Topics in Subtropics Newsletter

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News from the Subtropical Tree Crop Farm Advisors in California

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TOPICS IN THIS ISSUE:

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AUTHORS

- Sonia Rios, UCCE Farm Advisor, Riverside/San Diego County
- Ben Faber, UCCE Farm Advisor, Ventura/Santa Barbara County
- Craig Kallsen, UCCE Farm Advisor in Kern County

Craig Kallsen, Editor

FARM ADVISORS AND SPECIALISTS

Greg Douhan – Area Citrus Advisor, Tulare, Fresno, Madera
Phone: 559-684-3312
Email: gdouhan@ucanr.edu
Website: http://cetulare.ucanr.edu

Akif Eskalen – Subtropical Extension Pathologist UC Riverside
Phone: (951) 827-3499
Email: akif.eskalen@ucr.edu
Website: http://facultydirectory.ucr.edu

Ben Faber – Subtropical Horticulture, Ventura/Santa Barbara
Phone: (805) 645-1462
Email: bafaber@ucdavis.edu
Website: http://ceventura.ucdavis.edu

Elizabeth Fichtner – Orchard Systems, Tulare
Phone: (559) 684-3310
Email: ejfichtner@ucanr.edu
Website: http://cetulare.ucanr.edu

Craig Kallsen – Subtropical Horticulture & Pistachio, Kern
Phone: (661) 868-6221
Email: cekallsen@ucdavis.edu
Website: http://cekern.ucdavis.edu

Sonia Rios – Subtropical Horticulture, Riverside/San Diego
Phone: (951) 683-8718
Email: sirios@ucanr.edu
Website: http://cesandiego.ucanr.edu

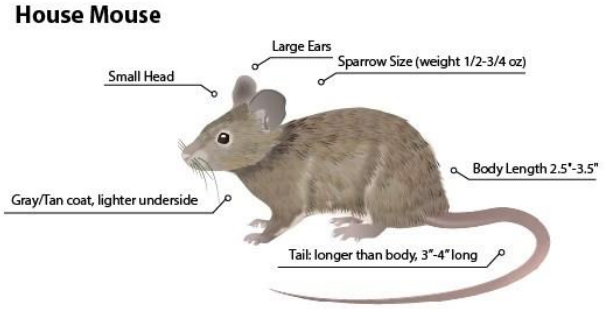
Philippe Rolshausen – Extension Specialist Subtropical Crops, UCR
Phone: (951) 827-6988
Email: philippe.rolshausen@ucr.edu
Website: http://ucanr.edu/sites/Rolshausen/

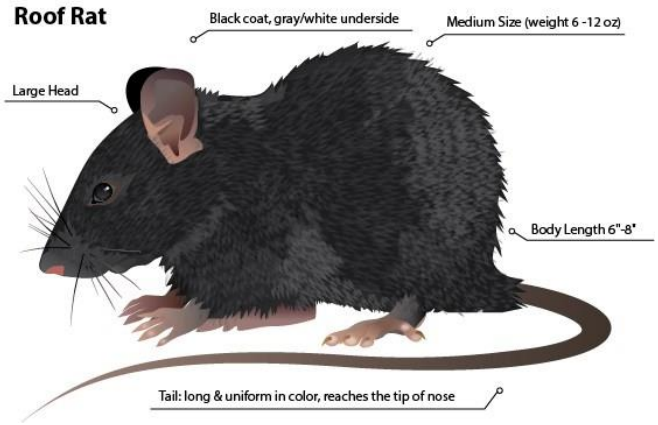
Eta Takele – Area Ag Economics Advisor
Phone: (951) 683-6491 ext 243
Email: ettakele@ucdavis.edu
Website: http://ceriverside.ucdavis.edu

Ah, Rats!

