Strawberry Insect Management

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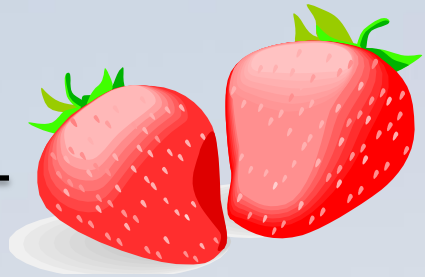
Strawberry insect pests



Fruit / flower feeding pests

- **Tarnished plant bug**
- Strawberry bud weevil (clipper)
- Strawberry sap beetle (picnic beetle)
- Slugs
- Eastern flower thrip
- Spotted wing drosophila

Foliage / stem feeding pests

- Meadow spittle bug
- Strawberry rootworm
- Two spotted spider mite
- Cyclamen mite
- Strawberry leafroller
- Aphids
- Potato leafhopper
- Cutworms

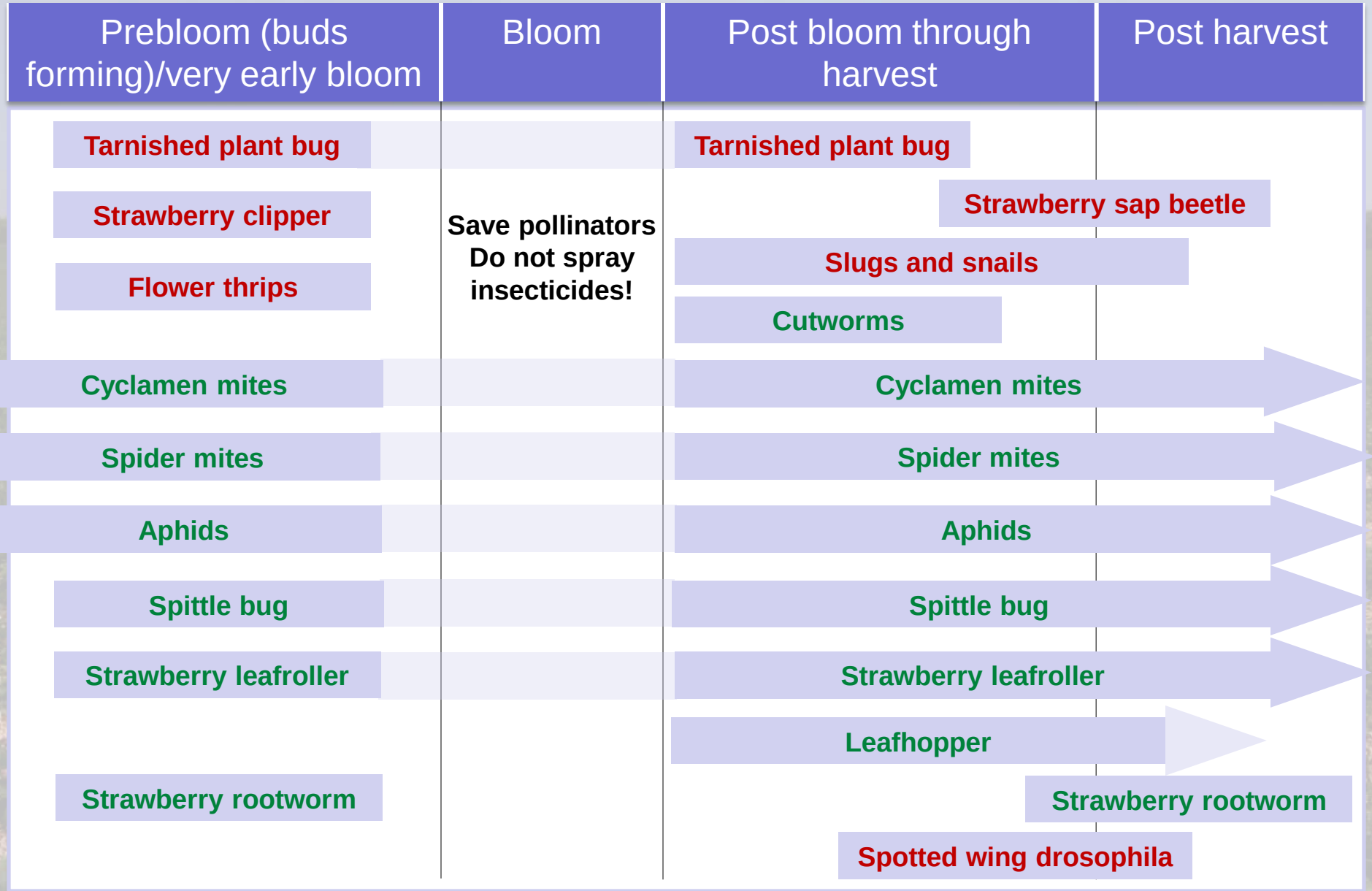
Root / crown feeding insects

- White grubs (Japanese beetle, May beetle, June beetle)
- Strawberry root weevil
- Black vine weevil

