Aphids: those sucking insects

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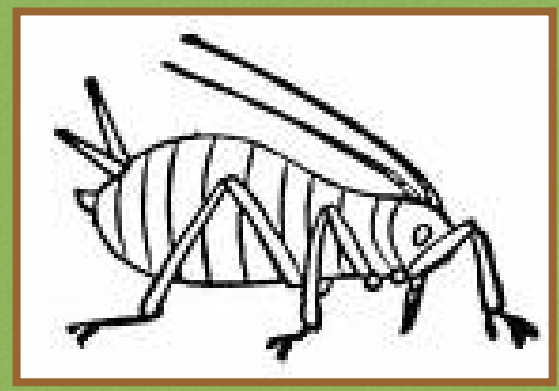
Outline

- Background and key characters
- Host-plant relationships
- Aphid biology and life cycle
- Geographical distribution
- Most common aphid pests
- Control options
- Where to get more information



Definitions

- Heteroecious – alternating between hosts
- Monoecious – remains on one host
- Holocyclic – Complete life cycle, goes through sexual reproduction
- Anholocyclic – always remains asexual

More definitions

- Alatae – winged insect
- Apterae – wingless insect

- Parthenogenesis – reproduction from unfertilized eggs by unmated females

- Viviparous – giving birth to live young
- Oviviparous – giving birth by laying eggs

Aphid background

- More than 4,400 species of aphids
- Related to scales, cicadas, hoppers
  - Hemiptera: Sternorrhyncha: Aphididae
- Aphids can feed on all plant parts
- Most aphids use trees or woody hosts
  - Trees slow to develop resistance
- Most aphid pests are exotic

Key aphid characters

- Aphids are soft-bodied, “weak”
- Most are <3mm long
- Head is pointed downward for feeding
- Antennae are 5- or 6-segmented
- Compound and simple eyes
- Walking legs, “skinny”

More aphid characters

- Thorax and abdomen appear fused
- Most aphids have cornicles (tail pipes)
  - Excrete alarm pheromones
- Most aphids have a cauda
  - "flick" honeydew

Host-plant relationships

- Most aphids feed within 1 plant family
- Some aphids are host-alternating (10%)
  - Primary woody plants in the fall/winter/spring
  - Secondary herbaceous plants in the summer
- Economically important aphids tend to have a wider host range
  - e.g., green peach aphid
    black bean aphid
    pea aphid

What kinds of plants do aphids like?

- Compositae
- Leguminosae
- Gramineae
- Umbelliferae
- Rosaceae
- Fagaceae
- Coniferae
- Saliceae

Aphid biology

- All aphids have piercing-sucking mouthparts
  - Fluid feeders (phloem), excrete honeydew
- Some aphids can vector disease
  - Non-persistent, i.e., temporary "dirty needle"
  - Persistent, i.e., transmit for life
- Aphids can easily mutate
  - Multigenerational clones in the summer
  - Adapt to new plant varieties
  - Become chemically resistant

Aphid life cycle

- Most aphids can alternate forms
  - Wingless, colony-building stage
  - Winged, dispersal stage
- Most aphids can reproduce without sex
  - Parthenogenic during the summer
  - Can produce 20+ generations/year

