Clover Seed Chalcid in Alfalfa

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

Oscar G. Bacon, Walter D. Riley, Vernon E. Burton, and Armen V. Sarquis

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%.

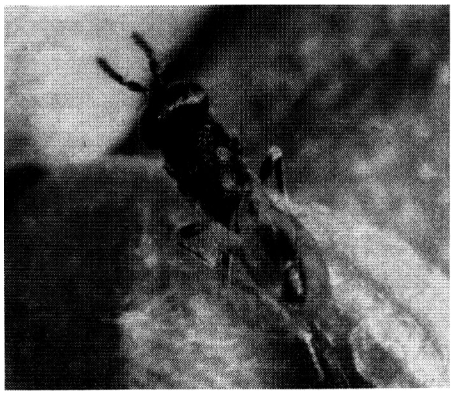
In fields sampled in Kern County, 3%–37% of the seeds were destroyed. Over 15% were destroyed in eight of the 13 fields, and three fields averaged more than 20% infested seed.

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 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. Populations 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 calcid 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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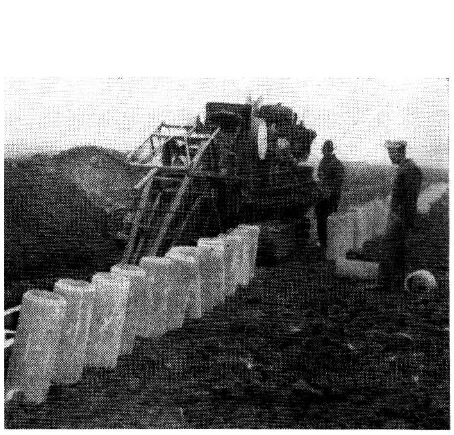
Area-wide Drainage

herringbone pattern and interception type systems solve drainage problems

Jewell L. Meyer and Clyde E. Houston



Installing concrete tile drainage system.

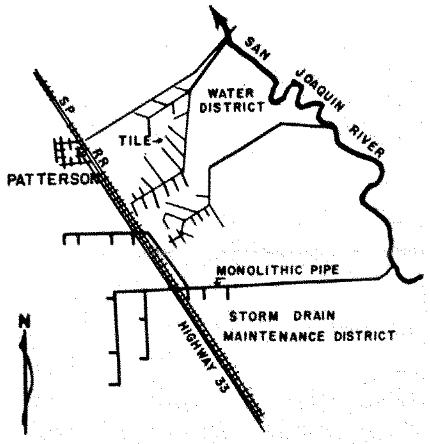
Nearly 50 acres of apricot trees in the Patterson area of Stanislaus County were killed when the water table rose to within 3′ of the surface in 1955. Several hundred additional acres were threatened by a rising water table.

Interpretations of water table fluctuations and determinations of hydraulic conductivity of the soil indicated that an area-wide drainage system installed in a herringbone pattern of 40,000′ of 4″ laterals and 10,000′ of 8″ main line should lower the water table to sufficient depth to eliminate water damage to trees. The system was installed with concrete tile laid about 8′ deep and with a gravity discharge into the San Joaquin River.

During the exceptionally wet winter of 1957–1958, the water table in the tiled area rose to within 5′ of the surface. Rainfall was recorded at 24″; annual average rainfall in this area is 11″. However, no trees were lost and farmers and irrigationists have estimated as many as 400 acres of trees were saved by the tile drain.

Investigation for a second project to help drain surface water from an adjacent rich vegetable land was begun in 1956. All water from irrigated crop land drained to the low end of fields and was ponded on individual farms to eventually evaporate or to percolate into the sub-

Installation diagram of two types of drainage systems near Patterson.



soil and contribute to the water table in the adjacent and lower orchard areas.

Investigation indicated that an interception type drainage system would be necessary to handle the problem. Consequently, 20,000′ of main line 30″ and 36″ diameter monolithic concrete pipe was laid in November, 1958, to discharge into the San Joaquin River and serve as the master drain. Thirty thousand feet of farm laterals 8″–20″ in diameter were tied into the master drain line. The entire system was designed to handle irrigation waste water for about 4,000 acres and storms of about 25 years frequency.

Observations the spring of 1959 indicate the interceptor line will handle all surface runoff. During pre-irrigation for tomatoes and beans in April and May over 3,000 acres of the 4,000 acres in the district were being irrigated at the same time. The system carried all excess water with no ponding on individual fields. Rainfall during the winter of 1958–1959 was below normal, therefore, a good test of storm drainage was not possible.

Jewell L. Meyer is Farm Advisor, Stanislaus County, University of California.

Clyde E. Houston is Extension Irrigation and Drainage Engineer, University of California, Davis.

The Patterson Water District was responsible for the tile installation. Stanislaus County Storm Drain Maintenance District No. 1 was responsible for the installation of the monolithic concrete pipe.

POTATO

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both were operating on the same land; running out of fuel in the tractor, or harvester; trucks getting stuck in wet spots; foreign objects being dug up; adjustments of harvester parts; and rest periods for the crews. The lands were laid out by the harvesters. This required removing the outer rear dual wheel from the trucks.

Potato Injury

Samples of potatoes from several different fields and growers using machine and hand harvesting were examined for injuries. The injuries were classed into three groups as bruised, cut, skinned. Bruised, included any damage to the flesh regardless of the amount; cut, anything sliced or shaved; and skinned, any skinning regardless of amount.

Machine harvested potatoes were hauled in side or rear dump type trucks and samples were taken as the trucks unloaded into pits at the shed.

Hand harvested potatoes were hauled in stub sacks and in bulk. Samples were taken from the stub sacks in the field before loading onto the trucks and again from the conveyor at the shed when the potatoes were unloaded from the trucks.

A comparison of the same variety of potatoes—White Rose—showed less injury with machine harvesting than with hand harvesting. There was a considerable increase of injury to the hand harvested potatoes between field and shed. Maturity of the potatoes could have been a factor in the difference.

J. R. Tavernetti is Agricultural Engineer, University of California, Davis.

Mike B. Zahara is Assistant Specialist in Vegetable Crops, University of California, Davis.

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fields; 2, complete burning of straw and chaff in the field after harvest; 3, tillage after harvest to cover seeds left in the field; 4, prevention of seed set on regrowth after harvest; and 5, covering of trucks loaded with seed to prevent the scattering of infested seeds or the occurrence of volunteer plants along highways. To be most effective, these measures should be generally practiced throughout seed producing areas.

Oscar G. Bacon is Associate Professor of Entomology, University of California, Davis.

Walter D. Riley is Principal Laboratory Technician in Entomology, University of California, Davis.

Vernon E. Burton is Farm Advisor, Kern County, University of California.

Armen V. Sarquis is Farm Advisor, Fresno County, University of California.

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