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FRUIT AND NUT NOTES

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SACRAMENTO VALLEY REGIONAL WALNUT NEWSLETTER

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The "SACARAMENTO VALLEY REGIONAL WALNUT NEWSLETTER" is a collaborative effort of walnut research specialists working together to provide Sacramento Valley growers and industry leaders the latest research and information effecting walnut production in today's changing environment. This newsletter will be published quarterly, be sure to look for upcoming issues!

WHY ARE SOME INDIVIDUAL YOUNG WALNUT TREES TURNING YELLOW AND NOT GROWING?

Richard Buchner & Joe Connell, UC Farm Advisors - Tehama & Butte Counties

When an individual young walnut tree turns yellow compared to all of its neighbors it often indicates that there is something going wrong in the root system. There are a variety of potential causes for these symptoms and we can't explore all of them fully here but we'll try to comment on some of the main things we see on farm calls.

Water logging. One of the more common problems has been water logging injury due to either excess irrigation or periods of excessive rainfall sometime during the past two years. When walnut roots are excessively wet they can die from lack of oxygen even without any major pathogens present. Rain during fall 2007 could have been a problem for some trees in young orchards that made good growth up the stake the 1st year (2006), made good growth the second growing season (2007), were pruned back last dormant season, BUT, either didn't grow this spring or made very weak growth in 2008. The rain in fall 2007 following irrigation may have been too much water resulting in damaged roots. Dead roots were already decomposing from secondary fungi in July 2008 while callus was growing along the edges of the sunken dead areas compared to live portions of the root. There was no *Phytophthora* detected, only decay caused by secondary fungi.

Moisture stress Good irrigation management is required for walnut growth and vigor. Young walnut trees are very sensitive to moisture stress and will stop growing at relatively low stress levels. Root systems need to be kept moist but not wet enough to favor root rot fungi and/or low oxygen conditions. Pressure chambers are the most effective technique for measuring tree water status. Research suggests walnuts will slow shoot growth at –8 bars Midday Stem Water Potential. Soil augers are useful for visual soil moisture evaluation and various soil moisture sensors are available. Be careful when using irrigation systems designed for mature orchards with large root systems where water placement is not as critical. Furrow or sprinkler water application may not always reach small root systems in young orchards resulting in tree stress and poor growth.

Soil borne diseases Diseases affecting crown and root systems of walnut trees include *Phytophthora* root and crown rot, Armillaria root and crown rot and Crown gall. Both *Phytophthora* and *Armillaria* cause similar above ground symptoms: poor terminal growth, small chlorotic leaves, premature defoliation, decreased productivity, dieback of terminal shoots and subsequent collapse and death. For *Phytophthora*, disease severity depends upon *Phytophthora* species, soil type, climatic conditions and tree age. *Phytophthora* affects the inner bark and cambium typically staining the wood and creating dead tissue (canker) that can extend above ground up the tree trunk. Black ooze from infected, decayed bark may be noticeable on either the English scion or the above ground portion of paradox rootstock. Removal of the outer bark reveals dead, brown tissue with a water soaked zonate appearance near the margin between healthy white and infected brown tissue if the fungus is active. Excessive soil moisture favors infection.

Armillaria or oakroot fungus is identified by removing dead bark from crown or root tissue and looking for creamy white, fan shaped fungal growths (plaques). These plaques are usually most abundant between the bark and woody tissue at the crown. The most reliable diagnosis is the presence of rhizomorphs which resemble brown to black shoestrings and are usually found adhering to the outer bark of roots. They develop best in moist soil. Armillaria may produce clusters of mushrooms around the base of infected trees following rainfall, usually from October to February.

Crown gall, caused by the bacterium *A. tumefaciens* is relatively easy to identify. Young galls are roundish "golf ball" shaped growths on root and/or crown tissue. Galls are made up of undifferentiated, disorganized soft spongy tissue. As galls enlarge, gall centers die creating an open cavity. Galls most often develop on root or crown tissue underground and may not be noticed until they enlarge and push soil up around infected trees. Careful excavation using shovels, water or air jets will reveal crown gall infection. Crown gall infected trees will be stunted, demonstrate poor growth and yellow foliage depending upon how severely the gall encompasses the crown. Untreated galls can girdle the tree .

