

Strawberry Yield under Reduced Application Rates of Chloropicrin and InLine in Combination with Metam Sodium and VIF

Husein Ajwa

University of California-Davis

Methyl Bromide Shank Injection



Methyl bromide



Definition: toxicity

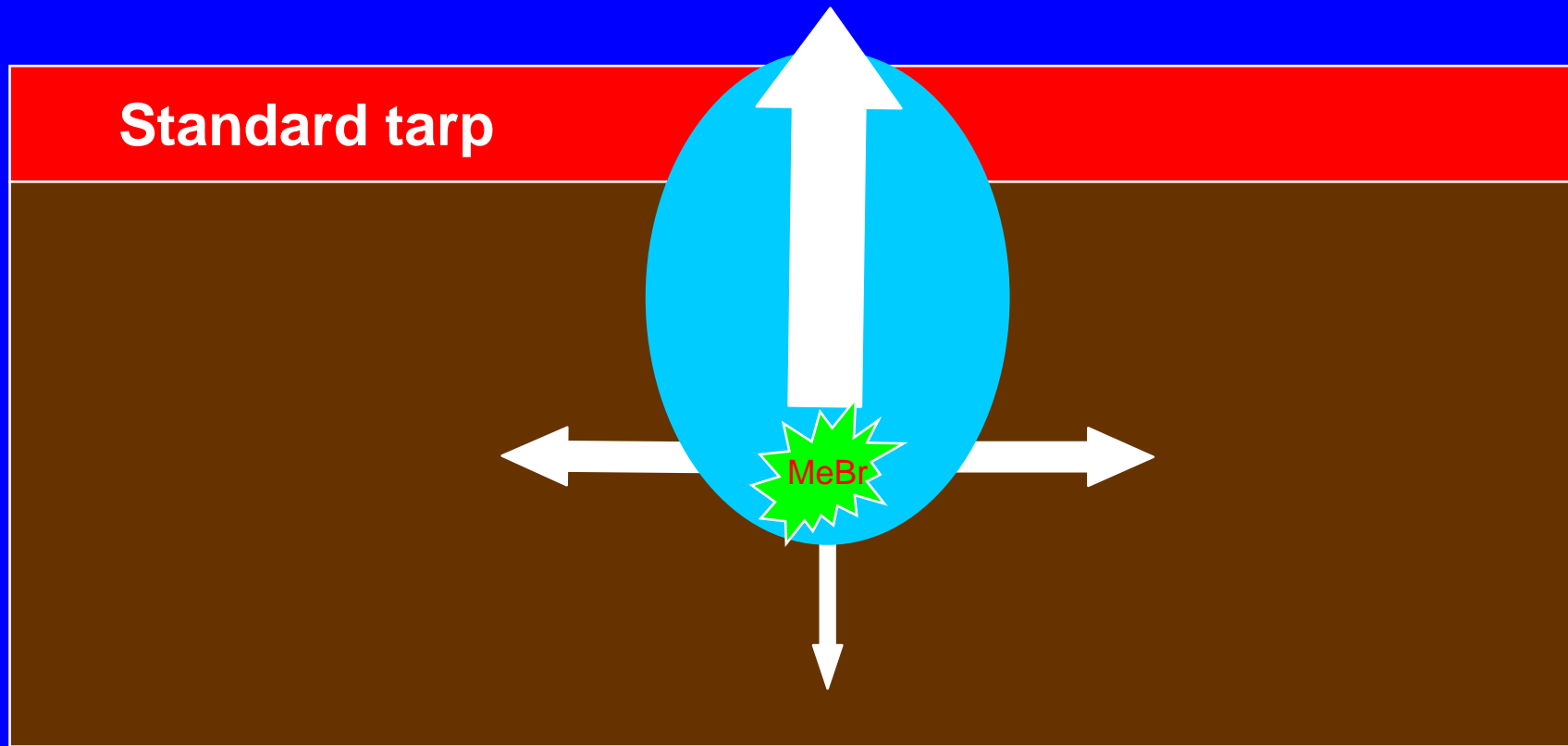
- ◆ The capacity to cause injury to an organism.
- ◆ The severity of toxicity is proportional to the dose and time of exposure.

Hyperdictionary

Soil fumigation: MeBr

- ◆ The fumigant must be in the target pest zone at lethal concentrations long enough to kill the target pest.
- ◆ Because MeBr diffuses quickly and is very toxic, it works well.
- ◆ Because of the 22 day soil half life of MeBr, it must be allowed to diffuse from the soil. Trapping MeBr could be hazardous to workers and crops.

Methyl bromide tarp diffusion



Question

- ◆ Do the alternative fumigants have chemical characteristics that are similar to MeBr?

Fumigant characteristics

Fumigant	Mole. Wt	Density at 20°C	Boil. Pt.	Vapor press.	H₂O Solubility
	g mol⁻¹	g ml⁻¹	°C	mm Hg	% w/w
MeBr	95	3.97	4	1420	1.34
Pic	164	1.66	112	18	0.2
1,3-D cis	111	1.21	104	34	0.22

Fumigant/soil interaction

Fumigant	Air/ water (K_H)	Soil adsorption (K_d)	Soil half life (d)
MeBr	0.244	0.07-0.1	22
Pic	0.093	0.14-0.3	1
1,3-D cis	0.056	1.3-1.5	7-11

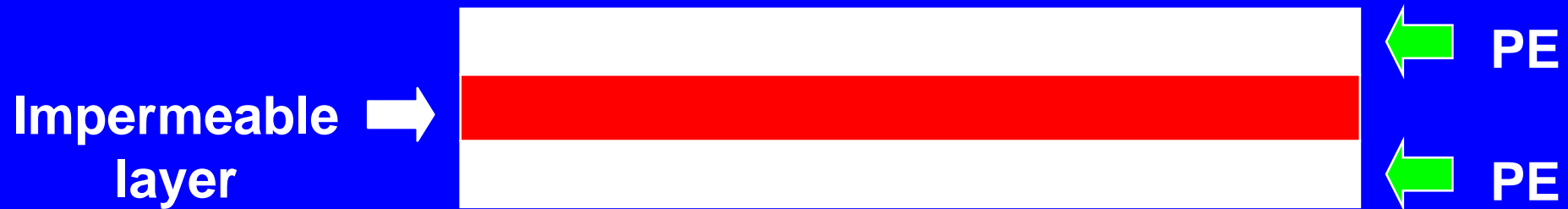
Alternative fumigant characteristics

- ◆ 1,3-D and Pic do not persist in soil as long as MeBr.
- ◆ 1,3-D and Pic do not diffuse in soil as well as MeBr.

