

Evaluation of robotic and mechanical weeders for in-row weed management in tomatoes

Scott Stoddard, Farm Advisor

Steve Fenimore, Weeds Specialist

UC Cooperative Extension

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Situation

- Weeds concentrated in the plant row
 - PPI herbicides displaced by transplanting
 - no cultivation

glyphosate PRE burn down
trifluralin/pendamethalin + metolachlor PPI
rimsulfuron PRE/POST







Current in-row weed management:

Banded POST application of Matrix (rimsulfuron) 2 oz/A fb 2 oz (total 4 oz/A).

Clethodim or sethoxydim POST for grasses.

Hand weeding.

Automated cultivators well tested in Salinas (R. Smith, S. Fennimore, L. Taurte), would they work in tomato production systems?



Finger weeders

- Simple, safe, inexpensive.
- Very limited weed control window.
- Can also break crusts.



Methods

- 1. PPI only
- 2. PPI + rimsulfuron 2-4 oz/A POST
- 3. PPI + finger weeder POST
- 4. PPI + robotic weeder POST
 - Trials in 2020, 2021, 2022, 2023
 - 1 bed x row length, RCBD, 4 reps
 - POST treatments ~ 2 weeks after transplanting
 - measure crop injury, weed control, hand weeding time, yield

2023 POST Cultivator Trials

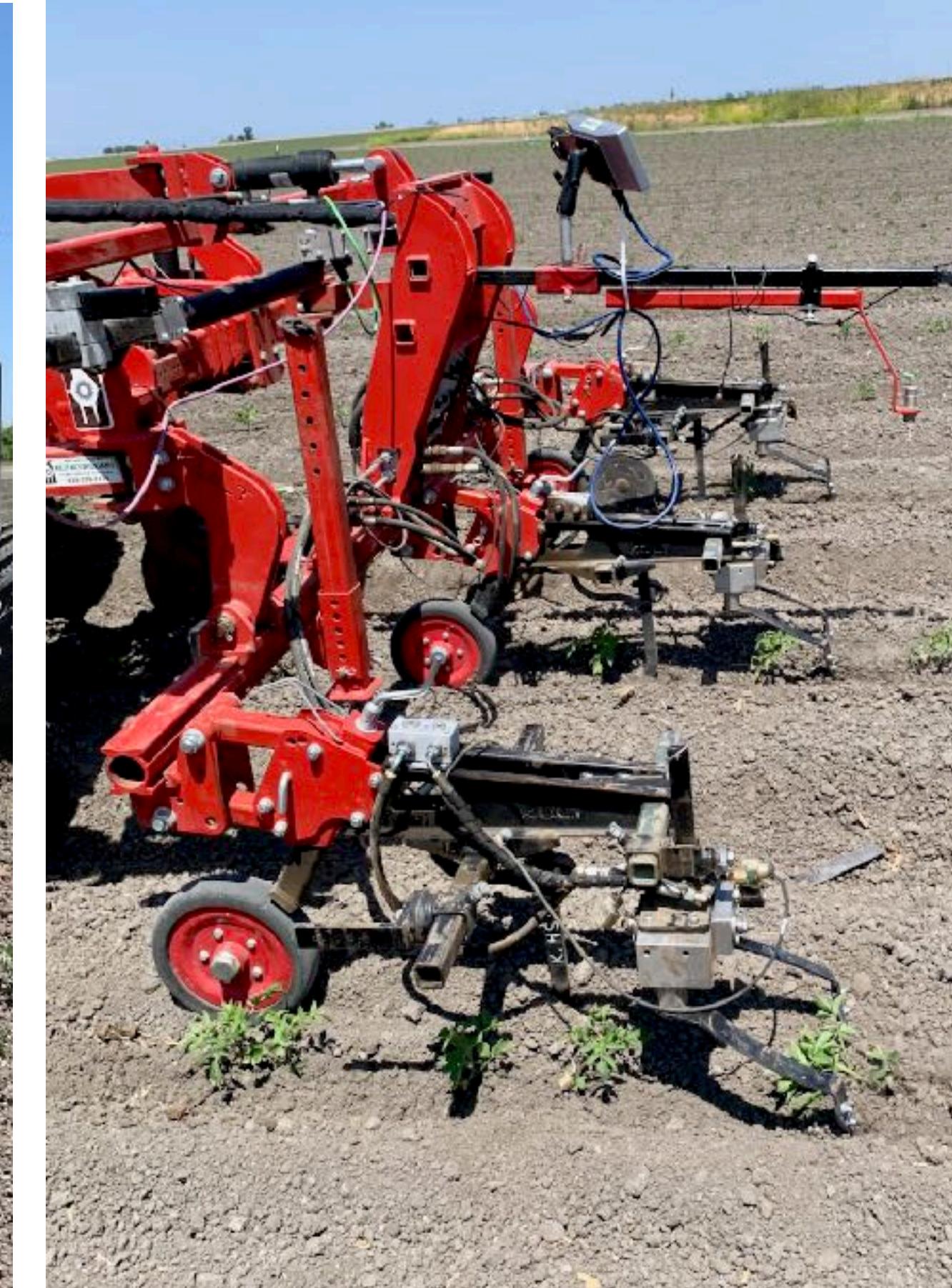
1. Soledad (Carbon Robotics laser weeder)
2. Gilroy (Kult)
3. UC Davis (Kult, finger weeder, Matrix herbicide)
4. Dos Palos (Kult)
5. Dos Palos (laser weeder, Robovator, finger weeder, Matrix herbicide)