Nematodes The four most common genera of nematodes found in walnut orchards are Root lesion (*Pratylenchus vulnus*); Ring (*Criconemella spp.*); Root knot (*Meloidogyne spp.*) and Dagger (*Xiphinema spp.*). Each nematode has its own method of infesting roots but they all damage root systems. Nematodes seldom kill trees they are tree stressors and act in conjunction with other stress factors to reduce growth and yield. Poor performing trees particularly in replanted orchards, without preplant soil fumigation are good candidates for nematode damage. Walnut roots may exhibit dark elongated lesions on inner bark tissue or show knots or galls. A soil sample analyzed by a lab familiar with nematode identification can confirm an initial diagnosis.

Vertebrates Rodents are potential pests in all orchards, but they are more likely to invade orchards next to rangeland or unmanaged areas. Voles, also called meadow voles or meadow mice, may move into walnut orchards and feed on the bark of young trees particularly when vegetation around tree trunks offers cover and protection. Pocket gophers are potentially serious pests especially in young orchards. Girdling and root damage results in poor tree growth and tree death if severe. Look for parallel tooth marks at feeding sites on the wood.

PLANTING A SUCCESSFUL ANNUAL RESEEDING COVER CROP

Janine Hasey, UC Farm Advisor, Sutter and Yuba Counties

Mark Cady, Community Alliance with Family Farmers

Three cover crop systems used in walnut orchards are winter green manure crops that are mowed or cultivated in spring, annual reseeding legumes or grasses, or perennial sods. This article focuses on annual reseeding cover crops although the planting guidelines are similar for successfully establishing any seeded cover crop.

Annual reseeding cover crops are planted initially in the fall and managed during the spring and early summer to allow plants to naturally reseed. They can only be maintained in non-cultivated orchards. Once seed has fully matured in early to mid-June, the annual reseeding cover crop is mowed. If managed properly, the cover crop will reseed annually and reestablish the following fall and winter so costs incurred will be initial seed and planting costs only.

Why are annual reseeding cover crops so well suited to orchards in our area? A primary advantage to an annual reseeding cover crop in high rainfall areas such as the Sacramento Valley is <u>better fall and winter orchard access</u> due to firmer ground. Early fall rains can make it very difficult to harvest in walnut orchards cultivated for weed control or incorporation of a winter green manure cover crop. Other advantages may include weed suppression, less runoff compared to bare soil, and reduced labor and diesel costs since the seeded cover crop is usually mowed only a couple of times in the spring and early summer. Allowing resident vegetation to grow during the winter with mowing in the spring and summer has many of these same advantages but may have less biomass than a seeded cover crop.

For any fall-seeded cover crop, the best results will be achieved with the earliest possible planting date. Any time in October to early November is suitable for planting a cover crop in the Sacramento Valley. By December, soil temperatures are too low to provide quick and consistent germination while competition from resident vegetation becomes more of a problem. A cover crop can be planted in young non-producing walnuts in October. In producing orchards, plan to seed just after harvest but before significant leaf fall for best stand establishment. Make sure the seed and equipment are lined up before walnut harvest begins.

Cover crops can be seeded with various planting equipment including a no-till drill, a standard grain drill or a broadcast seeder. No-till drills can be rented from seed suppliers or Resource Conservation Districts (the Colusa RCD has one). Grain drills are standard equipment for most field crop growers. Broadcast seeders are less available, though a fertilizer spreader can be used with some difficulty. In a pinch or on very small acreage, a worker with a large belly grinder on the tailgate of a pickup truck will suffice. Small seeded legume mixes are typically seeded at a rate of 25 to 30 lbs per *planted* acre.

The kind of ground preparation required depends on the seeding equipment. Whatever the method, you will want to have a flat, level surface that is ready for harvest without any further ground work. A no-till drill requires little or no ground preparation and will plant directly into most surfaces. A contact herbicide treatment (*not* a pre-emergent) applied at or before seeding will prevent weed competition.

