



Photo by Lyle Buss, UF



Hemipteran Beneficials & Pests

Dr. Joanie King
Assistant Professor and Extension Entomologist

College of Agricultural, Consumer, and
Environmental Sciences

New Mexico State University



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Identification is the very first step in any
Integrated Pest Management (IPM) strategy!

Want effective pest management?
Get to know the players!!

Identification is important for both beneficials & pests

Why?

- 1) Cannot implement successful IPM without a correct identification
- 2) Some beneficial and pest insects look superficially similar
- 3) Protect beneficial insects

Choosing insecticides and when to use them

Natural Enemies → Biological Control

The enemy of your enemy is your friend (therefore, beneficial)

Classical: Introduction of specialist natural enemies from the homeland of an introduced pest

Augmentation

- Inundative: Single mass release; goal to overwhelm
- Inoculative: Smaller releases; goal for populations to establish

Conservation: Enhance habitat for beneficial insects (e.g., plant insectary plants)

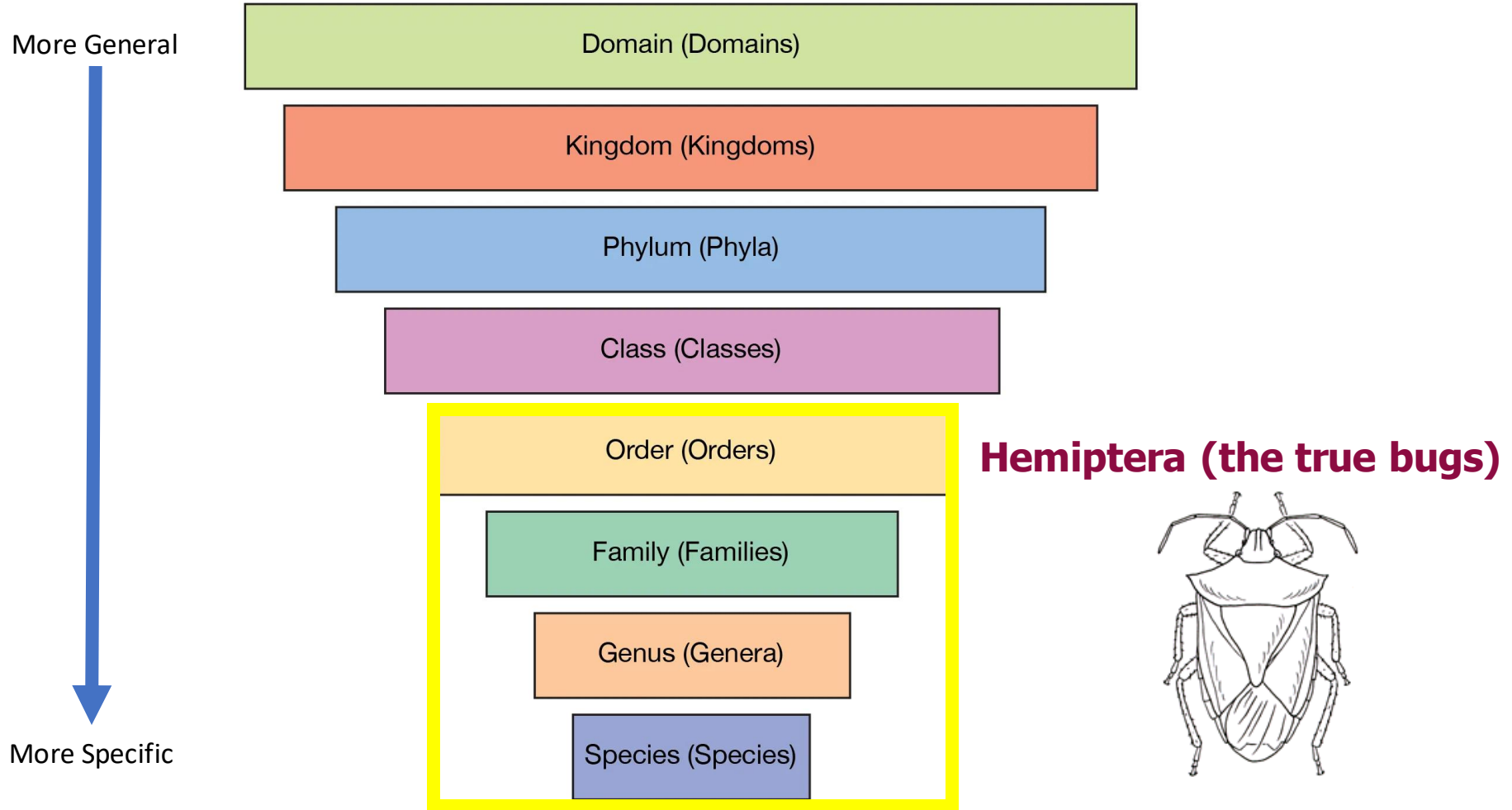
Insectary plants



Dill (*Anethum graveolens*)



How animals are classified



Arthropoda: (Order) Hemiptera – aphids, assassin bugs, mealy bugs, scales, true bugs, white flies, etc.

Large group. Some are pests, some are beneficial

All members have:

- Incomplete metamorphosis
- Piercing-sucking mouthparts

Suborder Heteroptera

- Species have forewings w/ both membranous & hardened portions (i.e., hemelytra)
- Antennae 4 or 5 segmented

Squash bug (*Anasa tristis*)



Assassin bug



Conchuela stink bug



Hemelytra

Example of piercing-sucking mouthparts (on an aphid)



Oleander aphids



Hemipterans have Incomplete Metamorphosis

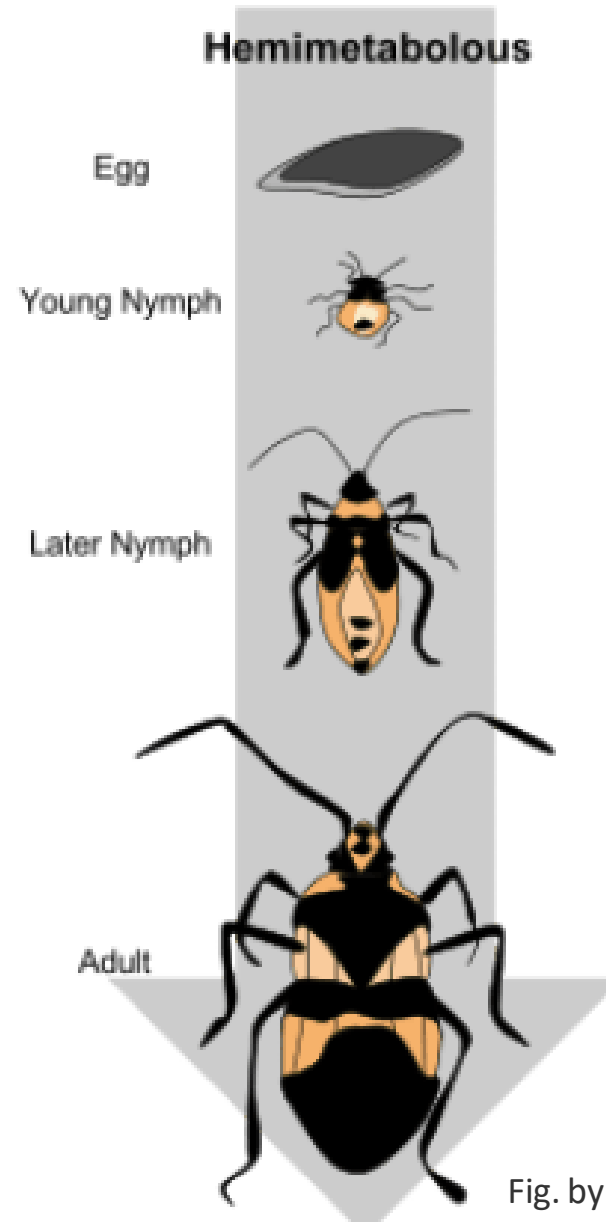


Fig. by Dr. Samanthi

Hemiptera: Aphidoidea – Aphids

Numerous species – host specificity varies

Small, 1/16 – 1/8 in. long

Piercing-sucking mouthparts

- Suck sap → weaken plants; can kill plant

Honeydew makers

- Attracts ants

Vary in color

Incomplete development

Winged & wingless forms

(crowded colonies produce winged forms)