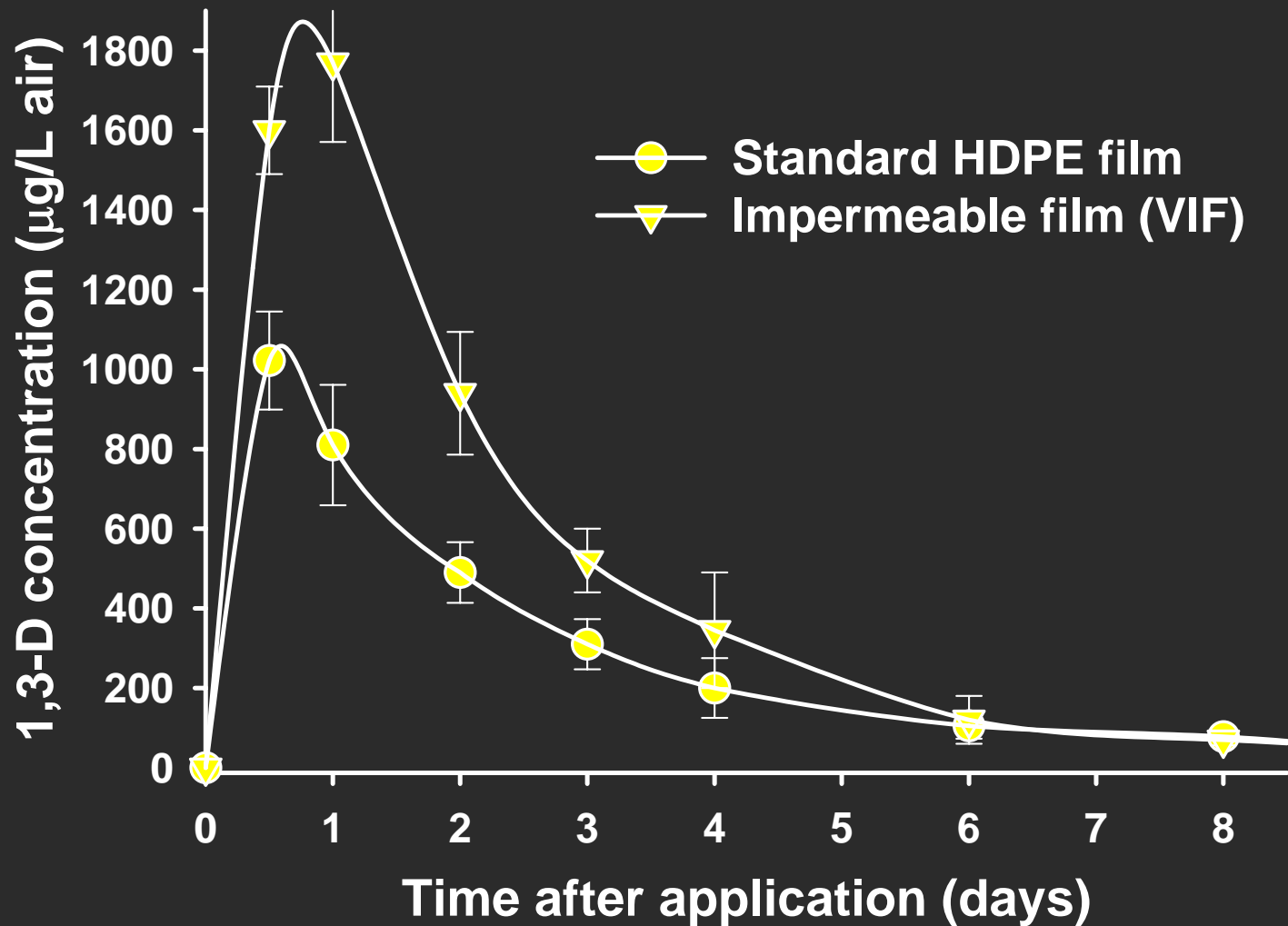
Ideas for improving the performance of alternative fumigants

- ◆ Increase fumigant retention, i.e. trap the fumigant in the soil.
 - A viable strategy due to the shorter persistence of these fumigants.
- ◆ Assist the dispersion of the alternative fumigant to improve pest control.
 - This is why drip fumigation improves fumigant efficacy.

VIF



VIF film is at least 300 times LESS permeable to methyl bromide than HDPE (Gamliel et al. 1998)



1,3-dichloropropene concentration in the gaseous phase of a Watsonville sandy loam soil after application of InLine (240 lb/A)

VIF project objectives

- ◆ Measure the effects of VIF on strawberry yields and fumigant persistence.
- ◆ To evaluate the use of VIF in combination with alternative fumigants to determine the minimum effective doses of chloropicrin and 1,3-D plus chloropicrin (Inline) for the control of soil borne pathogens, nematodes and weeds (next talk).
- ◆ Evaluate the economic viability of the effective fumigant doses identified above (4:40 pm talk).

Collaborators

- ◆ Diseases - Greg Browne, John Duniway, Frank Martin
- ◆ Nematodes - Becky Westerdahl
- ◆ Economics - Rachael Goodhue
- ◆ Fumigant distribution - Husein Ajwa
- ◆ Weeds – Kabir Zahangir, Oleg Daugovish, Steve Fennimore
- ◆ Drip fumigation - Tom Trout

Methods - research

- ◆ Field trials were located at Oxnard and Watsonville, CA during the 2002-03 & 2003-04 seasons.
- ◆ Inline and Pic were applied by drip injection at 50, 100, 200, 300 & 400 lb/A.
- ◆ Standard MBPic, and untreated checks were included.
- ◆ Replicated 4 times.

Methods - demonstrations

- ◆ Field demonstrations were located at Oxnard, Santa Maria and Watsonville, CA during the 2002-03 season.
- ◆ Inline and Pic were applied by drip injection at 100, 200, & 300 lb/A.
- ◆ Standard MBPic, and untreated checks were included.
- ◆ Replicated 2 times.



