Field Notes
San Joaquin County
November 2024

University of California
Agriculture and Natural Resources

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Southern Blight in Warm-Season Vegetable Crops

Southern blight is a destructive crown rot disease that rapidly kills the plant. The fungus (*Sclerotium rolfsii*) survives in soil as hardened seed-like structures called sclerotia for multiple years. Each infected plant produces a new crop of sclerotia, replenishing the pool of inoculum that can germinate in future crops. The sclerotia germinate in response to the presence of a host plant and then the mycelium produces acids and enzymes which allow it to aggressively infect plant tissues, most often stem tissues in contact with or buried in the soil. Southern blight is favored by high temperatures (over 86°F), high soil moisture, dense canopies, and frequent irrigation.

Field diagnosis can be done by looking for the white fan-like mycelium growing on the crown tissues (Figure 1). Severely affected plants can have vascular discoloration, which may be confused with Phytophthora, Fusarium wilt or Fusarium crown and root rot.

Figure 1. White mycelium on an infected tomato crown in the field.

With southern blight, vine death generally progresses much faster than with the Fusarium crown rot diseases. If white mycelium is not visible in the field, one can take symptomatic plants, wash the soil off and put the crown tissue in a plastic bag with a damp paper towel. This can also be done with potato tuber rots. If it is southern blight, the fungus will grow out onto the paper towel over the next few days to one week and eventually forms sclerotia (Figure 2).

Figure 2. The white mycelium growing after a day or two in a plastic bag with a damp paper tower at room temperature.

Southern blight is not one of the top diseases we see in vegetables. That said, it does occasionally cause economic losses in tomatoes and is also a major cause of tuber rot in potatoes. I have also seen it killing plants in bell pepper and cucumber. I was not aware until recently, but it can also attack young, newly planted trees. However, I have only heard of this happening locally on one occasion, so overall the risk seems to be low for woody perennials in our area.

It does seem as though there is a trend towards increasing problems with the disease, presumably because of the hotter summers that we have had of late. People often ask me, “Is there anything we can do?”. In the current season,

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Figure 3. Sclerotia forming on a paper towel after mycelium grew out from an infected tomato crown. They are light colored at first but quickly turn tan and then brown.

Figure 4. The white mycelium forming on a rotting potato tuber after incubation in a moist plastic bag.

not really. My only suggestion is to try to avoid wetting the surface of the beds once the plants are mature. Chemical control with fungicides has been investigated and has not been very successful. In theory, there are some products that might help protect the underground stem from infection if applied in advance. The issue is getting the product to where it needs to be at the right time. In tomatoes, at the stage where infections happen (mid to late season) tomatoes have large vines, and any sprays are not going to reach and penetrate the soil near the crown in sufficient quantity to be effective. Likewise, drip chemigation applications are probably too deep, with the fungicide not reaching the shallower layers of soil in sufficient quantities. In potatoes, we need to protect the tubers during the end of the season and have seen some efficacy from fungicides as well as from ammonium bicarbonate. Ammonium bicarbonate is a fertilizer that has been categorized as 'Generally regarded as safe' (GRAS) and thus is exempt from tolerances. It kills the mycelium, but not the sclerotia in the soil. It seems to be as effective as azoxystrobin in late-season applications to potato (at vine kill or at rewetting prior to harvest). As always, check the label before making a pesticide recommendation or an application and follow all label guidelines and restrictions.

I have observed two different patterns of disease distribution in local fields. Sometimes we see scattered plants here and there, surrounded by healthy vines. Other times, there are patches where many or most plants are dying. These patches generally are not huge but can still be disturbing to see. Most of the time, these areas seem to be associated with wetter spots in the field. And this makes sense, given that the fungus attacks the crown tissue near the soil surface and needs adequate soil moisture to infect. Spots where the moisture from the buried drip system comes to the surface and the soil around the crown stays wet seem to be hot spots. Historically, we had issues with Phytophthora root and crown rot in furrow irrigated fields, generally causing the worst problems at the ends of the rows or wherever the furrow water sat for longer. Today, we rarely see those problems, but southern blight seems to have taken its place, showing up in the areas where the soil is wetter from drip irrigation, due to soil texture differences, poorer drainage, or even spots where the plants aren't as vigorous due to other problems and therefore are using less water. Despite all the advantages of drip, it is expected that there will be some areas in a field that receive a bit too much water. We can't expect to achieve perfect uniformity, and we can't differentially manage flow rates in irregular shaped areas of the field. All that said, attention to avoiding over-irrigation may help reduce the risk of losses to southern blight.

