

Spider Mite on Cotton

underleaf coverage obtained with low volume, low pressure sprayers

Gordon L. Smith, Herbert F. Miller, Jr., and T. F. Leigh

A good underleaf spray coverage with contact acaricide achieved good control of spider mites on cotton in tests in the San Joaquin Valley.

Serious outbreaks of spider mites on California cotton have frequently followed spray applications of insecticides and acaricides in formulations which have given good control of the more active insects occurring on the upper surfaces of the foliage.

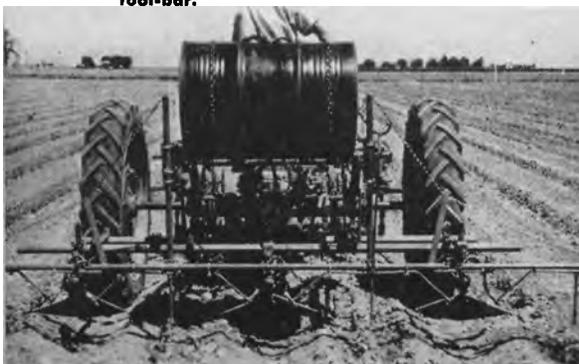
Acaricides having fumigation action are more satisfactory in the cotton belt states where more frequent applications of insecticides are required and where spider mite problems have not been so serious as they are in the arid southwest. Such acaricides have been unsatisfactory in California because the residual effect is so short that two or more closely timed applications are required; the high toxicity to man and animals limits the use of most of them; their adverse effect on natural control by killing beneficial insects; and because of uncertain and erratic control of mites—resistance of mites has been shown definitely on other crops.

Contact Acaricides Tested

There are several contact acaricides which are effective on mites only, are quite safe to use and have long residual effect. Therefore a series of experiments was undertaken to learn how these less objectionable chemicals could be used effectively and economically.

Acaricides in appropriate solvents—and readily emulsifiable with water—are essential for good results from spray applications with the type of sprayers considered in this work, but there is not sufficient agitation in the tanks of these sprayers for the use of wettable powders or other suspended solids. Any of these suspended materials in the spray will clog

View showing low volume, low pressure sprayer mounted on tractor with rear cultivator tool-bar.



nozzle tips and screens and abrasive action will result in repairs and delays.

Low volume, low pressure sprayers which deliver up to approximately 30 gallons per acre with pressure anywhere from 20 to 100 psi—pounds per square inch—are generally considered suitable for field crop spraying. A sprayer of this type may be tractor or trailer mounted.

The major parts of the sprayer are the pump, pressure regulator, screens and nozzles. Simple gear type pumps which give pressures up to 200 and 300 psi are most commonly used. The pressure regulator is a valve on a spring with an adjustment for obtaining the desired pressure in the line. Screens are needed on the end of the suction hose; in the liquid line between the pressure regulator and boom and in the nozzle body. A felt screen on the suction end of the hose in the spray tank was found to be the most efficient. Wire screens of 100 or 200 mesh, depending upon nozzle size, are used in the other screen positions. Nozzles should be



High-clearance cotton picker tractor equipped with wheel shields and sprayer.

chosen carefully for correct size and pattern shape.

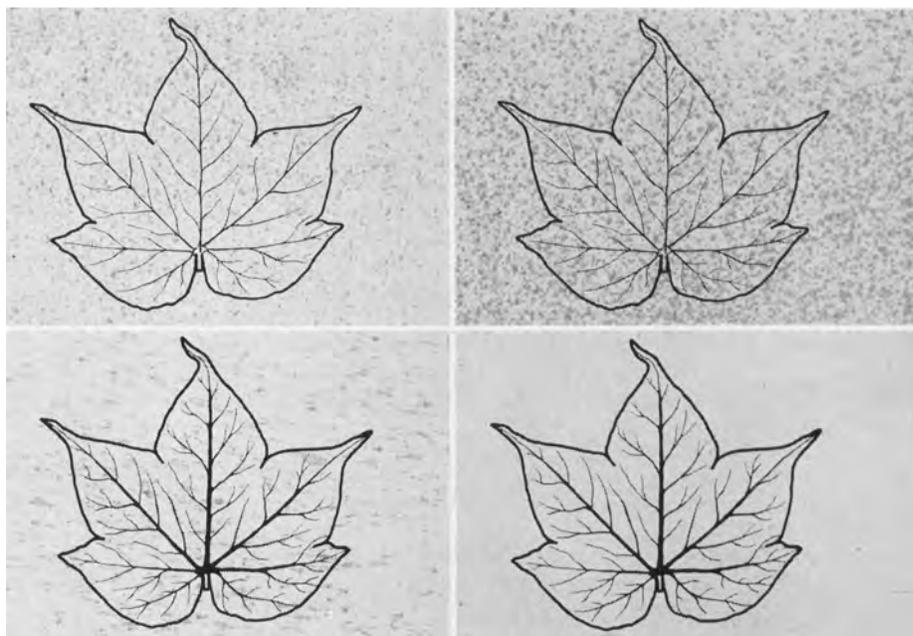
Adjustments for nozzle arrangements and for lowering and raising the nozzle boom—for different heights of the cotton plants—are necessary.

Proper cleaning of all lines and nozzles with clear water after each day's spraying helps eliminate clogging trouble when the sprayer is next used.

