

Clover Seed Chalcid in Alfalfa

no effective chemical control measures yet available for use against insect causing heavy losses to alfalfa seed growers

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A tiny wasp, the clover seed chalcid—*Bruchophagus gibbus* (Boh.)—is of increasing importance as a major pest in central California alfalfa seed producing areas. The insect has long been known in California and its damage has been particularly severe in the southern desert regions.

Estimates in certain fields in west Fresno County, in 1957, ran as high as 40% of the seed infested. During the fall of 1958, a survey was conducted in Fresno and Kern counties to determine more accurately the losses caused by this pest. Samples of mature seed in the pods were taken from 31 fields, 18 in west Fresno County and 13 in Kern County. The results tended to substantiate the estimates of damage made in 1957. In Fresno County the infested seed ranged from zero to 37%. The clover seed chalcid was found in all but one field in the survey. Damaged seed exceeded 15% in eight of the fields sampled and six of the 18 fields had infestations of 27%.

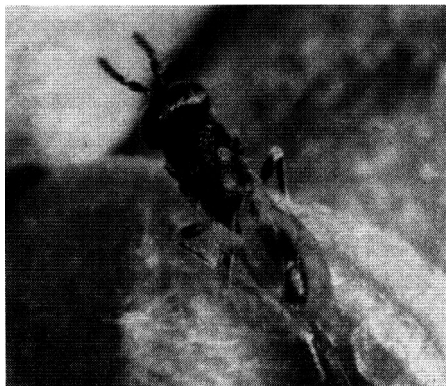
In fields sampled in Kern County, 3%–37% of the seeds were destroyed. Over 15% were destroyed in eight of the 13 fields, and three fields averaged more than 20% infested seed.

A comparison of samples revealed no significant differences in infestation between alfalfa varieties; both high and low infestations were noted in all varieties where enough fields were represented to make comparisons.

Wide Distribution

In addition to alfalfa, red and crimson clovers, the insect is reported to attack various bur clovers and trefoil. It apparently does not attack melilotus, alsike, ladino and white clover. It is world-wide in distribution and occurs in practically every locality in the United States where either red clover or alfalfa seed is grown commercially. It is generally distributed throughout California, at least as far north as Red Bluff, but damaging populations are largely confined to the southern desert regions and to the central and southern San Joaquin Valley.

The clover seed chalcid has been commonly referred to as the clover or alfalfa seed chalcis fly. Actually the insect is not a fly but a tiny, jet black wasp, about $\frac{1}{12}$ " long. It belongs to a group or super-



Adult clover seed chalcid resting on an alfalfa seed pod.

family of wasps, the members of which are mostly parasitic on other insects. The clover seed chalcid is thus a unique member of this group, for its larvae feed only within the developing seeds of alfalfa and certain other small-seeded legumes.

The insects pass the winter in the larval stage, within infested seeds. They may enter hibernation in late summer, but generally do not pupate until the latter part of February and throughout March. The adults begin to emerge and become active in the central valleys during April and early May. The earliest infestations are found in bur clover and in volunteer alfalfa along fence rows, ditch banks and roadsides. The chalcid may pass through a generation on bur clover and volunteer alfalfa before seed fields are mature enough for the insects to infest. However, many seed fields in the southern central valley become mature enough by late May.

The female inserts the eggs with her ovipositor through the seed pod into the soft, developing green seed. The eggs are placed singly and only one larva develops within a seed. According to studies conducted by other workers in Utah, the majority of the eggs hatch in four days; the average feeding period of the larva is approximately 10 days and the pupal period averages about 12 days. In Utah the period of development from egg to adult averages about 23 days in summer.

The exact number of generations that may occur under central California conditions has not been determined, but it is believed that there may be as many as three or four in a single season. Popu-

lations increase from spring through late summer; consequently, late season seed is more severely attacked.

The larva feeds within a developing seed, completely hollowing it out and leaving nothing but the seed coat. After completing its development, the newly formed adult wasp gnaws a hole through the seed coat and the pod and emerges. Seed pods or light seed with small round holes are diagnostic of chalcid damage. Frequently the actual amount of seed damage is not known to the grower, largely because the empty seeds—and some seeds from which the adult wasps have not yet emerged—are blown out with the chaff and screenings during threshing.

Control Difficult

Control of the chalcid is especially difficult because effective chemical control measures have not been developed. The eggs and the developing larvae within the seeds are well protected from the usual insecticides used in alfalfa seed fields. Systemic insecticides are being tested but it has not been demonstrated that the chemicals are concentrated sufficiently in the seeds to be effective in destroying the larvae.

The adult wasps are most active in the fields during bloom and seed set when bees and other pollinating insects are especially needed. Excessive application of chemicals during that period is undesirable because of harmful effects on pollinators. It may be possible to reduce, temporarily, a population of adult seed chalcids with an insecticide. However, continuous emergence of adults from the seeds and migration from outside sources of infestation, such as volunteer alfalfa and bur clover, will result in reinfestation of a field within a few days, requiring frequent, repeated applications.

The clover seed chalcid is attacked by at least 10 species of parasitic wasps and undoubtedly, they aid in reducing the seed chalcid populations, but apparently do not often occur in sufficient numbers to hold damage below economic levels.

Certain cultural practices or combinations of practices may aid in reducing chalcid infestations: 1, destruction of volunteer alfalfa and bur clover near seed

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