Is there anything that can be done in advance of the growing season to avoid the disease?

- In general, organic matter amendments (e.g. composted manure or municipal greenwaste) and cover cropping/green manures can contribute to general disease suppression by increasing total soil microbial activity, while residue decomposition may also release antimicrobial compounds to some pathogens (Leoni et al., 2014). On the other hand, sometimes the cover crop can be a host for southern blight, and if grown during the warmer months, the fungus can increase on the cover crop itself.
- Research on chitin amendments (e.g. crab meal) shows a small reduction in disease in potato. However, with the high cost of chitin amendments, this may not make economic sense.
- Fumigation with metam or chloropicrin can reduce sclerotia in the soil but may not be feasible due to the high costs and regulatory restrictions (buffers, etc.).
- The fungus survives in the soil for many years and has a very wide host range, even including some plants in the grass family, so rotation is not a very feasible strategy. However, we are looking at fields where two years of rice is part of a rotation with potatoes to evaluate whether the summer flooding reduces sclerotial counts in the soil. We acknowledge that rotation with rice is not an option for everyone but can work in certain situations.

As field diagnosis can be tricky, please call or email and I can help you with diagnosis of diseases in San Joaquin County vegetable crops.

Brenna Aegerter, Vegetable Crops Advisor

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2024 Delta Rice Recap

Delta rice acreage has been steadily increasing, and yields are comparable with the statewide average. I estimate that Delta acreage approached, if not exceeded, 15,000 acres in 2024. This article is my seasonal update on UCCE Delta rice research and observations.

Table 1. Rice acreage and yield.

	2023	2022	2021	2020	2019	2018	2017
SJC Acreage	10,990	8,930	7,070	4,990	4,360	3,620	3,060
Proportion of statewide acreage in SJC	N/A	4%	2%	1%	0.9%	0.7%	0.7%
Average SJC Yield (cwt/ac)	102	101	95	88	81	86	82
Average Statewide Yield (cwt/ac)	N/A	90	92	89	86	88	86

**Rice acreage and yield according to the San Joaquin County (SJC) Agricultural Commissioner's Crop Reports. Rice acreage in SJC is primarily in the Delta region. Delta acreage in other counties is not included in these statistics. At the time of publishing, 2023 CDFA statewide data were not yet available (N/A).*

Variety Trial: UCCE collaborates with the California Rice Experiment Station to evaluate commercial varieties and advanced breeding lines. The San Joaquin County Delta was one of eight locations in the 2024 statewide trial. The Delta is the only drill-seeded site and is a test site for very-early maturing varieties because it has cooler growing conditions than other rice growing regions of the state. Variety trial results will be available in the February 2025 newsletter.

Armyworm Monitoring: In 2024, we monitored for true armyworms on three Delta farms, and moth catches peaked around July 1st (Figure 1). I observed that feeding damage was highly variable across the three farms but also across fields on the same farm. This has important implications for in-season management and highlights the importance of scouting for crop damage and the presence of worms. UC IPM guidelines (https://ipm.ucanr.edu/agriculture/rice/armyworms/) provide monitoring guidelines and treatment thresholds. While a second peak has sometimes been observed in the Sacramento Valley, we have not observed a second peak after heading in the Delta.

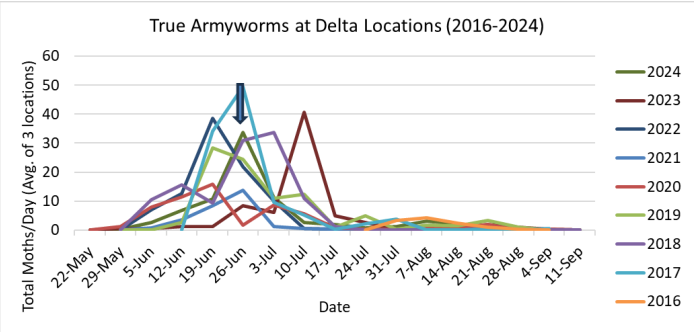

Figure 1. Delta true armyworm trap counts, 2016-2024. These data are the average of nine traps (three farms with three traps each).

