CASE GS0179 TRIFLURALIN STUDY 60 PM PM# 08/07/84

CHEM 036101 Trifluralin

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Golab, T. 1983. Radiochemical studies with ^{14}C trifluralin on various rotational crops: soybeans and others. Unpublished study received Sep. 20, 1983 under 1471-70; submitted by Elanco Products Co., Div. of Eli Lilly and Co., Indianapolis, IN; CDL:251257-B.

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CONCLUSIONS:

Confined Accumulation - Rotational Crops

1. This study is scientifically valid.

2. [^{14}C]Trifluralin residues did not accumulate in cabbage, corn, soybeans, sugarbeets, or tomatoes grown in rotation with soybeans in silt loam soil treated with [^{14}C]trifluralin (>99% pure) at 1.0 lb ai/A. Total radioactivity in rotational crop tissues ranged from 0.002 to 0.143 ppm, but none of the radioactivity was characterized as trifluralin, α,α,α-trifluoromethyl-2,6-dinitro-N-propyl-p-toluidine, or α,α,α-trifluromethyl-2,6-dinitro-p-toluidine. Trifluralin residues detected in the soil after the growing period (73 weeks) ranged from 10.9 to 19.6% of the applied radioactivity.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides because the soil analytical methods were not provided, the application rate was not confirmed, the soil was uncharacterized, meteorological data were not provided, and all degradates were not characterized.

MATERIALS AND METHODS:

Uniformly ring-labeled [^{14}C]trifluralin (specific activity 4 μCi/mg, >99% pure, Lilly Research Laboratories), at 1.0 lb ai/A, was incorporated into field plots of silt loam soil (<2% organic matter, soil not further characterized) in galvanized pipe (91.4 cm diameter, 61 cm height). The plots were planted to soybeans immediately after treatment. Following soybean harvest, the treated soil (7.5 cm) in each plot was turned and rotational crops were planted (Table 1). Soil samples (15-cm depth) were taken immediately after treatment; at planting and harvest of the primary crop; and at planting, during growth, and at harvest of the rotational crops (Table 2).

Soil samples were air-dried and an aliquot combusted to determine total radioactivity. Samples were also extracted and analyzed for [^{14}C]trifluralin residues and extractable and nonextractable degradation products by a referenced procedure (not provided).

Aliquots of plant samples were combusted to determine total radioactivity and were exhaustively extracted using various solvents ranging from lipophilic, nonpolar hexane, chloroform or methylene chloride to hydrophilic methanol and water. An aliquot of each extract was analyzed for [^{14}C]radioactivity by LSC, and a portion of the solid residue was combusted for total [^{14}C]radioactivity determination. Extracted [^{14}C]-trifluralin residues were characterized by TLC on silica gel plates in conjunction with LSC and/or autoradiography. The TLC solvent system was benzene:carbon tetrachloride (40:60, v:v).

REPORTED RESULTS:

Total radioactivity in samples of rotational crops (cabbage, corn, soybeans, sugarbeets, and tomatoes) ranged from 0.002 to 0.143 ppm after growing for various intervals in treated soil (Table 1). Insufficient radioactivity was present in all plant samples except corn to proceed with the solvent fractionation beyond water extraction and partitioning in chloroform and water. TLC analysis of plant residues indicated that no trifluralin, or its degradates, α,α,α-trifluoromethyl-2,6-dinitro-N-propyl-p-toluidine or α,α,α-trifluoromethyl-2,6-dinitro-p-toluidine were present in any plant tissues. Quantitative data were not provided.

[^{14}C]Trifluralin residues in soil were 67.0 and 5.7% of the applied radioactivity after 6 and 73 weeks, respectively (Table 2). Unidentified degradation products were present from 3.1 to 29% of applied, and the amount of radioactivity bound to the soil increased over the test period.

DISCUSSION:

1. The soil analytical methods were referenced but not provided.

2. Complete soil characteristics, such as pH, CEC, or textural analysis, were not reported.

3. Meteorological data, including temperature and rainfall, were referenced but not provided.

4. Degradation products were not characterized in soil or plant samples.

5. Recovery values were not reported.

Table 1. Total radioactivity detected (ppm) in rotational crops grown in silt loam soil treated with [^{14}C]trifluralin at 1.0 lb ai/A.

