

Low Volume Spraying

of deciduous fruit trees successful with air carrier speed sprayers

Arthur D. Borden

The speed sprayer introduced in California in 1944 proved that a large volume of air at a relatively low velocity is more efficient and economical than water as a means of applying liquid sprays of fungicides and insecticides.

In field tests the speed sprayer, using air as a carrier, gave a more uniform coverage, required less gallonage per tree than the conventional method and effected a saving of 80% in labor costs. The requirements of large volumes of water for mechanical bulk spraying was a problem, as a speed sprayer applying bulk sprays puts out 500 gallons of spray liquid every seven minutes.

Several attempts have been made to use air instead of water as the carrier but the equipment either lacked sufficient volume of air, directional control of the air stream or was designed primarily for the application of very concentrate sprays.

Field experiments with a partial or diluted concentrate spray applied with this equipment led to further field tests with low volume applications of standard spray mixtures. In low volume spraying the volume of liquid applied per tree was reduced until the tree was wet only to the point of no run-off.

Reduction in the spray liquid discharge was accomplished by reducing

the number of spray nozzles to less than half—from 80 to 36—and by reducing the disk apertures from 96/1000ths to 62/1000ths.

The volume of spray liquid applied to large pear trees in the dormant period as a bulk spray was about nine gallons per tree while in the low volume spraying the trees were sprayed with 2.5 gallons per tree. In the foliage sprays an average of 20 gallons per tree was used in bulk spraying and a little over two gallons per tree in the low volume spray applications. This reduced the volume of spray required per acre in the dormant applications from 810 gallons to 225 gallons and in the foliage sprays from 1800 gallons to 189 gallons.

Adequate Deposits

Chemical analysis made of the deposits of dormant oils, wettable sulfur, bentonite sulfur, copper compounds, limesulfur and of DDT compounds have shown that consistently as good or better deposits have been obtained by the low volume method of spraying than were obtained in the bulk sprays.

The dilutions used in these applications indicated that adequate deposits were obtained without using high con-

centrations. The amount of spray chemicals used was approximately an increase of only 50% over the conventional bulk spray mixtures.

Travel Speed

The rate of travel of the equipment is best determined by observing the coverage and drip from the trees immediately after spraying. If no drip occurs from the limbs or foliage the equipment is traveling too fast and should be slowed down. If run-off occurs the equipment may be speeded up until not more than a drip is observed.

The rate of travel also may vary with the dryness of the bark and foliage as it takes longer to build up to the point of drip when the bark is very dry.

No definite rate of travel can be given as that will vary with the type of equipment, the discharge gallonage and the condition of the trees. Field experience in large pear trees has shown that prebloom sprays may be applied at from 1.5 to 2.5 miles per hour depending upon the materials used, the equipment and the size of trees. Foliage sprays have been applied at from .8 to 1.5 miles per hour as the rate of travel.

