



Two Invasive Pests: European Pepper Moth and Bagra da Bug

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European pepper moth-Life stages

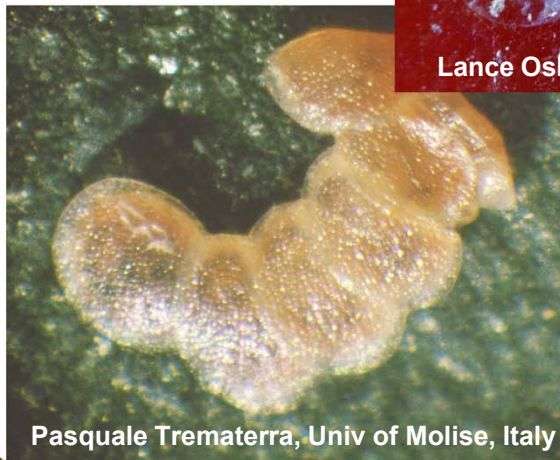


European pepper moth

- *Duponchelia fovealis* Zeller belongs to the grass moth or close-wing moth family Crambidae (Order: Lepidoptera)
- Native to the Mediterranean region and a greenhouse pest in the Netherlands
- Established in Europe, Middle East and Africa
- First discovered in San Diego County in 2004
- Widespread in California
- Present in Arizona, Colorado, Florida, Georgia, Oklahoma, and Texas
- Wide host range including corn, peppers, tomatoes, squash, strawberries, and ornamentals



European pepper moth-Eggs



- Eggs 0.5-0.7 mm and oval shaped
- Whitish green initially, turn pink, then red and eventually brown with mature
- Laid singly or in groups of 3-10 in roof-tile pattern
- Females lay up to 200 eggs
- Duration 4-9 days
- Found underside of leaves, on stems, plant base and in top layer of soil



European pepper moth-Larvae



- Creamy white to light brown with dark head capsule and brown or gray spots
- Grow from 1.5 mm at hatching to 20-30 mm at maturity
- Duration 3-4 weeks
- Feed on roots, stems, foliage, inflorescence and fruits



European pepper moth-Larvae

Marja van der Straten, Plant Protection Service,
Wageningen, The Netherlands



Carmelo Peter Bonsignore, Università degli Studi
Mediterranea di Reggio Calabria



Henk Stigter, Plant Protection Service, National
Reference Centre, The Netherlands



European pepper moth-Pupae



James Hayden, Florida DACS, Divi of Plant Industry



Henk Stigter, Plant Protection Service,
National Reference Centre, The Netherlands

- Yellowish to light brown initially and turn dark with maturity
- About 9-12 mm long
- Cocoon 15-19 mm long and spun with silk, frass, and soil particles under the foliage, below the soil line or attached to the pots.
- Duration 1-2 weeks



European pepper moth-Adults



- Adults have brown to grey wings with a wing span of about 20 mm and are good fliers
- Males have a long, slender abdomen that is turned upwards
- Length of the life cycle depends on temperature, but varies from 6-8 weeks



European pepper moth-Detection

- Look for signs of damage (leaf wilting, stem collapse) and presence (webbing, frass, life stages)
- Check where leaves touch the soil
- Base of the pots in container plants



European pepper moth-Control

- Chemical and other options:** Acephate, azadirachtin, chlorpyrifos, emamectin, imidacloprid, pyrethrins, and spinosad
- Pheromone traps**
- Cultural control:** Monitoring, sanitation, using drier potting medium
- Biological control:** *Bt* products, predatory mites (*Stratiolaelaps miles*, *Hypoaspis miles* and *H. aculeifer*), predatory beetle (*Dalotia coriaria*), parasitoid wasps (*Trichogramma evanescens* and *T. cacoeciae*), and entomopathogenic nematodes (*Heterorhabditis bacteriophora* and *Steinernema* sp.)



