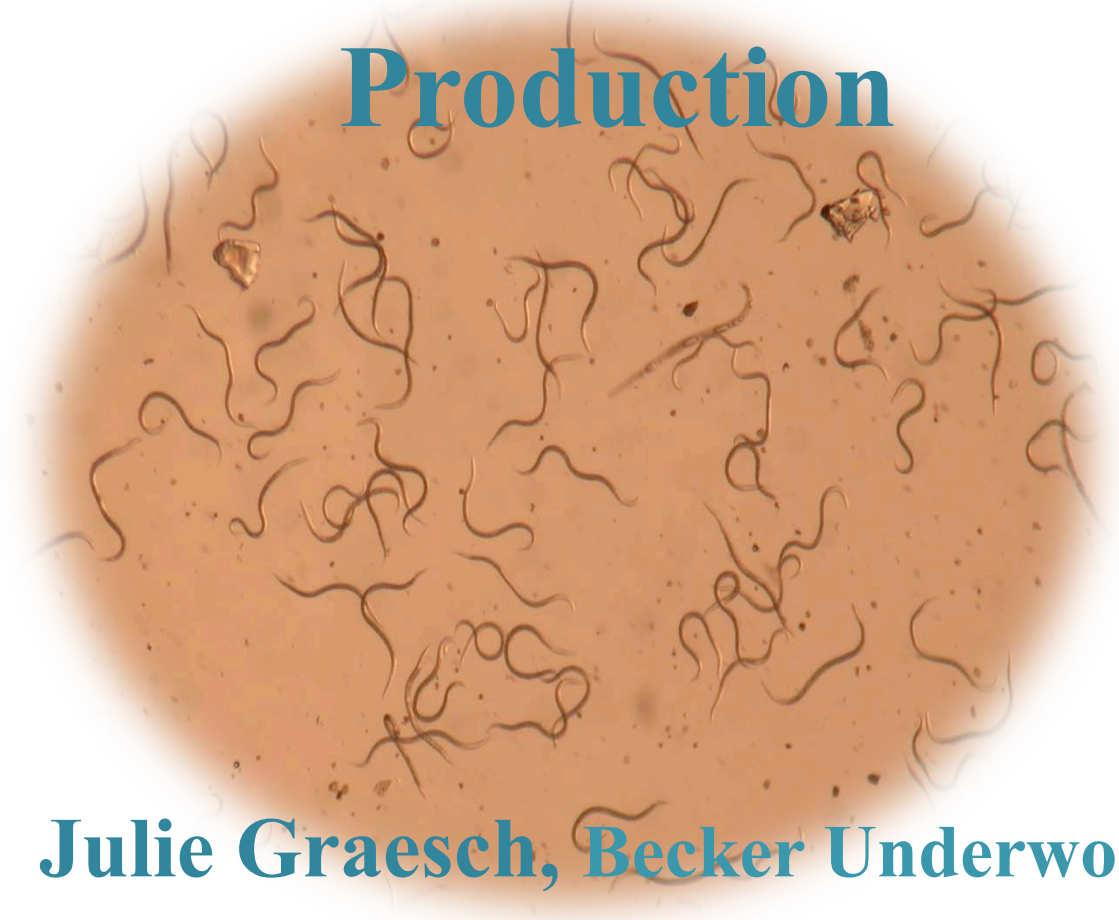
Successful use of Entomopathogenic Nematodes in Ornamental Plant Production



Julie Graesch, Becker Underwood

Biological Control in Ornamental Plant Production Symposium

January, 18 2012

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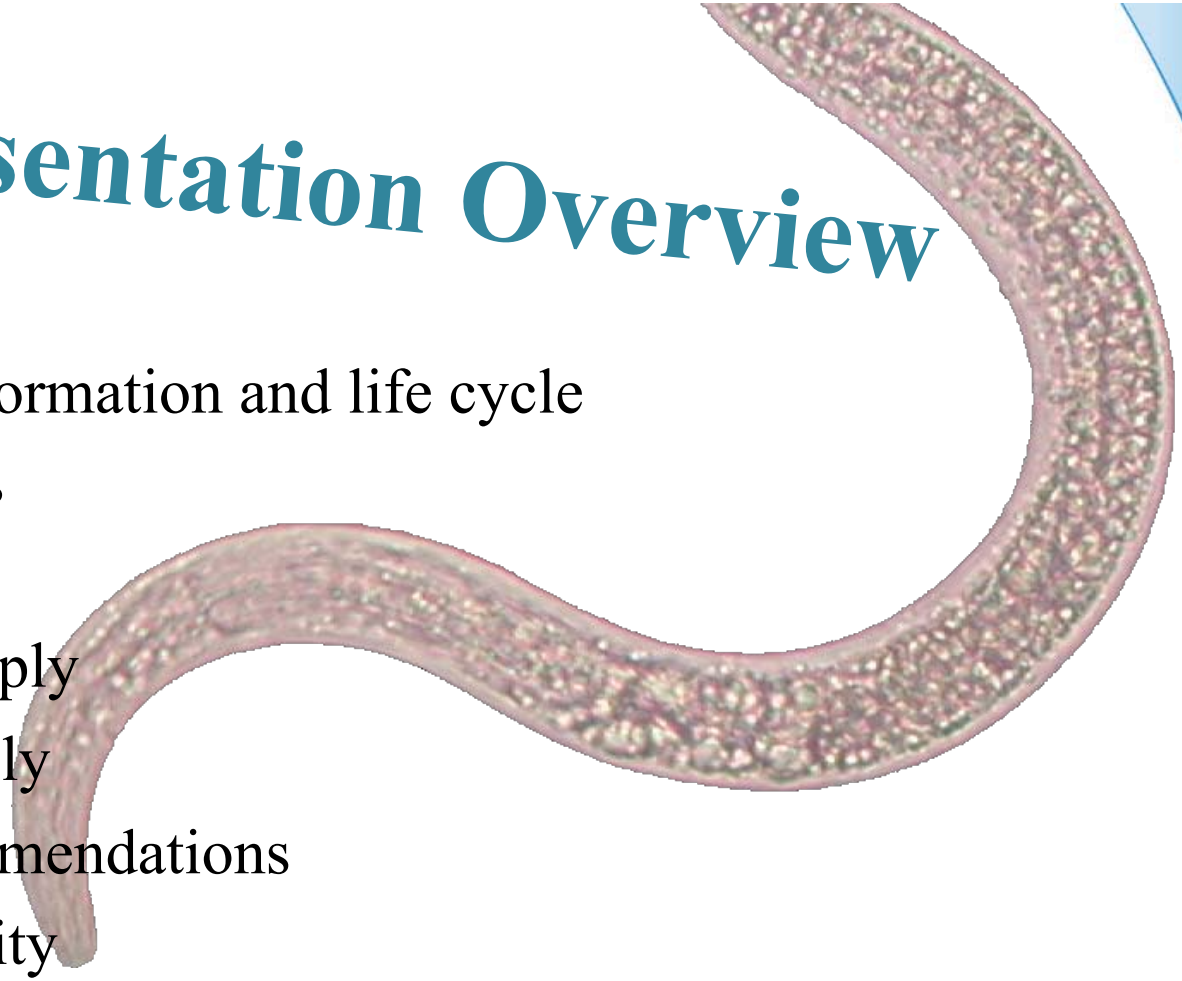
Presentation Overview