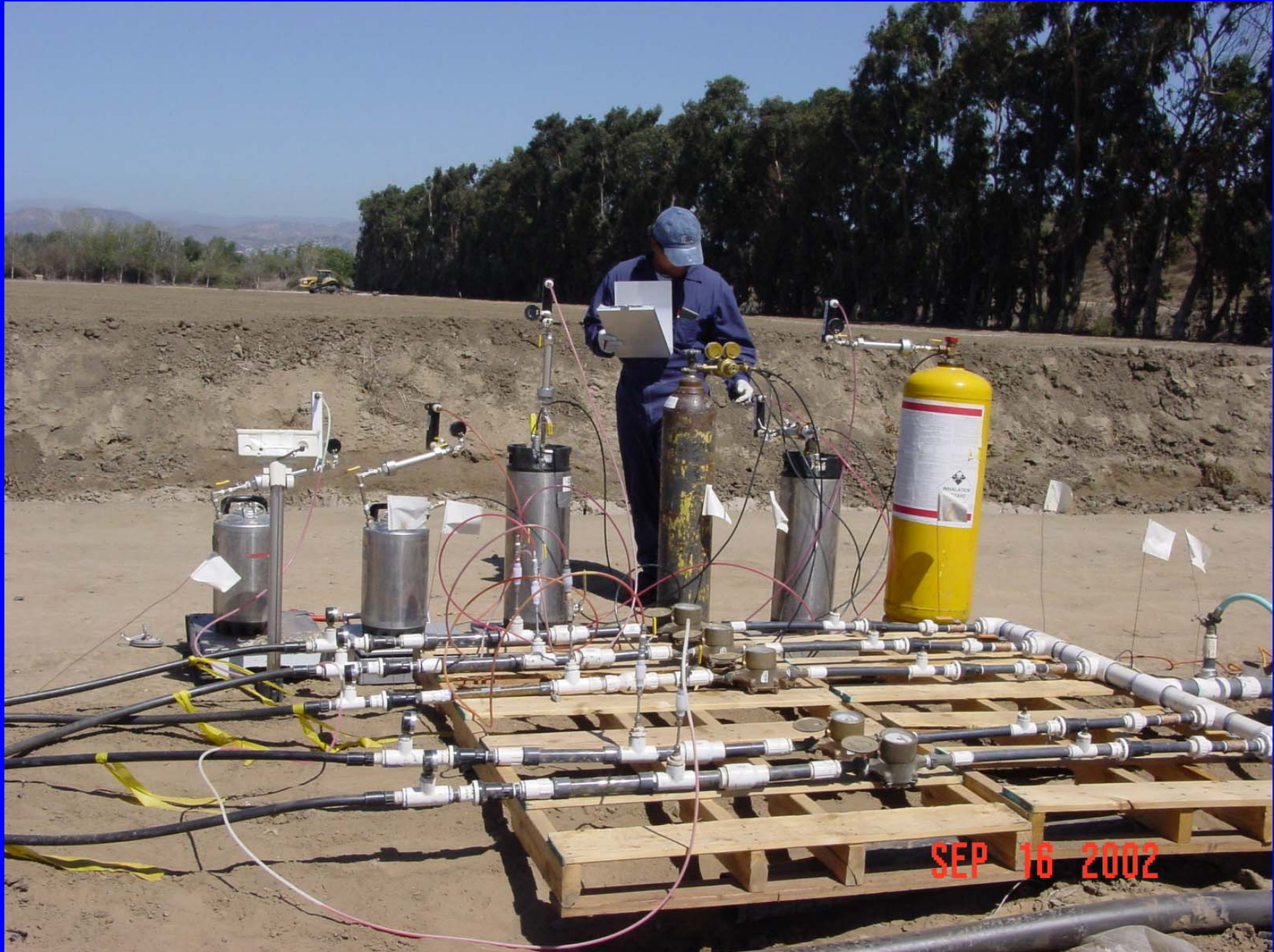
SEP 17 2002

Bed Shank Injection



Drip Application Equipment





SEP 16 2002

Results

Research Plots

1,3-D emissions

Time (hr)	VIF	VIF	HDPE	HDPE
	Above	Below	Above	Below
	--- micrograms/L air ---			
1	1	885	27	567
24	1	414	21	126
48	2	87	18	28