apterae

alatae

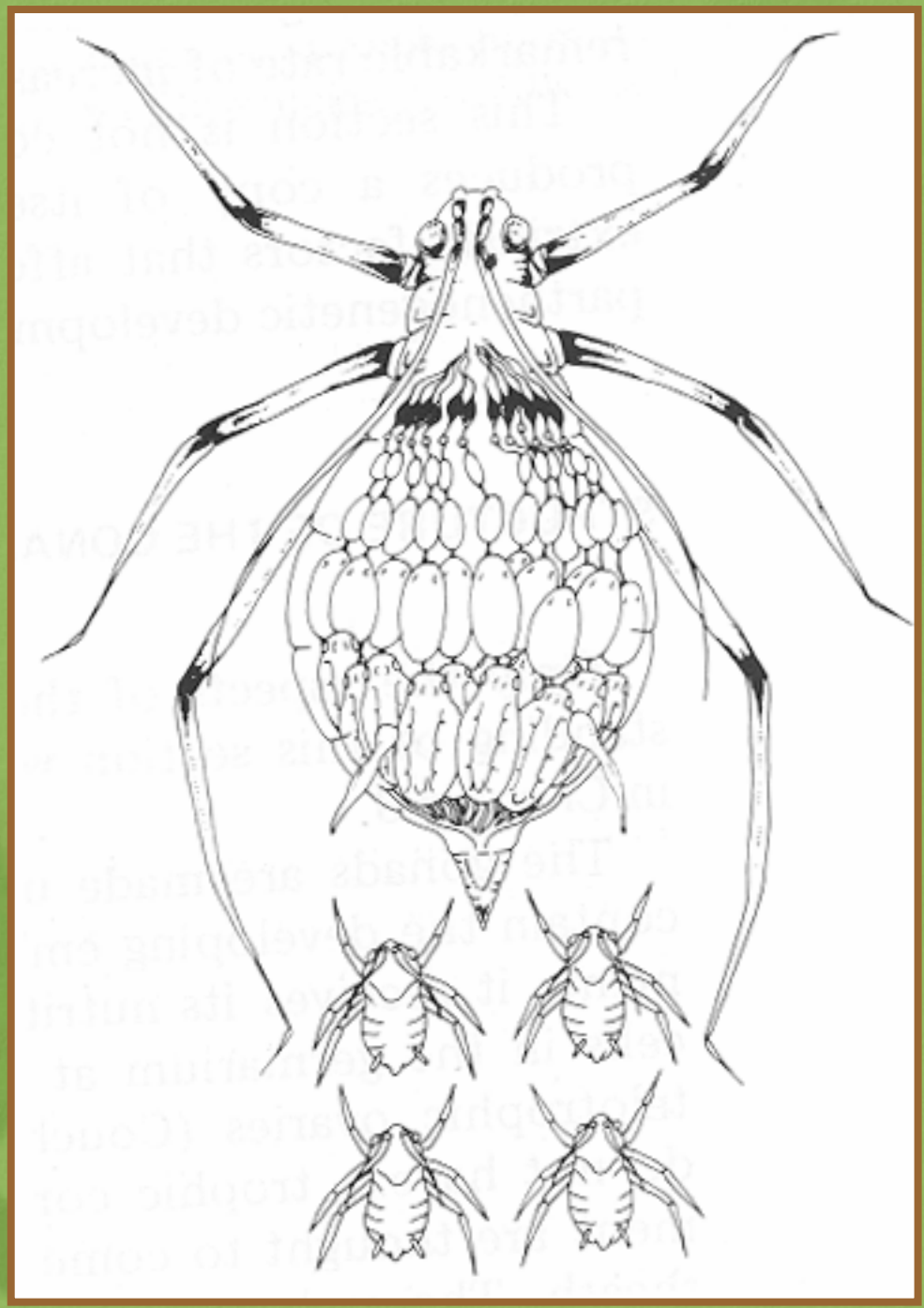
How aphids grow up

- Born alive, go through several molts (4-5)
- Wing pads obvious on larger instars
- Development depends on temperature
- Females can start reproducing quickly
  - Ovaries "ready to go" after last molt

