Shaugh. No. 114501

EAB Log Out Date: JAN 9 1987

Init.: [signature]

To: D. Edwards
Product Manager 12
Registration Division (TS-767)

From: Carolyn K. Offutt [signature: Carolyn Offutt]
Chief, Environmental Processes and Guidelines Section
Exposure Assessment Branch, HED (TS-769)

Attached, please find the environmental fate review of:

Reg./File No.: 264-379

Chemical: Thiodicarb

Type Product: Insecticide

Product Name: LARVIN

Company Name: Union Carbide

Submission Purposes: Union Carbide's response to concerns raised by M. Lorber on the leaching of thiodicarb

Action Code: 316

Date In: 12/8/86

EAB#: 70135

Date Completed: ____

TAIS (Level II) Days
1.0

Deferrals To:

____ Ecological Effects Branch

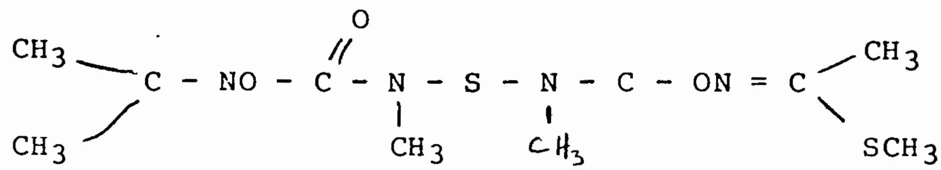
____ Residue Chemistry Branch

____ Toxicology Branch

EVALUATION OF LEACHING DATA PERTAINING TO THIODICARB

1. CHEMICAL:

Chemical name: Dimethyl-N,N'[thiobis[(methylimino)carbonyloxyl]) bis [ethanimidothioate]
Common name: Thiodicarb
Trade name: LARVIN
Structure:



2. TEST MATERIAL:

Not applicable.

3. STUDY/ACTION TYPE:

Evaluation of R. Jones' response to M. Lorber's evaluation of thiodicarb data.

4. STUDY IDENTIFICATION:

Title: - Letter from R. Jones to J.S. Lovell responding to M. Lorber's "note to file" on thiodicarb.
Author: R. Jones
Union Carbide Agricultural Products Company, Inc.
P.O. Box 12014
T.W. Alexander Drive
Research Triangle Park, North Carolina 27709
Identifying No: 264-379
Issue Date: 11-25/86
Record No: 186329

5. REVIEWED BY:

Matthew N. Lorber, Agricultural Engineer Date 1/9/87
Environmental Processes and Guidelines Section/EAB/HED

6. APPROVED BY:

Carolyn K. Offutt, Chief Date 1/9/86
Environmental Processes and Guidelines Section/EAB/HED

7. CONCLUSIONS:

R. Jones' comments on the 10/20/86 "Note to: File" (which is attached to this review) are appropriate. However, the basic conclusion of this note, that further field dissipation studies are required, is still appropriate if the registrant desires a registration of thiodicarb on ornamental and non-crop uses. Complete justification of this position is contained in the EAB review dated 1/8/87, Accession # 265950.

8. RECOMMENDATIONS:

Should the registrant desire a registration of thiodicarb on ornamentals and non-food uses, he is encouraged to perform actual use field leaching studies on thiodicarb. These studies should be conducted with the following in mind: 1) care should be taken to minimize sampling error as occurred in the earlier field dissipation studies performed by Union Carbide on thiodicarb applied to bare soil in three states. 2) A leaching event near the time of thiodicarb application should be guaranteed with irrigation to study its effect on thiodicarb leaching.

9. BACKGROUND

Union Carbide is seeking registration of thiodicarb for ornamental and non-crop uses. However, this registration has been denied due to leaching concerns of primarily the first degradate product, methomyl. Based on field studies and soil metabolism studies, it is established that thiodicarb metabolizes to methomyl rapidly (less than a week, as short as two days in some cases). Further, methomyl has been shown to hydrolyze slowly, with data in EAB files indicating no hydrolysis after 30 days at pH 5 and 7, but hydrolysis occurring with a half-life of 30 days at pH 9 (see Reg/File No: 352-366, EAB review dated 1/9/85). Finally, thiodicarb has been shown to be soluble and to move with water. Therefore, the concern was raised that thiodicarb could leach with rainfall near the time of application to the point where the primary degradate, methomyl, would not be subject to the more rapid microbial decay of the upper soil zones, but rather to hydrolysis in the lower soil zones and the ground water. For these reasons, a registration for ornamentals and noncrop uses was denied based on ground water concerns.