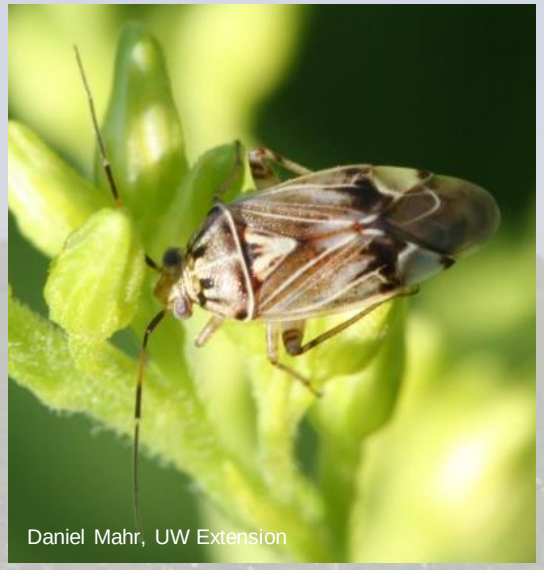
Strawberry insect pests and phenology

Field selection	Establishment
White grubs	Aphids
Strawberry root weevil Black vine weevil	Cyclamen mites
	Spider mites
	Leafhoppers
	Strawberry leafroller

Strawberry insect pests and phenology



Tarnished plant bug, *Lygus lineolaris* (Hemiptera: Miridae)



~1/4” long

- Most important insect pest of strawberry in WI
- 2-3 generations per year
- Overwinter as adults in protected areas in and around strawberry
- Adults emerge in spring when temperatures reach and remain around 49ºF
- Highly polyphagous

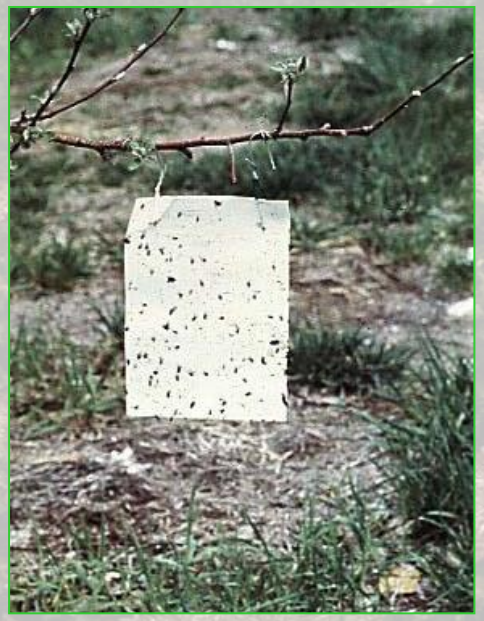
Damage: cause apical seediness and “cat-facing”

- Damage on fruit from adults and nymphs feeding on flower buds, developing fruit, receptacle
- Feeding on berries can result in deformed and stunted berries with concentration of seeds at tip, called button berries or cat-faced berries

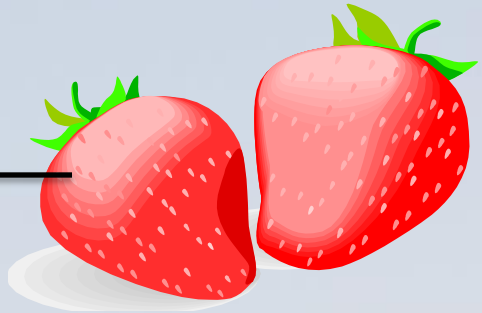
Tarnished plant bug

Monitoring

- Visual monitoring for injury
- Sweep sampling before bloom (1st flower bud formation)
  - Econ. thresh. 4 adults/20 sweeps
- Tapping flower clusters before flower open
  - Econ. thresh. 1 adult or nymph/ 1-4 clusters
- White sticky cards for detecting mvt
- Increase in population when alfalfa hay cut



