DEGRADATION OF DISLODGEABLE METHOMYL RESIDUE ON SWEET CORN FOLIAGE AND HUSKS

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ABSTRACT

Foliage from 4 sweet corn fields and the husks from 2 of these fields were sampled to determine the adequacy of the California-required 2 day reentry interval for methomyl on sweet corn. Each field was treated with Nudrin 90 Methomyl Insecticide (EPA Reg. # 201-347-ZA) at the maximum label rate of 0.5 lbs./acre (0.45 lbs. a.i./A). Samples were taken prior to the application and 1, 2 and (once) 3 days after the application. The data shows the dislodgeable methomyl residue below 1.5 ug/cm^2, the calculated safe level of reentry for methomyl (3), within the 2 day reentry period. Only the foliage samples drawn 17 hours after the seventh methomyl application to one of the corn fields was above the calculated safe level. The dislodgeable residue on husks was found to be well below this level at all times. The data does show a steady buildup of dislodgeable residue over the course of seven applications.

INTRODUCTION

In 1971, the California Department of Food and Agriculture established safe reentry intervals for specific pesticides on specific crops. A safe reentry interval is a designated period of time that must elapse between the time of application and the entry of unprotected workers into the treated field. The reentry interval is designed to allow adequate time for the amount of pesticide residue to degrade to a level calculated to be safe. For methomyl on sweet corn, the current safe reentry interval is 2 days. The calculated safe level of dislodgeable methomyl residue on foliage is 1.5 ug/cm^2 (3).

Methomyl (S-Methyl-N-((methylcarbamoyl) oxy)-thioacetimidate; Lannate^R; Nudrin^R) is a broad spectrum N-methyl carbamate insecticide used on many vegetable, fruit and field crops as well as ornamentals. Methomyl is a Toxicity Category 1 restricted use pesticide whose greatest known hazard to humans would be from acute exposure. It has an acute oral LD_{50} of 17 mg/kg in the male rat and 23.5 mg/kg in the female rat (1,2). It has an acute dermal LD_{50} greater than 5,000 mg/kg in the rabbit (2). Like other N-methyl carbamate insecticides, methomyl inhibits cholinesterase in humans as well as insects.

METHODS

With assistance from the Orange County Agricultural Commissioner's office, a cooperative grower was located. Arrangements were made to monitor methomyl residue levels in sweet corn fields after application. The grower treated his sweet corn with 0.50 lbs. (0.45 lbs. a.i.) of Nudrin 90 Methomyl Insecticide (EPA # 201-347-ZA) in 44 gallons of water per acre. Applications in each field were initiated at the ear formation stage. Subsequent Nudrin 90 applications occurred every third day up to 1 week before harvest. Each corn field was scheduled for 7 applications.

Leaf sampling: For sampling purposes, each corn field was divided into 3 sections. One furrow from each section was selected and marked. Eight sweet corn plants were selected and tagged, on an alternating basis, from each row adjacent to the selected furrows. One leaf disc was punched from each of the tagged plants for each sample. The composite sample consisted of 48 leaf discs.

Husk sampling: The marked furrows were also used for the husk sampling. The husk was punched from 4 ears of sweet corn from each row adjacent to the furrow. The outermost sheath of each ear was peeled back and punched. The composite sample consisted of 24 husk discs.

General: Samples were collected using a leaf punch. It punches a disc from the leaf, husk, etc. measuring 2.54 cm. in diameter. Samples were collected prior to and 1, 2, and (once) 3 days after the application. Three replicate samples were collected for each sampling period. As each sample was completed, the bottles were sealed with aluminum foil, capped and stored on ice. The samples were transported by automobile

to the California Department of Food and Agriculture's pesticide residue laboratory in Downey, California for immediate analysis. The dislodgeable residues were removed by adding 50 ml. of water and 4 drops of surten solution to the leaf discs and rotated using an electric rotator. The water extract was decanted after 20 minutes. The procedure was repeated twice more. The water extract was then prepared for and analyzed by a liquid chromatography method (4).

