

Which Bio Should I Use ?



How Can I Get Them To Stick Around ?

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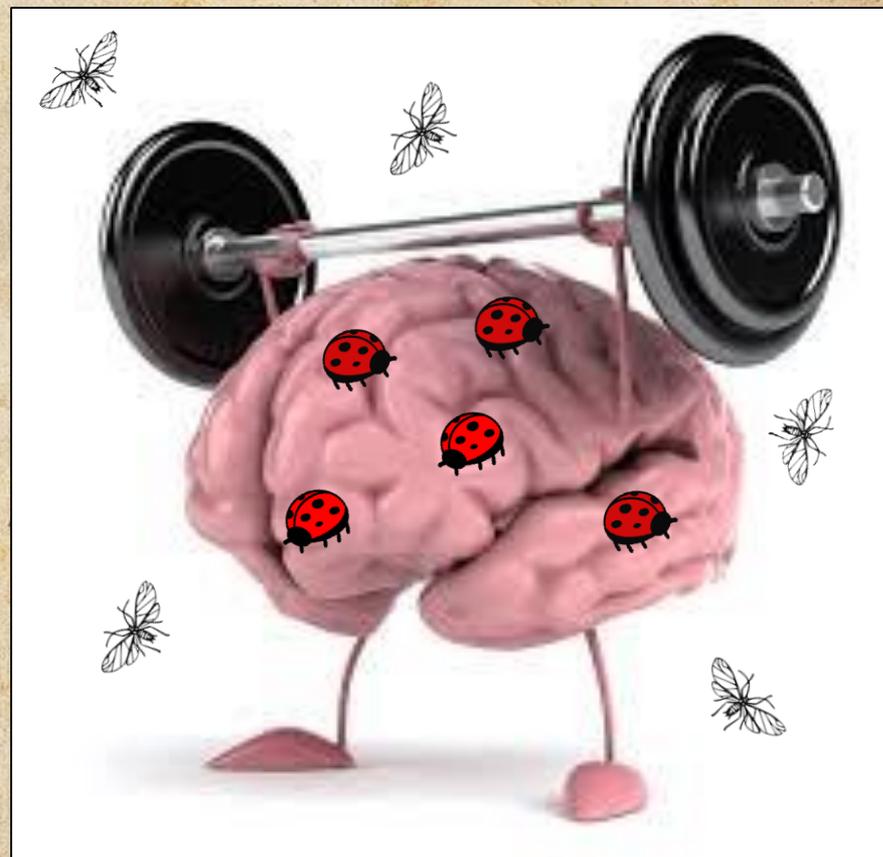
Topics To Cover

A Review of Common Biocontrol Agents For Greenhouse Pests & How to Keep Them Happy.

- Thrips Predators
- Spider Mite Predators
- Whitefly Parasitoids
- Aphid Parasitoids & Predators

Bio Brain-iac

- Challenge your knowledge anonymously!
- Random interactive sessions to keep you on your toes.



Name That Aphid Predator!

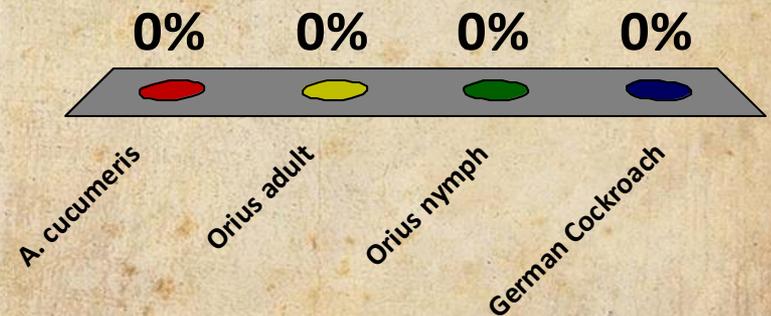


- A. Aphidoletes
- B. Aphidius
- C. Sasquatch
- D. Fungus gnat



Name This Thrips Predator!