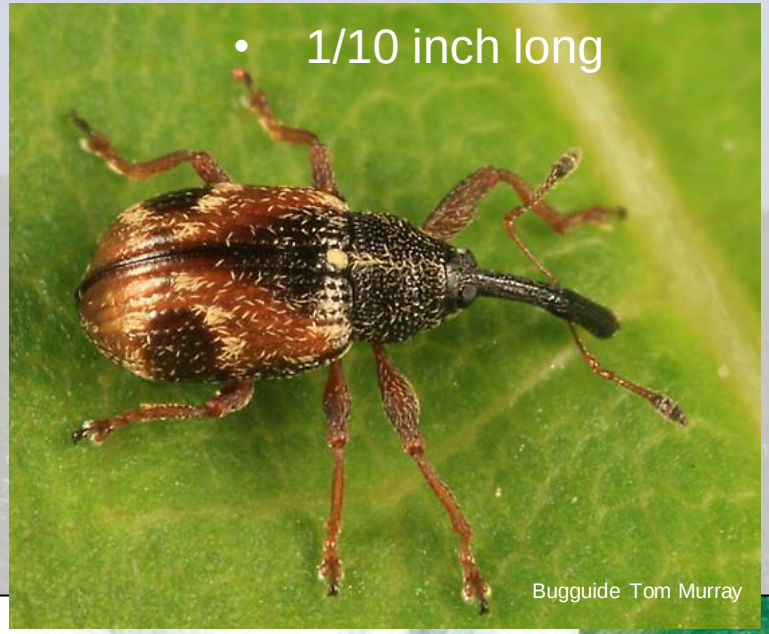
Tarnished plant bug

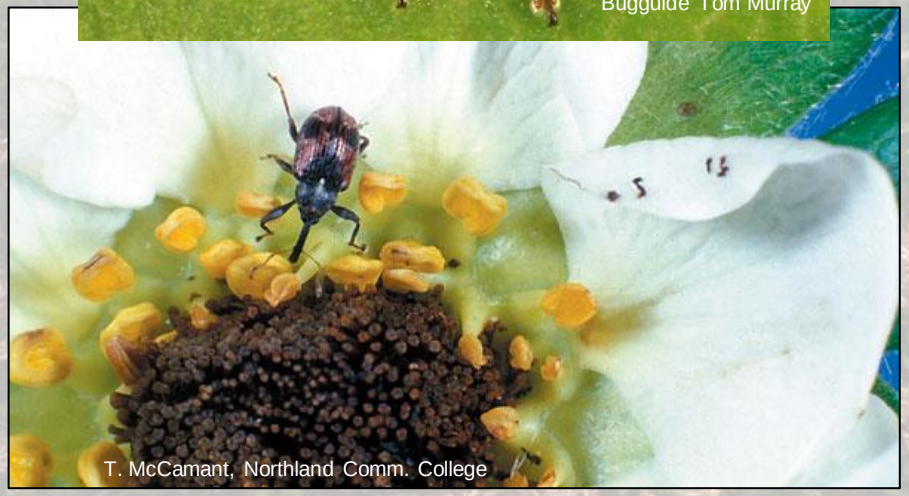


- **Cultural control**
  - Control broadleaf weeds can reduce overwintering populations. Avoid mowing broadleaf vegetation during bud swell, bloom, or early fruit set
  - Trap crop with alfalfa
- **Biological control –** none effective
- **Chemical control**
  - Assail, Brigade, Malathion, Danitol, Endosulfan, Rimon, Sevin XLR
  - 1-2 applications: when buds first become visible