For data purposes, both sides of the leaf discs were included in the sampled surface area. For the husk discs, only the exposed side was included in the sampled surface area.

A thermometer and hygrometer were placed in the fields to measure the high and low temperatures and the relative humidity for each sampling day.

RESULTS

The analytical results and the calculated average for each period are presented in Tables 1 and 2. The data is shown in graph form in Figures 1 and 2. The weather throughout the study was hot and mostly clear with fog occurring occasionally in the early morning. The thermometer and hygrometer used in the corn fields appeared to give false readings on several occasions and that data was excluded.

DISCUSSION AND CONCLUSIONS

Nudrin 90 was applied at the maximum label rate (0.45 lbs. a.i.) for sweet corn. At this rate, the foliar methomyl residue exceeded the calculated safe level (1.5 ug/cm^2) only during one sampling period. This occurred for the sampling period 17 hours after the seventh application. This residue level dropped below the calculated safe level before the expiration of the 48 hour reentry. The methomyl residue on the husks were one third or less of the calculated safe level during all sampling periods. Figures 1 and 2 show the level of methomyl residue in sweet corn slowly rising with each application through the seventh application, where it exceeded the calculated safe level during the 2 day reentry period. The reentry period for methomyl on sweet corn appears to be justified at the maximum label rate. Additional work is needed to characterize the rising methomyl residue over the course of the growing season and at which point during the latter applications the calculated safe level is exceeded.

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TABLE 1

Dislodgeable Methomyl Residue (in ug/cm^2) on Sweet Corn Leaves

Second application, Irvine Ranch field 101B

	Pre-Sample	16 hours Post	42 hours Post	64 hours Post
High replicate	.04	.38	.22	.24
Median replicate	.04	.38	.21	.15
Low replicate	.04	.30	.20	.14
Average	.04	.35	.21	.18

Second application, Irvine Ranch field 104B

	Pre-Sample	18 hours Post	42 hours Post
High replicate	.18	.93	.66
Median replicate	.15	.90	.63
Low replicate	.10	.85	.56
Average	.14	.89	.62

Fourth application, Irvine Ranch field 107

	Pre-Sample	21 hours Post	45 hours Post
High replicate	.57	1.06	.83
Median replicate	.46	.84	.78
Low replicate	.44	.72	.77
Average	.49	.87	.79

Seventh application, Irvine Ranch field 104B

	Pre-Sample	17 hours Post	42 hours Post
High replicate	1.15	2.19	1.50
Median replicate	1.12	1.64	1.17
Low replicate	1.05	1.59	1.10
Average	1.11	1.81	1.26

TABLE 2

Dislodgeabe Methomyl Residue (in ug/cm^2) on Sweet Corn Husks

Fourth Application on Irvine Ranch field 107

	Pre-Sample	21 hours Post	45 hours Post
High replicate	.12	.27	.22
Median replicate	.08	.21	.21
Low replicate	.07	.14	.15
Average	.09	.21	.19

Seventh Application on Irvine Ranch field 104B

	Pre-Sample	17 hours Post	42 hours Post
High replicate	.24	.50	.32
Median replicate	.18	.48	.30
Low replicate	.14	.42	.26
Average	.19	.47	.29

