

## Vegetable Info (August 2023)

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### Tomato following walnut: considerations and tips

Walnut prices have greatly declined in recent years. As a result, we're seeing orchards of walnut trees pulled with the expectation that several thousand acres may be removed over the coming years. Some of that ground may be going into tomato.

There are some concerns about growing tomatoes on old walnut ground, but very little formal research exists in this area. To support grower decision-making in the absence of this information, I reached out to processors and growers for their thoughts on how to make the transition successfully.

#### *Processors' concerns*

Old walnut ground presents some special challenges for tomato harvest. I spoke with representatives from several canneries to get their thoughts on what to be aware of, and tips for avoiding expensive problems.

#### **Talk about some of the issues with harvesting and processing tomatoes that have come out of walnut**

Woody material can both slow down the harvest and end up in the load. Canneries have zero tolerance for woody materials, as they can damage processing equipment, plug sieves, and can cause plant shut-down for cleaning. Nuts in the load will also cause it to be rejected, as potential allergens. Roots are especially an issue, since

a field may look clean but have many roots below the surface that will be brought up by the harvester. They also may not be recognized by the dirt sorters. If detected as MOT, large wood chunks mean a big deduction for the grower. Wood or nuts not showing up in the PTAB sample but detected while the load is being dumped can lead to the load not being processed. As well as being a financial hit for the grower (\$138/ton\*26 ton trailer=\$3588 if reconditioning isn't an option), rejected loads can also mean more scrutiny in the future.

#### **How does walnut differ from almond or other crops that leave woody residue?**

Sunflower, corn, and tomatoes can also leave woody residues in the field. Orchard debris breaks down more slowly. It may also be less likely to float, making it harder for the processor to sort it out from a load. Walnut orchards are more challenging than almonds as roots can be larger (a 40-year old orchard can have roots that are 12 feet long and 8 inches in diameter). Large pieces are especially dangerous as they're the most liable to break equipment. They also take more labor to remove and persist longer in the soil.

#### **Have you worked with any fields where the biomass has been chipped and then returned to the soil? Are there any special considerations for these fields?**

This practice isn't common, so no specific advice. It would probably depend on how finely the material is chipped. Likely, if chips are ending up on the harvester they will be more difficult to sort out than roots and more likely to migrate to the top of the load, so more likely to show up as MOT.

#### **Any tips for growers to avoid costly penalties?**

- Consider growing another crop before putting in tomato; consult with the processor
- Due diligence in root removal. The more labor put in on the front end, the cleaner the loads will be
- If tomato's the first crop after a walnut orchard, consider hiring extra sorters to help prevent woody material from entering the load

## Grower Experience

Bullseye Farms is a large Yolo County operation which has experience successfully transitioning fields from walnut to tomato. Their take is that it's expensive and laborious to clean the ground well, but they haven't had problems with the harvest. Higher yields (likely due to low disease pressure) will make it profitable over time. I also spoke with other growers who are preparing to put tomatoes into old walnut ground but haven't yet done so.

**What do you do to remove woody materials from the fields?** Push the trees over, grind them up, and haul the biomass off. After this, run a ripper through to 2.5 feet and have hand crews pick up the roots, repeat until the field is clean. It's a significant cost; about \$850/acre in labor on top of the cost of the ripping, grinding and hauling (\$1400-\$1500/acre). The older the orchard is, the more laborious it will be to remove the roots.

**What are some issues to watch for when transitioning ground from walnut to tomato?**

- **Pre-emergent herbicides** used in orchards can have plant-back restriction periods of up to 18-20 months; it's important to check the dates and products used.
- **Nutrient tie-up** hasn't been a problem, when the field was well cleaned and biomass was removed. Fertility needs haven't differed so far from those of other fields. However, tie-up will likely be more of an issue if chipped biomass is returned to the field.

**Any issues that you have had or would foresee where the biomass has been chipped and incorporated?** So far, all biomass has been removed. In one field, piles of chips from an orchard that was ripped out in January sat from June-October before removal. In a tomato crop planted the following April, there were poorly performing patches in the areas where the piles had been. However, unsure if this was due to allelopathy (live walnut trees produce a chemical that has a negative effect on tomatoes planted near them), nutrient tie-up, or some other cause. The ground was ripped after the chip piles were removed, so probably it wasn't compaction. The Yolo-Solano Air Quality District Agricultural Chipping Program is offering monetary incentives to use chips on-farm, and there are plans to experiment next year on a limited scale.

