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New UC Walnut Budding, Grafting and Planting Video Released

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Carolyn DeBuse, Horticulturist, USDA National Crop Germplasm Repository

Ray Lucas, Senior Producer/Director – Digital Media, UC ANR Communications Services

Walnut growers, nursery personnel and others involved and interested in walnut grafting, budding, and planting can access the newly released UC peer-reviewed video, ‘**Budding, Grafting and Planting Walnut Trees**’. **The entire video has been uploaded to You Tube using the link <http://www.youtube.com/watch?v=KQv65gYTtNU>**. Additionally, each of the 14 individual segments of the 70 minute video can be viewed separately.

The video has been three years in the making and provides in-depth instruction in the “art and science” of selecting grafting wood, performing whip, side whip, and bark grafting, patch budding, topworking older trees, and properly planting walnut trees. There are also sections containing basic information of why and when these operations are done, and the tools needed for each operation. Each segment is stand alone, enabling viewers to choose which they want to watch.

The demonstrator in this video is well-known Lake County nurseryman Alex Suchan of Alex M. Suchan Farm and Nursery in Upper Lake. Alex has been grafting trees since 1948 and offers a wealth of information to novices and experienced propagators, alike. Alex has been demonstrating grafting and planting for many years for commercial farmers, nursery personnel and amateur/backyard orchardists and grafters and the video extends the opportunity to wider and future audiences.

The video was produced by the authors with funding from the California Walnut Board.

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Besides directly from YouTube, links to the entire video and individual segments are now available from the UC Fruit and Nut Research and Information Center website, <http://fruitsandnuts.ucdavis.edu/photogallery/BuddingGraftingWalnut/> where viewers are also directed for more detailed information on walnut propagation. The video will also be available soon from the UC ANR Communications Services online catalog and from individual walnut farm advisors' websites. DVDs will be available in the near future for those who prefer a "hard copy" format.

Further information on the video can be obtained by contacting Rachel Elkins, Pomology Farm Advisor for Lake and Mendocino Counties, rbelkins@ucanr.edu.

Fall Orchard Management Considerations

Danielle Lightle, UCCE Farm Advisor, Glenn, Butte, and Tehama Cos.

Janine Hasey, UCCE Farm Advisor, Sutter, Yuba and Colusa Cos.

Harvest considerations:

- Early harvest timing will maintain kernel color quality and reduce infestation by navel orangeworm and mold-causing fungi.
- Shake only what can be picked up in the same day to preserve quality. The greatest loss of walnut quality occurs in the first 9 hours after harvest.

Postharvest pruning:

- Prune blighted branches and deadwood after harvest to remove possible *Botryosphaeria* (Bot)/Phomopsis or branch wilt infected wood.
- Prune when it is dry and rain is not predicted to avoid spreading Bot spores to fresh pruning cuts.
- Remove diseased wood from the orchard floor and burn if allowed.

Navel orangeworm (NOW) and codling moth (CM) control:

- Grade sheets may only identify damage as 'worm'. If insect damage is seen at harvest, identify which larvae have infested walnuts to determine insect control needs for next season. Descriptions of NOW and CM larvae and damage are found here: <http://www.ipm.ucdavis.edu/PMG/selectnewpest.walnuts.html>
- Once harvest is completed, be sure that hullers and dryers are clear of all trash nuts that may be harboring moth larvae.

Weed management/cover crops:

- Conduct a weed survey to evaluate the efficacy of the current year's weed control program and make appropriate changes for next season. More information can be found at: <http://www.ipm.ucdavis.edu/PMG/C881/m881dcweeds.html>
- Apply pre-emergent herbicides for winter weed control mid to late fall. Watch the weather and apply shortly before rainfall so that rain will move the herbicide into the soil before seedlings emerge.
- If considering a winter cover crop, ideal planting timing is after harvest but before leaves drop. With the possibility of continuing drought conditions, seeding a cover crop should only be considered where irrigation can be applied November through January if there is little or no rain. More information on cover crops in walnuts is available here: <http://anrcatalog.ucdavis.edu/pdf/21627e.pdf> and http://cesutter.ucanr.edu/Orchard_Crops_254/Cover_Crops/

Black Mushy Walnut Hulls – Possible Causes

Richard P. Buchner, UCCE Farm Advisor, Tehama County

Emily J. Symmes, UCCE Integrated Pest Management Advisor, Sacramento Valley

There are various reasons why walnut hulls turn black and become mushy. Some are pest related while other reasons include environmental stresses or tree physiology. This article briefly discusses each of these potential causes.

