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# TOMATO INFO

Field Observations

## Field Observations

Over the decades and continuing, we've benefitted from plant disease resistances incorporated into our various cultivars. Those tomato plant resistances have included root knot nematode, Fusarium wilt races 1, 2 and 3, bacterial speck, spotted wilt and others.

When I began working locally as a farm advisor in 1980, Fusarium wilt race 2 was spreading in Sutter County with major impact. Race 2 resistance has since been broken. Root knot nematode resistance was in a number of varieties as the arsenal of nematicides was off the market or voluntarily withdrawn because of cost, regulations or worker safety issues. Plant genetics solved the nematode problem. Slowly, the root knot nematode resistance from the *Mi* gene has been overcome in an increasing number of fields. When resistance to bacterial speck was introduced in tomato, that genetics greatly improves plant health from bacterial speck infection as the protective spray program was never highly effective. But this resistance was short lived, perhaps effective for 10 years before completely overrun by resistant strains of *Pseudomonas syringae*. The most recent development has been resistance breaking of the Sw5 genetics that provides protection from *Tomato spotted wilt virus*. Fresno tomato growers experienced this resistance issue in 2016 and there are identified occurrences in our local area this year.

The Red Queen's hypothesis is at work. The generalization in this context is that tomato breeders introduce pest barrier 1 and the Pests begin evolving to overcome barrier #1. So the plant breeders devise barrier #1.1. And the Pests start chipping away to overcome this new obstacle. Endless back and forth.

The point is: stay in tune, be ready for change, focus on the prize and have many tools in the toolbox. Integrated pest management (IPM) strategies are important.

## High Temperatures

Our weather conditions this year to date have been hot and dry. Less winter rainfall and less available water in many cases.

With so many acres of tomatoes grown on subsurface drip irrigation, I mostly hear growers relating water irrigation schedules in terms of hours of run time. Some of that is reasonably the easiest instruction for an irrigator to follow without processing it further.

One potential emerging problem this year (and other drought years), is unknowingly deficit irrigating. With soil moisture low at the start of the season, there is less margin for error. Those groundwater systems designed to run 24/7 to fully irrigate a crop at peak demand, clearly will suffer with reduced well water output into the summer months. While the best time to deficit irrigate, if needed, is beginning at early fruit ripening stage, plants will still benefit from irrigating near a target model evapotranspiration rate. With a depleted soil moisture profile at 2-to-4-foot depths, that historical deeper moisture cushion that allowed more drastic irrigation reductions and early complete cut offs should be reassessed this season.

Hours of run time should be adjusted as pump output changes. I suspect the output of many wells at the beginning of the season has now diminished to a lesser value. Thus an accurate flow meter becomes a valuable tool to access output in gallons per minute and not relying completely on simple hours of run time. Soil moisture sampling with soil probes or Watermark blocks or other monitoring devices also can help detect these changes.

**Broomrape: new discoveries continue**

For our 2021 season, new discoveries of branched broomrape continue locally.

CTGA and CTRI are exploring a plan to fund a broomrape eradication and management effort for industry. The cost of fumigation is pricey at approximately $5,000 per acre. CTRI is funding research to explore alternative control programs.

The concern is statewide for the California processing tomato industry. Most at risk are those growers with an infestation on their ranch. Concern is unknowingly spreading seeds prior to finding an infestation. Thus many equipment operations have been made within and among fields with blissful ignorance without realizing a tomato field had a problem. Neighboring fields are at risk. There are many potential ways to spread seed especially when sharing common equipment (transplanters, harvest equipment, gondola trailers, commercial spray rigs). The list is long and doesn't exclude human activities from hoeing crews, irrigators, PCAs. Spread can occur in many ways.

Sanitation between fields is a precautionary step to reduce pest spread including broomrape seed. Quaternary ammonium products have broomrape seed killing power and thus are part of a defense. The procedure is removing the bulk of the soil and debris from the tool, wetting down with water to soak seeds and then spraying down with a 1% product solution of quaternary ammonium and let it remain in place. (Note: MG-4 Quat is one product in common supply locally).

As an industry, the strategy should be to: scout and identify, isolate to contain, and work towards eradication of the weed in that field. As fumigation is expensive, the earlier an eradication effort begins, the fewer opportunities for the pest to spread. Quarantining a field without a treatment program to eradicate the pest in place appears unwise since that leaves many paths for these tiny and abundant seeds to spread passively by wind, dust devil whirls and water runoff. The broomrape seed doesn't differentiate a tomato harvester from a grain combine to a hay baler. There isn't a reprieve from seed movement even when tomato isn't grown. Seed survival is up to 35 years or so.

Careful: While the consequences of reporting a broomrape discovery in a field result in a no-crop harvest in the field area of the infestation, attempting to 'self-control' a limited-area discovery is challenging. From Israeli broomrape researchers, we were told that containment without effective chemicals is nearly futile. Several problems exist: seed production is abundantly high at over a 1,000 seed per individual shoot; seeds become viable within weeks after shoot

emergence; seeds are tiny beyond easy visual detection; broomrape continues to emerge until harvest. As broomrape shoots are growing within the canopy of the host tomato plant, complete discovery is difficult. While hand removal of shoots and glyphosate killing of the host tomato plant will reduce seed production, detection before some seeds developed is highly unlikely. Thus, even the most thorough job at shoot removal likely still increased the broomrape seed bank by well over 10 times. More likely the seed level increased 1000-fold from just a few seed capsules escaping per broomrape cluster. A hand weeding crew would need to scout and bag the shoots twice weekly up until harvest to reduce seed production with this strategy.