Green peach aphid (*Myzus persicae*)



Photo: Scott Bauer



By Alvesgaspar - Own work, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=10556413>



Aphid damage

Stunt & weaken plants → can kill plant

Honeydew makers

- Attracts ants
- Mold growth

May vector plant viruses (e.g., cucumber mosaic virus, lettuce mosaic virus, & turnip mosaic virus)

- Squash, cucumber, pumpkins, melons, tomatoes, spinach, lettuce, & beets = all susceptible to viral transmission

Ants tending aphids –
they LOVE the sticky honeydew



Photo: Alex Wild

Alfalfa stunting due to blue alfalfa aphid feeding



Photo: K-State

Pea aphid (*Acyrtosiphon pisum*)

Pest of alfalfa, peas, & clovers

Characteristics:

- 1/8 – 1/4 in. long
- Light to dark green
- Nymphs → small
- May be winged or wingless
- Found all over the plant

Damage in the spring, early summer, and then again in the fall



Oleander aphid (*Aphis nerii*)

Wide range of host plants (e.g., Apocynaceae, Asclepiadaceae, Compositae, Convolvulaceae, and Euphorbiaceae)

- Mostly pests of plants in the dogbane family (Apocynaceae): milkweeds, oleander, periwinkle, etc.

Characteristics:

- May be winged or wingless
- Winged adults are yellow & black
- Nymphs are yellow/orange w/ dark cornicles, antennae, & legs
- Tiny: 1.5 to 2.6 mm in length

Damage:

- Can vector a variety of viruses (*Potyvirus* and *Cucumovirus*)
- Feeding leads to stunted plant growth
- May cause sooty mold growth



Woolly apple aphid (*Eriosoma lanigerum*)

Serious pest of apple. Pest of elm (overwintering host)

Characteristics:

- Body is a reddish brown to purple, but is covered by white, wool-like wax
- Up to 2 mm long

Damage:

- Formation of root galls causes stunting in trees
- Sooty mold growth



Some of the waxy covering removed to show body



Blue alfalfa aphid/Bluegreen aphid (*Acyrtosiphon kondoi*)

Pest of alfalfa

Characteristics:

- ~ 1/8 inch long (slightly smaller than the pea aphid)
- Blueish green
- Congregate in clusters on the terminal growth

Damage:

- Blue alfalfa injects a toxin that stunts growth, reduces yield → may even kill plants
- May cause sooty mold growth
- Damage occurs in the early spring (when they have high populations)



Cowpea aphid (*Aphis craccivora*)

Pest of alfalfa and many other plants (e.g., lentils, peanuts, French beans, etc.)

Characteristics:

- ~ 1/10 in. long
- Glossy black or dark brown – legs are pale in color

Damage:

- Inject a toxin while feeding → stunts and may kill plants
- May transmit viruses (over 30 different viruses can be spread by this aphid)
- Damage may occur year-round (but limited in temperatures above 95°F or below 45°F)
- Up to 20 generations per year



Spotted alfalfa aphid (*Therioaphis maculata*)

Major pest of alfalfa

Characteristics:

- Tiny, adult = ~ 1/16 in.
- Fast moving
- Pale yellow to grey
- 4-6 rows of dark spots w/ small spines (on the upper abdomen/top)
- Smoky-veined wings (on winged form)
- Found on the undersides of lower leaves
 - If population increases, they can be found all over the plant

Damage:

Damage may occur year-round (limited in temperatures above 95°F or below 45°F)

