

Solarization and biofumigation for organic control of white mold in high tunnels

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Sclerotinia sclerotiorum

- Thrives in cool, moist conditions
- Persists in soil as sclerotia

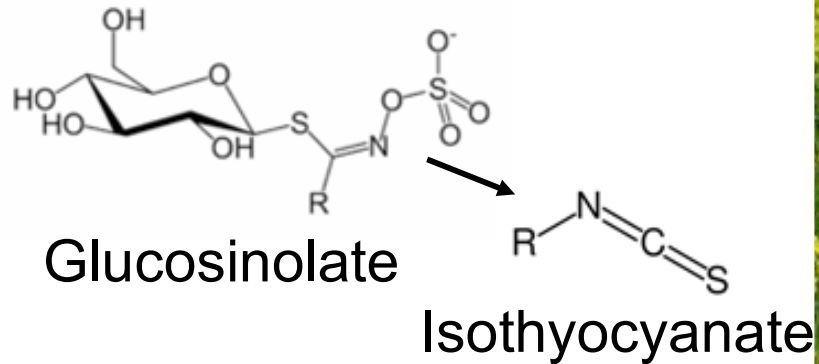


- White mold of lettuce
- Broad host range
- Problem in high tunnels

Organic management options

- Biofumigation

- General: Use of volatile chemicals produced by plants to control or suppress soil-borne pests and diseases
- Specific: Soil incorporation of brassicas, which contain glucosinolates that break down into volatile isothiocyanates



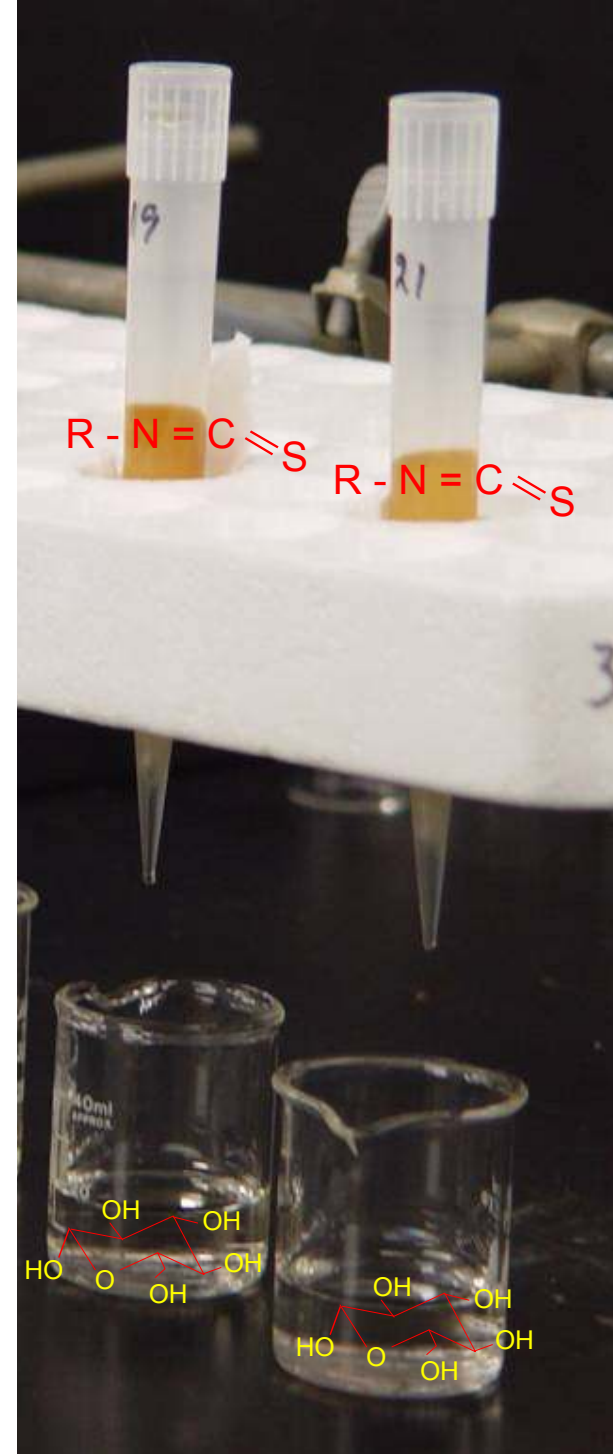
- Solarization

- Using clear plastic over the soil surface to capture solar energy, heat soil, and kill weed seeds and soil-borne pests and diseases

