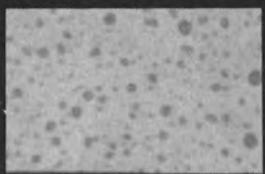
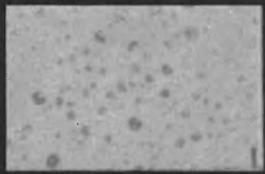
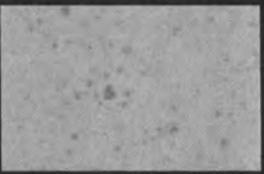
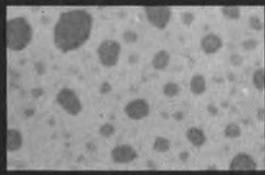
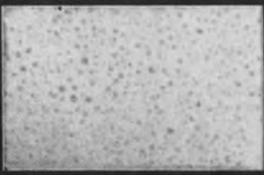


HEIGHT From Ground (feet)	DILUTE SPRAY (500 gpa)		CONCENTRATE SPRAY (60 gpa)	
	Outside	Inside	Outside	Inside
24				
16				
8				

Comparison between concentrate and dilute spray droplet patterns as collected on cards placed within trees. Safranine dye was used in the spray tanks.

J. E. DIBBLE · H. F. MADSEN · G. R. POST · A. H. RETAN

A progress report: CONCENTRATE SPRAYING controls

Concentrate spray trials in 1962 using low volume application rates substantiated the previous year's encouraging results with this new pest and disease control technique. In field trials for control of several major pests in deciduous fruit and nut crops, concentrate spraying with chemicals applied at 60 gallons per acre offered control equal to that obtained with conventional "dilute" spray rigs applying the same chemical concentration in a total of 400 gallons of spray per acre.

INFORMATION REPORTED here is from the second season of concentrate spray trials in northern California deciduous fruit orchards. The 1961 studies were devoted to an evaluation of the concentrate method of application using only 60 gallons per acre as compared with the dilute method using 400 to 1,000 gpa. A Canadian concentrate sprayer was used, and the dilute sprays were applied with whatever blower-sprayer was available at the test orchards.

In 1962, the field evaluations had two general objectives. One was to determine the proper gallonage for effective cover-

age of different tree crops. A second objective was to determine whether presently used dilute rigs could be modified to deliver gallonages in the concentrate range, and if equivalent control could be obtained. Nozzle modifications on the same Canadian machine used in 1961 allowed applications of 60 to 90 gallons per acre on test plots. An American-made sprayer, capable of delivering either concentrate applications at 60 to 125 gallons per acre or dilute applications at 400 gpa was also used. The high volume machines in regular use at the various ranches were also compared in the study when the opportunity arose.

1961 studies

The 1961 studies had shown that somewhat less material could be used per acre with concentrate sprays. To keep plots constant, the dosage of chemical was set on a per-acre basis and kept the same for each of the different machines and total rates of applications tested.

A few airplane spray applications were also included for comparison with the ground rigs in the 1962 study. Data obtained from the field trials are reported here on a tree crop basis.

Pears

Control of grape mealybug in pears was less effective with concentrate sprays in 1961 tests. The plots were repeated in 1962 using Diazinon with a concentrate sprayer at 60 gpa; grower-converted dilute sprayer at 60, 79, and 131 gpa; and a dilute application at 800 gpa. As in 1961, the dilute treatment gave the best control. In the concentrate range (60 to 79 gpa), the grower-converted sprayer was slightly better than the concentrate machine. There was no difference in the various gallonages used within the range of concentrate spraying.

A series of plots were established for European red mite on pears with Chlorobenzilate in one trial and Kelthane in another. In both cases there was no difference in the control obtained with the concentrate sprays ranging from 76 to 125 gpa as compared to a dilute treatment at 800 gpa. These data supported results obtained in 1961 and indicated that the concentrate method of application is satisfactory for control of spider mites on pear. For grape mealybug, a drenching spray seems to be necessary because of the tendency of the insects to hide beneath bark and protected sites.

Prunes

On prunes, trials were conducted for San Jose scale with Diazinon and oil applied at the green tip stage. Application rates ranging from 47 to 140 gpa gave control equal to a dilute application of 370 gpa. An airplane application was included in another test against San Jose scale and the degree of control was significantly less than that obtained with either a concentrate or dilute ground treatment.

At the postharvest stage, Tedion plus Ethion was applied to prunes for control of both the two-spotted mite and the European red mite. Concentrate sprays at 60, 90, and 125 gpa gave control equivalent to a dilute spray at 385 gpa. An airplane plot was also included, and very poor mite control was obtained. The 1962 plot data on prunes were similar to those obtained in 1961 and indicate that the concentrate method of application is feasible for control of insects and mites attacking this crop.

those applied by airplane, gave a good initial reduction of brown mite and residual control.

