A New Information Resource for California Fruit Farmers

Editors:

Guy Witney
University of California Farm Advisor
Riverside/San Bernardino Counties

Warren Currier
California Avocado Society

Welcome to the first edition of Subtropical Fruit News, a quarterly publication made possible by the generous support of the California Avocado Society and the Citrus Research Board.

Subtropical Fruit News will bring you the latest research results, farm issues, general topical information and upcoming events from University of California Farm Advisors, Specialists, Faculty and industry leaders throughout the State. Each issue covers broad topics for all fruit farmers, but is also tailored to fruit farming in your area and includes pertinent information from your local county Farm Advisor.

Subtropical Fruit News is free, but in order to receive copies in the future the enclosed red subscription form MUST be returned.

We would like to expand and improve this publication with each new issue, but have very limited funding. Industry/grower contributions would be greatly appreciated. All contributions would go 100% toward hard improvements in this newsletter such as adding photographs, and increasing the content and number of annual issues. Contributions can be made to Regents, University of California, 21150 Box Springs Road, Moreno Valley, CA 92557.

Snails - This Could Be The Year

Nicholas Sakovich
University of California Farm Advisor
Ventura/Santa Barbara Counties

For the most part, snails have not been a problem for a number of years, due primarily to the lack of abundant precipitation. This grace period would have been an excellent time to release the predatory decollate snail and give it a chance to establish.

If a biological control program was not established and snails are now a problem, there are a number of things to do:

Baiting:

Metaldehyde is a bait commonly used for the control of the brown garden snail. Placement of the bait is most important. Metaldehyde has a toxic effect both on contact with the snail's "foot" and after ingestion. Under the influence of metaldehyde, the snail loses a large percentage of water due to the muscle contractions and secretion of slime. If, however, the snail can reach shelter (that is a place of shade and high humidity such as underneath a tree), it may survive.

Placing the bait out between the tree rows may not attract a large percentage of the snails. Therefore, the metaldehyde bait should be placed nearer the tree dripline, close enough for the snail to find it, yet where the snail might encounter some difficulty finding shelter upon ingestion of a sub-lethal dose.

Deadline is a liquid metaldehyde product with a consistency of Elmer's glue. It can be dotted down the tree row, close to the drip line. Small equipment (manufactured by Scotcan of Santa Paula) has been custom-built for easy application of this material using an ATV-type vehicle to pull it. It is best to apply this material just prior to an irrigation or rain. Water will not dissolve the Deadline or wash it away. There is also a dry Deadline formulation called Deadline Bullets. Both materials have proven very effective in University of California tests.

Biological Control:

As mentioned earlier, the decollate snail (Rumina decollata) can provide excellent control of the brown garden snail; however, establishment of the decollate snail may take as long as five years, and not everyone is successful in establishing them. Decollates feed mainly on the young brown garden snail. If one has a large brown snail population, it is a good idea to bait first, then wait approximately 60 days for the bait to break down before releasing the decollates. Though it can be costly, it is best to distribute 50 decollate snails per tree throughout the orchard. A less expensive method would be to choose a cluster of core trees in areas that will not be baited and "raise" the snails there. As they multiply, they can be physically moved throughout the orchard. Supplemental food (rabbit pellets or yesterday's salad) and cover (old fertilizer bags) can be provided to increase the chance of successful snail rearing. Even light additional irrigations may be conducive to quicker colony establishment. Ducks have been used for many years in other countries for snail and weed control. Recently growers here have established their "herds" of ducks. They have done an excellent job of controlling both snails and weeds. As with many non-pesticide methods of control, extra care and labor will be in-
Fertilization and Irrigation Practices to Reduce Nitrate Contamination

Ben Faber
University of California Farm Advisor, Ventura/Santa Barbara Counties

California may follow Arizona’s lead and require some form of best management practices (BMP) when it comes to fertilizer use. BMPs are practices that minimize a degrading process, such as erosion or groundwater contamination, or maximize a resource, such as water.

