APHIDS

Aphids are the most common insect pests of small grains (for a key to aphids commonly found in small grains in California, see Summers and Newton 2003). They cause damage by feeding on the small grain crop and, except for the Russian wheat aphid, by serving as vectors of barley yellow dwarf virus. When small grain aphids become abundant, their feeding reduces plant vigor and results in yield loss. Damage results from early-season infestations before heading and late-season infestations in the heads shortly after heading. Significant losses can occur if aphid populations exceed 50 to 60 aphids per tiller (stem) before heads emerge from the boot. Heavy deposits of honeydew, particularly in the heads, may prevent grain or trash separation at harvest. High temperatures tend to reduce aphid populations.
The bird cherry-oat aphid (Rhopalosiphum padi) (fig. 1) is the most damaging aphid species in California small grain production and may reach injurious levels from late winter to early spring. Aphids first appear on lower leaves and stems and frequently colonize the underside of lower leaves. As plants grow, infestation progresses upward, with aphids feeding on stems and leaves and eventually colonizing the heads. The aphid has an olive-green body, which may vary from black to pale green, giving it a mottled appearance; a prominent reddish-orange patch between and at the base of the cornicles; pale green legs and cornicles with dark tips; and relatively long, black antennae.

The corn leaf aphid (R. maidis) (fig. 2) is found in the plant's whorl. This aphid has a greenish blue body with darker areas surrounding the base of the cornicles, which are short and broad. The head and short antennae are dark; cornicles and legs are black.

The greenbug (Schizaphis graminum) (fig. 3) is found on the underside of lower leaves. It often is the major aphid pest of small grains in the Imperial Valley and the Intermountain Region of Northern California. It has a light green body with a dark green stripe down the middle of the back. The antennae are black; the cornicles and legs are pale green, with the legs having black tips. The greenbug can damage plants by injecting toxins; these toxins usually do not affect yield unless greenbug populations are very high before tillering (the first 4 weeks after planting).

The rose-grain aphid (Acyrthosiphum (Metopolophium) dirhodum) (fig. 4) is an elongate green or yellow-green aphid with a distinct bright green stripe down its back. It resembles the greenbug but is larger, the joints in the antennae are darker than the middle portion of the antennae, and the antennae usually reach beyond the base of the cornicles. Unlike the greenbug, the rose-grain aphid doesn't produce toxins and usually appears later in the season, after full tillering.
The English grain aphid (*Macrosiphum avenae*) (fig. 5) appears later in the season, usually after heading, and is found principally on the maturing heads. It is larger than other aphids common on small grains. The body is light green to tan with black antennae, cornicles, and leg joints. The cornicles are long and narrow. Small black markings may be present on the abdomen.

The Russian wheat aphid (*Diuraphis noxia*) (fig. 6) is small, light green, and lacks prominent cornicles. It can be distinguished from all other cereal aphids by a second taillike appendage directly above the cauda, giving it a twin-tailed appearance when viewed with a hand lens. The Russian wheat aphid can damage plants by injecting a toxin that is responsible for many damage symptoms, the most characteristic of which are **longitudinal white streaks** on the leaves and sometimes on the stem. Heavily infested plants are stunted and sometimes exhibit a flattened appearance, with tillers lying almost parallel to the ground. Infested leaves curl up like a soda straw and remain in a rigid upright position rather than assuming the typical drooping posture, preventing access by common natural enemies (syrphid fly larvae, lady beetle adults and larvae, and lacewing larvae). The aphid is frequently found within these curled leaves. If the awns are trapped in the curled flag leaf, the head is usually distorted and assumes a fishhook appearance. Aphid populations tend to be higher and more damaging on moisture-stressed plants and on late-sown fields (late-sown fields can easily become moisture stressed). Wheat and barley are the most susceptible; rye and triticale, while susceptible, are usually less damaged; and oats appear to sustain little or no injury. Treatment thresholds for irrigated wheat are shown in table 1. Thresholds for irrigated barley may be similar, but thresholds have not been developed for rainfed wheat or barley. Injury is normally most severe on rainfed grain.

