta traps catch more moths than the old wing style trap. Trap color doesn't appear to affect trap catch. The orange color trap is less attractive to honey bees which keeps the bottoms cleaner and reduces honey bee mortality.

Degree Days

As with many organisms, temperature controls codling moth growth and development. Accumulated heat units are referred to as Degree Days (DD). One DD is one day (24 hours), with the temperature one degree above the lower developmental threshold. For example, if the minimum development threshold is 50° F and the temperature remains at 51° F for 24 hours, one DD is accumulated. As temperatures rise above the minimum threshold, more DD's are accumulated. In reality, 20 to 30 DD per day would be typical for a hot summer day in the Sacramento Valley. Codling moth thresholds are 50° F for the lower and 88° F for the upper threshold. Charts are available to calculate DD's using maximum and minimum temperatures. Inexpensive temperature sensors are available that directly out put DD accumulations. Local weather information and a DD calculator are available at the UCIPM website http://www.ipm.ucdavis.edu. Click on pest management guidelines.

Degree Days				
Date	Daily	Accumulated	Sunset Temp	Moth Activity
4/24/11	13.0	13.0	§	First male caught
4/25/11	8.7	21.7	§	
4/26/11	12.9	34.6	§	
4/27/11	8.7	43.3	63.2°	
4/28/11	7.7	51.0	§	
4/29/11	5.7	56.7	§	First female caught
4/30/11	9.4	66.1	65.8°	Female biofix
5/1/11	13.3	79.4	64.6°	
5/2/11	13.8	93.2	73.1°	
5/3/11	13.8	107.0	74.1°	
5/4/11	18.5	125.5	74.7°	
5/5/11	17.7	143.2	73.3°	5 females/day
5/6/11	18.5	161.7	74.6	
5/7/11	10.5	172.2	63.9	
5/8/11	8.1	180.3	§	
5/9/11	8.5	188.8	66.8°	First egg hatch
5/10/11	14.0	202.8	72.4°	
5/11/11	13.0	215.8	69.6°	
5/12/11	12.5	228.3	67.5°	
5/13/11	13.5	241.8	73.2°	
5/14/11	6.5	248.3	§	
5/15/11	2.6	250.9	§	
5/16/11	3.4	254.3	§	
5/17/11	4.6	258.9	§	

Figure 1. 2011 Codling moth activity compared to Degree Days and sunset temperature for Tehama County Ashley walnut. First egg hatch is 125 Degree Days from the female biofix. Notice that 13 days following the female biofix were above the 62°F threshold for egg laying. The boxes without numbers were below 62 F.

Historical Moth Catch for Tehama County – First Catch Dates

	2006	2007	2008	2009	2010	2011
Male	4/27	3/26	3/24	3/30	4/26	4/24
Female	5/4	4/2	4/14	4/20	5/3	4/29

Figure 2. First male and female trap catch for Ashley walnut in Tehama County using pear volatiles plus pheromone (combo) lures. The data was measured in a "conventional" orchard not using Pheromone Mating Disruption (PMD).The dates show the variation in codling moth activity through the years.