Walnut husk fly (WHF). In the Sacramento Valley, WHF egg laying can occur as early as late June or the first week of July; therefore it is recommended that traps go up by early June. WHF maggots are whitish after they hatch and turn yellow as they mature (Figures a, b). Mature WHF maggots are distinctly yellow with black mouthparts and measure approximately 3/16 of an inch long. Observing such maggots inside the husks of black, mushy walnuts on the tree indicates WHF infestation. The outer skin of the husk usually remains intact, hiding the maggots inside. After feeding in the husk for 3 to 5 weeks, mature maggots drop to the ground and burrow several inches into the soil to pupate and emerge in following years. There is one generation per year. More information on WHF is available at: <http://www.ipm.ucdavis.edu/PMG/r881301211.html>

Vinegar flies. Nuts on the ground or with husks blackened by other factors may be secondarily infested with the larvae of vinegar flies (*Drosophila* spp.), which should not be mistaken for WHF damage. Vinegar fly maggots are smaller and remain white in color compared to WHF maggots. For this reason, the mature yellow maggot stage is the best indicator to distinguish WHF and vinegar fly infestation.

Lack of adequate carbohydrate. Hulls may also become black and mushy due to lack of adequate carbohydrate when photosynthates are insufficient for nuts to mature properly. The carbohydrate deficit occurs later in the season, which is why the kernels are well formed and often look normal. These nuts can occur in many different situations when carbohydrate demand outweighs supply, usually in the lower inside shaded areas of the tree canopy. This condition appears to be more prevalent in heavy bearing varieties like Chandler, Howard, and Tulare and in heavy crop years, possibly because heavier crop loads place more nutritional demand on the tree to mature the crop. Reduced light penetration into the lower inside spurs for these and other varieties contributes to hull breakdown as well.



Figure 1. Newly hatched (A) and mature (B) WHF maggot. Photo by Bill Olson.

Environmental stresses. Environmental conditions and/or orchard management will also affect tree physiology. Any stresses experienced by the tree would be expected to impact kernel and husk condition. Moisture stress can be problematic and irrigation management that allows trees to experience large changes in stem water potential – becoming either too wet or too dry – may influence husk and kernel integrity

Diseases. It is possible that some of the black husks are related to *Botryosphaeria* (Bot) and/or *Phomopsis* infections. Initially, these diseases cause the hull to turn black and soft, but by late summer/early fall, the hull dries to a black/brown color (Figure 2). Research to understand the nut blight phase of Bot and *Phomopsis* is ongoing by Dr. Themis Michailides and cooperating farm advisors and growers.



Figure 2. Blighted fruit caused by Bot. The photo on the right shows Bot pycnidia. Photos taken September 3, 2014 by Themis Michailides.

Orchard Removal and Site Preparation for Walnut Planting

Joseph Connell, UCCE Farm Advisor Emeritus, Butte County

Getting a walnut orchard off to a good start is essential considering the investment cost required to develop a new orchard. If you are removing an existing walnut orchard that will be replanted, it's a good idea to plan for an 18-24 month transition between orchard removal and planting new trees. Trying to rush the operation creates several opportunities for a less satisfactory outcome. Walnut replant disease, nematode management, and soil preparation are important issues to consider when planning for a new walnut orchard. However, if you are planting a new orchard in land that has been fallow or in non-host field crops for two or three years, fumigation may not be needed.

Know your soil and your field. Before planting or replanting, review your local soil survey for information on the type of soils on your site and their distribution. Soil surveys describe each soil type and provide information about drainage, flooding, exchangeable sodium content and other details important for successful orchard establishment. However, soils can vary from survey descriptions. Using a backhoe to dig pits 5 to 6 feet deep in strategic locations where soil differences are expected will reveal stratified soil, compacted zones, hard pans, clay pans, or sand or gravel layers. Abrupt changes in soil density or texture can result in perched water during extremely wet years, endangering root health.