A meeting was held on 10/2/86 between representatives of Union Carbide, and EPA representatives including Sam Creeger (who denied the registrations) and Matt Lorber. Union Carbide presented their case that thiodicarb would not be a threat to ground water based on evidence of rapid decay of thiodicarb and methomyl residues. They also based their case on PRZM simulations of the three thiodicarb field sites. PRZM parameters for these simulations were sent directly to this reviewer, who then duplicated the simulations. He wrote up the results of those simulations and conclusions, which are in the attached 10/20/86 "Note to: File". He sent that note to R. Jones, who responded to it through his management. It is his response which is being reviewed here.

10. DISCUSSION

R. Jones concludes his letter to J.S. Lovell with the statement, "The points and additional data included in this letter, I believe, adequately address the concerns raised by Lorber in his recent memo." While R. Jones' comments do adequately address the concerns in that memo, they do not obviate the need for a field leaching study as a requirement for registration of thiodicarb. Complete justification for this requirement is contained in the EAB review dated 1/8/87, Accession No. 265950, and will not be repeated here.

It is true that the influence of bare soil vs. cover canopy on degradation rates may have been overstated in the "Note to: file". Still, the effect of temperature on degradation of carbamate pesticides has been well stated by Union Carbide in their rationalization for including the statement, "Do not apply if soil temperature is below 50 °F" on the aldicarb label. EAB has concurred with their conclusions concerning temperature and has agreed to that provision on the aldicarb label.

R. Jones presents soil residue data from the bare plots and nearby rotational crop plots. He states that on the day of the last application (47-71 days after the first application), "soil residues in plots with crops are essentially the same as those in the bare plots." This, he believes, is evidence that the presence of a canopy does not influence soil degradation rates. In fact, it would appear that this evidence proves exactly the opposite. Assuming the total amount applied to both sets of plots is the same (this information was not given), actually less has reached the soil in the rotational crops than in the bare plots because thiodicarb is sprayed onto the cotton canopy and this canopy would have intercepted a significant proportion of the thiodicarb application. Therefore, for soil residues to be the same on the last day of application (prior to disking of cotton crop residues into the soil), degradation would had to have been more rapid on the bare plots because more thiodicarb was applied to the bare soil as compared to the soil beneath the cotton canopy. In order to validly compare bare vs. canopy trials, exactly the same amount would have to have been applied to the soil beneath the canopy as to the bare soil.

R. Jones notes ~~that~~ rapid half-lives for aldicarb residues in Florida (16 days), South Carolina (9 days), and Arizona (7-21 days). Although this reviewer has a great deal of respect for R. Jones as a scientist and an eloquent writer, it should be noted that he presents arguments for his case, and makes statements which (because of his adept writing style) are taken as truisms. For example, the 16-day half-life in Florida was no doubt derived from a Union Carbide field study. Another Union Carbide field study, the Lake Hamilton field site in Florida, was extensively monitored for ground water migration of aldicarb residues. Although soil cores were not taken at this site (if they were, this reviewer has not seen them) which could be used to derive a soil half-life, R. Jones was able to duplicate the ground water residue concentration levels adequately in an unsaturated-saturated zone model link-up study ("Saturated Zone Movement and Degradation of Aldicarb Residues on the Florida Ridge", R. Jones, et al., Preliminary Draft). For the unsaturated zone, R. Jones assigned decay rates corresponding to half-lives of 30 days up to 60 cm, 150 days from 60 cm to the ground water, and between 180 and 360 days in the ground water. The 30 and 150 day half-lives in the unsaturated zone are significantly higher than the 16 day half-life R. Jones states as a "truth" for Florida surface soils.

As a final note, it is not the desire for this reviewer to maintain a running dialogue concerning the need for thiodicarb field leaching studies as a requirement for registrations of this pesticide on ornamentals and non-food uses. It is the policy of EAB (until it changes) not to ~~grant~~ recommend registrations for new pesticides or new uses in which the evidence strongly indicates a leaching tendency. The burden of proof to the opposite is on the registrant. Union Carbide has presented their case for thiodicarb, and we have reviewed the evidence and believe that a field leaching study is in order.

10/20/86

Note to: File

Subject: Leaching Potential of Thiodicarb

Union Carbide submitted the attached letter and modeling study on Thiodicarb in order to eliminate the need for future field dissipation studies. The purpose of this note is to comment on the modeling study as well as the need for further field dissipation studies.