- General information and life cycle
- Advantages
- Receiving
- When to apply
- How to apply
- Rate recommendations
- Compatibility
- Circulation and settling
- Checking Viability

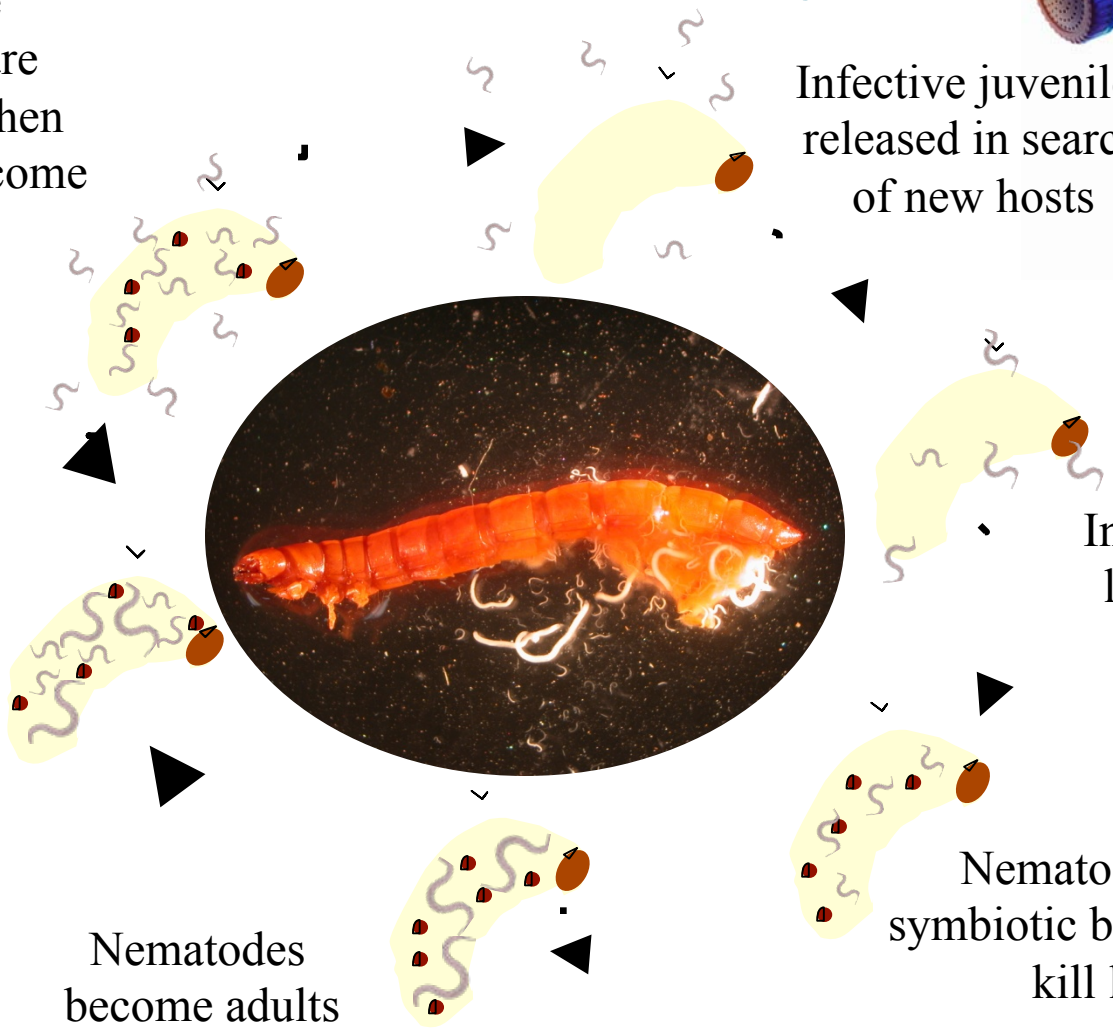
Entomopathogenic Nematode (EPN) Biology

- Soft-bodied, un-segmented, roundworms
- Naturally found in the soil environment
- Move through the soil in response to vibrations, CO_2 and other chemicals
- Infective juveniles are:
  - Free-living
  - Developmentally arrested
  - Non-feeding