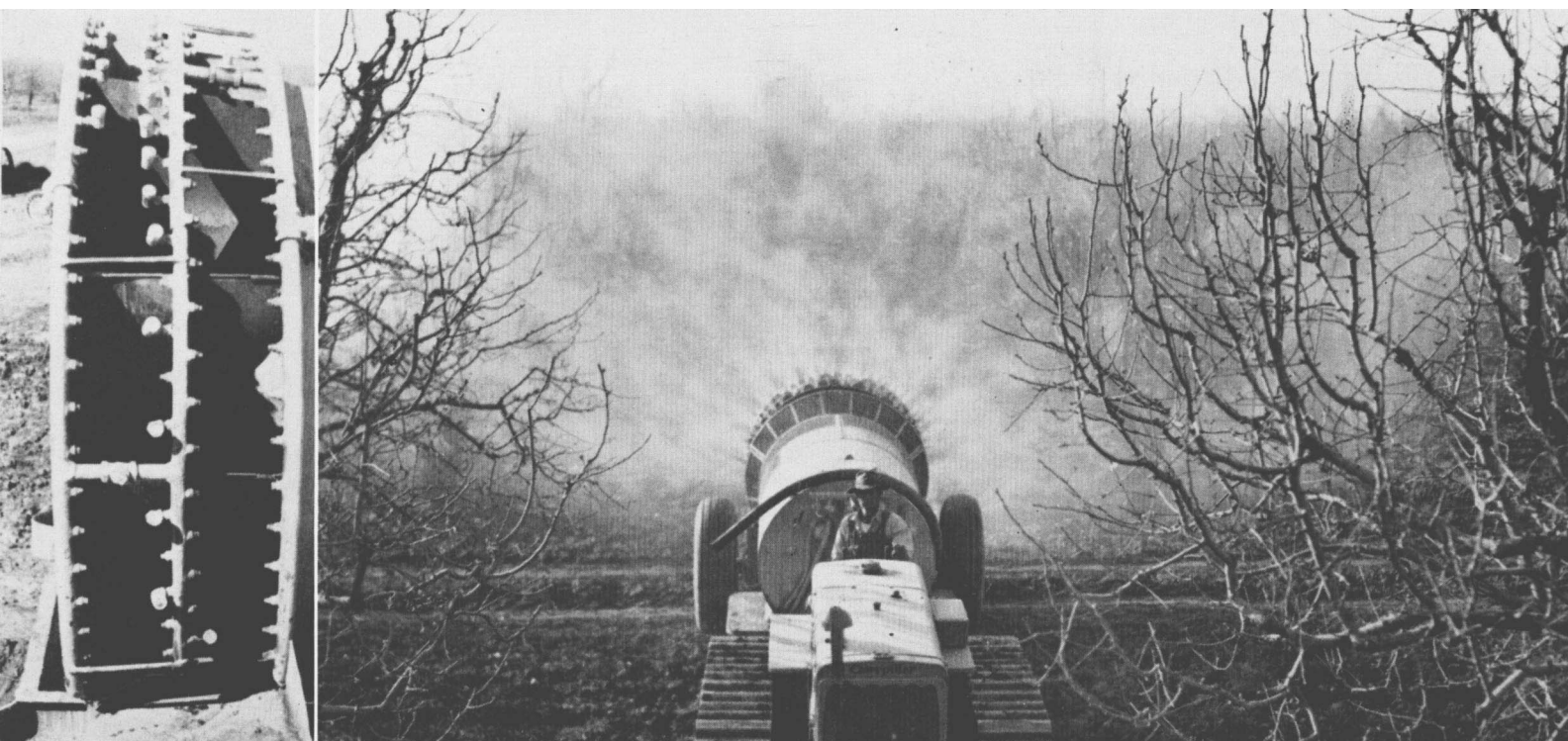
Air-Volume Necessary

Though most of the field investigations thus far attempted have been done with equipment rated as having a delivery of over 50,000 cubic feet of air per minute a few tests with equipment delivering over 30,000 cubic feet of air have been quite satisfactory.

Properly handled such equipment should prove efficient except possibly in

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Placement of spray nozzles on the discharge head achieves the butterfly wing spray pattern shown in this pear orchard. The close-up view of the discharge head shows the arrangement of the nozzles in the sections formed by the deflectors.



SPRAYING

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very large trees where a larger volume of air is required.

The principle of displacing the air in the tree area by the air delivered from

Dilution of Spray Chemicals Used in Bulk and Low Volume Sprays

| Spray compound | Amount per 100 gallons | |
|---------------------------|------------------------|------------------|
| | Bulk spray | Low volume spray |
| Oil emulsion..... | 5 gals. | 8.0 gals. |
| Emulsive oil..... | 4 gals. | 6.5 gals. |
| Lime sulfur solution..... | 3 gals. | 4.0 gals. |
| Wettable sulfur..... | 4 pounds | 6.0 pounds |
| Neutral copper..... | 1 pound | 2.0 pounds |
| DDT-wettable..... | 2 pounds | 3.0 pounds |

the equipment shows the necessity for a large volume of air. Without sufficient air volume the rate of travel of the equipment is too low to be practical.

Directional Control

The spray pattern of the liquid discharge from this type of equipment is important. In order to obtain adequate deposits in the tops of the trees it is necessary not only to have directional control of the air stream but also of the spray discharge. The shape of the spray pattern may be changed from a semicircular form to that not unlike the forewings of a butterfly by diverting more of the air stream in the direction of the tops of the trees. This is done by means of deflectors placed in the cowling of the fan housing.

Directional control of the spray discharge is obtained by the proper arrangement of the spray nozzles. More nozzles are placed in the air stream directed at the tops of the trees and less nozzles in the air stream going to the lower limbs.

