DYNAMAC
CORPORATION

ACIFLUORFEN

ENVIRONMENTAL FATE AND EXPOSURE ASSESSMENT OF ACIFLUORFEN

REVIEW AND EVALUATION OF DATA SUBMITTED SUBSEQUENT TO THE INITIAL REVIEW

Contract No. 68-01-6679

Final Report

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SUBMITTED TO:

Environmental Protection Agency
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SUBMITTED BY:

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Environmental Fate and Exposure Assessment of Acifluorfen

This review is the second reassessment of environmental fate and exposure data submitted by Rhone-Poulenc, Inc. for the registration of acifluorfen as a herbicide to control broadleaf weeds in soybeans (Accession No. 071323-071327 and 250467). It is based on additional data and comments submitted by Rhone-Poulenc (Accession No. 252764, March 16, 1984) in response to previous reviews of these data (Dynamac Corp., March 10, 1983 and August 26, 1984). Data submitted previously have been described in earlier reviews, and this information is not fully repeated here. New data submitted by Rhone-Poulenc on March 16, 1984 are included in this report. In studies that have been reevaluated to meet data requirements, a complete description of the data is included. In studies that do not satisfy current guideline requirements, a description of the studies' deficiencies is listed. Data submitted to support Study 10 were reviewed as an independent study (Study 16).

4.2 STUDY 2

Somma, N., F.A. Norris, and A. Guardigli. September, 1982. Photodegradation of Tackle in aqueous solution. Rhone-Poulenc, Inc., Monmouth Junction, New Jersey. ASD Report No. 82/048. Acc. No. 071323.

The registrant has submitted additional data to satisfy previous questions (Dynamac Corp., August, 1983) concerning the possibility of substantial losses of acifluorfen photodegradates via volatilization. All data submitted indicate that acifluorfen in aqueous solution is rapidly degraded on exposure to light. The estimated half-life is 92 hours for continuous exposure to UV radiation (285-375 nm, @ 40-45°C); this is roughly equivalent to 8 days of natural exposure (11-12 hours/day of sunlight). Numerous degradates are formed, but no one degradate is produced in greater than 10% yield. The most abundant degradate, 4-[2-chloro-4-(trifluoromethyl)phenoxy]-1-nitrobenzene, was found at a maximum concentration of 6.6% in solution. Loss of radioactivity (^{14}C uniform nitrophenyl ring label) by volatilization was <4% over a 216 hour period of irradiation. No further data are required.

4.4 STUDY 4

Wargo, J.P. July, 1982. Metabolism of carbon-14 labeled MC-10978 in Kansas, Virginia, Georgia, and New Jersey soils under aerobic and anaerobic conditions. Rhone-Poulenc, Inc., Monmouth Junction, New Jersey. ASD Report No. 82/040. Acc. No. 071324.

In the initial review (Dynamac Corp., March, 1983) of this study the effectiveness of the extraction procedures was questioned because a substantial amount of radioactivity was removed by each successive extraction for some of the samples. The petitioner has now submitted sufficient quantitative data to demonstrate that the first six extractions (sequentially extracted twice with each of three solvent systems) removed all but a relatively small amount of acifluorfen and its degradates. Recoveries of ^{14}C associated with any one compound in the seventh extraction (reflux in HCl:methanol) were <2.6% of the total radioactivity initially added. Based upon this information, it is assumed that levels of acifluorfen and its identifiable degradates not extracted from the soil are insignificant.

The petitioner has also submitted a complete set of autoradiographs from the TLC analyses that were used to quantify extracted acifluorfen and its degradates. This information demonstrates that sufficient analyses were completed to separate acifluorfen from other ^{14}C components in the soil extracts and thus provides quantitative data on the rate of acifluorfen degradation. However, it still is not clear from the photocopies of the autoradiographs whether degradates MC-10879 and MC-14621 as well as MC-10074 and MC-10108 can be clearly resolved by the TLC procedures used.

The petitioner has stated that the presence of MC-14621 was confirmed by HPLC and has submitted a sample chromatogram to demonstrate this. GC/MS

data were also submitted to verify the presence of MC-10108 and MC-10879; however, most of the MS spectra either could not be identified (figure numbers missing) or were not legible. A clear copy of this data should be resubmitted. Tabulations of quantitative ^{14}C recoveries from TLC analyses gave data for MC-14621 and MC-10108. It is not clear if MC-10074 was found, and no quantitative data for MC-10879 were provided. Data are needed to clarify the relative importance of these degradates (MC-10074 and MC-10879).