Crop	Sampling interval (weeks)[a]	Control		Treated	
		Fresh	Dry	Fresh	Dry
Plot A					
Wheat[b]					
Planting	22				
First sample	52	0.006	--[c]	0.034	--
Final sample	60				
seeds		--	0.001	--	0.002
straw		--	0.006	--	0.143
Cabbage[d]					
Planting	64				
First sample	67	0.001	--	0.011	--
Final sample	73	0.002	--	0.008	--
Plot B					
Corn[b]					
Planting	52				
First sample	57	0.004	--	0.020	--
Second sample	61	0.003	--	0.011	--
Final sample	73				
seeds		--	0.001	--	0.013
straw		--	0.008	--	0.037
Plot C					
Soybeans[b]					
Planting	52				
First sample	58	0.001	--	0.077	--
Second sample	61	0.001	--	0.047	--
Final sample	73				
seeds		--	0.004	--	0.037
pods		--	0.005	--	0.070
stems		--	0.016	--	0.064
Plot D					
Corn[b]					
Planting	5				
First sample	9	ND[e]	0.005	0.035	--
Final sample	19				
seeds		--	ND	--	0.011
stalks		--	0.003	--	0.136
Sugarbeets[d]					
Planting	50				
First sample	58				
tops		0.001	--	0.055	--
roots		0.021	--	0.109	--
Second sample	61				
tops		0.002	--	0.116	--
roots		0.005	--	0.025	--
Final sample	73				
tops		0.001	--	0.106	--
roots		ND	--	0.015	--
Plot E					
Corn[b]					
Planting	5				
First sample	9	ND	--	0.035	--
Final sample	19				
seeds		--	ND	--	0.010
stalks		--	0.003	--	0.110
Tomato[e]					
Planting	54				
First sample	59	ND	--	0.013	--
Final sample	64	ND	--	0.004	--

[a] Weeks after initial [^{14}C]trifluralin application.

[b] First rotational crop, or only rotational crop.

[c] Not sampled.

[d] Second rotational crop.

[e] The detection limit was 0.001 ppm.

Table 2. Radioactivity detected (% of applied) in silt loam soil treated with [^{14}C]trifluralin at 1.0 lb ai/A and planted to soybeans followed by a rotational crop.[a]

Sampling interval (weeks)[b]	Total[c]	Extracted	Soil bound	Trifluralin	Degradation products
			Plot A		
0	100.0	--	--	--	--
6	85.3	68.6	16.7	61.2	7.4
22	85.1	41.7	43.4	29.8	11.9
52	76.0	29.3	36.7	20.9	18.4
60	69.5	23.5	46.0	11.9	12.6
73	64.3	17.1	47.2	8.0	9.1
			Plot B		
0	100.0	--	--	--	--
6	90.5	73.0	17.5	67.0	6.0
22	88.1	41.5	56.6	28.7	12.8
52	73.5	37.7	35.8	22.6	15.1
57	75.1	30.3	44.8	23.4	6.9
73	59.6	13.8	45.8	5.9	7.9
			Plot C		
0	100.0	--	--	--	--
6	94.1	77.5	16.6	67.0	10.5
22	78.7	39.3	39.4	10.3	29.0
52	80.3	44.4	35.9	22.9	21.5
58	71.9	38.8	33.1	14.9	23.9
73	67.3	19.6	47.7	11.4	8.2
			Plot D		
0	100.0	--	--	--	--
4	79.9	66.4	73.		
52	76.0	29.3	36.7	20.9	18.4
60	69.5	23.5	46.0	11.9	12.6
73	64.3	17.1	47.2	8.0	9.1
			Plot E		
0	100.0	--	--	--	--
4	78.5	67.1	11.4	54.6	12.6
19	70.2	34.5	35.7	23.0	11.5
52	59.7	17.9	41.8	14.3	3.6
59	56.1	19.1	37.0	16.0	3.1
73	48.2	10.9	37.3	5.7	5.2

[a] Each sample consisted of six soil cores taken to a depth of 15 cm and air-dried prior to extraction.

[b] Weeks after soil treatment.

[c] Combustion analysis prior to extraction.