RCBD with 4 or 5 reps depending on location

OBJCTIVE: Evaluation of in-row weed control and crop injury



2023 Trials



Not all treatments in all locations.

In-row weed management: finger weeders



Kult/Robovator robotic cultivators



Carbon Robotics Laser weeder





finger weeder - PRE



finger weeder - POST

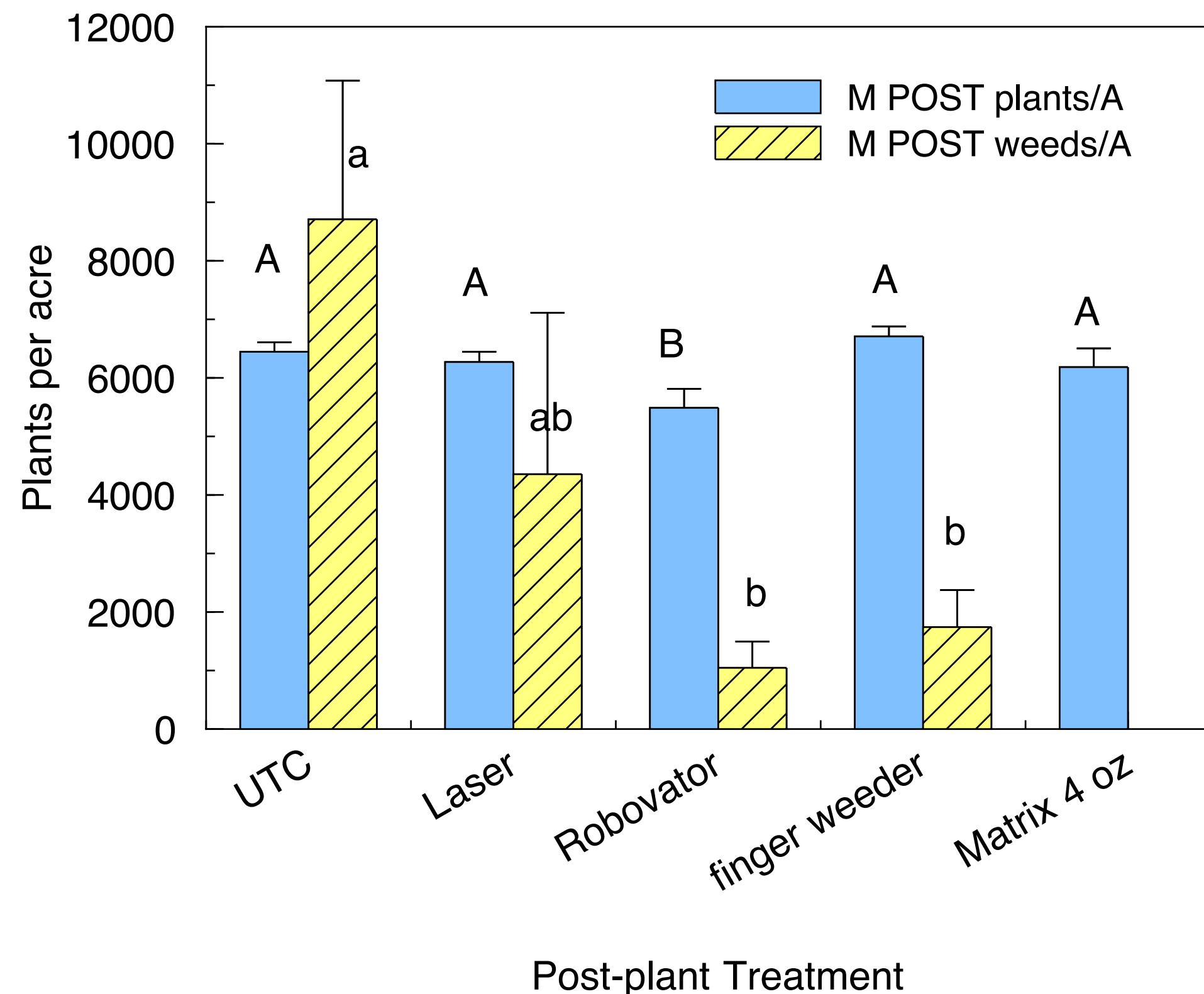
Results:
Medium crop, small weeds

Carbon Robotics laser weeder

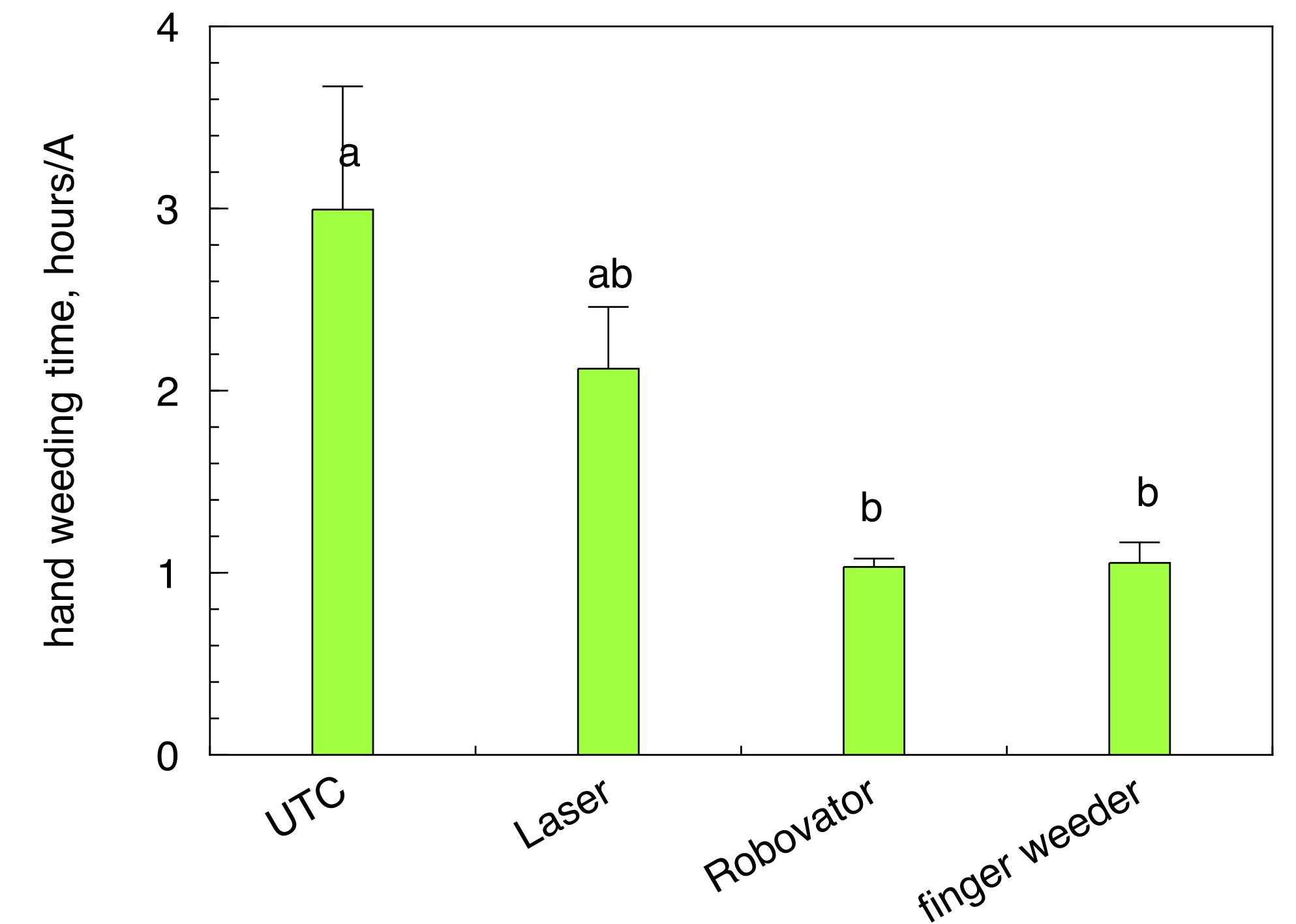


Merced County Results

Processing Tomato Cultivation Trial
Dos Palos, 2023



PT Cultivation Trials 2023 Graph



UC Davis Weed Day June 21, 2023



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2023 Results

	Weed Control (vs UTC)	hand weeding time (vs UTC)	Crop injury
Gilroy	91%	reduced 64%	yes
Davis	Kult: 87% Finger: 60%	reduced 52% reduced 44%	no
Soledad	79%	reduced 56%	no
Dos Palos 1	same	none	yes, 20%
Dos Palos 2	Laser: 12% Robovator: 85% Finger: 62%	reduced 30% 67% 63%	yes, 15% with Robovator