Up to 20 generations per year

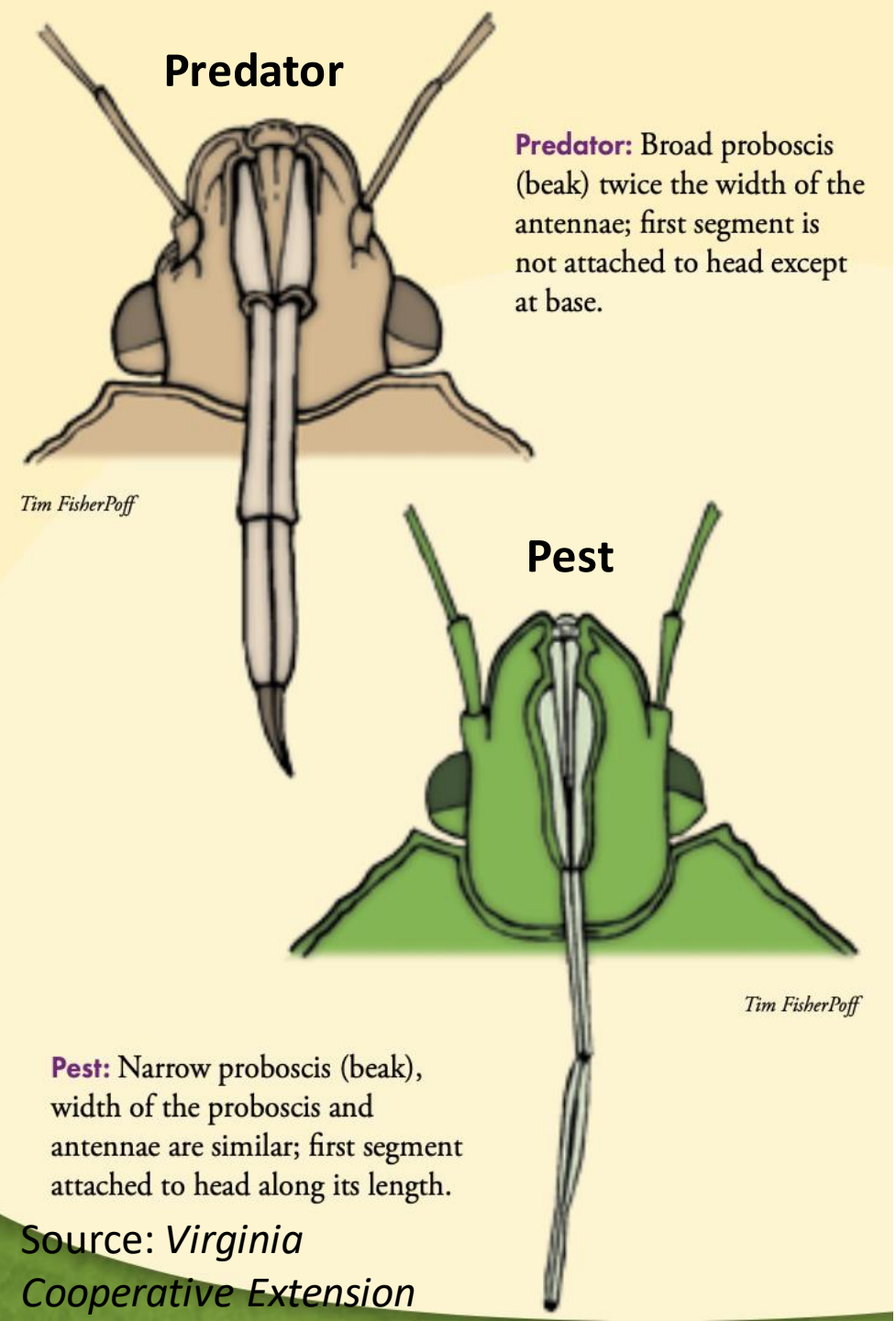
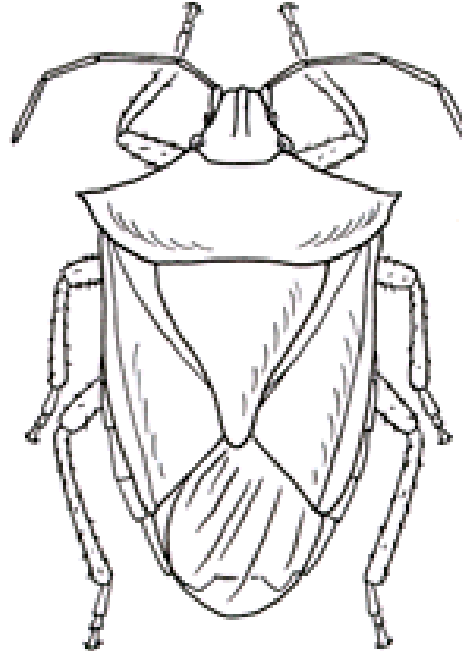


