

# **The Effect of Overhead Sprinkler Irrigation on Methyl Parathion Residue on Grape Leaves**

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In certain grape growing areas of the Salinas valley located in the central coastal area of California, one of the insect pest which established itself on grapes has been the orange tortrix, Argyrotaenia citrana (Fernald) (KIDO *et al.*, 1971). The principal damage is caused by the larval infestation of the grape clusters. Methyl parathion has been used as a control measure, but there has been concern involving the safe waiting interval for reentry of some workers into the insecticide treated field.

In the Salinas valley, a majority of the vineyards are frequently irrigated during the growing season with overhead sprinkling systems, and the effect of this type of irrigation on the persistence of insecticide residue after a foliar application was investigated in this study.

## Materials and Methods

Studies were conducted at two locations, both treated with methyl parathion (EC) sprays at the rate of 0.75 lb active ingredient per acre.

The initial trial was conducted at the Mirassou Vineyards on June 14, 1972. A single row of 62 vines of mature Sauvignon blanc grape vines spaced 8 foot apart in 12 foot rows were used for each plot. Sprays were applied with a 100 gallon capacity hydraulic sprayer (Fabricated Metals Inc., San Leandro, Calif.) equipped with a single row over-the-vine inverted U-boom sprayer. Three nozzles (AYHSS No. 20, Spraying Systems Co., Wheaton, Ill.) on each side of the boom were operated at 150 p.s.i. to give a rate of 100 gals/acre at the ground speed of 2.5 m.p.h.

One row was sprinkler irrigated during the night after the insecticide application for a period of 12 hours which provided an equivalent of 1 1/2 inches of water per acre.

Leaf punch samples for chemical analyses consisted of 100 leaf discs taken at random with a leaf punch (3 cm diameter) from 2 outer and 2 inner positioned leaves located approximately 4 foot above ground on 25 center vines in the plot. Samples were collected from both the irrigated and non-irrigated plots.

The second trial was conducted on mature Sylvaner grape vines spaced 6 foot apart in 12 foot rows at the Paul Masson Vineyards on September 11, 1972. Two types of applications were used: one, a concentrate spray at 25 gals/acre with a Windmill 350 sprayer (Gervan Distributing Co., Modesto, Calif.) and the other, a dilute spray at 100 gals/acre with an over-the-vine AMC double inverted U-boom sprayer (Agriculture Manufacturing Co., Fresno, Calif.) operated at 250 p.s.i. The ground speed of both sprayers was 3.5 m.p.h.

The spray trial was comprised of 6 plots. Each plot consisted of 2 adjacent rows of 36 vines per row and separated by a buffer of 6 vines. One of the plots was irrigated 1 day after the insecticide application, the second plot 3 days after application and the third plot 7 days after application. These plots were sprinkler irrigated for periods of 12 1/2 hours which gave an equivalent of 2 inches of water per acre. The three additional insecticide treated plots received no irrigation.

Leaf punch samples for chemical analyses were collected at random with a leaf punch (1.8 cm diameter) and consisted of 200 leaf discs from each plot.

Samples from the two vineyards were sent to the California Department of Food and Agriculture for chemical analyses. Samples from the Mirassou Vineyards were analyzed both for surface and internal residues of the leaves. The leaf samples collected from the Paul Masson Vineyards were analyzed for surface residues of methyl parathion and methyl paraoxon.

### Results and Discussion

The primary interest of the study was to determine the deposit and residue levels of methyl parathion at the time of application and at intervals thereafter up to a period of 28 days.

Prior to harvest, the hazards which the worker may encounter after an insecticide application may be from contact with residues on the surfaces of the treated foliage while performing such tasks as tying canes to the trellis wires, removing unwanted shoots and weeding. Therefore, the emphasis in the chemical analyses was placed on the insecticide residues which could be readily removed from the leaf surfaces and referred to as dislodgeable residues by GUNTHER et al., 1973.

TABLE 1

The effect of sprinkler irrigation on methyl parathion residues on Sauvignon blanc grape leaves at Mirassou Vineyards. Grape vines were irrigated during the night after the insecticide application.

