

098301



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Date Out EFB: 28 FEB 1984

To: Jay Ellenberger
Product Manager 12
Registration Division (TS-767)

From: Samuel M. Creeger, Chief *SMC*
Review Section No. 1
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)

Attached please find the environmental fate review of:

Reg./File No.: 264-330 and -331

Chemical: Aldicarb

Type Product: Insecticide/nematicide

Product Name: TEMIK

Company Name: Union Carbide

Submission Purpose: Field study - tile-drained corn fields

ZBB Code: other

ACTION CODE: 336

Date In: 12/20/83

EAB # 4132, 4133

Date Completed: 28 FEB 1984

TAIS (level II)

Days

63

2

Deferrals To:

 Ecological Effects Branch

 Residue Chemistry Branch

 Toxicology Branch

1. INTRODUCTION

1.1 Union Carbide has recently requested amendment of two of their TEMIK products to include use on corn. EEB became concerned that after application to a tile-drained corn field, toxic levels of aldicarb residues may leave the field via the drainage system and impact adversely on aquatic organisms down stream from the treated field. Therefore, EEB requested Union Carbide to conduct field monitoring studies on tile-drained corn fields.

2. DISCUSSION OF DATA

2.1 Tile-Drained Corn 1983 Field Studies Conducted in Michigan and Indiana, Dec. 6, 1983; acc. no. 251946.

Procedure

The study was conducted at two sites. One site was a 12.2 ha field near Blissfield, Michigan (drains were 27.4 m apart and 1.0-1.3 m deep) with drainage into a ditch. The other site was near Bluecast, Indiana and had two drainage systems of 5.0 and 14.2 ha each (drains were 9.1 m apart and 0.2-0.5 m deep) which drained into the Maumee River.

TEMIK 15G was applied to both sites at 1.68 kg ai/ha (1.5 lb ai/A).

See tables I-IX for soil profiles, treatment and sampling dates, soil and water residues, and soil temperatures.

Discussion

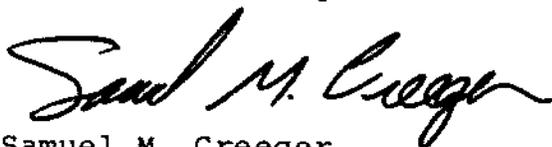
Some corn fields require tile drainage systems because the soils are poorly drained. Leaching of aldicarb residues in such soils would, therefore, be minimal. However, runoff of aldicarb residues via the subsurface drainage system could occur.

The data show that use of aldicarb on tile-drained corn fields as described and at rates as described will result in the presence of aldicarb residues in the drainage water as high as 172 ppb. However, rapid decrease in the residue levels in the water will occur when the drainage water enters the drainage ditches due to dilution and degradation. Refer to the 6/28/78 evaluation of aldicarb (oranges), sections 4.1.5-4.1.9 which shows degradation of aldicarb residues in the aquatic sediment/pond environment. Half-lives were estimated to be roughly 5-10 days.

Use of aldicarb on larger tile-drained corn fields of more permeable soil, at higher application rates, with higher levels of rainfall/irrigation, and with lower soil pH would result in higher levels of aldicarb residues leaving the field via the subsurface drainage system. However, these residues would also be subject to rapid dissipation and degradation after leaving the subsurface drainage system.

3. CONCLUSIONS

It cannot be said that the studies as conducted represent a worst case situation showing maximum levels of aldicarb residues leaving the field via the subsurface drainage system. However, assuming the residue levels leaving the field via the subsurface drainage system in a worst case situation to be 10X greater than the highest level (172 ppb) found in the submitted study, or 1.8 ppm, then due to degradation alone, the residues would fall to levels less than 5 ppb in 12-24 weeks after leaving the field. Add to this a minimal dilution factor of 10X-100X; the result is residues would fall to less than 5 ppb in no more than 2-10 weeks after leaving the field. The above would be true for a one-time-only input of pollutant. It must be kept in mind that aldicarb residues will continue to leave the field via the subsurface drainage system for at least as long as 6 months, albeit at decreasing levels. However, the concentration of residues will not build up due to continuous dilution.