EPN Life Cycle

Infective juveniles are produced when resources become limited

Infective juveniles released in search of new hosts



Nematodes reproduce for 2-3 generations

Infective juveniles enter larvae through natural openings or cuticle

Nematodes become adults in dead larvae

Nematode release symbiotic bacteria which kill larvae

Mutualistic Bacteria Kills the Host not the Nematode

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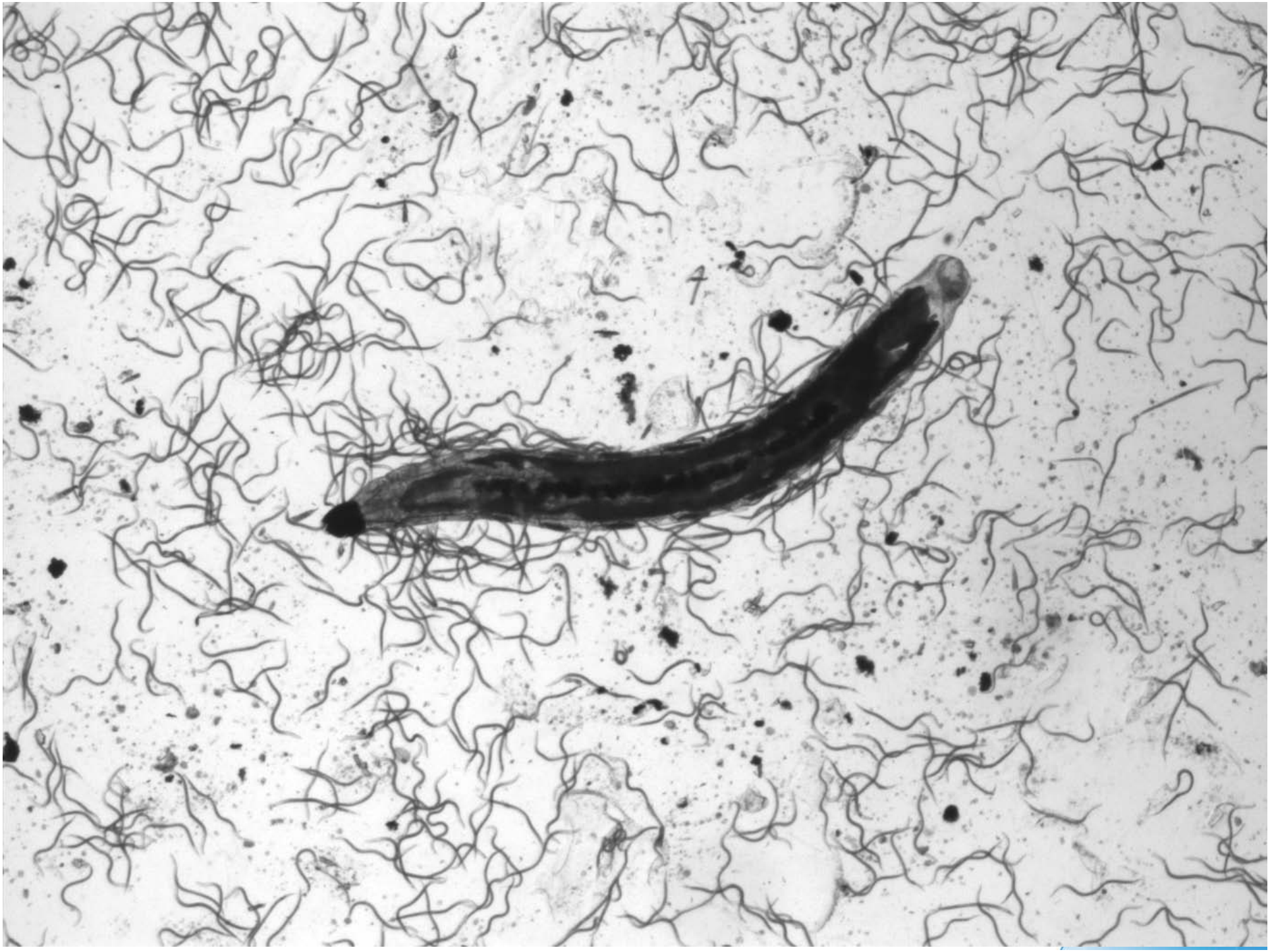

Advantages to Using EPN

- Reliable performance
- Rapid kill (24-48 hours)
- Suitable for integrated pest management practices
- Application strategies similar to chemical
- Applied through standard equipment
- Safe to crop, users and environment
- No re-entry interval
- No government requirements

Receiving EPN

- Remove nematodes from shipping packaging
- Check cold packs and nematodes viability
- Refrigerate nematodes around 41 °F
- Use immediately
- Do not use after expiration date