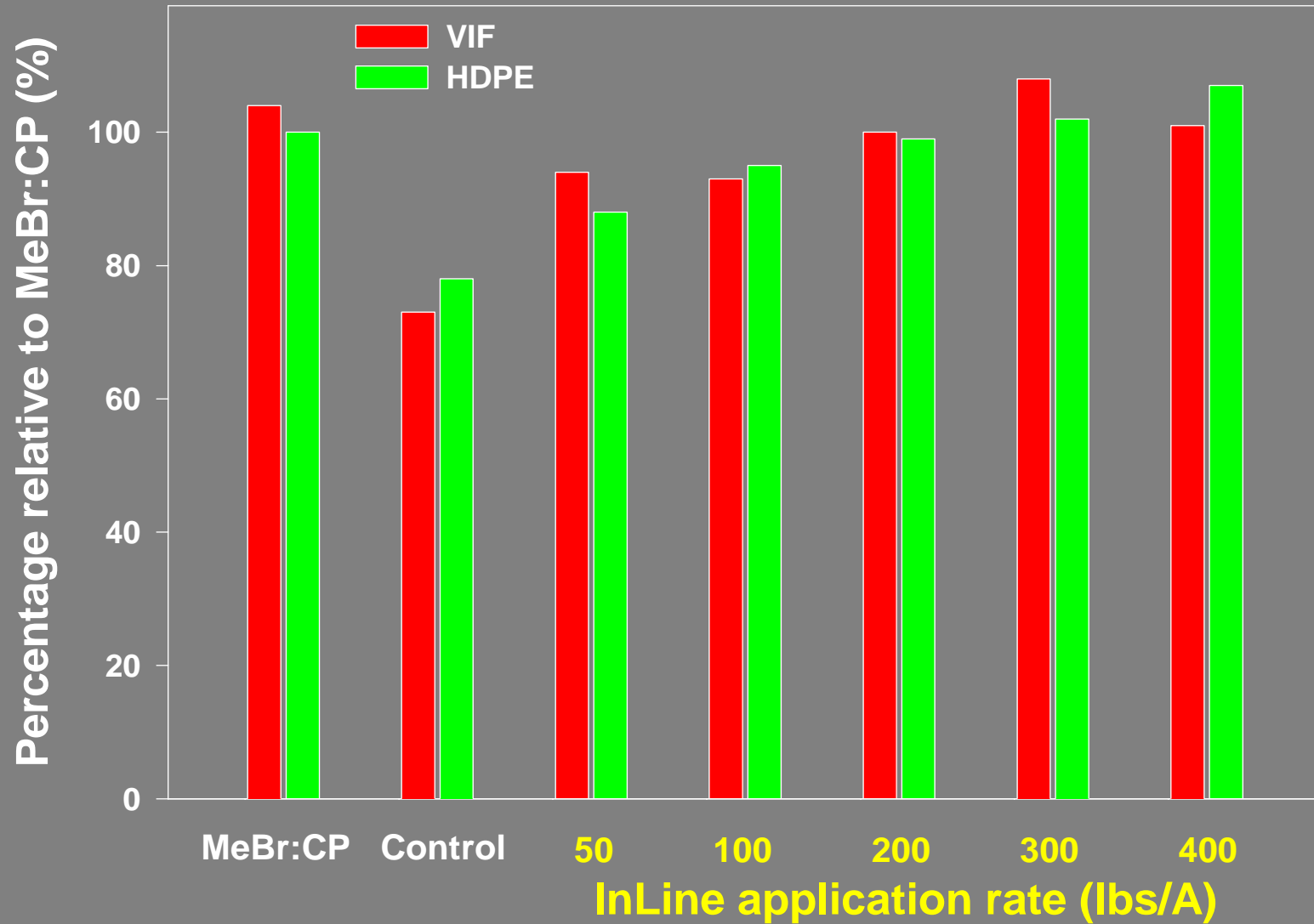
Ajwa, unpublished
Oxnard 2002-03

Chloropicrin emissions

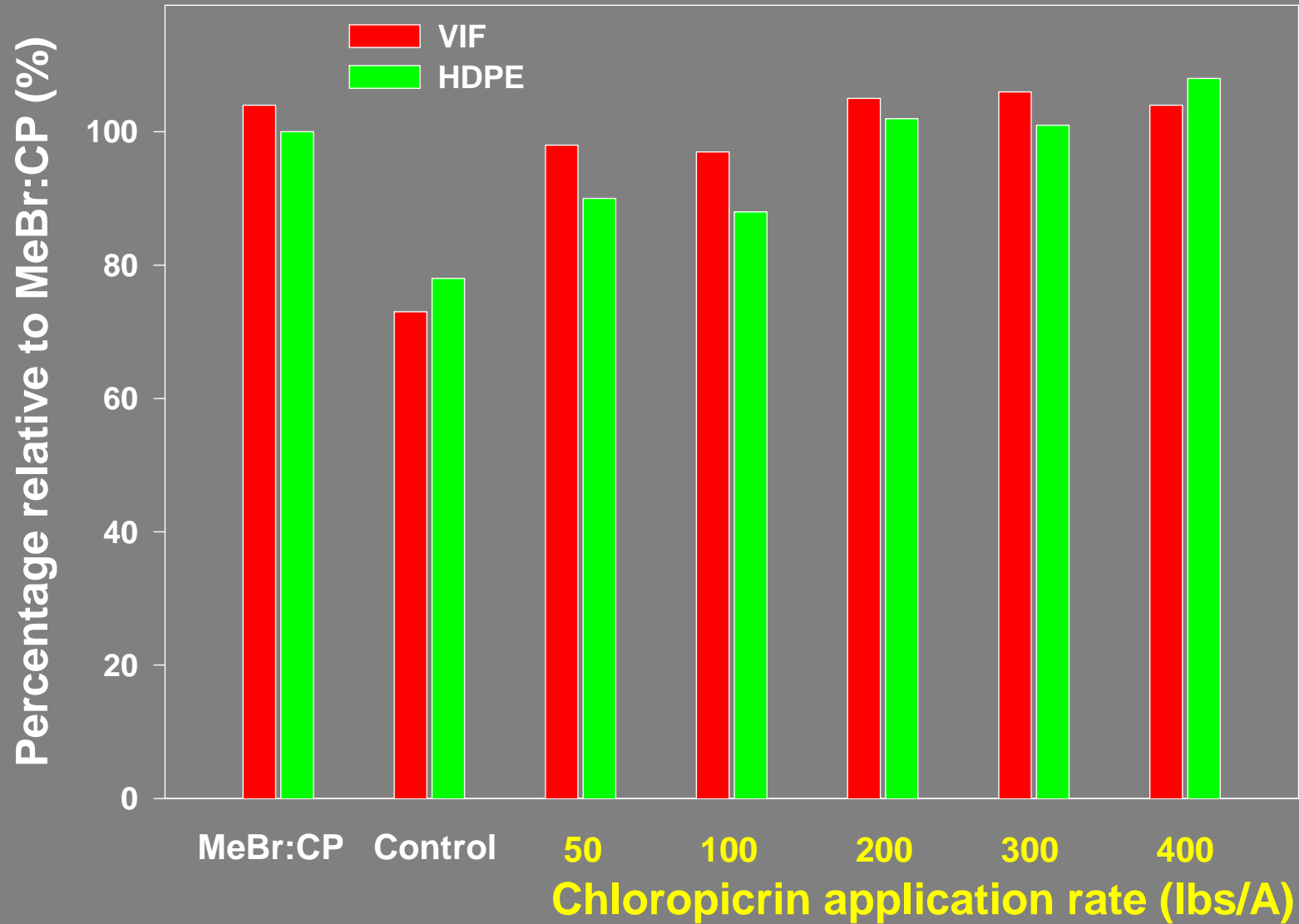
Time (hr)	VIF	VIF	HDPE	HDPE
	Above	Below	Above	Below
	--- micrograms/L air ---			
1	1	587	10	269
24	1	228	20	128
48	1	69	17	31