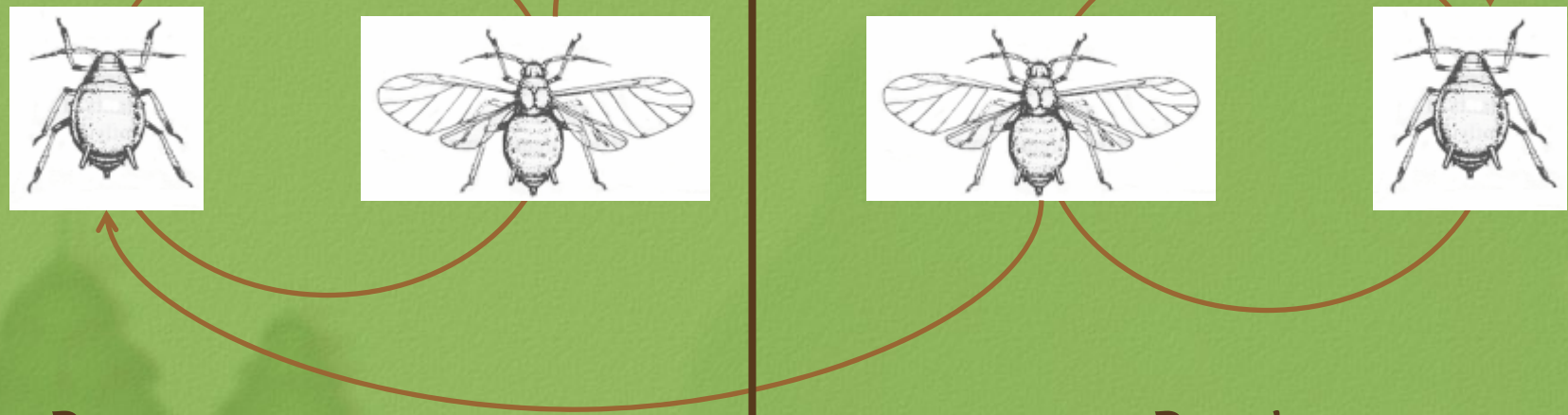



To be winged or not to be winged,
that is the question…

- Telescopic generations
- Grandmothers will influence offspring
  - External pressures determine form
  - Food availability and food quality, predators, temperature, photoperiod, time of year, crowding, presence of ants
- Alternating hosts, optimal food source



Host alternating w/out sexual reproduction*



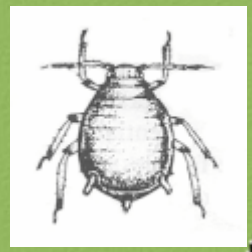
Potatoes

Peaches

*Least common (3%)

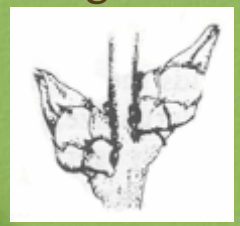
One host with sexual reproduction*

Stem mother



Wingless summer female

Overwintering egg



Summer migrant

xoxo

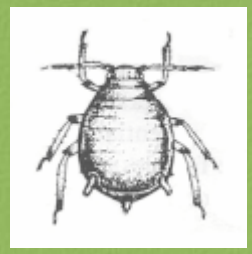
Sexual female

Male Migrant

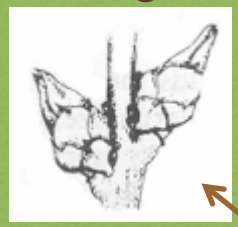
*Most common (87%)

Host alternating with sexual reproduction*

Stem mother



Overwintering egg



Summer migrant

Wingless summer female

xoxo

Sexual female

Male Migrant

fall/winter/spring

Fall migrant

summer

*Uncommon (10%)

Geographic distribution

- Most aphids live in temperate regions
- North America, Europe, Asia
- Some are adapted to cold weather
- Few aphids are tropical

Why are aphids so successful?

- Asexual reproduction most of the time
  - Live birth reduces mortality
  - Shortened life cycle (5-8 days to adult)
  - Telescopic generations "predict" future
- Capable of flight
- Feed on endless source of plants
- Use temperature and photoperiod

Do aphids have enemies?

- Predators, parasitoids and pathogens

Can enemies reduce aphid #'s?