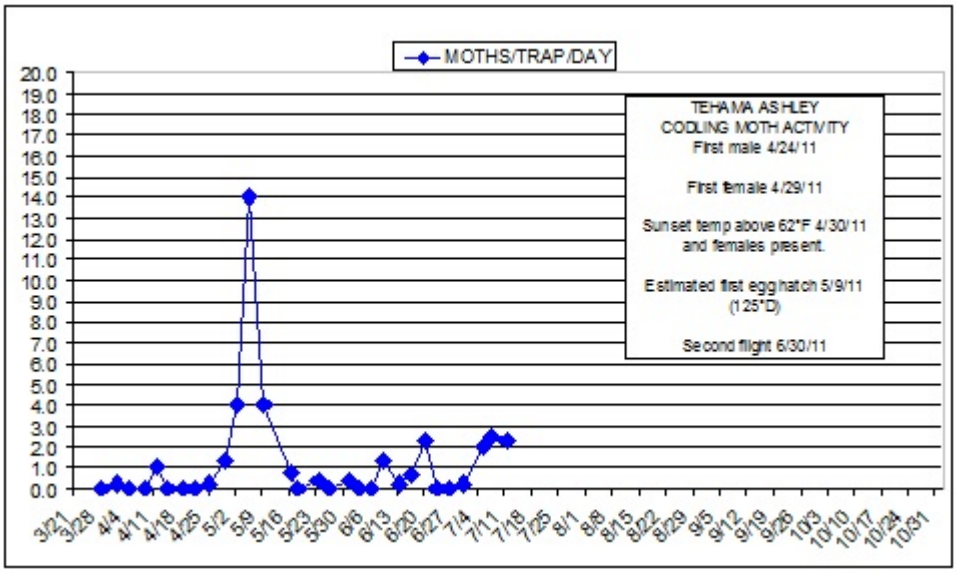

Figure 3. 2011 codling moth flight activity for Tehama County Ashley walnuts.

Codling Moth 2011 Situation

For Ashley walnut in Tehama County, first male codling moths were trapped on 4/24/11 with first females caught five days later on 4/29/11. Sunset temperature (Figure 1) on 4/30/11 exceeded the 62°F threshold for egg laying setting the female biofix at 4/30/11. First egg hatch is predicted 125 Degree Days following the female biofix so we could have had eggs hatching about 5/9/11. Following the female biofix we had thirteen days above the 62°F threshold for egg laying. First spray applications about 5/13/11, possibly tank mixed with a blight spray, should have worked well. Later sprays may have missed and be responsible for the damaged nuts in selected orchards. Remember, codling moth activity data for Tehama County may or may not be representative for other orchards in the Sacramento Valley. Different biofix dates could significantly affect DD accumulation. Orchards must be monitored on an individual basis for accurate codling moth management. Also, experience suggests later biofixes for orchards using Pheromone Mating Disruption (PMD). A consideration if you are using PMD and want to include a spray to decrease moth populations. Temperature and codling moth information are available at the UC IPM web site http://www.ipm.ucdavis.edu. Local codling moth pest management updates are posted at http://cetehama.ucdavis.edu. Click on Orchard Crops, click on Insect Updates.

Movento® (Spirotetramat) as a Nematicide

Carolyn DeBuse, UC Farm Advisor, Solano and Yolo Counties

A new approach to reducing nematodes in standing orchards is available to walnut growers. It is a foliar applied systemic nematicide called Movento® from Bayer CropScience LP. The active ingredient is a growth regulator called spirotetramat. Spirotetramat's metabolites are transported through tree foliage into the root system. Nematodes feeding on roots, ingest those metabolites resulting in nematode surpression.

Nematodes are a serious pest in walnut orchards even when measures were taken to limit their impact pre-plant with good sanitation and fumigation. Populations can build up in the soil or in tree roots negatively affecting tree health. Symptoms on mature trees include general decline, lack of new growth and lower yield. On young trees, nematode feeding results in lack of vigor, poor growth, and general stunting. Many things can cause poor tree health. If good orchard management and/or other approaches do not correct or identify the problem, soil samples to look for nematodes should be taken. The amount of damage depends upon tree age and health the number of nematodes and the species of nematode.

Lesion nematode (*Pratylenchus vulnus*) is the most damaging to walnuts. Lesion nematode migrates, procreates, and feeds inside the root. Ring nematode (*Mesocriconema xenoplax*) and root knot nematode (*Meloidogyne spp*.) can also damage walnut. Ring nematode lives in the soil and feeds on the root tips. Root knot nematode causes swellings on the roots, but only a small percentage of seedling rootstocks are susceptible to it. Both of these nematodes are apt to be more of a problem in sandy soils.