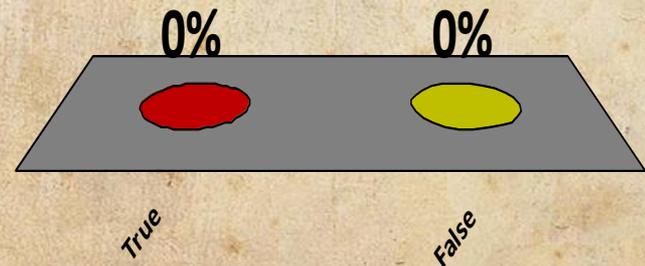
- A. *A. cucumeris*
- B. Orius adult
- C. Orius nymph
- D. German Cockroach



Aphid banker plants are used to rear *Aphidius* parasitoids to manage Foxglove Aphids.

A. True

B. False



Predators vs. Thrips



Predators: Organisms that eat other organisms

Thrips



Neoseiulus = Amblyseius cucumeris



What do they look like?

- ✓ Adults 8 legged & fast moving
- ✓ Small (less than 1mm)
- ✓ *A. cucumeris* - Beige
- ✓ *A. swirskii* - Clear white

What are they?

- ✓ Predatory mites
- ✓ Consume thrips eggs & immatures
- ✓ Feed on pollen
- ✓ *A. swirskii* also eats whitefly immatures



Neoseiulus = Amblyseius swirskii

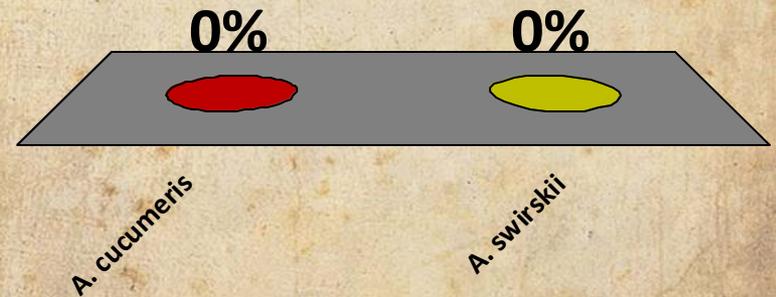
Which predatory mite attacks both thrips & whiteflies?

A. *A. cucumeris*

B. *A. swirskii*



I like to eat both!



Orius spp.

Thrips



What is it?

- ✓ Predatory bug
- ✓ Also eats aphids, mites & pollen
- ✓ Pierces & sucks pest juices

What does it look like?

- ✓ Adults, black, grey, white & brown
- ✓ Nymphs red/brown
- ✓ 1.4-2.4mm long



Adult



Nymph

Steinernema feltiae

Thrips



What do they look like?

- ✓ Elongated worms
- ✓ 1mm long
- ✓ Generally clear
- ✓ Curly appearance when alive, straight when dead

What are they?

- ✓ Beneficial nematodes
- ✓ Enter pest's body, kill them by releasing toxins, then eat their broken down tissues
- ✓ Applied to foliage or soil
- ✓ Also attacks fungus gnat larvae (when applied to soil)



Plant-Mediated IPM Systems

What are they?

Plants (usually non-crop), used as a foundation, in combination with other IPM practices, to manage pests.



For Example....

Trap Plants: Attract pests out of crop where they are then managed with nat. enemies, chemical insecticides or removal & disposal

Banker Plants: Provide nutrition (hosts that don't harm crop, hosts that can harm the crop, pollen/nectars) for an ongoing supply of nat. enemies 'mini-rearing systems'



Please see our handout for more information

Plant-Mediated IPM Systems for Thrips Predators

Pollen Power !

The predatory bug *Orius insidiosus* is slow to establish in ornamentals in early spring (SAD & lack of food)

Orius Banker Plants

- ✓ Pollen & Nectar Producers
- ✓ Ornamental peppers
 - var. Black Pearl & Purple Flash
- ✓ Alyssum/lobularia
 - var. Clear Crystal & Snow Princess
- ✓ Both also attract thrips



Plant-Mediated IPM Systems for Thrips Predators

Mighty Marigolds !

