

US EPA ARCHIVE DOCUMENT

098301

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Date Out EFB: 3 OCT 19 1981

To: Product Manager 12 Ellenberger
TS-767

From Dr. Willa Garner
Chief, Review Section No. 1
Environmental Fate Branch

Attached please find the environmental fate review of:

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

Chemical: Aldicarb

Type Product: Insecticide

Product Name: Temik

Company Name: Union Carbide

Submission Purpose: Ground water contamination from use on sorghum

ZBB Code: 3(c)(7)

ACTION CODE: 335

Date in: 10/8/81

EFB # 6, 7

Date Completed: OCT 19 1981

TAIS (level II)

Days

Deferrals To:

60

2

Ecological Effects Branch

Residue Chemistry Branch

Toxicology Branch

1.0 INTRODUCTION

This is to address the question raised by Product Manager tean-12, c/o Mr. Ellenberger, as to whether or not aldicarb would contaminate ground water when used to grain sorghum (PM Nos. 36590, 36591; EFB Nos. 82-6, 82-7). Expanded use to grain sorghum is proposed by Union Carbide under Section 3(c)(7) of FIFRA as amended on September 30, 1978.

2.0 BACKGROUND

Aldicarb[2-methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime] is a registered insecticide/nematocide that is currently used on several crops, mainly oranges, peanut, potatoes, cotton, sugarcane, dry beans, sugar beets, and sweet potatoes at rates of up to 20 lb ai/A/year (Reg. Nos. 264-330 and 331 for aldicarb 15G and 10G respectively). The chemical in its granular formulation can be applied and incorporated 2-3 inches below the surface. Aldicarb is stable to hydrolysis at pH 5-7 and temperature of 15-25 °C, however, the reaction at pH 9 is much faster with a half-life of 8 days. On the other hand, the biodegradation half-lives for aldicarb and its two major metabolites, aldicarb sulfoxide and aldicarb sulfone are 14.5 days, 60-90 days and >90 days respectively.

Aldicarb has high water solubility (7800 pm), and very low partition coefficient ($K_d < 4$). It leaches into the soil and contaminates ground water. The 1980 ground water monitoring data showed aldicarb contamination to the ground water in New York, Maine, Wisconsin, and Missouri. Possible leaching in Florida, Virginia, and Georgia has not been confirmed by Union Carbide. For these reasons, decisions on aldicarb uses should be handled on a case-by-case basis.

3.0 PROPOSED USE

Grain Sorghum. For nematodes control, apply at planting in seed furrow and cover with soil at the following rates:

Aldicarb 10 G :	0.5 -1.0 lb ai/A
Aldicarb 15 G :	0.525-1.05 lb ai/A

- ° Do not make more than one application per crop.
- ° Do not harvest within 90 days of application.
- ° Do not feed green forage or hay to livestock.

4.0 DISCUSSION OF DATA

4.1 No environmental chemistry or ground water monitoring data were submitted.

4.2 PESTAN LEACHING MODEL

A simulated PESTAN leaching model was carried out for a typical grain sorghum field in Kansas. Soil characteristics and composition in the top 0-6 inches of soil profile, as well as in the 48-60 inches, were obtained from the USDA soil survey report #4, 1966, page 45. The simulation was for a single application at 1.121 Kg/ha for a depth of 600 cm and a projected time of 720 days. The recharge rate was calculated using the average yearly precipitation according to the U.S. weather Bureau and the evapotranspiration rates according to Enfield. The degradation rate coefficient was the same value reported by Smelt et. al. 1978. The K_d was calculated using the average oc in the top five feet and K_{oc} relationships. Finally, soil porosity, characteristic curve coefficient, and air entry value were taken from Clapp and Hornberger typical of the Lockhard soil series in Saline County, Kansas.

4.3 PESTAN PREDICTIONS

Input and output parameters are filed in EFB.

Predictions obtained showed that aldicarb would not leach below the 300 cm. layer from the soil surface. PESTAN predicts a concentration of 3-43 ppb in the 60 to 120 cm. of soil profile and a concentration of <0.2 ppb in the 180-300 cm. of soil substratum.

5.0 CONCLUSIONS

The Environmental Fate Branch believes that when aldicarb is used on grain sorghum grown in Kansas, it would not leach into the saturated zone and contaminate ground water.

Sami Malak

Sami Malak, Chemist
Review Section #1
Environmental Fate Branch/HED

User's Name Sami Malak

Date 10/15/81

PESTAN Leaching Model Worksheet

Chemical : Aldicarb
Use Site (Crop) : Grain Sorghum
Location (State) : Kansas (Saline County)
Rainfall + Irrigation : 34.66
Evapotranspiration (%) : 14.55
Recharge (inches/year) : 20.11

Lockhard

Soil Characteristics : Texture silty loam pH 5.6(7.5)* CEC 17.5(28.4)
Soil Composition (%) : OM 1.16(0.09) Sand 9(2) Silt 68(64) Clay 23(34)

*In the 0-6" and 48-60" respectively. Source: USDA soil survey Report #4,1966, Page 45.