Do your best to identify and fix problems before your new orchard is planted. Stratified or compacted soil layers should be disrupted prior to planting by ripping or slip plowing. Soil modification in late summer or fall when the soil is dry will ensure the most disruption possible while allowing winter rains to settle the soil before planting and will avoid compaction. A slip plow (a ripper shank with a steel plate coming from the point of the ripper at a 45 degree angle to the surface) can lift soil at the bottom of the shank to the soil surface and permanently disrupt restrictive layers. Ripping breaks apart compaction or shatters hard pan, while slip plowing mixes soils with a clay pan or other restrictive layers. Both are typically done in two directions, with the second pass diagonal to the first. Another alternative is to use an excavator to turn over and mix soil layers in a wide slot down each tree row. This subsoil work should be done far enough in advance to allow soil settling to occur before planting. Once settled, low spots should be graded and leveled to improve surface drainage to help keep trees healthy. Planting trees on berms is recommended for most soils to reduce the chance of developing crown rot.

Root lesion nematodes. The root-lesion nematode of concern in California is *Pratylenchus vulnus*. English walnut, seedling Paradox hybrid, and black walnut rootstock are all highly susceptible with each root tip capable of supporting thousands of nematodes per gram of root. Almost every woody perennial will host this nematode species to varying degrees, so any previous tree crop planting is likely to have hosted *P. vulnus*. Most *Prunus* rootstocks are less preferred but still considered good hosts of *P. vulnus*. Equally important, *P. vulnus* can flourish in any soil type and at any depth on deep rooted woody perennials. These nematodes will slowly spread across an orchard via tillage and irrigation and over time will enlarge the area of plant damage.

Kill existing orchard root systems (and nematodes in walnuts) before tree removal. The main value of killing existing roots is to mimic *some* of what occurs when you fumigate. Research has shown that glyphosate is best for killing *Prunus* species roots (prunes, almonds, and peaches). Killing the old orchard's *Prunus* roots reduces the replant problem, but, it does not significantly reduce lesion nematodes since *Prunus* roots are not all killed with this treatment.

Garlon3A[®] combined with a surfactant is an effective treatment for killing walnut roots. Use of Garlon 3A on orchard cut stumps is currently allowed under a Special Local Needs 24(c) label. Users should have the Garlon 3A label and the 24(c) label for cut stump use in hand when they make the application.

The most effective method for killing root systems is to cut the tree down and paint the cambium of the freshly cut stump with herbicide within 5 minutes (see details below). This method can be used for any orchard crop. If you are removing an old orchard, use the stump killing method in the early fall before the end of October and treat promptly when trunks are cut off. Do not use this treatment in orchards being thinned due to the potential for damage to surrounding trees as a result of root grafting.

For orchard stump treatments, cut trees with a saw a couple of feet above the ground and paint the cut surface *within 5 minutes*.

- **For almonds, prunes, and peaches**, cut the trees to be removed before the end of October and paint the stump with straight undiluted Roundup[®] or a 1:1 mix of Roundup[®] (41% glyphosate) and MorAct[®]. This

herbicide treatment will reduce the *Prunus* replant problem but will not reduce populations of root lesion nematode within roots or soil (lesion nematode eggs can persist in dead *Prunus* roots for 2 years). Fumigation will still be needed if walnuts are to follow other orchard species.

- **For walnuts**, cut trees before the end of October and paint the stump with straight undiluted Garlon3A or a 1: 3 mixture of Garlon3A and MorAct or equivalent surfactant. Dead walnut roots break down sufficiently to significantly reduce carry-over lesion nematode populations.

Unless the label says otherwise, to apply herbicide, dab a sponge fastened to the end of a broom handle into the liquid, then onto the freshly cut surface. Fill an old 5 gallon container with a lip around its top no more than half full. Avoid getting the bucket handle wet. These mixtures are thick and paint-like and may damage sprayers or their components, and are also likely to clog the sprayer. Applicators will need boot covers, eye protection, and other personal protective equipment as labels require. Roundup and Garlon3A labels include stump killing recommendations. Be sure to check the labels on the materials you're using to make sure these relatively simple procedures are in compliance with the label.