I duplicated the PRZM simulations described in the attached report and came up with the same following conclusions: 1) that residues found at deeper depths in the initial field studies were the result of contamination introduced during the sampling process rather than normal leaching, 2) that the field studies can best be duplicated with a 3-8 day half-life for total thiodicarb residues, and 2) that simulations based on a degradation half-life of 3-8 days for thiodicarb residues would indicate little, if any, potential to leach.

However, I do not agree with the statement, "We believe this report should effectively eliminate the need for additional modeling, laboratory, or field research...". Rather, I believe there is still a need for field dissipation studies for thiodicarb for the following reasons:

1) Union Carbide admits to faulty sampling - that deeper residues were introduced during sampling and did not leach to these depths. Therefore, the admission is made that the studies were not an accurate representation of reality. With that truth, the validity of the rest of the study results must be questioned.

2) In an EAB review of these field studies, dated 7/6/84, it was noted that a description of analytical methods was not submitted, and hence these studies did not complete the field dissipation guidelines. To date, these methods have not been submitted.

3) The most important reason for the need for further dissipation studies is the effect of the method of application on degradation. The three field studies described in the attached report are the only field studies submitted for thiodicarb. None of them are under actual use conditions, but rather are applied to bare soil. Application of a pesticide to bare soil would tend to increase the biodegradation of the pesticide and hence reduce its leaching potential. This is due to the increased soil temperature at the surface of the soil under bare conditions as compared to cropped and shaded conditions. The cover crop would intercept sunlight, increase shade, and hence reduce soil temperature. Soil temperature approaching 120°F at the bare soil surface of the Dougherty Plains Field site at the time of aldicarb application has been cited as the cause of a noted 14-day half-life for aldicarb at that site in comparison to 4-8 week half-life noted in most other

field sites. Since thiodicarb is typically applied in several applications at full canopy development, applications to bare soil do not represent actual use conditions, and in this case, the difference is important.

For these reasons, primarily the third reason, it is recommended that the registrant be required to perform field dissipation and leaching studies for submitted uses of thiodicarb.

Matthew Lorber
Matthew Lorber, Agricultural Engineer
Environmental Processes and Guidelines Section/EAB/HED

cc. Padma Datta
Russell Jones

UNION CARBIDE

UNION CARBIDE AGRICULTURAL PRODUCTS COMPANY, Inc.
P. O. BOX 12014; T. W. ALEXANDER DRIVE
RESEARCH TRIANGLE PARK, N. C. 27709
(919) 549-2000

September 30, 1986
EPA Correspondence No. 225-86

Mr. Larry J. Schnaubelt
U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Pesticide Programs
Registration Division (TS 767)
Insecticide - Rodenticide Branch
Crystal Mall Building 2 - Room 202
1921 Jefferson Davis Highway
Arlington, VA 22202

Dear Mr. Schnaubelt:

RE: Leaching Potential of Thiodicarb

On August 1, 1986, we received a letter pertaining to your comments on our soil mobility study. As a result of your review a field leaching study was requested.

A meeting was held on August 14 with Akiva Abromovitch and Matt Lorber to discuss the soil dissipation study results. Mr. Lorber suggested at this meeting that pesticide root zone model (PRZM) simulations might adequately address Agency concerns.

Enclosed is a report which addresses the leaching potential for thiodicarb and its metabolites. We ask that you read this report before our meeting which has been scheduled for Thursday, October 2.

The report shows through the use of model simulations that residues found in deep strata in 1982 field dissipation studies were the result of contamination introduced during the sampling process. In addition, multi-year simulations performed for three worst case conditions demonstrate a minimal threat of thiodicarb and its metabolites to groundwater.

7725y

INTERNATIONAL TELEX NUMBER 4999378–ANSWERBACK APC RTP DOMESTIC-TWX 710-581-5169
INTERNATIONAL DISTRIBUTION SERVICES TELEX NUMBER 4999377–ANSWERBACK APC IDS

We believe this report should effectively eliminate the need for additional modeling, laboratory, or field research and look forward to discussing this further with you on Thursday.

Sincerely,

J.S. Lovell, Registration Manager
Insecticides and Intermediates
Registration and Regulatory Affairs

JSL/dn

Attachment

CC: Matt Lorber
Sam Creeger

7725y

114501

ASSESSMENT OF THE LEACHING POTENTIAL OF THIODICARB

Russell L. Jones

Union Carbide Agricultural Products Company, Inc.