    10-14 d after bloom

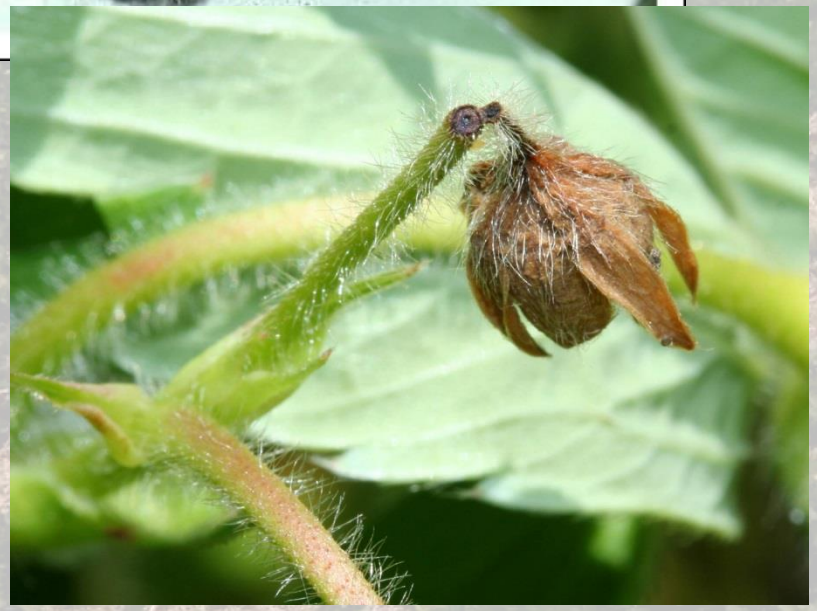
Strawberry bud weevil, *Anthonomus signatus* (Coleoptera: Curculionidae)





- 2 black spots
- Very common
- One generation/year
- Brambles also hosts
- Overwinters as adult
- In spring, feed on flower buds

Strawberry bud weevil



- Female pierces flower buds, feeds, then lays an egg
- Larva would die of exposure when flower opens up…
- So female clips off flower buds
- Larva feeds in clipped bud

Strawberry bud weevil damage

- Plants may compensate by putting out more flowers or increasing fruit weight, esp. if damage to primary or secondary buds
- Varieties tested Earliglow, Jewel, Seneca, Kent

English-Loeb et al. 1999 (JEE 92: 915-921)

Strawberry bud weevil management

Monitoring – Visual inspection for adults and clipped flower buds (3’ of row at 5 sites near wooded borders)

- Threshold: detection of >1 weevil or >1 clipped bud per 2 ft of row

Cultural control

- remove wild brambles
- trap crop with early varieties around perimeter

Chemical control – Insecticide application at early bud stage and again 10 days later if history: Brigade, Danitol, or Lorsban

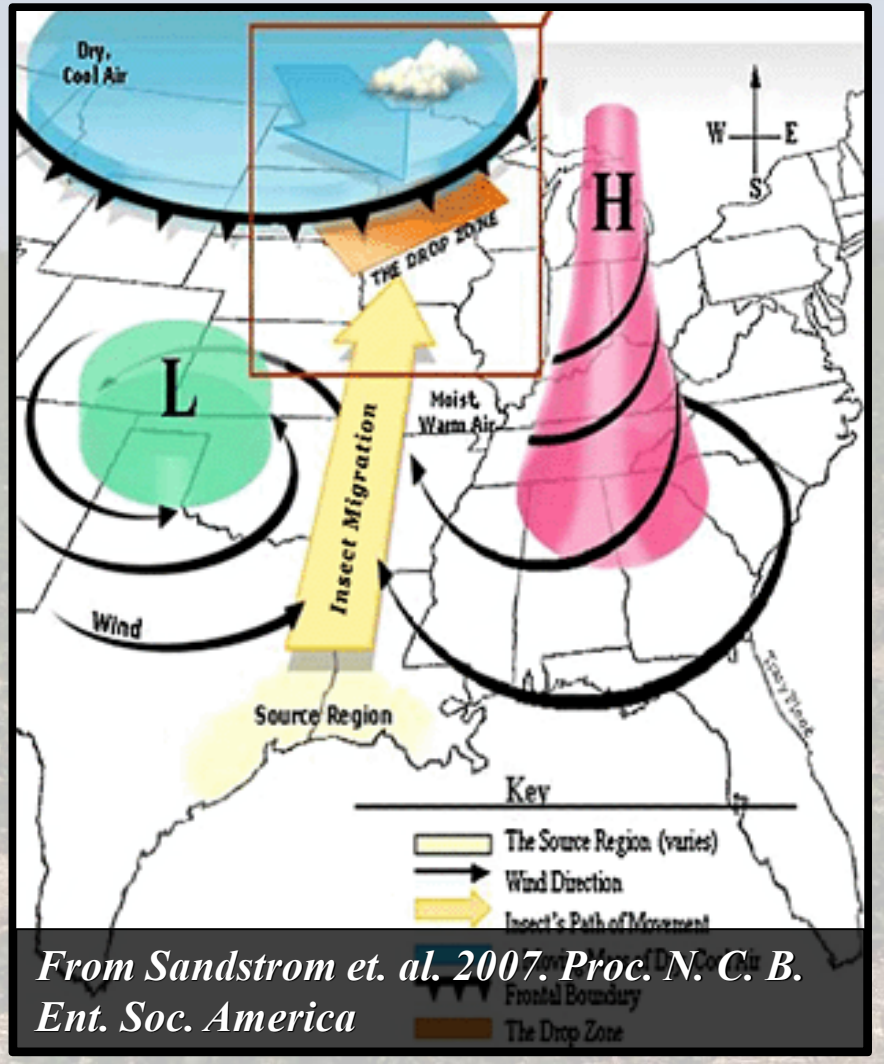
Eastern flower thrips, *Frankliniella tritici* (Thysanoptera: Thripidae)

