Bed and Flat Fumigation for Caneberries

Ventura County Caneberry Production Meeting
April 11, 2014

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Horticultural Contract Research & Consultation

Washingon

- Deep shank injected
- Telone C-35, C-17, PC 60. Metam
- Non-tarped.
- Planting life 5-10 years

California

- Applied noble plow
- MB:pic, Telone C-35, PC 60
- Tarped, sometimes TIF
- Planting life 1.5-5 years

Phase 2 fumigant labels

In effect now
Label requirements are very complex!!!

- Fumigation management plans
- Responder/community outreach
- Applicator training
- No applications near sensitive areas
- Buffers and buffer credits
- Posting
- Emergency preparedness

22 Acre Raspberry field (yellow block) fumigated with Telone C-35, 39 gallons/A, no tarp

Broadcast fumigated,

625 ft buffer

Bed fumigated with VIF tarp,

25 ft buffer

Grower Trials of Bed Fumigation

Five trials established in raspberry fields:

- Lynden 1, non-replicated, substantial *P. rubi* and *P. penetrans*
- Lynden 2, replicated, low P*. penetrans* and *P. rubi*; Also trialing non-tarped bed
- Lynden 3, replicated, substantial *P. penetrans*
- Burlington, replicated, high *P. penetrans* and P*. rubi*; Also trialing middle row management
- Mount Vernon, replicated, high *P. penetrans*

Treatments applied Sept 2010, raspberries planted April 2011

Treatment and evaluation timeline

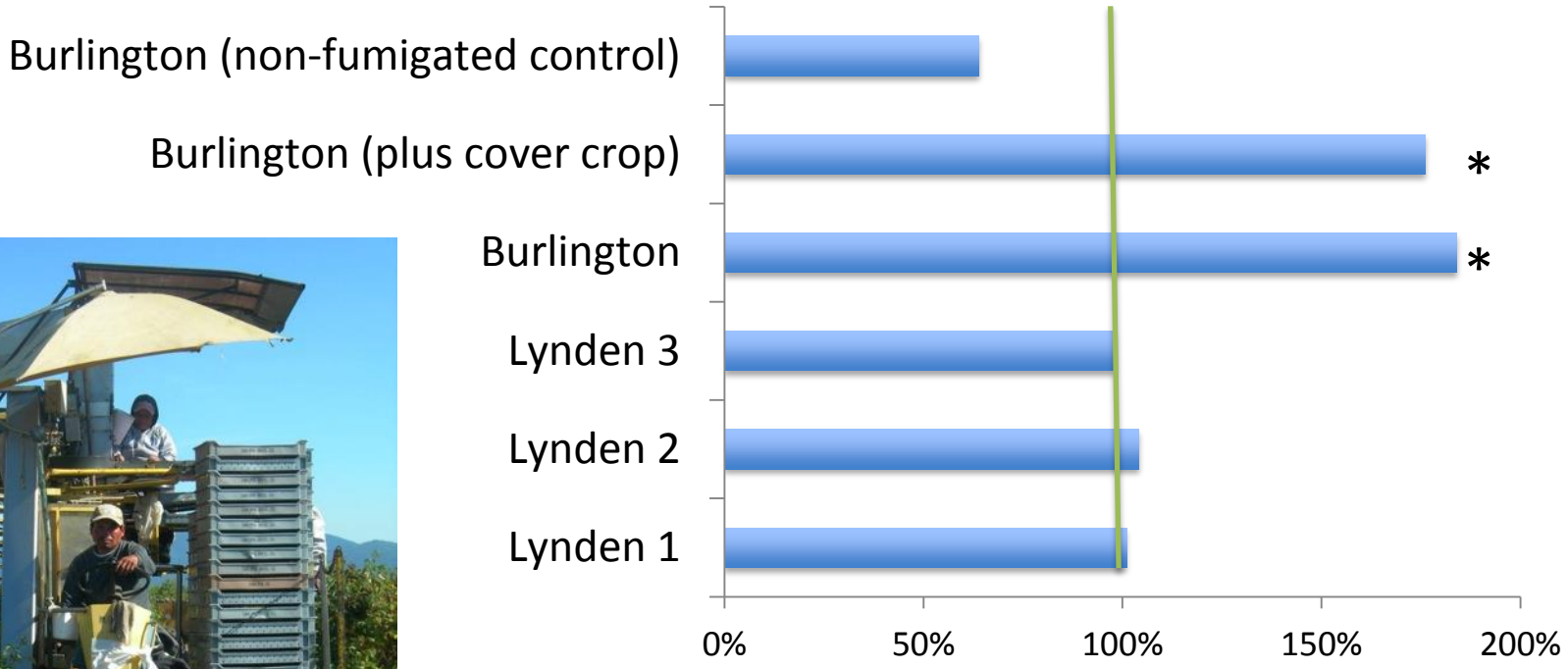
- Soil fumigated: Sept 2010 (Lynden and Burlington trials), 2011 (Mt Vernon trial)
- Raspberries planted April-May 2011
- Primocane growth measurements, December 2011
- Yield evaluations, July 2012
- Soil bioassay for *P. rubi*, October 2011 (and annually thereafter)
- *P. penetrans* extraction from soil and from roots, April and October of each year