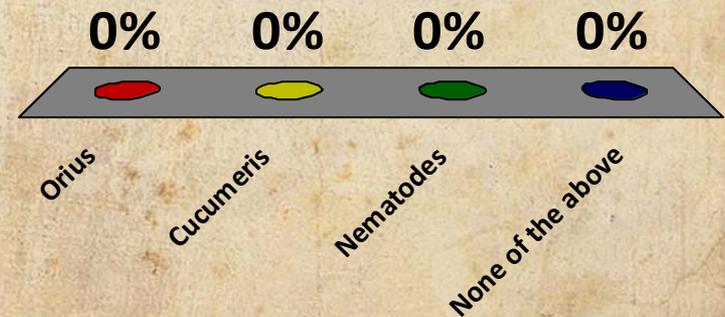
Thrips Trap Plants

- ✓ Marigolds attract thrips out of crop
- ✓ Predatory mites (*N. cucumeris*) released to feed on thrips & reproduce on marigolds



Which thrips predator do banker plants of alyssum &/or ornamental peppers sustain?

- A. Orius
- B. Cucumeris
- C. Nematodes
- D. None of the above



Predators vs. Spider Mites



Feltiella acarisuga

Spider Mites



What is it?

- ✓ Predatory midge (fly)
- ✓ Larvae (maggots) feed mostly on eggs & immature mites
- ✓ Adults feed on nectars



Adult

What does it look like?

- ✓ Adults
 - Pink/brown color
 - Long legs & antennae
 - 2mm in length
 - Active at night
- ✓ Larvae
 - Orange/brown color
 - 0.2-2mm in length
- ✓ Pupa fluffy & white on leaf undersides



Larva



Pupa

Phytoseiulus persimilis

Spider Mites



What are they?

- ✓ Predatory mites
- ✓ Consume all spider mite life stages
- ✓ *A. californicus* also feeds on pollen

What do they look like?

- ✓ Adults 8 legged & fast moving
- ✓ Small (less than 1mm)
- ✓ *P. persimilis*
 - Bright red/orange
 - Distinctly long legs
- ✓ *A. californicus*
 - Clear white/yellow, darker at edges

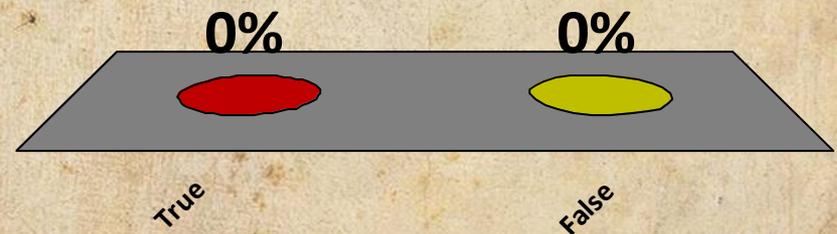


Neoseiulus = Amblyseius californicus

Predatory mites tend to move faster than their prey mites.