Hemiptera: Pentatomidae – Stink Bugs

Some are beneficial, some are pests

Characteristics:

- Vary in size, but typically 1/2" long
- Sides of pronotum w/ prominent tooth or lobe
- Leathery portion of forewing is broad & extends down
- Antennae 5-segmented
- Unpleasant odor when disturbed



Predator

Predator: Broad proboscis (beak) twice the width of the antennae; first segment is not attached to head except at base.

Pest

Pest: Narrow proboscis (beak), width of the proboscis and antennae are similar; first segment attached to head along its length.

Source: Virginia
Cooperative Extension

Pest Hemiptera: Pentatomidae – Stink Bugs

Characteristics:

- Have a thin, straw-like beak (similar diameter as antennae)
- Come in many different colors and patterns
- Feed on plants
 - Different plant parts (e.g., stems, leaves, fruits)

Brown Marmorated Stink Bug



Conchuela stink bug
(*Chlorochroa sayi*)



Conchuela stink bug
(*C. ligata*)



Bagrada bug –
invasive pest of *Brassica* crops



Beneficial Hemiptera: Pentatomidae: Asopinae – Stink Bugs

Characteristics:

- Have a thick beak
- Come in many different colors & patterns
- Generalist predators
 - Prefer to feed on immature insects
 - Have been observed to prey on Colorado potato beetle larvae

Twospotted stink bug (*Perillus bioculatus*)



Predatory stink bug
(*Zicrona americana*)



Photo: Jim Moore, Bugguide.net

Twospotted stink bug
(*P. bioculatus*) nymph



Photo: Claude Pilon, NA

Spined Solider Bug (*Podisus maculiventris*)



Photo: Lyle Buss, UF

Podisus sp. nymph feeding on a moth



Photo: Nate Walton, MSU Extension

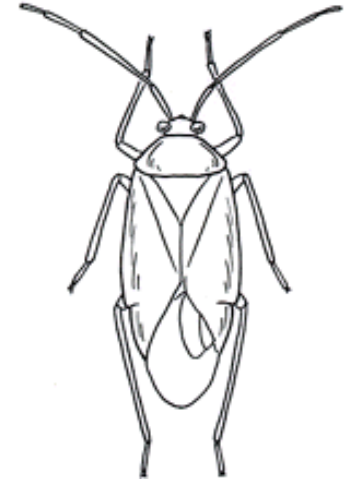
Hemiptera: Miridae – Plant Bug

Some are beneficial, some are pests
Over 10,000 known species

Characteristics:

- < 1/2" long
- Beak 4-segmented
- Antennal segments similar

The green mirid (*Creontiades dilutes*)
feeds on over 100 plant species = pest



Dicyphus hesperus preys on the greenhouse whitefly (*Trialeurodes vaporariorum*), & the two-spotted spider mite (*Tetranychus urticae*)



Hemiptera: Lygaeidae – Seed Bugs

Considered a pest sometimes (more of a nuisance pest)

Many spp. feed on seeds

Characteristics:

- 5/8 – 3/4" long
- Usually orange/red & black
- Shape is elongate or oval
- 4-segmented antennae
- Have 2 ocelli (simple eyes)