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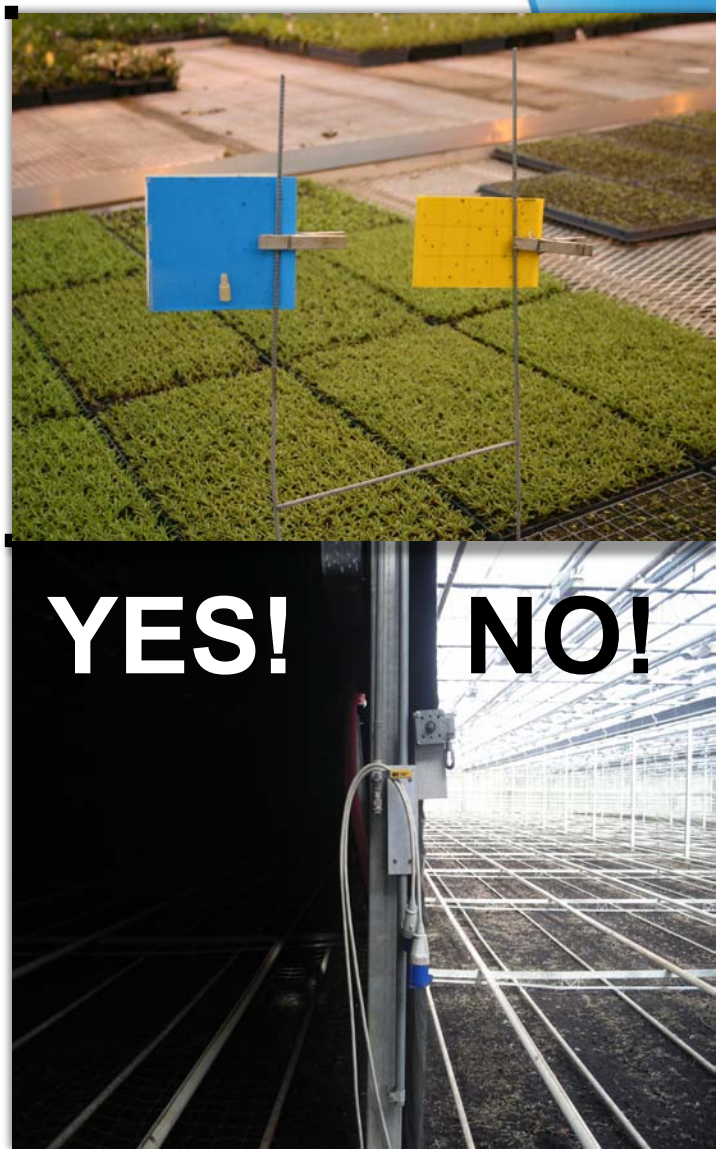
When to Apply EPN

- Preventative applications are best
- Target correct pest life stage
- Apply early mornings/evenings to avoid high temperatures, UV radiation, and desiccation
- Apply under ideal environmental conditions
  - Nematode activity temperatures
  - Moist soil/media



How to Apply EPN

- Applied through commonly used application equipment
  - Agitate to prevent setting
  - Remove all filters of 50 mesh or finer
  - Avoid nozzle apertures smaller than 0.5 mm
  - Do not exceed 300 psi pump pressure


Commonly Used Application Equipment
PUL-TANK

EPN Rate Recommendations

- Environment and pest susceptibility determines rate
- Rate expressed as number of nematodes per ft²/acre
- Re-application will depend on life cycle of target pest
  - Several application/year vs. one application/year

EPN Compatibility

- Compatible with biological control agents
  - Predators, parasitoids, entomopathogenic fungi
- Verify compatibility of previous and subsequent chemical applications

VALENT
Safari®
20 SG INSECTICIDE

Dow AgroSciences
Conserve® SC
Turf and Ornamental
Insect Control

Talstar®
PROFESSIONAL
INSECTICIDE

MOCAP®
NEMATICIDE-INSECTICIDE

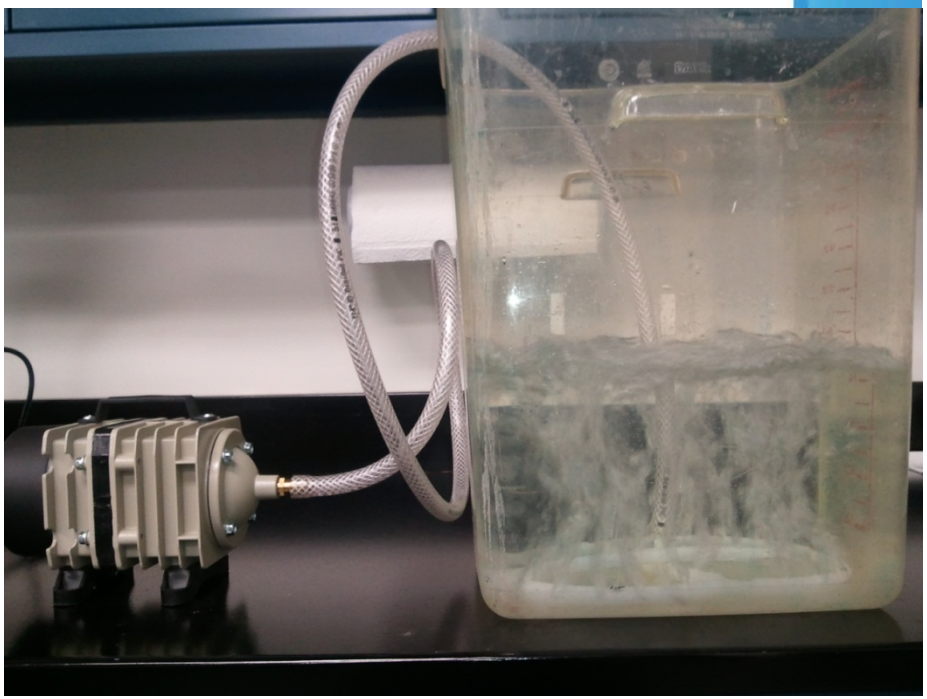
Dow AgroSciences
Dursban®
Specialty Insecticide