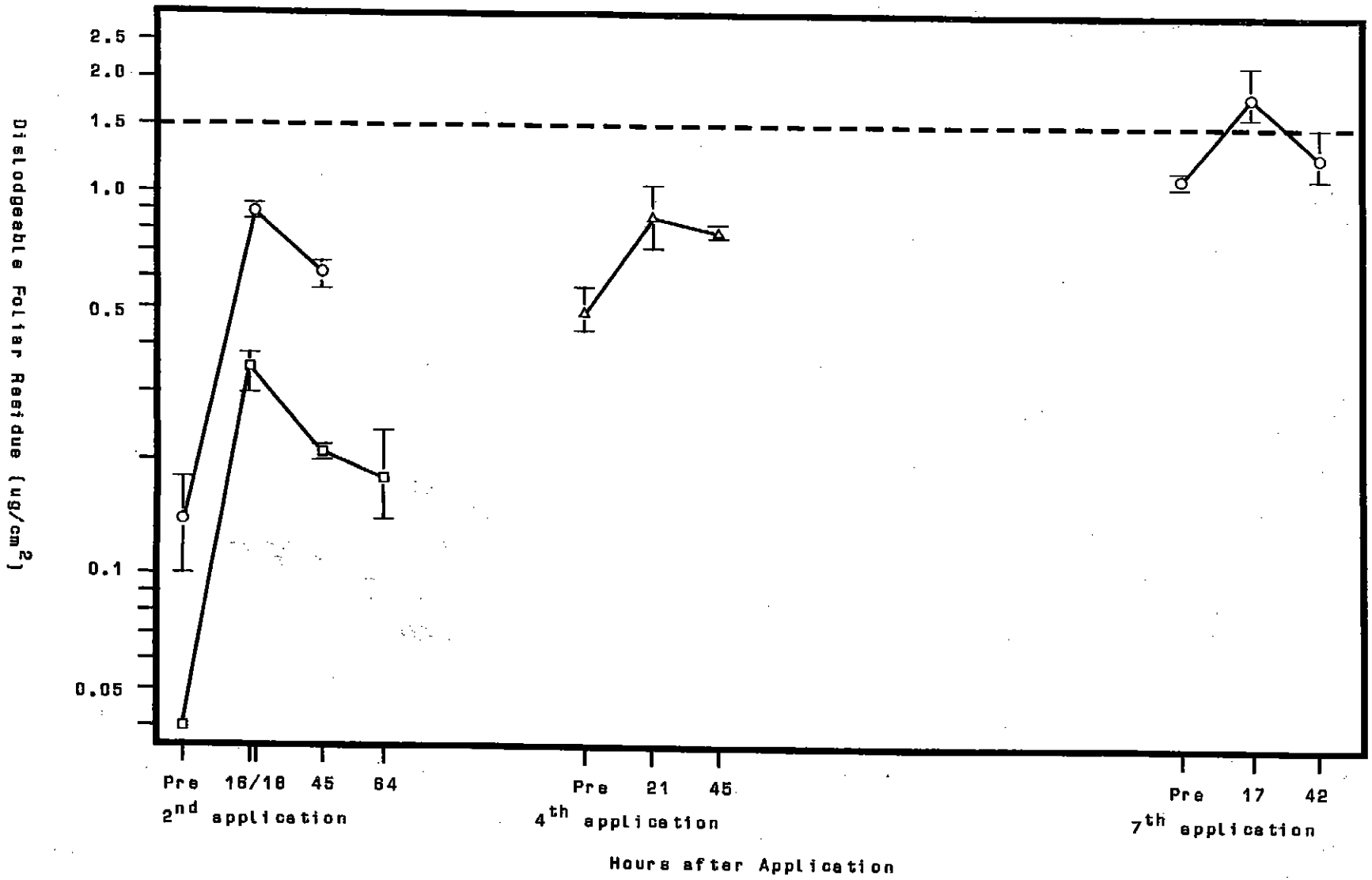

Figure 1. Degradation of dislodgeable methomyl residue on sweet corn foliage in three fields (field 101B: □; field 104B: ○; field 107: △). The calculated safe level for reentry (1.5 ug/cm^2) is represented by the heavy broken line.