Sonia Rios, Subtropical Horticulture Farm Advisor, Riverside/San Diego County

The roof rat (Rattus rattus, also known as a citrus rat, fruit rat, black rat, or gray rat) is an introduced species of rat native to southern Asia. It was brought to America on the first ships to reach the New World. This is the same species that carried the bubonic plague around the world and is the reservoir host for murine typhus, which is a disease that is transmitted by fleas. This primarily nocturnal vertebrate is a pest in citrus, nut orchards and other tree crops. In citrus, it builds leaf and twig nests in trees or it can nest in debris piles, thick mulch pile on the ground, or in shallow burrows under the tree. In livestock feed yards and barns, roof rats often burrow and hide under feed bunks or in the hay bales. Adult roof rats range from 12-14 inches long (30-36cm) and weigh 5-10oz. (150-250g) (UC IPM 2017). The large, sleek rat has a pointed muzzle and hairless scale-covered tail that can be longer than the body and head combined.





DAMAGE

A rats gnawing can cause some serious damage to just about anything, electrical wires, wooden structures, and they tend to not be picky about which agriculture crop to invade. Roof rats often feed on citrus, avocados, and other fruits, sometimes leaving hollow fruit skins hanging on the tree. In tree crops, they can girdle limbs or stems, leading to mortality to part or all of a tree. After harvest, they damage fruit and nuts in bins by chewing them and leaving excrement. This can cause major esthetics damage to fruit and become a food safety issue. Since rats are active throughout the year, and mostly at night, this can be a challenge to growers and can become infestation because of their quick gestational period of 3 to 4 weeks.

MANAGEMENT

Cultural Control

Because roof rats are such good climbers, swimmers, and hitchhikers it is hard to completely exclude them from your grove or orchard. Fruit trees should be isolated, not touching fences, overhead wires, or the scaffolds or branches of other trees. Roof rats will run along fence stringer boards or support poles, phone and cable TV wires, and tree branches to reach your fruit tree. Lower branches of the tree should never touch the ground. Reducing shelter and nesting opportunity sites of rats is crucial. Eliminate debris and woodpiles and store materials neatly off the ground. Thin and separate non-crop vegetation around orchards, such as weeds and remove dead wood from fruit trees, especially in citrus and avocado (UC IPM 2017). A low-hanging skirt of drooping branches give the rats additional access routes and provides them with protective cover while feeding. It's best to prune tree skirts so that the ground under them is open and visible. This lack of cover makes the rats uncomfortable and more susceptible to predators such as snakes and birds of prey.

Sanitation is also an important component to an IPM program. Use or remove all fallen fruit, do not leave any fruit behind, as the roof rat is an opportunist and will take advantage of the mess left behind.

Monitoring and Treatment Decisions

According to the UC IPM guidelines, the use of elevated bait stations containing 0.005% diphacinone*-treated oats (sold at some county agricultural commissioner's offices) is highly effective at controlling roof rats in orchards. Secure bait in a bait station before placing in trees on limbs 6 feet or more above the ground. Placing the bait in a secure bait station will prevent bait from dropping to the ground and creating a hazard for non-target species. Bait can only be applied during the non-bearing season, so growers must take a proactive approach to managing problematic rat populations (UC IPM 2017).

Trapping

Rat-sized snap or wooden box traps placed in trees are also effective, although a more time-consuming control option. Do not use glue board traps outdoors, as birds, lizards, and other non-target wildlife may be trapped. Rats are wary, tending to avoid baits and traps for at least a few days after their initial placement. Fasten traps to limbs and bait them with fruit or nut meats, but do not set the traps until after bait is readily eaten. Be aware that certain types of rat baits for use inside buildings (such as sticky traps) are not labeled for use outdoors in orchards; these are hazardous to wildlife and should not be used.

Preventative care, sanitation and scouting for rat's nests or damage is the easiest way to stop a problem before it becomes a problem. For more information regarding the roof rat, please visit the UC IPM website: http://ipm.ucanr.edu/PMG/PESTNOTES/pn74106.html.

*Baiting *Be sure to identify the species of rat present to avoid killing non-target or protected species.**

So You Want To Install Soil Moisture Meters?

Ben Faber, UCCE – Ventura County

So, every few weeks the question comes up of whether to install soil moisture meters which leads to the question of which to buy and install or have installed. And then come the questions of what do the readings mean and why aren't the readings consistent. Or maybe this question arrives after the grower has installed the sensors or system and the values don't conform to a known or knowable pattern.

The first question to the grower is why they want to install soil moisture sensors or a system. Everyone has a different answer which I've always found interesting. Usually it boils down to having more or better information, although it's hard to beat a good old soil auger. Which takes time and labor.

