32501
Shaughnessy No.

Completed: 10-13-88 DJM

EEB CHEMICAL PROFILE

Pesticide Name:

100.0 Fish and Wildlife Toxicology

100.1 Minimum Requirements

100.1.1 Avian Acute Oral LD_{50}

Species	Test Material	Results (mg/kg)	Category	Reference (MRID No.)
Mallard	95%	6.54	Supplemental	05008363
Bobwhite Quail		31.0 (28-35) 28 (22-27)	Core	00095655
Bobwhite Quail		12	Core (7-19)	E000IS00
European Starling	Unknown	> 32	N/A	Smith, 1987
Red-Winged Blackbird	Unknown	3.2 (1.8-5.6)	N/A	Smith, 1987
Ring-Necked Pheasant	97%	11.9 (8.58-16.5)	N/A	Smith, 1987
Bobwhite Quail	Granular 15%	33 (29-37)	Core	00095655
Bobwhite Quail	Granular 15%	29 (24-34)	Core	ED0DIS00
Bobwhite Quail	Technical	544 (464-630)	Core	00094233
Mallard		692 (552-866)	Core	00094233
Bobwhite Quail	Technical	715 (617-827)	Core	00058746

Species	Test Material	Results (mg/kg)	Category	Reference (MRID No.)
Mallard	Technical	510 (415-625)	Core	00058746
Pheasant	Technical	634 (547-737)	Core	00058746
Japanese Quail	Technical 100%	333 (282-392) 334 (275-405)	N/A	Smith, 1987

100.1.3 Fish Acute LC_{50}

Species	Test Material	Results (mg/kg)	Category	Reference (MRID No.)
Bluegill Sunfish	Technical 95%	0.039 (0.021-0.073)	Core	00068268
Rainbow Trout	Technical 95%	3 (2.6-3.5)	Core	00068268
Bluegill Sunfish	Technical 98%	0.3 (No C.L.)	Supplemental	0003505
Rainbow Trout	Technical 98%	1.8 (No C.L.)	Supplemental	0003505
Fathead Minnow	Technical 98%	4.3 (No C.L.)	Supplemental	0003505
Channel Catfish	Technical 98%	4.7 (No C.L.)	Supplemental	0003505
Largemouth Bass	Technical 98%	0.060 (No C.L.)	Supplemental	0003505

100.1.4 Aquatic Invertebrate LC_{50}

Species	Test Material	Results (mg/kg)	Category	Reference (MRID No.)
Scud	98%	0.052 (0.0049-0.058)	Supplemental	0003505
Glass Shrimp	98%	0.0039 (0.0027-0.0057)	Supplemental	0003505

Species	Test Material	Results (mg/kg)	Category	Reference (MRID No.)
Stoneflies	98%	0.0050 (0.0037-0.0067)	Supplemental	0003505

100.2 Additional Terrestrial Laboratory Tests

100.3 Additional Aquatic Laboratory Tests

N/A

100.4 Field Tests

Species	Test Material	Results (mg/kg)	Category	Reference (MRID No.)
Bobwhite Quail	15% Granular	Juvenile Bobwhite quail were penned on sorghum and treated with Di-Syston 15% granular. The compound was applied 3 times with 7-day intervals at a rate of 2 lb ai/A. No hazard found. However, weaknesses in study design limit usefulness of test in evaluation of hazard.	Supplemental	0095657
Bobwhite Quail	Spray Concentrate	Bobwhite quail and New Zealand rabbits were penned on alfalfa. Alfalfa was treated four times with 7-day intervals at a rate of 0.5 or 1.0 ai/A. No hazard was found at the 0.5 lb ai/A rate. One quail and three rabbits died at the 1.0 lb ai rate.	Supplemental	0095657

101.0 General Toxicology

Species	Test Reference Material	Results (mg/kg)	Category	(MRID No.)
Domestic Goat	97%	0	N/A	Smith, 1987
Mule Deer	97%	2.5-5.0	N/A	Smith, 1987
Rat (Male)	Technical	6.8 (5.9-7.8)	N/A	Smith, 1987
(Female)	Technical	2.3 (1.7-3.1)		
Rat	Unknown	2-12	N/A	Smith, 1987

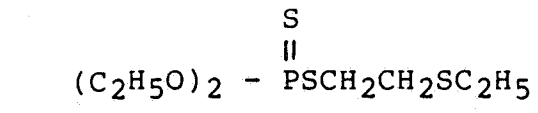
For data from the Toxicology Branch see the attachment, TOX Chem No. 341, March 8, 1988.