Monitoring: Before choosing a control strategy, nematode presence should be verified and quantified and if possible the species should be identified. Visual inspection of roots can detect nematode damage. Black lesions caused by lesion nematodes, swellings or small galls caused by root knot nematodes and a general lack of feeder roots could all be physical signs but only an experienced lab can determine presence, species and quantity of the nematodes. To collect samples, divide the orchard into 5-acre sections that have similar history and soil type. Soil samples should be collected in the area surrounding the tree where soil is often moist and roots are found easily. Collect soil and include any live roots found from depths between 6 inches and 3 feet. Generally 18 to 24 inch depth is sufficient. Sample randomly across the block; bulk the samples into a sealed plastic bag, keeping the bags cool and away from the heat. Refrigerate the samples if storing them and deliver or mail them in an insulated container. (For

information on labs that analyze for nematodes, contact your farm advisor or PCA). After the presence of damaging nematode species has been confirmed, then decide if you should treat with Movento®.

Research: Movento® use in walnuts has been studied for the previous three years by Dr. Michael McKenry, a Cooperative Extension Nematology Specialist located at the Kearney Agricultural Center in Parlier. His research covering three sites in 2010 showed a 50% reduction in lesion nematode populations over a 5-6 month period with various applications and timing. Movento® was effective in orchards growing on Northern California black and Paradox rootstocks. Yields were not significantly different in treated blocks compared to untreated blocks. For a more in-depth look at these studies, research papers are available online at http://walnutresearch.ucdavis.edu or Dr. McKenry's website http://www.uckac.edu/programs/Nematodes/ . From his research, the following suggestions describe our current understanding of Movento® use in walnuts. This research is ongoing and recommendations will change as we learn more.

Recommendations:

1) Test for nematodes prior to treating
2) Only one application per year is suggested.
3) The best time to apply is in late May, but other times during the growing season are possible.
4) Irrigate the orchard well 4 days ahead of application.
5) DO NOT IRRIGATE for 9 days following application for best efficacy.
6) Rate: 4 oz. per acre is the optimal rate for controlling lesion nematode. A higher rate of 6.25 oz. per acre is needed when trying to control ring nematode.
7) Use of other systemic pesticides in conjunction with Movento® is not well understood and not suggested at this time.

Update on New Walnut Varieties Forde, Gillet and Sexton

Janine Hasey, UC Farm Advisor, Sutter/Yuba Counties

Chuck Leslie, Walnut Improvement Program Director, UC Davis

Bill Olson, UC Farm Advisor, Emeritus

Bill Krueger, UC Farm Advisor, Glenn County

Forde, Gillet, and Sexton are walnut varieties released from the UC Walnut Breeding Program in 2004. They are growing in selection blocks, county and regional trials, and grower's orchards, typically in small acreages. Below are updated observations and research results on the performance of these three varieties on trees ranging from four to ten years old. Until we have more experience with these varieties, we recommend planting them only in smaller acreages.

Forde: Leafs out about 10-12 days before Chandler (about the same time as Vina and Tulare) but continues to harvest close to Chandler. In 2010 it was even later than Chandler in many locations. It consistently produces a very light, plump kernel with 56% yield and no tip shrivel. It has been a precocious yielder and has yielded as well as Chandler in most years except in 2010 when yields were only average. Lower yields were observed in a Stanislaus County trial where Forde yielded only two-thirds the crop of Gillet and Tulare over a three year period. The hull loosens around the nut, but often does not split

widely so nuts tend to stay in the canopy until shaken down. Therefore, when delivered to the dryer, more nuts have hulls and are wet which increases drying costs. Forde is a large, vigorous, upright tree with the nuts tending to be inside the canopy and protected from sunburn damage. In a Colusa County pruning trial, heavily, and to some extent minimally pruned third leaf trees, produced limbs with excessive branching (witches broom). It appears that limbs should not be headed during the training stage on this variety.

Gillet: Also leafs out 10-12 days before Chandler, but harvests in late September around Vina and Tulare time and before Howard. Gillet has had excellent yields with nuts averaging 51% kernel, generally extra light and light color, little tip shrivel, and yields halves easily. Shell seals are a concern in young trees, but were adequate in 2010. This variety is more suitable for cracking although nuts have been sold inshell. It is a very vigorous, large tree with a more open canopy allowing better light penetration. As with Forde, the nuts tend to be inside the canopy. Results so far in the Colusa County pruning trial suggest that either light heading (tipping) or even no heading of the scaffold limbs in the training stage may be adequate. Because of the earlier harvest, Gillet should be seriously considered for those with all the Chandlers and Howards they can handle.