Pylon®
miticide-insecticide

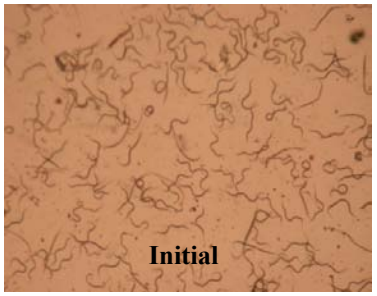
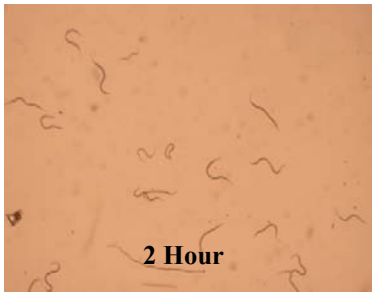
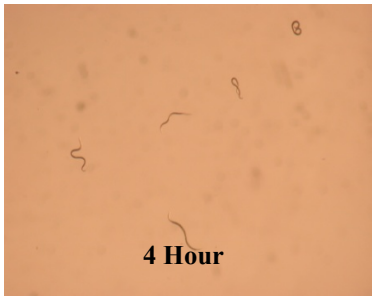
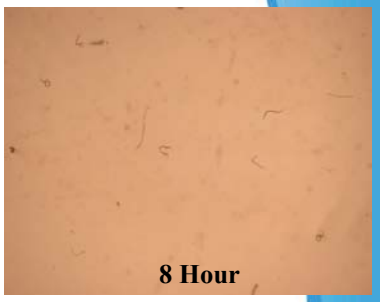
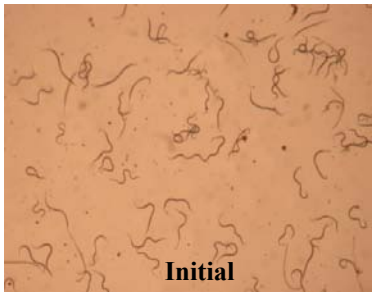
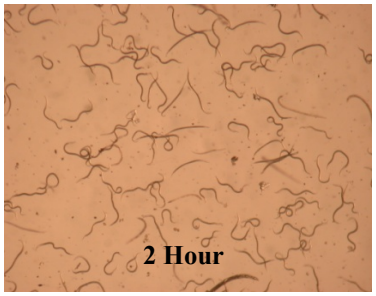
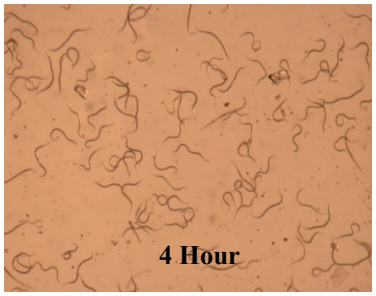
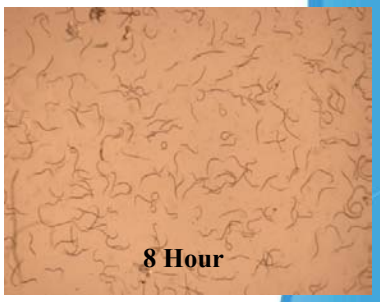
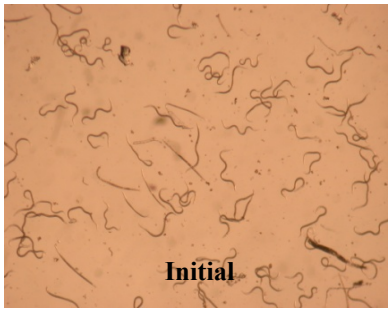
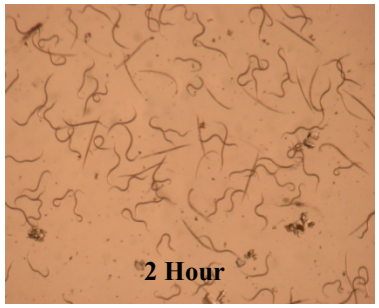
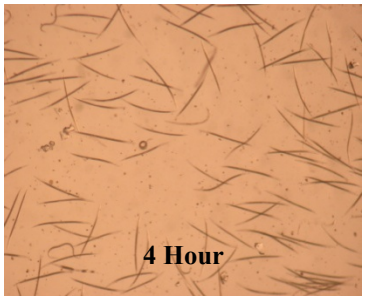
Nematode Circulation Test

No circulation, air circulation and mechanical circulation were compared to demonstrate the importance of keeping nematode solutions cool and well-agitated over time

- Evaluated
  - Settling
  - Temperature of solution
  - Number applied
  - Viability



Nematode Settling

No Circulation	 Initial	 2 Hour	 4 Hour	 8 Hour
Air Circulation	 Initial	 2 Hour	 4 Hour	 8 Hour
Mechanical Circulation	 Initial	 2 Hour	 4 Hour	 8 Hour

