Aphid Damage to Alfalfa Hay

honeydew of spotted alfalfa aphid apparently not distasteful to cattle but protein and carotene in damaged hay are reduced

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The spotted alfalfa aphid—*Therioaphis maculata* (Buckton)—causes damage to alfalfa in a variety of ways.

An uncontrolled infestation in one Fresno County field reduced the expected yield by over 50% on one cutting. The injury to the next cutting on this field was even more severe, so the yield was further reduced. Because of the weakness of the stand, grassy weeds took over and crowded out the alfalfa. After a severe infestation, regrowth of the alfalfa plants is usually markedly delayed. In some cases, the delay may be as much as a week. The effects of the spotted alfalfa aphid on yield are not important if the population of aphids is kept below 75 aphids per stem by natural control factors or by chemicals.

Severe uncontrolled aphid populations may kill the plants, resulting in thinned, weedy, or grassy stands. In some cases, there is a complete loss of the stand. The alfalfa plant appears to have a greater chance of survival when it is strong and healthy. Consequently, the loss of stand will be most severe to seedling fields, in first year plantings, in fields where early cuttings are made repeatedly, and in areas not suited to good alfalfa production. The killing of plants may also be aggravated by diseases such as the crown rots and root rots.

The spotted alfalfa aphid excretes large amounts of honeydew that is high in sugars. In heavy infestations, the plants appear to be covered with a sticky syrup. The damaged hay in such fields is difficult to harvest, and because of leaf loss additional reductions in quality occur. In some situations, it has been necessary to wash the mowers repeatedly and to steam clean the balers daily. These difficulties may be avoided by properly timed control practices.

Infestations of the aphid usually first become apparent on the bottom sides of the leaves low on the plant. As the numbers of aphids increase, the infested leaves are killed—through the removal of plant juices and the injection of a toxin—and fall from the plant. As the leaves die, the aphids move onto the stems and to healthy leaves higher up the plant. The honeydew excreted by the aphids becomes infested with black sooty molds and—in uncontrolled aphid infestations—only a tuft of leaves may remain at the top of the bare, blackened, sticky alfalfa stems. The hay from such damaged areas is reduced in quality.

Comparison of Alfalfa Hays with Different Aphid Infestations

Aphids per stem at time of harvest	Honeydew	Sooty mold	Crude protein %	Carotene ppm
1.8	none	none	19.9	82
47.1	light	none	20.3	75
304.6	common	trace	18.3	65
over 450	common to heavy	moderate	16.3	49

The loss of leaves due to the aphid attack reduces the protein and carotene content of the alfalfa hay. As shown in the above table, the degree of reduction varies with the severity of attack. All of the samples tabulated were obtained from an experimental plot in Kern County. The field was an exceptionally uniform stand of Caliverde alfalfa. The aphids had been controlled by earlier chemical treatments. Various levels of new populations of aphids had developed in the field during the 10 days before harvest but were not considered to be severe. The aphid population of about 50 per stem produced light honeydew but did not significantly affect the protein and carotene. The higher populations significantly reduced both the carotene and protein. However, these reductions are not as great as occurs where high populations remain over a longer period. In severely damaged hay, the crude protein may be reduced to a point as low as 12%.

To gain further information on the damage to alfalfa hay, a feeding trial was conducted in Kern County with some of this same hay. Uniform, thrifty, good-to-choice, ranch-raised Aberdeen Angus steer calves were used for the test. The steers had been grazing a field of dry beet tops. They were cut out of the herd, divided into test pens, and fed ranch-raised hay for a week prior to the start of the test. The steers were held overnight without feed or water before both the starting and finishing weights were determined.

Comparison of Three Hays Used in Feeding Trial

	Honeydew	Sooty mold	Defoliation	Hay grade
Clean hay	none	none	very light	No. 1 extra leafy
Honeydew hay	light	trace	light	Off $2–3 per ton
Damaged hay	abundant	abundant	heavy	Sample

Three different lots of hay were each fed to five steers. The clean hay had no honeydew and contained 19.9% protein and 82 ppm—parts per million—carotene. The second lot—the honeydew hay—contained a moderate amount of honeydew and a trace of sooty mold. It analyzed 18.3% protein and 65 ppm carotene. The third lot—the damaged hay—was African alfalfa hay from a different field but from the same area on the same soil type and of the same cutting period. It had very few leaves and was black from the sooty mold. This hay contained 14% protein.

The three lots of hay were fed for

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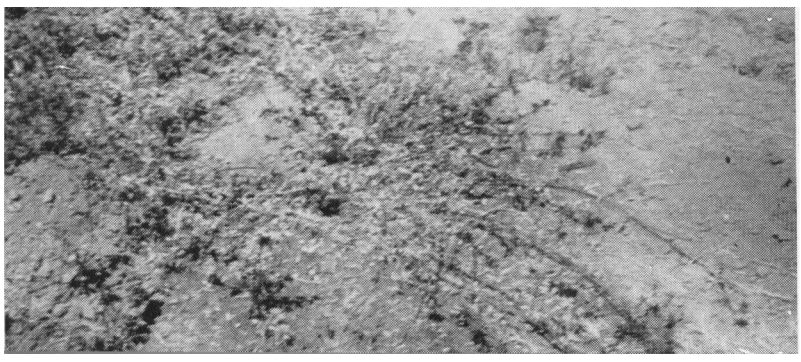
***Below left*—Isolated alfalfa plant severely defoliated by spotted alfalfa aphid. Note honeydew on ground beneath plants.**
***Right*—Destruction of alfalfa by spotted alfalfa aphid. In foreground missed by chemical application.**



CYCLAMEN MITE

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control of the cyclamen mite. The table shows that in the predator-stocked blocks infestations were always very low—during 1953 or 1954 which were favorable to high infestations, as well as in 1955 which was less favorable. In some fields, and only early in the season, just subsequent to stocking, were cyclamen mites found to be abundant, even on individual plants of a stocked block. Once the development of the predator population reached a level to achieve general distribution on all plants, these minor areas of abundant cyclamen mites—the hot-spots—disappeared and did not reappear.

