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Cooperative Extension, Stanislaus County

VEGETABLE VIEWS

SUMMER 2019, ISSUE #2

Watermelon Grafting Field Day

The UCCE Stanislaus County Watermelon Grafting Field Day was held in Hughson, Calif., on June 11.

Thirty growers and industry representatives walked through the grafting trial, watched the grafting demo, and grafted their own plants. Participants with different levels of experience with vegetable grafting showed their interests and asked many questions. My summarization of the ten most frequently asked questions from the field day are:

1. ***What vegetable crops can be grafted?*** The short answer is fruiting vegetables. Solanaceous and Cucurbitaceae vegetables, such as tomato, pepper, eggplant, melon, cucumber, watermelon, and squash, are the commonly graftable commodities.

2. ***Why grafting?*** The initial purpose of vegetable grafting is to combat soil-borne diseases. The prohibition and reduction of pesticide use is the driving force of vegetable grafting. Re-connecting the non-disease resistant variety (scion) with a rootstock whose root is bred for resisting soil-borne diseases can help maintain productivity and plant health. In addition, with more rootstocks being available, use of grafting has been expanded to increase crop yield, enhance nutrient and water use efficiency, and tolerate abiotic stresses (drought, cold, and salt).

3. ***In general, what are the differences between growing a grafted and non-grafted plant?*** The differences start at the seeding stage. First, more greenhouse space is needed for rootstock plant growth. Sometimes, rootstock seeds are sowed at a different time from commercial varieties to match their stem diameter at grafting. Second, grafted

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plants require a longer time before introducing into fields than non-grafted plants because they need to be healed after grafting for 7-10 days in a high humidity chamber. Third, the graft union is supposed to be kept above the soil surface at transplanting to avoid scion root growth. Fourth, grafted plants may have extended vegetative growth resulting in a possible delay on fruit maturation and harvest. Therefore, harvest schedules and yield at each harvest may be different from what we have experienced with non-grafted plants.

4. ***Is the grafting method different for watermelon vs. tomato?*** The answer is yes. For Cucurbitaceae vegetables, one-cotyledon and hole-insertion are the two most commonly used grafting methods; while cleft and splice methods apply to Solanaceous vegetables. For more details, please refer to the Grafting Manual at http://www.vegetablegrafting.org/resources/grafting-manual/.

5. ***How do I know what rootstocks are commercially available?*** Knowing where to find the information is the first step in choosing the correct rootstock for grafting. National efforts involved ten U.S. institutions aimed at increasing the adoption of vegetable grafting among U.S. vegetable industry. This team, under the support of USDA, established a website on which commercially available rootstocks are listed. The rootstock tables are updated periodically. Please check http://www.vegetablegrafting.org/resources/rootstock-tables/ to access the tables.

6. ***What are the rootstocks used for watermelon grafting? Are they also watermelon or other species?*** Bottle gourd (*Lagenaria siceraria*), squash (*Cucurbita moschata*), and interspecific hybrid squash (*C. maxima x C. moschata*) are the most commonly used rootstocks for melon and watermelon. Currently, more interspecific hybrid squash are being developed for high resistance to Fusarium wilt and abiotic stresses.

7. ***Will grafting affect the fruit flavor?*** I am not surprised to see this question. It appears that there is no absolute answer to how grafting will change fruit flavor so far. In tomatoes, many studies have found a lower fruit sugar content (Brix), but this may be attributed to the higher yield of grafted fruit (either more fruit per plant and/or bigger size per fruit) that "dilute" the sugar content.

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For melon and watermelon, researchers from other countries investigated the impact of rootstocks bred for flavor on fruit quality after grafting. Higher contents of sugar and other compounds that are key for body health have been detected in grafted fruit. It is hard to tell if the flavor change is welcome or not; let alone we still cannot assert that grafting will change the fruit flavor.

8. ***Will the watermelon size increase after grafting? Will this be an issue on fruit marketability?*** We had our first harvest on July 23 and 24. Though the data have not been analyzed yet, visual effect tells us the fruit size from the grafted plot is bigger than the non-grafted counterpart. This can be a marketability issue if the fruit weighs over 26 lbs. on average. We hope grafted plants can distribute more energy on producing more fruit than producing larger fruit. More harvests will be conducted, and data will be analyzed afterward to test our hypothesis.

