8-21-87

DATA EVALUATION RECORD PAGE 1 OF 9

CASE GS -- PP321 STUDY 2 PM --

CHEM -- PP321

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01

Vickers, J.A. and D.W. Bewick. 1986. PP321: adsorption and desorption in soil. Submitted by ICI Americas Inc., Wilmington, DE. Acc. No. 400524-06.

SUBST. CLASS = S.

DIRECT RVW TIME = 8 (MH) START-DATE END DATE

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

APPROVED BY: A. Schlosser
TITLE: Chemist
ORG: EAB/HED/OPP
TEL: 557-7709

SIGNATURE: Arthur O. Schlosser DATE: Aug 21, 1987

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

This study is unacceptable and would not fulfill EPA Data Requirements for Registering Pesticides because the concentrations of PP321 in the test solutions exceeded the reported water solubility of 0.004 ppm.

MATERIALS AND METHODS:

Preliminary studies determined an optimum soil:solution ratio of 1:100 and an equilibration time of 18 hours for the following batch equilibrium study.

Four soils (a sandy clay loam, a silt, and two sandy loam soils) were air-dried and sieved (2-mm) prior to use (Table 1). Samples of each soil were shaken in the dark at 4°C for 18 hours with 0.01 N calcium chloride solutions of phenyl-labeled [^{14}C]PP321 (radiochemical purity 99%, specific activity 2.49 GBq/mmol, Jealott's Hill) at 0.02, 0.05, 0.10, and 0.20 ppm. The solutions were centrifuged after shaking, and the supernatant was analyzed for total radioactivity by LSC.

Desorption of PP321 residues was investigated in the soil samples described above. The supernatant was replaced with untreated 0.01 N calcium chloride solution, the soil:solution was shaken for 6 hours, and the supernatant was analyzed for radioactivity by LSC. This procedure was repeated two more times with the soil:solution being shaken for 18 and 24 hours. The soil was analyzed for total radioactivity by LSC following combustion.

After the final desorption step, the soils treated at 0.02 ppm were extracted with acetonitrile. The extract was filtered, concentrated, and analyzed by TLC on silica gel plates developed in n-hexane:diethyl ether (70:30) and chloroform:acetonitrile: formic acid (96:3.5:0.5). Selected supernatants were also analyzed by TLC. Radioactive zones were located using autoradiography, identified by cochromatography with reference compounds, and quantified using a TLC linear analyzer.

REPORTED RESULTS:

PP321 had low mobility in the sandy clay loam, silt, and two sandy loam soils. Freundlich K_{ads} values ranged from 477 to 3064 for the sandy clay loam, 1121 to 4649 for the silt, 261 to 2492 for the England sandy loam, and 911 to 4008 for the NC sandy loam soils (Table 2). K_{des} values ranged from 1714 to 6813 for the sandy clay loam, 1075 to 6033 for the silt, 701 to 4310 for the England sandy loam, and 1240 to 3171 for the NC sandy loam soils.

PP321 comprised >81% of the applied radioactivity in the soil extracts (Table 3).

DISCUSSION:

1. The concentrations of PP321 in the test solutions exceeded the reported water solubility of 0.004 ppm.

2. K_{ads} and K_{des} values were somewhat variable between replicates (Tables 4-7).

Table 1. Soil characteristics.

Soil type	Location	Sand	Silt	Clay	Organic matter	pH	CEC (meq/100 g)
		%					
Sandy clay loam	Berkshire, England	48	26	25	2.70	6.3	16.0
Sandy loam	Surrey, England	71	21	8	1.22	6.2	6.4
Silt	Vicksburg, MS	2	88	10	0.74	6.0	6.8
Sandy loam	Goldsboro, NC	72	18	10	1.55	6.6	8.5

Table 2. Freundlich K values for the adsorption and desorption of [^{14}C]PP321 on four soils.

Soil type	Location	K_{ads}	K_{des}		
			1st Desorption	2nd Desorption	3rd Desorption
Sandy clay loam	Berkshire, England	477-3064	1821-6260	1714-6813	3511-9280
Sandy loam	Surrey, England	261-2492	1053-2925	701-4095	833-4310
Silt	Vicksburg, MS	1121-4649	2647-5145	1582-8750	1075-6033
Sandy loam	Goldsboro, NC	911-4008	1240-3171	2436-4146	1750-4107

4

Table 3. Distribution of radioactivity (% of applied) in soil extracts and supernatants analyzed by TLC from soils treated with phenyl-labeled [^{14}C]PP321 at 0.021 µg/mL.

Soil type	Fraction	PP321	3-Phenoxybenzoic acid	Compound XV[a]	Unknowns
Sandy clay loam (England)	Soil extract	83.0	0.3	0.1	2.2
	Supernatant	--	--	--	--
Sandy loam (England)	Soil extract	83.9	0.3	0.1	2.4
	Supernatant	1.3	0.1	<0.1	0.3
Silt (MS)	Soil extract	85.8	0.4	0.2	0.8
	Supernatant	0.5	0.1	<0.1	0.6
Sandy loam (NC)	Soil extract	80.8	0.1	0.2	2.6
	Supernatant	--	--	--	--

[a] (RS)-α-Cyano-3-(4-hydroxyphenoxy)benzyl (1 RS)-cis-3-(Z-2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylate.

5

Table 4. Distribution of radioactivity (as determined by LSC) from sandy clay loam soil (Berkshire, England) treated with an aqueous solution of [^{14}C]PP321 at four concentrations.