Days after insecticide application	Methyl parathion - p.p.m.					
	Unsprinkled			Sprinkled		
	Surface residue	Internal residue	Total residue	Surface residue	Internal residue	Total residue
0	16.3	28.5	44.8	11.7	23.2	34.9
1	1.6	3.7	5.3	0.4	1.1	1.5
2	0.7	1.5	2.2	0.3	0.6	0.9
5	0.1	0.2	0.3	0	0.02	0.02
8	0	0	0	0	0	0
14	0	0	0	0	0	0

TABLE 2

Surface residues of methyl parathion on unsprinkled Sylvaner grape leaves at Paul Masson Vineyards.

Days after insecticide application	Concentrate spray		Dilute spray	
	Methyl parathion - p.p.m.		Methyl parathion - p.p.m.	
	Range	Average	Range	Average
Pre-application	0	0	0	0
0	22.0 - 23.2	22.7	11.0 - 14.3	12.8
1	4.7 - 5.1	4.9	1.9 - 2.7	2.2
3	0.8 - 0.8	0.8	0.5 - 0.8	0.7
7	0.2 - 0.3	0.3	0.2 - 0.3	0.3
14	0	0	0	0
21	0	0	0	0
28	0	0	0	0

TABLE 3

The effect of sprinkler irrigation on surface residues of methyl parathion on Sylvaner grape leaves at Paul Masson Vineyards.

Days after insecticide application	Sprinkler irrigation - Days after insecticide application							
	<u>1 day</u>		<u>3 days</u>		<u>7 days</u>			
	Concentrate spray	Dilute spray	Methyl parathion - Concentrate spray	Dilute spray	Concentrate spray	Dilute spray	Concentrate spray	Dilute spray
Pre-application	0	0	0	0	0	0	0	0
0	11.1	9.1	17.1	8.9	19.8	7.4		
1	3.1*	1.6*	3.6	1.6	4.8	2.6		
2	0.8	0.6	-	-	-	-		
3	0.5	0.8	0.5*	0.5*	1.4	0.7		
4	-	-	0.2	0	-	-		
7	0.1	0	0.1	0.1	0.6*	0.2*		
8	-	-	-	-	0.5	0		
14	0	0	0	0	0	0		
21	0	0	0	0	0	0		
28	0	0	0	0	0	0		

\* Leaves sampled prior to irrigation.

The results of the residue analyses from the leaf samples collected from the Mirassou Vineyards (table 1) showed that dissipation of methyl parathion was rapid. In the unsprinkled plot, 90.2% of the surface residue of methyl parathion was lost from the leaves 1 day after the insecticide application and 95.7% by the second day. By comparison, in the plot which was sprinkler irrigated on the night after the insecticide application, the surface residue levels were reduced by 96.6% and 97.4% of the initial deposit levels 1 and 2 days respectively after the application.

The analyses also showed that the major portion - over 60% - of the total residues was found in the internal portion of the leaves and over 99% of the total residues was lost in 5 days after the application.

The results from the Paul Masson Vineyards showed that the average initial surface deposit obtained from the plots treated with the concentrate sprays (19.3 p.p.m.) was greater than those obtained from the plots treated with the dilute spray (10.7 p.p.m.) (tables 2 and 3). The results also showed that methyl parathion dissipated rapidly from the unsprinkled leaf surfaces and that sprinkler irrigation at 1, 3 or 7 days after the methyl parathion application had relatively little effect in reducing the amount of residue from the leaf surfaces (table 3).

No methyl paraoxon was found in the treated leaf samples from the Paul Masson Vineyards.

The studies conducted in the two vineyards showed that the effect of overhead sprinkler irrigation reduced the methyl parathion residues only slightly more than from the non-irrigated vines, and then only if the treated vines were irrigated on the night following the insecticide application. Later irrigation had very little or no effect on the reduction of this insecticide residue.

#### References

- GUNTHER, F. A., W. E. WESTLAKE, J. H. BARKLEY, W. WINTERLIN and L. LANGBEHN: Bull. Environ. Contam. Toxicol. 9, 243 (1973).  
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