Sexton: Leafs out the same time as Forde and Gillet and harvests about ten days before Chandler. It is a precocious variety and continues to have excellent yields. It sets in large clusters so may not size all the nuts. Kernel color has been good averaging 80% light and extra light and nuts yield 51% to 53% kernel. Observations include some tip shrivel in the CSU-Chico trial and some oilless nuts in Sutter County in 2010. Nuts have round, smooth and solid shells. It is a smaller tree with brushy growth that tends to form necked buds and narrowly forked branches. The fruiting spurs also die following heavy fruiting. It may require more pruning to form the structure and to prevent possible stunting from early over-cropping in a standard spaced orchard. Sexton may be suitable for hedgerows where limited tree size is an advantage, limb structure is less critical, and heavy early yield is an objective. Its pollen shed overlaps the female bloom. It may exhibit second flowering resulting in some small and late harvested nuts.

Pollenizers: Any of the standard early varieties (Payne, Ashley, Serr, or Vina) should be good pollenizers for Gillet. Howard or Tulare would be appropriate pollenizers for Forde and Sexton.

Walnut Blight Note: These varieties were originally selected and released based in part on observed low blight incidence during testing. Even though they leaf out 10-12 days before Chandler and we've had wet springs in 2010 and 2011, thus far we have not seen blight on these three varieties in northern California trials or orchards except for some limited blight on Sexton. Although the current observations are mostly positive, additional plantings and more experience are needed to confirm the level of blight resistance in these varieties.

Preparing Young Walnut Trees for Winter

Bill Krueger, UC Farm Advisor, Glenn County

As we move into late summer, it is time to think about preparing young trees for the dormant season.

Wind damage: When young trees are vigorous and in windy areas, consider late summer or early fall tipping (light heading cuts on upright vigorous growth) to keep the central leader or primary scaffolds upright and reduce wind damage. Where winds are severe, vigorous first year nursery and field grafted trees that have grown past the eight foot stake should be kept tied to the stake and headed back to no less than 9 feet depending on how much growing season is left. Avoid heading earlier in the season (before September) which may force lateral buds from the trunk to push, resulting in weak "twiggy" branches. This growth depletes tree resources, is not suitable for scaffold selection, and must be removed during delayed dormant pruning. If primary shoots begin to bend, break or flatten out any time during the

second growing season, they should be tipped back to reduce weight and breakage. This light tipping for second year trees can easily be done by hand or mechanically.

Freeze damage: Vigorous young trees growing late into the fall can be damaged by temperatures in the high 20s during autumn frosts that can occur in November. After trees have a few freezing nights they will withstand much lower temperatures without damage. To reduce risk, young trees should be "hardened off" by withholding water in September until the terminal buds are set (stopped growing). Also, avoid applying nitrogen fertilizer after late August. Do not stress trees to the point leaves are yellowing and dropping. Once the terminal buds have stopped growing, taking rainfall into consideration, irrigation can be resumed to match the tree's evapotranspirational (ET) requirements. Normally, the terminal buds will not resume growth at this point. Avoid dry soil in winter which can make both young and mature trees more susceptible to damage from extremely low temperatures during the winter months.

Both fall and winter freeze damage will show darkening of the wood and grey streaks in the inner wood. In the spring, buds are either dead or, if damaged, can be slow to emerge. Sometimes limbs or branches will leaf out, show weak growth and then dieback with resprouting from latent buds breaking further down the limb from undamaged tissues. Sunburn damage is often associated with freeze injury and will increase the overall amount of damage.

If young trees are damaged by an early frost, apply whitewash paint (50% interior latex paint and 50% water) to the trunk and primary scaffolds as soon after the damage is recognized as possible. The whitewash reduces the subsequent sunburn and allows healing of the damaged wood by reducing evaporation from the injury.

In the spring, pruning of suspected damaged trees should be delayed until late summer when the extent of the damage can be accurately determined. Also, reduce or delay fertilizer applications where damage is evident.

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