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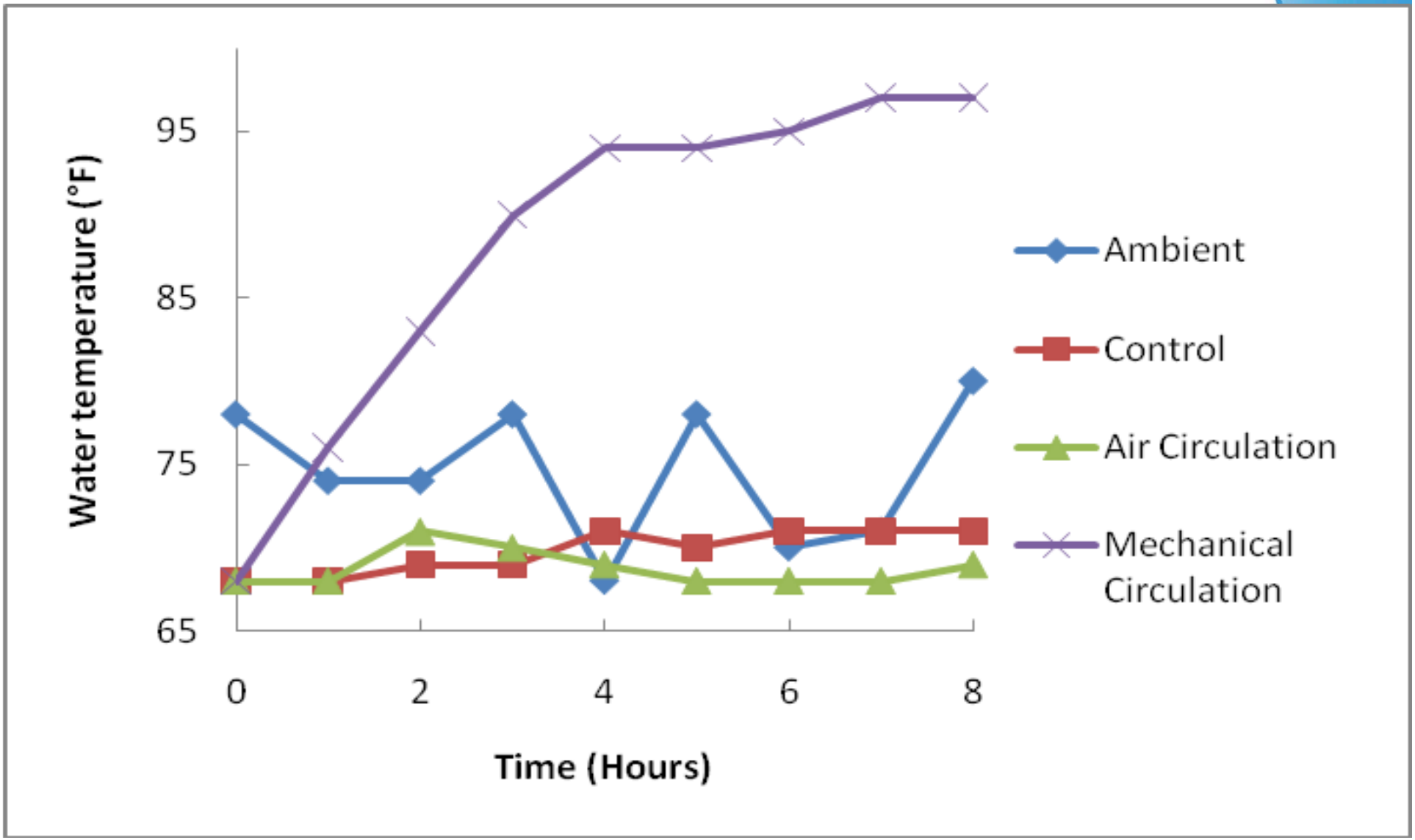