Aphid control can be achieved through the activity of natural enemies or, when needed, the use of insecticides (see Summers et al. 2002 for recommended insecticides and rates). Natural enemies include insects such as parasitic wasps (indicated by aphid mummies) and various predators (syrphid fly larvae, lady beetle adults and larvae, and lacewing larvae) as well as entomophagous fungi. These fungi can spread rapidly through an aphid population under proper temperature and humidity conditions and virtually eliminate the aphids within a week. The natural enemy complex is usually sufficient to control aphids; in any case, their effectiveness and relative numbers should be evaluated before insecticides are used. Insecticide

![Figure 5. English grain aphid. Photo by Jack Kelly Clark.](image1)

![Figure 6. Russian wheat aphid. Photo by Jack Kelly Clark.](image2)

<table>
<thead>
<tr>
<th>Growth stage</th>
<th>Treatment thresholds (number of aphids)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-leaf</td>
<td>5 per plant</td>
</tr>
<tr>
<td>early tillering</td>
<td>5 per tiller</td>
</tr>
<tr>
<td>late tillering</td>
<td>10 per tiller</td>
</tr>
<tr>
<td>first node</td>
<td>10 per tiller</td>
</tr>
<tr>
<td>boot stage</td>
<td>20 per tiller</td>
</tr>
<tr>
<td>heading and later</td>
<td>30 per tiller</td>
</tr>
</tbody>
</table>
use should be avoided if possible because natural enemies associated with small grains aid in pest control not only in this crop but in other crops as well.

CEREAL LEAF BEETLE

The cereal leaf beetle (*Oulema melanopus*) was first found in the eastern United States in the 1940s. Its range now includes the northwestern United States, and it is a threat to enter California. Adults and larvae feed on a variety of small grains and wild grasses, skeletonizing leaf surfaces and reducing photosynthetic area. Feeding also contributes to water loss by plants. Plants senesce earlier, produce fewer tillers, and have lower yields. Oat, barley, and wheat are preferred hosts. Adult beetles are approximately $\frac{3}{16}$ inch (5 mm) long and have shiny, metallic blue forewings and a bright red thorax. Adults spend the winter in leaf litter and duff near infested fields. They leave the overwintering site in the spring, mate, and begin to lay eggs. The small, yellowish eggs are placed individually on the upper surface of the leaf, and yellow, grublike larvae emerge in about a week at temperatures near 80°F (27°C). The larvae cover their bodies with a slimy brown substance comprised of mucus and fecal matter as a defense against predators. The larvae feed on the upper surface of a leaf, leaving only a thin membrane. Pupation occurs in an earthen cell about $\frac{1}{2}$ to 2 inches (1.2 to 5 cm) below the surface. Adults emerge from the pupae after about 15 to 20 days and move out of the grain field to protected places. They return to grain fields the following spring.

The treatment threshold used in many states is more than one cereal leaf beetle egg or larva per two stems if larvae have begun to hatch (damage assessments have not been done in California since this pest has not yet invaded California). Several insecticides provide good control. Since beetles prefer thin stands, agronomic practices that promote full stands are desirable. Natural enemies, including an egg parasite (*Anaphes flavipes*) and a larval parasite (*Tetrastichus julis*) aid in control of cereal leaf beetle in some areas.

MITES

The brown wheat mite (*Petrobia lateens*), winter grain mite (*Penthaleus major*), and Banks grass mite (*Oligonychus pratensis*) occur on small grains. The brown wheat mite (fig. 7) is about 0.025 inch (0.6 mm) long, oval shaped, and dark red or brown in color. The winter grain mite (fig. 8) is larger, 0.04 inch (1 mm) long, and dark bluish black with red-orange legs and a red-dish patch on the upper side. The Banks grass mite is extremely small, 0.001 inch (0.025 mm) long, and yellow to cream in color.

Leaves injured by brown wheat mite first appear silvery and later take on a scorched appearance. Injury caused by the winter grain mite results in yellowish leaves and stunted plants, symptoms similar to cold temperature injury. Banks grass mite turns leaves silvery, and the tips and margins later turn brown; webbing is an additional sign that injury is caused by the Banks grass mite. Both brown wheat mite and Banks grass mite cause the greatest injury to water-stressed plants. A timely irrigation usually alleviates the problem. Crop rotation helps control the winter grain mite. The brown wheat mite, winter grain mite, and Banks grass mite seldom cause significant damage in California.
The straw itch mite (*Pyemotes tritici*) parasitizes a variety of insects, including stored grain pests such as the Angoumois grain moth (*Sitotroga cerealella*). It also attacks humans. Infestations can occur on alfalfa, barley, oat, and wheat hay and can produce irritation on livestock and humans. People who handle infested straw, crops (beans, cotton, small grains), or crop residues can be severely affected. Symptoms are similar to those caused by chiggers and develop into a hivelike rash over much of the body. Intense itching can last a week or so and may be accompanied by fever, headaches, and mild diarrhea. Infestations of storage facilities can be treated with insecticides containing pyrethroids. No economical chemical controls are available for baled hay.