Cane Height (cm) 2011

	Burlington	Lynden 1	Lynden 2	Lynden 3	Mount Vernon
Non-fumigated	130 c	--	--	--	46
Bed fumigated	166 a	140	201	258	54
Bed fumigated (custom applicator's apparatus)	--	--	--	--	60
Bed fumigated+cover crop	146 b	--	--	--	--
Broadcast fumigated	137 bc	139	218	244	56
P-value	*0.0012*	*n/a*	*0.1002*	*0.4*	*0.29*

Plants in bed-fumigated plots generally grew as well as those in broadcast-fumigated plots.

2012 Harvested fruit weight, bed fumigated plots:
percent of fruit weight from broadcast-fumigated plots



Bed-fumigated plots were as productive as broadcast-fumigated plots, sometimes much more productive

P. rubi bioassay, 2011

Root rot control in bed-fumigated plots has been as good as in broadcast treated plots so far

Root rot severity	Burlington	Lynden 1	Lynden 2	Lynden 3	
beds					
Non-fumigated	5.5	--	--	--	
Bed fumigated, tarp	5.8	6.0	4.0	2.3	a
Bed fumigated, tarp+cover crop	4.3	--	--	--	
Broadcast fumigated	4.8	7.0	3.8	5.3	b
P-value	*0.68*	*n/a*	*0.70*	*0.05*	
alleyways					
Non-fumigated	6.3	--	--	--	
Bed fumigated, tarp	6.0	7.0	3.8	6.7	b
Bed fumigated, tarp+cover crop	6.0	--	--	--	
Broadcast fumigated	6.5	6.0	4.3	4.0	a
P-value	*0.90*	*n/a*	*0.80*	*0.01*	

P. rubi bioassay, spring 2013

In some trials, less root rot in alleyways than in beds.
No treatment differences.

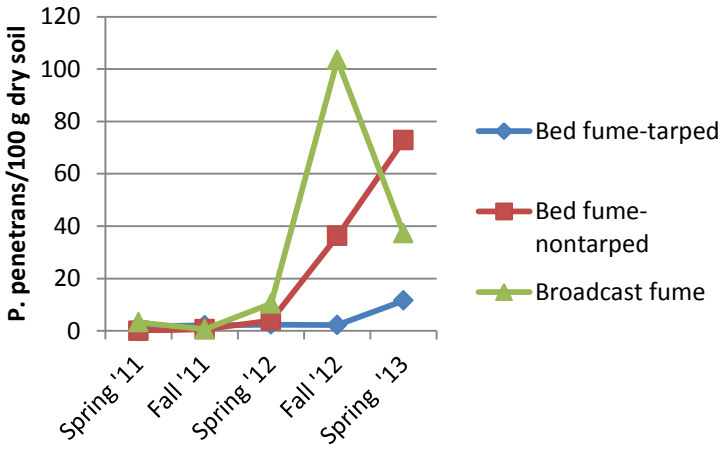
Root rot severity	Burlington	Lynden 1	Lynden 2	Lynden 3
Sampling location				
alleyways	5.6 a	5.8	4.1	2.7 a
beds	6.8 b	6.0	3.8	7.0 b
Fumigation treatment (all sampled from beds)				
Non-fumigated	6.3	--	--	--
Bed fumigated, tarp	7.3	7.0	4.0	6.3
Bed fumigated, tarp+cover crop	6.8	--	--	--
Broadcast fumigated	7.0	5.0	4.0	7.7