P. O. Box 12014

Research Triangle Park, NC 2770

September 30, 1986

SUMMARY

Simulations using the unsaturated zone model PRZM were performed to assess the leaching potential of thiodicarb and its metabolite methomyl. These simulations indicate that residues observed in 1982 field trials below 0.6 m were probably an artifact of the sampling procedure and actual movements did not exceed approximately 0.3 m. Model simulations performed for three "worst case" examples indicated the relatively rapid degradation rate associated with thiodicarb and its toxic metabolite in soil results in relatively low leaching potential.

INTRODUCTION

Thiodicarb is an effective insecticide for controlling Lepidoptera, Coleoptera, and certain other insect pests on a variety of agronomic crops. Thiodicarb is essentially immobile in soil but a metabolite, methomyl, is quite mobile. The potential for residues to move below the root zone, where degradation rates may decrease significantly due to decreases in the microbe population, seemed to be indicated by the presence of residues in the 0.6-1.2 m stratum in samples collected from three field studies conducted in California, Mississippi, and North Carolina with thiodicarb in 1982 (Hunt,

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1984). Therefore, the Environmental Protection Agency requested the manufacturer for simulations to assess the leaching potential of thiodicarb.

PROCEDURES

All simulations were performed using the unsaturated zone model PRZM (Carsel et al., 1984,) developed by the U.S. Environmental Protection Agency. Studies with aldicarb (Jones et al., 1986b, Lorber and Offutt, 1986, and Carsel, 1985) show the model predictions reasonably agree with field data, but that the model tends to slightly overpredict pesticide movements.

Rainfall data required for the simulations of the 1982 field studies were obtained by site measurements. Pan evaporation data was obtained from NOAA publications. Wilting points and field capacities used in the simulations were the mean values for the appropriate soil texture (Rawls et al, 1982).

The selection of the three sites and soils for the multi-year simulation was an extension of the procedures developed by Lorber (1985). The east coast is one of the most sensitive areas for pesticide leaching in the United States, especially for pesticides which degrade more slowly under acidic conditions. The New York and Florida soils used in the simulations were identified as the soils in the SIRS data used for sweet corn production most sensitive to leaching. The North Carolina soil was the most sensitive in the SIRS data base for aldicarb applications to peanuts (Jones, 1986b). For each soil the midpoint of the range given by the SIRS data base (Goran, 1983) was used for mechanical analyses, bulk density, available water, and organic matter. When data for lower horizons on organic matter or bulk density were not available, the ranges reported by Carsel et al. (1986) were used. The wilting points were calculated from the mechanical analyses, organic matter, and bulk density using the method of Rawls et al. (1982). The field capacity was the sum of the available water and the calculated wilting point. Weather

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data used in the multi-year simulations were from the EPA meterological data base.

In the simulations thiodicarb and methomyl were assumed to have an organic carbon partition coefficient of 20 (the lower end of the 20-40 range reported for aldicarb). This conservative estimate is based on data from thin layer soil chromatograms and column leaching studies which indicate movement of methomyl is less than observed for aldicarb residues. Since thiodicarb is essentially immobile, this assumption is highly conservative.

Degradation rates used in the simulation of the 1982 field studies were the rates regressed from the soil residue data (Hunt, 1984). A degradation rate corresponding to a half life of three days was used for the North Carolina and Florida multi-year assessment simulations and a half-life of five days was used in the New York simulations. These degradation rates, based on the 1982 field data, are for the diasppearance of toxic residues (thiodicarb and methomyl).

RESULTS AND DISCUSSION

Field Study Simulations Thiodicarb residues were detected below 0.6 m during some sampling intervals in the three field dissipation studies conducted in 1982 at sites in California, Mississippi, and North Carolina (Tables 1-3). Because these residues generally occurred in samples immediately following an application, the question arose whether these residues were from top soil which had contaminated samples from lower strata. Therefore PRZM simulations were performed using data from the Mississippi and North Carolina sites (Table 4). No simulations were performed for the California site since no rainfall or irrigation had been applied from the beginning of the test through the eighth application, and therefore, residues below about a 0.10 m had to have been introduced in the sampling process.

