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GROWER FACT SHEET: Aphid Management Guide

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INTEGRATED PEST MANAGEMENT (IPM)

IPM combines a variety of pest management techniques and strategies to either reduce pest populations or minimize their economic impact while maintaining plant quality.

Keys to Success

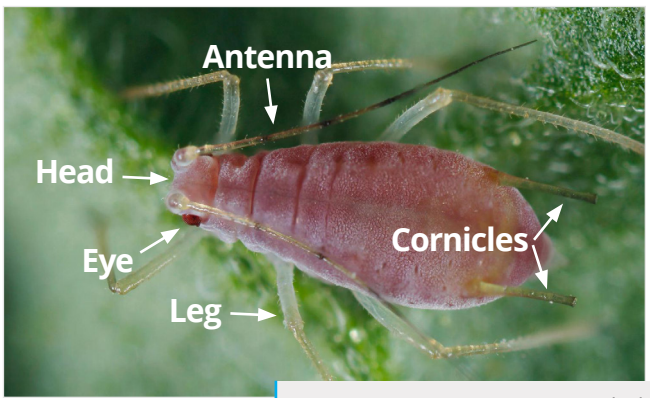
- Start clean and stay clean. Infestations are easier to prevent than cure.
- Change the mindset from pest eradication to pest management.
- Scouting/monitoring: look for signs of aphids, such as white cast skins on the plant surface, honeydew, and ant activity on the plants.
  - Utilize sticky cards and conduct regular visual inspections of the crop.
  - Check the underside of the leaves and stems for nymphs and adults.
  - Identify which stages of the pest are present.
  - Identify any beneficial insects currently observed in the crop.
- Record-keeping: record the time of year and growing conditions when populations are prevalent.
- Pest management decisions are based on population threshold: how many aphids are in the crop triggers an action.
- Implement control practices: cultural, mechanical, biological, and chemical.

APHIDS

Aphids are small (1.5 to 3.5 millimeters in length), soft-bodied insects with a pear-like shape. Their head is distinct from the thorax, containing a pair of segmented antennae and mouthparts. A pair of tube-like structures called cornicles are present at the rear of their abdomen. Their color can vary by species. The life stages of aphids include eggs, nymphs, and adults. The nymphs and adults look similar morphologically, but the adults often look bigger in size, sometimes have wings, and can reproduce.

Aphids have piercing-sucking mouthparts that allow them to remove fluids from the plant. Their feeding habits can lead to stunted plant growth, deformed and discolored leaves, and production of galls on leaves, stems, or roots. Aphids are vectors of plant viruses, capable of transmitting viruses from one infected plant to other healthy plants. They secrete honeydew, which leads to sooty mold formation. The black covering of sooty mold then restricts the photosynthesis of the plant.

Most of the population of aphids is wingless, but the development of winged aphids is determined by environmental factors like low host plant quality, overcrowding, short daylight, or temperature (Fig. 1). During most of the growing season, the population is female with an asexual reproduction cycle. The females do not lay eggs but give birth to living young females.



Potato aphid.
Image courtesy Joseph Berger, Bugwood.org.