**How have you seen this transition be most successful?** Just put in the labor to really get the roots out, and be cautious about incorporating materials.

## Take-home points

- Tomatoes have been successfully grown directly following walnut
- There is risk, and it's important to put in the work after orchard removal to avoid problems at harvest.
- If planning to follow walnut with tomato, it could be a good idea to discuss with the processor how you plan to clean the field.
- Waiting for a year or two before putting in tomato will reduce the associated risks

## Tomato Spotted Wilt Virus

I've received many reports of TSWV in resistant varieties this year—only at high incidence (>5%) in a couple fields, but enough to show that resistance-breaking (RB) TSWV is now common in the Sacramento Valley. Bob Gilbertson's virology team at UC Davis has identified two tomato RB variants in our area. One is the C118Y variant that appeared in Fresno in 2016. This aggressive variant is now dominant in the Central Valley, and was detected in the north in 2021 and 2022. In 2023, a new RB variant (T120N) was detected in Colusa and Sutter. Plants with spotted wilt from fields in Yolo and Solano were infected with both RB variants.

Dr. Gilbertson's team are still researching the biology and

ecology of the new strain. So far, it appears:

- The detection of the new Sutter/Colusa tomato RB TSWV variant across several counties, and tendency to be 50:50 with the Fresno strain in Yolo County fields, suggest it is also quite aggressive.
- Because disease management will likely be similar, it is not necessary to know which variant is involved.

## Unusual symptoms

Several unusual symptoms have been associated with TSWV infection this year (see p. 4). These include a strong yellowing, scorching and dieback of older leaves and curling and purpling of newer growth, ring-spotting on petioles and stems, and a notably lower frequency of fruit symptoms. However, these symptoms don't appear

to be associated with the new Sutter/Colusa RB variant because similar symptoms were observed in fields in Fresno, where the new variant has not been detected.

### IPM for resistance-breaking TSWV

Tomato spotted wilt virus is transmitted by thrips, which acquire the virus from feeding on infected plants. The virus is not passed to the eggs, so each new generation needs to acquire it by feeding on TSWV-infected plants. Weeds like prickly lettuce and sowthistle and cover crops like fava beans can carry the virus and serve as reservoir hosts and inoculum sources in the absence of tomato crops. In Fresno and Merced winter crops like lettuce or radicchio can also be bridge crops that provide inoculum for early-planted tomato fields.

Late infections normally don't cause economic damage, and treating for thrips is likely not worth it at this point in all except very late-planted fields. However, postharvest management can help reduce the risk of infections next year.

- If a field had high incidence this year, promptly till plants under and destroy any unharvested plants
- Assess the potential for neighboring crops (e.g. fava beans in cover crops, lettuce) or weeds (buttercup, cheeseweed, prickly lettuce, sowthistle) to act as reservoirs/bridge crops over winter
- Control weeds and volunteers in fallow fields
- Avoid back-to-back tomato in fields with high spotted wilt incidence

### TSWV Tools & Resources

- UC IPM brochure on TSWV ([great resource!](https://ipm.ucanr.edu/legacy_assets/pdf/pmg/tomato_spotted_wilt_print.pdf))
- Update on thrips population stages in processing tomato for Yolo & Colusa: <https://ucanr.edu/blogs/ThripsTSWVYoloColusa/>
- Presentation from July 11<sup>th</sup> TSWV special alert meeting: <https://ucanr.edu/sites/ccveg crops/files/386285.pdf>
- Handout from July 11<sup>th</sup> TSWV special alert meeting, with helpful tips: <https://ucanr.edu/sites/ccveg crops/files/386287.pdf>

## Updated tomato cost study available for processing tomatoes in the Sacramento Valley & northern Delta

An updated UC cost study for growing processing tomatoes in the Sacramento Valley and northern Delta region has been completed, and is available online at <https://coststudies.ucdavis.edu/en/current/commodity/tomatoes/>. Estimates are based on production practices considered typical for the crop and area, but these same practices will not apply to every farming operation, and differences can be significant

Total costs (including cash and non-cash costs) are estimated at \$5,248/acre, an increase of 58% over 2017, reflecting changes in input and labor costs over the past six years. The greatest increases were in the cost of irrigation water (up 85% since 2017) and fertilizer (up 72% per lb of N). Wage increases and new overtime laws contributed to 50-60% increases in labor costs. The price negotiated for this year, \$138/ton, is likely to offset the increased costs. However, with our late plantings, extended hot weather, the risk of rains, and the threat of branched broomrape and its associated sanitation costs, risks are also high.

