Vegetable Info (April 2023)

Introduction: new Vegetable Crops Advisor

My background and interests

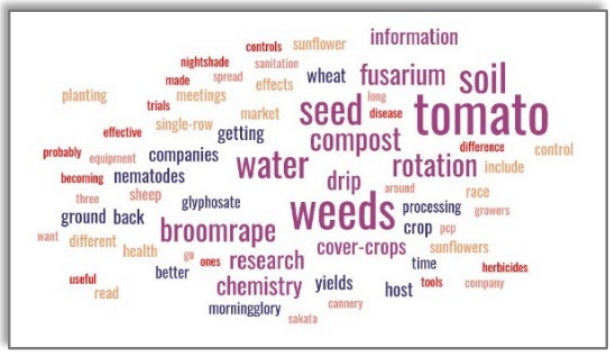
Greetings from the new UCCE Vegetable Crops Advisor! If I haven't met you yet, I hope to soon. My name is Patricia Lazicki. My background is in soil science, with emphases in nutrient cycling and soil health. I first worked in Yolo County tomato fields in 2005, when I did research with the Russell Ranch Long-Term Research project during my undergraduate degree in International Agricultural Development at UC Davis. In 2011 got an M.Sc. from the University of Illinois, where I researched links between crop management, soil health, and plant performance. Following this, I spent several years doing research and extension in West and Central Africa. I moved back to UC Davis in 2015 to work with UCCE Nutrient Management Specialist Daniel Geisseler on the California Fertilization Guidelines. I completed a Ph.D. at UC Davis in 2021. My dissertation research examined short- and long-term effects of organic materials on soil health and plant nutrition, with a focus on trellised fresh market tomatoes and a processing tomato-corn rotation.

Some reasons I'm excited to be in this position

- The chance to do holistic, applied, scientifically rigorous research that encompasses crop health, pest management, soil health, water dynamics and economic sustainability
- The opportunity to learn from and support local growers, PCAs and allied industry.

Short-term research priorities

Based on early conversations with growers, fellow farm advisors, UCD specialists, the CTRI and other industry folks, I have selected two main areas of focus in my first year.



- **Broomrape**— A priority concern with everyone I spoke to. My goal this year is to study broomrape research from California and around the world. In collaboration with UCD researchers and CTRI, I'd also like to include a page summarizing the most current local broomrape research and news on my website.

- **Pests & diseases**—Tomatoes have been grown here for a long time, and rotation times are getting shorter. This area is seeing both new pathogen threats (*Fusarium falciforme*) and resistance-breaking in historic threats (root-knot nematodes and tomato spotted-wilt virus). What chemical, cultural, and genetic tools will be most effective against these threats? With funding from CTRI, I'm conducting a study on two grower fields to assess the effective of K-PAM fumigation through drip tape on disease incidence and severity and yields, building on Brenna Aegerter's trials (https://ucanr.edu/sites/ccvegcrops/files/379242.pdf). I'm also collaborating with UCCE Pathology Specialist Cassandra Swett on a project testing varietal resistance to *F. falciforme*.

Any questions, comments, or suggestions? Please feel free to reach out! Contact info below:

Email: palazicki@ucanr.edu **Website:** https://ccvegcrops.ucanr.edu

Nitrogen management planning in a wet spring

This year's heavy rains may mean less soil nitrogen (N) will be available to support crop growth than usual, since much of the soil's residual mineral N may have been leached or lost to the atmosphere through denitrification. This is a good year to watch N closely and adjust as necessary.

Using soil nitrate tests to create an N budget

Nitrogen rate can be estimated using a budget approach, as the difference between the N required by the crop and the N supplied by non-fertilizer N sources. Data from a replicated processing tomato trial in Yolo County was combined with data from commercial fields around California and N availability estimates to create a free online N budget calculator (http://geisseler.ucdavis.edu/Tomato_N_Calculator.html). Table 1 shows how the calculator uses results of a spring soil nitrate test to estimate crop N rate. Estimates produced by the calculator should be confirmed with in-season monitoring.

Table 1: N budgets for a 60 t/acre crop in soils with low and high residual N levels. For details on how the numbers were derived, see Geisseler et al., 2020 [1].

Plant N uptake		**Low residual N**		**High residual N**	
Expected yield = 60 t/acre			lbs N/acre		lbs N/acre
Expected N in fruits (3 lbs N/ton fruit)			180		180
Expected N in vines (33% of total N)			90		90
Total expected N uptake			270		270
Estimated nonfertilizer N credits					
Residual soil nitrate-N*	(1st foot)	3 ppm N	5	25 ppm N	45
	(2nd foot)	5 ppm N	14	15 ppm N	43
Irrigation water N		0 ppm N	0	0 ppm N	0
Soil N mineralization			40		40
Total non-fertilizer N credits			59		128
Estimated fertilizer requirement					
Difference (uptake - nonfertilizer N)			211		142
Starter application			25		25
In-season N (assume 80% efficiency)			**233**		**146**

*Assumes a conversion factor of 3.6 to convert ppm N into lbs N/acre, and that 50% of residual N in the top foot and 80% of residual N in the 2nd foot are available in a subsurface drip-irrigated bed

Monitoring to adjust in-season rates

Tomatoes take up little N in the first 3-4 weeks after transplanting. However, during the period of rapid growth from early fruit set to first red fruit, N uptake rates can reach 5 lbs/acre/day. An in-season soil nitrate test indicates how much N is currently available to support this growth. For example, using the assumptions in Table 1, values of 15 ppm in the top foot and 10 ppm in the second foot would indicate a total of about 55 lbs N/acre currently available for crop uptake.