Seed bug (*Neortholomus scolopax*)
Feeds on native grasses



Photo: Salvador Vitanza, Bugguide.net

Large milkweed bug (*Oncopeltus fasciatus*) w/ nymphs



Photo: Greg Hume (Greg5030) - Own work, CC BY 3.0,
<https://commons.wikimedia.org/w/index.php?curid=47>

Small milkweed bug (*Lygaeus kalmii*)
Feed on flower nectar & milkweed seeds

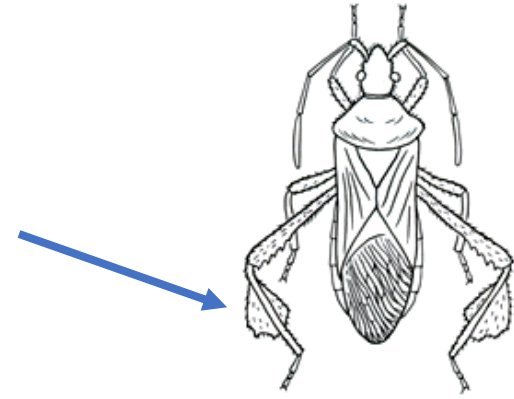


Hemiptera: Coreidae – Leaf-footed Bugs

Some are pests. Major pest = squash bug
Sap-sucking insects

Characteristics:

- Hind tibia usually thickened or expanded, sometimes looks like a leaf
- Narrow head
- No ocelli (simple eyes)



Squash bug



Pest Hemiptera: Coreidae – Squash bug (*Anasa tristis*)

A **major** pest of cucurbits (e.g., squash, pumpkins, gourds, cucumbers, melons, etc.) in NM

Characteristics:

- Incomplete metamorphosis

Eggs:

- Copper to black in color
- Clusters on the undersides of leaves

Nymphs:

- Bright green to pale green

Adults:

- 1 – 1.5 in. long
- Dusty-grey

Eggs



Young nymphs



Adult



Squash bug damage

Damage through feeding & may transmit diseases

Feeding: can cause wilting, yellowing, necrosis, & plant death

Vector plant pathogens: the bacterium *Serratia marcescens* → causes cucurbit yellow vine disease (CYVD)

Watermelon showing symptoms of CYVD



Damage caused by squash bug feeding





Leafhoppers (Hemiptera: Cicadellidae)

Some species are pests: for example, beet leafhopper, and the blue-green leafhopper (*Graphocephala atropunctata*) which feeds on more than 150 species of plants.

Stunt plant growth, Leaf stippling (bleached specks)

Characteristics:

- Incomplete development
- Piercing-sucking mouthparts
- Adults are small, ~1/8 in.
- Green, yellowish, or brown
- Long rows of small spines along hind legs

Beet Leafhopper (*Circulifer tenellus*)



Leafhopper mouthparts
(shown on beet leafhopper)



Leaf stippling on apple leaves
from feeding by rose
leafhopper



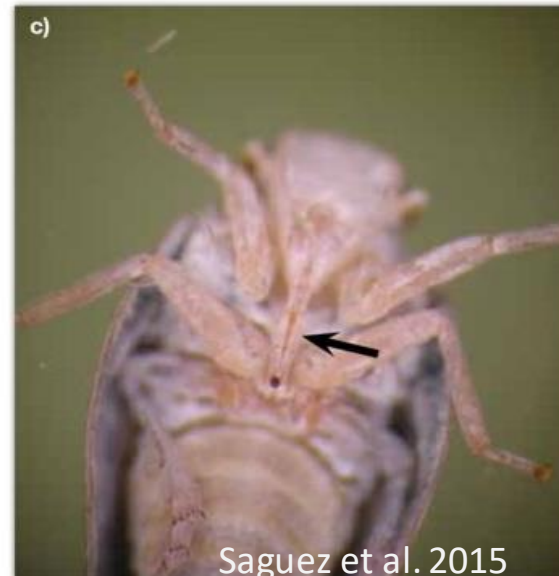
Pest Hemiptera: Cicadellidae – Beet leafhopper (*Circulifer tenellus*)

Pests of tomatoes, peppers, beans, melons, beets
melons, etc.