A. True

B. False

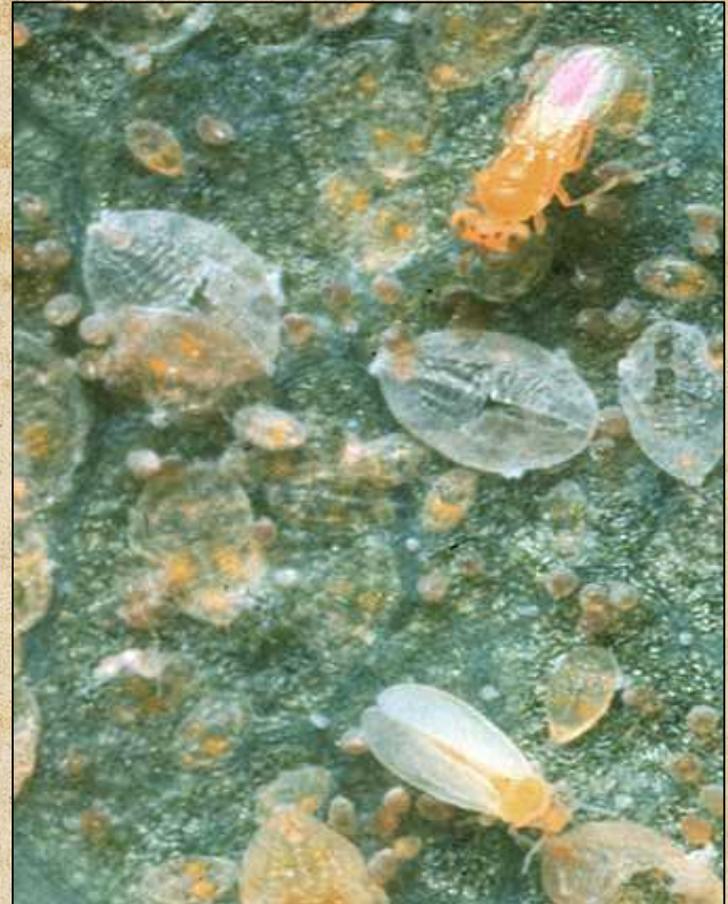


What the Heck is That on My Leaf ?

- A. Random piece of fluff
- B. Spider mite webbing
- C. **Felitella pupa**
- D. Predatory mite nest



Parasitoids vs. Whiteflies



Parasitoid: Organism that lives on/in another organism & eventually kills it.

Parasite: Same as above but doesn't usually kill it.

Encarsia formosa

Whiteflies



What is it?

- ✓ Wasp parasitoid
- ✓ Adults lay eggs inside WF nymphs
- ✓ Larvae develop inside and killing WF nymph
- ✓ Prefer Greenhouse WF over Silverleaf WF
- ✓ Adults also eat WF nymphs

What does it look like?

- ✓ Adults
 - Black & yellow
 - 0.7mm in length
- ✓ Larvae
 - Black – Greenhouse WF
 - Black & tan – Silverleaf WF



Adult



Parasitized
SWF Nymph



Parasitized GWF Nymph

Eretmocerus eremicus & *mundus*

Whiteflies



What are they?

- ✓ Wasp parasitoids
- ✓ Adults lay eggs under WF nymphs
- ✓ Larvae hatch, then crawl inside WF nymph
- ✓ Larvae develop inside, killing WF nymph
- ✓ Prefer Silverleaf WF over Greenhouse WF
- ✓ Adults also eat WF nymphs

What do they look like?

- ✓ Adults
 - Lemon yellow
 - 0.8mm in length
- ✓ Larvae
 - Golden brown – Both Silverleaf & Greenhouse WF



Adult



Parasitized SWF Nymph

Name That Movie Star!

A. Justin Bieber

B. Brad Pitt

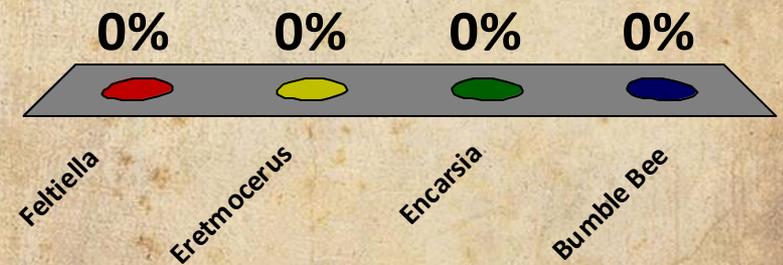
C. George Clooney

D. Cher



Name That Whitefly Parasitoid!

- A. Feltiella
- B. Eretmocerus
- C. Encarsia
- D. Bumble Bee



Parasitoids & Predators vs. Aphids



Aphidius* spp.** Aphids ***(colemeni, ervi & matricariae)

What are they?

- ✓ Wasp parasitoids
- ✓ Adults lay eggs inside aphids
- ✓ Larvae develop inside, turning aphid into 'mummies', killing them
- ✓ Adults feed on honeydew



Melon



Green Peach



Foxglove



Potato

What do they look like?

- ✓ Species tend to be difficult to tell apart
- ✓ Adults
 - Long antennae & legs & small waist
 - 2-3mm in length
 - Black with brown/red highlights
- ✓ Larvae
 - Within golden brown mummies



Adult



Developing larva

***Aphidius* species have their own favorite/preferred aphids**

Aphidius colemani* & *matricariae



Melon



Green Peach

Aphidius ervi



Foxglove



Potato

Aphids

Aphelinus abdominalis

What is it?

- ✓ Wasp parasitoid
- ✓ Adults lay eggs inside aphids
- ✓ Larvae develop inside, turning aphid into 'mummies', killing them
- ✓ Prefers foxglove &/or potato aphids over green peach &/or melon
- ✓ Adults will feed on aphids & honeydew



Adult



Foxglove



Potato

What does it look like?