Both grain drill and broadcast seeders require a soft surface into which small cover crop seed can be placed. Work up the top two inches of soil with a harrow or disk until the surface condition is fairly fine. Plant the seed right away. Seed should be buried in just the top quarter- to half-inch of soil. A no-till or a standard grain drill can place seed fairly precisely. If you broadcast the seed onto soft ground, a single pass with a ring roller should move seed and soil around enough to cover the seed. Normal fall and winter rainfall will be sufficient for germination and winter growth. A light irrigation may be needed by late November if there hasn't been sufficient rainfall for seed germination.

Common problems with cover crop seeding often involve poor timing. Early rain can stop you at any step of the seeding process. If rain falls after ground preparation but before seeding, weed seeds get a head start on the cover crop and the ground can seal up making it impossible to bury the seed with a roller or a standard grain drill. This is a good reason to have your seed and equipment lined up before walnut harvest is over.

This past year, we had several annual reseeding cover crop demonstration sites in tree crops. A subterranean clover mix with varying maturity times was preferred by most of the grower cooperators because it grew lower to the ground and didn't interfere with other cultural practices, it could be mowed more often if needed without decreasing seed production, and it fixed some atmospheric nitrogen. Another cover crop mix that performed well but grew much taller was a nitrogen fixing legume mix with several clovers including Persian clover. These lower growing legume mixes were preferred to those that included the grass soft chess (Blando brome) mainly due to the taller grass but also due to potential benefit of nitrogen fixation. Supplemental nitrogen is needed in mature walnut orchards and should be applied as a broad band in the tree row rather than broadcast or clover seed production will decrease over time. For more information, ANR Publication 21627, "Cover Crops for Walnut Orchards" is available at your local UC Cooperative Extension office.

MANAGING WALNUT HARVEST FOR QUALITY

Janine Hasey, UC Farm Advisor, Sutter and Yuba Counties

In spite of the extensive frost damage experienced by some walnut growers last April, there are some very heavy crops in all varieties this year. The next challenge as you prepare for harvest will be to maintain high nut quality by keeping in mind the most critical factors.

Early harvest pays. The most important fact to remember when harvesting walnuts is the earlier the harvest, the lighter the kernel color; the lighter the kernel color, the more money per pound you'll receive. Kernels are mature and at their lightest and highest value at the packing tissue brown stage when the packing tissue around the kernel has just turned brown.

Before harvest can begin, hulls must split and separate from the shell. Hull split is favored by cool weather, humidity, or rain. Valley temperatures are usually hot at the beginning of harvest which hastens kernel maturity but delays or prolongs hull split, sometimes for several weeks. Kernel color may darken while navel orangeworm and mold damage may increase with time.

Walnut varieties differ in their ability to produce light colored kernels and to retain light color after processing. Chandler retains light kernel color for a long period of time while Howard can become darker relatively quickly after processing.

***Optimizing light kernel color*:** The trick in the hot central valley is to get hull split to more closely coincide with packing tissue brown. To **promote early harvest**, ethephon (sold as Ethrel®) can be used to advance hull maturity. To advance harvest by about 7 to 10 days, apply ethephon when the packing tissue of <u>all nuts</u> just turns brown. Typically, about 17 days later, nut removal will be about 90 percent. Applying ethephon <u>before</u> packing tissue brown will result in decreased kernel weight. Start checking the packing tissue of earlier harvested varieties like Ashley and Serr by mid-August and later harvested varieties before the end of August if you plan to apply ethephon. Some uses of ethephon for early harvest include:

- Treating varieties whose kernels tend to be darker like Vina or those that darken more quickly after processing like Howard.
- Treating early varieties if processors provide early harvest incentives
- Treating young Howards that will be sold in shell
- Treating orchards that suffered late walnut husk fly or navel orangeworm damaged nuts last year

Ethephon can also be used to **promote a one shake harvest** by applying it about ten days prior to normal harvest date. Applying ethephon on some blocks to advance harvest may be very helpful in managing a large Chandler crop this year. Thorough spray coverage is essential when using ethephon, it should not be used on stressed trees, and applications should be made when air temperatures are below 90°F.

