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Walnut Notes

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Irrigation management tools for developing walnut trees

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Irrigation management decisions for young trees are more challenging compared to mature trees. In mature, full bearing orchards, the leaf area and root zone are relatively constant within a month or so after leafout. In developing orchards (years 1-6) irrigation managers have to account for an expanding canopy and enlarging root zone. Water loss through stomata at the leaf surface represents the primary way trees lose water, so as the leaf area expands water loss increases. Roots provide water uptake surfaces. As roots elongate horizontally and vertically, they improve access to additional soil moisture from storage of winter rainfall and rainfall that occurs after leafout as well as irrigation. In addition to a rapidly growing tree and changing evapotranspiration, water placement with an irrigation system is much more critical in developing orchards, particularly in the first year. Irrigation managers have to get adequate water to a much smaller target as first year root systems are small. Water placement is even more critical for potted trees.

We have visited orchards where the root zone in first or second year trees is completely dry following a seemingly adequate irrigation. The water did not get to the small developing root systems. Sometimes misplacement of the water encourages weed competition and other challenges. As trees grow, root systems expand and placement becomes less critical. Ultimately for mature trees, the crown area is purposely kept dry to discourage Phytophthora infection.

The goal in a developing orchard is to grow a large, structurally sound bearing area quickly. Several tools/techniques are available to help with irrigation decisions to get young walnut trees off to a good start.

1) Orchard Evapotranspiration – Real time daily or weekly estimates of orchard evapotranspiration (ET) are available, but they are typically projected for mature orchards with larger, more

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constant canopies. The challenge for young, developing trees is to adjust ET values to accurately predict water loss for a small expanding leaf area as well as accounting for expanding access to soil moisture as root systems grow. Figure 1 shows how that might be done. Orchard ET is covered in much greater detail at: http://cetehama.ucanr.edu/Water___Irrigation_Program/Weekly_Soil_Moisture_Loss_Reports/

2) Applied water – Measurement of applied water and/or knowledge of irrigation system performance are necessary to know whether the amount of irrigation and rainfall match estimates of real-time orchard ET. Flow meters are relatively inexpensive and fairly easy to install. Irrigation system evaluations may be available for growers in Tehama, Glenn, and Butte Counties from the Tehama County Resource Conservation District Mobile Irrigation Lab. During the past decade, the Mobile Irrigation Lab has been a free service. However, there may be a fee for the service in the future. For more information see http://www.tehamacountyrcd.org/services/lab2.html.

Figure 1. Water use estimates for first, second, third and fourth leaf walnut trees. PAR is a measure of sunlight interception. PAR stands for Photosynthetically Active Radiation.

3) Soil moisture monitoring – Visual evaluation, tensiometers and/or resistance blocks are the typical tools for use in developing trees. Once the orchard is developed, more sophisticated soil moisture monitoring devices may be used. One simple and effective method is to auger holes directly under the planted tree and visually evaluate soil moisture for adequacy. Visual inspection will indicate whether enough water is penetrating the soil in the smaller root zone. Soil color and how well the soil sample adheres to the auger and/or your hand are related to moisture content.

Tensiometers and resistance blocks are available to measure root zone soil moisture tension. Placement is critical when installing these devices. They are only as good as the root zone they represent. Some irrigation managers place a resistance block in the root mass at planting. Blocks can be checked frequently using a hand held meter. Tensiometers use a pressure gauge to indicate soil moisture tension. Additional information on measuring soil moisture can be found at: http://cetehama.ucanr.edu/Water___Irrigation_Program/On-farm_Irrigation_Sceduling_Tools/.

4) Midday Stem Water Potential – More and more irrigation managers are using pressure chambers to measure midday Stem Water Potential (SWP). In simple terms, the pressure chamber measures the "blood pressure" of a plant. The higher the blood pressure the greater the water stress. The pressure chamber has the advantage of measuring tree response to soil moisture conditions. The disadvantage might be cost and SWP measurements must be made between 12 to 4 pm. Irrigation management using SWP is illustrated in Figure 2. Notice that -6 to -8 bars water stress was maintained in season for shoot growth and -10 to -12 bars water stress was allowed in September to slow growth and prepare trees for winter. Again, more information is available at: http://cetehama.ucanr.edu/files/20516.pdf.

