DATA EVALUATION REVIEW

I. Study Type: Batch Equilibrium

II. Citation:

Cohen Samuel. 1989. Mobility of Unaged 2,4-Dichlorophenoxyacetic Acid Using Batch Equilibrium Technique. Submitted by Industry Task Force on 2,4-D Research Data. Performed by Center for Hazardous Materials Research, Pittsburgh, PA. MRID 42045302.

III. Reviewer:

Name: James A. Hetrick, Ph.D. James A. Hetrick
Title: Soil Chemist 18 SEP 1995
Organization: Environmental Chemistry Review Section #1
EFGWB/EFED/OPP

IV. Approved by:

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V. Conclusions:

This study provides acceptable data on adsorption-desorption of 2,4-dichlorophenoxyacetic acid (2,4-D) on sediment. This data in conjunction with the adsorption/desorption study (Acc No. 00112937) fulfill the unaged residue portion of Leaching/Adsorption-Desorption (163-1) data requirement. To fulfill the 163-1 data requirement, adsorption/desorption or soil column leaching studies are needed for aged 2,4-D residues.

The reported data indicate that 2,4-D has a low binding affinity to clay sediment. The Freundlich coefficient of 2,4-D is 1.27 ml g^{-1} (1/n= 0.827; K_{oc}=58.1). The desorption coefficient of 2,4-D is 1.64 ml g^{-1} (1/n=0.74; K_{oc}=78.1). Similar mobility data have been reported in previously reviewed adsorption/desorption studies (Acc. No. 00112937).

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VI. Materials and Methods:

A five gram subsample of Louisiana rice paddy sediment (pH 7.3, CEC 28.9 meq 100 g^{-1}, 2.1% OM, clay texture) was placed into each of ten 40 ml glass test tubes. Two of the soil samples were suspended in 0.01 M $CaCl_2$ aliquots (15 ml) containing 0.10, 0.51, 1.00, 2.47, and 5.12 μg a.i. ml^{-1}. (The [^{14}C]-2,4-D had a specific activity of 59.7 μCi ml^{-1}, a radiopurity of 94% (where was label), and a water solubility (25°C) of 890 μg ml^{-1}.) Each soil suspension was shaken

continuously for 24 hours. The experiment was conducted in the dark at a temperature of 22°C. After the adsorption experiment, the soil suspensions were centrifuged to separate the suspended sediment and supernatant. The supernatant was collected for chemical analyses.

The desorption experiment was conducted on soil samples remaining from adsorption experiment. Each soil sample was suspended in 15ml of 0.01 M $CaCl_2$, and then was shaken continuously for 8 hours. The desorption experiment was conducted in the dark at a temperature of 22°C. After the desorption experiment, the soil suspensions were centrifuged to separate suspended sediments and supernatant. The supernatant was collected for chemical analyses.

Analytical

Soluble residues in soil extracts were separated using an HPLC equipped with a C18 MICRO PAK column and a linear gradient solvent system of 0.1% trifluoroacetic acid (TFA)/water and 1% TFA/acetonitrile;UV and radioactive detector set at 280 nm. Separated residues were identified using co-chromatgraphy with 2,4-D, 2,4-DCP, chlorohydroquinone, 1,4 dihydroxy-2-chlorobenzene, 1,2,4-beneztriol, p-chlorophenoxyacetic acid, and o-chlorophenoxyacetic acid. In addition, the total ^{14}C content in soil was determined by combustion-LSC.

VII. Study Author's Results and/or Conclusions:

A. The material balance was 97 to 101% of applied [^{14}C]-2,4-D (Table 1).

B. The Freundlich coefficient of 2,4-D was 1.27 ml g^{-1} (1/n= 0.827) on clay sediment (Table 5; Figure 5 and 6). The calculated adsorption Koc of 2,4-D was 58.1. The desorption coefficient of 2,4-D was 1.64 ml g^{-1} (1/n=0.74) in a clay sediment/water system (Table 6; Figures 7 and 8). The calculated desorption Koc of 2,4-D was 78.1. These data indicate 2,4-D is mobile in terrestrial and aquatic environments.

VIII. Reviewer Comments:

A. The ^{14}C-residues were not identified using two confirmatory analytical methods. Because HPLC chromatograms indicate (>90% of the applied residue) was separated in a single peak, and this peak had a similar retention time as standard 2,4-D acid, EFGWB does not believe that secondary confirmation of [^{14}C]-residue is necessary. In future studies, [^{14}C]-residues should be separated and identified using at least two analytical methods.

B. The reviewer agrees with author's results and discussion.

2,4-D EFED Review

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