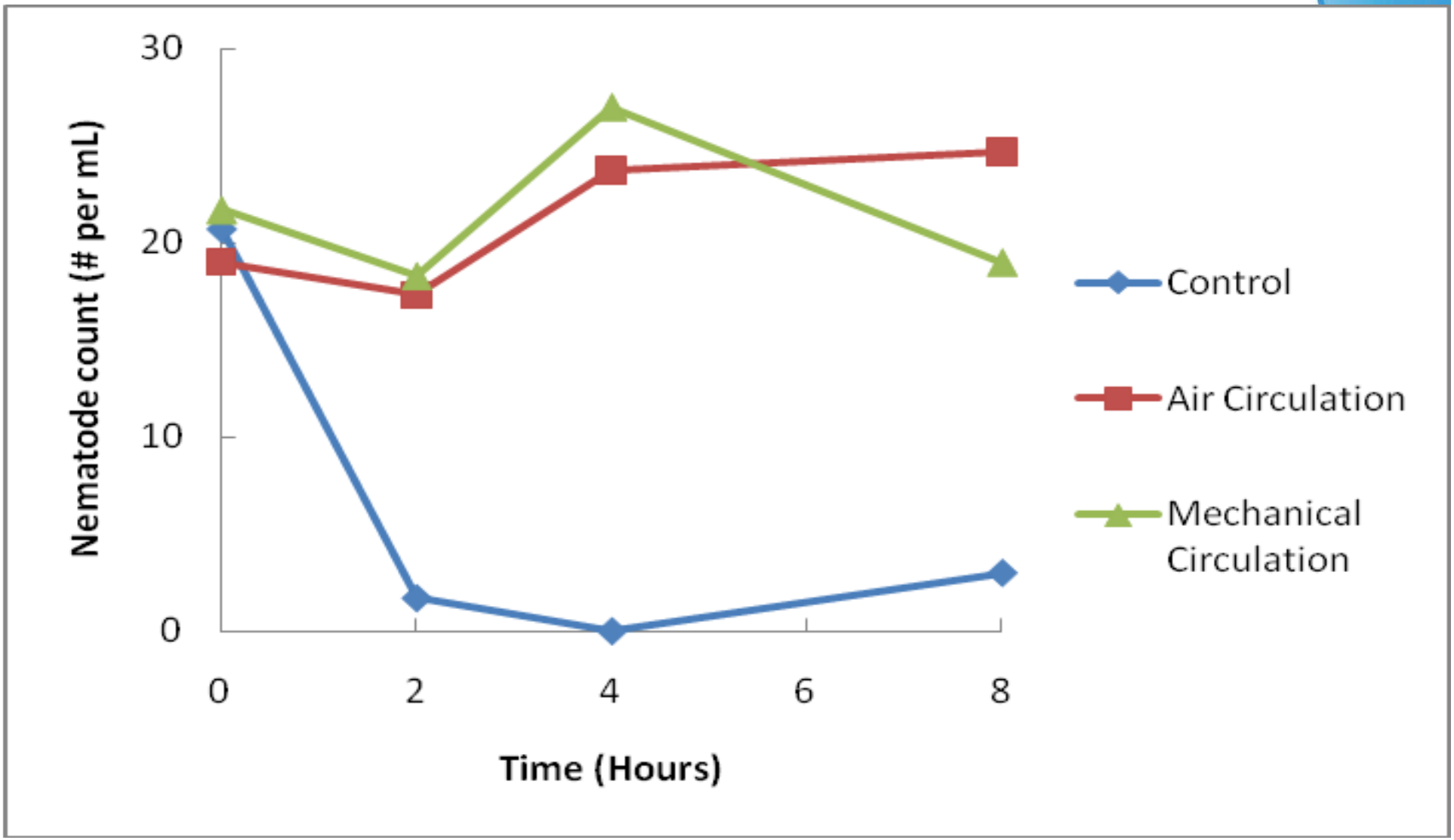
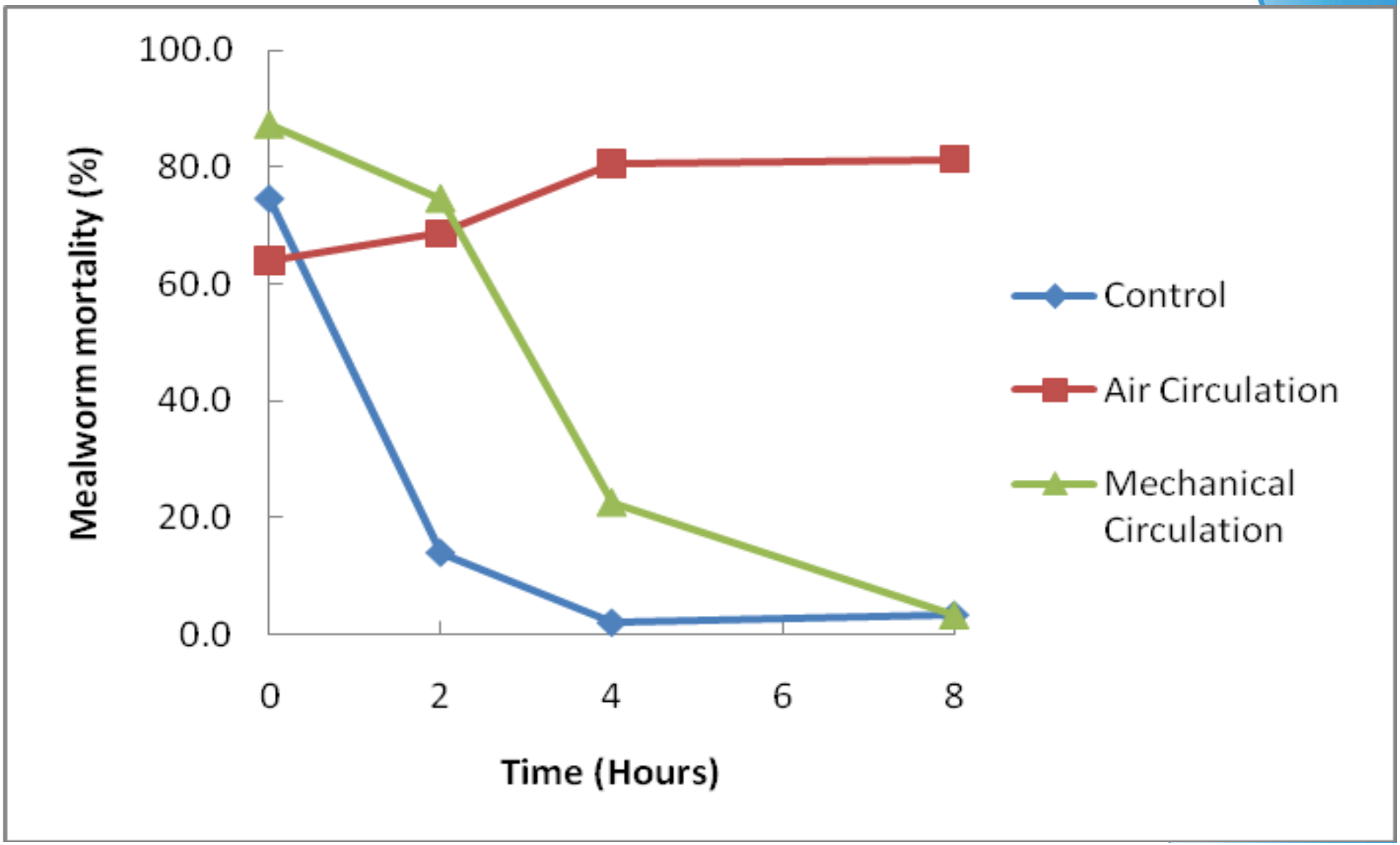
Temperature of Solution