Multi-year Assessment Simulations Simulations with the soil most sensitive to downward movement of pesticide residues (parameters are summarized in Tables 5 and 6) show only limited downward movement. Descriptive statistics are given in Table 7; cumulative frequency distributions are shown in Figure 1. The mean distances where movement did not exceed 0.1 kg/ha ranged from 20 to 35 cm in the simulations. Although groundwater concentrations will depend on the saturated zone degradation rate, the distribution of rainfall, the aquifer porosity, and the residue plume thickness, the movement into groundwater of 0.1 kg/ha of pesticide residues at one time will result in a calculated groundwater concentration of 10-25 ppb. Actual groundwater concentrations (if any) would be considerably less due the tendency of PRZM to overpredict residue movement, the conservative assumptions made regarding the mobility of thiodicarb residues and that all the thiodicarb reaches the soil immediately after application, and potential saturated zone degradation of thiodicarb residues. The limited movement of thiodicarb residues in these three most sensitive soils using these conservative assumptions indicate that thiodicarb residues have relatively low leaching potential, primarily due to their relatively rapid degradation rate.

CONCLUSIONS

Unsaturated zone model simulation of thiodicarb movement and degradation indicate that residues present in deeper strata in 1982 field studies were most likely introduced in the sampling process. Simulation using soils identified as the most sensitive in three East Coast locations indicate relatively low leaching potential for thiodicarb residues.

REFERENCES

Carsel, R. F., C. N. Smith, L. A. Mulkey, J. D. Dean, and P. Jowise, 1984. Users Manual for the Pesticide Root Zone Model (PRZM) Release 1, EPA-600/3-84-109.

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Rawls, W. J., D. L. Brakensiek, and K. E. Saxton, 1982. Estimation of Soil Water Properties Trans. ASAE. 25:1316-1320.

TABLE 1. Thiodicarb residues measured in 1982 California field dissipation study

	Thiodicarb residues (ppm) and standard deviation in indicated stratum (m)			
Sampling Period	0-0.15	0.15-0.3	0.3-0.6	0.6-1.2
Pretreatment	<0.02	<0.02	<0.02	<0.02
Post 1st application	0.17 ± 0.01	0.23 ± 0.05		
Post 4th application	0.40 ± 0.03	0.08 ± 0.12		
Post 8th application	0.21 ± 0.05	0.19 ± 0.17	0.03 ± 0.00	0.04 ± 0.02
3 DALA	0.18 ± 0.12	0.02 ± 0.01		
8 DALA	0.08 ± 0.03	<0.02		
14 DALA	0.07 ± 0.03	<0.02	<0.02	<0.02
28 DALA	<0.02	<0.02	<0.02	<0.02
56 DALA	<0.02	<0.02	<0.02	<0.02

DALA - days after last application.

TABLE 2. Thiodicarb residues measured in 1982 Mississippi field dissipation study.

Sampling Period	Thiodicarb residues (ppm) and standard deviation in indicated stratum (m)			
	0-0.15	0.15-0.3	0.3-0.6	0.6-1.2
Pretreatment	<0.02	<0.02	<0.06[a]	<0.02[a]
Post 1st application	0.10 ± 0.05	0.07 ± 0.01		
Post 5th application	0.12 ± 0.08	0.11 ± 0.06		
Post 10th application	0.24 ± 0.29	0.12 ± 0.05		
Post 15th application	0.71 ± 0.12	0.39 ± 0.07	0.63 ± 0.75	0.04 ± 0.03
3 DALA	0.40 ± 0.15	0.49 ± 0.43		
7 DALA	0.34 ± 0.08	0.05 ± 0.04		
14 DALA	0.22 ± 0.04	0.02 ± 0.01	<0.02	0.09 ± 0.09
28 DALA	0.06 ± 0.02	<0.02	<0.02	<0.02
61 DALA	0.02 ± 0.02	<0.02		
91 DALA	<0.02	<0.02		

[a] single analysis
DALA - days after last application.

TABLE 3. Thiodicarb residues measured in 1982 North Carolina field dissipation study.

Sampling Period	Thiodicarb residues (ppm) and standard deviation in indicated stratum (m)			
	0-0.15	0.15-0.3	0.3-0.6	0.6-1.2
Pretreatment	<0.02	<0.02	<0.02	<0.02
Post 1st application	0.09 ± 0.07	0.07 ± 0.04		
Post 5th application	0.13 ± 0.04	0.05 ± 0.01		
Post 10th application	0.21 ± 0.04	0.10 ± 0.02		
Post 15th application	0.17 ± 0.04	0.08 ± 0.03	0.09 ± 0.07	0.06 ± 0.05
3 DALA	0.17 ± 0.06	0.14 ± 0.11		
7 DALA	0.02 ± 0.01	0.04 ± 0.04		
14 DALA	<0.02	<0.02	<0.02	<0.02

DALA - days after last application.