So once that is cleared up, it comes down to what area they want to monitor. Is it an acre, 10 acres, 50 acres, 100 acres, 200 acres, 1,000 etc.? What are the different irrigation blocks, soil types, aspects? How complex is the area that is to be monitored? Do they need one monitoring site or many? Can the information be gathered in the field, or does it need to be accessed from a distance? Linked by hardwire, infrared, cell phone, Wi-Fi, satellite, etc.?

Then the question is does the grower do the installation or is it done by a company? And then whatever the case is, who maintains the system and for that matter, who maintains the information? What software is used and who interprets it?

And what sensors are being used: tension, electrical resistance, conductance, capacitance, electromagnetic…….? The list seems to go on and there are no models and brands coming out on a regular basis. And how reliable are the sensors? What's their lifespan? And what are they measuring and in what units? How affected are the readings by salinity and what soil volume are they measuring?

And then how much do you want to spend? $100 per installation, $1000? With a monthly or yearly maintenance fee or none? Who responds when there are problems?

Wow, so yeah, there are lots of questions. Here's a chart that might help categorize some of the questions:

Method	Cost	***Ease of use***	Accuracy	***Reliability***	*Salt-affected*	***Stationary***
Gypsum block	**L**	**H**	**H**	**H**	**L**	**YES**
Tensiometer	**L**	**M**	**H**	**M**	**L**	**YES**
Portable tensiometer	**M**	**M**	**H**	**M**	**L**	**NO**
Solid-state tensiometer	**M**	**H**	**H**	**H**	**L**	**YES**
Time domain reflectometer	**H**	**M**	**H**	**H**	**M**	**BOTH**
Neutron probe	**H**	**L**	**H**	**H**	**L**	**YES**
Feel (soil probe)	**L**	**H**	**H**	**H**	**L**	**NO**
Gravimetric (oven)	**L**	**M**	**H**	**H**	**L**	**NO**
Conductance	**L**	**H**	**M**	**M**	**H**	**BOTH**
Capacitance	**M**	**H**	**M**	**H**	**M**	**BOTH**

H, high; M, medium; L, low

And the good Almond Doctor might help some more:

http://thealmonddoctor.com/2015/07/10/soil-moisture-sensing-systems/

So now you've made this decision of what to buy, but there is the question of where to put the sensor. This last point is so often overlooked. The sensor needs to be in the active root zone where water is being taken up. Not where it's convenient to read, and not where the plants can't use the water. Placement is so often overlooked.

The sensors need to be placed in representative sites - trees that are typical of the area being irrigated - and they need to be placed in the root zone where water is being taken up. They need to be near healthy trees that have a healthy root system. They need to be in the root zone, not where it's convenient to read. I've seen sensors that are out in the middle of an alley where there are no roots. They need to be in the wetted area, not outside of the wetted area.

Sensors are measuring what is at that placement point. Some can read a little further out from that spot, but most are only reading the soil volume a few inches away around the sensor tip. So if the sensor is in a sandy part of the orchard, it's not going to tell you what the moisture is in a spot that is in a heavier soil part of the orchard. It can reflect the rate of removal by trees of similar dimension since water removal is driven by evapotranspiration. The sandy soil sensor won't tell you how much water is left in the heavier soil site, but it can tell you the best time to irrigate that whole block. The most limiting soil moisture content of the orchard will tell you the frequency of irrigation. Sensors at a deeper depth can then tell you when to turn the water off.
And lastly, when they are installed, they often destroy the immediate root system, so initial readings are not going to be accurate. There are no roots there to take up water. It takes a while to establish a new balance once the sensor is in place.

Questions? Maybe some of these publications can further help sort out what questions to ask:

http://calag.ucanr.edu/Archive/?article=ca.v054n03p38
http://calag.ucanr.edu/Archive/?article=ca.v054n03p47
http://anrcatalog.ucanr.edu/Details.aspx?itemNo=21635

Khaled Bali, our Irrigation Specialist at Kearney Research and Education Center near Fresno, is part of a group in the process of evaluating different types and models of soil moisture sensors. He should have a publication in the near future that can more accurately sort through the many sensor choices that are available at this time. But in time, there should be more models on the market and new updates will be necessary.