Spray Pattern Important

In these tests the best results—determined by spray patterns and subsequent kill of mites—were obtained with a flat fan nozzle directed up at a 45-degree angle from the horizontal and with a .018-inch orifice size. This nozzle gave a 56-degree spray angle and delivered .060 gpm—gallons per minute—at 60 psi when the spray rig was traveling 3 mph.

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Upper left. Spray pattern of acaricide on upper surface of a cotton plant leaf sprayed for control of spider mite and lower left the spray pattern on the underside of a leaf, obtained with the flat fan nozzle sprayer. Upper right. Spray pattern of acaricide on a leaf's upper surface and lower right the absence of spray adherence to the undersurface when spray was applied with cone nozzles. Patterns shown are actual size and were obtained on sensitized paper reacting with ferric chloride in the spray; leaf outlines are greatly reduced.



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PRODUCTON OF DRY EDIBLE LIMA BEANS IN CALIFORNIA, by R. W. Alford, Cir. 423.

LANDSCAPING

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A good turf sod creates a sunshine-absorption layer on top and a moist shaded surface beneath. This shading prevents large amounts of heat absorption by the soil and thus keeps the ground from getting hot. Because the maximum temperatures at noon are held down close to wet-bulb temperature, the net thermal radiation that would come from bare hot dry ground to the house can be reversed so that the cool grass will act as an absorber of heat radiated from the house.

Conduction takes place through the ground horizontally depending upon the temperature differences. There is a significant advantage in having the ground as cool as possible surrounding the house because of this horizontal conduction of heat in the deep soil. In addition there is a cool moist layer of air lying above a turf cover, whereas a dry warm one lies above dry soil, asphalt, or concrete. The placement of trees and especially the use of grass near the house allows the heavier cool air to flow inside, when low openings are provided for through circulation.

The sun's heat entering a house through the roof can be reduced greatly by properly insulating the ceilings and by the use of white reflectant materials on the roof surface. In addition, the location of trees close to the house can materially restrict the area of the roof exposed to the sun's rays.

An effective way of reducing the heat inflow through walls, when not shaded by trees, is to cover them with vines. This has two advantages: shading the wall and cooling the air next to the wall surface by evaporation of moisture from the living plants.

East or west walls receive much more heat in summer than south walls. The heat problem on east walls is less troublesome than west walls since the soil, wall, and the air temperatures inside and outside have cooled greatly during the night. The heat absorption for areas on the south can be considerably reduced and

delayed by the use of roof overhang, trees and vines.

With proper landscaping the house walls, soil, and paving will not be warmed to high temperatures until the sun is moving away in the late afternoon. As the sun moves toward the west, its angle becomes lower, and therefore groups of tall, vertically growing shrubs and small trees can be effective in providing shade on the west and north walls. By this shading the sun is cut off and the air temperatures will begin to drop early.

Paved surfaces generally absorb and release more heat than bare ground and therefore have less temperature change day to night. If kept wet they can serve in place of grass turf, but in most cases this is inconvenient and impractical. Dark pavements are usually hotter than grass in the daytime and light-colored pavements usually have objectionable glare. In hot regions, it is well to keep all dry paving to a minimum and to have as much shading as possible. The coldest exposure is toward the north sky, so the vertical shading by trees and vines is more effective than horizontal shading providing the same interception of absorption and radiation.

As much as one tenth of the total heat entering an ordinary house comes through the windows. Every attempt should be made, therefore, to keep the sun's rays from penetrating glassed areas.

Living areas facing south can be made more comfortable in summer by providing dense tree or vine shade overhead, using as much moist turf as possible beneath and providing adequate overhang to keep the sun off walls, paving, and glass. Tall deciduous shrubs planted so one looks into their shaded and cooler north sides, greatly reduce glare and the shimmering view of hot dry areas. Careful selection of plants and their placement should be made to prevent any interference with cooling breezes or winter sun.

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MITE

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Two nozzles per row were used for plants up to 30" in height and four per row for plants of greater height. This resulted in applying 10 and 20 gallons per acre. When using four nozzles per row, the two nozzles on either side of the plant were placed 18" apart on a boom-drop.

This adjustment of flat fan nozzles showed a good deposit of spray on the underleaf as well as on the upper surfaces of the leaves.

During the tests it was soon evident that sprays of very fine droplets from the cone type nozzle could be driven only a very short distance onto the underleaf surfaces. If cone nozzles giving larger droplets were used, the gallonage would be increased and higher pressure would be required. This would defeat the objective of low gallonage and low pressure spraying.

Consequently the flat fan type of nozzle was used for further work. The pressure was kept at 60 psi throughout the experiments. The gallons applied per acre therefore varied with the size of orifice, the speed of the tractor and the number of nozzles per row.

Spraying late in the season in rank cotton is generally possible with standard tractors when properly shielded. However, tractors with a higher—36"—than normal axle clearance are more desirable for late season spraying.

Sprayers mounted on such tractors and with an extra extension for nozzles on the boom-drop, may be used for late season spraying—until the cotton begins to close-in in the middles.

Tall, rank, closed-in cotton requires a reinforced—or shielded—boom-drop to spread the foliage ahead of the nozzles, however, the types of shields have not been tested sufficiently to permit specific recommendations.

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