There has been some talk in Sacramento of requiring permits for Nitrogen use just as required for pesticides. Recently, California legislation was passed that increased the fertilizer tonnage tax to support research and education in the environmentally sound uses of fertilizers. Failure to adopt appropriate standards and methods of fertilizer practice could lead to the adoption of more burdensome regulations.

How did we get into this situation? After World War II the munitions industry turned its production capacity to the manufacturing of nitrogen fertilizers, creating a cheap, easily handled material for agriculture. Nitrogen, aside from water, is most often the limiting nutrient in crop production, and with the new source of nitrogen, yields increased across the country. Unfortunately, nitrogen applied in excess of plant need must go somewhere. Frequently this is lost to runoff, eventually arriving in surface water bodies, or it percolates below the root zone of plants and ends up in groundwater.

What’s so little waste,” you might say. That “little waste” was shown to be insufficient to grow sugar beets in Glenn County when irrigation water was applied that had been pumped from groundwater. This groundwater had a concentration of 10 parts per million (ppm) nitrogen with previous soil applied nitrogen as the like-source. 1 ppm is the public health limit for drinking water standards. This standard applies to all municipal waters. The reason for this health concern is the possibility of methemoglobinemia, or “blue baby syndrome.” This problem is associated with “infants who ingested water that contains excess nitrogen which can result in a reduced capacity of the blood to carry oxygen. As of 1987, 10% of the wells in California and 40% of the Metropolitan Water District exceeded the 10 ppm limit.

Growers are well aware of the existing problems of price, availability and quality of water. But managing water to reduce nitrate contamination should be of concern to all growers, especially in improving relationships with the urban population. The reason we are talking irrigation and fertilization is because the time is that they are inextricably linked. Water is the major carrier of nitrate in the soil, and irrigation practices lead to poor fertilizer management. If applied in excess of plant requirements, water will move away from the root zone carrying nitrate into groundwater or in runoff into surface waters. With improved control over irrigation, there will be improvement in nitrate management.

The following are a few guidelines in improving fertilizer and irrigation management:

Put the water where the tree is:
- Cap off sprinklers to trees that are in poor health or missing. Isolate irrigation blocks.
- Make sure the water being applied is going to an area where there are trees.
- Put trees of similar size in the same irrigation block.
- Add new valves if replacement of trees are in areas that were once irrigated with older trees. Improve distribution.

With The Rain Comes Gummosis

Nicholas Sakovich
University of California Farm Advisor, Ventura/Santa Barbara Counties

One serious problem a citrus grower may encounter during the wet spring weather is gummosis, caused by several species of phytophthora, P. citrophthora being the most prevalent. The fungi is widespread and common in our growing areas, and in most cases, is not a problem as long as growers follow a few simple cultural and sanitary procedures but we don’t continue to get large amounts of rain.

Prevention steps:
1. Several resistant rootstocks are available. They include Troyer/Carrizo, Cleopatra, Macrophylla, C136, and Triffid.
2. New trees should be planted high, mulched, the infected areas are dark.
3. Care should be taken to minimize or eliminate irrigation water from contact with trees.
4. A bordeaux solution can be painted on the trunk to prevent infection (this is not a cure).
5. After orchard, shrimp painting has helped increase air movement in the orchard, thereby accelerating the drying of tree bark.

Symptoms:
The first and most obvious symptom is the profuse gummy on the surface of the affected bark. When the bark is scraped, the streaked areas are darker than the surrounding green or white tissue. This contrast provides us with a definitive line within body that is visible and infected tissue.
When entirely killed, the bark, which will be thin and fibrous, is easily cracked in vertical strips. When trees with these symptoms are found in an orchard, the infection most likely occurred many months earlier and is not visible by normal procedures. Because the fungus, in all likelihood, is no longer present and treatment is not necessary. Despite this, better summer temperatures, the phytophthora species will usually die out or become inactive. It is therefore mainly

Foliar Urea Increases Citrus Yields

Carol Lovatt and Ammar Ali
University of California, Riverside

Foliar applications of low biuret urea (LBU) in the winter increased the yield of 30-year-old "Washington" Navel oranges and were profitable for three consecutive years in this study.