European pepper moth-Control

Treatment	Rate (100gpa)	% Change (24 h)	% Change (72 h)
Untreated	-	-33.0	33.3
Bifenthrin	20 oz	-75.0	-50.0
Bifenthrin+Orthene	20 oz + 8 oz	-50.0	-70.0
Emamectin	4.8 oz	0	-42.9
Lambda-cyhalothrin	5 oz	-12.5	-12.5
Chlorantraniliprole	16 oz	28.6	-28.6
Spinosad	22 oz	-28.6	-14.3
Orthene	8 oz	-37.5	-50.0

Bethke and Vander Mey, 2010



Bagrada bug



Bagrada bug

- *Bagrada hilaris* (Burmeister) belongs to the stink bug family Pentatomidae (Order: Hemiptera)
- Native to Africa and known to cause damage in Asia and Europe
- First discovered in Los Angeles in 2008
- Now present in Southern California, parts of Central Coast and parts of Arizona
- Prefers cruciferous hosts, but can feed on a variety of other hosts like potato, cotton, okra, legumes, cucurbits, cereals, and strawberries



Bagrada bug-Life stages



Bagrada bug-Mouthparts



Bagrada bug-Damage



- Stippling and necrotic spots on the foliage
- Stunted plant growth
- Loss of apical dominance
- Formation of multiple heads
- Plant death
- Younger seedlings are very susceptible



Bagrada bug-Eggs



Natwick



Barlow

- Barrel shaped eggs, whitish initially and turn orange as they mature
- Laid in clusters on foliage, stems, or in soil
- Females lay up to 95-150 eggs in 2-3 weeks
- Hatch in 3-6 days



Bagrada bug-Nymphs



- There are five nymphal instars
- Dark head and thorax and reddish or orange abdomen with white and black markings
- Newly hatched or molted nymphs are orange



Bagrada bugs-Adults



- Adults 5-7 mm long and 3-4 mm wide
- Males are smaller than females
- Life cycle varies from 3-8 weeks depending on temperature



