

The Alfalfa Seed Chalcid: An Important Alfalfa Seed Pest

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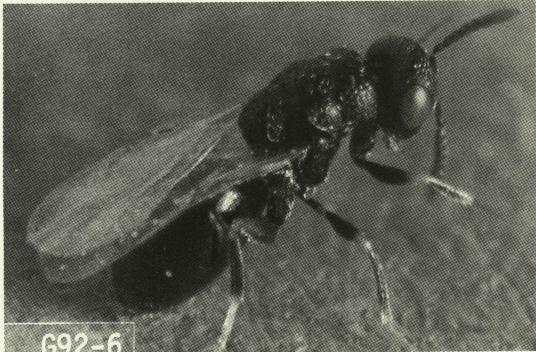


Fig. 1. A female adult alfalfa seed chalcid, approximately 1/16 inch long.



Fig. 2. Seed chalcid adults emerged from these seeds leaving characteristic exit holes.

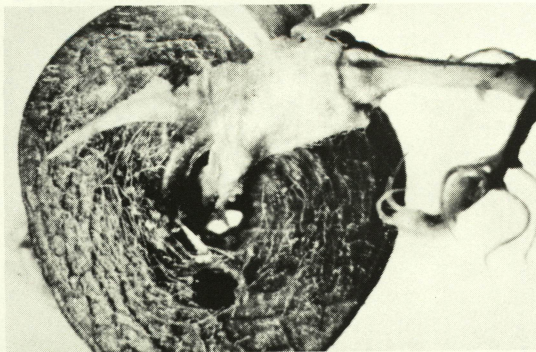


Fig. 3. An alfalfa seed chalcid emergence hole in a pod.

The alfalfa seed chalcid (*Bru-chophagus roddi*) is a small wasp commonly found in alfalfa seed. Insect adults are often seen flying around the combine at seed harvest or crawling in bins of unconditioned seed. Damaged seeds containing immature larvae are encountered at the seed processing plant during seed sorting on the gravity table.

Severe chalcid damage may occur when growers ignore established crop sanitation and chalcid reduction practices. Cultural practices help keep this pest in check without pesticide use, but yield losses of up to 20 percent are not uncommon.

Appearance

The alfalfa seed chalcid is a tiny (1/16 inch long) black wasp (fig. 1). The body is shiny and black but not metallic, and the eyes are red. The males have longer, hairier antennae than the females.

The larvae are white, legless, and grublike. Immatures develop from egg to pupa inside one seed. To see the larvae, lightly crush infested seed with a pencil point and examine the seed under a microscope or hand lens. A seed containing a seed chalcid larva appears whole but is slightly larger and less glossy than normal seed.

Life history

Seed remaining in the field from the previous harvest or in volunteer alfalfa along roadsides and ditch banks are sources of infestation. Chalcids overwinter in seed as mature larvae that give rise to adults the following spring. Adults begin to emerge in May when the first seedpods appear. The adults may live up to 4 weeks in the field.

Adults fly during the day when temperatures exceed 70°F, mostly between 11 a.m. and 5 p.m. Researchers have recorded seed chalcids moving three-quarters of a mile, and we can assume they are capable of traveling several miles.

The females emit a volatile chemical, called a sex pheromone, to attract males for mating. Unmated females can still lay eggs, but their offspring will all be male.

Females insert eggs into developing seedpods, one egg to each seed, 7 to 9 days after the flower has been pollinated. Eggs hatch in several days, and the larvae begin to feed on the insides of the seeds. One seed contains enough nourishment for one larva to reach maturity.

Shortening day lengths in the fall induce larval diapause, a resting state. Diapausing mature larvae spend the winter inside hollow seed. Once mature, the adult chews its

way out of the seed, leaving a round exit hole (fig. 2). If the seed is still enclosed by a pod, the chalcid will chew a hole through the pod (fig. 3).

Each female produces an average of about 38 offspring, but as many as 86 are possible. The offspring are about 60 percent female. The chalcid produces two generations per year in Idaho, but additional generations are possible where the growing season is longer.

The seed chalcid cannot lay eggs in mature seeds. It requires green, developing pods for oviposition. Therefore, adults emerging in seed bins pose no threat to undamaged seed.

Damage

Alfalfa seed chalcid damage can be recognized by the tiny emergence holes in seeds and pods. Often, damage goes unnoticed until the seed is being cleaned, when large amounts of light seed become evident on the gravity table. When the table is set to remove chalcid seeds, some good seeds are also floated off, producing an additional loss. The full extent of the damage is often difficult to determine because much of the light, chalcid-infested seed is blown out of the combine at harvest.

Damage by the seed chalcid is variable, but in general, the longer a field has been in alfalfa seed production, the higher the seed chalcid population. Losses as high as 85 percent have been recorded. However, today's cultural practices hold damage below catastrophic levels.

A recent survey in Canada found seed losses averaging 4 percent and ranging from less than 1 percent to 20 percent. In our 1991 survey of 15 Treasure Valley seed fields, damage ranged from 0 to 7.4 percent. The median was 1.4 percent chalcid-damaged seed. While most seed fields in Idaho are not seriously affected, a few have significant levels of damage.

Management

Adult seed chalcids emerge over a span of several weeks. This continuing emergence of adults makes insecticide use an uneconomical control method. Sprays applied for lygus bugs or aphids may kill the adult chalcids present that day but not the adults emerging later. Spraying is not effective on larvae because they are protected inside the seed.

No insecticides are specifically registered for control of the seed chalcid. Reduced spraying for lygus bugs and other pests in recent years has probably contributed to higher seed chalcid levels in some areas.

Cultural practices

The following cultural practices help reduce seed chalcid populations.

- **Irrigate in fall.** Moisture helps fungi break down the seed coat surrounding the chalcid. Without this protection the seed chalcids die as they lie on the ground during the fall.
- **Set back or cut hay in the spring.** This delays bloom. The first generation seed chalcids emerge when the first pods would normally appear but find no pods for egg laying.
- **Use an adequate population of alfalfa leafcutting bees.** About 40,000 bees per acre are needed to rapidly pollinate the crop and minimize the length of time that young pods are available to chalcids for egg laying.
- **Destroy chaff and light seed produced during harvest.** Bury or compost the chaff and waste seed left in the field and produced at the cleaning plant.
- **Destroy volunteer alfalfa.** Volunteer alfalfa and California burclover are important sources of new infestations. Chalcid populations can build in any waste area where these plants

go to seed. For instance, we found one area of volunteer alfalfa in Idaho with 31 percent damaged seed.

- **Cultivate lightly in the fall or spring.** Use a spring-tooth harrow to bury chalcid seeds at least 3/4 inch. The seed chalcids are unable to emerge through the soil and will die there.

Natural enemies

At least four parasite species in Idaho help keep chalcid populations in check naturally. These parasites, also tiny wasps, lay their eggs in seeds containing alfalfa seed chalcid larvae. The parasite eggs hatch, and the parasite larvae devour the seed chalcid.

In our 1991 Treasure Valley survey, we found parasitism ranging from 8 to 77 percent, with a median of 45 percent. The most common parasites we found in Idaho were *Liodontomerus perplexus*, *Aprostocetus bruchophagi*, and *Pteromalus medicaginis*. *Mesopolobus bruchophagi* was less common. While integrated pest management practices may have increased seed chalcid populations by reducing the number of spray applications, it also may have helped these parasite populations.

Resistance

Plant breeders have found that plants with highly curled pods have the least seed chalcid damage. The seed chalcid's relatively short ovipositor (egg-laying structure) is unable to reach the inner seeds in curled pods. No varieties have yet been developed to take advantage of this trait.

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