Grape growers add their voices to the concentrate chorus

Tests last year showed that air carrier models at low volume compare with over-the-vine sprayers; growers may be able to use sprays all season long

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SUCCESS with concentrate sprayers in orchards has aroused interest among grape growers who want to know if they can apply the same techniques.

Concentrate spraying offers a major advantage in table grapes because it allows the grower to use spray all season long. In general, dusts instead of sprays have been preferable late in the season for a couple of reasons: late season sprays have required high gallonage for good coverage, and growers have steered away from them because they fear fruit scarring.

Perhaps an even more important reason growers stay with dusts late in the season is the possibility of water spotting or ringing on the tip of the berry. This can occur when dusts already on the berry are washed to the tip, and concentrate there in the drip-off.

But concentrate spraying, with its uniform surface application at low gallonage doesn't cause this run-off. Spraying throughout the season offers better pest control, and a more realistic approach to integrated control. It allows growers to chart their insect and mite populations throughout the season with confidence they can suppress pests with effective materials when they have to. Dusts have become less effective in recent years because of the lack of new materials and increased insect resistance.

Of course, concentrate sprays are not foolproof. They require initial calibration, followed by adjustment and supervision. Poor control is just as possible with this method as any other. A concentrate sprayer is not a set-and-forget machine. It requires supervision and periodic checking to see that materials are being applied where they are needed. Coverage is basic to control — and control is what it's all about.

One of the first questions that had to be answered was whether air-carrier type sprayers could apply concentrate mixes as well as the best over-the-vine units using high volume rates. Also, growers wanted to know how the newer air-carrier concentrate sprayers compared with conventional vineyard sprayers.

Field tests were made initially in Thompson Seedless raisin grapes, and more recently in table grapes. Spray application techniques and rates were evaluated primarily in control of spider mite and leafhopper, and with gibberellin. Spray equipment must prove itself for applications of all chemicals for growers to be interested.

Interest in concentrate sprays for grapes was evident during 1968, and became widespread in 1969, particularly among table grape growers. A few table grape growers used concentrate sprayers for part of their pest control programs in 1968 and 1969. Many other growers attended demonstrations or observed the operation of concentrate sprayers.

Comparison of air carrier and commercial boom type spray applications for the summer control of Pacific mite

Equipment (speed = 2.4 mph.)	GPA	Average number of mites per leaf (days after application) 3	18	35
Air carrier	5	2.6	5.5	1.8
Air carrier	20	2.7	2.8	0
Air carrier	50	1.9	1.9	1.8
Air carrier	75	1.6	1.1	1.8
Air carrier	150	0.9	1.2	1.9
Air carrier	300	1.3	1.1	5.4
OTV boom	200	0.8	0.4	1.8
OTV boom	400	0.6	0.7	0.9
Air + boom	250	2.9	1.2	3.6
Check	...	4.9	7.5	14.0

(Materials used = Orchex 696 oil 2 gal./acre + Ethion EC 1 qt./acre)

Comparison of gallons per acre in air carrier spray applications for the control of Pacific mite in the spring

Total gallons of spray per acre	Average number of mites per leaf (days after application) 14	24	40
4	0	0	1.9
19	0	0.3	3.4
50	0	0.1	2.1
100	0	0.2	2.9
Check	1.1	4.2	9.4

(Material used: Orchex 696 oil @ 4 gal./acre)

Spray every middle

A few growers say they get control by spraying every other middle. Spray patterns from concentrate equipment indicate otherwise. For example, one test with gibberellin made it apparent every middle must be sprayed for uniform coverage. Bunch halves exposed to the gibberellin spray were larger than the halves not exposed. When both sides were sprayed, appli-

cation and berry development were quite uniform.

The need to spray every middle is probably the major disadvantage to concentrate spraying. Many growers use over-the-row boom sprays which cover two rows at one time. Besides speeding the spray operation, two-row sprayers allow one middle to be irrigated as long as the other is dry enough for the sprayer to operate.

Air carrier spray applications from 4 to 100 gallons per acre (gpa.) generally were superior in coverage and control to the average boom arrangement at 50 to 200 gpa. Control was approximately equal to over-the-vine inverted "U" boom sprayers operating at 200 to 300 gpa.

It was apparent that the air volume is too great in most units designed for trees to be effective in grapes. Air generally flattened or shingled the large leaves, prohibiting spray penetration. It became obvious that smaller air carrier sprayers to spray up and through the vines would perform best.

Moving too slowly was found to be as detrimental as too much air. Because of the short distance from sprayer to vine, travel speed can be increased over orchard speeds. Limits have not been determined. Air must be controlled to avoid too much dust, especially critical with some of the air carrier units tested. Shielding the air intake or delivery system may be the answer.

Air direction critical

Directing or ducting the air flow from the fan up through the vine appears to be the best system for maximum coverage. For the conventional air carrier sprayer the hollow cone disc type nozzles operating at approximately 100 psi. offer the best spray pattern and the most versatility for adjustments.

Operating speeds of 2.5 to 4.5 mph. seem feasible as long as proper calibration has been made and coverage is checked and obtained. Air velocity seems best at approximately 100 mph. at the nozzle. Air volume may vary from 10,000 to 30,000 cfm., depending on the air delivery system.

Detailed studies using water soluble, oil soluble, and fluorescent dyes showed pattern variations when gallonage, type of sprayer and speed of travel were changed. Replicated trials to evaluate leafhopper and Pacific mite control and gibberellin performance are reported in the tables.