Characteristics:

- 3 mm (1/8 in) long
- Wedge-shaped body
- Pale green to brown
- Fly or jump away

Beet Leafhopper (*Circulifer tenellus*)



Beet leafhopper (*C. tenellus*) damage

Stunting of the plant, yellowing, curling foliage (shriveled petals & leaves), poor quality, plant death

Curly top virus; beet leafhopper (*Circulifer tenellus*) = vector

Damage in melons



Stippling



Curly top virus infection



Beneficial Hemiptera: Reduviidae – Assassin, Ambush bugs

Characteristics:

- Somewhat large, 1/2 — 3/4" long
- Elongate head w/ a constricted "neck"
- Piercing-sucking mouthparts ("beak")
 - Appears thick
 - Curved beak folds under the body

Numerous species:

- *Zelus* and *Sinea* spp. are the most common in NM
 - *Zelus* spp. are elongate & vary in color (brown, green, grey, orange, &/or red)
 - *Sinea* spp. are shorter, typically stout, w/ spiny front legs

Many assassin bugs prefer caterpillars, but they will prey upon just any insect

Sinea sp.



Wheel bug (*Arilus cristatus*)



Zelus sp. egg mass



Leafhopper assassin
(*Zelus renardii*)



Beneficial Hemiptera: Geocoridae – Big-Eyed Bugs (*Geocoris* spp.)

Characteristics:

- Small, 1/6" long
- Have large, bulging eyes that extend past the width of their thorax
- Long, straw-like beak
- Vary in color, but adults are typically a combination of grey, brown, or tan

Eat a lot of PESTS!

Early instar nymphs feed on mites & insect eggs

Later nymphs & adults feed on aphids, flea beetles, leafhoppers, Lygus bugs, lepidopteran (moths) eggs & caterpillars, thrips, spider mites, & white flies

Sometimes inject their mouthparts into plants for moisture → does not harm the plant. However, makes *Geocoris* sp. susceptible to certain systemic insecticides

Big-eyed bug (*Geocoris* sp.)



Big-eyed bug (*G. punctipes*) nymph



Photo: Lyle J. Buss, UF

Big-eyed bug feeding on a whitefly nymph



Photo: Jack Dykinga, ARS

Beneficial Hemiptera: Nabidae – Damsel Bugs (*Nabis* spp.)

Characteristics:

- 3/8—1/2" long
- Have a slender body & narrow toward the head
- Slightly enlarged forelegs
- Brown or tan in color. Some spp. have darker markings
- Wings are held crossed over back (at rest) & extend to the tip of their abdomen

Eat a lot of PESTS!

Adults and nymphs feed on small, soft-bodied insects

Damsel bug



Damsel bug feeding on a caterpillar



Beneficial Hemiptera: Anthocoridae – Minute pirate bugs (Orius spp.)

Characteristics:

- Tiny, < 1/8" long
- Have black bodies w/ black & white forewings (resembles an "X" pattern)
- Body is somewhat flattened
- Have a prominent beak
- Nymphs are pale in color, from yellow to orange

Adult minute pirate bug



Minute pirate bug feeding on whitefly nymphs



Minute pirate bug nymph



Photo: Adam Sisson, ISU, Bugwood.org

Photo: Jack Dykinga, USDA

RAVENOUS predators

Eat aphids, mites, small caterpillars, thrips, whiteflies, and insect eggs

Unknown bugs in/on your plants?

Try to identify it!

Bug Guide:

<https://bugguide.net/>

Still unsure?