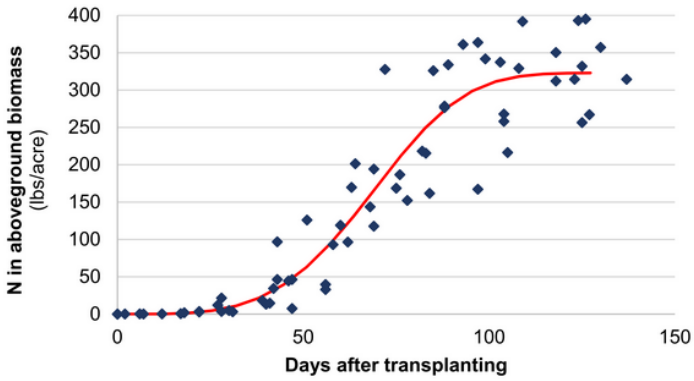


Figure 1: Seasonal N uptake in California processing tomatoes [1]

Table 2: Leaf N sufficiency ranges [2]

	N (%)	
Growth stage	Lower	Upper
First bloom	4.6	5.2
Full bloom	3.5	4.5
10% of fruits showing red color	2.7	3.8

….N management planning, continued….

Leaf samples can be used to monitor and adjust N rates. The fourth whole leaf from the growing tip is generally sampled. The ranges in Table 2 were developed based on a survey of 100+ high-yielding processing tomato fields. Values within the ranges indicate that crop N is likely sufficient for the growth stage. The further that low values are from the lower end of the range, the more likely the crop is to be deficient; values higher than the upper end of the range suggest luxury consumption. Very low values between first and full bloom indicate rapid adjustment is needed to support canopy development.

Irrigation uniformity improves N use efficiency! Irrigation Evaluation Field Day to be held by the Yolo County RCD on Friday, April 21, 2023. Register here for this free event: tinyurl.com/MIL-workshop

Other resources

- Sampling for soil nitrate determination: http://geisseler.ucdavis.edu/Guidelines/Soil_Sampling_Nitrate.pdf
- California Agriculture article on taking and interpreting a soil nitrate test: https://calag.ucanr.edu/Archive/?article=ca.2016a0027
- Plant tissue sampling: http://geisseler.ucdavis.edu/Guidelines/Plant_Tissue_Sampling.pdf
- California Fertilization Guideline for processing tomatoes: http://geisseler.ucdavis.edu/Guidelines/Tomato.html

References

1. Geisseler D., Aegerter, B.J., Miyao, E.M., Turini, T., Cahn M.D., 2020. Nitrogen in soil and subsurface drip-irrigated processing tomato plants (*Solanum lycopersicum* L.) as affected by fertilization level. Scientia Horticulturae 261, 108999.
2. Hartz, T.K., Miyao, E.M, Valencia, J.G., 1998. DRIS evaluation of the nutritional status of processing tomato. HortScience 33, 830-832.

Annual meeting presentations

Did you miss the annual tomato meeting in January? Presentations are available online at http://ccvegcrops.ucanr.edu

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 here to take a brief survey. https://surveys.ucanr.edu/survey.cfm?surveynumber=40523

Broomrape updates

Matrix (rimsulfuron) has been granted a 24c ("Special Local Needs") registration for use on broomrape in processing tomato. https://apps.cdpr.ca.gov/sln/assets/labels/303093.pdf More info here: https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=56257

Make sure your crew knows what to look for: https://bit.ly/broomrapeflyer

The best cure is prevention. Updated equipment sanitation guidelines are available: https://bit.ly/tomatosanitationBMPs

Harvester Sanitation Field Day planned for 2023; English, Spanish sessions available. Date TBD

Contact Cassandra Swett (clswett@ucdavis.edu) for a consultation or to evaluate the efficacy of your off-season cleaning practices.

Working wet ground creates risks later in the season

Working or planting into a wet soil too soon causes soil compaction. Planting into wet or compacted soils can affect performance later in the season.

Phytophthora root rot (*Phytophthora parasitica* and *P. capsica)*

Phytophthora root rot can affect tomatoes at any stage where there is free water in the soil. The pathogens are widespread in California soils so epidemics may occur when the environment is conducive. It is most common after wet winters, especially when the soil has been compacted by working fields when they are too wet. It can slow crop growth and reduce vigor, and severe infections can cause total crop loss. Since its distinctive symptoms are belowground, it may go undetected. Roots of all sizes may have water-soaked lesions that gradually dry and turn brown as the disease progresses. The xylem of the root often turns brown above the lesion, and the discoloration can extend up into the lower part of the stem. Aboveground, affected plants are slow-growing and may wilt or die in hot weather. In poorly drained soils with a history of infection, fungicides may be beneficial.
https://ipm.ucanr.edu/agriculture/tomato/phytophthora-root-rot/

Limited root system slows growth, may increase susceptibility to stress

Roots in compacted soils must exert more force to grow than roots in less compacted soils, making them slower-growing, shorter, and thicker [1]. Aboveground biomass also grows more slowly, and flower bud formation can be reduced [1,2]. Since the root system is exploiting a smaller volume of soil, compaction restricts access to soil water and nutrients. Drought, heat, or a heavy fruit load can therefore become stressful more quickly than they would on a plant with a healthy root system.

[1] Flocker, W.J., Vomocil, J.A., Howard, F.D., 1959. Some growth responses of tomatoes to soil compaction. Soil Science Society of America Journal 23(3), 188-191.

[2] Flocker, W.J., Menary, R.C., 1960. Some physiological responses of two tomato varieties associated with levels of soil bulk density. Hilgardia, 30 (3), 101-121.
https://hilgardia.ucanr.edu/Abstract/?a=hilg.v30n03p101