

Steam: More than just hot air?

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Steam Systems

Problems

Research

First!

- There is no silver-bullet method.
- Steam, ASD and other non-chemical methods for soil disinfestation are not 'replacements' for soil fumigants
- They are additional tools to give growers more options

Steam for soil disinfestation

- Used for many decades
- Stationary and mobile steam soil disinfestation solutions exist
- BUT: Many are either not available in US or too expensive or both.

Stationary Systems

- Sheet Steaming
- Common in European Union and Greenhouses
- Energy intensive: 1 hr to disinfest 10cm depth.



Mobile Systems EU

- Hood Steaming
- Lower energy consumption
- Takes 5-10 min to reach 185 F at 10 cm depth



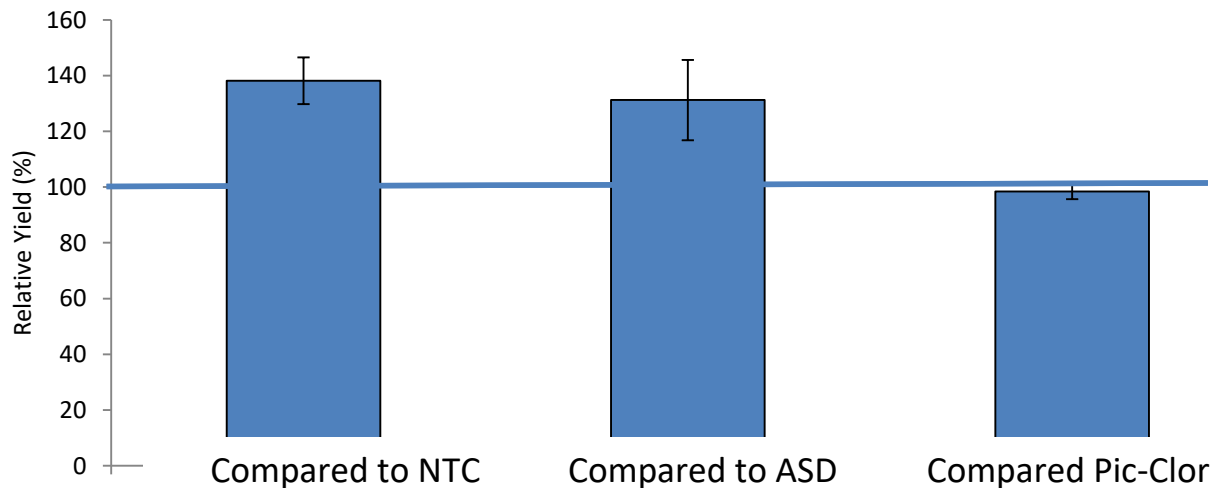
Mobile Systems USA

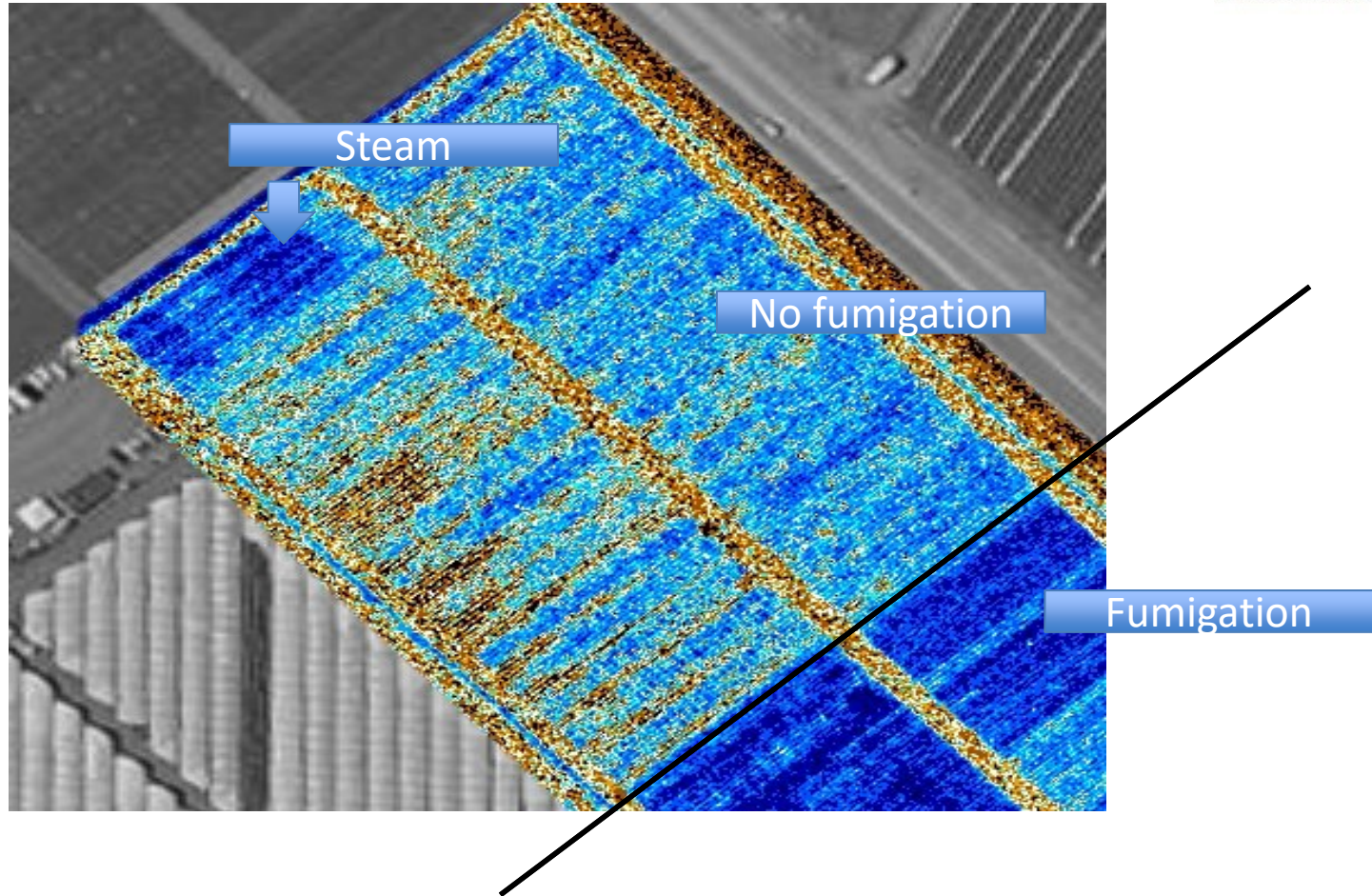
- Shank Steaming
- Takes 5-10 min to reach 185 F at 10 cm depth
- Constantly moving machines
- Propane or Diesel



Does steam work?

Average relative yield of 7 field trials over 4 seasons, compared to NTC (control),
ASD and Pic-Clor 60.
Seasons 2011/12 – 2014/15





So what's the problem?

- Logistics!!
- Energy and Water Consumption
- Slow Speed

All this needs to be moved

- Steam machine
- Steam graded hoses and injection systems
- Soil covers (plastics, metal hoods)
- Water source (often separate nursing tank)
- Gas source (often separate Propane or Diesel tank)

