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CASE GS0187 PENDIMETHALIN STUDY 9 PM PM# ~~02/15/83~~

CHEM 108501 Pendimethalin

BRANCH EFB DISC 30 TOPIC 050525 GUIDELINE 40 CFR 163.62-9b/c/d

FORMULATION 00 - ACTIVE INGREDIENT

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Barringer, D.F., Jr., M.I. Haugwitz, S.B. Jakowlew, et al. 1974. CL 92,553: A study of the leaching of CL 92,553 (Prowl herbicide) from four different soil types: Project No. 2-463. Unpublished study received Sep. 27, 1974 under 5F1556; submitted by American Cyanamid Co., Princeton, NJ; CDL:094674-B.

SUBST. CLASS = S.

DIRECT RVW TIME = 4 (MH) START-DATE END DATE

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CONCLUSION:

Mobility - Leaching and Adsorption/Desorption

This study is scientifically invalid because the materials balance was too low (63-69% of the applied radioactivity was recovered) and the analytical methods used to determine radioactive residues were inconsistent (two techniques used). In addition, this study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because the experimental protocol (leaching soil columns under suction) was not appropriate for assessing the mobility of pendimethalin in soil.

MATERIALS AND METHODS:

Sand, sandy loam, silt loam, and clay soils (Table 1) were placed in soil columns (~2-inch inside diameter) to a depth of 14 inches, and saturated with deionized water. Additional portions (~30 ml) of each soil were then treated with 4-methyl-labeled [^{14}C]pendimethalin (Prowl, specific activity 18.8 µCi/mg, 98.3% pure, Stamford Laboratories) at 519 µg/ml of methyl alcohol, and placed on top of the appropriate soil column. Each soil column was attached to a suction pump that extracted leachate from the bottom of the column at a rate of 0.9 inches/hour. A total of 20 inches of deionized water was drawn through each column.

The soil columns were divided into four 3.5 inch segments, and the soil segments were dried. Aliquots of each soil segment were combusted, and the evolved $^{14}CO_2$ was trapped and quantified using LSC. Leachate collected from each soil column was combusted, and a 4-ml aliquot was quantified using LSC. Because of extreme variability in the results of combustion analyses for the top three 5-inch segments of the soil columns, additional aliquots of these soil samples were extracted with methanol (1.5-3.0 ml/g of soil) and the extract was quantified using LSC.

REPORTED RESULTS:

Recovery of [^{14}C]pendimethalin residues from the soil columns and the leachate ranged from 63 to 69%. The majority of the radioactive residues recovered from each soil column was found in the 0- to 3.5-inch segment (Table 2). Limited movement of [^{14}C]pendimethalin residues below the top 3.5 inches occurred in the sandy loam and silt loam soil columns, with ≤1.7 and 2.0% of the applied radioactivity detected at the 3.5- to 14-inch depths, respectively. In the sand soil column, [^{14}C]pendimethalin residues were 11.1, 0.5, and 0.9% of applied at the 3.5- to 7-, 7- to 10.5-, and 10.5- to 14-inch depths, respectively. Corresponding residues in the clay soil column were 17.1, 15.8, and 0.8% of applied. For all soil columns, ≤0.3% of the applied radioactivity was found in the leachate.

DISCUSSION:

1. The experimental design was inappropriate for assessing the mobility of pendimethalin in soil. Water used to leach the soil columns was drawn through the columns at a constant rate by means of a suction pump, and may have increased the mobility of pendimethalin in the soils tested.

2. The 0- to 3.5-inch soil segments were analyzed for radioactivity using a different analytical procedure than the procedure used for the remaining soil segments. Values reported for the 0- to 3.5-inch segments represent extractable radioactivity only, and cannot be compared to values reported for the remaining soil segments which represent total (extractable and bound) radioactivity. This may have accounted for the low materials balance.

3. It was stated that the test soils were treated with [^{14}C]pendimethalin at 519 µg/ml of methyl alcohol. However, because the volume of methyl alcohol applied to each soil column was not reported, actual treatment rates cannot be ascertained.

4. K_d values were not reported.

Table 1. Soil characteristics.

Soil type	pH	Sand	Silt	Clay	Organic matter	Moisture at field capacity	CEC (meq/100 g)
		%					
Agricultural sand (New Jersey)	4.9	96	3	1	0.26	2.04	1.6
Sandy loam (New Jersey)	5.1	68	24	8	3.60	16.92	6.1
Silt loam (Wisconsin)	6.7	24	56	20	5.6	30.65	--
Clay (Hawaii)	7.1	18	32	50	3.1	34.88	--

Table 2. Distribution of radioactivity (% of applied) in soil columns treated with [^{14}C]pendimethalin and leached with 20 inches of water.

Soil segment (inches)[a]	Sand	Sandy loam	Silt loam	Clay
0 - 3.5	56.4	62.6	60.7	34.3
3.5 - 7	11.1	1.4	1.5	17.1
7 - 10.5	0.5	0.1	0.3	15.8
10.5 - 14	0.9	0.2	0.2	0.8
Leachate	0.3	0.2	0.3	0.1

[a] Values for the 0- to 3.5-inch soil segment represent extractable radioactivity; values for the remaining soil segments represent total (extractable and bound) radioactivity.