ITEM	Unit	2014	2017	2023	% change (2017-2023)
Transplanting	\$/acre	\$ 636	\$ 763	\$ 990	30
Seed	1,000	\$ 18	\$ 25	\$ 32.5	30
Irrigation water	acre ft	\$ 65	\$ 65	\$ 120	85
Labor: tractor driver	hour	\$ 17.00	\$ 19.21	\$ 29.46	53
Labor: irrigator	hour	\$ 13.60	\$ 17.40	\$ 26.51	52
Labor: non-machine	hour	\$ 13.60	\$ 16.31	\$ 26.51	63
Diesel	gallon	\$ 4.12	\$ 2.87	\$ 4.77	66
UN 32	lb of N	\$ 0.84	\$ 0.58	\$ 1.00	72
<b>ASSUMPTIONS:</b>					
yield	tons/A	44	44	46	5
crop price	\$/ton	80	72.5	138	90

For an explanation of calculations used, refer to the full study. For more information contact Brittney Goodrich at [bkgoodrich@ucdavis.edu](mailto:bkgoodrich@ucdavis.edu). To discuss this study with a local Cooperative Extension farm advisor, contact Patricia Lazicki (530-219-5198; [palazicki@ucanr.edu](mailto:palazicki@ucanr.edu)).

## Spotting TSWV in the field



**Fruit symptoms**, when present, are diagnostic. They can include cloudy spots or ringspots, bumpiness, and rings formed by necrotic tissue. **Not to be confused with:** Stinkbug damage. Stinkbug sucking activity causes light-colored spotting on ripe fruit, often corky below the surface.



**Leaf symptoms** nearly always include some necrosis. Bronzing on young leaves is a common symptom of early infection. New leaves may be small, curled, and necrotic. Necrotic ringspots, if present, are a good indicator of TSWV. **Not to be confused with:** Fusarium falciforme can also cause necrosis and distortion on young leaves. But unlike TSWV, the leaves often have a uniform interveinal yellowing or bleaching, such that the green veins stand out. New leaves can have a bunched appearance.



**Unusual symptoms** TSWV produces a wide range of symptoms in tomato plants depending on time of infection. However, many folks have been reporting unusual symptoms this year. These include striking chlorosis (yellowing), scorching and die-back of older leaves, curling and purpling of new growth, and ringspots on petioles and stems. Notably, fruit symptoms may be less common and severe. The range of possible symptoms and the similarity to other diseases (compare the TSWV(+) shoot dieback in the photo on the left with the TSWV(-) dieback on the right, caused by an unidentified root rot) make visual ID difficult, especially if fruit symptoms are not present. A rapid and reliable immunostrip test is available to confirm TSWV infection but does not differentiate RB TSWV: <https://orders.agdia.com/agdia-immunostrip-for-tswv-isk-39300>

**For more info or if you have samples that you'd like diagnosed, contact Patricia Lazicki at [palazicki@ucanr.edu](mailto:palazicki@ucanr.edu) or (530) 219-5198**

TSWV also infects peppers, and causes bumps, ringspots, and necrotic spots on the fruits. Leaves may not have necrosis.



# Equipment Sanitation Workshop 2023

This is a summary of a field day hosted by UC specialists Brad Hanson & Cassandra Swett, CTRI's Zach Bagley, & Dave Viguie of Viguie & Timothy Farming.



## Research recommendations

### Why sanitize?

Broomrape produces thousands of tiny seeds that can spread easily with soil on equipment. Seeds can remain viable in soil for more than 20 years and will not germinate without a host, making it very difficult to control once it is present. Sanitizing equipment between fields in one way to limit the spread of broomrape within and among regions and provide similar benefit for other pests and pathogens that spread with soil or plant debris.