Ajwa, unpublished
Oxnard 2002-03

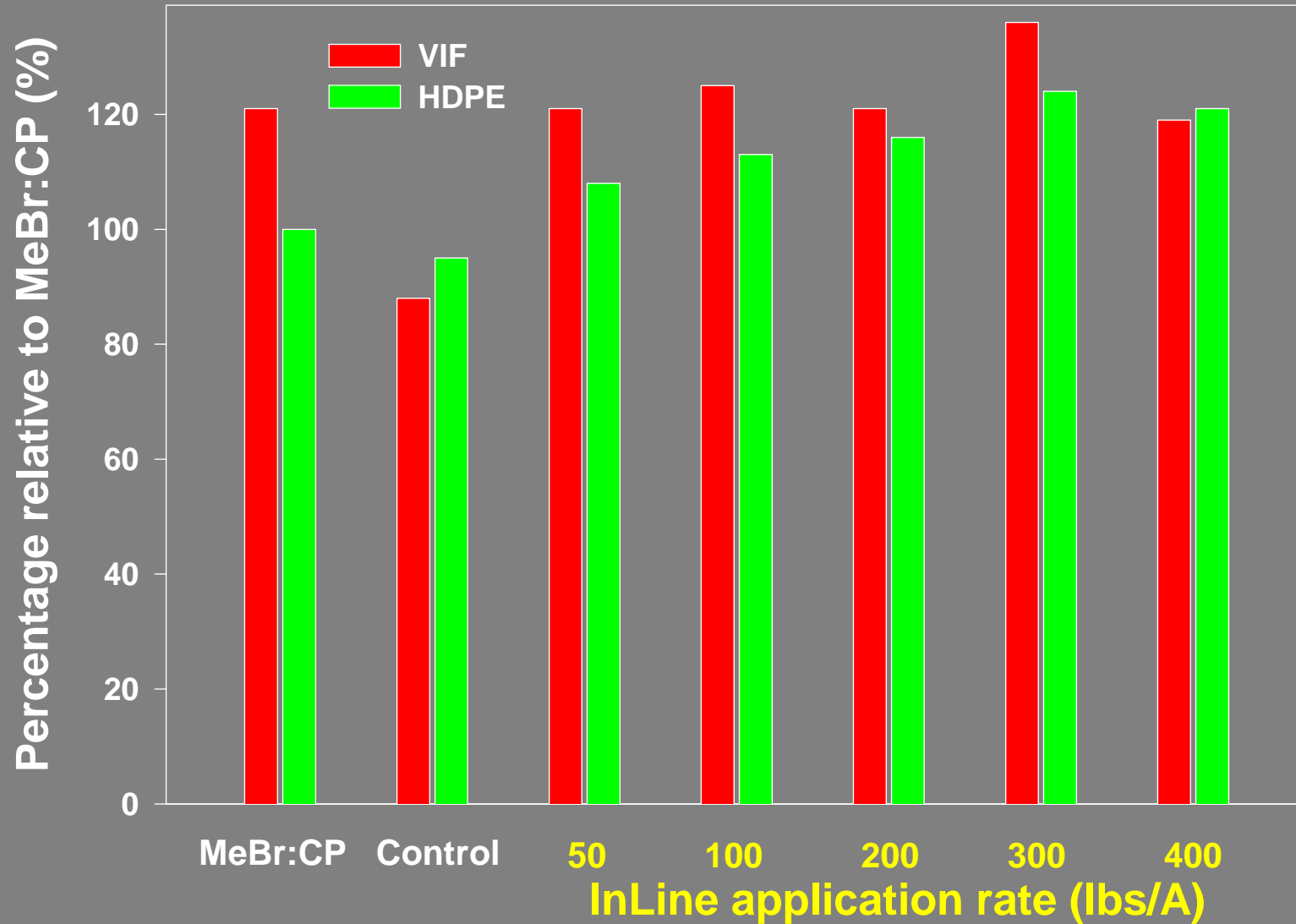
Watsonville, 2002/03



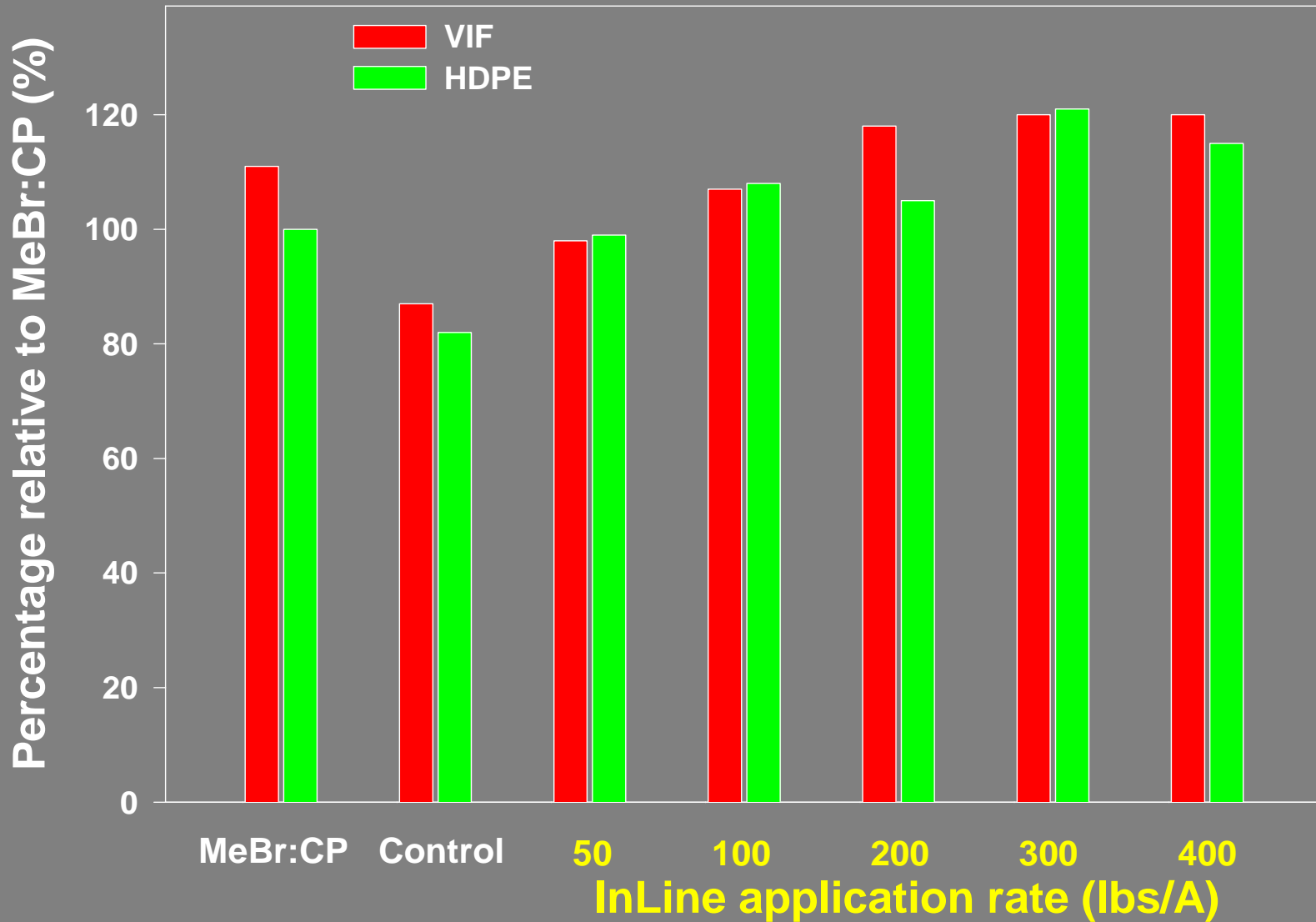
Watsonville, 2002/03



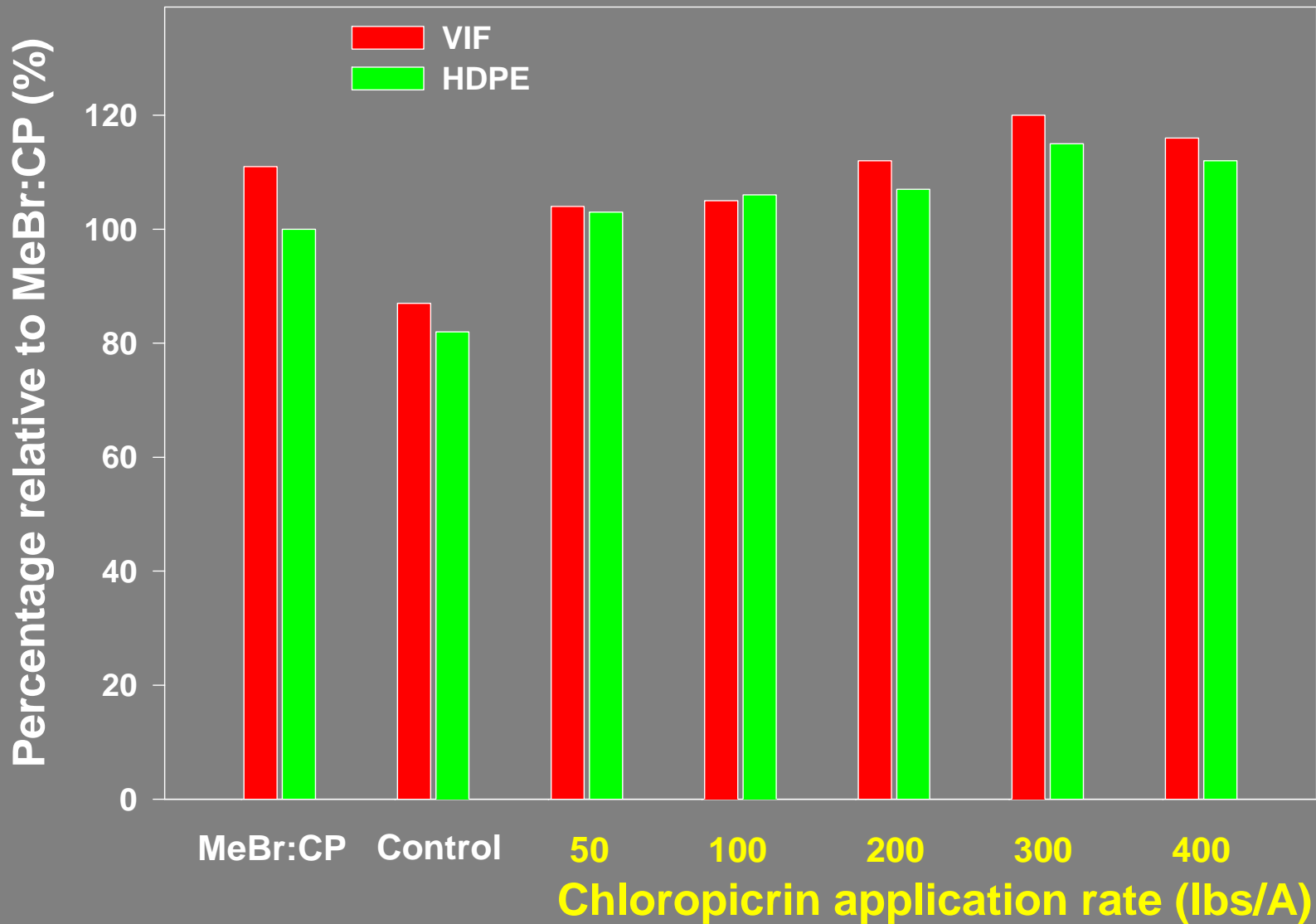
Watsonville, 2003/04



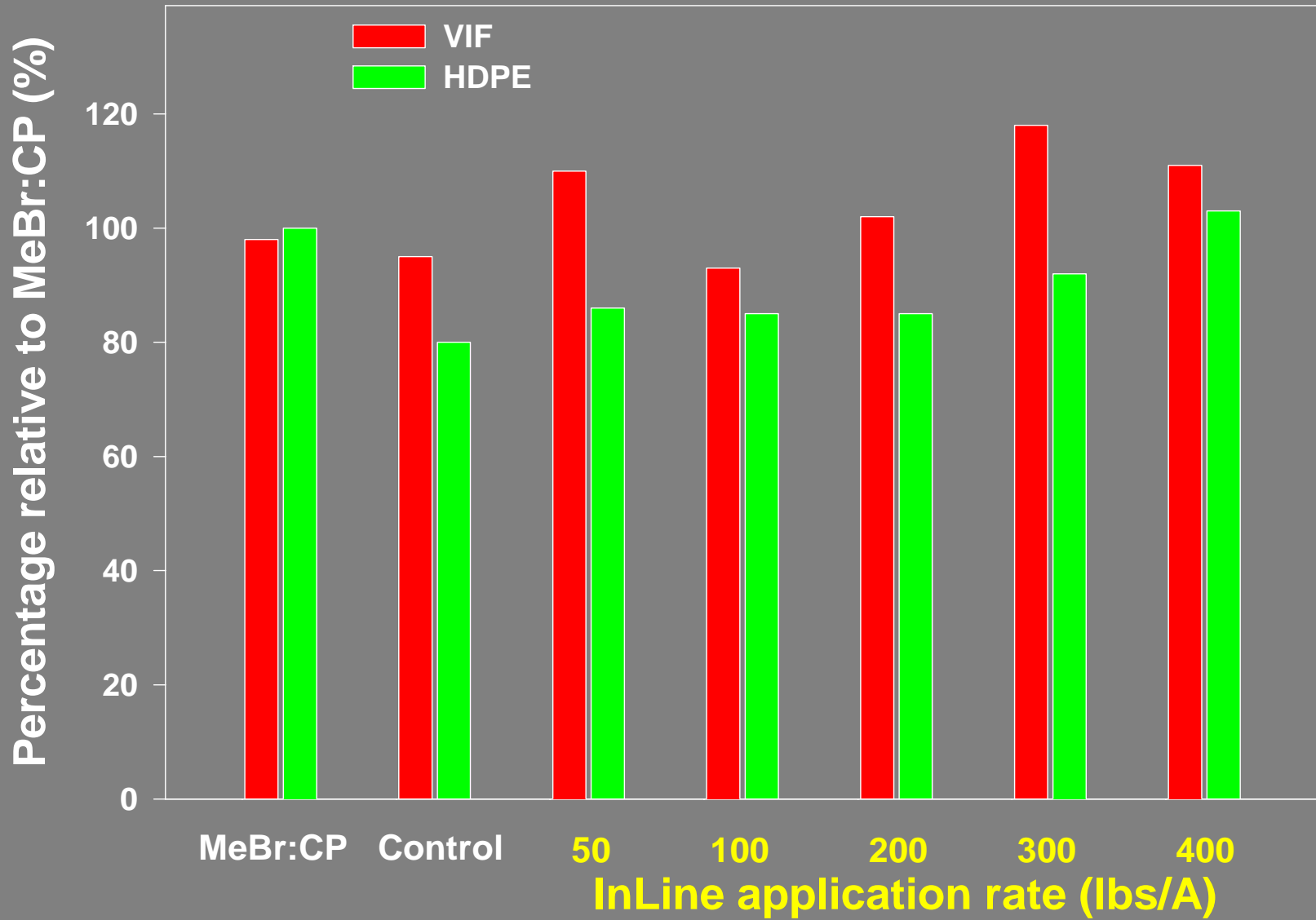
Oxnard, 2002/03



