FIELD SANITATION PRACTICES
In the early 1980s, a seed company pathologist directed me to a tomato field in the Sutter Basin that was devastated with Fusarium wilt race 2. The sense of loss and significance of the disease may have been similar to the scenario when someone returns to their cabin in the hills after a forest fire had swept through. The dousing with whitewash did not lessen the visual impact of this scorched tomato field. The seedsman also provided a map showing the location of their vigorously growing race 2 resistant variety planted in a portion of the field.

In recent years, I worked with UC Plant Pathologist Mike Davis on a campus-located field test to evaluate the spread of Fusarium by infested tomato plant debris. The pathogen was able to establish itself within a year and cause infection. By the 3rd consecutive annual tomato planting, the level of spread approached 20%.

The lesson learned was obvious: don’t spread Fusarium. Take some precautionary steps to clean equipment especially when leaving an infested field and going into a ‘clean’ field. It’s logical. It might be analogous to removing your muddy work boots before entering your home.

Here’s the rub. Not all the pathogens are easily detectable. Imagine a farming operation where one person is responsible for tomato production. Does the partner handling the field crops know to clean the soil from an infested field in the rotational crop years? There are other examples.

Local Egyptian broomrape infestation:
The discovery of an infestation of broomrape in a local tomato field is a stark example of unknowingly introducing a harmful parasitic weed pest. In this case, the consequence of this discovery was a CDFA/USDA quarantine resulting in crop destruction of the host tomato crop without harvest. Also unfortunate, the occurrence was in a field with newly installed drip irrigation system: a substantial investment without any return in that year. Supportively, the processing tomato industry through CTGA, CTRI and tomato processors organized with CDFA to fund a control effort to eradicate this new species introduction into the United States. Fumigation is costly at ~$4K per acre. Subsequently, in order to remove the quarantine, the grower must plant susceptible host crops to monitor broomrape emergence as escapes. There are limited economic crop choices until the grower demonstrates successful eradication. The hardship continues.

How would anyone know ahead of time that a field was infested with the tiny speck of a broomrape seed? And before these parasitic weeds emerged as a foreign-looking plant to trigger an alert, how many tractors and people passed through the field as unaware potential carriers to spread the seeds?

Bottom Line: Vigilance with sanitation may reduce the introduction of unwanted pests. Perhaps field sanitation should be an adopted routine when leaving a field. This might apply to all of us as field personnel scouting fields as well as equipment operators and irrigators. An ounce of prevention is worth…
Broomrape detection:

Familiarity with broomrape identification is useful. The 2 species in California (branched and Egyptian) are both in our local production area. The differences are subtle, but both are distinct from all other weeds found in local tomato fields. Detection in tomatoes would more likely occur on more mature plants as opposed to an early growth stage. Shoots are light yellow-colored, succulent appearing in abundant clumps. The plants are parasitic, without chlorophyll, and thus are dependent on attaching to a host plant to survive and thrive. Attachments are underground. Grasses are not hosts; and not all broadleaf crops serve as hosts. Upon discovery of a limited infestation, to reduce spread, hand dig broomrape plants, and immediately bag in plastic to solarize in place. However, it is likely that some viable seed have set and seed capsules have opened to shed mature seed.

The Challenge:

The treatment is expensive, far beyond an economic return for an individual grower. Remaining under quarantine has its penalties as well. Currently, no tomato processor will accept tomato fruit from a field contaminated with broomrape for fear of being responsible for further spreading the seeds on bulk trailers, from cannery-accumulated debris and through wastewater. The added expensive of scraping off soil and plant debris from equipment, washing and sanitizing all equipment leaving a quarantined field, restricting access to the quarantined area, limiting off site flow of water is onerous. Downstream, downwind, and neighboring growers and landowners may be vulnerable. Crop selection is challenging, as preferred hosts need to be planted as indicators of eradication success, and saleable to offset expense.

A responsible grower reports. I believe the challenge of excluding pests is considerable. I believe it does take a community effort along with joint funding to address the problem. My understanding is the California Tomato Research Institute was initially formed to address broomrape control as a major focal point. A legislative marketing order was formed in those early days to assess all canning tomato growers based on tonnage to pool dollars to treat a broomrape-infested field. While the marketing order no longer exists and the 1970s broomrape threat subsided, broomrape incidence has reemerged. Three fields with branched broomrape were discovered in San Joaquin County in 2014 and a resurface from a historical infestation in San Benito County in 2009 to go along with the 2014, new species discovery in Solano County. Why the lapse in years?
The Industry Response? What will be the tact if additional fields are infested in the future? Can we move as an industry to accept the presence of broomrape without quarantine? The Australian and the Israeli tomato industries approach is to control the pest much like another weed within the season because eradication attempts failed. The question remains for us in California: left unchecked and without government quarantine, how big of an agronomic problem will broomrape become? If the new species outbreak in the Dixon field represents the norm, the problem is serious and would likely worsen without an eradication effort.

A quarantine program without an economic means to eradicate the pest is not a solution. If the problem becomes worse, the industry needs to rally. Below are 2 links to broomrape information.


http://www.ipm.ucdavis.edu/EXOTIC/egyptianbroomrape.html

Cost of Production Studies:

A sample cost of production was completed for our region. The study had input from a grower committee where details were gathered on equipment operations and crop inputs with special attention given to irrigation by drip. Costs were computed by Don Stewart operating a ‘UC Budget Generator’ program with oversight from Ag Economist Karen Klonsky. The study was completed in cooperation with UC San Joaquin County Farm Advisor Brenna Aegerter. The studies can be downloaded at http://ceyolo.ucanr.edu/Vegetable_Crops/Cost_Studies_20/ . From the 22-page studies, page 10 and 11 comprise the heart of each study.

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expenses ($/ton) $72 $83 $73

yield (tons) 44 38 35

Table 1. Sample cost of production, processing tomatoes, lower Sacramento Valley & San Joaquin County, 2014.
The hypothetical farm had 1,000 acres of tomatoes in a 3,500 acre diversified row crop operation. All land was share rented on a percent of gross basis with the grower owning a shop and office. Of the 1,000 acres of tomatoes, 300 acres were furrow irrigated and 700 were subsurface drip irrigated. The drip system was financed by the grower on land with a long-term lease agreement. The drip tape portion of the system had an expected life of 5 years. Only transplants were used and all were custom planted. At harvest, half of the acres was custom harvested by a processor while the remaining was grower harvested. Separate studies were conducted for drip and for furrow.

Cost of production continues to increase with a current estimate of ~$3,150 per acre. Our cost evaluations indicate that subsurface drip irrigation hasn’t lowered production costs (Table 1). While fall tillage operations are reduced, less water is applied, and less hand weeding is needed, the overall cost of the drip system and maintenance of the drip tape increase total cost of production to be similar to the conventional furrow system. The advantage of the drip system weighs in favor of higher yield as the driver.

![Figure 4. Sample cost of production, Yolo County area, 1961 to 2014.](image)

Looking back over the years, cost of production was calculated to be $500 per acre in the 1960s and increased to $1,300 in the 1970s (figure 4). By 2001, cost was $1,700 and continued to a current high of over $3,150. From those 1960s studies, nitrogen was 20¢ per pound, diesel was 20¢ per gallon, seed was $15 per pound, hand labor was about $1.40 per hour including benefits and irrigation water was $3 per acre foot. In 1967, a 1st class postage stamp was 5¢.

Best wishes for a productive 2015.

Submitted by,

Gene Miyao
Farm Advisor, Yolo, Solano & Sacramento counties

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