

UCNFA 2010

**Nursery/Floriculture Insect and Disease
Management Symposium
October 28 -- Watsonville**

Making Pest Management More Efficient -- The Bedding Plant IPM Alliance

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IPM and Agricultural Sustainability

- **Profit margins are thin**
- **Need to provide IPM techniques that reduce fertilizer, water, and pesticide use**
- **External societal concerns**

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CA pesticide use greenhouse transplants

Plant pathogens -- top 5 materials = 59% of total

<i>Active ingredient (ai)</i>	<i>Percent of total applications for plant pathogens</i>	<i>Key pests targeted</i>	<i>FRAC¹ mode-of-action group</i>	<i>FRAC resistance risk</i>
Copper hydroxide	15.00	Bacterial and fungal leaf blights	M1	Low
Mefenoxam	13.37	Phythium, Phytophthora	4	High
Thiophanate-methyl	12.17	Fungal pathogens and water molds	1	High
Maneb	9.95	Fungal leaf blights	M3	Low
Chlorothalonil	8.33	Fungal pathogens	M5	Low

Arthropods -- top 5 materials = 47% of total

<i>Active ingredient (ai)</i>	<i>Percent of total applications for insects and mites</i>	<i>Key pests targeted</i>	<i>IRAC¹ mode-of-action group</i>
Azadirachtin	14.13	Thrips	unk
<i>B.t. israelensis</i>	9.84	Fungus gnats	11
Pyrethrins	8.18	All insects, mites	3
Permethrin	7.90	All insects, mites	3
<i>B.t. aizawai</i>	7.03	Caterpillars	11

CA pesticide use greenhouse container

Plant pathogens -- top 5 materials = 51% of total

<i>Active ingredient (ai)</i>	<i>Percent of total applications for plant pathogens</i>	<i>Key pests targeted</i>	<i>FRAC¹ mode-of-action group</i>	<i>FRAC resistance risk</i>
Thiophanate-methyl	13.83	Fungal pathogens and water molds	1	High
Mefenoxam	13.53	Pythium, Phytophthora	4	High
Iprodione	8.85	Fungal leaf blights	2	Medium-high
Phosphorus acid	7.85	Pythium, Phytophthora, downy mildew	n/a	n/a
Fosetyl-AL	7.10	Pythium, Phytophthora, downy mildew	33	Low

Arthropods -- top 5 materials = 37% of total

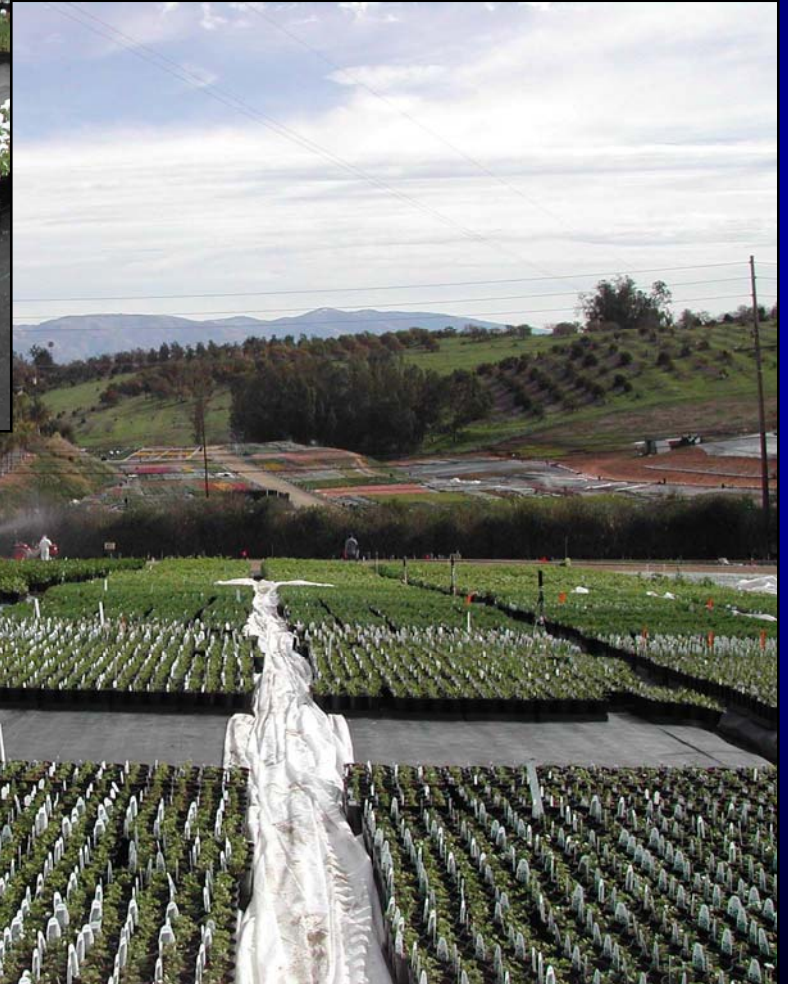
<i>Active ingredient (ai)</i>	<i>Percent of total applications for insects and mites</i>	<i>Key pests targeted</i>	<i>IRAC¹ mode-of-action group</i>
Abamectin	13.10	Mites, thrips	6
Imidacloprid	6.61	Aphids, whiteflies	4A
Acephate	6.04	All insects	1B
Spinosad	5.90	Thrips	5
Dinotefuran	5.01	Aphids, whiteflies, fungus gnats	4A