TABLE 4

PRZM Imput Parameters for Field Study Simulations

	Mississippi	North Carolina
Rainfall Data	site measurements	site measurements
Pan Evaporation Data	Newton Experimental Station	Chapel Hill Weather Station
Soil Properties		
Field Capacity (vol. percent)	36.0	20
Wilting Point (vol. percent)	20.8	9.5
Bulk Density (gm/cm)	1.5	1.5
Organic Matter (wt. percent)		
0-15 cm	.30 1.50	0.40
Greater than 15 cm	0 0	0
Pesticide Applications		
Amount Applied per Applicatons (kg/ha)	0.9	0.9
Total Number of Applications	15	15
Total Amount Applied (kg/ha)	13.5	13.5
Application Dates	6/30, 7/6, 7/9, 7/12, 7/16, 7/19, 7/23, 7/26 7/30, 8/4, 8/10, 8/18, 8/23, 8/27, 9/1	6/25, 7/1, 7/7, 7/13, 7/19, 7/23, 7/29, 8/4, 8/10, 8/16, 8/20, 8/26, 9/1, 9/7, 9/13
Pesticide Degradation Rate (half life in days)	8	3

Kd: .08

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TABLE 5

PRZM Input Parameters
for Multi-year Assessment Simulations

	NY Sweet Corn	NC Peanuts	Florida Sweet Corn
Weather Data	Ithaca Weather Station	Maysville Weather Station	Moore Haven Lock Weather Station
Soil Name	Hinckley	Valhalla	Pompano
Soil Field Capacity (vol. percent)	0-0.2 m: 20.4 0.2-0.4 m: 9.6 greater than 0.4 m: 6.6	0-0.55 m: 13.60 0.55-0.75 m: 22.4 greater than 0.75 m: 7.9	10.4
Soil Wilting Point (vol. percent)	0-0.2 m: 11.6 0.2-0.4 m: 4.1 greater than 0.4 m: 3.1	0-0.55 m: 5.6 0.55-0.75 m: 9.9 greater than 0.75 m: 4.4	6.9
Soil Organic Matter (wt. percent)	0-0.2 m: 4.5 0.2-0.4 m: 0.33 greater than 0.4 m: 0.11	0-55 m: 0.75 0.55-0.75 m: 0.14 greater than 0.75 m: 0.08	3.0 %
Soil Bulk Density	0-0.2 m: 1.083 0.2-0.4 m: 1.3 greater than 0.4 m: 1.4	0-0.55 m: 1.5 0-0.55-0.75 cm: 1.425 greater than 0.75 m: 1.575	1.475
Maximum Rooting Depth (m)	0.6	0.6	0.6
Crop Information Emergence Maturation Harvest	 June 5 July 15 Oct. 3	 May 20 July 1 Oct. 15	 Sept. 1 Oct. 1 Nov. 22
Pesticide Degradation Rate (Half-Life Days)	5	3	3
Pesticide Application	Table 6	Table 6	Table 6

$K_{oc} = 20$

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8

TABLE 6

PRZM Input Parameters for Multi-year Assessment Simulations

	NY Sweet Corn	NC Peanuts	Florida Sweet Corn
Amount Applied per Application (kg/ha)	0.84	0.84	0.84
Total Number of Applications	6	2	20
Total Amount Applied Each Year (kg/ha)	5.04	1.68	16.8
Application Dates	9/15 9/18 9/21 9/24 9/27 9/30	8/12 8/26	9/1, 9/2, 9/3, 9/4, 9/5, 9/6, 9/7, 9/8, 9/9, 9/10, 9/11,9/12 9/13, 9/14, 9/15 9/16, 9/17, 9/18 9/19, 9/20

TABLE 7

Summary of Multi-year Assessment Simulations

	Mean*	Median	25th Percentile	75th Percentile	Standard Deviation
Depth (m) at which total Residue Movement					
Does not exceed 1 kg/ha					
NY sweet corn	0.082	0.10	0.05	0.10	0.02
NC peanuts	0.055	0.05	0.05	0.05	0.02
FL sweet corn	0.174	0.15	0.15	0.20	0.05
Depth (m) at which Total Residue Movement					
Does not exceed 0.1 kg/ha					
NY sweet corn	0.203	0.20	0.15	0.20	0.13
NC peanuts	0.308	0.30	0.20	0.40	0.14
FL sweet corn	0.337	0.35	0.30	0.40	0.09

*Total annual movement simulated for 19 different years.

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Figure 1
Cumulative Frequency Distribution Showing Maximum
Movement of Thiodicarb Residues Greater than 0.1 kg/ha