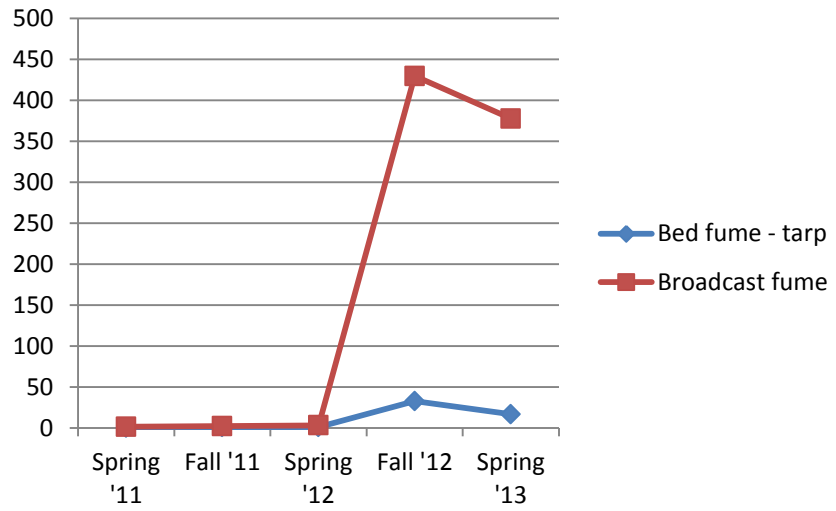
Nematode recolonization in bed- and broadcast-fumigated plots