The bedding plant production system

- **Short 8 to 10 week crop cycle**
- **Most profits are made on volume**
- **Typical grower will have over 200 species or cultivars**
- **No tolerance for plant damage**







The key pests

- *Pythium* spp., *Phytophthora* spp., botrytis, INSV, other fungal and bacterial leaf spots
- Western flower thrips, fungus gnats, shore flies, aphids, spider mites, whiteflies

The IPM program

- **Reduce total number of pesticide applications by 30% over three years**
- **Reduce organophosphate, pyrethroid, and carbamate applications to fewer than 15% of total**
- **Include economic analysis of IPM implementation**

The IPM program

- **Four collaborators, two in northern CA and two in southern CA**
- **Includes propagation, bedding plants, and container color**
- **All currently rely primarily on conventional pesticides**
- **Major funding from the CA Department of Pesticide Regulation**

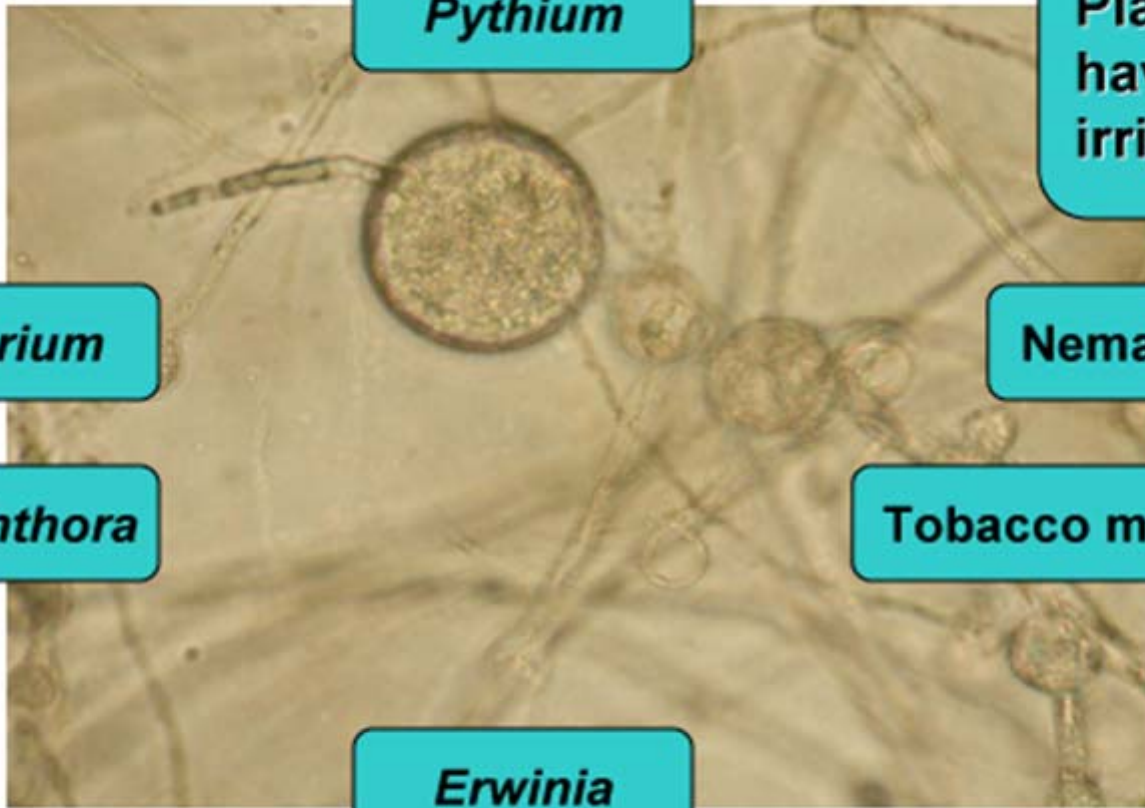
The IPM program

- **Emphasize good water and fertilizer management**
- **Focus on pathogens**
- **Insect and mite sampling plans**

Water

- **Pest problems often related to water use -- pathogens, fungus gnats, algae**
- **Water management systems**
 - storage and recycling
 - filtering
 - water content meters (irrigation scheduling)
 - treatment

Pathogens in irrigation water



Pythium

Plant pathogens
have been found in
irrigation water

Fusarium

Nematodes

Phytophthora

Tobacco mosaic virus

Erwinia

Chlorine dioxide

- **Inexpensive, effective biocide**
- **Kills free-floating and biofilm bacteria**
- **Destroys the integrity of the biofilm**

What pathogens will chlorine dioxide kill in irrigation water?

Laboratory cultures of these pathogens were tested using both clean and nursery pond water

- *Phytophthora sp.*
- *Pythium sp.*
- *Colletotrichum sp.*
- *Fusarium sp.*
- *Alternaria sp.*
- *Cylindrocladium sp.*

(J. MacDonald, UC Davis)



**Demonstration-
scale chlorine
dioxide systems
will be used at
two
greenhouses**

www.aquapulsesystems.com

Effective Microorganisms (EM•1®)

- Many biological controls for plant pathogens are available
- Compost teas have varying degrees of efficacy
- **EM1®** (*Lactobacillus casei*, *Saccharomyces cerevisiae*, and *Rhodopseudomonas palustris*) **has shown good efficacy against Phytophthora diseases.**

