A DEGRADATION STUDY OF DISLODGEABLE OXAMYL RESIDUE ON TOMATO FOLIAGE IN SAN DIEGO COUNTY

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SUMMARY

During September of 1983, a degradation study of dislodgeable oxamyl (Vydate) residue on tomato foliage was conducted in San Diego County. The safety interval for oxamyl on tomatoes is 1 day. Samples were collected for seven consecutive days beginning 24 hours after the application. None of the sample results taken exceeded the suggested safe level value of 1.5 ug/cm^2. This study substantiates that under the conditions of this tomato field and application rate, the existing safety interval is adequate.

INTRODUCTION

In June 1971, the California Department of Food and Agriculture established safety intervals for specific crop/pesticide combinations. A safety interval is the time period that must elapse between the application of a pesticide and the entry of unprotected workers into the treated area. This waiting period was instituted to allow sufficient time for toxic materials to environmentally degrade to a low toxicity residue level. The adequacy of these safety intervals has not been thoroughly evaluated since their introduction. In 1983 several studies were initiated to validate existing safety intervals. This study was conducted to monitor the foliar decay rate of oxamyl.

Oxamyl (Vydate) is a broad spectrum contact-type carbamate insecticide and acaricide, effective against a wide variety of pests (Hayes, 1982). It has an oral LD_{50} (rat) of 5.4 mg/kg and a dermal LD_{50} (rabbit) of 740 mg/kg (NIOSH, 1980).

Knaak et al. (1982) calculated a safe level value for dislodgeable oxamyl residue on leaves. This level (1.5 ug/cm^2) is not expected to produce cholinesterase inhibition in field workers, and represents the maximum residue level which would ensure negligible risk to the field workers. This study was conducted to monitor the degradation of oxamyl with time in relation to this calculated safe level.

METHODS

With assistance from the San Diego County Agricultural Commissioner's staff, a local tomato grower was contacted and asked to cooperate in this study. One tomato field was monitored for seven consecutive days after the oxamyl application. The field was located near the Pacific Ocean approximately midway between San Diego and Los Angeles, near Camp Pendleton Marine Base. The application rate was one quart (0.5 lbs. a.i.) of Vydate/acre applied in a tank mix of 50 gallons of water/acre.

The tomato field was divided into three areas. One row from each area was selected and identified with markers for daily sampling. Twenty plants in each row were chosen for sampling. Three replicate samples were taken from each plant each day. Each composite sample consisted of 60 leaf punches, one leaf punch from each of the 60 plants. These samples were collected using a 2.54 cm disk leaf punch which was cleaned with alcohol between samples. The first sample was taken approximately 24 hours after the application, then again every 24 hours, for a total of 7 sampling days.

The leaf punch sample bottles were sealed with aluminum foil, capped, and stored on ice. Samples were shipped to Chemistry Laboratory Services in Sacramento for analysis. Dislodgeable residues were removed by mechanically shaking the leaf disks with a water-surfactant solution. The aqueous wash was extracted with ethyl acetate, dried with anhydrous sodium sulfate, and concentrated or diluted as necessary. The analysis was by gas chromatography with a method sensitivity of 0.001 ug/cm^2.

Weather data for the time period of this study was obtained from the Marine Corp Base. Air pollutant data was obtained from the nearest California Air Resources Board monitoring station at Costa Mesa-Placentia, approximately 25 miles northwest of the study site.

RESULTS

The analytical results for each composite sample as well as a calculated average for each day are presented in table 1. The minimum detectable level (0.001 ug/cm^2) was used in calculating the averages for each sample under the detection limit. Weather conditions during the study were warm and humid with occasional light precipitation. The rainfall however, was too light for measurement. Table 2 shows the maximum and minimum air temperatures as well as the average dew points and wind speeds for the period during which the study was conducted. Table 3 shows the average daily concentrations of selected air pollutants monitored at a nearby ARB station in the south coast air basin for the same period. Figure 1 shows the data from Table 1 in chart form.

DISCUSSION

None of the sample results exceeded the recommended level of 1.5 ug/cm^2 suggested by Knaak (1982). The highest level found (0.04 ug/cm^2) was 38 times lower than this suggested safe level. The application rate used during this study was one half the maximum allowable rate recommended by the label. For purposes of estimating the dislodgeable oxamyl residue for a maximum rate application, doubling the highest amount detected gives an estimated 0.08 ug/cm^2. This level would be approximately 19 times lower than the suggested safe limit. This study substantiates the adequacy of the existing safety interval, given the conditions of this tomato field and the application rate of the material. Existing safety intervals were established upon the degradation of maximum label application rates. To minimize cost and pest resistance to the material growers usually do not apply maximum rates. Several factors such as, ambient and radiant temperature, humidity, and solar radiation may influence the degradation of pesticides. These factors were not within the scope of this study to measure and were not taken into account.

TABLE 1

Date	Days After Application	ug/cm^2 Replicate 1	Replicate 2	Replicate 3	Average[a/]
Sept. 22	1	.024	.030	.020	.025
23	2	.020	.030	.040	.030
24	3	.020	.015	.012	.016
25	4	.028	.012	.009	.016
26	5	.007	ND[b/]	ND	.003
27	6	ND	ND	ND	.001
28	7	ND	ND	.008	.003

a/ Averages were calculated with nondetectable levels equivalent to .001 ug/cm^2.

b/ ND=nondectable. The minimum detectable level for these samples were .001 ug/cm^2.