= Labor intensive

Energy and Speed

- Depending on machine:
- 10-40 hrs/acre
- 100-200 gal of propane / acre

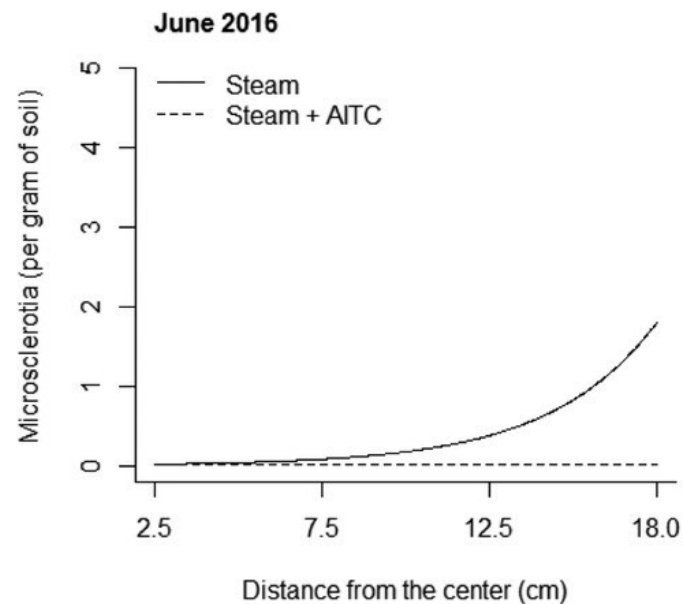
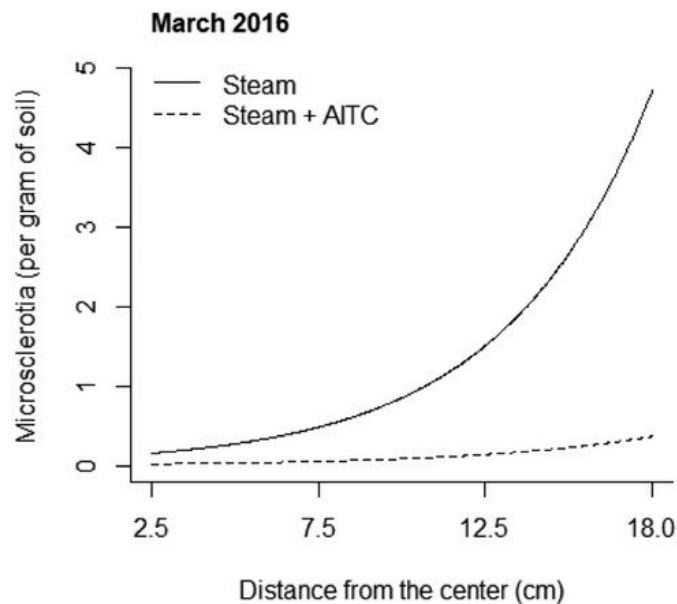
Those problems are not solved as of yet!

- This is why we need research
- In Europe: No soil fumigants are available. Pressure to use alternative systems is much higher than in US

Research:

Can we make steam faster? (and less energy consuming)

- Combination of Steam with Biofumigant (AITC)
- Combination of Steam with heat releasing chemicals