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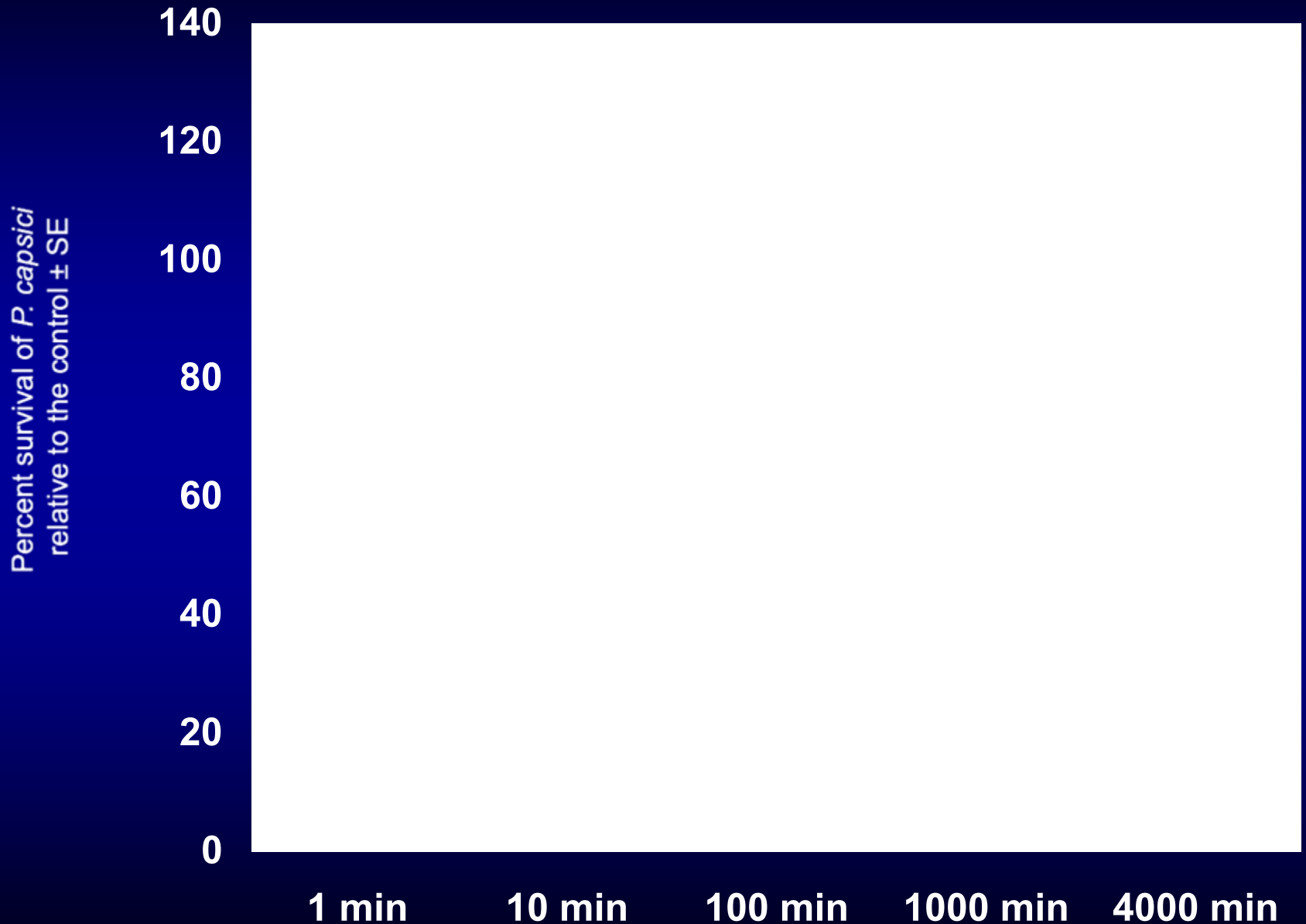