Satisfactory gibberellin application with concentrate sprayers requires a change from present recommendations. Current recommendations are for dilute equipment on a parts per million (ppm.) basis. Generally, a 10 ppm. gibberellin bloom thinning spray and a 40 ppm. sizing spray are applied at 200 to 250 gpa. As expected tests in Kern County showed that similar concentrations in low volume applications were not effective, since less gibberellin is applied.

A more realistic approach in concentrate gibberellin sprays is to use a rate per acre basis instead of parts per million. Trials comparing dilute at 175 gpa. at bloom and 225 gpa. at shatter with 33 and 96 gpa. applying with the concentrate sprayer and 175 gpa. at bloom and 225 gpa. at shatter with the dilute. Applying 7 gm. active giberellic acid (GA) per acre for the thinning spray and 36 gm. per acre for the sizing spray gave comparable results. Thus, if good coverage is obtained, the amount of active gibberellin is the critical factor, rather than the gallonage of spray applied.

CONCENTRATE VERSUS DILUTE SPRAYERS

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Q. *How do concentrate Sprayers work, and how are they different from conventional, dilute sprayers?*

A. Concentrate units use air as a vector rather than water. The concentrated, liquified compounds are generally released through non-conventional nozzles, under quite low pressure, 60 p.s.i. for example. The blast of air generated by the blower shears off the liquid accumulated in the nozzle cavity, atomizes the liquid into a mist, and propels it into the vines. Conventional sprayers use dilute chemicals in water under high pressure (600 p.s.i.) to penetrate the foliage. We feel that the smaller droplets of mist are more desirable than larger droplets and give better coverage for the amount of spray used. Concentrate nozzle heads are varied, but all depend on the shearing action of a blast of air.

Q. *What are the advantages of concentrate sprayers?*

A. They use less water and material, and the less water applied, the better. With one loading of a 300 gallon tank on a concentrate rig, a grower can get good coverage for insects or mites on up to ten acres of vineyard. It's less work than if he had to fill a 500 to 600 gallon tank and mix chemicals for application of 150 to 200 gallons per acre with a dilute sprayer.

Since the concentrate units use less water there is no run-off on the vines and fruit. This can allow for spraying throughout the season. Excess run-off from dilute spraying has caused table grape growers alarm that the run-off would spot or ring berries when they spray late in the season. Consequently they've gone to using dust during that period, and dust, in turn, has its own problems with drift. The ability to spray throughout the season is a more realistic approach to total pest control, and growers can monitor the amount of insects and mites on their vines to determine when to spray for best results.

Concentrate sprayers are relatively inexpensive. Most have power-take-off shafts for regular tractors and some have ground drives. They tend to weigh less and therefore don't cause so much compaction in middles. They are smaller and more easily maneuvered in the field than boom-fitted, dilute types, although some concentrate designs also use a boom arrangement.

We've found that applying four to 100 gallons per acre with concentrate generally gave better coverage than the average dilute boom sprayer laying on 50 to 200 gallons per acre. The concentrate coverage was about the same as that of an over-the-vine rig operating at 200 to 300 gallons per acre.

Q. *What are the disadvantages of concentrate sprayers?*

A. With most growers wanting to spray in every other row, so that they can continue irrigation along with spraying operations, some find that the concentrate units, which are intended for every row use are not satisfactory. Other concentrate units can handle four one-half rows on each pass, enabling the grower to use dry rows during irrigation.

Concentrate sprayers intended for use with fruit trees can generate too much wind to be effective in vineyards. When the wind is too great it will drive the leaves into a shingled mass that blocks out the mist from circulating to interior vine surfaces. We've found that the types that spray up and into the vine foliage give the best application. Ducting or directing the air stream into the vines is also a must to keep down dust.

In short, concentrate sprayers aren't foolproof. They have to be suited for the purpose the grower intends to use them for. They have to be calibrated to start with and need their particular adjustments and supervision as they are used.

Q. *Well, then, are there any instances where it might be a toss-up whether to go to concentrate or dilute?*

A. It's up to the grower and his practices and objectives. When the appearance of the fruit is not so critical as with the late table grape season, we can't say flatly that a concentrate sprayer that penetrates vineyard foliage is better than a conventional, over-the-vine unit in proper working order. That is, if the conventional unit's nozzles are not worn out and putting out too much liquid without adequate control. If you use a dilute sprayer with worn, oversized nozzles, you'll find that your tractor driver, in order to follow his instructions of so many rows for each tankful, will be taking the only recourse, driving faster. This increased speed just causes an even less effective application.

Q. *How can the effectiveness of spray coverage be determined?*

A. At the Kearney Station we have what we consider a very valid and rapid means of spotting the best coverage for nozzle arrangement, speed, and gallonage. In separate areas of a test plot, we use a couple of six-foot rods or stakes with small cards, "target cards", attached at increments of one foot. Each rod or stake with its five cards facing out is placed within the vine up next to the trunk. We put a water-soluble dye in our spraying liquid and go through the spraying trial. The degree of coverage is shown in the amount of dye that ends up on the cards.

We also collect leaves for laboratory analysis of spray residues.

Some growers like to use fluorescent dyes in their sprays and then check for coverage with a blacklight, and we're certainly not knocking that method.

Any technique that is satisfactory to spot control in spraying is fine. Control is, after all, the main thing.