Yellow Clover Aphid on Alfalfa

pest not ruinous to state's alfalfa industry but production costs increased by frequent field inspections and treatments

R. C. Dickson and H. T. Reynolds

By mid-May 1955 the populations of the yellow clover aphid—*Therioaphis trifolii* (Monell)—in alfalfa fields in the desert areas of California had dropped off to such an extent that many fields did not require treatment.

After the yellow clover aphid was discovered in California on February 7, 1954, there was a surge of heavy populations—a common occurrence with many new pests—but there seems to be a settling down to a less injurious annual pattern.

Following the initial flare-up in the desert in June and July of 1954, the aphid sank to low numbers in August and September. By October, 1954, the aphid population was rising and through the fall and early winter there was some damage to hay and a great deal of damage to seedling fields. Populations were generally low in December, 1954, and January, 1955. This spring it began to build up with warmer weather and was damaging alfalfa hay in some fields by March 1. Damage to untreated fields continued severe into May but then the populations subsided.

Localities nearer the coast have their population peaks shifted toward the summer. It appears that the yellow clover aphid may never be a pest in a true coastal climate.

The highest population counted in the current investigations amounted to about 600 aphids per stem of alfalfa, or more than one billion per acre. Short hay alfalfa begins to show stickiness at about 40 aphids per stem, or 70 million per acre. Populations injurious to seedling alfalfa may be much lower, possibly not more than one aphid per plant on very small seedlings.

An important fact in yellow clover aphid populations is the high percentage of winged forms produced. Stands have been ruined in a few days by aphids that have flown in from adjacent hay fields.

Yellow clover aphid feeding seems to be poisonous to the alfalfa plant. This is particularly evident in small seedling alfalfa. The little plants die suddenly from the feeding injury.

Damage to hay crops may take the form of retarded growth, stickiness from honeydew—aphid excrement—that interferes with harvesting and baling, or sometimes complete loss of quality from the dropping of the lower leaves and blackening by sooty mold fungus which grows on honeydew. A special type of injury is prevention of regrowth after cutting. Aphids may completely cover the developing shoots when they are about 1" long and stop their growth entirely. If allowed to persist, this situation may cause the death of many plants and seriously thin the stand as heavy aphid populations on large alfalfa may do. The aphid appears to be aided in stand thinning by soil fungi that invade weakened roots.

The yellow clover aphid in California goes by the scientific name of *Therioaphis trifolii* (Monell), also called *Myzocallis trifolii* (Monell). It has become increasingly evident that the yellow clover aphid in California is not identical with the yellow clover aphid that has been present on clovers in eastern and midwestern United States for the past 80 years.

The yellow clover aphid in California seems to be the same one that has lived on alfalfa in India and in the Mediterranean region for a long time. Whether this alfalfa-preferring yellow clover aphid is a distinct species, a subspecies, or a host-preference strain will have to be worked out later.

It is very probable that the yellow clover aphid in California was accidentally introduced into New Mexico about two years ago. From that center it has spread west through Arizona into Cali-

Concluded on page 15

biological control

natural enemies of aphid in California sought in European, Mid-East countries

C. P. Clausen

Field observations on the yellow clover aphid were made in southern California during the past year to determine the status of the predators that attack the aphid and the presence or absence of internal parasites. No internal parasites were found.

The Indian aphid predator—*Chilomenes sexmaculata*—which was obtained from the United States Department of Agriculture last year, has been reared in quantity, and a number of releases were made in infested alfalfa fields in Riverside, in Imperial, and in San Diego counties.

Research on the pest is being done in Italy and France to determine whether parasites attack the yellow clover aphid there. If any parasites are found, they will be shipped to California for rearing and release.

A parasite search has been initiated in Israel that will probably extend for one year and will cover the known range of the yellow clover aphid from northern Europe through Egypt and the Near East to India. The work was started in Israel because entomologists in that country have reported that at least two parasites of the yellow clover aphid occur there. There are no parasites recorded in other countries.

An effort is being made to obtain specimens of the parasites in Israel for shipment to California. Large-scale rearing and colonization will be conducted at Riverside immediately upon the arrival of shipments of parasites of the yellow clover aphid.

C. P. Clausen is Chairman, Department of Biological Control, University of California, Riverside.

S. E. Flanders, Professor of Biological Control, University of California, Riverside, is making the field observations in Italy and France.

Robert van den Bosch, Assistant Entomologist in Biological Control, University of California, Riverside, is conducting the search for parasites in the Near East countries.

PICKERS

Continued from page 13

an average of 320 pounds per acre. This total loss was made up of an average of 230 pounds per acre shell corn loss and 90 pounds per acre of ear corn loss. These weights are losses chargeable to the machines and do not include ears dropped before harvest. The average yield of the fields tested was 5,000 pounds per acre.

The field losses—in each test case—represent the results of the influence of a number of variable factors, such as moisture, machine adjustment and operation, corn variety, time of day. It is not possible to separate the influence of these variable factors so that an absolute loss value can be assigned to them. It is possible, however, with those factors that strongly influence the loss to determine the way in which they cause it to vary.