9. ***What are you going to tell people through this trial?*** The merits of grafting are well-recognized; however, the cost is the biggest barrier of wide adoption. Reducing the cost while maintaining crop yield and fruit quality is key to keep grafting as an attractive approach. Increasing plant spacing/decreasing plant population is considered as a method to save the cost on the grower's end. We hope to find the balance between population reduction and yield and fruit quality/marketability in order to keep grafting in the grower's toolbox as a credible practice.

10. ***You used multiple scions grafted onto different rootstocks, so do you expect these rootstock-scion combinations to have similar results?*** My answer is no. Showing which combinations will have positive effects and finding out the interactions are the other purposes of this trial. Previous experience indicated that not every commercial cultivar is suitable for grafting, or that they may only fit certain rootstocks. Quality, yield, and other parameters may become weak after grafting.

Grafted and non-grafted watermelon plants were transplanted at the spacing of 3 feet, 4 feet, and 6 feet (left to right). The corresponding plant population is 2074, 1555 (25% reduction), and 1037 (50% reduction) per acre, respectively (photos were taken on May 24, 2019).

Questions? Contact Dr. Wang at 209-525-6822 or zzwwang@ucanr.edu

Evaluating the performance of a sulfentrazone herbicide on basil

The purpose of this research is to collect performance data to support registration of sulfentrazone herbicides on basil. Leafy green and culinary herb growers are affected by a limited number of herbicides, resulting in tremendous manual weed removal. Therefore, screening existing pre-emergent herbicides and collecting their performance on weed control will help with their registration to provide California leafy green and herb growers more choices for chemical weed suppression and save labor cost for manual weeding.

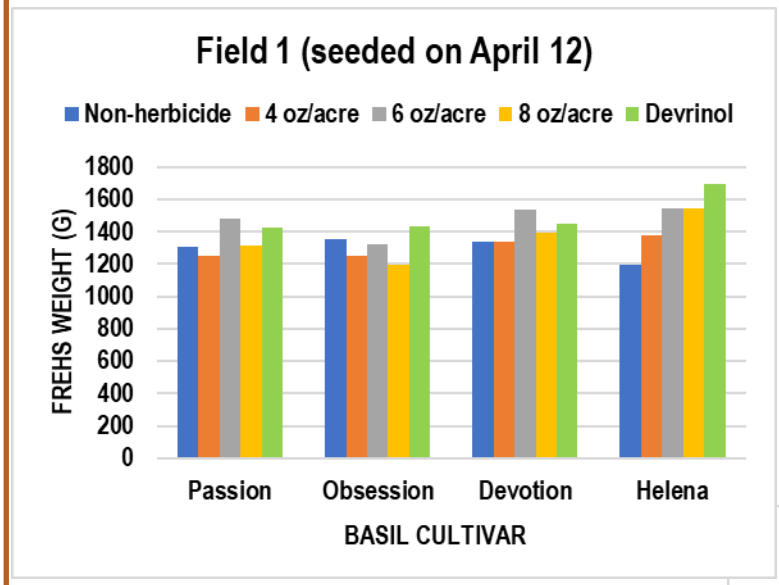
This research is sponsored by the Western IR-4 and collaborated with Ratto Bros Inc. in Modesto, Calif. Two separate fields were seeded with four basil cultivars 'Passion,' 'Obsession,' 'Devotion,' and 'Helena' on April 12 and May 7, respectively. The Zeus XC (active ingredient: Sulfentrazone) was soil-applied the next day after seeding at rates of 4, 6, and 8 oz./acre, respectively. The herbicide Devrinol was applied at 2.5 lb./acre as the grower's standard practice.