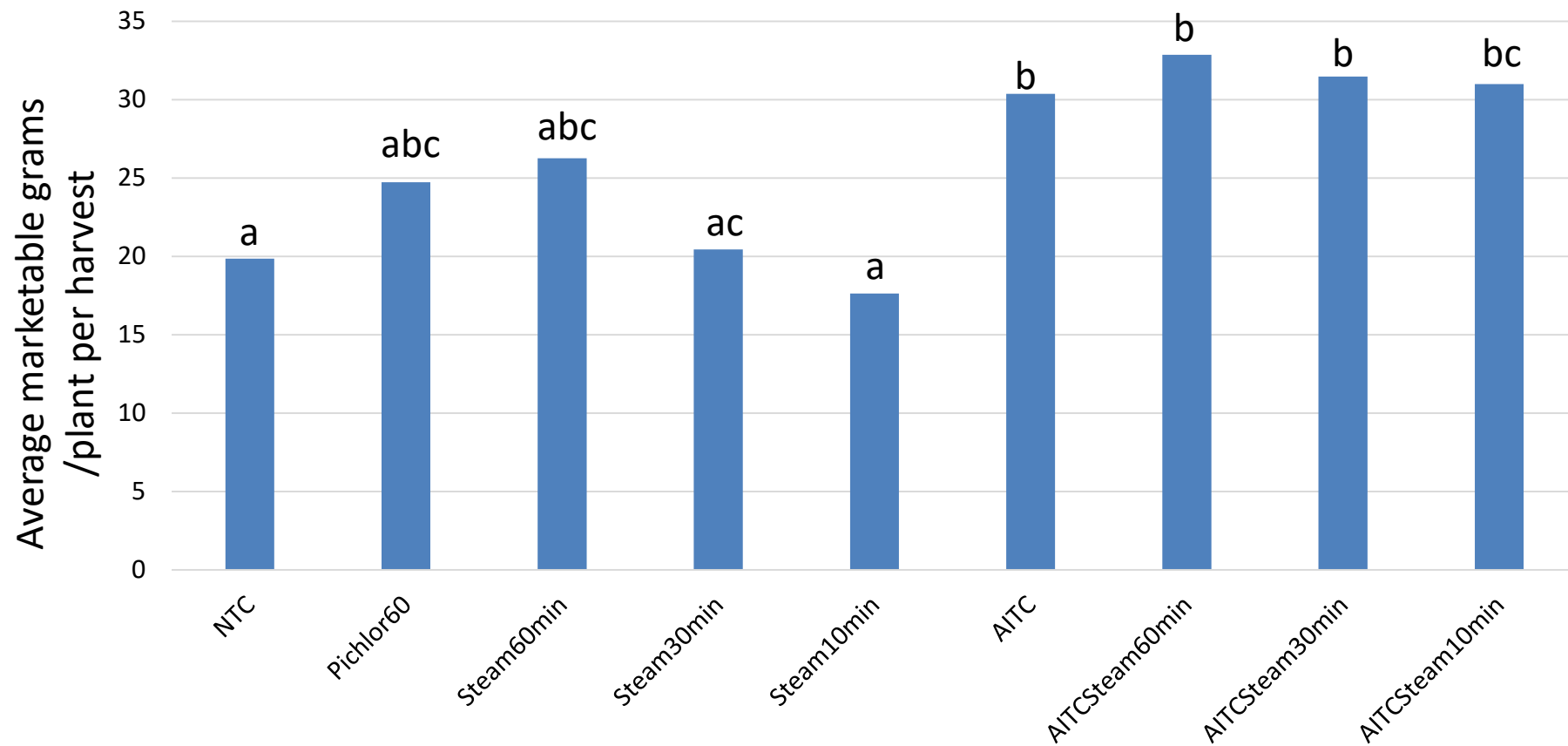


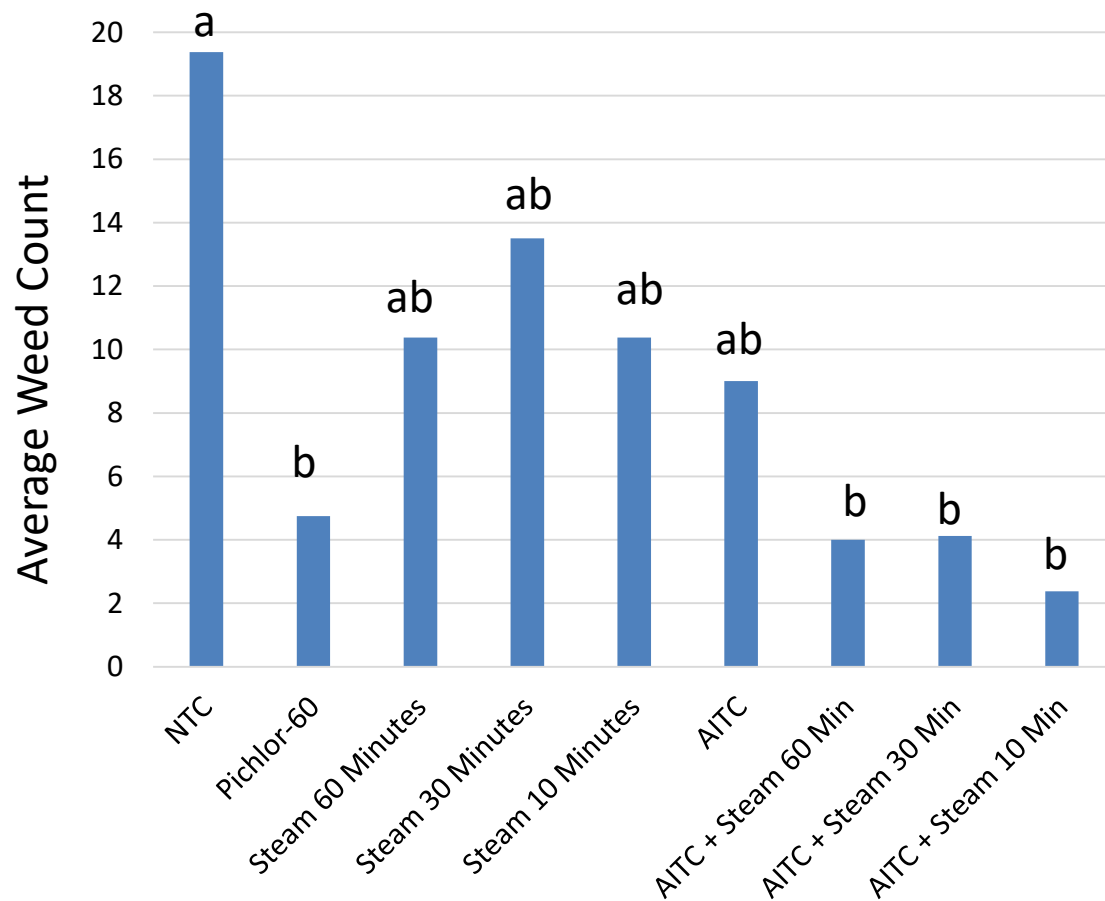
Kim, D.S., Hoffmann, M., Kim, S., Scholler, B.A. and Fennimore, S.A. 2020. Integration of steam with allyl-isothiocyanate for soil disinfestation. *HortScience* 55(6):920-925.