Bagrada bug-Identity crisis



Convergent, sevenspotted, multicolored Asian lady beetles



Bagrada bug nymphs



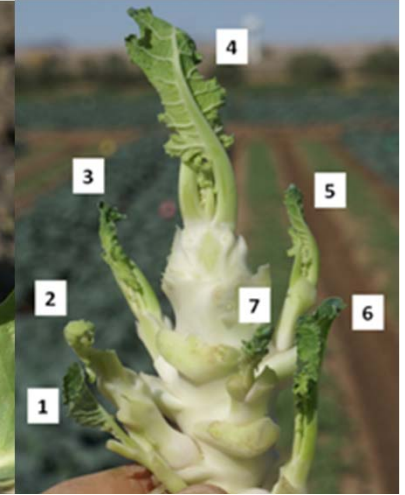
Harlequin bug



Bagrada bug



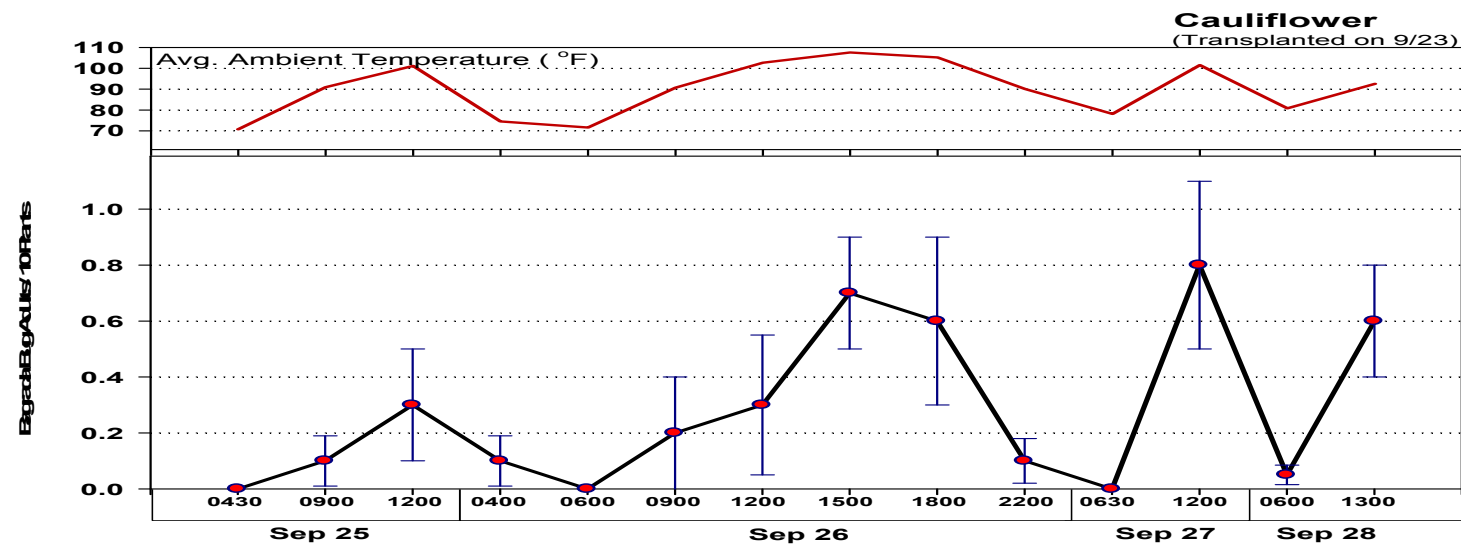
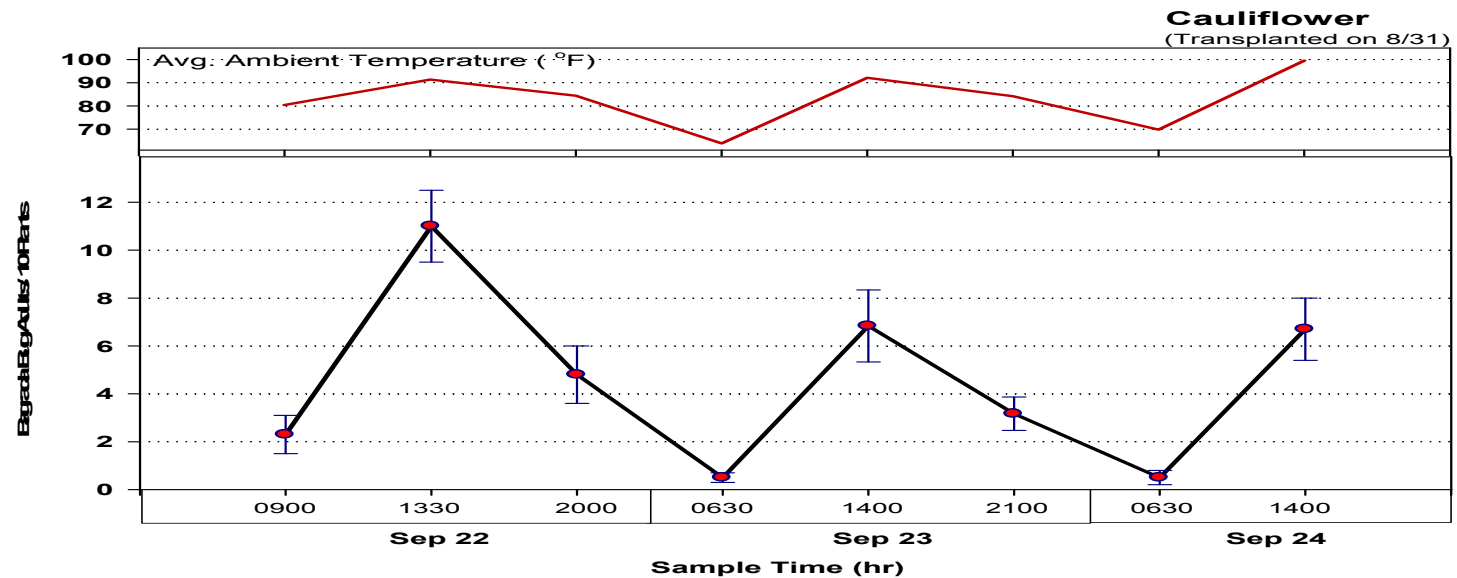
Bagrada bug-Detection



- Look for eggs, nymphs, adults, and mating adults
- Active during warmer parts of the day
- Damage symptoms
- Look for them on alternate hosts such as alyssum and wild mustard



Bagrada bug-Diel activity



Bagrada bug-Host preference



Host	Mean % Adults	% Nymphs*
Alyssum	27.8	40.0
Wild mustard	27.8	0.0
Broccoli	25.0	0.0
Green bean	19.4	60.0
Tomato	0.0	0.0

*One assay



Bagrada bug



Potential risk for other hosts



Trap crops or source of infestation?