Harvesting over the hand weeded infested area is not advisable. Seed will likely be picked up by the harvester via soil and seed stuck to tomato plants. Thoroughly cleaning a tomato harvester will be challenging. Broomrape seed is not as fine as dust, but is tiny sized. Not harvesting the infested area is the better choice to avoid moving seed on harvest equipment. Not driving equipment through the area makes sense as seed could be in the furrow. Keep gondola trailers from passing through an unharvested area as trampled vines with fruit on bed shoulders could more easily collect broomrape seed and be the vehicle for spread. The risk of broomrape seed spread would be highest down the row, then across the field and even may continue into the succession of later fields to be harvested.

A grower harvesting an infested area without taking mitigation steps is simply being reckless.

However, there are likely lightly infested fields where broomrape is not detected, yet exists. While ignorance can be a blessing, the consequences of spread remain real. Thus, taking precautionary steps to clean equipment including use of disinfestants may be prudent and necessary.

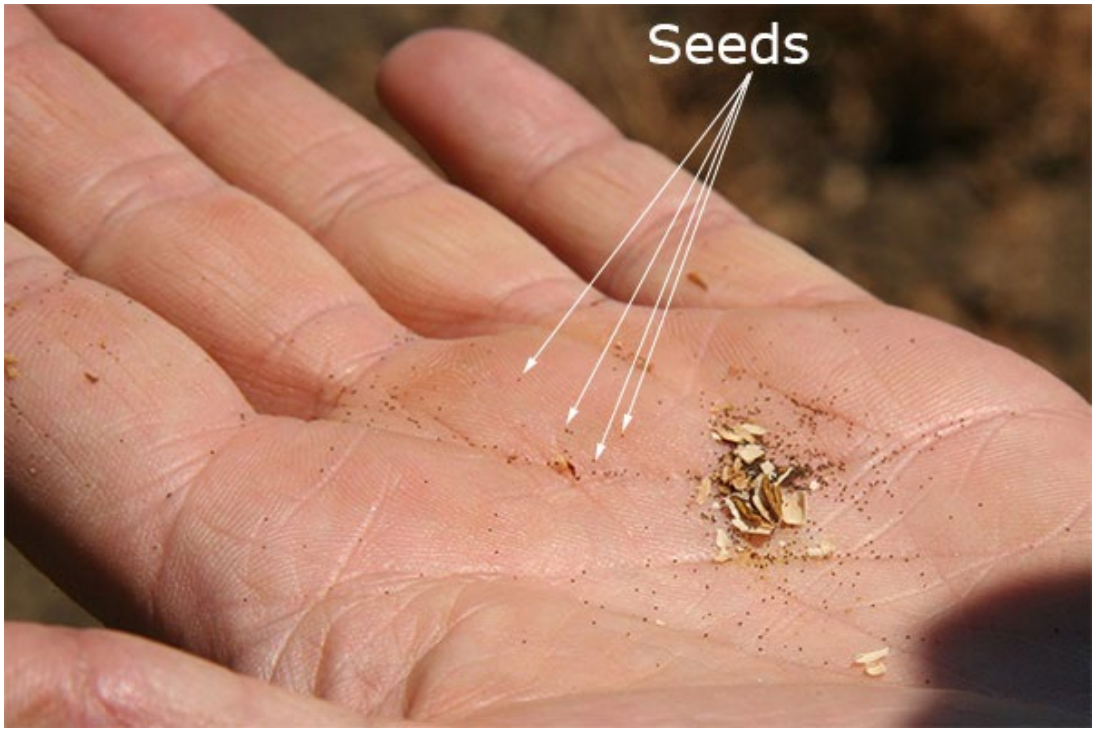
For broomrape seed, the procedure would be to: 1) physically scrape the bulk of soil and debris from equipment; wash with water to wet seed to precondition as well as to remove soil and fine debris; and spray to wet with a 1% solution of quaternary ammonium product and leave in place. The steps are time consuming. These instructions are simpler said than performed. Designate one place in the field to concentrate rather than scatter potential dirty areas. It would seem logical that the piles also be sprayed with quat ammonium as a precaution.

Containing broomrape to limit spread is difficult. And without an eradication program once discovery is made, the equipment sanitation effort within the infested field should remain in place across rotational crops and long into future years. Sanitation steps might be wise across all fields.

A Wish List: A more economical eradicant is needed to clean up the known infested fields. As well, imagine the value of a hand-held broomrape seed detection device to reduce field to field spread on equipment or workers. Imagine the usefulness of a fluorescent dye that only lights up on contact with broomrape seed. Or imagine a cell phone app for broomrape detection with a toggle switch selector for seed or shoots.

Without these detection tools, the precautionary practice of cleaning and sanitizing equipment (and shoes, tools, etc) before exiting a field seems sensible.

UC Weed Specialist Brad Hanson and grad student Matt Fatino are conducting a field experiment at one of the infested commercial field sites since 2020. In 2019 when the discovery was made, the grower estimated the infestation increased 10x the following year when experimentally, tomatoes were planted in 2020. By the end of 2020, the infestation was equivalent to over 1,700 broomrape clusters per acre. Each cluster appeared to average 5 shoots with ~10 flowers per shoot.. If each flower produced a seed capsule containing 200 seeds, in the second year, 17 million seeds were produced per acre. This abundant production of long-lived seed escalates the threat. Broomrape control will be challenging. Unless steps are taken early, later control efforts will involve many more fields.

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