TABLE 2

Date	Temperature °F Maximum	Minimum	Average Dew Point	Average Wind Velocity Knots
Sept. 22	81	72	72	SW10
23	71	70	71	SW8
26	81	67	67	SW8
27	78	55	62	SW7
28	75	55	62	SSW6

TABLE 3

Average Concentrations of Selected
Air Pollutants in the South Coast Air Basin
Reported by the Costa Mesa-Placentia Station

Date	Carbon Monoxide CO/ppm	Sulfur Dioxide SO_2/ppb	Nitric Oxide ppb	Nitrogen Dioxide ppb	Oxides of Nitrogen ppb	Ozone ppb
Sept. 21	0.4	0.0	7.0	9.0	17.0	11.0
22	0.7	0.0	8.0	13.0	20.0	13.0
23	0.5	0.0	8.0	17.0	25.0	16.0
24	1.3	2.0	16.0	20.0	36.0	15.0
25	1.2	0.0	17.0	18.0	34.0	23.0
26	1.1	1.0	3.0	14.0	17.0	24.0
27	1.2	3.0	8.0	18.0	27.0	15.0
28	0.6	0.0	2.0	16.0	18.0	22.0

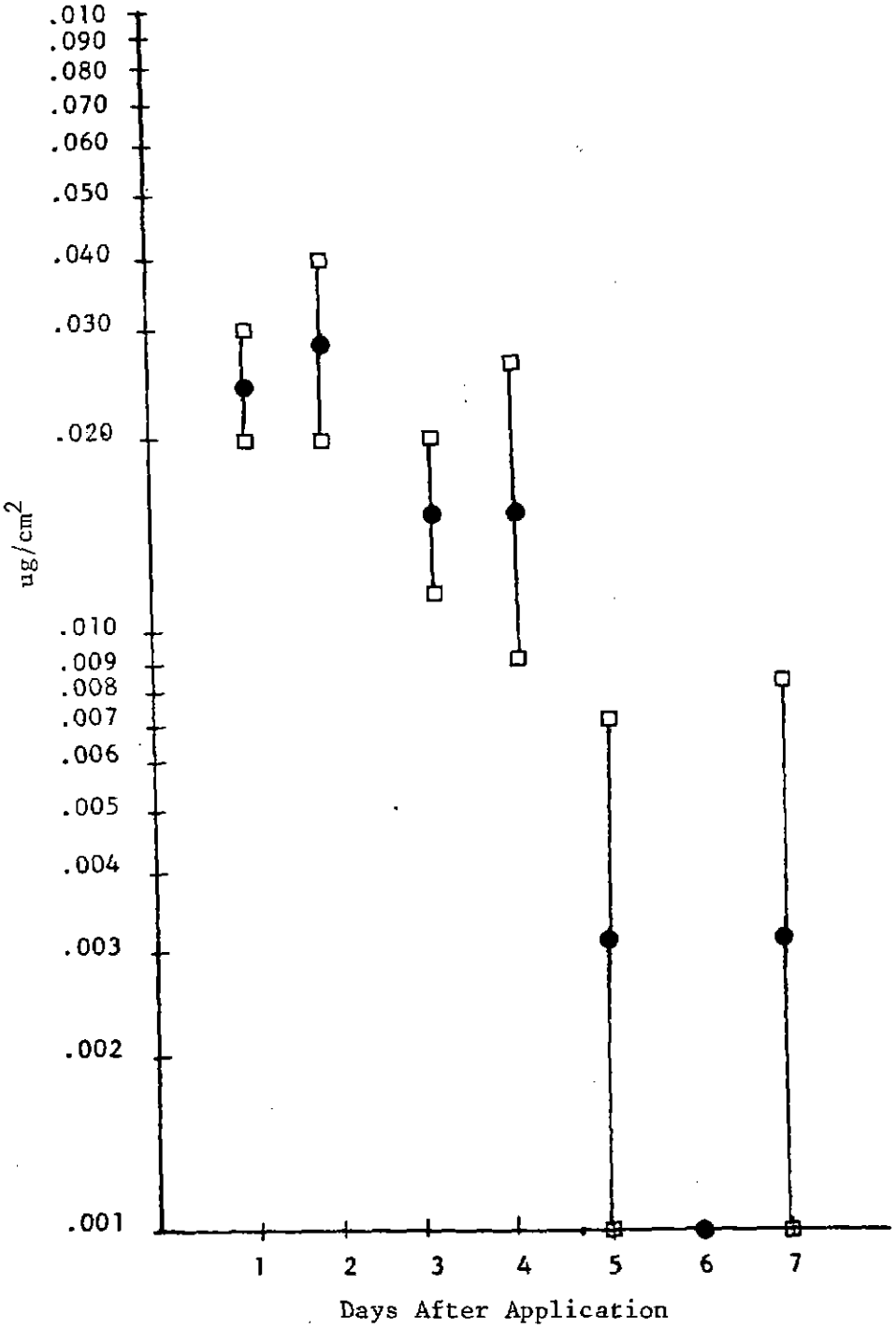

Figure 1. Analytical results of oxamyl concentrations plotted against time.

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