Fumigation will kill roots down to about 4 feet; however, herbicide stump treatments will kill walnut roots as deep as they go. Root killing herbicide application is especially useful in reducing the walnut replant problem whether or not fumigation is planned. ***Wait at least 60 days after applying the root killing herbicide before removing treated stumps and wait one full year before replanting*** or you will not get much value from the kill treatment. For more information go to UC Nematologist, Dr. Michael McKenry's website <http://kare.ucanr.edu/programs/Nematodes/>

Fallow period: It is not recommended to plant directly after tree removal. Remember that 60 days are required for root killing herbicide to take effect before stump removal. The land should be left fallow for ripening and cultivation the next season. Alternatively, a crop that is not a host to nematodes, such as Sudan grass or safflower, may be planted the following summer to further reduce nematode populations and create more effective conditions for fall fumigation.

Plan for effective fumigation when it's necessary. Send soil samples to a lab to determine if nematodes are present. Plan to fumigate if lesion nematodes (*Pratylenchus vulnus*) are present. Where soil is fallowed, it should be ripped and reworked through the summer to dry the soil to a 5 foot depth. Moisture content at the time of fumigant application should be at or below 12-18 percent. Fumigants work better in dry soils at high soil temperature so fumigate after July 1st and before November 15th before 2 inches of rainfall occurs and while soil temperatures are above 55°F at one foot depth.

Seal the soil. Most fumigants can be followed by sealing the soil with compaction and/or water sealing. The more completely the soil is sealed, the more effective the fumigant will be in reducing nematodes and other soil pathogens. If fumigant is broadcast, follow the label recommendation of additional water to increase penetration. Follow label recommendations for time needed to aerate the soil before planting.

How to Avoid Freeze Damage in Young Walnut Trees

Katherine Pope, UCCE Farm Advisor, Sacramento, Solano and Yolo Cos.

You've spent all year pushing your new walnut trees to grow. Now it's time to get them to stop and harden off before we experience freezing temperatures. It's tempting to push growth as long as possible, but that's risky. In severe cases of freeze damage, young trees can die back almost to the roots. Freezing temperatures can also severely damage trees in mid-winter if the trees are in dry soil.

Freeze Damage

Vigorous young trees are more vulnerable to freeze damage than older trees. Fully dormant walnut trees can withstand temperatures well below freezing. The problem comes when temperatures drop to 28° F or below before the trees have experienced a few nights near 32° F to become acclimated. Trees can be managed to encourage cold hardiness by following these key steps:

- Don't apply nitrogen fertilizer past August. This avoids encouraging new, tender growth.
- Withhold irrigation during September until a terminal vegetative bud sets.
- Consider protective painting with white latex.
- Delay pruning young trees until March after the threat of frosts have passed.

Water management is perhaps the most critical step. To encourage terminal bud set, avoid irrigating in September until growth at the tips of the branches has stopped. Hold off on water until you stop seeing new growth and red leaves but not so long that you get yellowing leaves and defoliation. Once growth has stopped, resume irrigating in October if there is no rainfall. Make sure soil is moist before the possibility of a November freeze event.

In addition to water management, painting young trunks and shoots white can prevent freeze damage if applied before a freeze event, and can minimize damage if applied as soon as possible after a freeze. Research by UC Walnut Specialist Bruce Lampinen has shown painting after leaf fall with white interior latex paint diluted 50% with water minimizes damage to shoots and buds, especially on the south-west side of the tree. The paint moderates large day-to-night temperature fluctuations after sunny winter days.

If you don't paint early, painting trees after a freeze can still help decrease severe damage. Wilbur Reil, Farm Advisor Emeritus, found that when trees were painted a week after a freeze event 18% showed damage, compared with 46% damaged in the unpainted trees. Painting any parts that may be damaged should improve recovery and protect against winter sunburn of affected tissue. To know if you have freeze damage that warrants painting, look for darkened cambial tissue below the bark. Symptoms resemble sunburn. It's most likely to be found on the south and west side of the tree, especially on horizontal branches.

Winter Kill

For almost a century, it's been observed in California that after a freeze event walnut trees on dry soil are more likely to suffer damage than trees on moist soil. Hopefully, we'll have a wet fall, but if not, this risk will be important to keep in mind. Walnuts on lighter soils are thus particularly susceptible. If rainfall is minimal in November and December and temperatures threaten to drop below freezing, irrigate to moisten soil.

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