- ✓ Adults
 - Short antennae & legs
 - 3mm in length
 - Black & yellow
- ✓ Larvae
 - Within blackened mummies



Developing larva

Aphids

Aphidoletes aphidimyza

What is it?

- ✓ Predatory midge (fly)
- ✓ Larvae (maggots) feed on numerous aphids
- ✓ Adults feed on honeydew & nectars



Melon



Green Peach



Potato



Foxglove



Adult



Larvae

What does it look like?

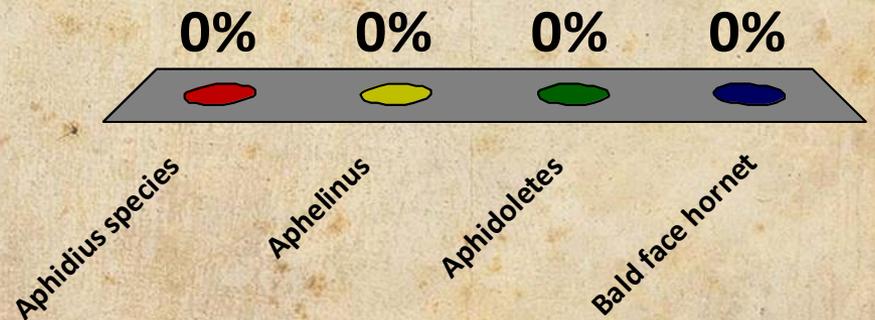
- ✓ Adults
 - Pink/brown color
 - Long legs & antennae
 - 2-3mm in length
 - Active at night
- ✓ Larvae
 - Orange/red color
 - 2-3mm in length
- ✓ Oval & brown in the soil

Hint: Aphidoletes – Aphidol **EAT** es – **Eats Aphids**

Name That Aphid Parasitoid!

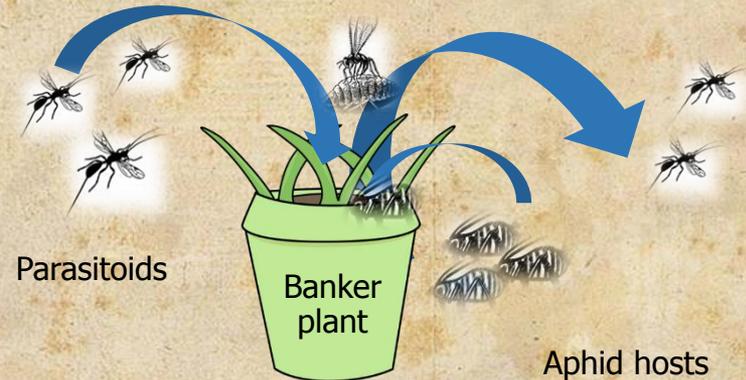


- A. **Aphidius species**
- B. Aphelinus
- C. Aphidoletes
- D. Bald face hornet





Plant-Mediated IPM Systems for the Aphid Parasitoids



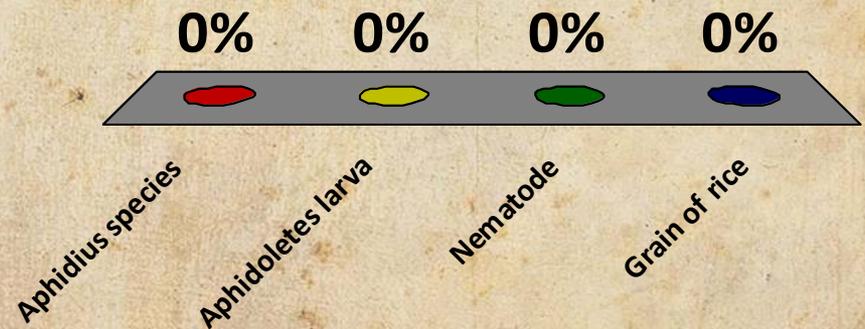
Aphid Banker Plant System

- ✓ Winter wheat/rye/barley is purchased infested with the cereal *Rhopalosiphum padi*
- ✓ *Aphidius colemani* are released onto the system
- ✓ *A. colemani* reproduces within the system
- ✓ *A. colemani* then disperses into crop to search for [green peach](#) or [melon aphid](#)

Name That Aphid Predator!