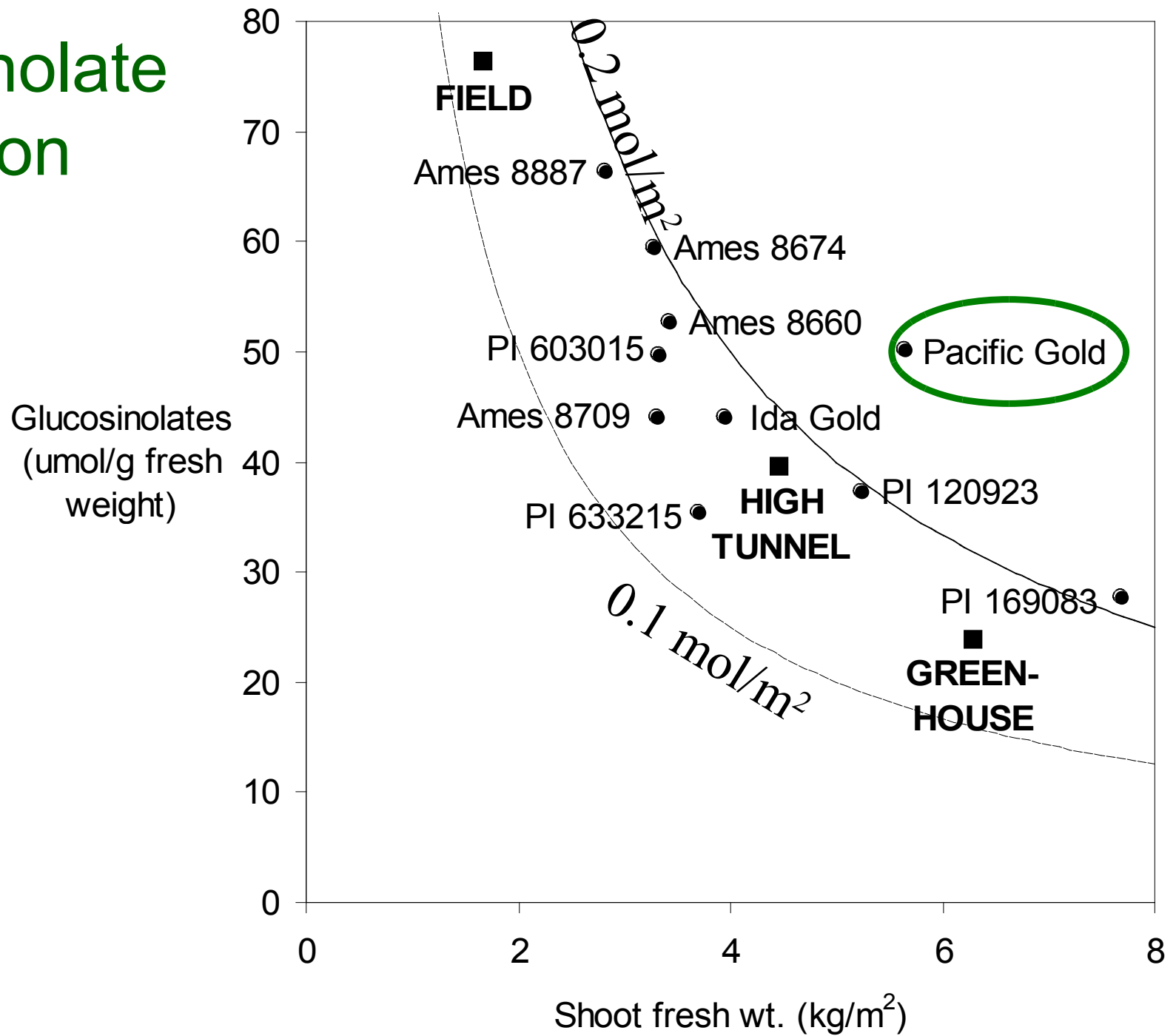


Glucosinolate production

- Objective
 - Identify suitable brassica cover crop
- Methods
 - Evaluated 47 brassica accessions for suitability as a cover crop in high tunnel (winter) and field (spring)
 - *Brassica juncea* (Indian mustard),
 - *B. napus* (Rape),
 - *B. carinata* (Ethiopian mustard),
 - *Eruca sativa* (Arugula)
 - Determined glucosinolate content of most promising accessions



Glucosinolate production



George Antonious, Michael Bomford and Paul Vincelli. 2009.
Screening Brassica Species for Glucosinolate Content.