102.0 Physical and Chemical Properties

102.1 Chemical Name

O,O-diethyl S-[2-(ethylthio)ethyl]phosphorodithioate

102.2 Structural Formula



$(C_2H_5O)_2 - PSCH_2CH_2SC_2H_5$

102.3 Common Name

Disulfoton

102.4 Trade Name

Di-Syston

102.5 Molecular Weight

274.4

102.6 Physical State

Liquid

102.7 Properties

102.7.1 Solubility

25 ppm in water at 20 degrees C (soluble in most organic solvents).

102.7.2 Octanol/Water Partition Coefficient

102.7.3 Soil Adsorption Coefficient Kd

102.7.4 Vapor Pressure

1.8×10^{-4} millibars at 20 degrees C.

103.0 Behavior in the Environment

EAB Review of May 6, 1988, by Regelman

Photodegradation in Water - This study may be acceptable if the registrant provides the information requested in the RECOMMENDATIONS section.

The reported data indicate that Di-Syston degraded in pH 5 buffer exposed to natural sunlight (Latitude 38.05 N, Longitude 84.30 W; October 5 to 15, 1987; average temperature 19.4 $\pm$ 2.8 degrees C) with a calculated half-life of 93 hours. The half-life for control (dark) samples was greater than 300 hours. Di-Syston Sulfoxide was the major degradation product.

Photodegradation on Soil - This study was unacceptable as presented. The registrant must provide the information requested in the RECOMMENDATIONS section for reevaluation of the study.

The reported data indicate that Di-Syston degraded on a sandy loam soil exposed to natural sunlight with a half-life of 2.4 days; control (dark) samples degraded with a half-life of 16.7 days. The primary photoproduct (in both exposed and dark samples) was Di-Syston Sulfoxide. In exposed samples, Di-Syston Oxygen Analog Sulfoxide and Di-Syston Sulfone were detected at less than 10 percent after 2 days.

Photodegradation in Air - This study is unacceptable. The material balance was low and high percentages (19 to 23 percent) of "unknown" (unidentified) material was reported in two of the experiments (see RECOMMENDATIONS section for specific details).

Volatility (Field) - This study is unacceptable as presented. The registrant must provide the information requested in the RECOMMENDATIONS section for reevaluation of the study.

Accumulation in Fish

a. Uptake/Depuration Phases - This study may be acceptable provided the registrant submits the information requested in the RECOMMENDATIONS section for reevaluation of the studies.

b. Metabolite Identification - This study may be acceptable if the uptake/depuration studies are acceptable after submission and reevaluation of requested data.

Summary of Reported Data - At a Di-Syston concentration of 0.80 ppb for 35 days followed by a 14-day depuration period, the following rate parameters and bioconcentration factor (BCF) were calculated:

Uptake rate constant (K_1), ug/kg fish/ug/L water/day	83 (± 17)
Depuration rate constant (K_2), day^{-1}	0.20 (± 0.04)
Time (50%) for clearance, day	3.4 (± 0.69)
Bioconcentration factor (BCF)	410 (± 120)
Time to reach 90 percent of steady-state, days	11 (± 2.3)

Metabolite Identification

a. Edible portion, Di-Syston Oxygen Analog Sulfoxide (76 ppb, 21 days; 88, 35 days); other residues at levels not greater than 60 ppb.

b. Nonedible portion, Di-Syston Oxygen Analog Sulfoxide (92 ppb, 21 days; 103 ppb, 35 days); Di-Syston Sulfoxide and 1-(ethylsulfinyl)-2-(methylsulfinyl) ethane at levels above 50 ppb, but no other residues were present above 50 ppb. Parent Di-Syston was present at less than 50 ppb in all samples.

EAB review of May 18, 1986 by Abramovitch.