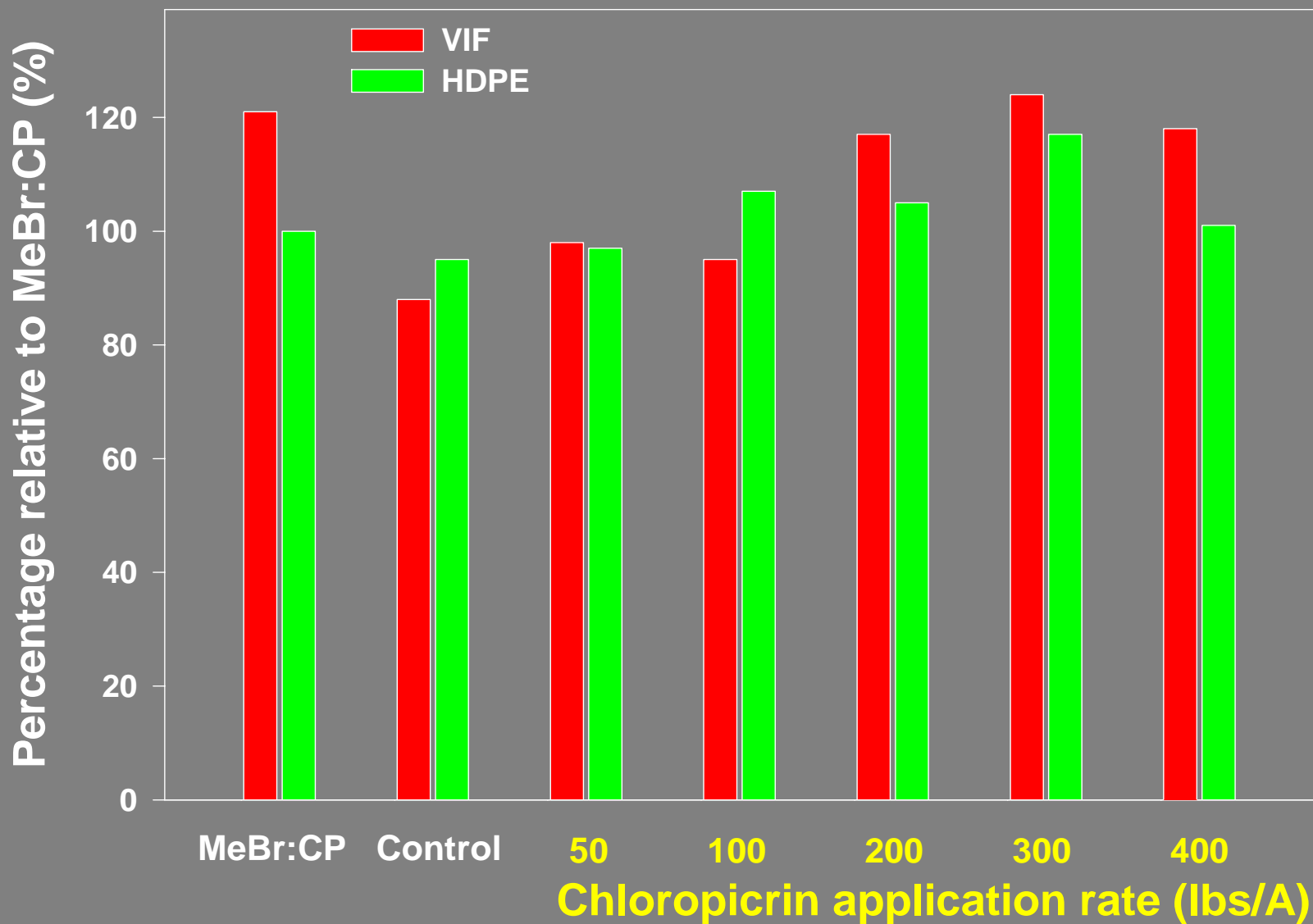
Oxnard, 2002/03



Oxnard, 2003/04



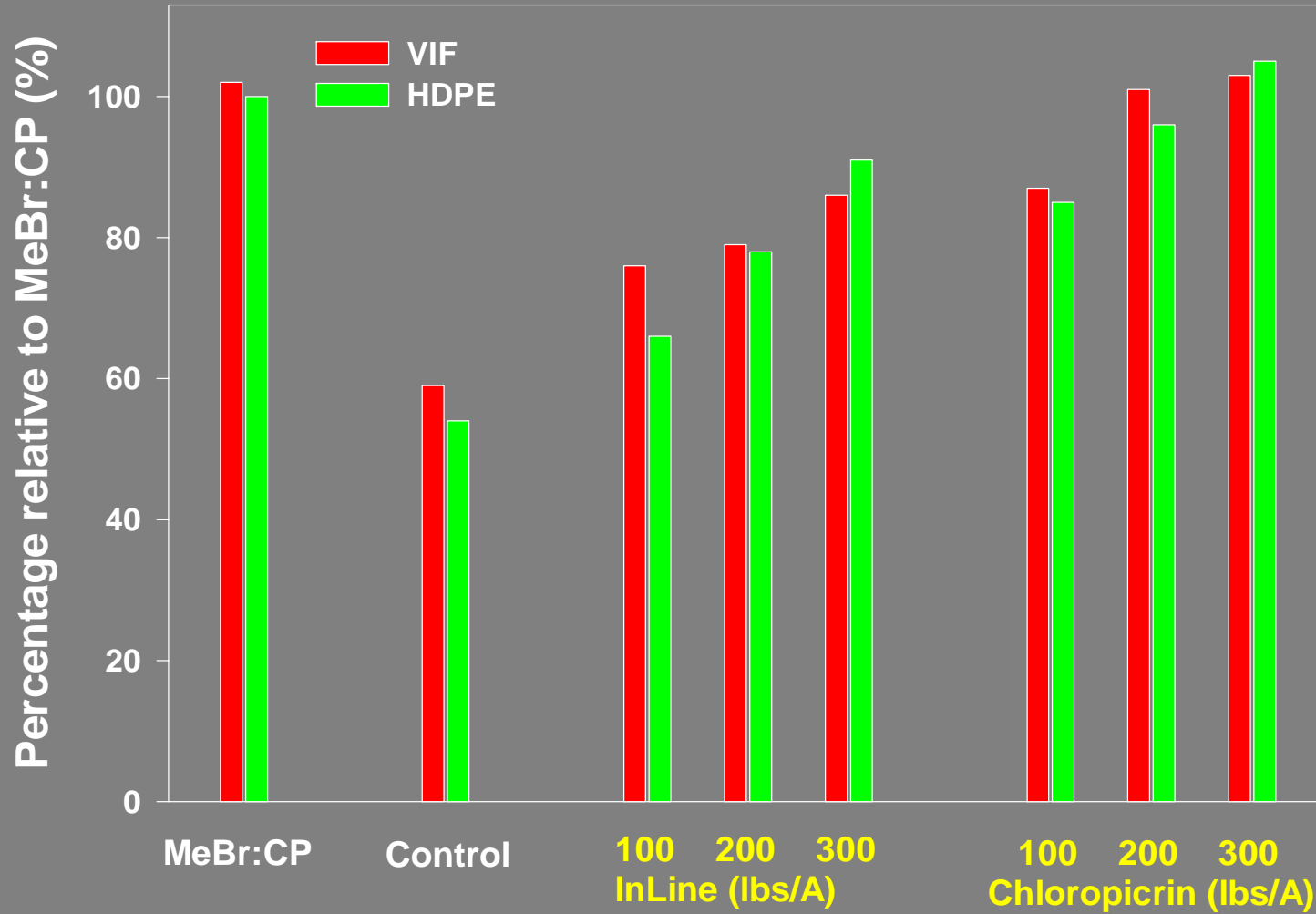
Watsonville, 2003/04



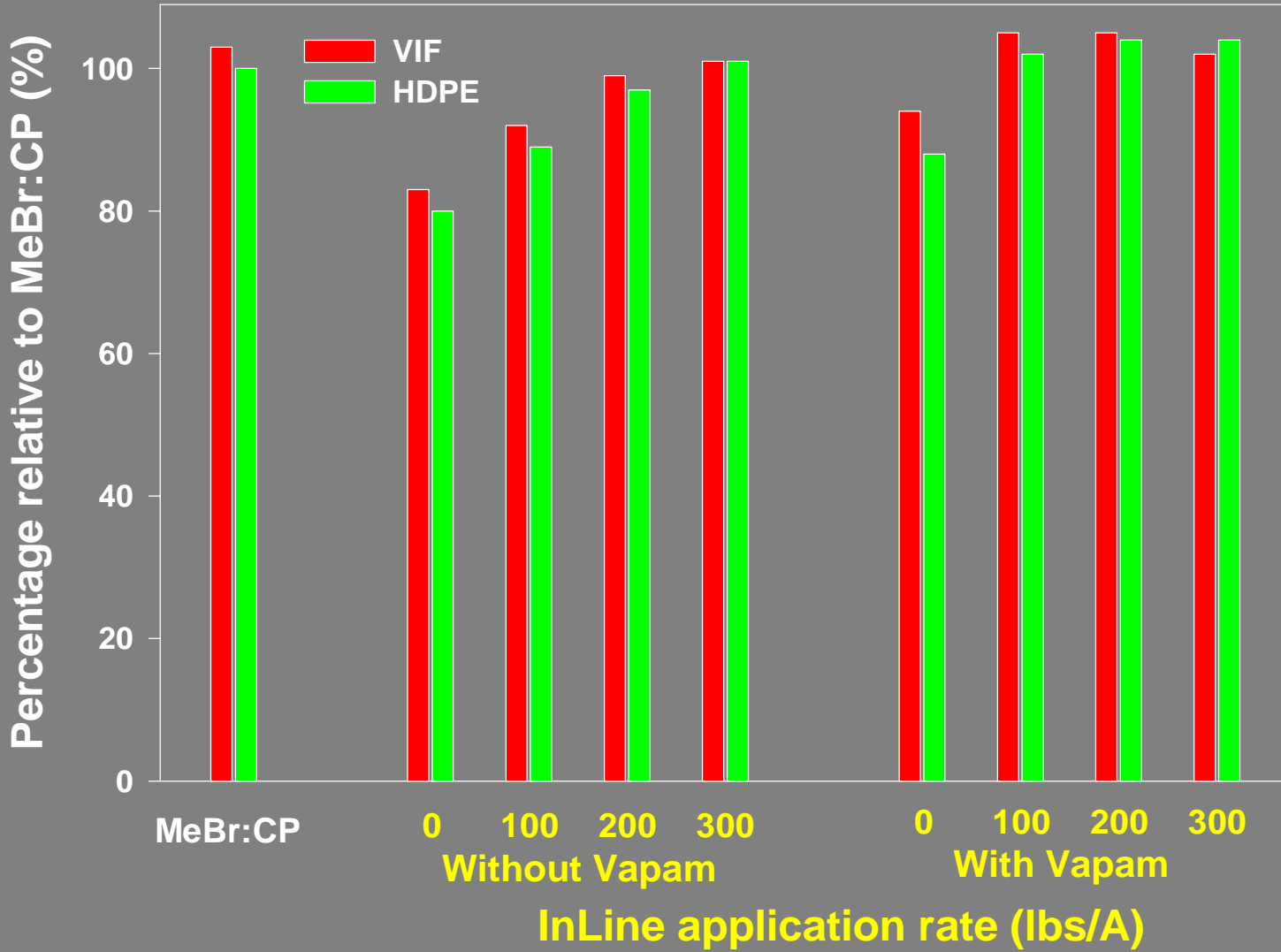
Results

Demonstration Plots

Watsonville, 2002



Santa Maria, 2002



Summary

- ◆ VIF contributed to a 4 to 6% increase in total yield compared to HDPE
- ◆ 300 lbs of Inline or 200 lbs of Pic alone are needed for commercially acceptable yields regardless of film type.
- ◆ Sequential applications of metam sodium following 200 lb/A Pic or Inline applications resulted in commercially acceptable yields.

Acknowledgments

- ◆ CA Strawberry Commission
- ◆ USDA-CSREES methyl bromide transitions
- ◆ Coastal Berry – Stuart Yamamoto
- ◆ Seacrest Farms – Glenn & Steve Imoto
- ◆ Mandalay Berry Farms – John Dullam & Juan Hernandez
- ◆ D&B Specialities – Daren Gee & Hank Guerrero
- ◆ Driscoll's – Tom Sjulín