Number of Trees Sprayed at Various Rates of Travel in Low Volume Spraying

| Miles per hour | Feet per minute | Number of tree spaces passed with trees spaced | | | | |
|----------------|-----------------|--|--------|--------|--------|--------|
| | | 18 ft. | 20 ft. | 22 ft. | 24 ft. | 26 ft. |
| 1.0 | 88 | 5.5 | 4.4 | 4.0 | 3.7 | 3.4 |
| 1.5 | 132 | 7.3 | 6.6 | 6.0 | 5.5 | 5.0 |
| 2.0 | 176 | 9.8 | 8.8 | 8.0 | 7.3 | 6.8 |
| 2.5 | 220 | 12.2 | 11.0 | 10.0 | 9.1 | 8.5 |

Field experience has shown that a better distribution of the spray liquid in the air stream and a more desirable range of droplet sizes are obtained either with nozzles giving a fan-shaped pattern or a cone-shaped pattern than is obtained with spray jets. There is also the added advantage that these two types of nozzles are less apt to clog and are more readily cleaned than the jet type.

The droplet size must not be too fine or the deposits will be less. Coarse droplets tend to increase run-off.

Preliminary studies indicate that a droplet size range of from 30 to 100 microns in diameter gave very satisfactory deposits.

Advantages

In low volume spraying the problem of transporting large volumes of water is greatly reduced as the gallonage applied per tree is much less and the saving in cost of materials per acre—by preventing run-off of the spray liquid—is from 50 to 90% of bulk spraying. Added to this is the additional saving in time and equipment needed in refilling.

With the development of more air-carrier types of equipment and the use of the low-volume method of application the spraying of deciduous fruit trees promises to be much more efficient and economical than is the present practice of bulk spray applications.

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POULTRY

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A positive reaction to the HI test is reliable evidence that the bird tested has been infected with PE. A bird will continue to react positively for a long time after recovery.

If a flock has had two attacks of respiratory disease and specimens were not submitted for laboratory examination until the second attack, a positive reaction to the HI test at that time would not reveal whether the first or second attack was due to PE. Conversely, if PE was diagnosed when the first outbreak occurred, the HI test would be of no value in identifying the disease responsible for the second attack.

This feature of the HI test is probably responsible for some of the mistaken beliefs that PE has occurred twice in the same birds.

The PE vaccine which has been available for the past few years is prepared from infected embryos with formalin added to kill the virus. This vaccine is incapable of producing the disease and can be safely used on any farm.

NEW PUBLICATIONS

A copy of the publications listed here may be obtained without charge from the local office of the Farm Advisor or by addressing a request to Publications Office, College of Agriculture, University of California, Berkeley 4, California.

New Grape Varieties

RUBY CABERNET AND EMERALD RIESLING, by H. P. Olmo. *Bul. 704, May, 1948. (12 pages.)*

PERLETTE AND DELIGHT, by H. P. Olmo. *Bul. 705, May, 1948. (6 pages.)*

SCARLET, by H. P. Olmo. *Bul. 706, May, 1948. (6 pages.)*

Tomato Pests

CONTROLLING COMMON PESTS ON TOMATO IN NORTHERN CALIFORNIA, by A. E. Michelbacher, W. W. Middlekauff, and N. B. Ahesson. *Cir. 384, April, 1948. (15 pages.)*

Breeding Turkeys

SELECTING TURKEYS FOR BREEDING IMPROVEMENT, by W. E. Newlon and V. S. Asmundson. *Ext. Cir. 143, April, 1948. (15 pages.)*

Extensive field trials of such vaccine in which only a part of the flocks were vaccinated have shown that it does not give complete immunity against natural infection. Nearly all of these flocks became infected in six months or less subsequent to vaccination.

The loss from both mortality and decreased egg production among the vaccinated birds was enough less than among the nonvaccinated, that the flock owners considered vaccination worthwhile.

Much experimental effort has been directed toward developing live-virus vaccine which will produce complete and lasting immunity. The progress that has been made indicates that this objective will be accomplished in the reasonably near future.

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DONATIONS FOR AGRICULTURAL RESEARCH

Gifts to the University of California for research by the College of Agriculture, accepted in April, 1948

BERKELEY

| | |
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| Carbide and Carbon Chemicals Corp..... | \$2,400.00 |
| Studies on ethylene oxide and other epoxides. | |
| Division of Food Technology | |
| Corn Industries Research Foundation..... | \$7,000.00 |
| Studies in the chemistry of starch and other carbohydrates. | |
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