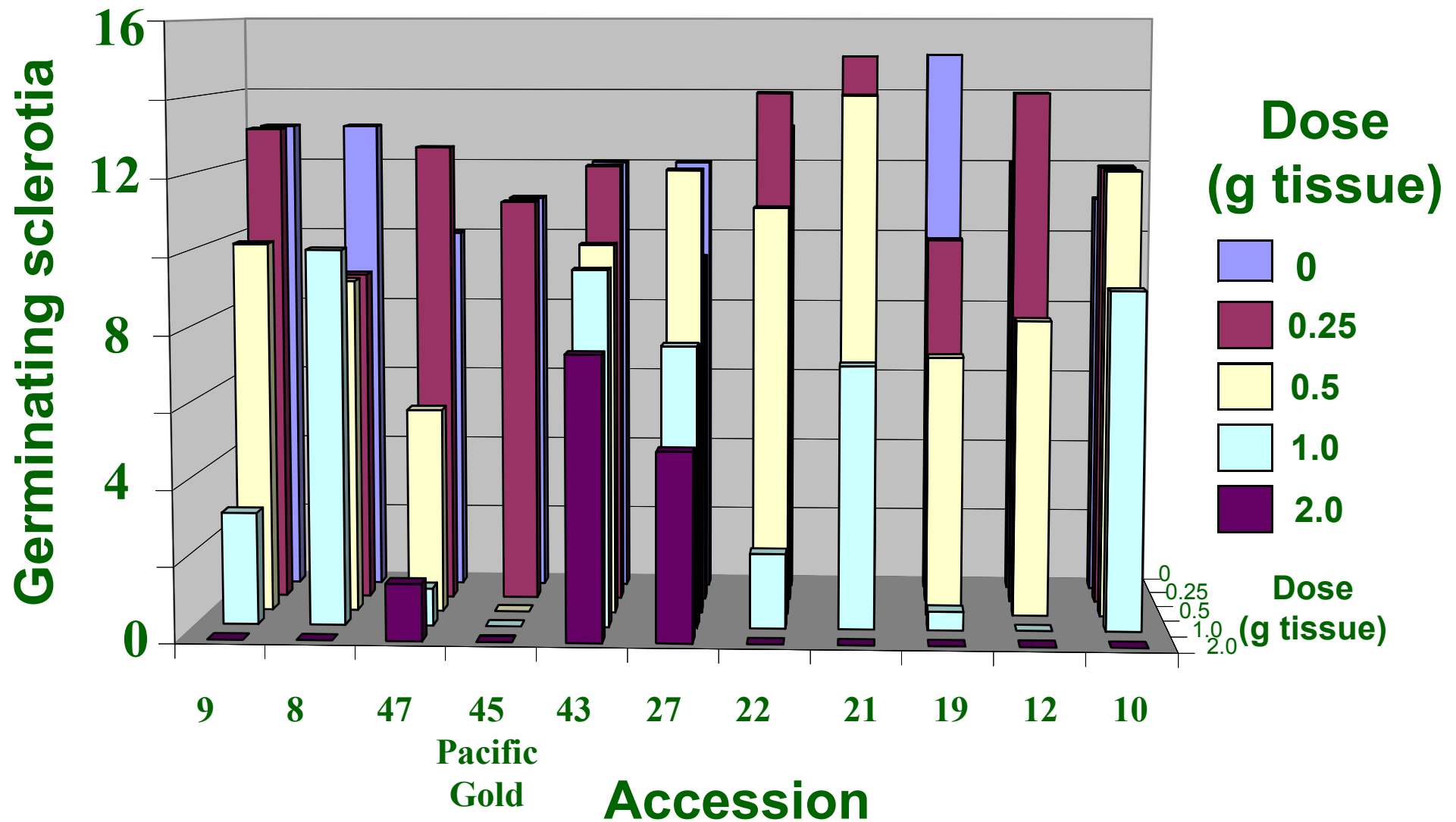
Journal of Environmental Science and Health. Part B: Pesticides: 311-316