Samuel M. Creeger
February 28, 1984
Section #1/EAB
Hazard Evaluation Division

TABLE 1
Michigan Pretreatment Analyses
(Sampled 5/19/83)

	Soil Strata (m)	Sand	Mechanical Analysis (Wt %)		Organic Matter (Wt %)	pH	Moisture Content (Wt %)	Aldicarb Residues (ppb)
			Silt	Clay				
Core 1	0-0.3	51	29	20	3.7	8.2	17.0	ND
	0.3-0.6	57	32	11	0.52	8.3	13.8	ND
	0.6-1.2	17	72	11	0.62	8.9	19.4	ND
Core 2	1.2-1.8	37	40	23	1.3	8.7	18.6	ND
	1.8-2.1	11	26	63	0.60	8.8	16.7	ND
	0-0.3	77	22	7	1.9	6.9	12.5	ND
Core 3	0.3-0.6	53	32	15	0.12	6.1	12.6	ND
	0.6-1.2	73	20	7	0.26	9.1	14.4	ND
	1.2-1.8	83	10	7	0.02	9.1	15.1	ND
Core 4	0-0.3	69	20	11	3.0	8.1	13.0	ND
	0.3-0.6	61	22	17	1.7	7.7	15.9	ND
	0.6-1.2	71	18	11	1.0	8.8	16.5	ND
Average	0-0.3	71	12	17	1.9	7.7	12.6	ND
	0.3-0.6	73	10	17	0.52	7.4	14.0	ND
	0.6-1.2	89	2	9	0.20	9.0	15.3	ND
Average	0-0.3	65	21	24	2.6	7.7	13.8	ND
	0.3-0.6	61	24	15	0.72	7.4	14.0	ND
	0.6-1.2	62	28	10	0.52	9.0	16.4	ND
	1.2-1.8	60	25	15	0.65	8.9	16.9	ND

ND = None detected at a sensitivity of 5 ppb.

TABLE 11
Indiana Pretreatment Analyses
(Sampled 5/19/83)

	Soil Strata (m)	Sand	Mechanical Analysis (Wt %)		Organic Matter (Wt %)	pH	Moisture Content (Wt %)	Aldicarb Residues (ppb)
			STLE	Clay				
Core 1	0-0.3	8	53	39	4.5	7.5	22.6	ND
	0.3-0.6	12	37	51	1.3	7.6	21.2	ND
	0.6-1.2	9	42	49	0.96	7.6	16.9	ND
Core 2	1.2-1.8	10	37	53	0.98	8.7	21.7	ND
	0-0.3	11	47	42	2.4	5.9	20.5	ND
	0.3-0.6	0	33	59	0.82	5.7	22.4	ND
Core 3	0.6-1.2	22	36	53	0.78	8.4	19.5	ND
	1.2-1.8	15	38	47	0.92	8.2	25.3	ND
	0-0.3	19	44	37	2.5	5.8	22.1	ND
Core 4	0.3-0.6	13	34	53	0.66	5.7	22.6	ND
	0.6-1.2	11	42	47	0.86	8.8	17.4	ND
	1.2-1.8	11	40	49	0.86	8.9	18.7	ND
Average	0-0.3	17	40	43	2.3	7.1	19.3	ND
	0.3-0.6	11	36	53	0.78	6.4	22.4	ND
	0.6-1.2	13	40	47	0.86	8.7	15.9	ND
Average	1.2-1.8	0	55	45	0.88	8.8	15.9	ND
	0-0.3	14	46	40	2.9	6.6	21.1	ND
	0.3-0.6	11	35	54	0.89	6.4	21.1	ND
Average	0.6-1.2	11	40	49	0.87	8.4	17.4	ND
	1.2-1.8	9	43	48	0.91	8.7	20.4	ND

ND = None detected at a sensitivity of 5 ppb.

TABLE III

Michigan Post Treatment Soil Results

TEHIC Aldicarb, 1.68 Kg a/ha at Planting (5/30/83)