### Where and when to sanitize?

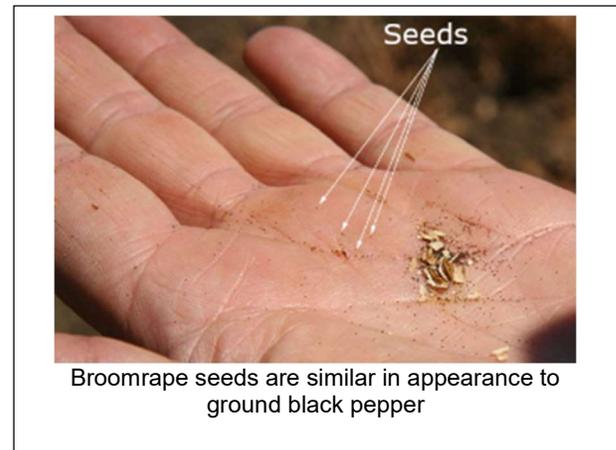
The best practice is to clean and sanitize equipment in the field directly after the operation. Many processors are taking similar steps to clean and sanitize harvest trailers before they return to fields.

### Physically clean first

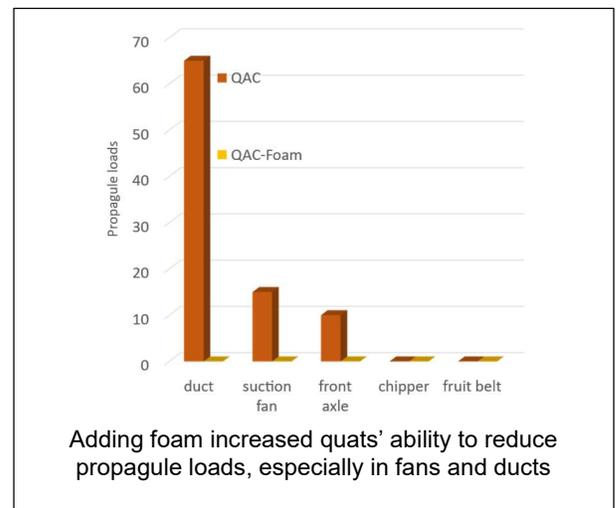
All soil and debris should be physically removed to the greatest extent possible before sanitization, since broomrape seed can be carried in any soil. Soil can also deactivate the sanitizers used to sterilize broomrape seed. Tests on a harvester found that blowing off loose soil and debris with high-pressure air alone decreased propagule loads by 85%, and adding pressure water wash further decreased loads by 90%. Hard-to-access areas like axle areas, the suction fan, and ducts carry the highest debris loads and should be given special attention.

### Sanitize with quaternary ammonium

Sanitize with quaternary ammonium compounds (QAC or quat) after physical cleaning. Clorox Pro Quat, Chem Quat, Flo San, and Mg 4-Quat are locally available products. Lab tests found that 1 minute of exposure to a 1% solution of a commercial QAC product killed broomrape seed. This solution was also effective against fusarium wilt spores. Tests on harvesters found that adding foam increased effectiveness, especially in hard-to-reach areas



Broomrape seeds are similar in appearance to ground black pepper



Adding foam increased quats' ability to reduce propagule loads, especially in fans and ducts

Best Management Guidelines:  
<https://ucanr.edu/blogs/UCDWeedScience/blogfiles/98532.pdf>

## Discussion and questions

Representatives from several grower and processor operations were present at the field day. The following are some points from the discussion which followed the presentation of research findings and management guidelines.

**How safe are the recommended sanitizing materials for the applicators? What's the recommended PPE?** Concentrated QACs are corrosive to the eyes and can irritate the skin. Follow label PPE: wear goggles or face shield and chemical-resistant gloves and protective clothing when handling.

**Is the wastewater from sanitation a concern?** QACs are deactivated in soil, so wastewater is not a big concern if sanitization is done in the field. It's toxic to aquatic life and shouldn't go down drains, however. Processors using large volumes in a small area should consult their local wastewater treatment expert.