- Send specimens to the NMSU Plant Diagnostic Clinic: <https://plantclinic.nmsu.edu>
- Live or intact (i.e., don't squish it!) in baggie, container, jar, or pill bottle; attach submission; bring them to your County Agent
- Photos – good, clear images, **magnified**; attach to email with your name, host of pest, damage observed, location & send to your County Agent

Resources

Common pests and IPM Strategies

<https://pubs.nmsu.edu/h/H176/index.html>

Squash bug IPM:

<https://pubs.nmsu.edu/h/H183.pdf>

Pocket Guide to the Beneficial Insects of New Mexico:

https://aces.nmsu.edu/pubs/insects/docs/Beneficial_Insects.pdf

Using Insectary Plants to Attract and Sustain Beneficial Insects for Biological Pest Control:

<http://aces.nmsu.edu/pubs/h/H169/welcome.html>

IPM for Home Gardeners:

<https://aces.nmsu.edu/pubs/circulars/CR655.pdf>

Questions about the presentation or plant problems?

Contact Information

Email (*preferred*): Dr. Joanie King

joaniek@nmsu.edu

Office Phone:

(575) 646-3665

Office:

Skeen Hall, NMSU N250



Tarantula Hawk Wasp
Your state insect!

Aphid management

Cultural

- Keep plants well-watered & fertilized (aphids target plants exhibiting stress)
- Remove weeds

Mechanical

- Remove aphids using a stream of high-pressure water (repeat daily, until populations decline)
- Floating row covers – install at the time of planting
- Regularly check plants to ensure no aphids have made it past the row cover barrier

Chemical

- Insecticides are available (e.g., permethrin) however, they are highly toxic to beneficial insects

Organic options:

- Neem oil
- Insecticidal soaps & horticultural oils

These are contact insecticides = will only kill aphids that come into direct contact

Apply to both sides of leaves

Aphid management

Biological

Depending on the presence & abundance of natural enemies = infestations may be managed

Support beneficial enemies

Several spp. of natural enemies are commercially available for supplemental releases

Big-eyed bugs
(Hemiptera:
Geocoridae)



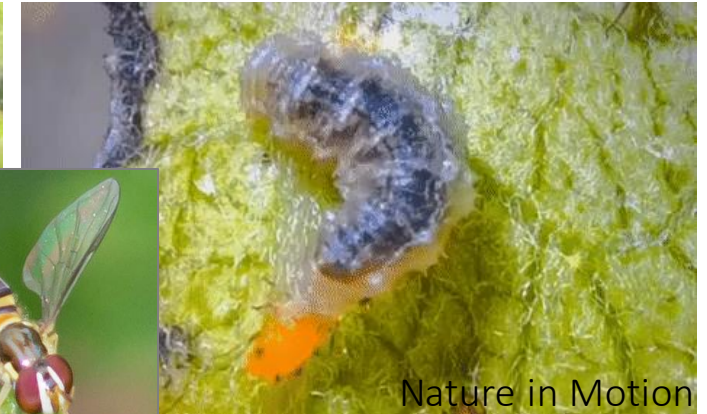
Minute pirate bugs
(Hemiptera:
Anthocoridae)



Lady beetles (Coleoptera: Coccinellidae)



Hoverflies (Diptera: Syrphidae)



Lacewing larvae (Neuroptera)



Parasitoid wasps
(Hymenoptera)



Beet leafhopper (*C. tenellus*) management

Cultural

- Remove weeds in & around fields
- Yellow sticky cards – detection ONLY
- Monitor for signs of *curly top virus*
- Plant Extra Plants
 - Destroy infected ones

Mechanical

Floating row Covers

Biological

Natural enemies: big-headed flies, ants, assassin bugs, & egg parasitoids (families Mymaridae & Trichogrammatidae)

Beauveria bassiana may be applied for beet leafhopper control

Chemical

Not recommended

Yellow sticky cards



Row covers



Squash bug management

Cultural

Best control method = prevention through sanitation

- Remove old pants after harvest
- Remove plant debris during growing season
- Early detection of nymphs &/or eggs is most important

Mechanical

- Handpick nymphs, eggs, & adults

Biological control

- Ground beetles (Carabidae) eat the eggs
- Damsel & big-eyed bugs eat the nymphs



Chemical

- Insecticides are last resort (arbaryl, permethrin, bifenthrin, esfenvalerate)
- Applied early in the season, early in the morning or late in the evening (when squash bugs are inactive)
- Organic options: Apply diatomaceous earth around the base of plants