The ultimate question, though, is to ask yourself how irrigation is being done and how it can be improved. The basics of design, maintenance, distribution uniformity and how scheduling is being currently done – when and how much to apply – need to be addressed. Definitely, soil moisture sensors can help, but you have to know how to use them and maintain them, just like the whole irrigation system.

A grower who uses tensiometers told me that people think of soil sensors as though they were a book. Something cut and dried. A simple plot line that you follow. Irrigation is not a book. There are many other subplots to irrigation than just reading the digital face. Looking at the weather, evapotranspiration, the tree, how fast the moisture is depleted, how deep the moisture is being pulled from all contribute to the "sensors" used to irrigate. Use them all. Even though this grower has

irrigators on 250 acres of trees, he also checks the orchard tensiometers at least once a week on his own to confirm all of his senses.

Notes on Applying Gibberellic Acid (GA) to Navels in the Southern San Joaquin Valley of California.

Craig Kallsen, UCCE – Kern County

Note 1

Dr. Charles Coggins, emeritus professor and long-time citrus researcher at UC Riverside, reconfirmed in the late 1990's that late September to mid- October is the best time to apply gibberellic acid (GA) foliarly to navel orange in the San Joaquin Valley for reducing puff and crease, rind staining, and, generally, for maintaining a more juvenile rind longer. Applying GA two-weeks before color break (i.e. when the oranges begin to turn from green to orange) still remains a handy rule-of-thumb. Color break in mid-season navels (like Washington, Frost Nucellar, Atwood and others) usually occurs about two weeks after color break in the early navels (like Beck and Fukumoto). Dr. Coggins' work showed GA was significantly more effective when a nonionic silicon-based surfactant was included with the spray. Note that the addition of an effective surfactant can increase the chance and/or severity of significant leaf drop. Always follow the surfactant's label carefully.

Note 2

Uptake of GA by the peel is improved if the spray solution is acidic. A pH of the spray solution of about 4 to 5 is recommended and several acidifying agents and products are available to accomplish this. In general, tank mixing other pesticides or nutrient solutions with GA should be avoided. Read the adjuvant label carefully regarding acidification of sprays containing gibberellic acid.

Note 3

Growers achieve good results using the label recommended rates of GA per acre using concentrated or dilute sprays. Whichever route the grower goes, adequate spray coverage of the fruit is essential and, generally, adequate coverage is most likely to occur with higher gallonage, assuming most of the spray solution stays on the tree. Most of the beneficial results of gibberellic acid are probably obtained with about 25 grams of gibberellic acid (active ingredient) per acre.

Note 4

Every year at least one navel grower in Kern County reports a significant drop of fruit and leaves as a result of a gibberellic acid spray. Often the gibberellic acid was sprayed within a week of two of a narrow-range oil spray. There appears to be a connection here, but gibberellic acid and oil have been sprayed a few days apart or even from the same tank with no ill effects. Nevertheless, numerous field observations suggest avoiding spraying petroleum oils and gibberellic acid within a week or more of each other. Make sure when applying either gibberellic acid or oil that the trees are not under water stress and that GA or oil are not applied to trees that show phytotoxic affects from either a previous oil or GA spray. The addition of an effective spreader may increase the risk of leaf drop with GA. Monitor soil-water carefully in the fall before GA or oil is applied. The temptation is to reduce irrigation too much in response to the first light rains of fall. Often these rains, especially in Kern County, will not meet the water requirements of the citrus, especially on the hilltops leaving the trees susceptible to damage from chemical spray applications.

Note 5

Gibberellic acid works best on orchards with fruit that normally hold up well on the tree after the fruit reaches maturity. Fruit of some varieties can be 'stored' on the tree longer than others. For example, Frost Nucellar fruit is somewhat infamous for fruit quality problems if left on the tree too long, while Washington navel fruits often hold up well on the tree. However, there are notable exceptions to this generalization and this is where grower records and experience with individual orchards is invaluable. The best strategy is to harvest blocks that are prone to early rind breakdown and to treat only blocks where the fruit holds up longer with GA. Applying GA to a block with poor fruit-holding qualities may extend the life of the fruit a few weeks, while gibbing the fruit of a good-holding block may give the grower an additional six to eight weeks of tree storage. Treating with an auxin (an isopropyl ester of 2,4-D is registered for this purpose) in November or early December is necessary if fruit is treated with GA. The auxin prevents the fruit from dropping. There is no point in delaying the maturation of the rind with GA into May if the navel is going to drop from the tree in February.