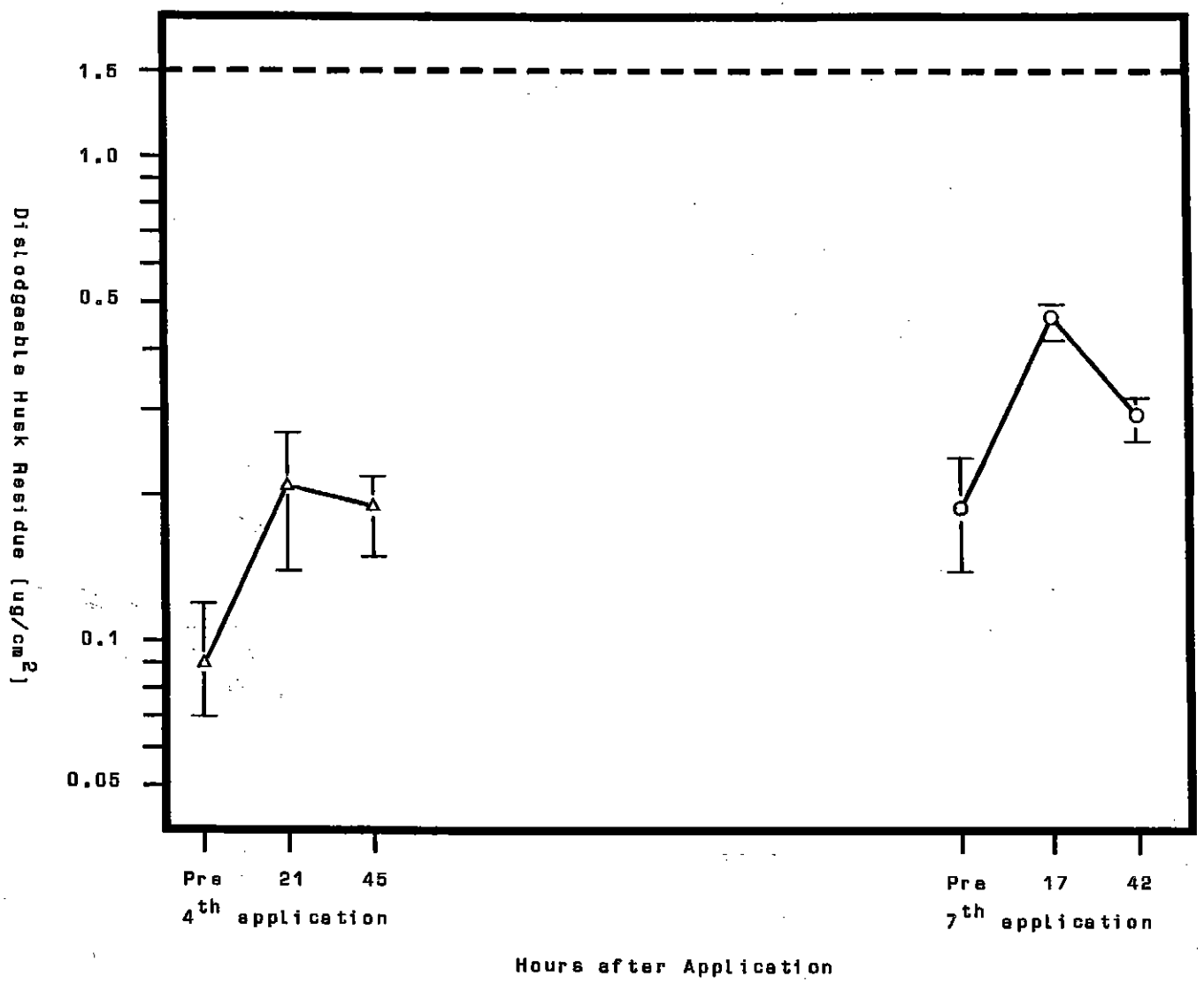

Figure 2. Degradation of dislodgeable methomyl residue on sweet corn husks in two fields [field 107: △; field 104B: ○]. The calculated safe level for reentry [1.5 ug/cm^2] is represented by the heavy broken line.