EVALUATION OF ENDOSULFAN, OXYDEMETONMETHYL, DEMETON AND DISULFOTON APPLIED WITH GROUND EQUIPMENT FOR SEASONAL CONTROL OF THE GREEN PEACH APHID, MYZUS PERSICAE (SULZER), ON POTATOES

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Endosulfan (Thiodan®), oxydemetonmethyl (Meta-Systox-R®), demeton (Systox®), diazinon, parathion, endrin and several other insecticides have been used in Eastern Washington to control the green peach aphid, Myzus persicae (Sulzer). However, endosulfan, which became available to potato growers in 1958, has become the most widely used insecticide on potatoes in this area (Schopp et al. 1961). Therefore, when the strawberry aphid, Chaetosiphon fragaefolii (Cockerell) in southwestern Washington developed resistance to this insecticide between 1960 and 1964 (Shanks 1967), there was concern lest the green peach aphid in eastern Washington might also become resistant to the insecticide. Also, though we still have no evidence that resistance to endosulfan is developing, it would be comforting to know that one or more other insecticides are available that could be used as substitutes for it.

In 1965 and 1966, some potato growers, because of personal preference, treated large acreages with oxydemetonmethyl or demeton. Subsequently, fieldmen, growers, and county agricultural agents reported that these two systemic insecticides and endosulfan varied in control of aphids from poor to excellent. As a result, we made experimental tests at Moses Lake, Washington in 1967 and 1968 to evaluate the relative performance of endosulfan, oxydemetonmethyl, demeton and disulfoton (Di-Syston®), applied by ground equipment to large field plots for seasonal control of aphids on Russet Burbank potatoes. The results obtained with 3 to 4 applications of sprays each season are reported.

Materials and Methods: Endosulfan was applied at a rate of 1 lb actual toxicant in 17.8 gal spray/acre/application, and oxydemetonmethyl, demeton, and disulfoton were applied at 0.5 lb actual toxicant in 17.8 gal spray/acre/application, the maximum registered rate for oxydemetonmethyl and demeton. Applications were made with a tractor-mounted, Slosser-type row-crop sprayer to 4 rows of potatoes at a time. Each row was sprayed with 4 nozzles, 2 that forced spray upward from beneath the foliage and 2 that forced it downward into the foliage. The 100-ft-long plots were 8 rows wide in 1967 and 4 rows wide in 1968.

The experimental design used both years involved a split-plot arrangement with 6 soil treatments (not considered in this report), 4 foliage spray treatments, and an untreated check. Each of the 30 different combinations was replicated 4 times, and each of the 4 different treatments and the untreated checks was represented 24 times.

In 1967, the potatoes were planted May 15-16, and the sprays were applied June 8, 20, and 30. However, during the last application, some spray boomlets became entangled in potato vines though the tractor was equipped with vine separators.

In 1968, the potatoes were planted May 23-24, and the sprays were applied June 19 and 26, and July 3 and 12, before the rows closed and ground equipment could no longer be used. Border rows of potatoes around the test area were sprayed 3 times in 1967 and 4 times in 1968 to prevent aphids from migrating into the test plots.

Each year, the effectiveness of the treatments was determined by picking and examining 25 compound potato leaves/plot for aphids. The leaves were picked at random from the lower 2/3rds of the plants. Leaf samples were picked June 23 and July 5, 17, and 31, 1967, and June 26 and July 3, 11, 17, and 24, and August 7, 1968.

Results and Discussion: The green peach aphid was scarce on potatoes at Moses Lake during both years, perhaps as a result of the effective control of spring generations of the aphid on peach trees in another experimental area about 15 miles southwest of Moses Lake. Earlier, Powell et. al. (1968) reported that the spraying of all peach trees on the south side of the Royal Slope between Othello and Vantage in the spring had reduced the populations of winged and wingless aphids on potatoes in the area 97%. Also, the experimental aphicides were highly effective, and the relatively small size of the untreated plots left for comparison failed to contribute materially to the population.

Although aphids were not abundant in 1967 or 1968, significantly more aphids were present in the unsprayed than the sprayed plots. No one treatment was significantly better than another (Table 1), but this result was not surprising since the insecticides used are among the most efficient aphicides known.

Endosulfan is registered at 1 lb/acre/application, but neither oxydemetonmethyl nor demeton are registered at more than 0.5 lb/acre/application (disulfoton has not been registered for use as a foliage spray). Consequently, oxydemetonmethyl and demeton may be expected to perform better when they, too, are applied at 1 lb/acre. However, in a multiple application test with sprays applied with ground equipment in 1962 (Powell 1966), endosulfan and oxydemetonmethyl applied at 1 lb/acre both gave excellent but not significantly different control of aphids or leaf roll. Also, in other tests (Powell, unpublished data), demeton and disulfoton sprays were not as effective as endosulfan or oxydemetonmethyl sprays

when they were applied with ground equipment. Oxydemetonmethyl, demeton, disulfoton, and endosulfan all kill by contact; in addition, oxydemetonmethyl, demeton, and disulfoton are taken up by young potato plants, and aphids are also killed when they feed on the plant sap.

The addition of oxydemetonmethyl to the list of aphicides recommended for potatoes in the 1969 Washington State University Chemical Insect Control Handbook should be welcomed by growers who wish to start control of aphids early with a systemic-type insecticide.

Footnotes

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4/ Mention of a proprietary product does not necessrily imply its endorsement by the USDA.

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Table 1--Seasonal control of the green peach aphid on potatoes with 3 applications in 1967 or 4 applications in 1968 of 4 insecticides applied as sprays with ground equipment. Moses Lake, Washington.

Insecticide	Date of spray application and date and number of aphids/100 compound potato leaves							
				1967				
Treatment	6-8	6-20	6-23	6-30	7-5	7-17	8-1	Total
Endosulfan	Sp[1/]	Sp	0.0[2/]	Sp	1.0	2.0	0.0	3 a[3/]
Oxydemetonmethyl	Sp	Sp	.0	Sp	4.0	.0	.0	4 a
Disulfoton	Sp	Sp	.0	Sp	4.0	3.0	1.0	8 a
Demeton	Sp	Sp	.0	Sp	.0	11.0	2.0	13 a
Untreated	--	--	17.0	--	1.0	16.0	15.0	49 b

						1968					
	6-19	6-26	6-26	7-2	7-3	7-11	7-12	7-17	7-24	8-7	Total
Endosulfan	Sp	1.5	Sp	0.0	Sp	1.5	Sp	0.0	0.0	10.0	13.0 a
Oxydemetonmethyl	Sp	.5	Sp	2.5	Sp	2.5	Sp	.0	.0	7.5	13.0 a
Disulfoton	Sp	.5	Sp	3.0	Sp	2.5	Sp	2.0	1.5	8.5	18.0 a
Demeton	Sp	1.5	Sp	.5	Sp	4.5	Sp	.0	2.0	10.0	18.5 a
Untreated	--	2.5	--	4.0	--	14.0	--	6.0	2.0	13.5	42.0 b

1/ Sprayed
2/ Number of aphids/100 leaves
3/ Totals followed by the same or common letter are not significantly different