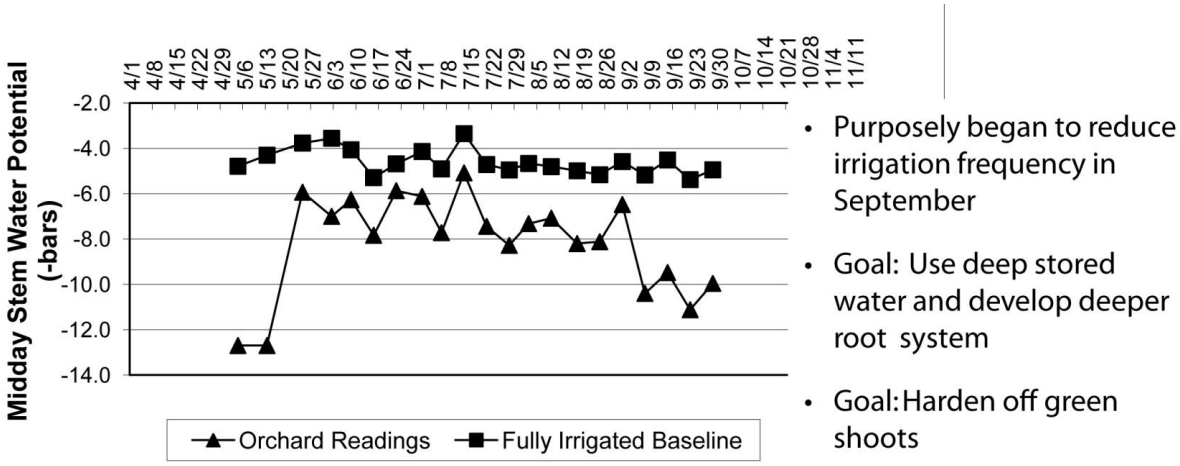

Figure 2. Example of how a pressure chamber SWP is used to manage irrigation in a first leaf walnut orchard. The baseline represents SWP when soil moisture is not limiting ET.

5) More information specifically for developing orchards is available at http://cetehama.ucanr.edu/Water___Irrigation_Program/Irrigation_Management_-_Water_Resource_Meetings/. Refer to the third presentation on the list titled "Irrigation Management Tools for Developing Orchards (34 slides).

Walnut husk fly trap study

Janine Hasey, UCCE Farm Advisor, Sutter, Yuba, and Colusa Counties
Bob Van Steenwyk, Research Entomologist, UC Berkeley

Walnut husk fly (WHF) continues to be a serious insect pest in the Sacramento Valley. Timing of control relies on monitoring adults with yellow sticky traps with ammonium carbonate lures. In 2011, several orchards had extensive husk fly infestation although few flies were captured in the traps. It was speculated that the commercial WHF trapping system was not accurately monitoring the WHF population emergence. Studies were conducted in 2012 to examine the effectiveness of different commercially available traps and lures which is summarized in this article. For more information on the performance of the various traps and lures, see Walnut Research Reports 2012 at http://walnutresearch.ucdavis.edu. For information on WHF biology and spray timing, see http://cesutter.ucanr.edu/files/168651.pdf

The Studies: Trials were conducted in commercial orchards in three counties on different varieties: San Benito (Payne), Sutter (Hartley), and San

Joaquin (Vina). Ten trap and lure treatments were at two different trap heights; low traps were placed about 6 feet above the ground, high traps were placed in the top 5 feet of the tree canopy. All traps were checked weekly and trap positions were rotated within the block weekly to correct for position effects. Traps were placed in trees 12-14 June depending on location and were monitored until 4-7 September.

Since this is a summary article, only the data for the standard trap/lure and trap/lures found to be most effective is presented.

- Standard trap - Trécé Pherocon® AM/NB traps with Trécé AM Supercharger (**T-trece)**
- Trécé Pherocon® AM/NB traps with UC super-charged ammonium carbonate lures (**T-carb)**
- Alpha Scents trap with Alpha Scents brand RHACOM lure (**AS-alpha**)
- Alpha Scents trap with UC super-charged ammonium carbonate lures (**AS-carb**)

Results: Trap data from the three orchards were combined and analyzed by height and sex.

High traps captured more female and total WHF. T-carb, AS-alpha and AS-carb traps captured significantly more female, male, and total WHF than the T-trece.

Low traps captured slightly more males. There was significantly more male WHF captured in T-carb, AS-alpha and AS-carb than T-trece. AS-alpha traps captured significantly more female WHF than all other treatments except AS-carb but AS-carb captures were not significantly different compared to any other treatment.

Lure differences - Alpha Scents RHACOM and UC super-charged lures with ammonium carbonate had significantly greater catch than the Trécé AM Supercharger lure, probably due to the increased load rate of ammonium carbonate and greater release rate of ammonia in Alpha Scents RHACOM and UC super-charged lures compared to Trécé lure.