- Adults can live up to 4 months
- Survive cold winter nights by entering the cracks in the soil
- Extent of damage: males < females < males-females in copulation
- Several studies are under way to know more about this pest



Bagrada bug-Control

- Chemical control:** Pyrethroids, organophosphates, and neonicotinoids
- Cultural control:** Monitoring, mechanical removal, overhead irrigation, cultivation, and removal of alternate hosts
- Other options:** Azadirachtin (against immature stages), pyrethrins, essential oils, insecticidal soaps, entomopathogenic fungi such as *Beauveria bassiana*, *Metarhizium brunneum* (*M. anisopliae*), and *Isaria fumosorosea* (*Paecilomyces fumosoroseus*)



Bagrada bug killed by *Beauveria bassiana*
Surendra Dara, UCCE



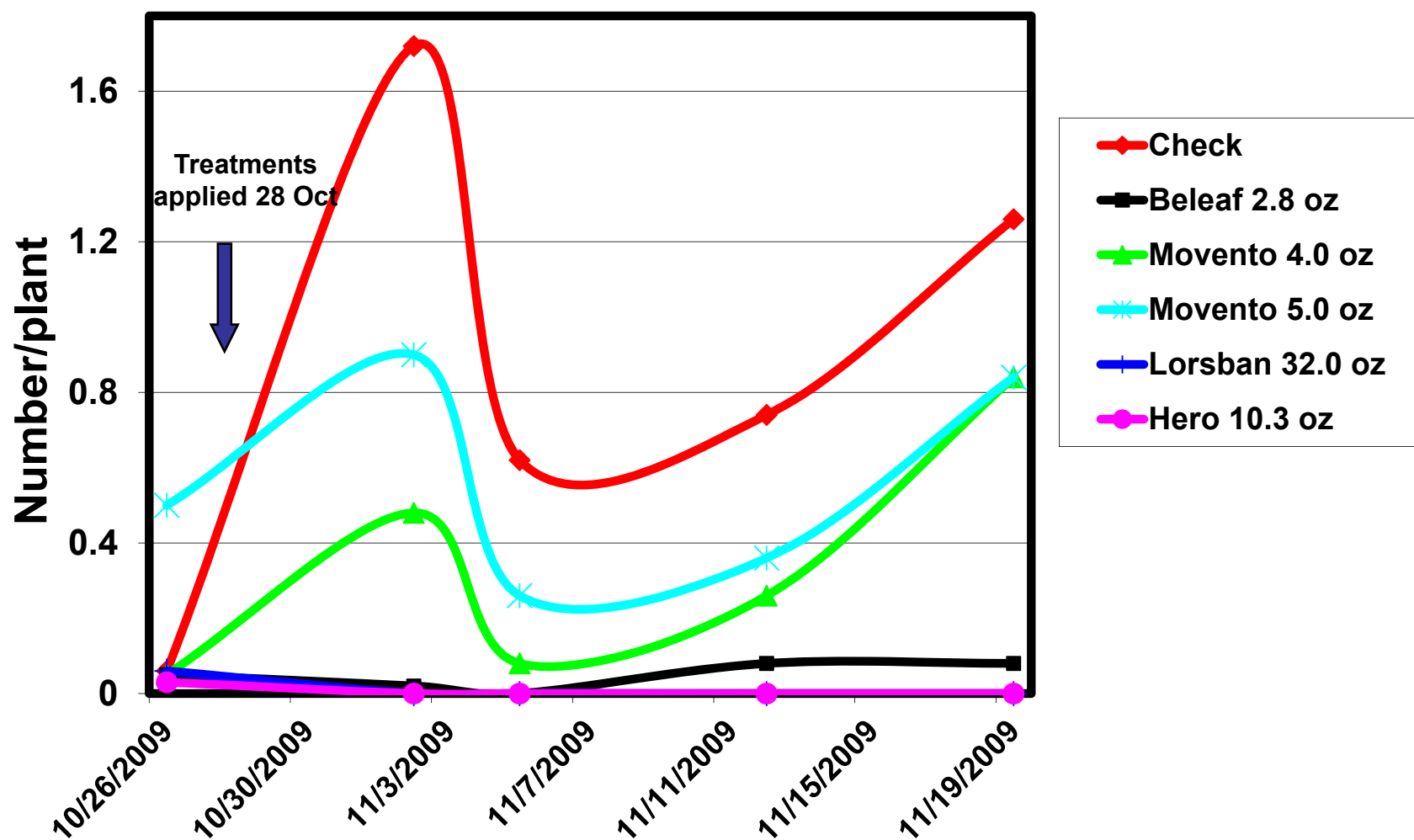
Bagrada bug killed by the green fungus, *Metarhizium anisopliae*
Surendra Dara, UCCE