PESTAN Input Parameters

Solubility (ppm) 7800
Estimated Recharge Rate (cm/hr) 0.005737
Sorption Constant (Kd) 0.1123
Degradation Rate Coefficient (/hr) 0.00019**
Bulk Density (gm/cc) 1.5
Soil Porosity (cm³/cm³) 0.485
Characteristic Curve Coefficient 5.3
Air Entry Value (cm) 78.6
Dispersion Coefficient (cm²/hr) 0.06
Minimum Depth (cm) 0
Maximum Depth (cm) 600
Minimum Projected Time (day) 0
Maximum Projected Time (day) 720
Number of Applications 1
Application Rate (kg a.i./Ha) 1.121
Days Before Beginning of Recharge 12

TITLE: ALDICARB/GRAIN SORGHUM/KANSAS/SIM

MODEL USED: PESTAN

DATE: 10/14/81

SOLUBILITY= 7800 ppm

RECHARGE RATE= .005737 cm/hr

SORPTION CONSTANT= .1123

DEGRADATION RATE COEFFICIENT= .00019 /hr

BULK DENSITY= 1.5 gms/cc

SOIL POROSITY= .485 cc/hr

CHARACTERISTIC CURVE COEFFICIENT= 5.3

AIR ENTRY VALUE= 78.6 cm

DISPERSION COEFFICIENT= .06 cm²/hr

LOADING= 1.11398

PROJECTED WATER CONTENT= .376222

PORE WATER VELOCITY= .015249 cm/hr

POLLUTANT VELOCITY= .0105329 cm/hr

LENGTH OF POLLUTANT SLUG= 3.79612E-03 cm

NUMBER OF APPLICATIONS= 1

APPLICATION RATE= 1.121 kg a.i./Ha

DAYS BEFORE RECHARGE= 12

SOLUTION CONCENTRATIONS (ppm)

DEPTHS	0.0 cm	60.0 cm	120.0 cm	180.0 cm	240.0 cm	300.0 cm	360.0 cm	420.0 cm	480.0 cm	540.0 cm	600.0 cm
AT 0 DAYS	1.67E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 72 DAYS	1.26E-01	9.41E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 144 DAYS	1.13E-02	4.33E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 216 DAYS	1.19E-03	3.65E-02	2.62E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 288 DAYS	1.31E-04	1.15E-02	1.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 360 DAYS	1.52E-05	2.45E-03	2.67E-03	1.77E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 432 DAYS	2.05E-06	4.34E-04	1.66E-03	9.62E-05	1.02E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 504 DAYS	0.00E+00	6.88E-05	6.48E-04	1.67E-04	1.24E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 576 DAYS	0.00E+00	1.04E-05	1.90E-04	1.50E-04	5.20E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 648 DAYS	0.00E+00	1.50E-06	4.57E-05	8.67E-05	1.01E-05	6.80E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 720 DAYS	0.00E+00	2.20E-07	9.63E-06	3.70E-05	1.14E-05	3.03E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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MODEL USED:PESTAN

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RECHARGE RATE= .005737 cm/hr

SORPTION CONSTANT= .1123

DEGRADATION RATE COEFFICIENT= .00019 /hr

BULK DENSITY= 1.5 gms/cc

SOIL POROSITY= .485 cc/hr

CHARACTERISTIC CURVE COEFFICIENT= 5.3

AIR ENTRY VALUE= 78.6 cm

DISPERSION COEFFICIENT= .06 cm²/hr

LOADING= 1.11398

PROJECTED WATER CONTENT= .376222

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POLLUTANT VELOCITY= .0105329 cm/hr

LENGTH OF POLLUTANT SLUG= 3.79612E-03 cm

NUMBER OF APPLICATIONS= 1 APPLICATION RATE= 1.121 kg a.i./Ha DAYS BEFORE RECHARGE= 12

SOLUTION CONCENTRATIONS (ppm)

DEPTH	0.0 cm	30.0 cm	60.0 cm	90.0 cm	120.0 cm	150.0 cm	180.0 cm	210.0 cm	240.0 cm	270.0 cm	300.0 cm
AT 140 DAYS	1.29E-02	1.16E-01	4.11E-02	5.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 176 DAYS	4.10E-03	5.13E-02	4.91E-02	3.59E-03	2.55E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 212 DAYS	1.33E-03	2.08E-02	3.83E-02	8.34E-03	2.11E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 248 DAYS	4.44E-04	8.00E-03	2.35E-02	1.11E-02	8.46E-04	1.03E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 284 DAYS	1.44E-04	3.00E-03	1.24E-02	1.05E-02	1.79E-03	6.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 320 DAYS	4.60E-05	1.10E-03	5.98E-03	7.90E-03	2.53E-03	1.96E-04	4.18E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 356 DAYS	1.60E-05	3.99E-04	2.69E-03	5.08E-03	2.70E-03	3.99E-04	1.60E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 392 DAYS	5.08E-06	1.44E-04	1.16E-03	2.92E-03	2.33E-03	5.84E-04	4.74E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AT 428 DAYS	1.08E-06	5.17E-05	4.80E-04	1.54E-03	1.72E-03	6.72E-04	9.04E-05	4.31E-06	0.00E+00	0.00E+00	0.00E+00
AT 464 DAYS	6.85E-07	1.85E-05	1.93E-04	7.66E-04	1.14E-03	6.41E-04	1.36E-04	1.10E-05	6.85E-07	0.00E+00	0.00E+00
AT 500 DAYS	4.36E-07	6.54E-06	7.67E-05	3.61E-04	6.90E-04	5.31E-04	1.65E-04	2.09E-05	8.72E-07	0.00E+00	0.00E+00