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ORCHARD FACTS

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Sacramento Valley Walnut Newsletter

Preparing Young Walnut Trees for Winter

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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 trees and field grafted trees the first year after the graft 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 heavy heading earlier in the season (before October) 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. During the second growing season, if primary shoots begin to bend, break or flatten out, 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 if it's the first frost of the season. . After trees have a few freezing nights they will withstand much lower temperatures without damage. To reduce this risk, young trees should be "hardened off" by withholding water in September until the terminal buds are set (stopped growing). Do not stress trees to the point leaves are yellowing and dropping. Once the terminal buds have stopped growing, irrigation can be resumed to match the 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 may then dieback with resprouting from latent buds sprouting 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.

Controlling Glyphosate-Resistant Weeds in Orchards with Rely: Understanding the Issue and Managing the Solutions

Brad Hanson, UC Weed Extension Specialist, Davis

Doug Munier, UC Farm Advisor, Glenn, Butte, and Tehama Counties

By now, many tree fruit and nut producers in the Central Valley are familiar with glyphosateresistant weed species. In the north Sacramento Valley, glyphosate resistant ryegrass is widespread. In the south Sacramento Valley and through much of the San Joaquin Valley, many horseweed and hairy fleabane populations are no longer controlled with formerly effective glyphosate applications

With herbicide-resistant weeds, spontaneous changes or mutations in the DNA of an individual plant can lead to changes in plant biochemistry and result in loss of efficacy of a single herbicide or whole classes of herbicides for the new biotype. When a resistant biotype is first introduced into a field, whether from a new mutation or seed introduction from another area, it is usually a single plant or perhaps a few individuals and probably is a not a noticeable weed problem. However, if those resistant plants produce seed and the same herbicide is used again (and again) the resistant biotype can become dominant in the population in just a few generations. For most conventional fruit and nut producers, rotating herbicide modes of action is a critical first step in reducing problems with herbicide resistant weeds while ensuring the viability of currently available herbicides. However, wherever feasible, non-chemical weed control techniques like mowing, tillage, and handweeding should also be used to supplement chemical weed control tactics.

One postemergence herbicide that is becoming more important in tree fruit and nut crops is glufosinate, commonly sold in California as Rely, Rely 200, or the newest formulation Rely 280. Rely is a very good, broad spectrum herbicide that can provide control of many common weeds, including several glyphosate-resistant species. However, similar-sounding chemical names and Rely marketing strategies have led to some confusion about the relative strengths of glyphosate and glufosinate.

The biggest difference in weed control efficacy of these two herbicides is related to the translocation, or systemic movement, of the active ingredient once it enters the plant. Glyphosate is generally very well translocated in susceptible plants while glufosinate translocation is much more limited. Because of the reduced levels of translocation, good coverage (adequate water volume, nozzle and pressure selection) is much more critical for

glufosinate compared to glyphosate. On small broadleaf weeds, glufosinate and glyphosate often provide very similar levels of control as long as spray coverage is adequate. Because the growing point of grass weeds is below the soil surface, these weeds can be more difficult to fully control with glufosinate; good burn down of treated tissue is usually observed, but regrowth can occur. Similarly, in established perennial weeds, glufosinate is usually less effective than glyphosate due to regrowth after the initial burn down.

Although Rely does not have the same weed control properties as glyphosate, especially for grasses and perennial weeds, it is a very useful herbicide for reducing selection pressure for new glyphosate-resistant weed biotypes and for managing existing glyphosate-resistant populations.Glufosinate and glyphosate have completely different target enzymes in different biosynthetic pathways. Thus far, there are very few reports of resistance to glufosinate and no reports of glyphosate-resistant weeds also being resistant to glufosinate.

Thumbnail comparison of glyphosate and glufosinate herbicides.

Chemical name	***Glyphosate***	***Glufosinate***
Trade name(s)	Roundup, Durango, Honcho, etc	Rely, Rely 200, Rely 280
Mode of action	Inhibits EPSP synthase (EPSPS) enzyme	Inhibits glutamine synthetase enzyme
Selectivity	Non-selective	Non-selective
Soil activity	Essentially none	Essentially none
Translocation	Very good	Limited
Coverage needed	Less critical	Critical – especially on larger weeds
Broadleaf weed control	Broad spectrum. Good control of small to medium plants but can vary with large weeds.	Broad spectrum. Good control of small weeds, less effective on large weeds or dense stands due to coverage.
Grass weed control	Broad spectrum. Usually good control of vigorously growing grasses.	Broad spectrum. Control can vary by size - seedling grasses often controlled, small established grasses may be burned down but regrow, some success with medium-sized grasses nearing maturity
Perennial weed control	Good – can vary depending on plant size and time of year	Poor – burns tops; however plants often regrow from roots/rhizomes
Resistance reported	Yes, in California – ryegrass, horseweed, hairy fleabane, others suspected. 19 species worldwide.	Not in California. Ryegrass in Oregon, goosegrass in Malaysia.