Weedy Rice: We need to stay vigilant in our efforts to prevent the spread and manage weedy rice. Early in the season, weedy rice is often mistaken for watergrass because it grows taller than the cultivated rice. However, I have noticed that watergrass (and barnyardgrass) will head sooner than weedy rice, and weedy rice has a lime green color in full light. There is a video on the CA Weedy Rice website (https://caweedyrice.com/) that can help with identification, or call me if you would like help. In-season management includes rogueing or spot spraying before viable seed is produced. The organic herbicide Suppress is registered for spot spraying. Post-harvest management should include straw chopping, but ***not*** incorporation, and winter flooding. This will keep seed on the soil surface where it can potentially deteriorate over the winter. With my colleagues, Whitney Brim-DeForest and Luis Espino, I will host a meeting for the Delta rice industry in early 2025 to provide weedy rice research updates and management information. Stay tuned for the meeting announcement.

Cover Cropping: With funding from the CDFA Healthy Soils Program and CA Rice Research Board, we are evaluating whether cover cropping improves soil carbon and nitrogen dynamics in the rice system. We are also assessing cover crop species performance, like survivability and biomass production. Since rice may be grown over multiple seasons without rotation, cover crops may provide an opportunity to introduce plant diversity, including nitrogen-fixing legumes. While the 2022-23 winter season was excessively wet, which hindered cover crop establishment, the 2023-24 season started off dry, so sowing and establishment were successful. We observed that the brassicas emerged quickly and started covering the soil after just one month, but when rainfall became more frequent after the new year, the brassicas died off. In contrast, the two vetches and balansa clover started off slowly but had vigorous stands by early spring, despite the wet conditions. For more information on these trial results, please visit my blog article (https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=59659). The 2024-25 winter season will be our third and final year of trialing.

Disease Observations: In past years, I have been called out to fields to help diagnose diseases, which were later confirmed as stem rot, aggregate sheath spot, or rice blast. The 2024 season, however, was a relatively light disease year, and my colleague, Luis Espino, also observed that in the Sacramento Valley. Just to recap, it is important to scout for these diseases at late-tillering and early-heading because fungicide treatments are most effective when applied between late-boot and early-heading. Rice blast may be exacerbated by too much nitrogen, and stem rot and aggregate sheath spot by low potassium (K), so proper plant nutrition is a good strategy to mitigate disease. K can be limiting in some Delta soils, so one of my future goals is to do K fertilizer rate trialing to determine if it can reduce disease incidence and/or boost yields.

Herbicide Resistance Testing: UCCE, under the direction of Extension Specialist Kassim Al-Khatib, provides herbicide resistance testing for rice growers. If you suspect that weeds have developed resistance to certain herbicides, please collect mature weed seeds at the end of the season and submit them to me.

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Alternate Wetting and Drying: Earlier this year, I applied for funding from the Delta Science Program to evaluate the practice of Alternate Wetting and Drying (AWD) in the Delta. AWD is a management practice where a flooded field is temporarily drained during the growing season and then re-flooded. Research from other states and countries has shown that the practice can reduce methane emissions from rice fields, but there has not been research done in the Delta, with its unique soil and climate conditions. If the grant is awarded, this project would begin during the 2025 season.

I want to take this opportunity to thank all the growers who collaborated with us on these projects. I wish everyone a happy, healthy end to 2024.

Michelle Leinfelder-Miles, Farm Advisor, San Joaquin County and Delta Region

Field Corn Variety Trial Results

The 2024 UCCE Delta field corn variety trial, located on Tyler Island, was planted on April 26th by air planter and consisted of three replicate blocks of eleven varieties. The trial included nine varieties submitted by seed companies and two submitted by the grower. All varieties were glyphosate tolerant. Each plot consisted of four 30-inch beds on an average row length of 1370 feet. Seed was planted approximately two inches deep and six inches apart down the row. The soil is a Rindge mucky silt loam with approximately 20 percent organic matter in the top 15 inches of soil. The Rindge series is a mucky peat soil down to about 60 inches, and approximately 55,600 acres in the Delta are described by the Rindge classification. The previous crop in the field was triticale. Subsurface irrigation by "spud ditch" was employed. The fertilizer program consisted of pre-plant UN-32 (113 lb N/acre) and at-planting 8-24-6 with zinc chelate (31 lb N/acre). Weed control was by cultivation and glyphosate herbicide program, and Onager miticide was applied. The field was harvested on October 14th.