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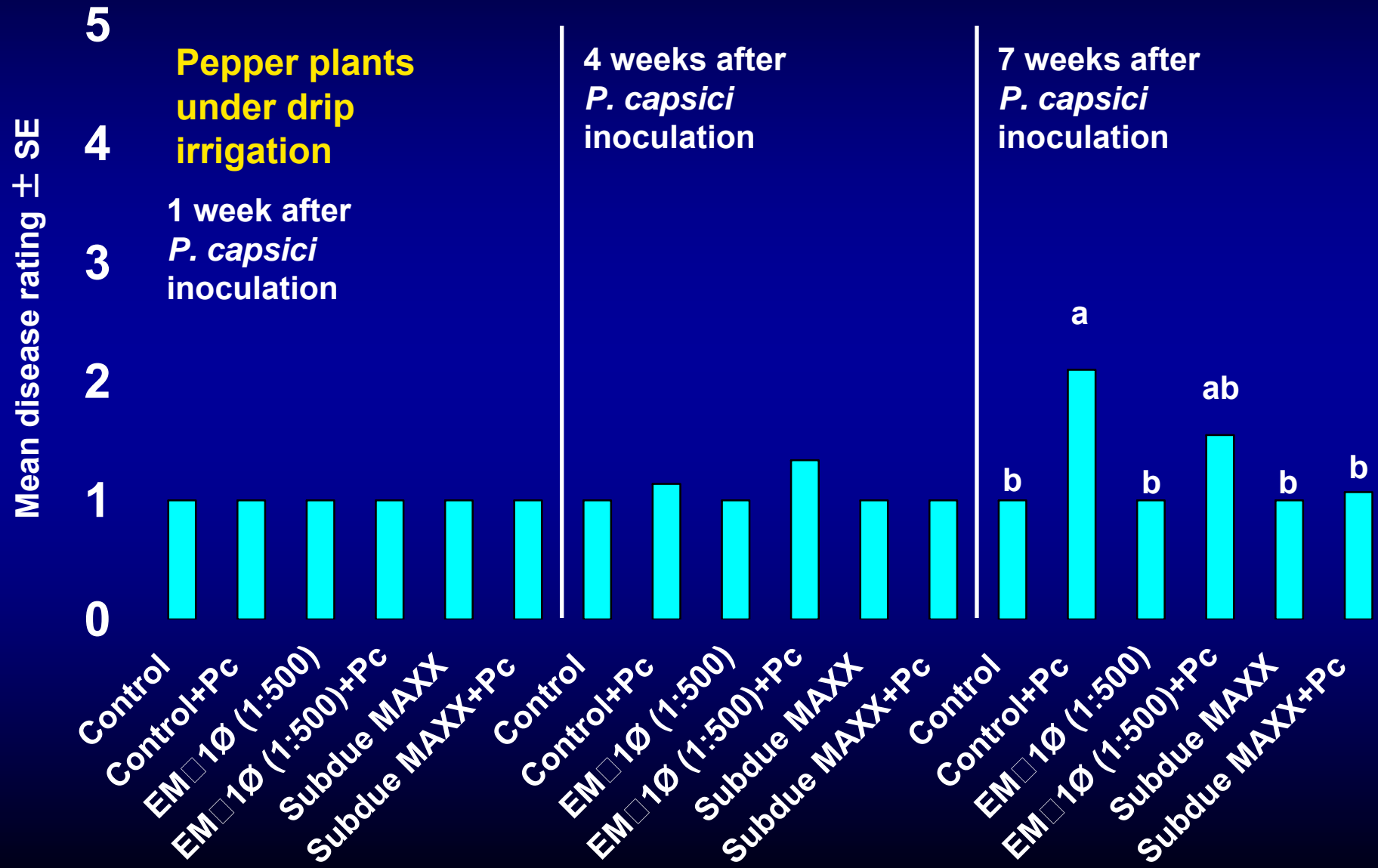
www.teraganix.com

