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IPM for Bedding and Container Color Plants

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CA environmental horticulture industry

- $13 billion annual economic impact
- Annual and perennial potted crops, bedding plants, nursery stock, cut flowers, sod
- 25% of US production
- Bedding plants ≅ 300 producers with wholesale value of $1 billion

What are bedding and container color plants?

The bedding plant production system

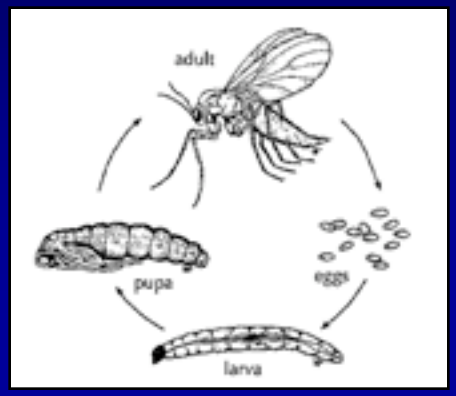
- Short 8 to 10 week crop cycle
- Most profits are made on volume
- Typical grower will have over 200 species or cultivars
- No tolerance for plant damage

Bedding plant production characterized by distinct production stages and different types of irrigation

The key pests

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

Key arthropod pests
Biology and damage



Fungus gnats
(*Bradysia* spp.)

Shore flies
(e.g. *Scatella stagnalis*)

Moth flies
(Family Psychodidae)

Key disease pests

CA pesticide use in the greenhouse

Plant pathogens -- top 5 materials

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

Arthropods -- top 5 materials

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

Project goals

- **Goal #1: Reduce total number of pesticide applications by 30% over three years**
- **Goal #2: Reduce organophosphate, pyrethroid, and carbamate applications to fewer than 15% of total**

PMA objectives

Objective 1: Form an IPM team to develop effective pest management solutions for bedding and color plant production

IPM team

Dr. Michael Parrella, UC Davis Entomology

Dr. Christine Casey, UC Davis Entomology

Mr. James Bethke, UC Farm Advisor

Ms. Chrissie Davis, Koppert Biological Systems

Dr. Dave Fujino, UC Davis Center for Urban Horticulture

Dr. Deborah Mathews, UC Riverside Plant Pathology

Ms. Julie Newman, UC Farm Advisor

Dr. Lucia Villavicencio, Center for Applied Horticultural Research

Ms. Annika Knoppel, Nursery Growers Assn. of CA

Dr. Cheryl Wilen, UC IPM Weed Science

Ms. Kimberley Steinmann, CA DPR

Dr. Loren Oki, UC Davis Plant Sciences

Dr. Ann Chase, Chase Horticultural Research

Mr. Mark Robertson, CA DPR

Ms. Rebecca Sisco, IR-4 Program Western Region

Fungus gnat monitoring

Fungus gnat management

Treatment	YSC counts	Trade name	Common name	Life stages targeted	MOA group	REI
First	Release at start of crop	Entomite -M	*Hypoaspis miles*	Larvae	n/a	n/a
Second	Low	Gnatrol	*Bacillus thuringiensis israelensis*	Larvae	11A1	4hr
Third	Rising	Distance	Pyriproxifen	Larvae; reduces egg laying	7D	12hr
Fourth	Peak	Citation	Cyromazine	Larvae	17	12hr

Key pathogens

- **Many biological controls for plant pathogens are available, e.g. RootShield (*Trichoderma harzianum* T-22) and Pro-Mix PGX media (*Bacillus subtilis* MB1600)**
- **Compost teas have varying degrees of efficacy**
- **AEM (***Lactobacillus casei, Saccharomyces cerevisiae, and Rhodopseudomonas palustris***) has shown good efficacy against Phytophthora and Pythium diseases.**

PMA objectives

Objective 2. Enhance pest identification and monitoring skills as well as understanding of pest thresholds and tolerances among collaborating growers

The IPM demonstration

- 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

IPM demonstration
Cal Color Growers

- Morgan Hill, CA
- Plugs, six-packs, container color
- Market: big box stores, IGC, other growers

Issues to address

- Concerns about *Pythium* contamination in their media
- Interested in using more biological and reduced-risk pesticides
- Want to reduce pest management costs

The IPM demonstration

- Evaluated plant loss and crop quality in pansy, salvia, and vinca plugs three, six, and nine weeks after sowing
- Compared Cal Color media with AEM or RootShield (each applied once at planting) to PGX media
- Water management

Mean flat quality nine weeks after sowing – Cal Color

- ***Salvia:*** **Plants grown in PGX finished with mean quality near 5, while plants grown in Cal Color media finished near 2, regardless of the treatment they received**
- ***Pansy:*** **Cal Color with AEM finished near 4, while PGX finished below 3**
- ***Vinca:*** **finished with a mean quality of about 3.5, regardless of treatment**

IPM demonstration
Ball Tagawa Growers

- Arroyo Grande, CA
- Plugs from seeds and cuttings
- Market: other growers

The IPM demonstration

- Evaluated plant loss and crop quality in pansy, salvia, and vinca plugs two and five weeks after sowing
- Compared an untreated control, AEM, RootShield, and Pageant fungicide (2 applications of each)
- Water management

Mean flat quality five weeks after sowing – Ball Tagawa

- Salvia, pansy, and vinca crops produced with no fungicides, biological fungicides (2 applications) or conventional fungicide (2 applications) were of equivalent quality and yield.
- Moderate levels of fungus gnats were present but no crop damage was seen.

PMA deliverables

- 21 grower meetings
- 3 team meetings
- 2 grower educational programs
- 2 scientific programs
- 1 grower newsletter article

How did we do?

What worked

- Biological disease control and associated shift in fungicide use
- Water management
- Informal grower education

What didn't

- The economy
- Arthropod monitoring
- Difficulty obtaining plant pathology expertise
- Time devoted to securing additional funding

How did we do?

What's left

- Arthropod biological control
- Water management, cont.
- Best practices manual
- Online resources

PMA objectives

- Objective 3. Promote wider use of arthropod biological control through the release of natural enemies and the use of entomopathenogenic fungi

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Collaborators

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Thank you
Questions?