Can we reduce the time of steaming when we combine steam with AITC?

- Two field trails:
Central Crops Clayton
Hort. Crops Castle Hayne
- Two seasons: 2020/2021
2021/2022







Prelim Conclusions

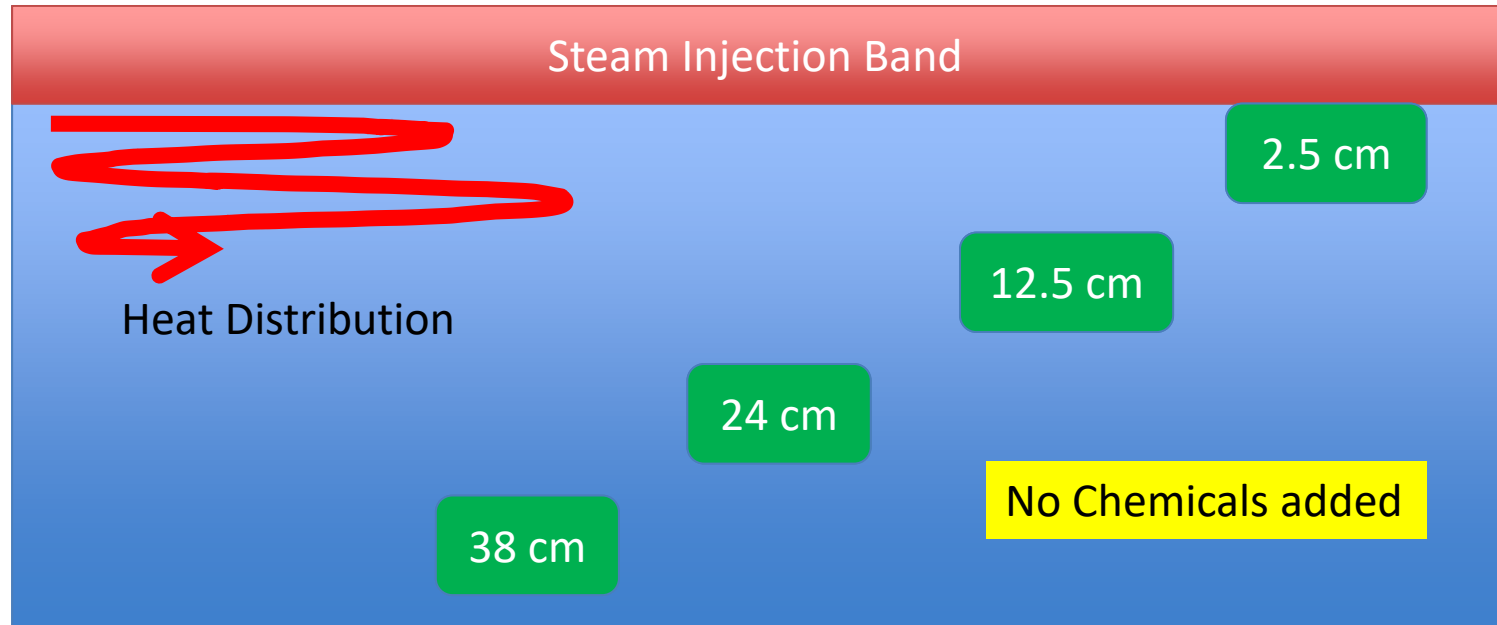
- AITC alone did increase yield, compared to steam alone and combined treatments
- AITC combined with steam at any time reduces weed pressure, compared to steam alone
- Second year is currently under way.