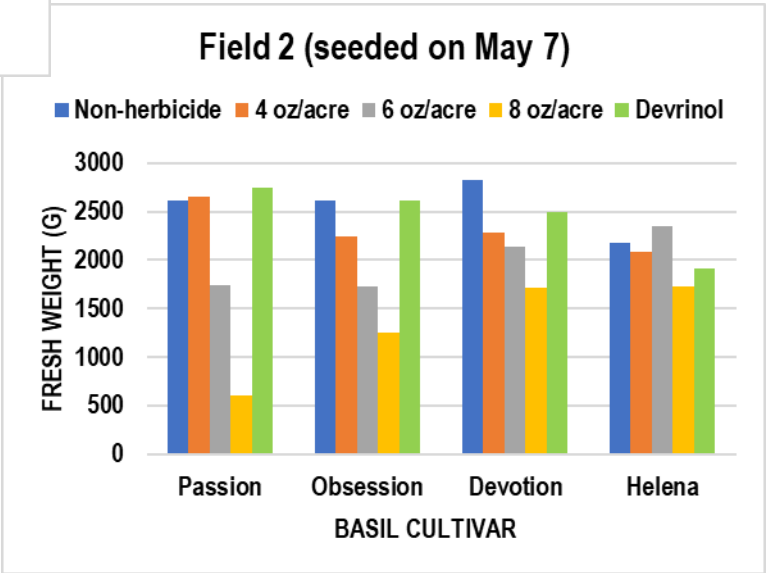
Starting at day 7 (1 week after seeding), an area of 4 sq. ft. (2 ft. x 2 ft.) was framed and pictured from each treatment within a replication at a weekly basis until day 70 (10 weeks after seeding) and day 63 (9 weeks after seeding) for fields seeded on April 12 and May 7, respectively. Crop injury and weed control were evaluated every two weeks, and fresh weight was measured on June 28 and July 12. Data analysis is underway. The following pictures and graph demonstrate the development of trials and preliminary treatment effect on crop injury and fresh weight. In field 2 (seeded on May 7), crop injury and fresh biomass reduction are the most severe for plots sprayed at 8 oz. per acre for all cultivars; whereas this treatment effect was not detected in field 1 (seeded on April 12). Statistical analysis is being conducted and will provide treatment comparisons later.

Crop injury was the most severe in the plot sprayed with 8 oz./acre (far right). Germination was severely inhibited, and leaf stunting was evident. Far left: herbicide-free plot; middle left: 4 oz./acre; middle right: 6 oz./acre. Pictures were taken on June 14, 2019 (38 days after seeding).

Basil leaves were cut on June 28 and July 12, 2019. Bagged samples were weighed for fresh biomass.

Average fresh weight of four basil cultivars applied with different herbicide treatments from fields 1 and 2.





Plant Growth Problem Chart

For the current season, I have received a total of nine reports with plant growth problems. Most of these have been diagnosed for various pathogens, pests, and environment-related growth disorders. The problems are summarized in the following table:

Crop	Time	Location	Diagnosis
Processing tomato	April 29 and May 3, 2019	Westley and Patterson, Calif.	Garden Symphylans, also called garden centipedes, damaged young transplants. Low temperature and moist soils are the possible reasons for them to move up to topsoil.
Fresh market tomato (organic)	May 10, 2019	Modesto, Calif.	Leaves were stunting and severely cupping. Herbicide applied to the fence drifted to the plants causing the damage.
Pumpkin and watermelon	May 29 and July 19, 2019	Turlock, Calif.	Squash bugs from last fall created significant damage to the leaves and young watermelon fruit. Adults laid eggs, and now the new generation started to create more damage.
Processing tomato	July 10, 2019	Westley, Calif.	Fusarium wilt was confirmed, and it is likely Race 3 because the variety 'H1293' is an F2 cultivar.
Pepper	July 19, 2019	Patterson, Calif.	Newly transplanted peppers had necrosis on stems. For some plants, the symptom extended down to soil base. Samples have been sent for further diagnosis. Results will be available soon.
Cucumber and fresh market tomato	July 22 and 30, 2019	Modesto, Calif.	By looking at the plants and talking with the growers, over-fertilization appeared to be the main reason.

Performance of crop biostimulants on processing tomatoes

A plant biostimulant is defined as a substance or microorganism that, when applied to seeds, plants, or the rhizosphere, stimulates natural processes to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress, or crop quality and yield. Crop biostimulants have become a rapidly growing and important part in crop nutrient management, yield enhancement, and stress alleviation; yet, little science-based information on use recommendations and efficacy evaluation is available. In 2019, we collaborated with biostimulant manufacturers to conduct two research trials in Patterson, Calif., to evaluate the efficacy of crop biostimulants on the productivity and fruit quality of processing tomatoes. Products were either soil drenched for root absorption or foliar sprayed at different crop growth stages. Normalized difference vegetation index (NDVI), fruit yield and quality (e.g., Brix, titratable acidity, pH), and plant aboveground biomass are being measured. Data will be updated and available at the end of the season.

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