Lynden 2

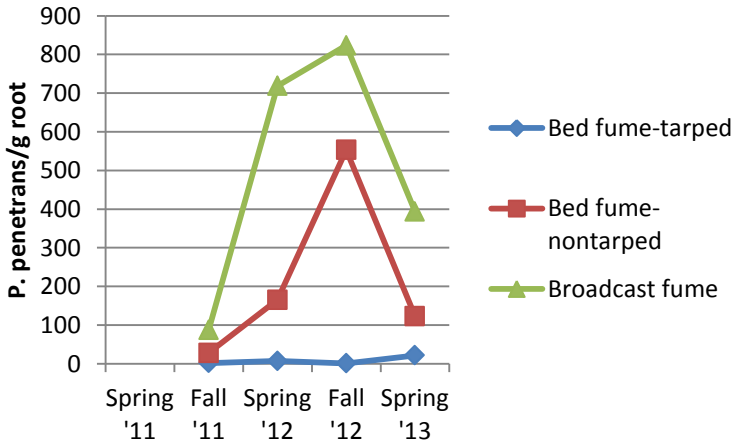
Lynden 3

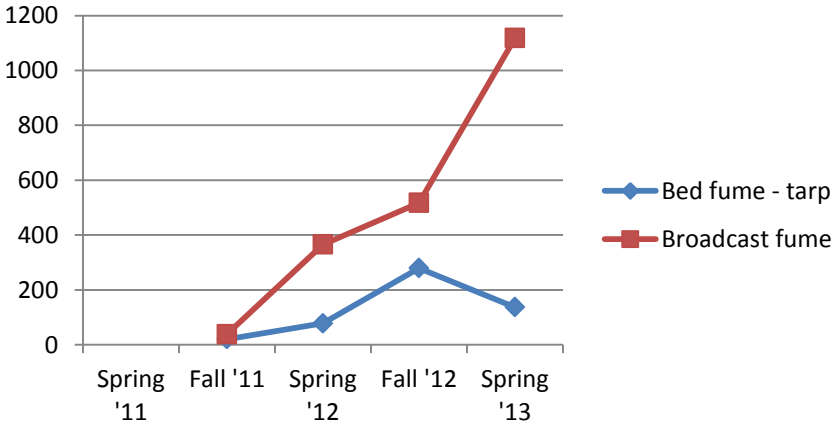
From Soil





From Roots

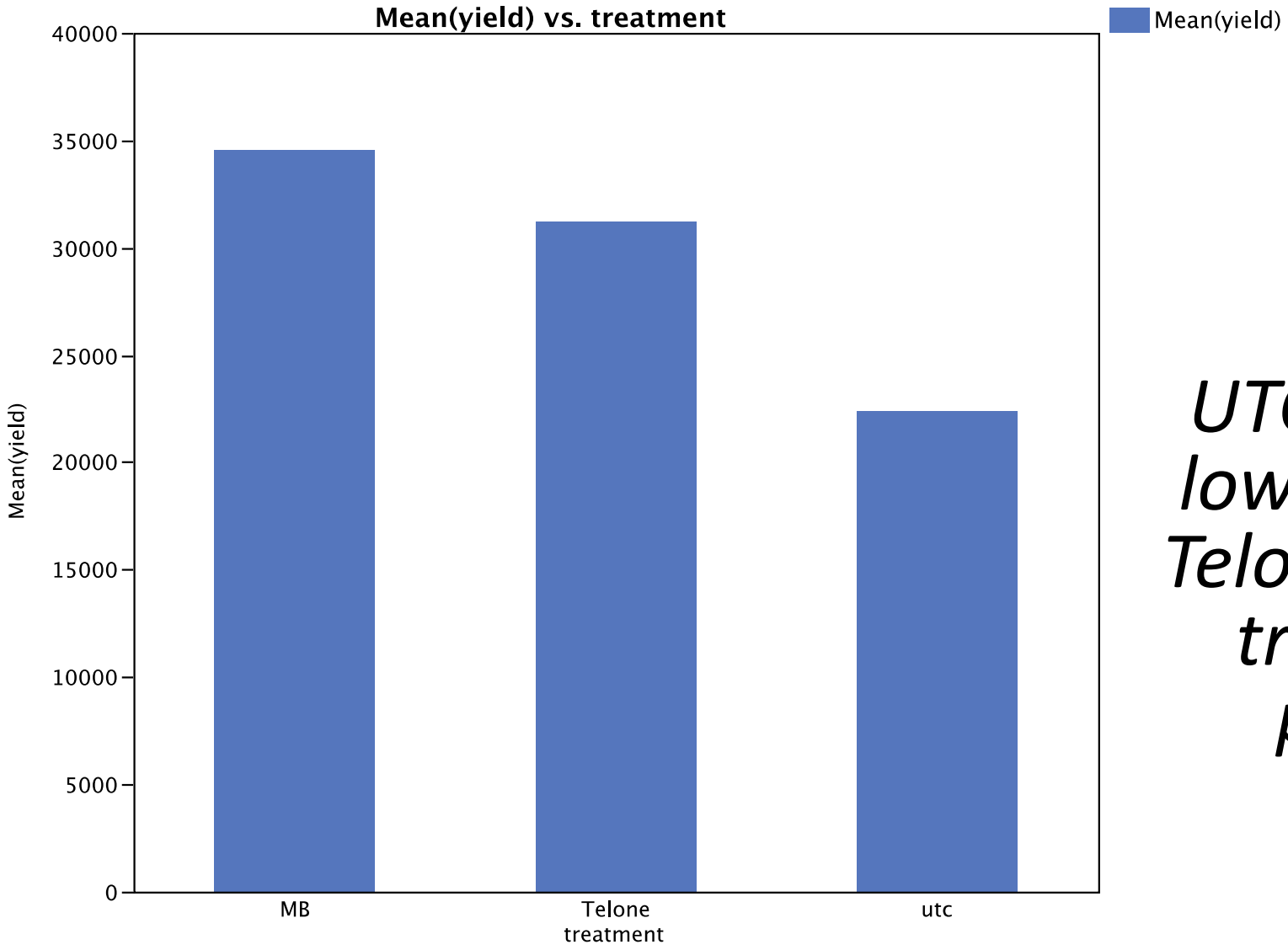




Challenges:

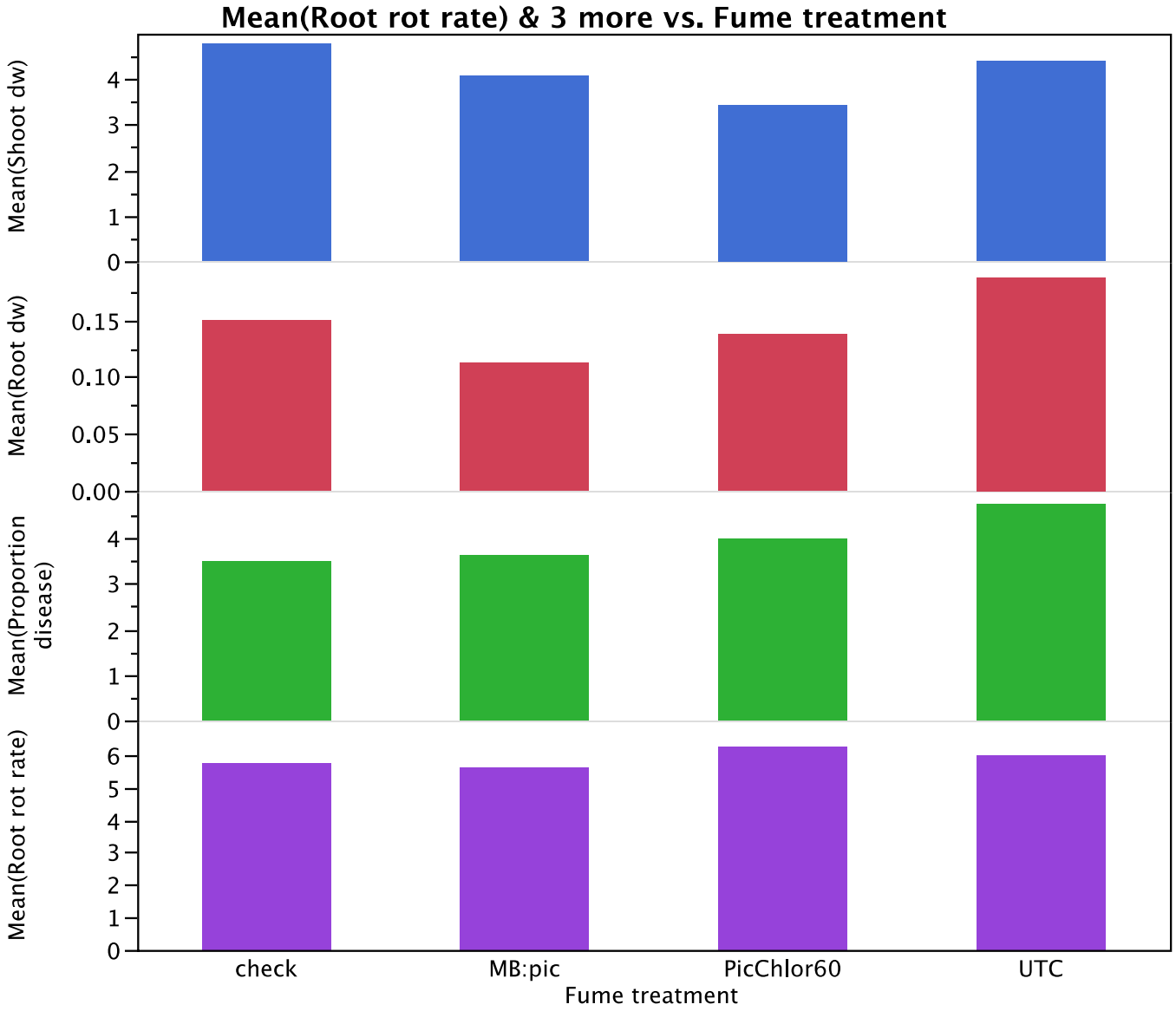
- The shaper we used (an adjustable unit for vegetables) can only make beds up to about 8” high. You’d need a different shaper to make **larger beds**.
- You’ll need GPS or some other way to assure that beds are made in the correct **location**.
- It takes **more time** to fumigate a field this way; we usually travel at about 3 mph when fumigating and laying tarp. (Broadcast rig travels about 5-6 mph.)