Stand counts were made approximately two weeks after planting. The stand was assessed in the center two rows of each four-row plot, counting the plants along a 10-foot length. All varieties reached bloom between July 6th and July 11th (71-76 days after planting). There were periods of exceptionally hot weather during the 2024 growing season, including during bloom (Fig. 1).

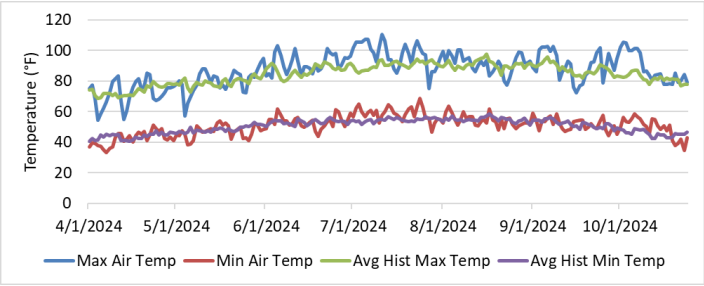

Figure 1. Temperature data from the California Irrigation Management Information System (CIMIS) Staten Island station, which is the most proximal station to the trial location. The maximum and minimum temperatures for the 2024 season are shown in relation to the average historical temperatures for that station (2016-2023).

Corn has photosynthetic adaptations that impart heat tolerance, but research has shown that the photosynthetic capacity of corn can be impeded when high leaf temperatures inactivate photosynthetic enzymes. High mid-season temperatures may have impacted yield for some varieties, but overall performance appears comparable to previous years.

We monitored head smut, common smut, and Fusarium ear rot (Figure 2), as well as plant lodging and ear height, in mid-September. The three diseases are generally managed by variety selection. Fusarium ear rot incidence was relatively high this year, and members of the industry have confirmed this for other regions of the state. Head smut incidence was low this year, and common smut is not widely observed at this site. Winds were light during the harvest season, so no lodging was observed.

Figure 2. Diseases monitored in the UCCE Delta field corn variety trial: A) Fusarium ear rot, B) head smut, and C) common smut. Fusarium ear rot incidence was high in 2024.

Table 1 (page 5) presents mean values for the three replicates. The statistical method used to compare the means is called the Tukey's range test. Varieties were considered statistically different if their P value was less than 0.05, or 5 percent. What this means is that when differences between varieties exist, we are 95% certain that the two varieties are actually different; the results are not due to random chance. Differences between varieties are indicated by different letters following the mean. For example, a variety that has only the letter "a" after the mean yield value is different from a variety that is followed by only the letter "b", but it is ***not*** different from a variety whose mean value is followed by both letters ("ab"). Six varieties have the letter "a" following their mean yield, which means that those six varieties all performed similarly in the trial. In other words, based on this trial, we cannot attribute numerical differences to varietal differences.

In addition to yield, there were also statistical differences among varieties for stand count, days to bloom, Fusarium ear rot, ear height, grain moisture, and bushel weight. The CV, or coefficient of variation, is the standard deviation divided by the mean, or a measure of variability in relation to the mean. For Fusarium ear rot, the variability among the three replicates was very high.

Special thanks go to cooperating grower, Gary Mello, and the participating seed companies.

Michelle Leinfelder-Miles, Farm Advisor, San Joaquin County and Delta Region

Table 1. 2024 UCCE Delta field corn variety trial by Michelle Leinfelder-Miles, UCCE farm advisor.