Number of Nematodes Applied

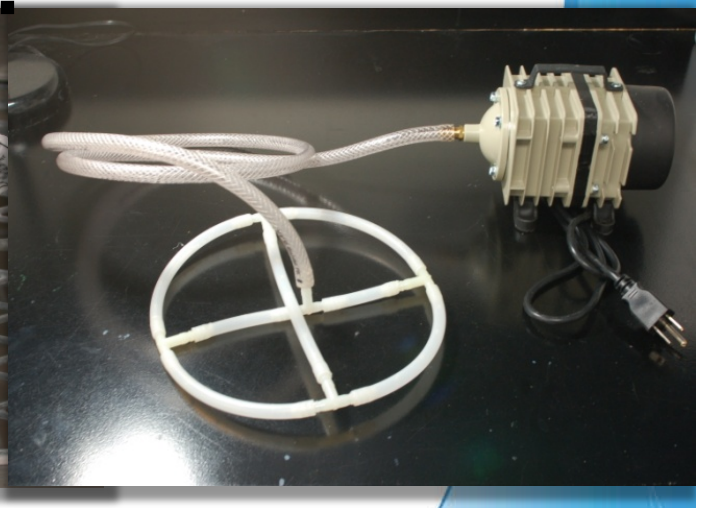


Nematode Viability

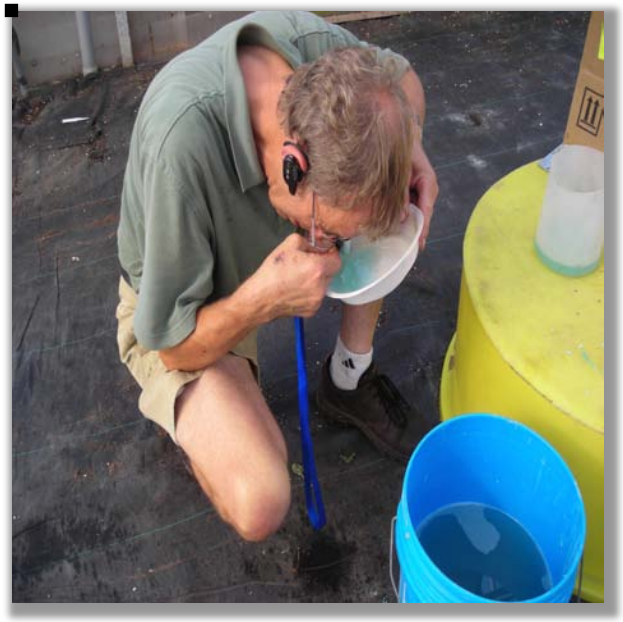


Nematode Circulation Take Home Message

- Keep nematode solutions cool and well agitated
  - **Mechanical circulation**: use solutions within 2 hours
  - **Air circulation:** use solutions within 4 hours
    - Minimum air pump of 2.5 cfm (70 L per minute)



Check Nematode Viability



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How To Check Viability

Supplies:

hand lens, flashlight, empty tray, nematodes

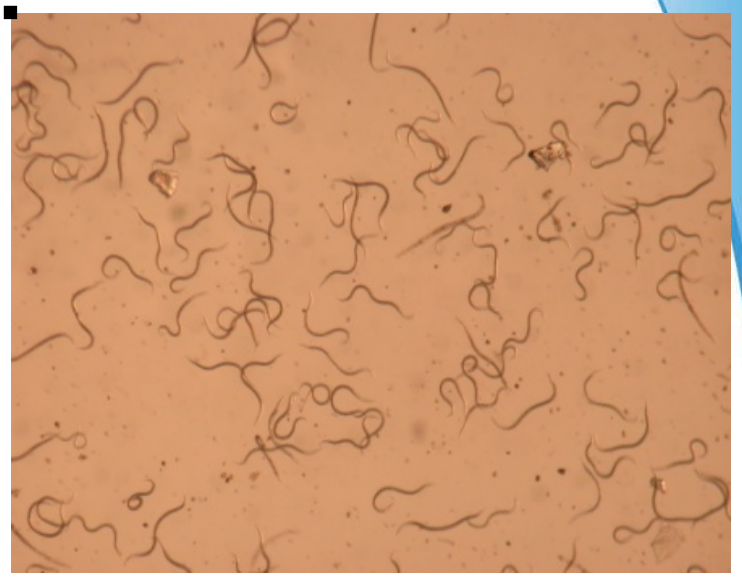
1. Collect a sample of nematodes
2. Position flashlight under tray
3. Position hand lens close to solution
4. View nematodes

When to Check Viability

- Upon arrival
- During application
  - Temperature of solution
  - Circulation method
- After application
  - Application equipment
  - Tank mix solution
- Trouble shooting

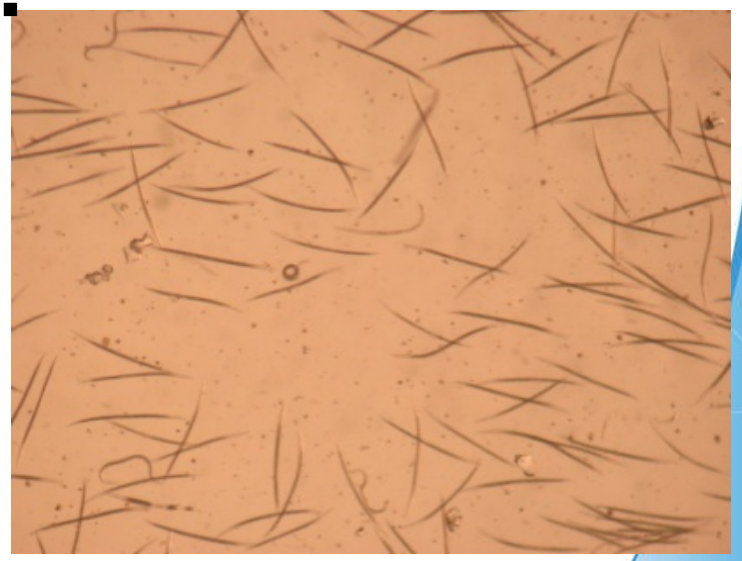
Viable:

- Nematodes will be various shapes
- Nematodes will be moving



Non-viable:

- Nematodes will be straight
- Nematodes will not be moving



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