- Yes! Great option for homeowners
- Usually a time delay in suppression
- Susceptible to broad spectrum insecticides
- Buying commercial isn't most effective

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- Adults feed on pollen/nectar
- Diverse plantings will attract many enemies

Do aphids hire security guards?

- 25% are ant-tended
- Increase honeydew production
- Relax defense behavior

More security: galling

- About 700 species can make galls
- Associated with host-alternating, defense
- Found on dicot plants
  - Rosaceae, Rutaceae, Solanaceae
- Found on leaves, petioles, flowers, roots
- Galls enclose aphids or loose leaf rolling
  - Plant irritation forms galling
  - Stimulates defensive growth


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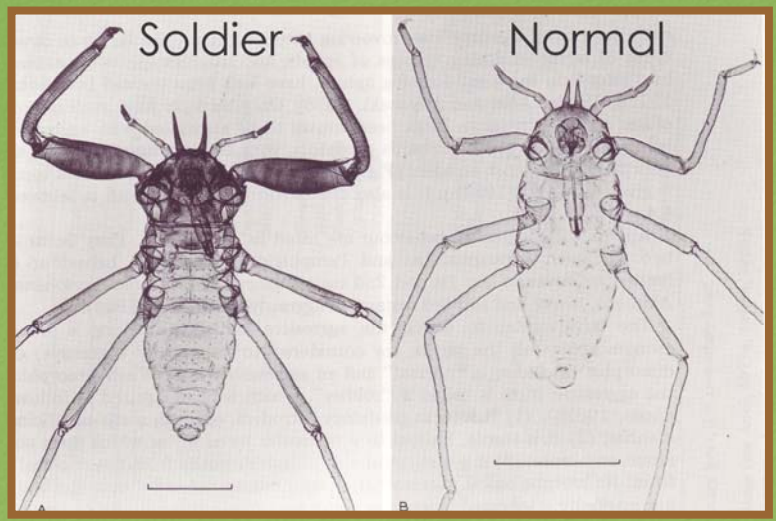
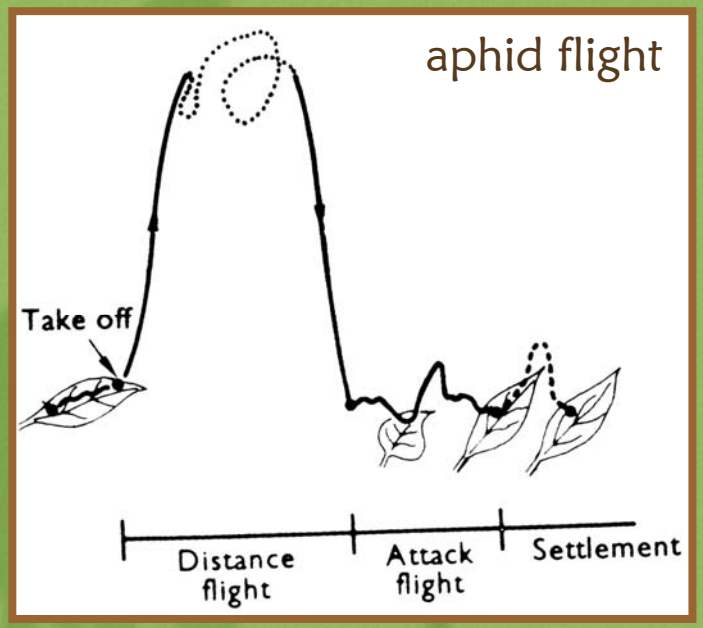
Are aphids wimpy?

