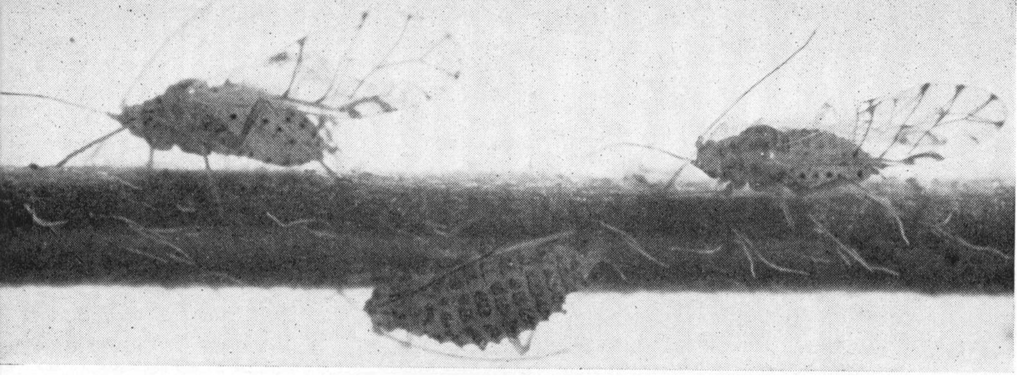

Two winged and one wingless adult yellow clover aphid.

chemical control

insecticides when properly applied will give effective commercial control of pest

H. T. Reynolds and R. C. Dickson

Under conditions of high populations, the yellow clover aphid—easy to kill by insecticide applications—is difficult to control because of rapid reinfestation.

In most cases this is the result of migration of winged aphids from heavily infested neighboring fields or from poor insecticide applications.

For the best control, heavily infested fields must be treated or destroyed. The most effective insecticides must be used —and proper applications made—because any skips in an application create focal points for rapid reinfestations.

In general, sprays are preferred to dusts—except for the use of toxaphene during seed production—in order to reduce the problem of drift. This is to protect man, livestock, nearby crops, and to minimize losses to honeybees.

Malathion and—particularly—parathion are lethal to pollinating insects, and every precaution should be taken in their use. State regulations require that permits be obtained from the County Agricultural Commissioner for applications of parathion and Systox, and some counties require permits for the use of malathion.

Systox is not detrimental to pollinating insects and is less toxic to most other beneficial insects. Its use should be carefully considered by the alfalfa grower.

Proper timing of insecticide applications is largely a matter of experience. It is difficult to base applications on aphid numbers because of the rapid reproduction of this species.

On small seedling alfalfa, treatments must be made at low infestation levels—one or more per plant. On older plants, treatments may be based on the generalized appearance—low quantities of honeydew in the field plus an increasing population—and later damage may be prevented in this manner. Treatments must not be delayed under these situations.

The alfalfa grower must make frequent inspections—preferably at two- or, at the most, three-day intervals—to determine the condition of his fields and possible need for immediate treatment.

For the purpose of simplicity, chemical control is based on three phases of alfalfa production. Many insecticides are effective in controlling the yellow clover aphid; parathion, malathion, and Systox are the most promising.

Parathion may be used at the rate of 2 to 4 ounces of actual material per acre, or malathion at the rate of 8 to 12 ounces of actual material per acre. The lower rates of both materials have been satisfactory when ground equipment was used, and the higher rates when aerial equipment was used. The residual period of control is only a few days in extent.

Systox may be used at the rate of 2 to 4 ounces of actual material per acre, but applications must not be made within 21 days of cutting. Either rate has been effective by air or ground equipment. The residual period of control with 4 ounces of Systox is about 2½ weeks, but with 2 ounces it is about the same as that of parathion.

Parathion at 4 ounces of actual material per acre has been effective, but applications must not be made within 15 days of cutting. Malathion will give

Concluded on page 15

resistant plants

alfalfa variety resistant to aphid attack and adapted to desert areas planned

E. H. Stanford

The principles of genetics—basic to scientific plant breeding—are to be applied in a project in the Imperial Valley to develop a strain of alfalfa resistant to the yellow clover aphid and adapted to the growing conditions in the desert areas of the southwest.

Alfalfa varieties grown in desert valley areas, such as Imperial, Coachella, and Palo Verde, require characteristics different from varieties grown in other alfalfa-producing districts. Plant growth during the low winter temperatures is essential for maximum productivity and year-round feed production. Furthermore, the varieties grown in the desert valleys must be adapted to extremely high summer temperatures.

The varieties, Africa and India, have been used and come nearest—but not completely—to meeting requirements. Probably 80% of the acreage in Imperial Valley is renovated each year when old stands are cultivated and additional seeding is made to thicken the stand.

The yellow clover aphid—since it became established last year—has damaged thousands of acres of alfalfa. The expense of insecticides and their application have increased production costs by several dollars a ton.

Strains of alfalfa resistant to the yellow clover aphid are known but they are not adapted to the growing conditions of the southwest.

By using an aphid resistant variety such as Lahontan—on which the aphid cannot survive—as one parent strain, and a variety most adapted to meet the growing requirement—such as Africa—it is expected that a series of crosses and backcrosses followed by selection will produce a strain of alfalfa suitable to desert areas and resistant to the yellow clover aphid.

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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.

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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.

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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.

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