Phytophthora capsici survival in EM•1® treated water



P. capsici disease in EM•1® treated plants

EM•1® applied for 4 weeks; plants then inoculated with *P. capsici*

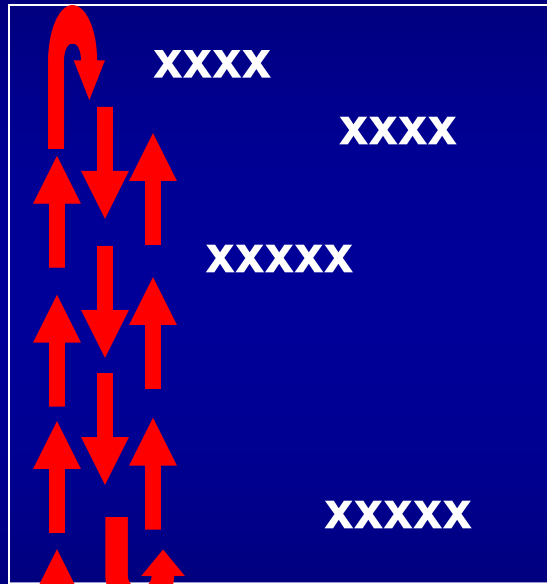


Sampling for nursery pests

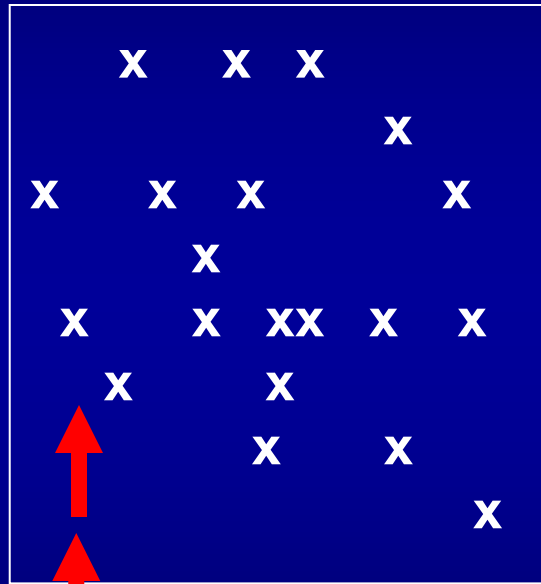
- **Why sample? New pests, correct timing of controls, look for natural enemies.**
- **How many plants do you look at?**
- **The more aggregated a pest's distribution is, the more plants you will need to look at to find it.**