10.1 Hydrolysis

a. Study Identification: Hydrolysis of DI-SYSTON in Aqueous Sterile Buffer Solutions - The study was conducted by W.M. Leimkuehler and J.S. Thornton of Mobay Chemical Corporation (Report No. 68943).

b. Materials and Methods - DI-SYSTON-ethylene-^{13}C, ^{14}C with specific activity of 20.38 mCi/mmole and 99%+ radiochemical purity, was incubated in the dark at 20 and 40 degrees C in sterilized buffer solutions of pH 4.4 (potassium phosphate), pH 7.1 (sodium phosphate), and pH 9.2 (boric acid-potassium chloride) in concentrations of 0.5 and 5 ppm. Aliquots were extracted with dichloromethane:methanol (2:1) and analyzed on TLC in reference to authentic samples. Radioactive bands were scraped and quantitated by LSC. The remaining aqueous solution was evaporated (acetonitrile azeotrope) and redissolved in methanol. The nonextractable radioactive material from the aqueous hydrolysis solutions at pH 4 and 7 was derivatized with diazoethane for further analysis by GLC.

c. Reported Results - The primary hydrolysis products were the DI-SYSTON oxygen analog (POS) at pH 4, a mixture of des-ethyl DI-SYSTON metabolites of which the major one is des-ethyl $POSO_2$ at pH 7 and a product obtained at pH 9 which converted to 2-(ethylsulfonyl) ethane sulfonic acid upon treatment with potassium permanganate (see attachment). The hydrolysis half-lives were as follows:

Temperature (degrees C)	pH	Half-Life (Day) 4	7	9
20		1174	323	231
40		30	23.2	22.7

d. Study Author's Conclusions - No additional conclusions to those listed in the above results.

e. Reviewer's Discussions and Interpretation of Study Results - The study satisfied the EAB hydrolysis data requirement. DI-SYSTON hydrolyzes with half-lives of more than 230 days at 20 degrees C at a pH range of 4 to 9.

10.5 a. Study Identification: Leaching Characteristics of Aged DI-SYSTON Soil Residues - The study was conducted by J.J. Obrist (Report No. 67485, February 16, 1979).

b. Material and Methods - Three glass sectional columns with funneled bottoms were packed with untreated Kansas sandy loam soil (see attachment) to a height of 30 cm. The columns were saturated with distilled water, excess water was drained off, and the amount of water needed for soil saturation was recorded. One hundred grams of moist sandy loam soil fortified with 1.88 mg (18.8 ppm) radiolabeled DI-SYSTON was incubated under greenhouse conditions for 30 days. The aged soil (10 g for each column) was placed on top of three replicate sandy loam soil columns, 30 cm long and 4.8 cm i.d. Leaching was induced by passing 0.01N calcium sulfate solution saturated with oxygen through the columns. The amount of water was equivalent to 1.25 cm (0.5 inch) of daily rainfall for 45 days (a total of 56 cm of rainfall). After 45 days the column sections were separated and the soil was divided into 9 column portions and 350 mg of the dried soil were combusted to determine the ^{14}C content. All leachate and soil methanol extract fractions (5 mL aliquots) were assayed by LSC and TLC.

c. Reported Results - During the aging period, 15 percent of the radio-activity was lost probably due to the production of carbon dioxide. After the aging period almost 80 percent of the applied radio-activity could be extracted from the soil by methanol-water extraction. TLC indicated that only 0.2 percent of the extract was the parent DI-SYSTON. DI-SYSTON sulfoxide (PSSO) and DI-SYSTON ($PSSO_2$) comprised 25.3 and 26.7 percent of the applied radioactivity, respectively. No oxygen analog metabolites were found. The leachate contained 48.4 percent of the initially applied radioactivity in the form of DEPT (27%) and DEP (14%) and 8 percent of the material balance stayed at the origin of the TLC plate and was not identified. The top of the column (0 to 1.25 cm) contained 14 percent of the initially applied material in the form of PSSO, $PSSO_2$, DEP, and DEPT with traces of DI-SYSTON.

d. Study Author's Conclusions - The study author concluded that although leaching occurred below

12 inches, none of the leachate activity was found to contain DI-SYSTON or its oxidative metabolites.

e. Reviewer's Discussion and Interpretation of the Study Results - The reviewer is satisfied with the way the study was conducted and with the information it provided. The study indicates that DEP and DEPT (see attachment) have the potential to leach and enter ground water but the parent compound and its oxygen analogs are not likely to be found in ground water.

~~Attachments~~