With due regard for the limitations of the test data, the following losses can be expected at the indicated field speeds:

Speed (Miles per hr.)	Average field loss (Pounds per acre)
2.0	200
2.5	250
3.0	400
3.5	670

In similar fashion the relationship between the amount of space between the snapping rolls and the field loss is found to be:

Space between snapping rolls (Inches)	Average shell corn loss (Pounds per acre)
0 (Rolls touching)	200
½	320
1	580

For these tests the space between rolls is defined as the distance from the top of the rib on one roll to the root of the roll on the other at a distance of about one foot above the points of the snapping rolls.

When kernel moisture content is plotted against field loss, as in the lower graph, a scattered pattern results and no correlation is apparent. While the results of these tests indicate that kernel moisture content is not a strong factor in determining the amount of field loss chargeable to the machine, the influence of moisture should not be disregarded. As the moisture content goes down, preharvest losses from ears dropping to the ground and from broken-over stalks may increase. Also, at the lowest moistures, more careful operation is necessary to keep losses low.

By coding the points plotted on the moisture loss graph, the influences of field speed and picking roll adjustment and modification on field losses are illustrated. Where field speeds were under 2½ miles per hour and the space between picking rolls was less than ½", losses of less than 300 pounds per acre were found. Where either field speed was over 2½ miles per hour, or the distance between snapping rolls was ½" or over, field losses of from 300 to 400 pounds per acre were found. Where a combination of speed over 2½ miles per hour and either a distance between snapping rolls of over ½" or arc welded beads were run along the snapping rolls, losses of 400 to 700 pounds per acre were found.

Sheller losses were determined in some tests. They were found to be negligible except where the sheller was overloaded or mechanically disarranged. No other factors were noted that seemed to have any marked effect on losses.

W. N. King is Farm Advisor, Kern County, University of California.

Lloyd Peterson was Farm Advisor, Los Angeles County, University of California, at the time the above-reported tests were made.

R. G. Curley is Extension Agricultural Engineer, University of California, Davis.

APHID CONTROL

Continued from page 5

about the same results when used at 10 to 12 ounces of actual material per acre but must not be applied within seven days of cutting.

Occasionally it may be necessary to treat stubble alfalfa as soon as the hay is removed from the field. In such circumstances, only parathion or malathion should be used. Systox is most effective if used following the first irrigation when there is a good regrowth 4" to 6" high. Best results were obtained with treatments made at this time.

Normal applications of toxaphene as used for *Lygus* bug control will—in most cases—hold the yellow clover aphid in check. Usually 10% toxaphene plus 50% sulfur at 30–35 pounds per acre has been sufficient, but toxaphene-DDT combinations have given better results. Toxaphene—15% with 5% DDT and 40% sulfur—has given excellent control, and toxaphene-DDT combination sprays are promising. However, in general, dusts are preferred to sprays because of better penetration into the lower parts of the plants, which is the normal habitat of this aphid.

Systox at the rate used on hay alfalfa has given excellent results, although the 4-ounce application is preferred when the alfalfa is large. When spider mites also are a problem, the grower should use 6 to 8 ounces per acre, as lower rates are not sufficient for control of these latter pests.

The appearance of the yellow clover aphid in California has made the production of alfalfa more costly but has not ruined it as a crop. There is no reason that alfalfa should not be as important a part of California agriculture in the future as it has been in the past.

H. T. Reynolds is Assistant Entomologist, University of California, Riverside.

R. C. Dickson is Associate Entomologist, University of California, Riverside.

YELLOW CLOVER APHID

Continued from page 4

fornia and north as far as Fresno. It has also spread east over Texas and north through Oklahoma into Kansas and Arkansas.

The yellow clover aphid in California does well on all commercial varieties of alfalfa it has encountered in southern California. It also prefers bur clover, *Medicago hispida*, sour clover, *Melilotus indica*, and black medic, *Medicago lupulina*, and will breed on berseem, *Trifolium alexandrium*. It will not live on red clover, ladino clover, Hubam clover, subterranean clover, vetch, or birdsfoot trefoil.

Ladybird beetles have provided the only effective biological opposition that the yellow clover aphid has encountered in California. Other predatory insects, as lacewings, syrphids, pirate bugs, and big-eyed bugs, do eat some yellow clover aphids, but their populations are not large enough to balance the yellow clover aphid population. Therefore, they have been of little practical value in biological control.

In July, 1954, some fields had their aphid populations cleaned up by ladybirds but usually too late to save the hay crop. In the spring of 1955, the first effective work by ladybirds appeared shortly after mid-April in a few fields adjacent to barley. Since then their number and effectiveness have increased so that by mid-May they were giving practical control in a majority of desert alfalfa fields. The widespread use of insecticides in alfalfa fields appears to have only slightly delayed the appearance of effective ladybird populations.

No internal parasites of the yellow clover aphid have ever been observed in California. Under especially wet conditions, some yellow clover aphids are killed by entomophagous fungi.

R. C. Dickson is Associate Entomologist, University of California, Riverside.

H. T. Reynolds is Assistant Entomologist, University of California, Riverside.