Fixed precision sampling plans

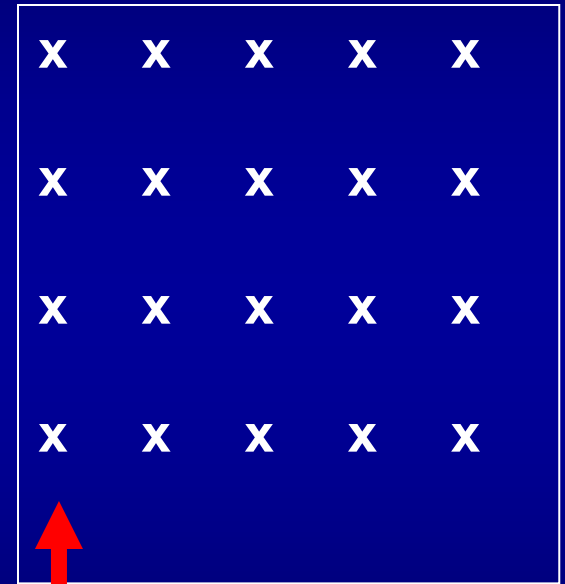
Relate sampling to pest distribution



Clumped



Random



Uniform

→ = Scouting pattern

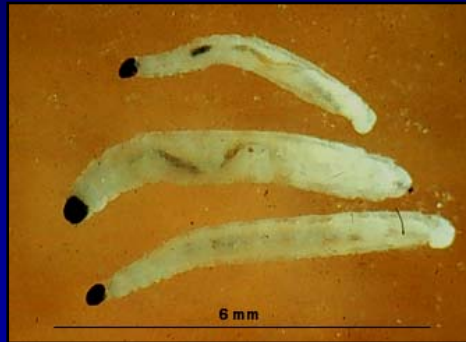
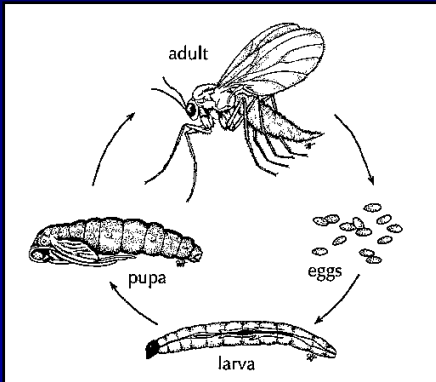
x = infested plant

Fixed precision sampling plans

- **Thrips:** uniform when plants are flowering, random or clumped otherwise
 - YSC; use to assess rising or falling populations and chose control accordingly
 - 3 cards per 10,000 ft²
- **Whiteflies:** clumped; use YSC to find hot spots
- **Spider mites:** clumped; 38 plants per 10,000 ft² examined to determine proportion infested

Fungus gnats, shore flies, moth flies

Biology and damage



**Fungus
gnats**



**Shore
flies**



**Moth
flies**

Fungus gnats, shore flies, moth flies

Monitoring

- **Visual**
 - observe flies on foliage, soil surface
- **Sticky traps**
 - 3x5 inches; bright yellow; orient vertically or horizontally
 - cover with plastic wrap and count a 1 inch vertical strip under a microscope
- **Potato slices at the soil surface @ 48 hr**
 - detect presence of larvae and evaluate control



Summary

- **Sustainable practices are becoming a necessity**
- **Water will be a predominant issue for growers for the foreseeable future**
- **New approaches to conserving and disinfecting water are here now**
- **Good water practices can reduce pest problems**



Thank you

Questions?