***What else can you do to keep walnut kernels light*?** Once harvest begins, pick up, hull, and dry nuts as quickly as possible. Most quality loss occurs in the first 9 hours after harvest. The hotter the temperature, the more quickly kernel color darkens. Do not allow walnuts to become water stressed during the summer or before harvest. Cutting off water too early before harvest can result in hulls shriveling and darker kernel color in severe drought situations. Drying times of less than 24 hours will help keep Howard kernels light in color.

SITE PREPARATION FOR WALNUT PLANTING

Bill Krueger, UC Farm Advisor Glenn County

Preparation for planting a new walnut orchard should start with a soil evaluation. Walnuts have traditionally been planted on class one soils, the deepest most uniform well drained soils. Recent research and grower experience has shown that with the right preparation and planting system walnuts can be successfully grown on less than ideal soils. Soil evaluation will help determine the steps to take prior to planting to insure successful results.

Soil survey maps are a good place to start. A soil survey for the area of interest is available at your local NRCS office, Cooperative Extension office or can be found online at http://websoilsurvey.nrcs.usda.gov/app. The soil survey will provide information on the type of soils present and their distribution and acreage. It describes each soil type and provides information about drainage, flooding, exchangeable sodium content and other details important to successful orchard establishment. The soil survey cannot provide all of the detail that may be necessary. Using a backhoe to further explore the soil can provide valuable information necessary for orchard development. Digging backhoe pits 5 to 6 feet deep in strategic locations where soil differences are expected will allow for a first hand examination of the soil. Look for stratified soil, compacted zones, hard pans, clay pans etc. Your local Farm Advisor may be able to provide assistance in the evaluation of the backhoe pits. Abrupt changes in soil texture can result in a perched water table which is unhealthy for walnut roots.

If soil modification is necessary it will be much easier to accomplish before planting. It should be done in the late summer or fall when the soil is dry to insure the most disruption possible while allowing winter rains to settle the soil before planting. Touch up leveling or smoothing can be done in the spring before planting. Leveling will be necessary if the orchard is to be flood irrigated. With low volume (drip or microsprinklers) or solid set irrigation systems leveling to grade will not be necessary. Leveling to smooth out low spots or improve surface drainage should be done to keep the future orchard healthy.

Deep uniform soils may only require shallow ripping (1.5 to 3 ft.) to loosen the soil. Stratified soils or soils with hardpans or claypans will require deep ripping or slip plowing (3 to 6 ft.) to disrupt layers. Ripping is less effective for clay pan soil because of the elastic nature of the clay which will flow around the ripper and reseal in a short period of time. A slip plow, a ripper shank with an iron plate coming from the point of the ripper at a 45 degree angle to the surface of the soil, can lift soil at the bottom of the shank to the soil surface and permanently disrupt a clay layer. Ripping and slip plowing are typically done in two directions, with the second pass being diagonal to the first. In a walnut trial at the Nickel's Research facility in Arbuckle a backhoed trench 10 years after slip plowing revealed a disrupted claypan and deeper rooting in the slip plowed area compared to the non slip plowed area. Surprisingly, no increase in tree size or yield was noted. This may be due to the low volume irrigation (drip) system and frequent fertilization.

Soil physical characteristics can to some extent be overcome by the use of low volume irrigation, especially under close tree spacings. Soil can be modified to a depth of 6 feet but large equipment is necessary and it is expensive ($300-$500 per acre). Backhoeing tree sites to mix the soil may be practical on sandy soils where it can be done quickly but will probably be cost prohibitive on heavier soils.

Planting trees on berms is recommended especially on heavier soils. Ridge berms in the fall after soil preparation to allow for settling over the winter.

FUMIGATION GUIDELINES

Carolyn DeBuse, UC Farm Advisor, Solano / Yolo Counties

Why fumigate?

When replanting a walnut orchard following an old walnut orchard you need to consider the pests and diseases that remain in the soil that may damage your new orchard. Soil fumigation can reduce or eliminate these soil pathogens, nematodes, perennial weeds, weed seeds, soil fungi and bacteria. It is basically killing the pathogenic soil ecosystem that the previous walnut orchard supported to give your new trees a chance to grow in uncontaminated soil promoting vigorous growth in their first years. Fumigation will provide an economic gain over the life of the orchard as a result of increased yields attributable to a larger tree size. If you are planting a new orchard in land that has been fallow or in field crops for two or three years, fumigation may not be needed. Talk to your farm advisor to make an informed decision.