Note 6

Sometimes fruit does not grow as quickly as a grower would like, and a block that was scheduled for an early or mid-season harvest may be rescheduled for a late season harvest. Gibberellic acid applications can still delay harvest (although not for as long a period of time) if treated later than October. Follow label directions carefully. Do not apply GA to fruit that is in the process of changing color. A two-tone fruit may result and buyers are accustomed to purchasing fruit that is completely orange. If you miss the desired pre-color break window, wait until the fruit has turned completely orange and then apply GA. Even late applications can improve rind juvenility. However, do not wait too long. Again, check the label for application timing. Gibberellic acid can reduce the yield of next year's crop if applied too late.

Note 7

Gibberellic acid and an isopropyl ester of 2, 4-D can also be applied to some other citrus fruit in Kern County with good results. Read and follow the labels carefully when applying the commercially available plant growth regulators for crop registrations, uses, timings, rates, cautions and other necessary information that will vary with citrus variety. Puff and crease and rind staining of Minneola tangelo, lemons, and some mandarins is reduced and fruit storage on the tree is extended by the use of these growth regulators. The timing of application is similar to that of navels in most cases.

Fall Leaf Tissue Sampling

Craig Kallsen, UCCE-Kern County

Navel Orange leaf tissue samples should be taken in September or October from non-terminal leaves that developed during the spring flush on non-bearing branches. Make sure that sampled leaves are spring flush leaves. In nitrogen deficient blocks, the spring flush leaves may no longer be present as a result of resorption of the nitrogen from the leaf prior to an early drop. Sampling younger leaves will yield results overestimating the amount of nitrogen storage in the tree.

The sample should include the average-looking leaves from all quadrants of the trees. The temptation, in citrus blocks with poor-looking canopies, is to take the worst looking leaves. However, the tree has resorbed most of the nutrients from these worst looking leaves in preparation for dropping them, and information derived from these leaves is carries less meaning for deficiency situations. If a nutritional deficiency is present, it should show up in the average leaf of the orchard.

Most navels are regularly treated with copper fungicides to prevent a number of fungal diseases and copper is sometimes left out of the tissue analysis to reduce cost. However, trees of early-maturing navels that are harvested early and not subject to the same late fall and winter disease pressures of mid and late maturing navels, may not be treated with copper as a fungicide. Growers of early-maturing navels should include this element as one of the nutrients to be included in the leaf analysis. Copper deficiency is a real possibility on trees of early maturing fruit that are not treated with fungicides and growing in some of the sandy soils in Kern County. For some pictures and descriptions of some nutrient deficiencies see http://edis.ifas.ufl.edu/ch142 and http://ipm.ucanr.edu/PMG/C107/m107bpleaftwigdis.html

FREE! **Citrus: UC IPM Pest Management Guidelines**

Publication Number: 3441
Copyright Date: Rev. 2017
Length: 234 pp.
Language: English
Author: GRAFTON-CARDWELL [CROP],DEBIASE [ED
Inventory Type: PDF File

Availability: Always Available

$0.00 Download PDF

This is a free publication if you access it as a **web page** or **downloadable PDF document**.
These official UC-approved guidelines for pest monitoring techniques, pesticide use, and non-pesticide alternatives for agricultural crops are essential tools for anyone making pest management decisions in the field. This 124-page guideline covers citrus fruit and was updated in August 2015.

A hard copy version of these guidelines can be purchased as **Publication 3441P**.
The PDF version of this publication is best viewed using the free Adobe® Acrobat® Reader. You can download a free copy of the Acrobat Reader from **Adobe Systems Incorporated**.
Some users have experienced problems using Preview with these documents; we recommend using the Adobe® Acrobat® Reader.

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Craig Kallsen, Citrus, Pistachios/Subtropical Horticulture Advisor
cekallsen@ucdavis.edu or 661-868-6221