

US EPA ARCHIVE DOCUMENT

7-8-87

DATA EVALUATION RECORD

CASE GS --                      LINDANE                      STUDY 4                      PM --

---

CHEM 009001                      Lindane

BRANCH EAB                      DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID    No MRID                      CONTENT CAT 01  
 Jordan, E.G. and F.A. Norris. 1986. Lindane-<sup>14</sup>C-photodegradation on soil  
 by natural sunlight. Pesticide Assessment Guideline 161-3. Report No. 86/  
 RHL/605/AG. Unpublished study prepared and submitted by Rhone-Poulenc, Inc.,  
 Monmouth Junction, NJ. Acc. No. 265725.

SUBST. CLASS = S.

DIRECT RVW TIME = 10              (MH) START-DATE                      END DATE

REVIEWED BY: J. Harlin  
 TITLE: Staff Scientist  
 ORG: Dynamac Corp., Rockville, MD  
 TEL: 468-2500

APPROVED BY: P. Mastradone  
 TITLE: Chemist  
 ORG: EAB/HED/OPP  
 TEL: 557-9734

SIGNATURE: *Paul J. Mastradone*

DATE: 7/8/87

CONCLUSIONS:

Degradation - Photodegradation on Soil

This study is scientifically invalid and unacceptable because the material balance was incomplete (>40% of the applied radioactivity was not accounted for after 21 days of irradiation). In addition, this study would not fulfill EPA Data Requirements for Registering Pesticides because volatilization was neither measured nor controlled.

MATERIALS AND METHODS:

A slurry of air-dried, sieved (250 μm) sandy loam soil (70% sand, 15% silt, 15% clay, 2.8% organic matter, pH 6.4, CEC 10 meq/100 g) and water was spread on four glass plates (20 x 20 cm) and air-dried. Each plate was divided into 16 squares; soil on three of the plates was treated with [<sup>14</sup>C]lindane (uniformly labeled, radiochemical purity 96.73%, specific activity 1.93 mCi/mmol, Pathfinder Laboratories) at 445.7 μg/square (~0.99 lb ai/A). Two of the treated plates were irradiated with natural sunlight (intensity 200-5000 μw/cm<sup>2</sup>; Table 1) by setting the plates outdoors for 8 hours per day for 28 days (samples were kept

indoors during bad weather; the study was conducted over a period of 35 days, but the days the plates remained indoors were not counted). A third treated plate and an untreated control plate were incubated in darkness in the laboratory at room temperature. Treated and control samples (2 squares/plate) were analyzed after 0, 1, 3, 7, 14, 21, and 28 days or irradiation.

A portion of the soil sampled from each plate was analyzed for total radioactivity by LSC following combustion. Additional soil samples were extracted three times with toluene:methanol:acetone (1:1:1, v:v:v). Samples were filtered after each extraction. An aliquot of each extract was analyzed by LSC. Extracts containing significant amounts of radioactivity were analyzed for lindane by GC with electron capture detection. The extracted soil samples were analyzed for unextractable radioactivity by LSC following combustion.

#### REPORTED RESULTS:

[<sup>14</sup>C]Lindane degraded with a half-life of 21-28 days on sandy loam soil irradiated with natural sunlight (Table 2). Lindane declined from 97 to 44% of the applied in irradiated (28 days) samples during 35 days of incubation, and was the only extractable [<sup>14</sup>C]compound in the soil. In the dark control sample, lindane comprised 81% of the applied after 28 days (calculated half-life 58.4 days) and was the only extractable [<sup>14</sup>C]-compound in the soil.

#### DISCUSSION:

1. The material balance was incomplete; >40% of the applied radioactivity was not accounted for by the termination of the study. The registrant suggested that the loss of material was due to volatilization of either lindane or its degradates.
2. Irradiated samples were reportedly incubated for 35 days, but in reality appeared to be irradiated for 28 days because samples were kept indoors during bad weather.
3. Recovery values from fortified samples and detection limits were not reported.

Table 1. Average natural sunlight intensities for Monmouth Junction, NJ.<sup>a</sup>

Date (1986)		Average daily intensity ( $\mu\text{E}/\text{m}^2 \cdot \text{s}$ ) <sup>b</sup>	Total daily solar irradiation ( $\text{E}/\text{m}^2$ )
August	15	436-1251	34.5
	19	405-1081	26.5
	20	520-1326	29.8
	22	800-1287	38.1
	23	600-1441	35.6
	24	871-1429	41.6
	25	442-1418	34.7
	26	773-1227	33.0
	27	--	12.0
	28	--	12.0
	29	762-1477	38.4
	30	841-1586	44.3
	31	822-1552	42.5
September	1	623-1256	37.1
	2	--	12.0
	3	212-1061	22.2
	4	133-623	12.8
	5	325-816	20.4
	6	583-1443	35.6
	7	312-916	25.4
	8	639-1286	36.5
	9	669-1478	39.5
	10	688-1216	33.2
	11	330-1313	31.9
	12	307-884	22.9
	13	--	39.5
	14	--	28.9
	15	270-1241	29.4
	16	779-1463	39.6
	17	678-1421	38.3
	18	384-1042	27.0

<sup>a</sup> Latitude 40°25'N, longitude 74°30'E.

<sup>b</sup> Sunlight intensity recorded between 7 am and 5 pm.

Table 2. Distribution of radioactivity (% of the applied) in sandy loam soil treated with [ $^{14}\text{C}$ ]lindane at 445.7  $\mu\text{g}/\text{sample}$  ( $\sim 0.99$  lb ai/A) and irradiated with natural sunlight for 28 days.

Sampling interval (days)	Extractable		Unextractable	Total [ $^{14}\text{C}$ ] <sup>a</sup>
	Lindane	Total		
	<u>Irradiated</u>			
0	96.9	96.2	0.14	102.2
1	85.2	87.0	1.54	97.2
3	78.6	79.3	1.45	93.3
7	71.1	74.8	2.30	83.1
14	58.0	55.9	3.42	69.7
21	50.7	51.5	4.09	58.9
28	44.2	44.1	5.72	55.9
	<u>Dark control</u>			
0	94.2	93.4	0.19	102.6
1	91.1	89.6	0.12	96.7
3	88.0	89.3	0.20	99.3
7	79.7	80.5	0.22	94.5
14	76.5	72.4	0.76	82.3
21	73.7	77.2	0.77	80.9
28	81.0	73.9	1.08	72.1

<sup>a</sup> By LSC following combustion of unextracted soil.