Glucosinolate inhibition of *S. sclerotiorum*

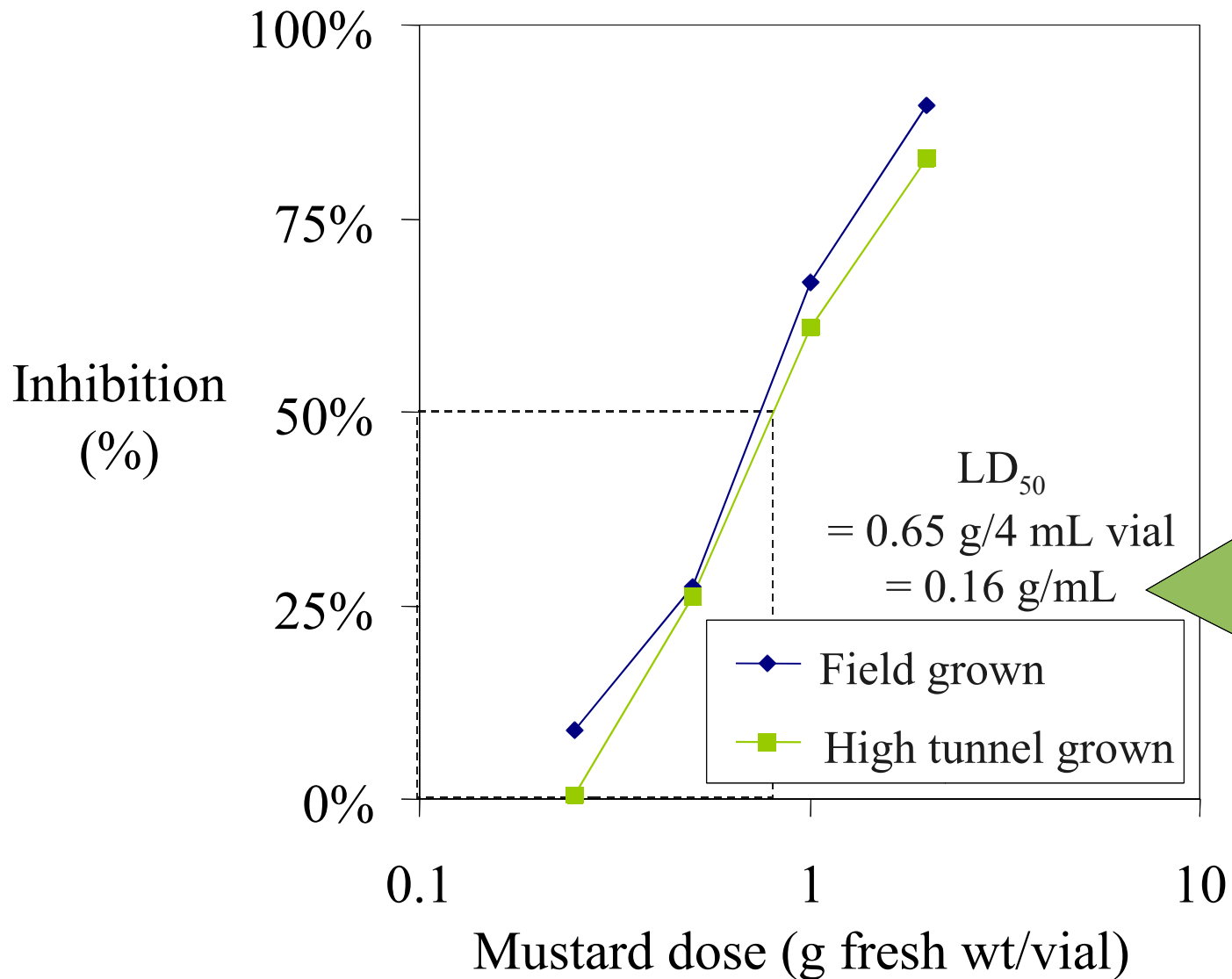
- Objective
 - Calculate LD₅₀ of promising brassicas
- Methods
 - Tested 11 promising brassica accessions for ability to suppress germination of *S. sclerotiorum* apothecia
 - Mixed 15 sclerotia with 4 mL of soil and 0, 0.25, 0.5, 1.0 or 2.0 g of brassica leaf tissue
 - Sclerotia plated on moist soil following 24 h of biofumigation
 - Measured germination after 6 wk incubation at 16 °C