**How corrosive are diluted quat compounds?** At recommended concentrations, QACs are not corrosive to mild steel, stainless steel, or typical durable equipment parts. Minimize exposure to electronics and other sensitive components.

**How long will diluted quat remain effective?** Recent tests with several dilute QACs suggest they're stable in the tank for at least a week: <https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=57686>. To be on the safe side, it's suggested to use a batch within a week of mixing.

**Could I save time on physical cleaning by increasing either the volume or concentration of quat solution (to overcome soil's ability to deactivate it?)** Possibly, to some degree. This is an active area of ongoing research by Dr. Hanson and Dr. Swett's teams. Increasing the volume of solution applied is more likely to be useful than increasing the concentration of quat in solution.

**What's the benefit of using a foamer, if any?** Tests on harvesters found that delivering quat with a foamer decreased propagule loads compared to quat alone. This was likely due to increased residence time, especially on places like ducts or the underside of the machine.

QACs are commonly used in food processing operations such as the dairy industry. Their use as a sanitizing agent against broomrape is still experimental, and is not specifically mentioned on the labels. It's recommended to speak with the County Agriculture Commissioner before starting to use them regularly in your program.

**For more information, contact Patricia Lazicki ([palazicki@ucanr.edu](mailto:palazicki@ucanr.edu), 530-219-5198)**

## Southern Blight Detection & Management Resources

Southern blight isn't normally a major problem for northern California processing tomatoes. As 2017 showed, however, it can be an issue when the conditions are right (soil temperatures over 86°F, high soil moisture, dense canopies, and frequent irrigation). I've seen it in a few fields this season. **It can look similar to fusariums but the management implications are different.** Cassandra Swett and Joe Nunez put together an excellent resource in 2017 outlining how to field diagnose and manage for Southern blight, freely available online here: <https://swettlab.faculty.ucdavis.edu/wp-content/uploads/sites/434/2017/09/Southern-Blight-Cliff-Notes-2017.pdf>. And a 2020 update on some of UC's ongoing southern blight research can be found here: <https://ucanr.edu/blogs/blogcore/allPostsByCategory.cfm?getallposts=1&tagname=bean>

## Seeking Collaborators on Broomrape Research

The broomrape research team at UC Davis is looking for-

- Additional impacted commercial field sites for long term management trials.
- Ground truthing opportunities for early detection. This would include allowing researchers into an impacted field with multi-spectral cameras on drones.
- Additional growers interested in working with the equipment sanitation team in sampling field equipment to assess potential improvements to their current practices.
- Seeking input from PCAs and growers on commercial applications of Matrix chemigation in order to fine-tune future recommendations.



Interested? Want more info? Contact Zach Bagley at 530-405-9469 or Brad Hanson (bhanson@ucdavis.edu)

## Input Needed: Yolo County Climate Action & Adaptation Plan

A message from Kate Reza at the Yolo County Resource Conservation District

Yolo County is in the process of developing its [2024 Climate Action and Adaptation Plan](#) (CAAP). The plan, which is an update to the 2011 Climate Action Plan, will include an expanded section on the role of farms, ranches, and natural lands as part of the solution to climate change.

The Yolo County RCD is leading the 'Natural and Working Lands Technical Advisory Committee' to make sure that the agricultural community is well-represented in this process. **We are soliciting feedback from the entire Yolo County agricultural community. Every grower's voice is important to inform CAAP implementation actions.**

The survey is available in English and Spanish here: <https://www.yolocounty.org/government/general-government-departments/community-services/climate-action-sustainability/yolo-county-climate-action-commission/cap-technical-advisory-committees-tacs/working-lands-outreach-survey>

Or scan here:



Responses are due by October 13<sup>th</sup>. Thank you very much!

## New Advisor Needs Assessment



My first job as a new farm advisor is to conduct a needs assessment to guide my research and extension priorities. What do you think are the biggest priorities for increasing the sustainability and profitability of vegetable crop production in Yolo, Sacramento, and Solano counties? Please click on the link to take a very brief survey, or scan the QR code.

<https://surveys.ucanr.edu/survey.cfm?surveynumber=40523>

Or, feel free to give me a call (530-219-5198). I'd love to come by and chat.