In this study winter applications of foliar applied low biuret urea (Unocal Plus) at a rate of 28 lbs. of nitrogen per acre increased the ammonia concentration of "Washington" Navel orange trees. Pre-previous studies (Table 1 and 2) show that this leads to increased flower numbers and more leafy inflorescences (flowers and leaves mixed on new shoots), which are known to be more productive in yield than leafless inflorescences (flowers only). Overall, yields increased with no reduction in fruit size. The foliar applications were made once per season in November, December, January or February resulting in increased net dollar per acre (Table 3 and 4). The yield increase resulting from the winter foliar application of low biuret urea was not due to improved nitrogen status if the trees. All trees also received 110 lbs. of nitrogen per acre as LBU applied to
Is There Salty Water In Your Future?

Gary Bender
University of California Farm Advisor
San Diego County

Salty water is the nemesis of the avocado tree, but it may play a significant role in the production of fruit in Southern California in the very near future. With water projected to cost $500 to $1000 per acre foot in San Diego County by the year 2000, many growers are currently drilling wells and hitting (you guessed it) salty water.

Water samples from wells in northern San Diego County in 1992 ranged from a low of 300 ppm to a high of 4000 ppm with a mean of 1031 ppm total dissolved salts (TDS). Water from seawater recharge plants is also somewhat salty, ranging from 950 to 1050 ppm TDS. As a benchmark, district water (derived mostly from the Colorado River) ranges from 590 to 640 ppm.

Except for a few lucky growers in the river valleys, well water in San Diego County has never been a major source of water for agriculture. Not only is the supply limited, but the water quality (as mentioned) is often poor.

The question remains; if we do incorporate poor quality water into our irrigation scheme, how can it best be used to cause the least deleterious effect on our tree crops?

Fortunately we have a reclaimed water trial running with the city of Escondido, which is providing valuable information. The trial is now in its second year, and we know that pure reclaimed water (1000 ppm TDS with 300 ppm chloride) applied at 100% ETc will cause unacceptable tip burn and leaf drop in avocados. The avocados were irrigated using CMIS station readings multiplied by the old UC crop coefficients (ranging from 0.35 in January to 0.55 in July) with a 10% ETc for leaching. The total applied water per acre in the first year was only 2.25 ac ft per acre. The solution to the problem with reclaimed water may be increasing application to 150% ETc.

Methods for utilizing salty water:

1. The most obvious method for handling salty water is to just use more water and irrigate more often. Avocado growers in San Diego County have long noted that groves irrigated with 4 acre feet of water per acre per year will have reduced tip burn to a point where it is almost non-existent. Coincidentally, these groves often have the highest yields. Longer sets will keep the salts leaching below the rootzone and irrigating more often (at least twice a week during the summer months) to keep the salts diluted - tree roots are better able to exclude salts when the soil is moist. A pump failure and/or a missed irrigation or two in the summer will often result in severe tip burn which will occur about one month after this incident.

2. The bloom and fruit setting period is a very sensitive time in the life of the tree and the best quality water should be applied during this period. Blending of saltier water into better quality water should begin gradually later in the season with the poorest quality water being applied in the fall when evapotranspiration is declining.

3. Preliminary information from the reclaimed water trial on avocados has indicated that chloride can accumulate to high levels in the soil during the summer months, but is apparently not absorbed into the tree until late August. Therefore a heavy leaching irrigation with good quality water should be applied in early August. The duration of the leaching irrigation depends on the amount of salt accumulation in the soil. The EC of the soil extract after the leaching should be less than 1.5 for avocados, less than 1.7 for other Salvia species, and less than 1.8 for grapefruit.