Site	Soil Strata (m)	Moisture Content (wt %)				pH of Composite				Aldicarb Residues in Composite (ppb)			
		June 16	July 26	Oct 7	June 16	July 26	Oct 7	June 16	July 26	Oct 7			
Site 1	0-0.3	11.8	7.2	10.2	12.9	8.2	9.2	7.2	7.5	7.5	30	37	ND
	0.3-0.6	11.4	7.7	7.3	12.2	7.9	5.5	6.7	7.5	7.9	ND	ND	ND
	0.6-1.2	16.6	17.3	8.7	13.7	16.1	11.6	9.2	9.3	9.0	ND	ND	ND
Site 2	1.2-1.8	17.0	17.0	17.5	15.4	15.4	14.8	9.2	9.2	--	ND	ND	--
	0-0.3	13.0	9.7	9.0	13.3	6.9	9.8	--	--	--	274	51	ND
	0.3-0.6	11.0	7.0	4.6	11.3	7.5	5.6	--	--	--	ND	25	ND
Site 3	0.6-1.2	14.6	15.4	9.7	13.6	14.8	10.7	--	--	--	ND	ND	ND
	1.2-1.8	16.1	16.1	18.4	22.0	22.0	14.1	--	--	--	ND	ND	--
	0-0.3	14.2	8.9	10.1	12.8	9.1	8.9	--	--	--	265	41	ND
Site 4	0.3-0.6	13.6	14.1	5.8	15.9	8.2	4.5	--	--	--	ND	23	ND
	0.6-1.2	14.3	13.3	14.2	15.8	15.8	7.0	--	--	--	ND	ND	ND
	1.2-1.8	15.1	15.1	15.1	15.3	15.3	15.3	--	--	--	ND	ND	ND
Average	0-0.3	13.1	9.1	9.8	13.0	8.6	9.8	7.0	7.1	7.4	257	54	ND
	0.3-0.6	12.7	9.3	5.6	12.7	8.1	6.1	6.6	7.3	7.7	ND	15	ND
	0.6-1.2	15.4	15.3	10.2	15.1	15.5	9.4	8.8	9.2	8.9	ND	ND	ND
Average	1.2-1.8	16.6	16.6	14.8	14.8	18.7	14.8	9.2	9.2	9.2	ND	ND	ND
	0-0.3	13.3	10.6	9.7	12.9	10.0	11.1	6.7	6.7	7.3	458	86	ND
	0.3-0.6	14.7	8.4	4.5	11.5	8.9	8.9	6.4	7.0	7.4	ND	10	ND
Average	0.6-1.2	16.2	15.2	8.2	16.5	15.2	8.3	8.3	9.0	8.8	ND	ND	ND
	1.2-1.8	15.6	15.6	15.6	15.0	15.0	15.0	9.2	9.2	9.2	ND	ND	ND

ND = None detected at a sensitivity of 5 ppb.

TABLE IV

Indiana Post Treatment Soil Results

TEHIK Aldicarb, 1.68 Kg a/ha at planting (6/10/83)

Site	Soil Strata (feet)	Moisture Content (wt %)				pH of Composite				Aldicarb Residues in Composite (ppb)			
		June 15	Replicate 1 July 27	Oct 7	June 15	Replicate 4 July 27	Oct 7	June 15	July 27	Oct 7	June 15	July 27	Oct 7
Site 1	0-0.3	18.0	13.5	15.5	20.4	15.8	15.1	7.6	7.0	6.5	320	268	36
	0.3-0.6	21.5	16.6	15.4	20.1	16.6	16.8	7.2	6.7	6.2	ND	15	ND
	0.6-1.2	16.4	17.1	14.8	17.3	17.9	16.3	8.9	9.0	8.3	ND	ND	ND
Site 2	1.2-1.8	16.5	16.7	16.5	15.6	15.7	17.1	9.0	9.0	8.3	ND	ND	ND
	0-0.3	15.9	12.3	14.6	20.9	15.4	17.4	--	--	--	55	160	19
	0.3-0.6	15.9	17.2	17.5	21.6	16.9	16.1	--	--	--	ND	9	ND
Site 3	0.6-1.2	16.4	17.4	16.4	21.6	19.6	15.3	--	--	--	ND	6	ND
	1.2-1.8	15.2	16.3	18.3	19.5	18.7	16.0	--	--	--	ND	ND	ND
	0-0.3	19.8	15.6	15.0	19.3	17.7	15.9	--	--	--	1432	ND	ND
Site 4	0.3-0.6	19.1	17.0	20.8	21.2	17.3	15.9	--	--	--	8	374	22
	0.6-1.2	17.9	18.2	16.4	19.0	17.8	14.7	--	--	--	ND	5	ND
	1.2-1.8	17.9	15.7	14.8	17.4	15.6	19.3	--	--	--	ND	5	ND
Average	0-0.3	18.1	13.7	14.5	17.1	13.8	14.0	8.0	7.7	7.0	243	161	19
	0.3-0.6	20.9	15.6	16.3	22.1	18.2	15.8	6.1	6.1	6.5	ND	5	ND
	0.6-1.2	16.4	15.5	15.0	19.7	17.8	15.7	8.9	8.8	8.5	ND	ND	ND
Average	1.2-1.8	16.3	15.1	17.7	16.6	16.5	16.0	8.9	8.6	8.5	ND	ND	ND
	0-0.3	18.0	13.8	14.9	19.4	15.7	15.6	7.8	7.4	6.8	513	241	24
	0.3-0.6	19.4	16.6	17.5	21.3	17.3	16.2	6.7	6.4	6.4	2	9	ND
Average	0.6-1.2	16.8	16.9	15.7	19.4	18.3	15.5	8.9	8.8	8.4	ND	3	ND
	1.2-1.8	16.5	16.0	16.8	17.3	16.6	17.1	9.0	8.8	8.4	ND	ND	ND

ND = None detected at a sensitivity of 5 ppb.