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Life Cycle

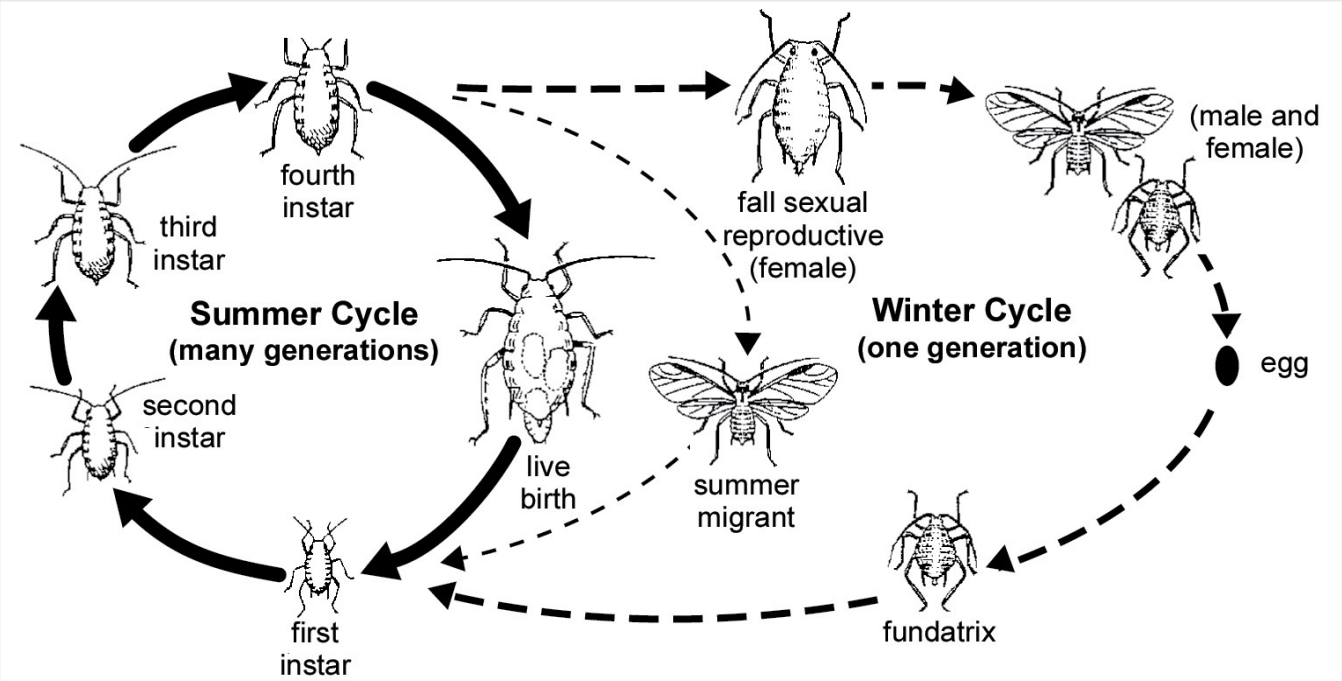


Figure 1. Aphid life cycle. Asexual reproduction occurs during most of the year (summer cycle). Some aphid species produce a generation of sexual individuals that produce overwintering eggs, as shown in the winter cycle.
Reproduced by permission from Pest Notes: Aphids. UC Statewide IPM Program. Univ. Calif. Agric. Nat. Res. Publ. 7404.

Chemical Control

- Pesticide safety
  - The use of insecticides is one option in the IPM toolbox (Table 1). Read and follow all label instructions for proper use.
  - Handle all pesticides carefully and store in their original containers.
  - Keep out of reach of children, pets, and non-licensed personnel.
  - Dispose of empty containers in a safe manner.
- Resistance management
  - Rotate products with different modes of action (MOA) to limit pesticide resistance.
  - Make no more than two sequential applications of any group before rotating to another MOA.

Green Peach Aphid.
Photo Courtesy of Jim Baker, North Carolina State University, Bugwood.org

TABLE 1. LIST OF INSECTICIDES AS PART OF AN APHID MANAGEMENT PROGRAM.		
ACTIVE INGREDIENT	TRADE NAME	IRAC MODE OF ACTION GROUP
Abamectin	Avid	6
Acephate	Precise, Orthene	1B
Acetamiprid	TriStar	4A
Afidopyropen	Ventigra	9D
Azadirachtin	AzaGuard, Azatin O, AzaSol, Molt-X	Inhibits molting hormone
Beauveria bassiana Strain GHA	BotaniGard	
Beauveria bassiana Strain PPRI 5339	Velifer	
Bifenazate + Abamectin	Sirocco	20D + 6
Bifenthrin	Attain TR, Talstar	3A
Chlorpyrifos	DuraGuard ME	1B
Cyantraniliprole	Mainspring	28
Cycaniliprole	Sarisa	28
Cycaniloprole + Flonicamid	Pradia	28 + 29
Cyfluthrin	Decathlon	3A
Cyfluthrin + Imidacloprid	Discus	3A + 4A
Dinotefuran	Safari	4A
Fenoxycarb	Preclude	7B
Fenpropathrin	Tame	3A
Flonicamid	Aria	29
Flupyradifurone	Altus	4D
Imidacloprid	Marathon, Benefit, Mantra	4A
Isaria fumosorosea Apopka Strain 97	Ancora	
Isaria fumosorosea Strain FE 9901	NoFly WP	
Kinoprene	Enstar	7A
Lambda-cyhalothrin	Scimitar, Demand CS	3A
Methiocarb	Mesurol	1A
Mineral Oil	Ultra-Pure Oil, SuffOil-X	Suffocation
Neem oil	Triact	
Potassium salts of fatty acids	M-Pede	Desiccation
Pymetrozine	Endeavor	9B
Pyrethrins	Pyreth-It, Pyrethrum	3A
Pyrethrins + Oil	Pycana	3 + suffocation
Pyrifluquinazon	Rycar	9B
Spinetoram + Sulfoxaflor	XXpire	5 + 4C
Spirotetramat	Kontos	23
Tau-fluvalinate	Flagship	4A
Thiamethoxam	Flagship	4A
Tolfenpyrad	Hachi-Hachi	21A