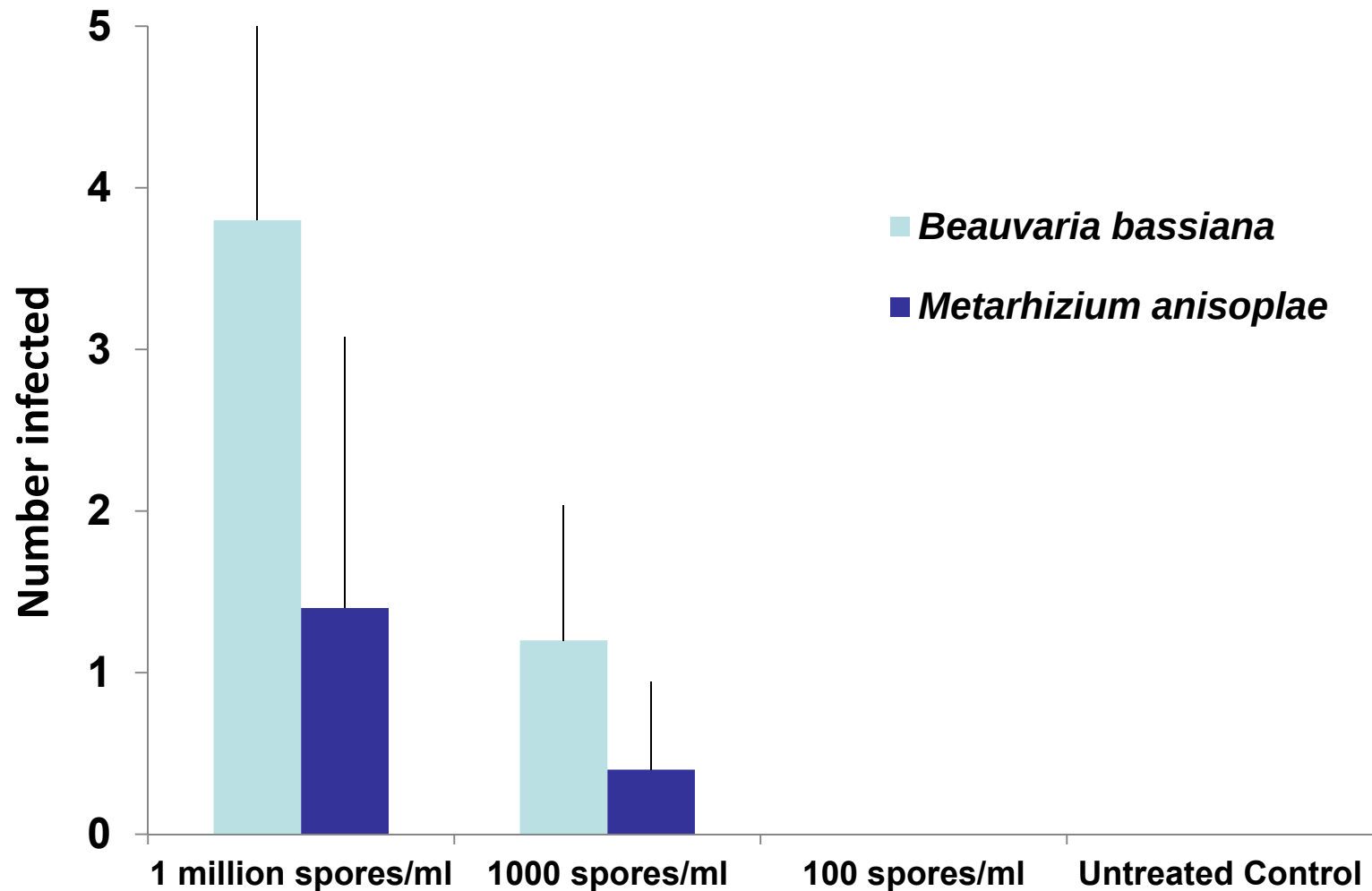
Bagrada bug killed by *Paecilomyces fumosoroseus*
Surendra Dara, UCCE