Which lure to use - Since growers and pest control advisors have had difficulty in purchasing ammonium carbonate, the commercial Alpha Scents RHACOM lures would be the preferred lure.

The traps - The difference in trap catch appears to be the result of ammonia release rate among commercial lures and not the trap design or sticky surface. The Alpha Scents (AS) traps have a hot melt pressure sensitive (HMPS) adhesive while the Trece (T) traps have Tangle-trap® Sticky Coating (TSC) (Contech Co.) adhesive. The HMPS adhesive is less messy than the TSC but it is very difficult to remove flies or debris from it making it a single-use trap. Additionally the AS traps were observed to have large amounts of other insect species that may result in reducing WHF flies captured under very high WHF population densities. The TSC adhesive can be reapplied to the T traps and they can be reused a number of times.

Conclusions:

- Alpha Scents back-folded yellow traps/lures were about twice as effective as Trécé Pherocon® AM/NB traps with Trécé AM Supercharger.
- The increase in effectiveness was related to the lure efficacy and not the trap efficacy.
- Since Trécé Pherocon® AM/NB traps with Trécé AM Supercharger are widely used in California to monitor WHF, the relative lack of the lure's effectiveness may explain the increased WHF infestation observed in 2011.

2013 Study:

A WHF trap study is underway to reevaluate the trap/lures used in this study with the addition of Suterra's trap and lure which was not included in the 2012 trial.

Howard nut drop

Joseph Connell, UCCE Farm Advisor, Butte County

During about the third week in June, young Howard walnut trees experienced nut drop of perhaps as many as 200-300 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 watery kernel material, and termination of shell development that appears to have been triggered about 10 days before the drop was observed. This nut drop, wide spread with the

Howard variety, was similarly noted in 2003 and 2011. 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 pollinizers 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 this recent drop and previous Howard drop events with similar symptoms were unable to detect any evidence of walnut blight bacteria and this was a dry year as well. 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. Pressure chamber readings in some orchards with significant drop in 2013 indicated the trees were too wet, possibly due to over irrigation. This may have contributed by aggravating the problem 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 alone were at fault it would seem other cultivars could be affected in the wettest most saturated areas and this doesn't seem to be the case.

Abrupt temperature change? Only Howard was affected with nut drop in 2003 and 2011 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 May were generally in the mid-70s to a high of about 90°F. These temperatures were followed with temperatures in the high 90s on June 1st and 3rd, mid-80s on June 4th - 6th, and a sudden rise of temperature on June 7th – 8th to 104°F accompanied by dry north winds with humidity dropping from around 70% to 44%. These temperature and humidity fluctuations can also trigger mesophyll collapse sometimes observed in leaves.

Combination of factors? It's possible that a sudden increase in temperature coming where soils are saturated might have contributed. Perhaps Howard is 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 under similar environmental conditions…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 in most mature orchards.

Ethephon use considerations in the Sacramento Valley

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

Ethephon is an ethylene-based plant growth regulator applied at walnut maturity indicated by packing tissue brown (PTB), or shortly thereafter, to accelerate hullsplit and harvest timing. By advancing walnut harvest by four to seven days, nut value is increased by lighter kernel color. This year, start looking for packing tissue brown on early varieties before mid-August. For a thorough discussion of ethephon use, packing tissue brown,

and proper application, read the revised article by Bob Beede, Kings County Farm Advisor Emeritus, at the following link: http://cesutter.ucanr.edu/files/168965.pdf or hard copy is available from our offices. Sampling nuts as stated in the previous article will give you the information you need to either apply ethephon to advance harvest or try for one shake harvest once you determine the date of packing tissue brown.

Considerations when applying ethephon:

- Chandler has been responsive to ethephon application and many local growers have found treating certain blocks a good way to spread the harvest timing and drying into more manageable allotments of this widely planted variety.
- Although Howard is responsive to ethephon, avoid using it in orchards that are stressed with problems such as the "yellow Howard problem".
- The benefits of ethephon application are usually seen 14 to 23 days after application. Test shake a tree and evaluate hull adhesion before committing to harvest.
- In addition, earlier harvest can avoid the last flight of navel orangeworm thus reducing damage and mold damage can also be decreased by avoiding early rains.
- Nuts delivered to the huller/dryer without hulls will dry more quickly than nuts delivered in hull. Less drying time should be needed the earlier the hull cracks and separates from the shell.
- Make sure your ethephon sprays only hit the target walnut crop. Since ethephon is a plant growth regulator, drift onto nearby fruit crops such as kiwifruit can have unintended consequences including fruit drop.

Persons with special needs wishing to attend a program should contact the cooperative extension office in advance, 538-7201. Efforts will be made to accommodate your specific need.

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