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SMALL GRAIN PRODUCTION MANUAL PART 7

Pest Management of Small Grains—Insects

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This publication, *Pest Management of Small Grains—Insects*, is the seventh in a fourteen-part series of University of California Cooperative Extension online publications that comprise the *Small Grain Production Manual*. The other parts cover specific aspects of small grain production practices in California:

- *Part 1: Importance of Small Grain Crops in California Agriculture*, Publication 8164
- *Part 2: Growth and Development*, Publication 8165
- *Part 3: Seedbed Preparation, Sowing, and Residue Management*, Publication 8166
- *Part 4: Fertilization*, Publication 8167
- *Part 5: Irrigation and Water Relations*, Publication 8168
- *Part 6: Pest Management—Diseases*, Publication 8169
- *Part 8: Pest Management—Vertebrates*, Publication 8171
- *Part 9: Pest Management—Weeds*, Publication 8172
- *Part 10: Small Grain Forages*, Publication 8173
- *Part 11: Small Grain Cover Crops*, Publication 8174
- *Part 12: Small Grains in Crop Rotations*, Publication 8175
- *Part 13: Harvesting and Storage*, Publication 8176
- *Part 14: Troubleshooting Small Grain Production*, Publication 8177

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.





Figure 1. Bird cherry-oat aphid. Photo by Jack Kelly Clark.



Figure 2. Corn leaf aphid. Photo by Jack Kelly Clark.



Figure 3. Greenbug. Photo by Jack Kelly Clark.



Figure 4. Rose-grain aphid. Photo by Jack Kelly Clark.

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 (*Acyrtosiphum (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.



Figure 5. English grain aphid. Photo by Jack Kelly Clark.



Figure 6. Russian wheat aphid. Photo by Jack Kelly Clark.

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 tail-like 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.

Table 1. Russian wheat aphid treatment thresholds for irrigated wheat

Growth stage	Treatment thresholds (number of aphids)
2-leaf	5 per plant
early tillering	5 per tiller
late tillering	10 per tiller
first node	10 per tiller
boot stage	20 per tiller
heading and later	30 per tiller

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

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 reddish 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.



Figure 7. Brown wheat mite. Photo by Jack Kelly Clark.



Figure 8. Winter grain mite. Photo by Jack Kelly Clark.



Figure 9. Wheat stem maggot. Photo by Jack Kelly Clark.



Figure 10. Small grain wireworm. Photo by Jack Kelly Clark.

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.

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