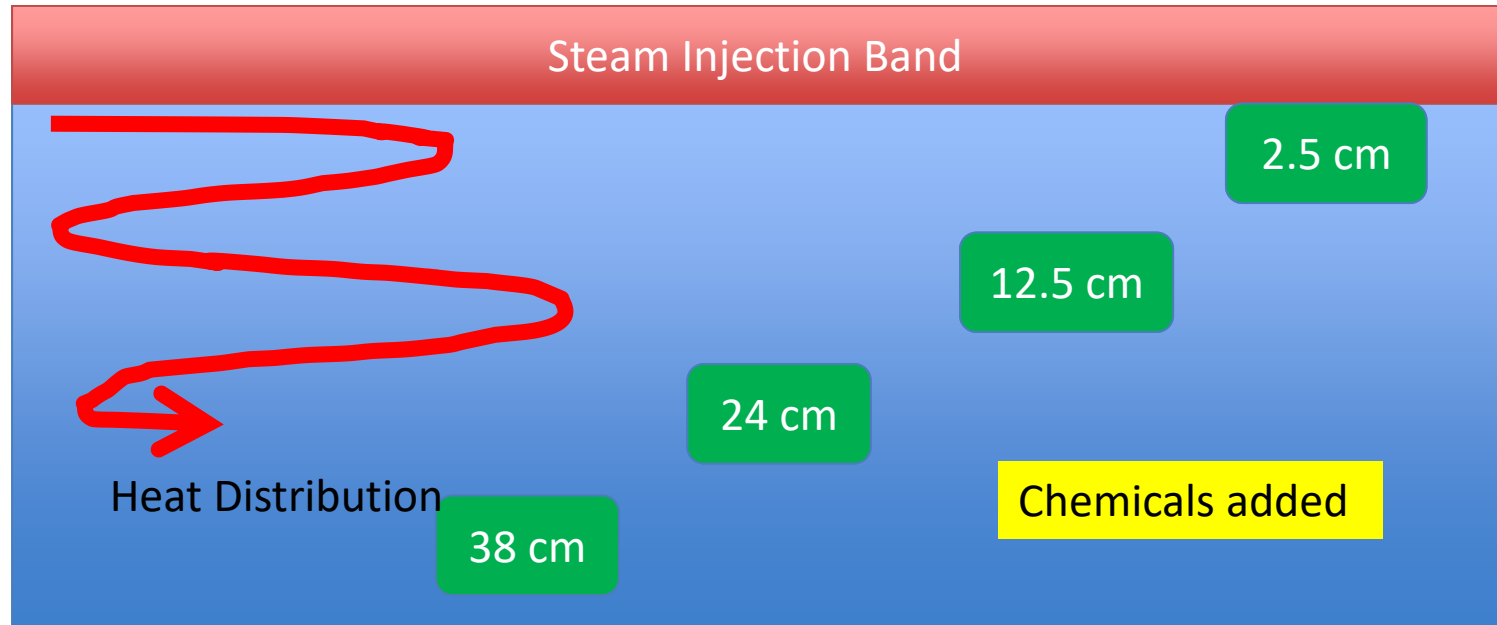
Can we increase the efficacy we combine steam with exothermic chemicals?