Initial concentration in solution (µg/mL)	Replicate	In solution after adsorption	In solution after 1st desorption	In solution after 2nd desorption	In solution after 3rd desorption	Left in soil (µg/g)	Recovery (%)
		µg/mL					
0.204	1	0.01280	0.00364	0.00363	0.00547	16.80	88.4
	2	0.01180	0.00331	0.00261	0.00458	16.30	85.1
	3	0.00951	0.00330	0.00290	0.00329	15.80	81.5
0.101	1	0.00324	0.00224	0.00148	0.00136	8.90	91.4
	2	0.01770	0.00168	0.00188	0.00120	8.32	90.7
	3	0.03330	0.00207	0.00157	0.00146	8.39	86.1
0.052	1	0.00182	0.00111	0.00209	0.00060	4.31	86.6
	2	0.00223	0.00093	0.00166	0.00091	4.27	86.3
	3	0.00354	0.00120	0.00136	0.00070	4.12	84.0
0.021	1	0.00201	0.00107	0.00111	0.00021	1.92	98.9
	2	0.00138	0.00033	0.00093	0.00039	1.69	85.8
	3	0.00096	0.00033	0.00045	0.00039	1.78	88.4

6

Table 5. Distribution of radioactivity (as determined by LSC) from sandy loam soil (Surrey, England) treated with an aqueous solution of [^{14}C]PP321 at four concentrations.

Initial concentration in solution (µg/mL)	Replicate	In solution after adsorption	In solution after 1st desorption	In solution after 2nd desorption	In solution after 3rd desorption	Left in soil (µg/g)	Recovery (%)
		µg/mL					
0.204	1	0.01270	0.00965	0.00981	0.00437	16.10	86.8
	2	0.01380	0.01580	0.00874	0.00566	14.90	82.8
	3	0.02060	0.01680	0.00714	0.00504	15.00	84.6
0.101	1	0.02830	0.00301	0.00557	0.00372	6.62	82.7
	2	0.00395	0.00603	0.01050	0.00856	6.68	81.6
	3	0.01260	0.00844	0.00224	0.00578	6.38	77.1
0.052	1	0.00516	0.00346	0.00277	0.00252	3.70	83.7
	2	0.00418	0.00368	0.00190	0.00165	3.70	80.7
	3	0.00365	0.00286	0.00164	0.00120	4.12	86.5
0.021	1	0.00905	0.00074	0.00135	0.00059	1.88	96.5
	2	0.00154	0.00071	0.00159	0.00079	1.56	83.9
	3	0.00272	0.00074	0.00137	0.00091	1.50	83.4

7

Table 6. Distribution of radioactivity (as determined by LSC) from sandy loam soil (Goldsboro, North Carolina) treated with an aqueous solution of [^{14}C]PP321 at four concentrations.

Initial concentration in solution (µg/mL)	Replicate	In solution after adsorption	In solution after 1st desorption	In solution after 2nd desorption	In solution after 3rd desorption	Left in soil (µg/g)	Recovery (%)
		µg/mL					
0.204	1	0.00751	0.01360	0.00592	0.00612	15.70	84.8
	2	0.00612	0.00778	0.00748	0.01010	15.80	86.6
	3	0.01760	0.00593	0.00462	0.01050	15.70	87.0
0.101	1	0.00249	0.00310	0.00174	0.00425	8.15	86.6
	2	0.00451	0.00565	0.00233	0.00370	8.43	90.8
	3	0.00439	0.00572	0.00251	0.00326	7.53	81.6
0.052	1	0.00172	0.00168	0.00123	0.00121	1.75[a]	39.0
	2	0.00457	0.00282	0.00185	0.00138	3.93	84.2
	3	0.00264	0.00194	0.00172	0.00177	3.96	83.2
0.021	1	0.00114	0.00156	0.00080	0.00073	1.82	95.3
	2	0.00211	0.00104	0.00053	0.00060	1.68	88.3
	3	0.00140	0.00084	0.00063	0.00075	1.61	84.3

[a] Data not used in calculation; registrant stated the figure was low due to spillage of freeze-dried soil.

Table 7. Distribution of radioactivity (as determined by LSC) from silt soil (Vicksburg, Mississippi) treated with an aqueous solution of [^{14}C]PP321 at four concentrations.

Initial concentration in solution (µg/mL)	Replicate	In solution after adsorption	In solution after 1st desorption	In solution after 2nd desorption	In solution after 3rd desorption	Left in soil (µg/g)	Recovery (%)
		µg/mL					
0.204	1	0.00768	0.00519	0.00440	0.01690	15.20	85.8
	2	0.00567	0.01160	0.00481	0.00558	16.30	86.2
	3	0.00560	0.00422	0.00713	0.00384	15.60	81.1
0.101	1	0.00254	0.00222	0.00185	0.00215	8.61	88.8
	2	0.00327	0.00272	0.00113	0.00255	8.33	86.6
	3	0.00234	0.00256	0.00133	0.00205	8.02	82.7
0.052	1	0.00432	0.00135	0.00300	0.00101	3.87	81.9
	2	0.00182	0.00114	0.00106	0.00132	3.92	79.9
	3	0.00275	0.00188	0.00147	0.00158	3.93	82.1
0.021	1	0.000741	0.00060	0.00037	0.00050	1.89	93.9
	2	0.000509	0.00061	0.00040	0.00048	1.72	85.5
	3	0.000450	0.00040	0.00045	0.00034	1.71	84.2