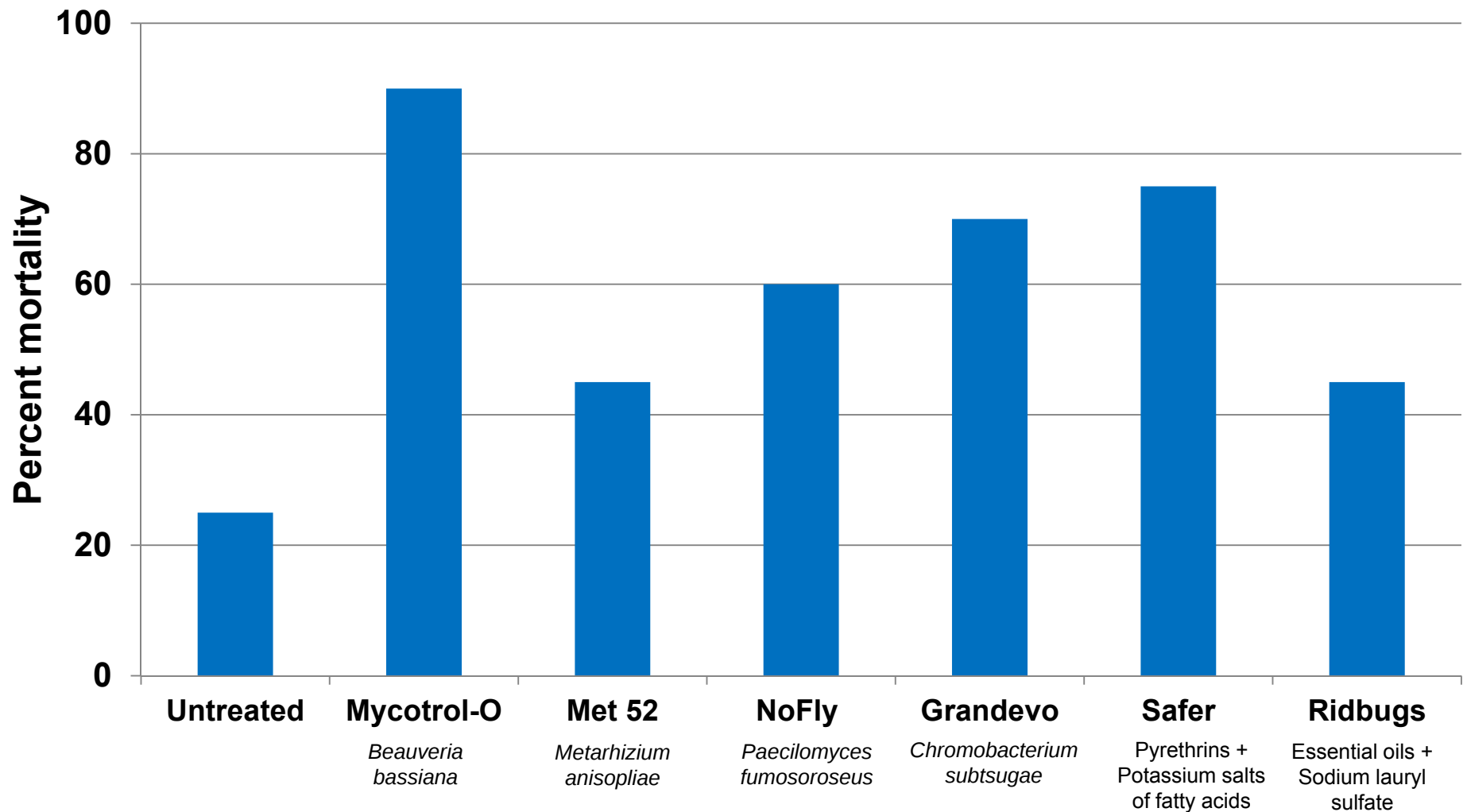
Bagrada bug-Chemical control



Bagrada bug-Microbial control

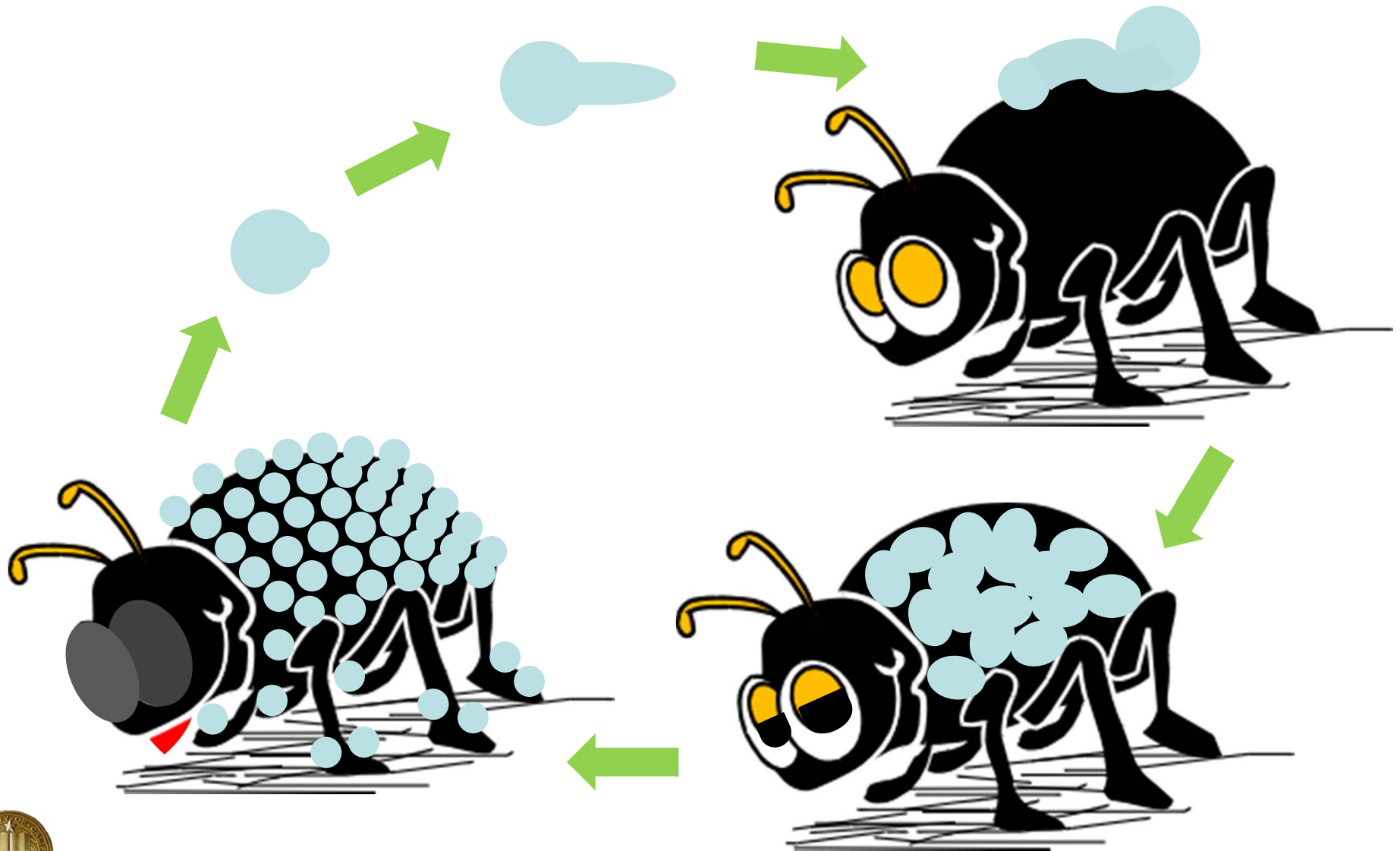


Bagrada bug-Organic options



Dara, unpublished-average of two assays

How entomopathogenic fungi infect insects



Bagrada bug-*B. bassiana*



Thank you

- Keep an eye out for these pests
- Stay tuned for research updates
- This presentation can be downloaded from <http://ucanr.edu/meetingpresentations>

