Acaricides on Apples and Pears

tentative ratings of 11 acaricides given for spider mite control in northern California for 1953 season

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Season to season variance in the effectiveness of new chemicals—used as acaricides for spider mite control on apples and pears in northern California—makes it necessary that only tentative toxicity ratings of the acaricides be listed following each season's field investigations.

These new chemicals are organic compounds with relatively high phytotoxic—injurious to plants—properties and generally show a selective toxicity to the species of mites to be controlled. Though a number of the chemicals have been field tested for three years or more there is still much to be learned regarding their toxicity under varying conditions.

The table on this page lists the tentative ratings of 11 acaricides made following field tests in the 1952 season. The dosage rate per acre is based on a bulk application of 800 gallons per acre in an average sized orchard. In semiconcentrate and concentrate applications not more than a 20% reduction in material is permissible under ideal application conditions.

The formulations as wettable powders, in general, are less phytotoxic than the emulsions. Some of the emulsifiable compounds exhibited excess foaming in the spray tank and excess runoff on the foliage.

The residual values or effectiveness of the acaricides—in holding down a mite population—vary widely. Compounds of low residual values necessitate several applications per season for satisfactory control. In some cases a single application of the compounds with comparatively high residual values—six to eight weeks—may prevent spider mite injury until harvest is complete.

Though these compounds are specific in the control of spider mites satisfactory results were not obtained unless the foliage and fruit received thorough, uniform coverage. Timing also is important. It was easier to obtain control before the population of mites showed a marked increase than to begin control when the mite populations had already caused damage.

There are indications in California and the Pacific Northwest that the European red mite has shown resistance to control by use of the phosphate group of acaricides. This factor is under study.

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Tentative Rating of Acaricides Used on Apples and Pears in Northern California. The Listed Ratings Are Based on Single Application of a Given Material

Material	Dosage per 100 gals.	Per acre	Effectiveness against E. Red	2-spot	Bryobia	Phytotoxicity
Para-chlorophenyl *para* chloro benzine sulfonate—Ovotran (usage dependent upon registration)	½ lb. 50% wettable	3–5 lbs. 50%	3	3	3	Apples—Injury if used above 3 lbs. 50%/acre. Pears—Do not use before second cover spray. At second cover, injury if used above 3 lbs. 50%/acre. After second cover, injury if used above 5 lbs. 50%/acre.
Beta-chloroethyl—beta (para-tertiary-butyl-phenoxy) alpha-methyl-ethyl sulfite—Aramite	1½ lbs. 15% wettable	10–12 lbs. 15%	1	3	0	May spot tender foliage, cause russet spots on fruit of pears. No injury noted on apples.
Para-chlorophenyl phenyl sulfone—Sulphenone	3 lbs. 50% wettable	18–24 lbs. 50%	3	2	1	Yellowing of foliage on Winter Nelis. No injury noted on Bartlett pears or apples.
2,4-dichlorophenyl benzine sulfonate—Genite 923	1½ pts. 50% emulsifiable	1½–2 gals. 50%	3	2	3	Yellow spotting on young pear fruit which fades out by harvest. Yellowing of foliage from early seasonal application. Injury to several apple varieties.
Di(*para* chlorophenyl) methyl carbinol—Dimite	1½ pts. 25% emulsifiable	1½–2 gals. 25%	2	3	3	None noted on apples or pears.
Diethyl *para*-nitrophenyl thiophosphate—Parathion	1 lb. 25% wettable; ½ pt. 42% emulsifiable	8 lbs. 25%; 4 pts. 42%	2	2	2	None noted from wettable powder. Emulsifiable forms may cause ring around calyx end of pears. Late applications on pippin apples may cause russetting.
Tetraethyl pyrophosphate—TEPP	½–⅓ pt. 20% emulsifiable	4 pts. 20%	1	1	2	None noted in recent years on apples or pears.
S(1,2-dicarbethoxyethyl) 0-0-dimethyldithiophosphate—Malathon	1 pt. 50% emulsifiable; 2 lbs. 25% wettable	1 gal. 50%; 16 lbs. 25%	3	3	(not known)	Emulsifiable formulations may cause ring on young pear fruit around calyx end, which fades out by harvest. No injury noted on apples.
Ethyl *para*-nitrophenyl thionobenzine-phosphonate—E. P. N.	¾ lb. 27% wettable	6 lbs. 27%	3	2	0	No injury noted on apples or pears.
4,6-dinitro-arthocyclohexyl phenol, dicyclohexylamine salt—DN-111	¾ lb. 20% wettable	6 lbs. 20%	2	2	3	Yellow spotting of young pear fruit which fades out by harvest. Injury to fruit and foliage under high temperatures.
Dimethyl *para*-nitrophenyl thiophosphate (mixed with 6% parathion)—Metacide	½ pt. 50% emulsifiable	4 pts. 50%	2	2	2	None noted on pear. Has caused injury to Bellflower, Skinner seedlings and Golden Delicious apples.

Rating—O = ineffective; 1 = partially effective (kills only certain stages); 2 = moderately effective; 3 = effective.