Yield-California trial, fall 2011



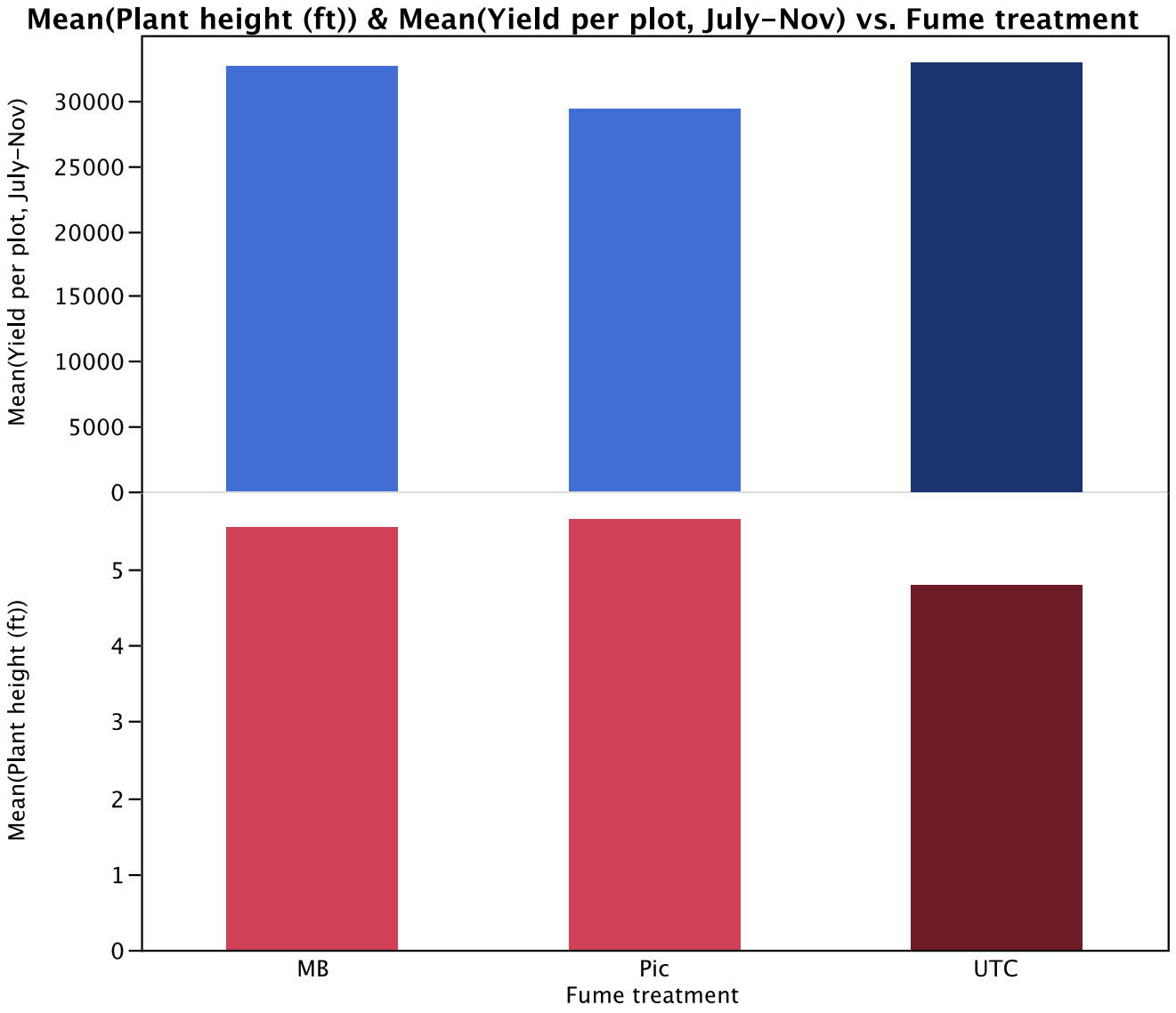
UTC yields lower than Telone, MB-treated plots