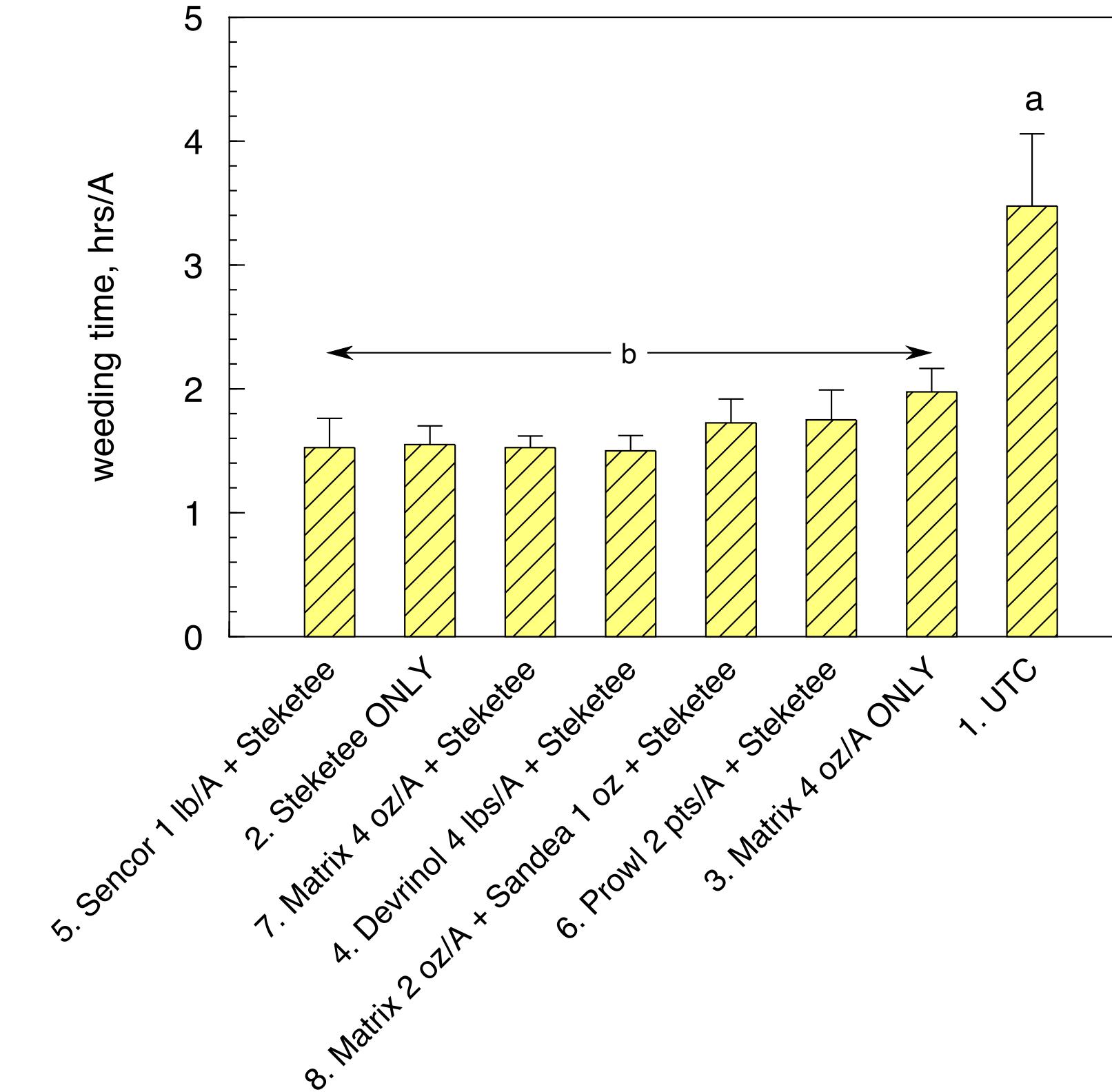
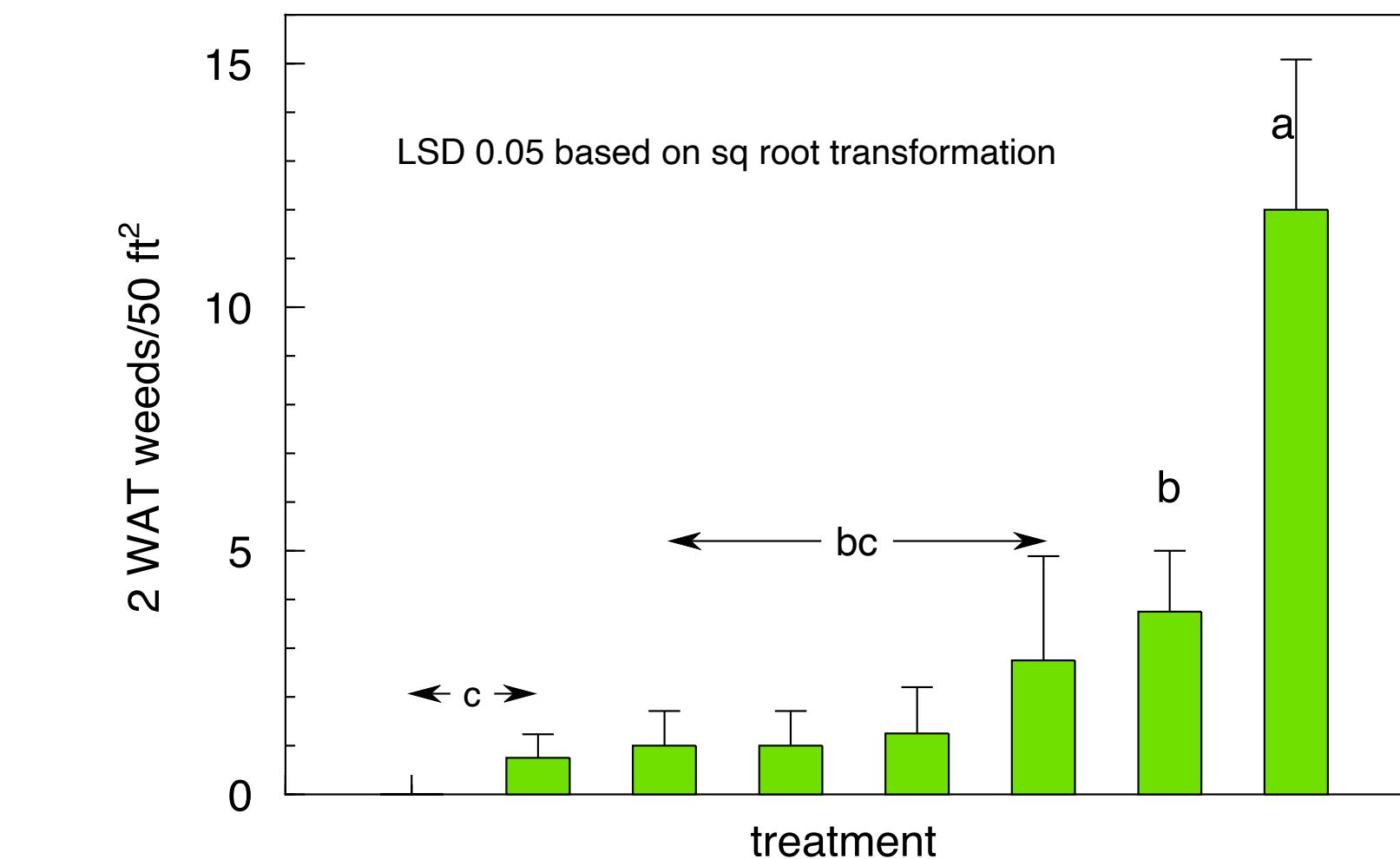
Fresh market tomatoes

1. UTC
2. Steketee ONLY
3. Matrix 4 oz/A ONLY
4. Devrinol 4 lbs/A + Steketee
5. Sencor 1 lb/A + Steketee
6. Prowl 2 pts/A + Steketee
7. Matrix 4 oz/A + Steketee
8. Matrix 2 oz/A + Sandea 1 oz + Steketee

Commercial FM tomato field. Dual PPI,
cultivation, hand weeded.

Post plant pre-emergent herbicides

Le Grand, CA 2023





Conclusions

- Significant reduction in weeds with all cultivators as compared to UTC (0 - 91%, mean 59%).
- Significant reduction in hand weeding time (0 - 69%, mean 47%).
- Cost savings based on hand weeding of \$14 - \$96/A
 - *typical hand weeding \$230/A*
 - *Matrix \$45/A*



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