TABLE V
 ALDICARB RESIDUES IN SDIL AFTER APPLICATION
 TO TILE DRAINED CORN FIELDS 1983
 BLISSFIELD, MICHIGAN

Strata (m)	Mean Aldicarb Residues					
	ppb ^b	17 Days ^a Fraction ^c	ppb	57 Days Fraction	ppb	130 Days Fraction
0-0.3	257	0.685	54	0.144	ND	0.0
0.3-0.6	ND	0.0	15	0.040	4	0.009
0.6-1.2	ND	0.0	ND	0.0	ND	0.0
1.2-1.8			ND	0.0	ND	0.0
Total		0.685		0.184		0.009

^aThe number of days after TEMIK® 15G application.

^bEach number represents the mean residue on 16 samples (arithmetic mean of four analyses of four composite samples).

^cAmount remaining as a fraction of the total aldicarb applied calculated assuming an even distribution (375 ppb) in the top 0.3 m of soil.

TABLE VI
ALDICARB RESIDUES IN SOIL AFTER APPLICATION
TO TILE DRAINED CORN FIELDS 1983
BLUECAST, INDIANA

Strata (m)	Mean Aldicarb Residues					
	ppb ^b	5 Days ^a Fraction ^c	ppb	47 Days Fraction	ppb	119 Days Fraction
0-0.3	513	1.368	241	0.643	24	0.064
0.3-0.6	2	0.005	9	0.024	ND	0.0
0.6-1.2	ND	0.0	3	0.008	ND	0.0
1.2-1.8	ND	0.0	ND	0.0	ND	0.0
Total		1.373		0.675		0.064

^aThe number of days after TEMIK® 15G application.

^bEach number represents the mean residue on 16 samples (arithmetic mean of four analyses of four composite samples).

^cAmount remaining as a fraction of the total aldicarb applied calculated assuming an even distribution (375 ppb) in the top 0.3 m of soil.

TABLE VII
 Water Analyses
 Blissfield, Michigan
 Tile Drained Corn

<u>Date</u>	<u>ph</u>	<u>Aldicarb Residues (ppb)</u>
Tile Drain Composite		
6/13/83	7.6	ND
6/20/83	7.3	ND
6/27/83	8.0	ND
7/5/83	7.1	7
7/11/83	7.1	10
7/18/83	7.1	ND
7/25/83	7.1	ND
11/14/83	7.3	2
11/23/83	7.4	2
Creek		
7/25/83	7.1	ND
8/1/83	7.3	ND
8/8/83	7.2	ND
Ditch		
8/16/83	7.1	ND
11/8/83	7.4	2
11/14/83	7.3	1
11/23/83	7.4	2

TABLE VIII
 Water Analyses
 Bluecast, Indiana
 Tile Drained Corn

<u>Date</u>	<u>pH</u>	<u>Aldicarb Residues (ppb)</u>
Tile Drain Composite		
6/16/83	7.9	2,2
6/24/83	7.9	ND,ND
6/29/83	7.0	172
7/6/83	7.8	66
7/15/83	7.1	52
7/22/83	7.6	43
11/25/83	6.6	5
12/2/83	6.6	1
Maumee River		
7/27/83	7.5	ND
8/2/83	7.5	ND
8/7/83	7.9	ND
8/10/83	7.8	ND
11/25/83	6.7	ND
12/2/83	6.7	ND

TABLE IX

Soil Temperatures

Tile Drained Corn

Blissfield, Michigan

<u>Strata</u> <u>(m)</u>	<u>Date/Time</u>		
	<u>6/20 (9 a.m.)</u>	<u>7/26 (8 a.m.)</u>	<u>10/5 (12:30 p.m.)</u>
0.0-0.3	21°C	21°C	18°C
0.3-0.6	29°C	24°C	18°C
0.6-1.2	17°C	22°C	20°C
1.2-1.8		20°C	17°C

Bluecast, Indiana

<u>Strata</u> <u>(m)</u>	<u>Date/Time</u>	
	<u>6/20 (2 p.m.)</u>	<u>7/27 (7 a.m.)</u>
0.0-0.3	24°C	22°C
0.3-0.6	23°C	24°C
0.6-1.2	19°C	23°C
1.2-1.8	21°C	20°C