S. sclerotiorum germination (out of 15) following exposure to mustard extracts



S. sclerotiorum inhibition



0.16 g/mL in
top 10 cm
=
16 kg/m²
...
2X higher than
our best
mustard yield

High Tunnel Study

Treatments
(4 reps; RCBD):

1. Untreated control
2. Solarization
3. Biofumigation
 - Macerated Pacific Gold mustard tops incorporated into soil at 800 g/m² fresh weight
4. Biofumigation and solarization

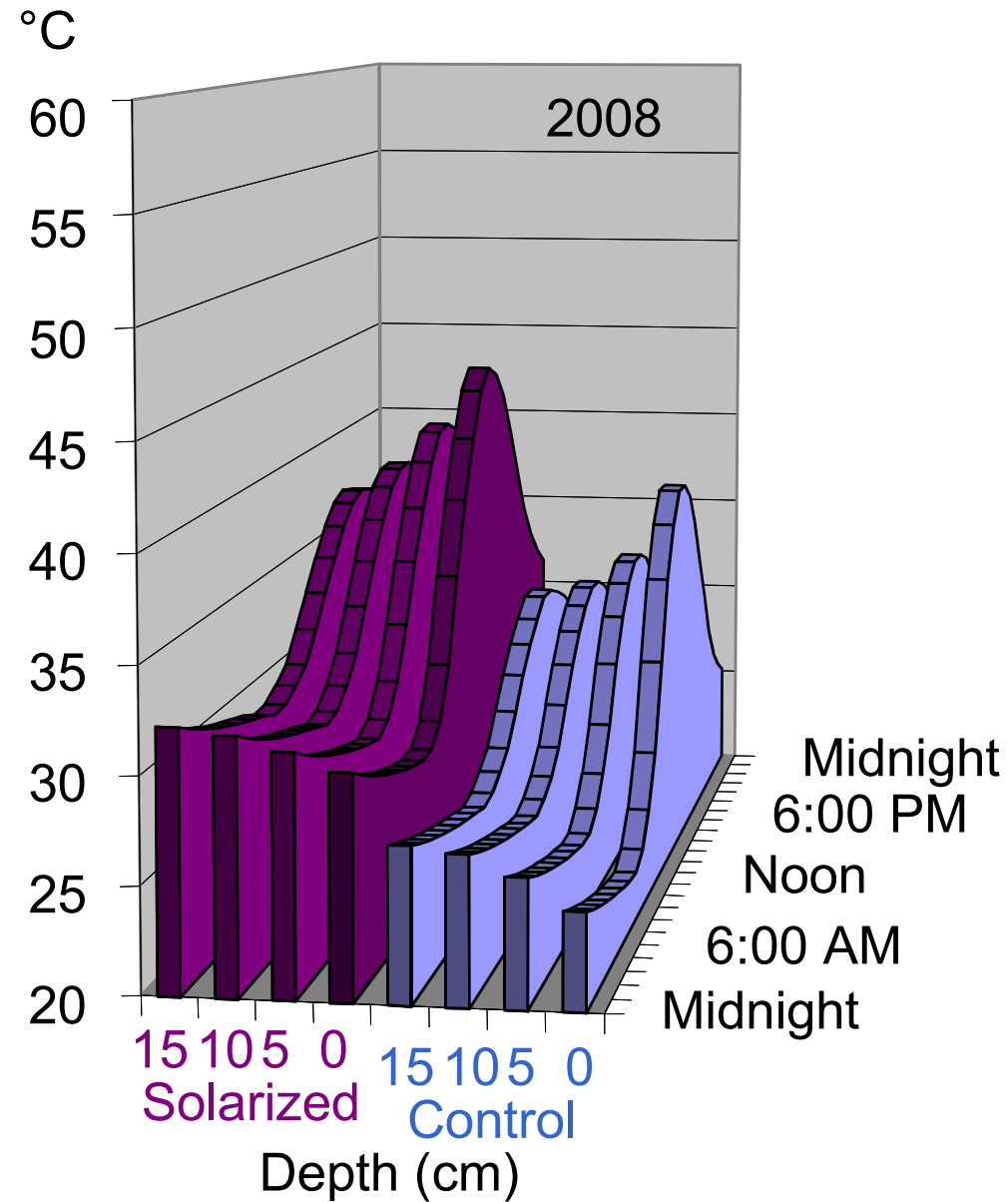
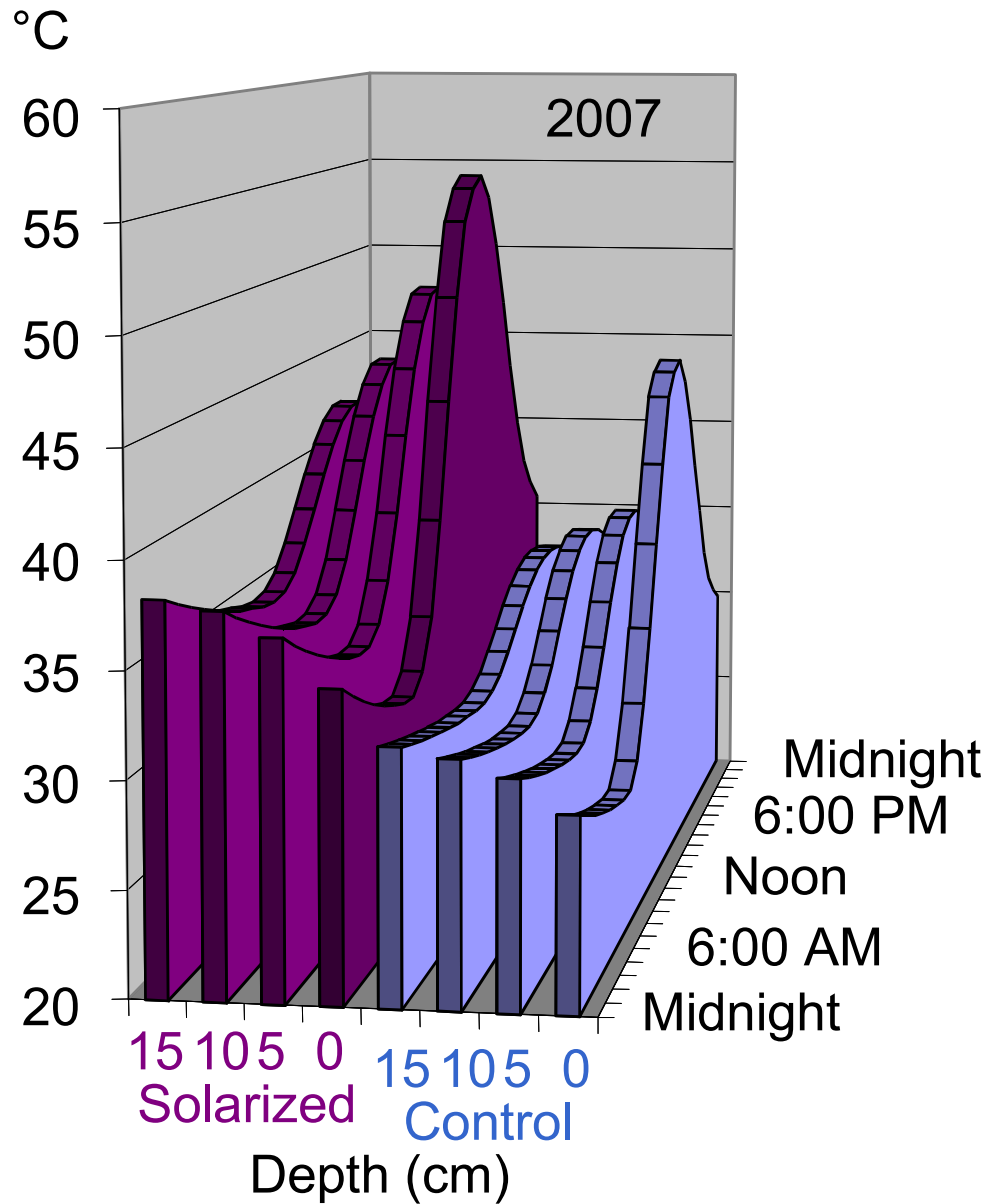