- Biological control agents (BCAs)
  - BCAs can be an effective option in a management program (Table 2). There are both parasitoids and predators that can be released preventively to regulate the aphid population.
  - Companies that produce beneficial insects have side effects/compatibility databases to guide the use of insecticides if BCAs are present.
  - Koppert side effects: https://www.koppert.com/news-information/side-effects-database/
  - Biobest side effects: https://www.biobestgroup.com/en/side-effect-manual
  - Bioline app: available on Google Play or the Apple App Store.

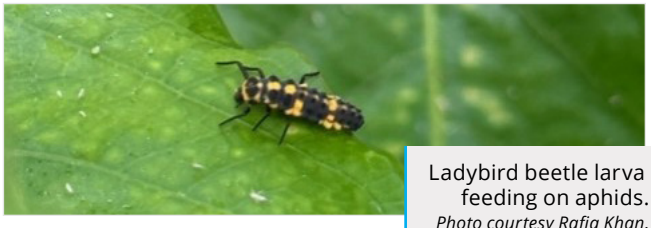
Table 2. BCAs that can be used as part of the IPM program.

Biological Control Agent	Control Type
Aphidius spp. (Parasitic wasp)	Parasitoid
Aphelinus abdominalis (Parasitic wasp)	Parasitoid
Ephedrus cerasicol (Parasitic wasp)	Parasitoid
Aphidoletes aphidimyza (Aphid midge)	Predator
Chrysoperla carnea (Green lacewing)	Predator
Adalia bipunctata (Two-spotted lady beetle)	Predator
Hippodamia convergens (Convergent lady beetle)	Predator
Coccinella septempuctata (Lady beetle)	Predator
Orius spp. (Minute pirate bug)	Predator

- Cultural control
  - Start with and maintain a healthy crop. Stressed plants are more vulnerable to pest and disease infestations.
  - Avoid over-fertilization, especially with nitrogen. Aphids thrive on soft, succulent new growth.
  - Provide proper spacing, and space on time.
  - Manage weeds in the greenhouse, throughout the nursery, and in the landscape, as these can be sources of aphid populations.
- Mechanical control
  - A directed spray of water at high pressure can physically remove aphids from the plant.
  - Yellow sticky cards can help catch and monitor flying aphids. Cards laid horizontally on the top of the crop can capture those in the plant. Sticky cards need to be replaced with new ones regularly.
  - Screening enclosures can help exclude aphids from entering production areas.
  - Prune plant stems if the aphid population is localized.
- Notes: Successful management of aphids largely relies on preparation of planting, monitoring, and proper decision-making in the use of IPM tools. The application of cultural, mechanical, biological, or chemical control strategies depends on the abundance of the aphid population, growing season, value of the crop, and cost associated with the application method.

Adalia bipunctata.
Photo courtesy Whitney Cranshaw, Colorado State University, Bugwood.org.

Aphidius ervi.
Photo courtesy Melissa Schreiner, Colorado State University, Bugwood.org.



Ladybird beetle larva feeding on aphids.
Photo courtesy Rafia Khan.