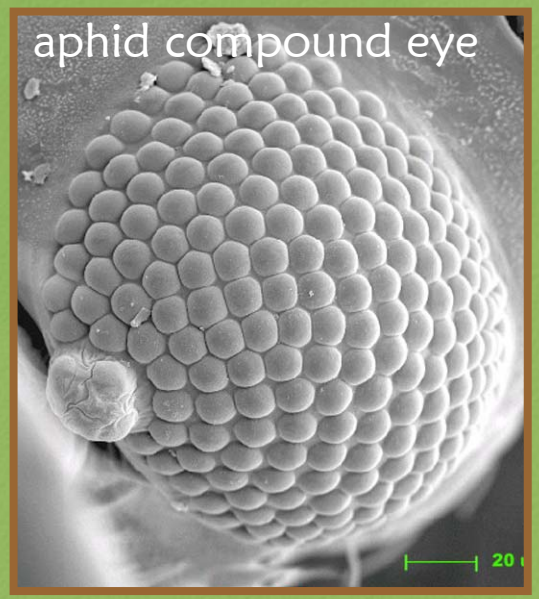
- Attempt defensive measures
  - Dropping from the plant, flying away
  - Some are distasteful to predators
  - Walking away, kicking, "waxing" predators
- Some aphids have soldiers for defense!



Other common questions

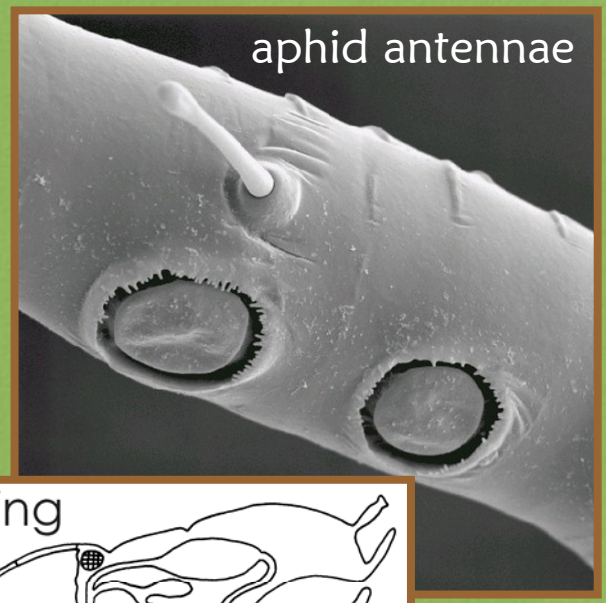
- *Are aphids strong flyers?*
  - No, but use wind currents to migrate
- *Can aphids see well?*
  - Not really, yellow is good cue

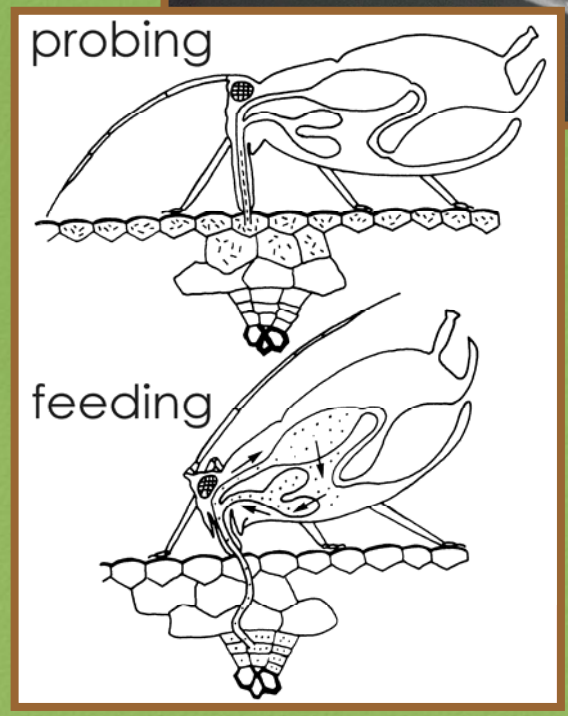




Other common questions

- *How do aphids recognize their food?*
  - First they scan plant with antennae and probe with stylets before settling
- *Are there any beneficial aphids?*
  - Not really, but they are part of the food chain