Fumigation guidelines:

Kill and remove previous orchard roots- The roots left in the soil from the previous orchard will harbor nematodes and pathogens allowing them to quickly invade the newly planted trees. It is imperative to kill and/or remove these roots. To kill the roots, paint freshly cut orchard tree stumps with 50ml Garlon 3A plus 100ml MorAct before the end of October. Wait at least 60 days before pushing the stumps and ripping the ground. If this method is used you do not have to cross rip your ground and hand remove all the roots. If you choose to not kill the roots, they should be removed in the traditional style of deep ripping the soil to bring roots to the surface and then hand removing them from the orchard site.

Nematode sampling: Send soil samples to a lab to determine if nematodes are present. Plan to fumigate if lesion nematode (*Pratylenchus vulnus*) is found.

Fallow for one year: If you can afford to delay planting, the site should be left fallow for at least one year between removal of the old orchard and planting to help decrease nematode and soil pathogen populations and to dry out the soil.

Timing: Fumigation should take place after completion of soil preparation in the fallow year between August and November 1st, before 2 inches of rainfall occurs after July 1.

Soil moisture: Fumigants move 10,000 to 30,000 times faster is soil air than in soil water so it is important to dry out the soil. Moisture content at the time of application should be at or below 12-18 percent. The fallow soil should be ripped and reworked through the summer to dry the soil to a 5 foot depth. Planting Sudan grass or safflower in the spring will also help dry the soil.

Soil temperature: Fumigants work better at high soil temperatures so it is important to fumigate before the soil temperatures drop. It is recommended to fumigate before November 15th with soil temperatures above 55°F. Soil temperatures should be taken at one foot depth.

Sealing the soil: Tarping the soil is recommended following a gas fumigant like methyl bromide. Less volatile fumigants can be followed by sealing the soil with tarps or soil compaction and/or water sealing. The more completely the soil is sealed the more thoroughly the fumigant will work killing the soil pathogens and weeds. If fumigant is broadcast, follow the label recommendation of additional water to increase penetration.

Soil Aeration: Follow label recommendation for needed time to aerate the soil before planting.

Fumigation choices: To make a choice you need to consider your soil type and soil moisture. See chart of available fumigants created by Dr. M. McKenry (2007)

FUMIGANT NAME	APPLICATION AMOUNT	SOIL TYPE	SOIL MOIS-TURE
Methyl bromide (restricted use only)	225-350 lb/ac injected at 10 in.	any	<12-18%
1,3 Dichloropropene (Telone II)	33.7 gpa	sandy-sandy loam	<12%
1,3 Dichloropropene+ chloro-picrin (Telone C-35)	49-50 gpa	sandy-sandy loam	<12%
Telone II plus Metam-sodium (Vapam HL)	Telone 33.7gpa plus Met-sod 110lb/ ac incorporated in top 5 inches	sandy-sandy loam	<12%
Telone II plus chloropicrin	Telone broadcast at 33.7gpa with Pic stripped at 170lb/ac	sandy-sandy loam	<12%
Telon II plus cholorpicrin	Telone 33.7gpa apply using Buess-ing shank at 20 in. plus 250-350 lb/ ac Pic at 28 in.	silty or clay loam	<12-18%

Nutritional considerations: Fumigation can lower available phosphorus (P) and zinc (Zn) so monitor nutrient levels in the new trees with leaf analysis as the orchard establishes. .

For more information go to Dr. M. McKenry's website http://www.uckac.edu/nematode/

Upcoming Field Meeting

"COVER CROP SEEDING DEMONSTRATION"

Tuesday, September 16, 2008
10:00 a.m. – Noon
Highway 70, ¼ mile north of Woodruff Lane
Marysville, CA

Co-Sponsors: UC Cooperative Extension, Sutter and Yuba Counties
Community Alliance with Family Farmers

Details upcoming in "Orchard Notes" newsletter and on the
UCCE Sutter/Yuba Counties website http://cesutter.ucdavis.edu

FRUIT & NUT NOTES

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