# **PROGRESS REPORT TO CTRI, September 2019**

**Project Title**: Preemptive development of management strategies for branched broomrape: an emerging threat to California specialty crops

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## Key Takeaway(s) at this date:

There was no visible tomato plant injury associated with the evaluated decision support system (DSS)-PICKIT techniques under California condition.

## The main Goal and Objectives of the funded project:

The overarching goal of this project is to develop actionable, cost-effective solutions for rapid detection, containment (sanitation), management, and eradication of branched broomrape in both fresh and processing tomato production systems of California.

The specific objectives to be address in the first year of the project are:

- Evaluate the crop safety of DSS-PICKIT technique under California conditions;
- Determine the cardinal temperatures for seed germination of broomrape;
- Calibrate a thermal time model for prediction of the parasitism dynamics.

### Progress towards and Preliminary Findings on project objectives to date:

- A. Seed Collection: Broomrape seed collection from greenhouse propagated plants was scheduled for May to July, 2019. However, the planned soil collection from an infested field site was delayed by winter soil conditions and delays in the CDFA permitting process. Soil was collected in June 14, 2019 and branched broomrape plants are currently being propagated at the Contained Research Facility (CRF) of UC Davis. Matured seeds are expected to be ready for collection by the end of September or early October 2019.
- **B.** Seed Germination: The seed germination studies were scheduled to commence by August but were delayed by seed collection and permitting delays. We now plan to

commence the germination study by October, once seeds are collected and preconditioned. The data collected from the seed germination study will be useful in modeling broomrape parasitic dynamism in tomato, which is an important component of the overall goal of this project.

- C. Crop Safety Trials: As scheduled, tomato safety trials to evaluate the crop safety of the DSS-PICKIT system were conducted with supplemental funding from the USDA-IR4 program in spring 2019. Two trials were initiated in May and June-planted tomatoes and a third rotational crop safety experiment was established in June 2019 and will be planted to rotational crops in 20120. Regular crop injury evaluations and plant vigor ratings did not reveal any visible crop injury or developmental delays. Fruit yield data were collected in August but have not yet been analyzed. Thus far, the DSS-PICKIT techniques for broomrape control appear safe in tomato under California production conditions.
- **D. Biosolarization Study:** The biosolarization study was conducted as planned. Three treatments were incorporated to the soil prior to the biosolarization treatment: early development tomato plants, late development tomato plants and tomato pomace. Non amended and non-tarped plots were used as control. All the tested treatments with organic amendment showed accumulation of organic acids that are the target biopesticides that are expected to have an important role in the inactivation of broomrape seeds in the soil. Further statistical data analysis needs to be performed but preliminary results are showing that the incorporation of tomato plants generate different type of organic acids than those generated in plots amended with only tomato pomace. The next step would be to confirm if the detected levels do inactivate broomrape seeds.
- **E. Genetic analysis of California branch broomrape:** We joined an international effort aiming to analysis the genetic diversity of broomrape species across the globe. We sent plant materials of branched broomrape obtained from our CRF experiment to Dr. Susann Wicke (Institute for Evolution and Biodiversity, University of Muenster, Germany). The genetic analysis will allow us to gain insight into the origin of California broomrape population i.e. where does California branched broomrape come from? This study was not part of our initial proposed plan.

**What's next for this project:** A preliminary observation with the current seed propagation suggests that the level of broomrape parasitism in tomato may depend on the variety of the crop. We would like to a conduct a study that evaluates a wide range of tomato varieties, to determine if there are differences among varieties with regard to hosting broomrape. Secondly, we only evaluated the safety of the DSS-PICKIT techniques on a single tomato variety; it may be important to determine if there is differential response of California commercial tomato varieties to these techniques. We have also prepared an extension-type article about the biology and management of branch broomrape that will be released very soon.

## This project as leverage for other dollars:

CTRI funds for this project are being successfully leveraged with other sources to address this important risk to the California tomato industry. Other funding sources include CDFA-PHPPS

(CTRI-Bagley lead), USDA-IR4 program (Hanson lead), and most recently a CDFA-Specialty Crop Block Grant (Mesgaran lead-PI). Those additional sources of funding will likely total nearly \$500k over the next three years.