High Tunnel Study

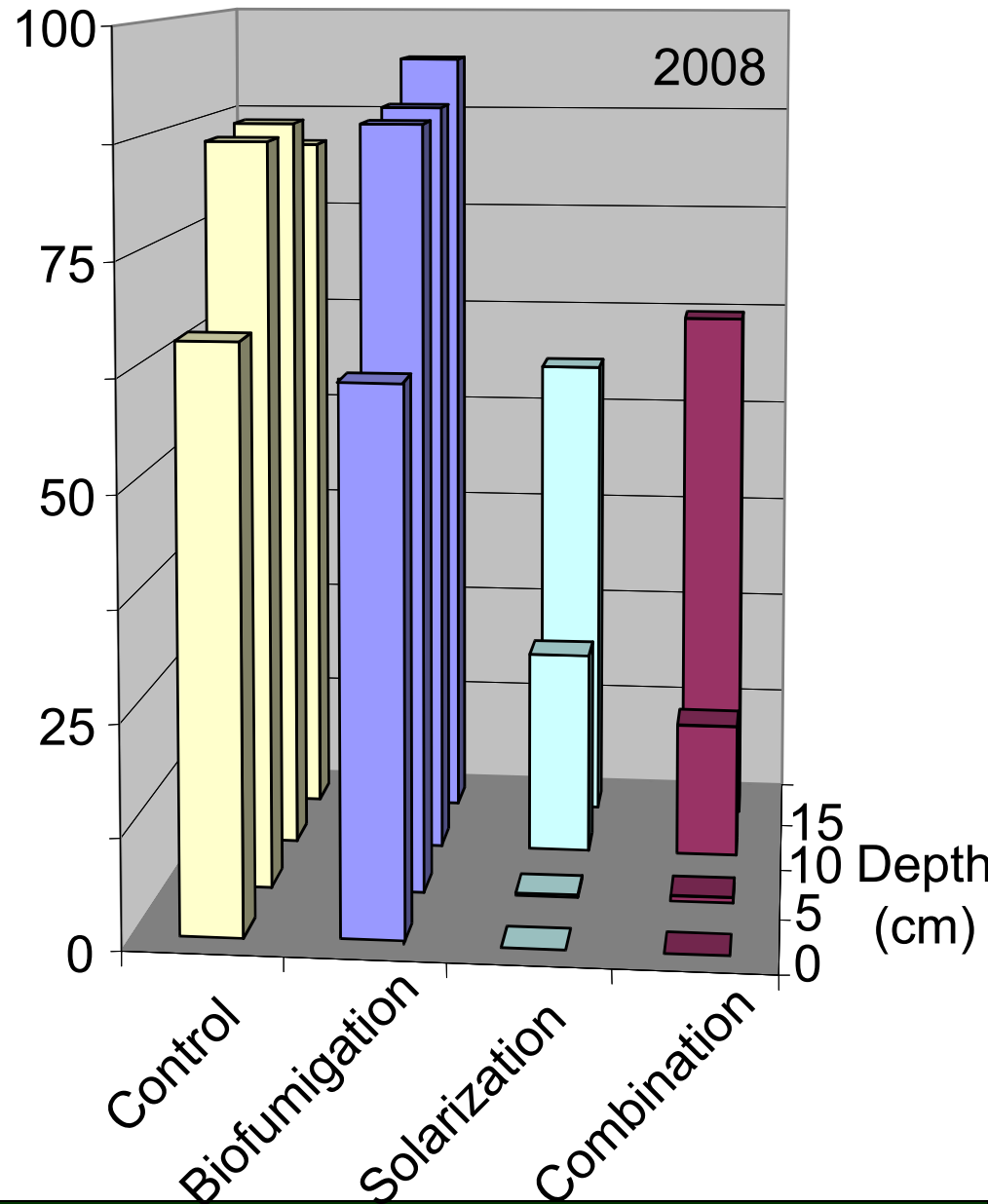
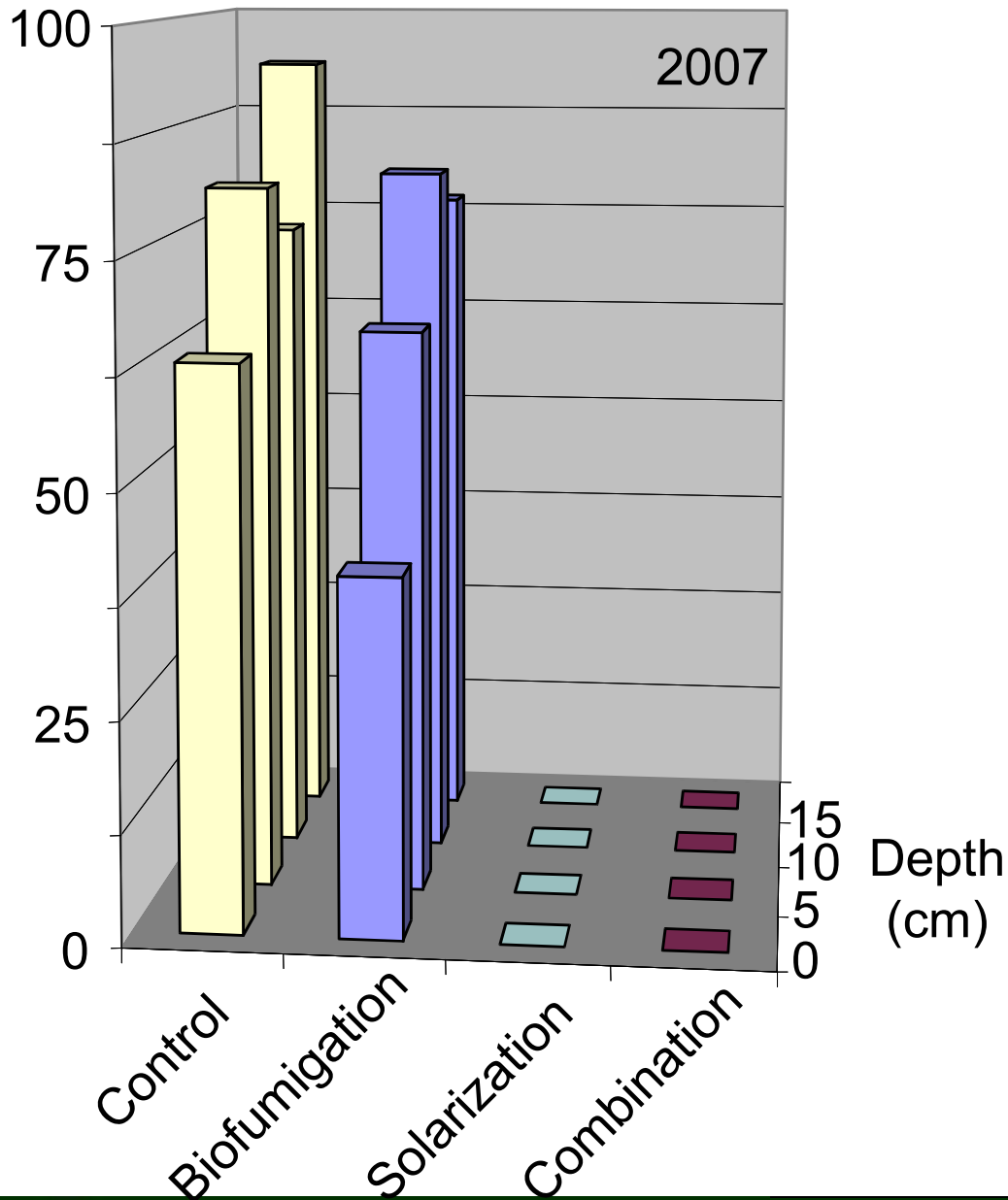
- Setup in late July, 2007 & 2008
- Mesh bags of sclerotia buried with temp. probes 0, 5, 10 & 15 cm below surface
- Bags collected 4 wk after setup & germinated for 6 wk



Daily soil temperature flux



Germinating sclerotia (%)



Conclusions

- Four weeks of summer solarization in a high tunnel kills most sclerotia.
- Effectiveness of solarization decreases with depth.
- Effectiveness depends on temperatures achieved.
- Pacific Gold offers best potential as biofumigant among accessions tested.
- Biofumigation with 800 g/m² not effective. Lab study suggests much higher rate needed.



Thanks

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