ALFALFA

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ing does affect the quality of alfalfa hay. Carotene losses as result of leaf shatter are indicated by angle-lined portion of the graph in the first column on page 4 of windrows 1st, 2nd, 3rd and swath. The protein losses are similarly depicted in the graph in the second column on page 4.

The second windrow, made at 55% to 65% moisture content was well above all others in carotene retention. The slower drying of the first windrow retarded the inactivation of enzymes, causing a greater reduction of carotene than in the second windrow. The low carotene content of windrow three and the swath were the results of greater exposure to the elements.

The first and second windrows were highest in protein content, but the third windrow was lower than the swath. Some shatter occurred from hand raking at this lower moisture content, causing a loss of over one percentage point in protein, even though raking was usually done in the morning to minimize its effect.

To compare laboratory results with actual field operations using conventional haying equipment, machine raked windrows of hay made at varying moisture contents were studied. When cured, the hay was baled and weighed for each treatment and the results compared with similar laboratory tests.

Here, again, leaf shatter was low and the protein content high when the hay was raked at any point above 55% moisture content. Raking below that point caused progressively greater damage, except for periods of high relative humidity.

Maximum yield was obtained by raking just before leaf shatter begins, usually about 55% moisture content. Raking when the hay was damp or tough as a result of high humidity was equally effective in the retention of leaves.

Raking immediately after mowing—which is effective on light, mature hay and in areas of exceptionally low relative humidity—may, however, under less favorable conditions reduce yield as much as 3% and prolong the curing period one to three days.

For the least leaf shatter, the greatest carotene and nearly maximum protein retention, plus faster curing, it is recommended from the results of these tests that alfalfa hay be raked between 55% and 65% moisture content.

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The Feed Laboratory Bureau of Field Crops of the California State Department of Agriculture co-operated in the study reported above.

ACARICIDE

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Ovotran has shown a comparatively long residual value and ovicidal—egg-killing—properties against all three species of mites. As it is relatively slow in its kill of adult mites it should be used early—before the adult population is high—or in conjunction with another compound such as TEPP or parathion if used later. It will cause injury in combination with lime sulfur.

Aramite has shown a comparatively long residual value on two-spot and Pacific species of mites but not on European red or Bryobia. It has good ovicidal properties and a rapid kill of adult forms. It is incompatible with lime sulphur, Bordeaux mixture and other strong alkaloids. Its compatibility with sulphur, at first questioned, has now been confirmed.

Sulphenone has been erratic in control in past seasons, but has shown improvement recently probably due to change in formulation. It has only a fair residual value—two or more applications generally being required. High deposits on the foliage and fruit are apparently a necessity.

Genite 923 shows only a fair residual value but has good ovicidal properties though it will cause injury in combination with TEPP. It is not registered for use on apples due to spray injury.

Dimite has shown a long residual value except on European red mite. It has good ovicidal properties and shows a rapid knock-down of adult spider mite. Apparently it is nonphytotoxic at dosages required.

Parathion has shown a short residual and weak ovicidal value though the knock-down of adults is rapid. Several applications a season are usually required. It is highly toxic to humans but residual deposits disappear rapidly which makes it possible to use parathion within 21 days of harvest. Its efficiency is apparently better in the cool period of early season than in the warm days of early summer.

TEPP has shown no residual or ovicidal values. The knock-down of adults is rapid but inadequate without repeated applications. It is often used just prior to harvest in emergencies. TEPP is readily destroyed by alkaline materials and like parathion its human toxicity is high.

Malathon shows a fair residual value generally requiring two or more applications. It is effective against the egg and adult but has had only limited study in California. Its low toxicity to humans makes it much safer to use than other organic.

EPN shows a fair residual value, is a weak ovicide and rather specific as to species controlled. It has shown the most promise on European red mites but requires several applications per season. It is highly toxic to humans.

DN-111 has a short residual value, is weak as an ovicide and has a rapid knock-down of adults. It is not compatible with oil. Its efficiency is best in the early season while temperatures are cool.

Metacide has a short residual and a low ovicidal value and resembles parathion, in toxicity. Control with metacide may require several applications.

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NEMATODE

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75% and class four had 76%–100%. To arrive at the root index each class was weighted by the factor of 0, 1, 3, 5, or 7 for the classes 0 to 4 respectively, then the total divided by seven.

The results of these tests show that the flat treatment was much more effective than any of the row treatments in reducing the root-knot nematode population. Also it is apparent from the root gall examinations that it is not necessary to kill all of the root-knot nematodes in the area to obtain satisfactory growth of plants in fumigated soil.

One difficulty encountered in the row treatments resulted from the undecomposed roots and plant parts which caught on the chisels and disturbed the beds excessively, loosening the soil where the seeds were planted. This could possibly dry out the soil too rapidly and have an adverse effect on germination. In some cases the loose soil resulted in seeds being planted too deep.

Excessive disturbance of the soil probably can be avoided by fumigating at the same time the beds are formed. This would offer the additional safety factor of treatment well before planting time. Further investigations concerning the possibility of phytotoxicity—plant injury—in different soil types and under varying weather conditions are being continued. Fumigation at the time of planting can not be recommended for general use until more information on phytotoxicity is obtained.

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