4. Another method for handling salty water is to simply apply it to crops that are less sensitive to salts. We have observed pummelos being irrigated this past summer with well water that averaged around 1400 ppm TDS. The crop did not appear to be affected by the salt, and tip burn on the leaves was minimal. Tables in the Western Irrigation "Handbook" can be useful in comparing the sensitivities of various crops to salty water. For instance, tree crops with increasing salt tolerance are avocados (the least tolerant), plums, almonds, grapes, apricots, peaches, walnuts, pears, apples, lemons, oranges, grapefruit, pomegranates, olives, figs, and dates (the most tolerant).

5. When wells are drilled we have often noticed that the poorest quality water is often found at shallow depths (down to 200' deep). Some well drillers case the wells down to 200' and then pump chloride up the outside of the well casing to prevent salty water from entering the well. The well is then drilled down to 600' to 1000' depth. One driller reports that the water quality using this technique improved from 1800 ppm to 300 ppm by excluding shallow salty water.

Some Pros And Cons Of Citrus Rootstocks

Nicholas Sakovich
University of California Farm Advisor
Ventura/Santa Barbara Counties

Many citrus growers will be setting out new trees this spring. Choosing the right rootstock for your particular site is very important and should be done with great care. Below I have listed some of the more important advantages and disadvantages of commonly used citrus rootstocks.

Macrophylla Adantages:
1. Vigorous
2. Prolific yielding, especially at an early age
3. Tolerant to gummosis
4. Acceptable tolerance to boron, chlorides and a calcarceous soil

Disadvantages:
1. Susceptible to slice bark necrosis

Rough Lemon

Advantages:
1. Vigorous
2. Does well in sandy soils
3. The Schaub rough lemon shows beter tolerance to gummosis than other rough lemons
4. Good replant in absence of phytophthora and nematodes

Disadvantages:
1. Sucker badly
2. Poor fruit quality with oranges and mandarins

Volkameriana

Advantages:
1. Shows some resistance to gummosis, though not immune
2. Good tolerance to root diseases
3. Compatible with Eureka lemon
4. Of the vigorous rootstocks, it is the most cold hardy

Disadvantages:
1. In California, not yet widely used, therefore limited information
2. Poor fruit quality with oranges and mandarins

Yuma Ponderosa

Advantages:
1. Consistently a top producer
2. Compatible with Eureka lemon
3. Suckers badly
4. Good tolerance with oranges and mandarins
5. Growers have little experience with this rootstock, but its high yields small trials are encouraged with lemons

Truwer/Carrizo Chafelago

Advantages:
1. Excellent fruit quality
2. Tolerant to phytophthora

Disadvantages:
1. Unsatisfactory in calcarceous soils
2. Incompatible with Eureka lemons

Citrullana 4475 (Swingle)

Advantages:
1. Tolerant to phytophthora and nematodes
2. Good cold hardiness

Disadvantages:
1. Unsatisfactory in calcarceous soils
2. Incompatible with Eureka lemon
3. Unsatisfactory in clay soil

Trifoliate

Advantages:
1. Tolerant to phytophthora and nematodes
2. Because of this tolerance, a good

Subtropical FRUIT NEWS
Bracing for the Perseae Mite
Riverside County has seen only minor infestations of avocado groves by the perseae mite mostly confined to areas near the San Diego County line. However, we should be prepared for the worst scenario this spring and expect the spread of this pest through our major avocado growing areas.

With this in mind, the following comments by Gary Bender on the mite’s progress and control in San Diego County are worth noting:

After the heavy rains, we’ve noticed a dramatic decline in perseae mite (Oligonychus perseae) populations on many avocado groves. Without mites on the leaves, the predacious mite (Typhlodromus helvolus) has nothing to eat...and you may be wasting your money releasing it. The bottom line: before you release predacious mites, make sure you see perseae mite activity.

Based on last year’s observations, mite populations will probably increase dramatically this May if you have perseae mite problems last year. You need to get this in control in time before they get out of hand.