Phytophthora bioassay-California trial, Spring 2012



No significant differences between treatments

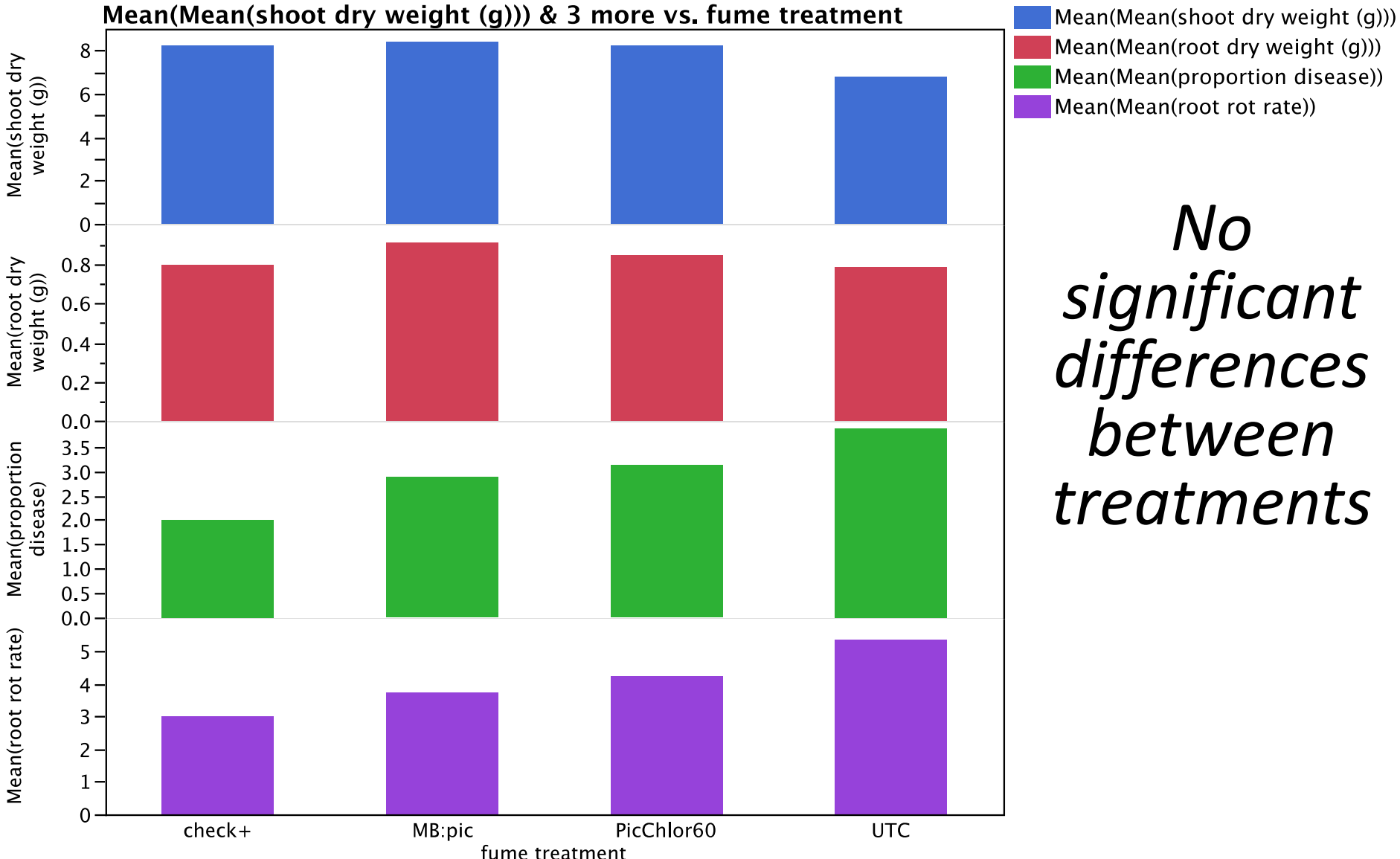
Yield and Plant Height-California trial, fall 2013



No significant differences in yield

Plant height of UTC is significantly lower than fumed plots

Phytophthora bioassay-California trial, fall 2013



No significant differences between treatments

Another option-metam (Vapam)

- Telone C-35, deep shank injected
- 35 gal/A
- 20 A field
- 20% credit for 2-3% organic material
- 460 ft buffer

- Vapam HL, applied with rotary spader
- 75 gal/A
- 20 A field
- 20% credit for 2-3% organic material
- 96 ft buffer
- ?Less volatile?

Applying Vapam with a rotary spader

Applying Vapam with a rotary spader

About 75% of the fumigant is injected in these sweeps near the front of the spader

Applying Vapam with a rotary spader

Spader blades rotate slowly, mixing soil and Vapam

Sweep

Applying Vapam with a rotary spader

Power roller

Spader blade

Remaining 25% of Vapam is injected ahead of this shallow power harrow

Applying Vapam* with a rotary spader

Seal generated by power roller

*Relax. They are just applying water in this demonstration.

Other options?

- Paladin (Dimethyl Disulfide)
  - Effective, strong smell
  - Must be applied under VIF or TIF tarp
  - 25 ft buffer for bed applications
- Mustard meals
  - Effective in greenhouse tests, less encouraging in field
  - Incorporate with rotary spader?
  - Mustard variety matters

Thanks!!

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