- A. Aphidius species
- B. Aphidoletes larva**
- C. Nematode
- D. Grain of rice



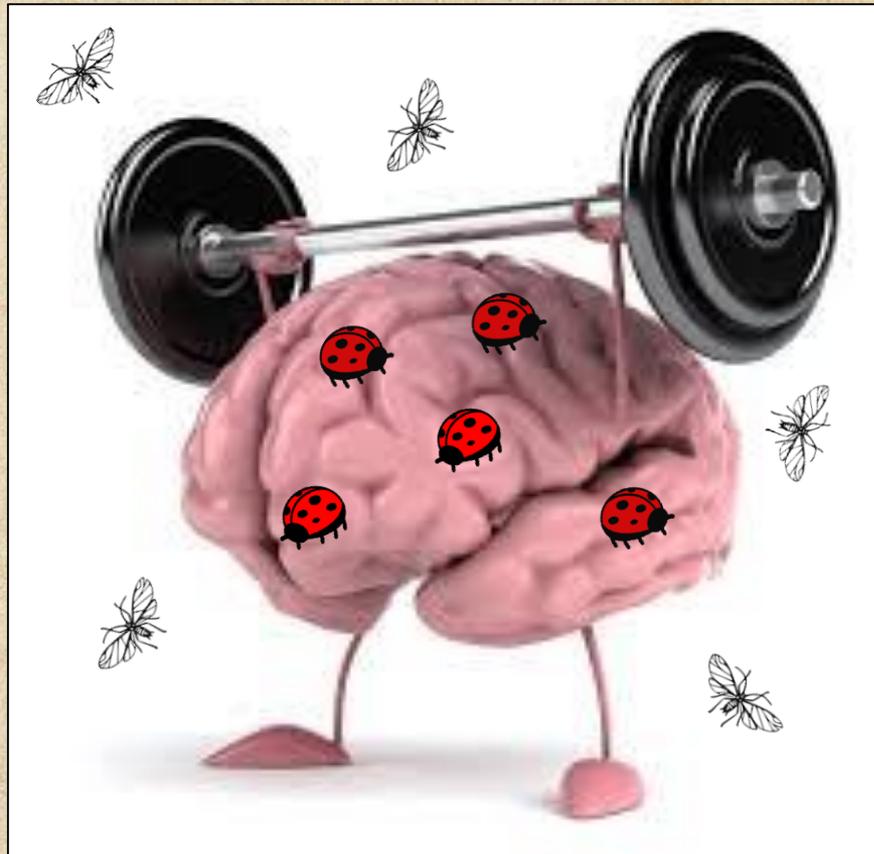
Aphid banker plants are used to rear *Aphidius* parasitoids to manage Foxglove Aphids.

A. True

B. False

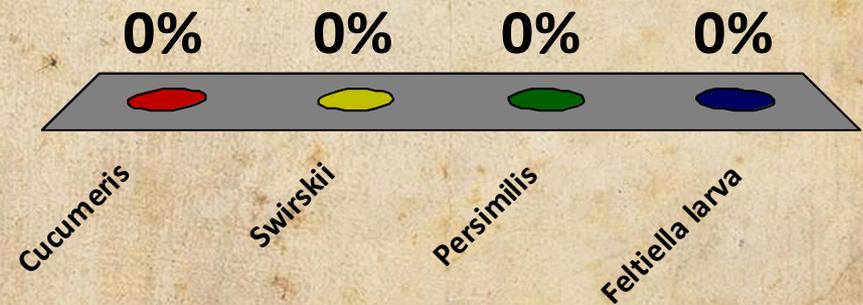


Super Bonus Round!



Name That Spider Mite Predator!