Riverside County Grove Inspectors have observed negative action against the perseae mite in the past. Those combinations have been successful in controlling the mite population. We have also observed that the mite populations are much lower than they were last year.

Bumps and Ridges on Lemons and Limes
Cool, foggy weather, or rain, during blooming time can increase the incidence of botrytis fungus infection on blossoms and parts, and these infected parts, if lying on a young fruit, can stimulate cells to grow as bumps or ridges on the peel. With the loss of chemicals in recent years, we don’t have the protection that we had before to control this problem. General preventative measures such as avoiding mechanical or chemical injury, protecting against frost, and pruning out dead twigs and wood, help reduce the incidence of botrytis. The bloom is crucial. We don’t have the best environment for the bloom, which is the best time for the bloom. The bloom should be protected. However, some growers have reported early bloom as a result of the January rain followed by early January early February warm weather. February rain on these new flowers and fruitlets will certainly result in an increase in botrytis damaged fruit.

Spots On Avocado and Citrus Leaves
After the prolonged rainy spell in January, several citrus and avocado groves throughout the county have developed large dead spots on leaves. We have determined that the leaf spots are caused by a fungus - Colletotrichum gloeosporioides. The fungus is a common, symptomless invader of citrus and avocado leaves which usually causes no injury to the tissue. However, if adverse conditions exist (such as prolonged wet weather) this may cause excessive tissue stress, and the invading fungus is able to cause these symptoms on leaves. In the past, symptoms have been referred to as "weather spotting".

Avocado Root Rot Watch
Guy Witney
University of California Farm Advisor
Riverside/San Bernardino Counties

After nearly a decade of drought many growers may be complacent when it comes to avocado root rot hazards. However, if wet conditions persist we may enter the spring with some of the most conducive root rot conditions in years.

Many hundreds of growers came into the fruit production business during the drought years; and although I am sure all are well informed of the danger of rot rot, few have had to face the reality of a severe outbreak. The winter deluge of 1992/93 may well be the duster-bathe we have all hoped for, but the wet conditions pre-storms have few behind ideal for the rapid infection of groves by root rot in the coming spring.

The pathogen survives in the soil primarily as chlamydomspores in decaying roots. These are eventually released to the soil and are able to survive for several years. When soil temperatures are between 55 and 85 F, the chlamydospores germinate. At these soil temperatures, sporangia are also produced at active infection sites. Both Chlamydospores and sporangia release swimming zoospores which are able to infect new roots. If conditions are right, these zoospores may be able to travel some distance, particularly in free water running down hillsides. Also, moist soil carried on shoes, cars, wheel, picking bins, or any other surface can carry the potential inoculum to new sites.

Always spray shoes with alcohol or use a copper port bath when entering a grove, particularly when visiting several different areas. Keep vehicles on the road and never enter a known root rot site. Be sure that the packhouse is cleaning bins before redirecting them back to the field. Direct freshly running water down established channels, away from downslope trees.

Allette and Ridorim are registered for use on avocados for root rot. Both have proven effective but should be used before the trees reach a state of severe decline.

Assuming that sufficient mites are available for release in the spring, there is an important lesson we have learned from this past season’s experience: We have noticed that tree-to-tree spread of predacious mites seems to be fairly slow. It would be best to release mites on every tree (if you can afford to).

The predators are not a cure - it may take several seasons for them to bring the perseae mites down to levels below economic damage.

We have a lot of unanswered questions. For instance, will we still have to spray with sulprofom this year if we have released predacious mites? Perhaps if the biological control activity on leaves is low and the amount of leaf damage and fruit drop is high.

Will the chemicals kill the beneficial mites? We don’t have good information on this and this is a crucial question. Overall, we think that more research dollars should be spent on studies looking at the basic biology of the mite, alternative chemicals, scouting for other predators in Mexico and better techniques for rearing predators in the insectary.