Entry Name	Variety Source	Stand Count (plants/ac)	Days to Bloom*	Fusarium Ear Rot* (%)	Head Smut (%)	Common Smut (%)	Plants Lodged (%)	Ear Height* (in)	Moisture (%)	Bushel Wt. (lbs/bu)	Yield‡ (lbs/acre)
P 14830AML	Pioneer Seeds	37752 ab	75 a	1 c	3	0	0	52 ab	13.0 a	61.8 bcde	13123 a
P 1366	Grower	36300 abc	75 abc	1 c	0	0	0	55 a	11.9 c	61.2 de	12714 ab
LG 7514	Grower	36590 abc	72 cd	2 c	0	0	0	49 abc	12.2 bc	63.0 ab	12324 abc
P 1222AM	Pioneer Seeds	37171 abc	76 a	2 c	1	0	0	52 ab	12.0 bc	62.1 abcd	12280 abc
D 54SS74RIB	Nutrien Ag Solutions	38623 a	72 cd	2 c	1	1	0	46 bc	12.3 bc	61.5 cde	12226 abc
LG 64C43VT2RIB	LG Seeds	36590 abc	73 bcd	2 c	0	0	0	47 abc	12.4 abc	60.7 e	11928 abcd
PS 8360VT2ProRIB	ProHarvest	36010 abc	76 a	2 c	1	0	0	53 ab	11.9 c	61.5 cde	11188 bcde
B SX5543RR	Baglietto Seeds	33687 c	71 d	16 a	2	0	0	40 c	12.5 abc	63.3 a	11034 cde
B SX5583VT2P	Baglietto Seeds	31654 cd	71 d	6 bc	0	0	0	47 abc	12.6 ab	61.3 de	10987 cde
D 53SS13RIB	Nutrien Ag Solutions	34267 bcd	75 a	6 bc	2	0	0	54 ab	12.1 bc	62.5 abc	10479 de
LG 63C54PCE	LG Seeds	35138 abcd	74 abc	11 ab	0	0	0	54 ab	12.4 abc	61.0 de	10212 e
Average		**35798**	**74**	**5**	**1**	**0**	**0**	**50**	**12**	**61.8**	**11681**
Coefficient of Variation (%)		**7**	**3**	**106**	**-**	**-**	**-**	**10**	**3**	**1.4**	**9**
Significant variety effect (P value)		**0.0002**	**<0.0001**	**<0.0001**	**N/A**	**N/A**	**N/A**	**0.0001**	**0.0001**	**<0.0001**	**<0.0001**

Results for each variety are expressed as the average across three replications.
* Data were transformed for analysis. Arithmetic means are presented.
‡ Yield adjusted to 15% moisture.

UC ANR Announcements and Calendar of Events

Western Alfalfa and Forage Symposium
December 10-12, 2024
Sparks, NV
For more information and to register, please visit: https://calhaysymposium.com/.

Northern San Joaquin Valley Almond Day
Tuesday, January 21, 2025
8:00am – 12:00pm
Modesto Centre Plaza/DoubleTree Hotel, 1000 L St., Modesto, CA, 95354
Contact: Brent Holtz, baholtz@ucanr.edu

SJC and Delta Field Crops Meeting
Friday, January 24, 2025
8:00am – 12:00pm
SJC Cabral Agricultural Center
Save the date! More information to come on the Delta Crops blog: https://ucanr.edu/blogs/sjcfieldcrops/.
Contact: Michelle Leinfelder-Miles, mmleinfelder-miles@ucanr.edu.

Grape Day
Tuesday, February 4, 2025
7:30am – 1:00pm
Hutchins Street Square, 125 Hutchins Street, Lodi, CA
Contact: Justin Tanner, jdtanner@ucanr.edu.

Northern San Joaquin Valley Tomato Production Meeting
Wednesday, February 12, 2025
8:00am – 11:00am
Modesto Centre Plaza/DoubleTree Hotel, 1000 L St., Modesto, CA, 95354
in conjunction with the California Tomato Growers Association Annual Meeting
For info on educational portion, contact Scott Stoddard (209) 385-7403 or csstoddard@ucanr.edu.
For info on CTGA luncheon meeting and exhibition, contact CTGA (https://ctga.org/), (916) 925-0225 or info@ctga.org.

Rangeland Summit
Tuesday, March 4, 2025
8:00am – 5:00pm
SJC Cabral Agricultural Center
Contact: Theresa Becchetti, tabecchetti@ucanr.edu

Quad County Walnut Institute
Tuesday, March 18, 2025
Time: TBA
SJC Cabral Agricultural Center
Contact: Brent Holtz, baholtz@ucanr.edu

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Notes from the Field

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