Most common ornamental aphids

- Green peach aphid
- Black cherry aphid
- Currant aphid
- Giant conifer aphids
- Rose aphids
- Giant willow aphid
- Elm leaf aphid
- Honeysuckle witches' broom aphid
- Leafcurl ash aphid
- Woolly apple aphid
- Snowball aphid

Common damage symptoms

- Cluster on flower buds, under leaves, stems
- Reduce plant vigor
- Produce mottling or leafcurl
- Gall formation
- Yellowing or speckling
- Sooty mold will reduce photosynthesis

Green peach aphid

- Can be green, yellow or red in color
- Oval shaped
- Can vector several plant diseases

Green peach aphid

- Winter hosts: peach, apricot, cherry, plum
- Summer hosts: > 200 ornamentals
- Common greenhouse pest
- Widely resistant to organophosphates and carbarmate insecticides
- Damage: leaf curling in the spring
- Can survive without sexual reproduction in warmer climates

Black cherry aphid

- Large, jet black aphids
- Winter hosts: sweet cherry, sour cherry
- Summer hosts: ?unknown?
- Can kill new growth
- Damage: leaf curling in the spring
- Peak populations in June

Black cherry aphid

Currant aphid

- Winter hosts: currant
- Summer hosts: motherwort and marsh betony
- Often on the leaf undersides
- Damage: leaf discoloration
- Insecticide options limited

Giant conifer aphid

- ¼” long, long-legged
- Reddish-brown color
- 30 species in our area

Giant conifer aphid

- Monoecious: pines, fir, Douglas-fir, spruce
- Each species is host specific to a tree genus
- Feed in large clusters, common and destructive
- Damage: yellowing, needle drop, dieback
- Honeydew and sooty mold common
- Peak populations in late spring

Rose aphids

- Light green, purple or pink in color
- Large (2.5mm) body; has long, dark legs
- One main host: Roses, eggs laid on canes
- Often on the leaf undersides
- Damage: distortion of new leaves and flowers, particularly like newly buds
- Honeydew promotes mold

Rose aphid

Elm leaf aphid

- Yellow to green in color, spots on abdomen
- One host: elm (American elm)
- Damage: leaf yellowing and leaf drop
- Honeydew is often a nuisance

Honeysuckle witches' broom aphid

- Small and green in color
- One main host: honeysuckle (tartarian)
- Damage: distorts new growth, leaf curling, and small leaves
- Systemic insecticides more effective

Woolly apple aphid

- Purple in color with white “cotton” body
- Long strands of white wax are produced that help to protect the colony

Woolly apple aphid

- Winter hosts: elm
- Summer hosts: apples, young trees
- Damage: yellowing foliage
- Colonies form at wound sites on trunks, limbs, and twigs, and feed on tender bark
- Move to roots and trunk below ground
- Swollen galls can form on roots; galls increase in size and fungi can attack

Control options

- Tolerance, do nothing
- Natural enemies can regulate populations
- High pressure from water hose
- Dormant oil before bud burst for eggs
- Horticultural oils will suffocate aphids
- Insecticidal soaps

Control options

- Use insecticides with caution
- Will kill natural enemies too
- Contact is key with exposed aphids!
  - Dursban, Merit, Orthene
  - Pyrethroids are erratic, can flare #'s
- Protected aphids need a systemic product
  - Soil drench or foliar application

Summary

- Most aphid species are uncommon
- Most are monoecious and holocyclic
- Parthenogenesis has allowed success
- Aphids are highly mobile and abundant
- Aphids are typically nuisance pests
- Deciduous tree-dwelling aphids are host specific and more easily identified

Where to get more information

- utahpests.usu.edu
- www.earthlife.net/insects/aphids.html

- *Garden Insects of North America.* Cranshaw. 2004. ISBN 0691095604
- *Insects and diseases of woody plants.* Cranshaw et al. 2003. ISBN 1889143049
- *Insects that feed on trees and shrubs.* Johnson and Lyon. 1991. ISBN 0801426022

Thank you!

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