Annual ryegrass is currently the main weed with resistance to glyphosate in the Sacramento Valley. Here are a few important points:

- Although ryegrass is a winter annual weed, under irrigated conditions it can germinate at any time of the year.
- For the past two years we've been studying mid-summer (July/August) germinating ryegrass. Some of these weeds are surviving the pre-harvest burndown herbicides and entering the early fall as older well tillered plants which are difficult to control.
- Early fall applications last year of pre-emergent herbicides in one Sacramento Valley almond weed control trial gave erratic control of ryegrass when they were applied before the first post-harvest irrigation. According to one knowledgeable PCA, applying pre-emergent herbicides after the first post-harvest irrigations often gives better ryegrass control.

When properly used as part of a well-planned weed management program, Rely can be an effective weed control and resistance management tool for walnut orchards. In particular, it is important to remember that Rely does not translocate as well as glyphosate and applications should be planned accordingly. Best season-long weed control and reduced selection of herbicide-resistant weed biotypes is likely to be obtained using combinations of preemergence herbicides, postemergence applications of glyphosate and glufosinate or other burndown materials, and non-chemical control tactics wherever possible.

Using Ethephon to Accelerate and Enhance Harvest in 2010

Carolyn DeBuse, Farm Advisor, Solano and Yolo Counties

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Weather patterns in spring play a role in the timing of walnut maturity and harvest. Cool spring temperatures can delay the harvest of many fruit and nut crops. In walnuts, flowering can be delayed or spread out by cool rainy conditions during bloom. Once the kernel is mature, fall temperatures also affect harvest time in walnuts. Cool, humid or moist weather promotes hull split and hastens harvest time whereas dry, hot temperatures delay hull split and harvest. The prediction this year is that the walnut maturity will be later than usual by about 7-10 days following the pattern of our other tree crops this summer. Heavy rains can also slow down harvest and reduce the nut quality as occurred in 2009. The one tool available to help advance harvest is ethephon. Growers who treat with ethephon to advance harvest date will increase the potential for light kernels, while reducing the risk of problems caused by navel orangeworm and mold from harvest delays.

Ethephon (also known as Ethrel®) is an ethylene-based plant hormone that accelerates hull maturity. If applied at full nut maturity (packing tissue brown) it can advance harvest 4-7 days. If applied 5 days after packing tissue brown, ethephon can promote one shake harvest. For a complete description of ethephon and how to use it, refer to the July 2009 Sacramento Valley Walnut News:

" Fast Facts About Ethephon Use in Walnuts" by Bob Beede.
(http://cesolano.ucdavis.edu/newsletterfiles/Fruit_and_Nut_Notes17751.pdf)

Here are the highlights of what you need to know:

Benefits

- Potentially advances harvest by 4-7 days. The variety, weather, and coverage determine crop response.
- Increases the percentage of light colored nuts by decreasing the time between nut maturity (packing tissue brown) and hull maturity (hull split and nut abscission), the reduced time lessens the natural darkening of the nut.
- Reduces insect and mold damage. Navel orangeworm damage can be reduced by harvesting earlier and avoiding the last flight while mold damage is decreased by avoiding early rains.
- Nuts delivered to the huller/dryer without hulls dry quicker than nuts delivered in hull.
- Some handlers have an early harvest bonus program.

Application

- For best results ethephon should be applied when 95% to 100% of the nuts are at packing tissue brown (PTB). Check PTB by collecting 100 nuts from the lower part of the trees randomly across the orchard. Cut them open and exam the tissue that surrounds the nut. When this is completely light brown then the nut is at PTB.
- Good coverage is important. Ethephon does not move within the plant tissue. For a nut to be affected it must be sprayed.
- Apply when the temperatures are cool and never spray when it is above 90°F. In warmer areas, a nighttime spray may be necessary.