Commonly, predators enter new fields late in the first year and keep pace with incipient cyclamen mite infestations, or they may follow so quickly during the second year that they achieve, on their own, a condition nearly comparable with that in the predator-stocked berries. However, there is lack of uniformity when only natural migration is relied upon. There may be considerable numbers of rather large hot-spots. These may become a source of economic loss, even though the predators do usually clean up the infestations as they move through the fields in population waves. The average densities of cyclamen mites may thus be rather low in comparison with those in berries entirely free of predators, but economic loss often does result. This is more pronounced if the lag period is great and the plants have suffered serious loss in vigor from which they do not quickly recover even though the cyclamen mite infestations are no longer injurious. If new fields are very close to older berries which have been under biological control, the natural movement of predators into the new fields may give results just as good as does artificial stocking.

On the other hand, if fields are far removed from sources of predators there may be a very serious time lag and, consequently, prolonged and serious infestations of cyclamen mites. In such cases the resulting infestations may be as severe as are those observed under the predator-excluded condition. Early stocking with predators is a solution.

The material for stocking new fields is obtained from older fields having adequate populations of predators. Examination by a competent entomologist or acarologist is required to determine which fields are suitable sources of predators. Once this is established and a rate of application of prunings containing predators is determined, all subsequent work associated with this method of control could be done by the growers themselves.

February is the normal period for pruning berries in the central coastal area. Only hand-pruned material is satisfactory for stocking purposes. However, if an adequate source of predators were located, prunings from one acre could be used to stock from five to 20 acres of new plantings, depending upon the abundance of predators in the material.

New fields—to be stocked—should be pruned two to three weeks earlier than the fields which are to supply the stocking material. This is in order that the new plantings can begin foliage regrowth subsequent to pruning and prior to the stocking operation, if the stocking material is to be moved directly to the new fields. However, the prunings can be held in a cool, shaded and sheltered location in burlap bags for a period not exceeding one month prior to use in the new fields. This is usually adequate time to permit the new fields to obtain some growth after pruning, in case they are pruned at the same time as the source field. Storage also has the advantage that pests such as red spider mites and aphids die during storage and would not be introduced into the fields with the prunings.

Both old, dead leaves and the new growth contain predators so the prunings can be gathered and placed in burlap bags for storage until needed. A handful of leaf material is placed in the crowns of every fourth or fifth plant and natural spread to intervening plants is adequate.

Results obtained by small scale procedures have been transposed to give rough approximations of the labor required to stock 10 acres of new plantings. Approximately four man-days of labor are needed to prune a one-acre source planting and six man-days to bag the material—about 500 bags—transfer to storage, and later to the fields to be stocked. The amount of material obtained from the one acre, on the average, would be adequate to stock 10 acres of new plantings. At one man-day per acre, 10 man-days would be required to stock the 10 acres. This would be a total labor item of 20 man-days to obtain the material, handle and later stock 10 acres of plantings. Even three or four man-days per acre would be a small item of cost or effort in terms of the relief from cyclamen mite which the evidence indicates could be expected. Pruning of the source field—a normal requirement whether or not the material is to be used for stocking purposes—is included in the labor estimate.

It is hoped that commercial acreage tests can be conducted during 1956 with the co-operation of volunteer growers.

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29 days with no supplement other than white block salt. There were no apparent toxic effects of even the most severely damaged hay, and all the calves remained healthy throughout the test. The calves fed light honeydew hay ate a little more feed and gained a little more than the clean hay lot; but the clean hay lot showed slightly more efficiency of gain. However, these small differences are not significant. The gain and the efficiency of both the clean hay and honeydew lots were significantly superior to the severely damaged hay lot.

Weight Gains in Feeding Trial

	Average daily gain in pounds	Pounds of hay to produce 100 lbs. of gain
Clean hay	1.93	835
Honeydew hay	2.21	844
Damaged hay	0.72	2054

Although this feeding trial was limited in duration and the number of animals fed, the results confirm earlier predictions based on appearance of the hays. It would appear that a slight amount of honeydew does not appreciably reduce the feeding value so long as the sooty mold has not invaded the honeydew or the alfalfa plant has not started losing leaves. There is even some evidence that hay with moderate amounts of honeydew is eaten more readily. On the other hand, hay which has lost leaves and has turned black from sooty mold fungus is lower in feed value and palatability as compared to undamaged hay. The extent of damage will usually depend upon the amount of leaf loss and mold. In this test, severely damaged hay was worth about 40% as much as undamaged hay when measured in pounds of hay fed to produce a hundred pounds of beef.

Unchecked, the spotted alfalfa aphid can hamper the production, reduce the yield, and impair the quality of alfalfa hay, but it can be controlled economically by careful use of the chemical treatments properly applied.

Until resistant alfalfa varieties become commercially available or until introduced parasites take over the control of the aphid, growers must depend on chemical controls—and best results are obtainable when all growers in an area cooperate in control treatments.

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The chemical analyses of the alfalfa hays were made by the Department of Agronomy, University of California, Davis.