- Do not overwinter outside in WI
- Highly polyphagous
- Populations introduced each spring on winds / storm fronts from south
- Timing and magnitude of each spring’s introductions determine severity of injury in strawberries
- Several generations can develop each summer after thrips are introduced to region
- Hot, dry conditions favor greatest population increases in summer and subsequent infestations of brambles

Annual northward migrations

- Black cutworm
- Potato leafhopper
- Eastern flower thrips
- Corn earworm
- Corn leaf aphid
- Beet leafhopper
- Aster leafhopper
- Others

"Aerial Plankton"



From Sandstrom et. al. 2007. Proc. N. C. B. Ent. Soc. America

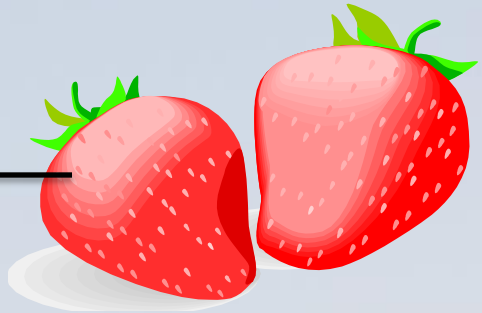
Damage in strawberry

- Injury may occur at blossom stage or on small berries
- Thrips feed on blossoms causing wilting and drop
- Thrips feeding on fruit will cause seedy berries that do not size or color: tough, small, brown berries (russeting) with little flavor

Monitoring

- **Sampling:**
  - Sample as earliest flowers of earliest varieties begin to open
  - 10 blossoms per site; 5 or more sites per variety
  - Shake/tap blossoms in white bowl, tray or zip-lock bag (can add 2 drops nail polish remover / ethyl acetate to kill them)
  - yellow sticky traps can be used to detect thrips presence
- **Threshold:** 2-10 per blossom or small berry

Flower thrips



- **Cultural control** – none mentioned
- **Biological control** – none mentioned
- **Chemical control**
  - Entrust, Spintor, Radiant, Danitol, Endosulfan, Lorsban, Brigade (some same as TPB and clipper)
  - Applications prebloom or before 10% plants in bloom, if needed continue at 5- to 6-day intervals until 4 days before first harvest (Weinzierl, U of IL)
  - Discontinue sprays after all harvestable berries have reached dime size

Spittle bug, *Philaenus spumerius* (Hemiptera: Cercopidae)

~1/4” long

- Meadow spittle bug
- Very common native insect
- Very polyphagous
- Weeds in planting may be more attractive than strawberries

Spittle bug

Only nymphs

make “spittle”

Spittle bug

Damage

- Feed by sucking plant sap
- Usually more noticeable than damaging, but can reduce yields if feeding on fruit stems – small sized fruit
- Aesthetic problem in “Pick-your-own”

Spittle bug

Monitoring

- Visual monitoring for spittle masses
- Threshold is about one mass per square foot of canopy
- Don’t count spittle masses on weeds!