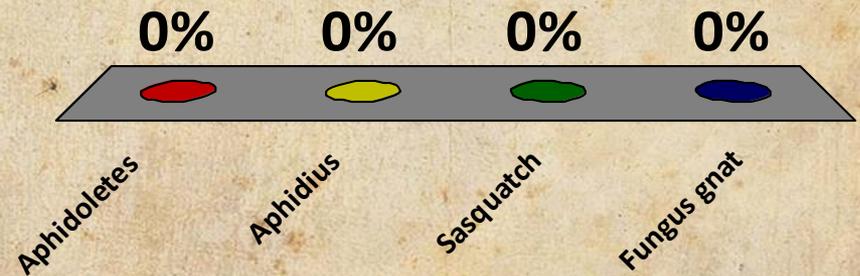
- A. Cucumeris
- B. Swirskii
- C. Persimilis
- D. Feltiella larva



Name That Aphid Predator!



- A. Aphidoletes
- B. Aphidius
- C. Sasquatch
- D. Fungus gnat



**The whitefly parasitoid,
Eretmocerus develops within
golden brown parasitized nymphs.**

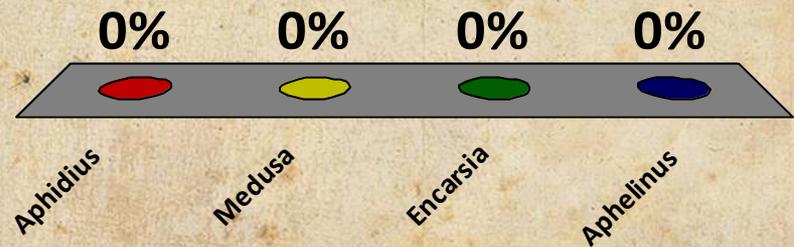
A. True

B. False



What Wasp Parasitized This Aphid?

- A. Aphidius
- B. Medusa
- C. Encarsia
- D. Aphelinus



Marigolds can be good trap plants for thrips.

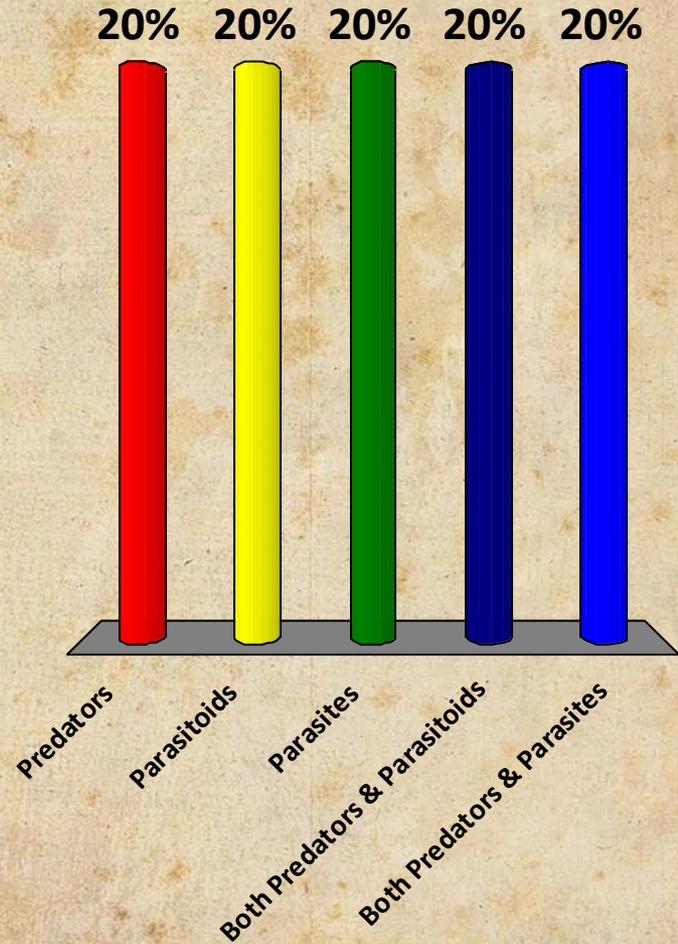
A. True

B. False



Which of the following usually kills their prey?

- A. Predators
- B. Parasitoids
- C. Parasites
- D. Both Predators & Parasitoids**
- E. Both Predators & Parasites



I learned something new today at this workshop!

A. True

B. False



Questions?



THANK YOU!!!

Visit our Website! <http://www.uvm.edu/~entlab/>

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