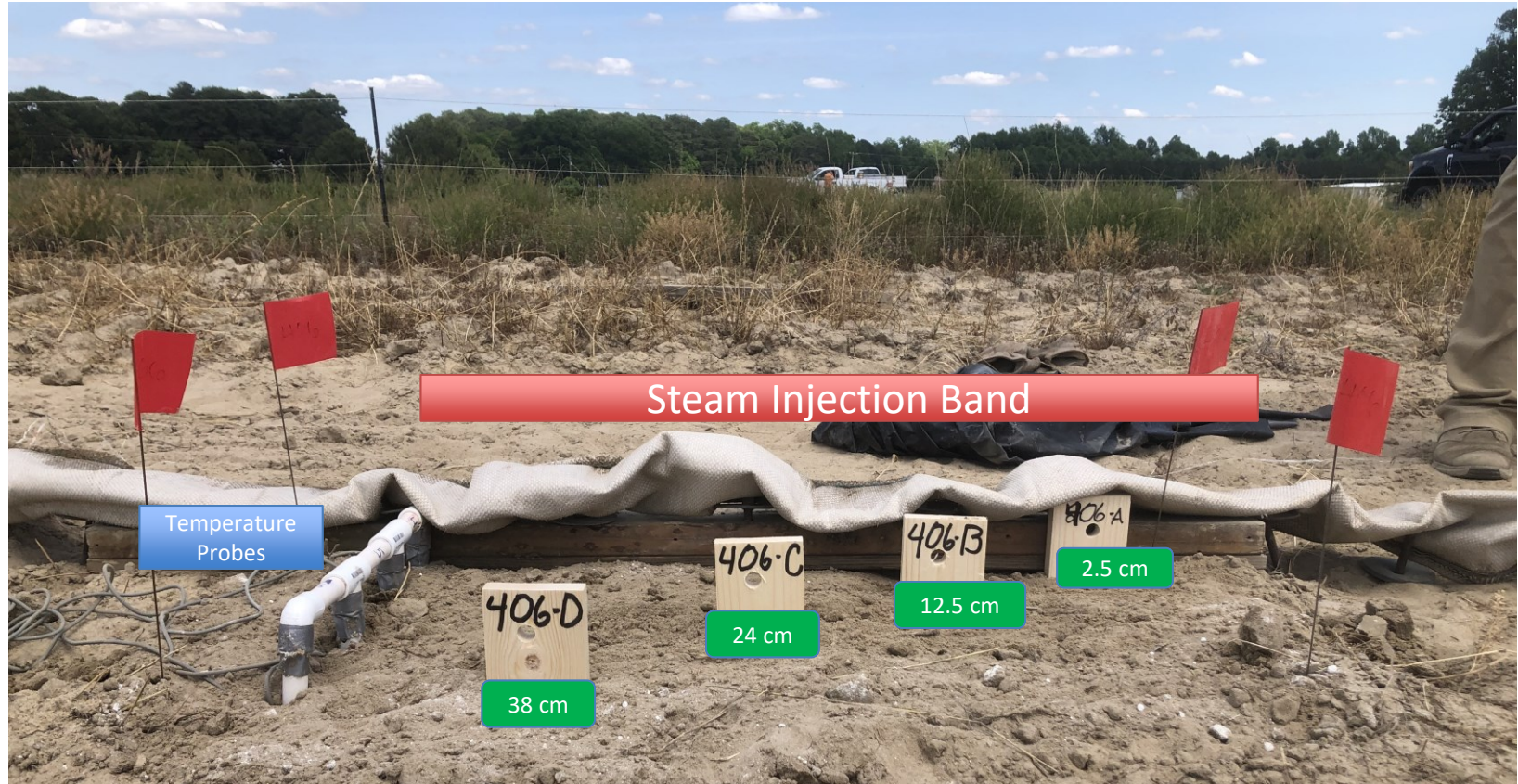


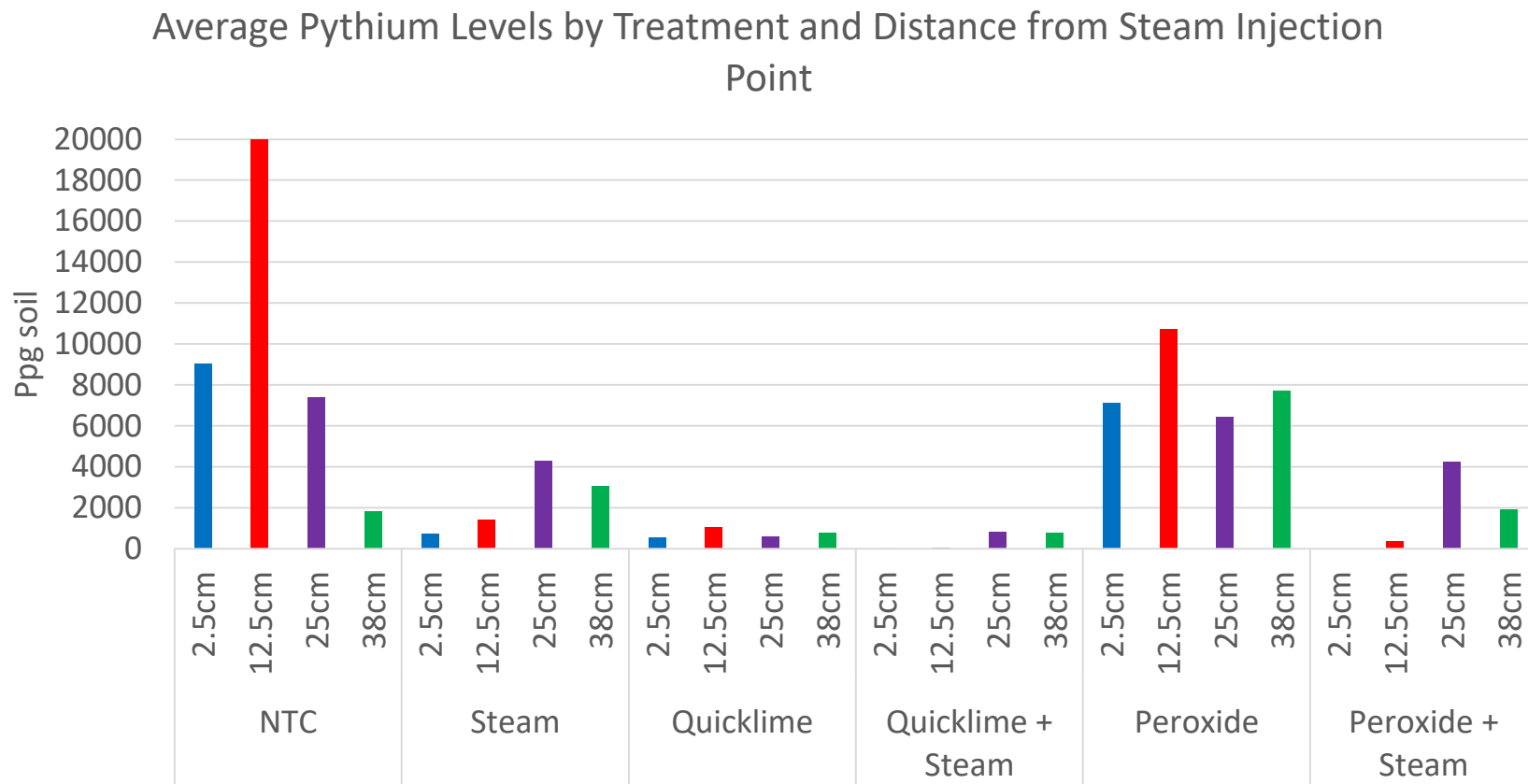
Microplot Trials

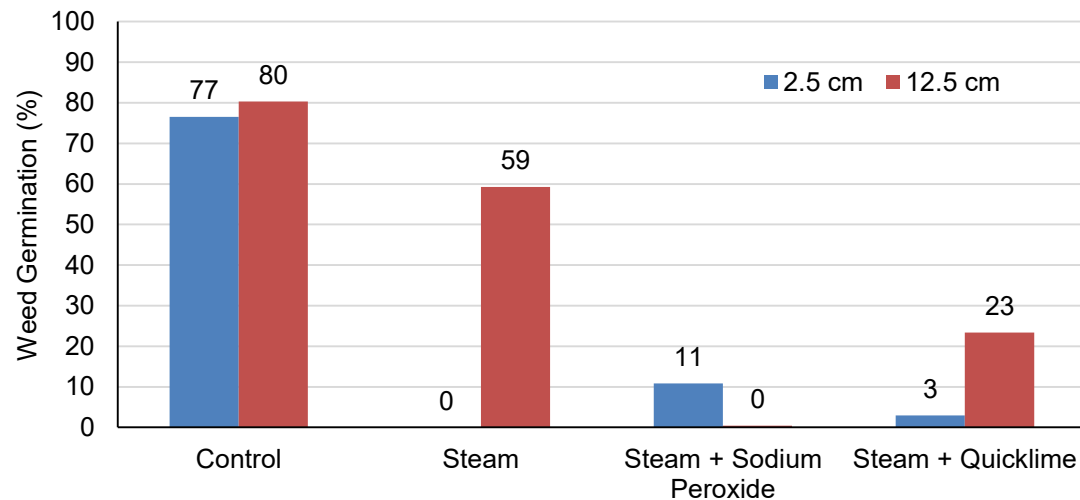


Microplot Trials









Prelim Conclusions

- Steam + PerOxide increases the weed and pathogen control efficacy, compared to steam alone
- Repeat of Microplot trial is underway

Thank you

- Emma Volk, MS Student and Research Assistant
- Gene Fox, MS Student
- Joe Neal, Weed Scientist, NCSU
- Steven Fennimore, Weed Scientist, UC Davis

Funded by:

USDA-NIFA MB Transition: 2020-06812: High-Efficiency Steam Application for Soil Disinfestation in Strawberry Nurseries; National Strawberry Grower Association (NASGA)





Thank You

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