Apples

Data were obtained only on control of spider mites and apple aphid since the other pests and diseases of apples were not present at economic levels in the test plots. On two-spotted and European red mite, applications were made first with Diazinon plus Tedion, and secondly, with Diazinon plus Kelthane. Concentrate sprayer applications were made at 60 and 90 gpa, concentrate-dilute at 125 gpa, and dilute at 400 gpa. Mite counts after application showed better control with 90 gpa than 60 and no difference between the 90 and 125 gpa treatments. In this case, the latter applications were slightly better than the dilute spray. The data indicate that an increase from 60 to 90 gpa may be necessary in large trees with heavy foliage. Plots for control of apple aphid were treated with Diazinon at the

The data obtained on concentrate spraying for the past two seasons are summarized in the table. Most of the information is on insect pests rather than plant diseases because of the low incidence of disease in the test orchards. However, reports from other areas where concentrate spraying is under test indicate that disease control is satisfactory.

In the coming season, attention will be given to determining the correct dosages of spray chemicals for concentrate spraying. It seems evident that less material per acre can be used with concentrates, but precise dosages for several compounds need to be defined. It is hoped that the studies in 1963 will lead to recommendations of rates on a per-acre basis—a necessary determination before the general use of concentrates on deciduous fruits is possible.

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pests in deciduous fruit and nut crop tests

SUMMARY OF 1961-1962 CONCENTRATE SPRAY TRIALS IN CALIFORNIA

Pest or disease	Number of evaluations	Control obtained (concentrate as compared to dilute)
Almonds		
Brown mite	14	Equal control
Apples		
European red mite	8	Equal control when 90-125 gpa used
Two-spotted mite	8	Equal control
Apple aphid	4	Better control with concentrate
Peaches		
Oriental fruit moth	8	Equal control
San Jose scale	11	Equal control
Peach silver mite	16	Equal control
Peach twig borer	20	Equal control
Brown rot		Equal control, but disease incidence low
Pears		
Grape mealybug	31	Better control with dilute
Potato aphid	6	Equal control
Codling moth	6	Equal control
European red mite	24	Equal control
Prunes		
Peach twig borer	14	Equal control
San Jose scale	42	Slightly better control with dilute
European red mite	5	Equal control
Two-spotted mite	14	Equal control
Brown mite	4	Equal control
Prune leafhopper	4	Equal control
Leaf curl plum aphid	2	Equal control
Walnuts		
Walnut aphid	6	Equal control
Codling moth	6	Equal control but infestation low
Walnut blight	8	Disease incidence too low to draw conclusions

Peaches

The spray trials on peaches were established primarily for peach twig borer, but it was also possible to obtain data on Oriental fruit moth and San Jose scale. Concentrate sprayer applications were made at 60 gpa, the concentrate-dilute rig at 79 and 125 gpa, and the grower-converted sprayer at 130 gpa. The applications of Diazinon were made at the pink bud stage. Fruit counts at harvest showed that control of peach twig borer, Oriental fruit moth, and San Jose scale control was as good or better with low-volume concentrate sprays than with dilute treatments at 400 gpa. The spray trials over two seasons on peaches show that control of the principal pests can be obtained with concentrate sprays.

Almonds

The only plot on almonds in 1962 was a trial for control of the brown mite. Triethion applications were at 60 gpa with the concentrate sprayer; 90 and 125 gpa with the concentrate-dilute sprayer and 400 gpa with the dilute rig. An airplane plot was also included at 22 gallons per acre. The mite counts after application showed that all treatments, including

same gallonage ranges used in the mite plots. In this case, the concentrate applications gave better control than the dilute.

Walnuts

On walnuts, it was hoped that data could be obtained on codling moth and walnut blight, but infestations were too low to draw any conclusions. Walnut aphid was present, however, and a number of trials were run against this pest. With malathion as the insecticide, good control was obtained with the concentrate machine at 60 gpa, the concentrate-dilute rig at 125 gpa, and a dilute application of 400 gpa. In additional tests, application rates were reduced to 30 gallons per acre and the dosage of malathion was cut in half. Control equal to the other tests was obtained. When the application rate per acre was kept at 30 gpa but the speed of travel was increased from 1½ to 2½ miles per hour, control was not as effective. The walnut aphid is relatively easy to control, however, and these reduced application rates would probably be less effective against other pests. It is significant that concentrate applications were successful in obtaining control on such large trees, however.