Spittle bug

- **Cultural control**
  - reduce broadleaf weeds
- **Biological control**
  - none effective
- **Chemical control**
  - most insecticides are effective (Assail, Brigade, Danitol, Endosulfan, Rimon, Sevin XLR)
  - use adequate pressure to wash away spittle

Two spotted spider mites, *Tetranychus urticae* (Acari: Tetranychidae)

~1/50” long

- Two-spotted spider mites most common to damage mites in strawberry
- Many generations per season and overwinter as mated adult females
- Feed on underside of leaves
- Wingless but highly mobile (balloon in wind on silk threads)

Top photo: Two-spotted spider mite adult; Chad Smith, Coastal Research & Education Center, Clemson University
Bottom photo: Discolored, damaged leaf (left leaf); Surendra Dara, University of California-Extension

Damage

- Mites feed on plant sap on underside of leaves in tangle of webbing
- Feeding can cause discoloration of leaves (bronzing), starting on underside of leaves Severely damaged leaves die and drop, resulting in reduced plant vigor, fruit size, and yield
- Warm, dry weather favors mite outbreaks
- Localized infestations

Two spotted spider mite

- **Cultural control**
  - Annual renovation of beds removes food and habitat
- **Biological control**
  - Predatory mites (e.g. *Noesiulus fallacis*). 1 predatory for 10 pest mite enough for control. Commercially available
- **Monitoring:** Check for “bronzing” areas. Examine 60 leaves

  Econ. Threshold: 25% or more of leaflets sampled with mites
- **Chemical control**
  - Danitol, Acramite, Agri-Mek, Kanemite, Oberon
  - Apply before bloom and again after bloom if needed

Strawberry rootworm, *Paria fragariae* (Coleoptera: Chrysomelidae)

~1/8” long

- Adults feed mostly at night
- Adults feed on leaves
- Females lay eggs on older leaves near the soil surface
- Larvae feed on roots for ~2 months, but do not cause significant damage
- 2nd generation adults emerge in mid summer and feed on foliage

Damage

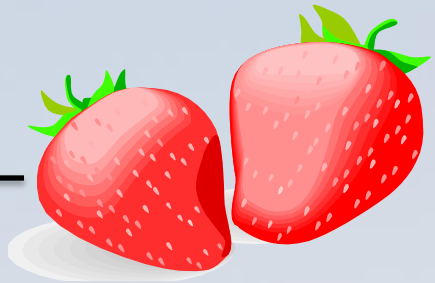
Holes ~1/16” diameter

Although larvae feed on roots of strawberry, leaf-feeding by adult beetles is more damaging to strawberry production

Monitoring

- Scout fields at night with a flashlight
- Sticky traps (same as tarnished plant bug)
  Thresh. 10-20 beetles/plant

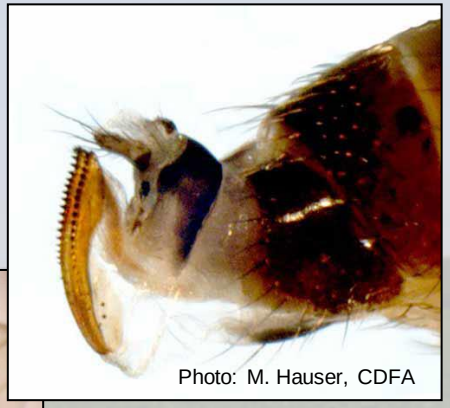
Strawberry rootworm control



- **Cultural control**
  - Plowing down planting and rotating with other crop
- **Biological control –** none effective
- **Chemical control**
  - No recommendation in *Midwest Small Fruit and Grape Spray Guide* (“insecticides used for control of other strawberry pests are likely to control this pest as well”)
  - Assail, Brigade, Danitol, Endosulfan, Rimon, Sevin XLR

Appearance

Diptera: Drosophilidae: *Drosophila suzukii*



1/16 to 1/8 inch long (2-3 mm)

Life cycle: oviposition

Oviposit in ripening and ripe fruit (as opposed to over-ripe fruit)

Spotted wing drosophila

Monitoring

- Plastic 32 oz. deli cup
- Drill or melt ~ten 3/16” holes
- Add ~1 inch of bait:

  - apple cider vinegar or

  - 1 tbsp. active dry yeast + 4 tbsp. sugar + 12 oz. water
- Add drop of soap
- Hang in fruit canopy near fruit, in shade
- Action threshold: 1st fly trapped!

Spotted wing drosophila control

- **Cultural control**
  - remove alternate hosts
  - timely harvest
  - remove overripe and damaged fruit
- **Biological control**
  - none available
- **Physical barrier**
  - netting crop with net <1mm mesh size
- **Chemical control**
  - Conventional insecticides: OPs, carbamates, pyrethroids
  - Selective insecticides: spinosyns, and pyrethrins
  - Spray interval: every 4-7 days until harvest

Questions?

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