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2023 Applied Research and Extension Projects

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The 2023 vegetable crop applied research and extension programs will continue focusing on three interrelated themes: pest management of insects, weeds, and diseases; evaluating innovative production practices on vegetable crops; and optimization and protection of irrigation management and water quality.

I. Pest management of insects, weeds, and diseases

Effects of pre-plant burndown use of Glufosinate on leafy vegetables. I have conducted several herbicide evaluation trials on basil with the collaboration of the IR-4 Projects and Ratto Bros. in Modesto, CA since 2019. In 2023, our collaborative project will focus on supporting the registration of pre-plant burndown use of Glufosinate in both direct-seeded and/or transplanted spinach, lettuce, cabbage, and mustard greens. According to the local cultural practices, spinach, lettuce, and mustard will be directly seeded, while cabbage will be transplanted. Individual research plots will include at least one variety of each vegetable. 'RELY 280' herbicide (active ingredient: 24.5% Glufosinate-ammonium) will be pre-plant burndown broadcast to bare soil of individual vegetable plot at two rates (43 and 87 fl oz/acre) and different timings (3, 7, and 14 days prior to direct seeding or transplanting). Crop injury, vigor, and stand will be evaluated at 14, 28, and 42 days after seeding or transplanting to determine the crop response to different applications of the herbicide. All crop performance data will be used to evaluate the potential of registration of the herbicide use in these vegetables. The same evaluation trial will be conducted simultaneously by Yuma Agricultural Center (Yuma, AZ), University of Florida (Citra, FL), University of Georgia (Tifton, GA), and The Ohio State University (Wooster, OH).

NOTE: The RELY 280 herbicide tested in the trials is currently not registered for use on the aforementioned vegetables in California. The application rates and timings that will be tested are for research purposes only and do not necessarily reflect the actual use on your crops. Always follow the herbicide label directions because what's on the label is the law.

Developing an integrated management strategy for Fusarium falciforme vine decline in processing tomato. Fusarium falciforme is an emerging soil-borne fungal pathogen that causes severe stem rot and premature vine decline in processing tomatoes. This disease has been reported in the top tomato-producing counties in California and currently has no known effective management tactics. Infested plants predispose fruit to

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sunburn and rot, leading to fruit quality erosion and yield losses. To understand disease severity among cultivars and explore possible cultivar-based management practices, I will implement a processing tomato variety trial in Crows Landing, CA. The study is led by Drs. Brenna Aegerter (UCCE San Joaquin County) and Cassandra Swett (UC Davis), and supported by the California Tomato Research Institute. Fourteen (14) commercial processing tomato cultivars will be planted in a grower's field (Table 1), which was previously identified for the infestation of Fusarium falciforme.

Table 1. Processing tomato varieties to be used in the Fusarium falciforme evaluation trial.

Treatment	Variety
1	SVTM9037
2	N6428
3	SVTM9036
4	SVTM9011
5	BOS0811
6	BP74
7	SVTM9016
8	HM5522
9	SVTM9040
10	HM5511
11	H1662
12	HM8268
13	HM58841
14	BP101

Other pest management projects in 2023 include *monitoring the beet leafhopper population and the incidence of curly top virus on processing tomatoes* and *evaluating the potential of reducing soil fumigation in California's seedless watermelon using grafting and biofungicides*. Both studies will repeat from 2022. For the beet leafhopper and curly top virus project, yellow sticky traps and within-field monitoring spots will be set soon as more tomato fields recover from flooding and are being transplanted. For the biologics and watermelon grafting trial, we will use the same products and rootstocks. The tentative planting date will be May 17, 2023.

II. Evaluation of innovative production practices

Watermelon rootstock variety trials. The grafted watermelon project has entered its fifth year since 2019. The 2023 watermelon rootstock variety trial will continue to identify rootstock-scion combinations that could outperform non-grafted plants. The same seven (7) commercially available watermelon rootstocks will be used in the 2023 trial (Table 2). Each rootstock will be grafted onto the same scion, 'Warrior' by Tri-Hishtil located in Mills River, NC. These rootstocks represent three types (interspecific hybrid squash, Citron, and *Lagenaria siceraria*). All grafted and non-grafted watermelons were transplanted on April 19, 2023 (Fig. 1).

Table 2. List of rootstocks that will be included in the 2023 watermelon rootstock variety trial.

Rootstock list	Type
Carnivor	Interspecific hybrid squash (*Cucurbita maxima* x *Cucurbita moschata*)
Camelforce	Interspecific hybrid squash
Cobalt	Interspecific hybrid squash
Flexifort	Interspecific hybrid squash
RS841	Interspecific hybrid squash
Carolina Strongback	Citron rootstock
Pelops RZ	Bottled gourd (*Lagenaria siceraria*)

Figure 1. The trial was transplanted on April 19, 2023, in a commercial watermelon field in Modesto, CA.

Figure 2. A flow meter was connected to communication devices in a processing tomato field in Crows Landing, CA (photo taken on April 17, 2023). Utilizing the flow meter, datalogger, and cellular modem, we can access to field irrigation data remotely through CropManage while offering irrigation recommendations to growers.

III. Optimization of irrigation management

Leveraging irrigation online-decision tools to manage water and nitrogen application for watermelon and processing tomato. Since 2020, I have been evaluating the adaptability of irrigation online decision-support tools to optimize water application and nitrogen fertilization for watermelon and processing tomatoes. Each tool was evaluated for the capability of simulating the irrigation demand based on growth stages and reducing total irrigation without comprising fruit yields. Tools like CropManage (https://cropmanage.ucanr.edu/) are able to compare the grower's actual irrigation and nitrogen fertilization with recommendations made by the system. With support from the National Watermelon Association, California Tomato Research Institute, and various private partners, I will continue to adapt online decision-support tools into sustainable water and nitrogen management in watermelons (including grafted plants) and processing tomatoes. The goal remains to develop crop- (watermelon and processing tomato) and site-specific irrigation and nitrogen management practices through real-time monitoring of water applied, weather-based estimates of evapotranspiration, and measurements of soil water and plant-soil nitrate contents (Fig. 2).