**WHEAT STEM MAGGOT**

The wheat stem maggot (*Meromyza americana*) (fig. 9) larva is about 0.25 inch (6 mm) long and is pale green or cream. It is a legless maggot that is generally found inside the stem. The adult is a small, yellowish white fly with bright green eyes and three black stripes across the thorax and abdomen.

Eggs are laid in September and October and hatch later in fall. The young maggots overwinter. When development resumes in spring, damage is caused by maggots feeding in the upper portion of the stem, which cuts off nutrient flow. The wheat heads turn a whitish color, and they easily pull free from where they have been chewed and slide out of the leaf sheath. Infested plants also have fewer tillers than healthy plants. Injury caused by the wheat stem maggot is obvious but usually not serious, so control is not needed.

**WIREWORMS**

Small grain wireworms (*Aeolus* sp., *Anchastus* spp., *Melanotus* spp., and *Limonius* spp.) (fig. 10) are found in the soil. Damage is done by the larval stage, which is a thin, yellowish brown worm that has a shiny, tough skin. Wireworms feed on roots of emerging plants, killing the seedlings and reducing the stand. As plants mature, wireworms may girdle the stem, causing white heads. This damage is similar in appearance to that caused by common root rot, take-all, and wheat stem maggot. Wireworm infestations are difficult to detect prior to visible plant injury. Infestations of small grains are most likely following a long-term legume crop or natural or temporary pasture.

Fallowing during summer with frequent tillage (springtooth or disk) should be done on fields known to contain wireworm larvae. Small grain fields damaged in the seedling stage can be replanted if replanting occurs before existing plants begin to tiller. Rotation to nonhost crops is useful. Chemical controls, if used, must be applied preplant or as seed treatments.

**OTHER INSECTS**

Other insect pests such as cutworms, grasshoppers, and armyworms can occasionally damage small grains, but damage is not regular or widespread.

**REFERENCES**


Strand, L. L. 1990. Integrated pest management for small grains. Oakland: University of California Division of Agriculture and Natural Resources Publication 3333.


FOR MORE INFORMATION
To order or obtain printed ANR publications and other products, visit the ANR Communication Services online catalog at http://anrcatalog.ucdavis.edu. You can also place orders by mail, phone, or FAX, or request a printed catalog of our products from:

University of California
Agriculture and Natural Resources
Communication Services
6701 San Pablo Avenue, 2nd Floor
Oakland, California 94608-1239
Telephone: (800) 994-8849 or (510) 642-2431
FAX: (510) 643-5470

E-mail inquiries: danrcs@ucdavis.edu

An electronic version of this publication is available on the ANR Communication Services Web site at http://anrcatalog.ucdavis.edu.

Publication 8170
© 2006 by the Regents of the University of California, Division of Agriculture and Natural Resources. All rights reserved.

The University of California prohibits discrimination or harassment of any person on the basis of race, color, national origin, religion, sex, gender identity, pregnancy (including childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition (cancer-related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or status as a covered veteran (covered veterans are special disabled veterans, recently separated veterans, Vietnam era veterans, or any other veterans who served on active duty during a war or in a campaign or expedition for which a campaign badge has been authorized) in any of its programs or activities. University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University’s nondiscrimination policies may be directed to the Affirmative Action/Staff Personnel Services Director, University of California, Agriculture and Natural Resources, 1111 Franklin Street, 6th Floor, Oakland, CA 94607-5201, (510) 987-0096. For a free catalog of other publications, call (800) 994-8849. For help downloading this publication, call (530) 297-4445.

This publication has been anonymously peer reviewed for technical accuracy by University of California scientists and other qualified professionals. This review process was managed by the ANR Associate Editor for Agronomy and Range Sciences.

pr-9/06-SB/CM