Harvest

1) Do not assume that the benefits that you want to gain are going to be exactly 14 days after application. In one San Joaquin Valley study with Serr, the best hull removal was 23 days after application. Test shake a tree and evaluate hull adhesion before committing to the harvest.

Cautions:

2) Do not spray before PTB as losses in kernel weight, nut quality, and hullability can occur.

3) Do not spray stressed trees. The effects of ethephon can be amplified and defoliation may result.

4) Over spraying with higher rates than recommended can have a negative effect on trees causing defoliation, twig dieback, and reduced catkin production the following year.

Potassium Deficiency in Walnuts

Melanie Covert and Joseph H. Connell, UC Farm Advisor Intern and Farm Advisor, Butte County

Potassium (K) is removed with the crop; about 50 pounds of K_2O (potash) is contained in one ton of hulls plus 11 pounds in one ton of kernels. So, if half the hulls leave the orchard with a two ton walnut crop, that removes about 72 pounds of K_2O annually (50 lbs. in the hulls plus 22 lbs. in the kernels). K sources in soil come from plant residues, weathering of soil parent materials, and inter-layers of common clays, which adsorb K and release it during wetting and drying cycles as they hydrate and swell. Potassium is held tightly by the clay particles and is slowly available to the tree unless concentrated fertilizer applications overwhelm the soils ability to tie up the material.

Symptoms. Deficiency symptoms usually appear in early to mid-summer, with most affected leaves located along the middle of shoots. Trees will show upward rolling and scorching of leaf margins, gray-yellow 'bronzing' of the leaves and pale color. These symptoms are usually not uniform across the orchard but in scattered "pockets" here and there. This is because the amount of available potassium in the soil is quite variable. At marginal K levels, growth and yield can be impaired.

Levels. July/August leaf K levels are adequate when they're in the 1.2 -2.0% range. Walnut leaf tissue levels below 1% are considered deficient and soil potassium treatments become necessary.

Potassium Fertilizer Applications. Potassium deficiency can be corrected by soil or foliar applications. Fertilizer sources include potassium sulfate or potassium chloride (KCl) for soil applications or potassium nitrate (KNO_3) for foliar sprays. Potassium chloride is less expensive than potassium sulfate but can cause chloride toxicity if it is not leached out of the root zone before growth begins in the spring. Potassium nitrate gives temporary correction and is best for spot treatments.

Soil applications are applied in the fall to allow winter rains to move K into the root zone. Potassium fertilizers should be applied in narrow 'bands' along tree rows rather than broadcast applied to maximize fertilizer uptake efficiency because the nutrient moves very little in the soil and its concentration in the soil solution is very low.

Either “mass doses” of 1500 to 2000 lbs. of material applied at three to five year intervals or annual “maintenance” rates of 300 to 500 lbs can be effective. If correction of a deficiency is expected the year following the treatment, the higher rates should be used and may need to be followed with foliar KNO_3 applications in the spring. Because mass doses are expensive, growers have been reluctant to apply K this way and prefer the more frequent low-rate surface-banded maintenance applications. Research has also shown application through drip systems to be effective and economical in prune and may be useful in walnut.

Some precautions to consider if you are using KCl for K deficiency correction.

1. Do not use KCl on soil with clay pans or high water tables which will not allow adequate leaching of the Cl from the root zone.

2. Be sure that adequate water, either as rainfall or irrigation, follows the application prior to bud break in the spring. In soils with good drainage, 20 inches would be adequate. Potassium chloride injury is always more common following dry winters.

3. Lower maintenance rates are safer than mass dose rates.

4. If you have applied KCl, you should include a chlorine analysis in your annual leaf analysis to be sure that chloride levels are not getting too high.

Why Are Some Individual Young Walnut Trees Turning Yellow and Not Growing?

Richard Buchner and Joe Connell, UC Farm Advisors, Tehama and 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. Photos of some of these corresponding problems can be viewed at http://cesutter.ucdavis.edu/Orchard_Crops/Yellow_Leaf_Symptoms_and_Causes.htm

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 spring 2010 could have begun or aggravated a problem for some trees in young orchards that made good growth the first year or two but made very weak growth this spring.

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. This year some orchards fell behind in irrigation this spring due to cool weather and rain showers in May that caused some to put off irrigations. If you fell behind in spring water stress may have occurred following the peak water demand during July and lower interior leaves may have yellowed, scorched, and defoliated.

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 (a series of reddish or brownish lines in the tissue) 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.

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