The results from the TLC analyses of the soil extracts (Table 1) (excluding refluxing with HCl:methanol) do not agree with the acifluorfen recovery data submitted in the original registration application (Table 2). Both the sampling intervals and the rates of acifluorfen breakdown differ significantly between the two sets of data. In the originally submitted data, half-lives of acifluorfen were estimated to vary from 14-63 days to >112 days. The estimates were poor because of the limited data reported. The most recent data set is much more complete and demonstrates that acifluorfen is very persistent (half-lives of 84-271 weeks). The petitioner must explain the discrepancies between the two data sets before this information can be evaluated.

Newly submitted data included the total DPM of ^{14}C extracted from each sample. Values vary substantially from soil type to soil type indicating variation in the specific activity of the test substance or in the rate of treatment. The descriptions of the test substance and procedures for soil treatment in the original application submission (December, 1982) indicate that only one rate of application and only one specific activity (per label) were utilized. This discrepancy should be explained by the petitioner.

Table 1. Recovery of nitrophenyl ring-labeled and trifluoromethyl phenyl ring-labeled [^{14}C]acifluorfen from four soils incubated aerobically.[a]

Incubation time (weeks)	NJ soil		GA soil		VA soil		KS soil	
	NO_2	CF_3[b]	NO_2	CF_3	NO_2	CF_3	NO_2	CF_3
0	90.5	91.0	96.9	70.3	93.0	86.6	86.3	93.9
1	84.1	83.9	81.4	88.3	94.2	90.7	87.9	91.9
2	85.5	80.9	86.8	82.2	89.9	88.8	77.4	99.2
9	66.0	67.3	77.4	81.0	87.8	84.3	73.6	90.8
18(16)[c](13)[d]	58.9	44.6	70.3	59.8	89.8	72.4	79.0	80.6
56(70)[c]	56.1	62.7	83.6	51.2	58.3	63.2	87.7	83.0
Half-life (weeks)[e]	88	>56[f]	>>56[f]	106	84	145	>>56[f]	271
r^2	0.66	--	--	0.69	0.93	0.82	--	0.50

[a] Acifluorfen levels determined by TLC analyses of methanol, acetic acid in methanol, and HCl in methanol (ambient) extracts. Data submitted February, 1984.
[b] Soils were dosed with [^{14}C]acifluorfen labeled in the nitrophenyl (NO_2) ring or the trifluoromethyl phenyl (CF_3) ring.
[c] The last two sampling intervals for the Georgia and New Jersey soil dosed with trifluoromethyl phenyl-labeled [^{14}C]acifluorfen (CF_3) were 16 and 70 weeks.
[d] The last two sampling intervals for the Virginia soil dosed with trifluoromethyl phenyl-labeled [^{14}C]-acifluorfen (CF_3) were 13 and 70 weeks.
[e] First order half-lives were estimated by reviewer using least squares regression; r^2 is the coefficient of determination.
[f] Data do not conform to first order kinetics (r^2 <0.50).

Table 2. Total recovery of [^{14}C]acifluorfen in solvent extracts of four soils treated with 5 ppm acifluorfen.[a]

Incubation time (weeks)	NJ soil		GA soil		VA soil		KS soil	
	NO_2	CF_3[b]	NO_2	CF_3	NO_2	CF_3	NO_2	CF_3
0	97.5	99.3	99.0	99.7	99.5	97.5	99.7	99.3
2	76.6	82.2	82.5	84.0	90.4	89.9	99.6	87.2
8	--[c]	--	--	--	--	80.5	--	--
9	38.6	75.7	61.6	68.9	73.3	--	83.6	--
13	--	--	--	--	--	69.0	--	64.1
16	--	52.2	--	38.5	--	--	--	--

[a] Values expressed as percent of ^{14}C initially added. Data submitted December, 1982.
[b] Soils were dosed with [^{14}C]acifluorfen labeled in the nitrophenyl (NO_2) ring or the trifluoromethyl phenyl (CF_3) ring.
[c] Samples not taken or not analyzed.

4.5 STUDY 5

Piznik, M., and J.P. Wargo. September 1982. Abbreviated aerobic/anaerobic soil study with radiolabeled Tackle (MC-10978). Rhone-Poulenc, Inc., Monmouth Junction, New Jersey. ASD Report No. 82/047. Acc. No. 071324.

The applicant has submitted a method for determining the water holding capacity of a soil (termed the moisture capacity by the applicant), and the method appears to be adequate. However, a water holding capacity of 45% for a loamy sand soil (83.6% sand) with only 1.9% organic matter seems unreasonably high. As previously stated a soil in this textural class would be expected to contain 10-20% moisture at 0.33 atm. The applicant has stated that the "soil was visibly moist but not excessively water logged." This implies that the soil was somewhat water logged, and thus at least a portion of the sample was not aerobically incubated. The rate of acifluorfen breakdown and the metabolite distribution also suggest that the soil was partially anaerobic during the unflooded phase of this study. The breakdown of acifluorfen during the unflooded phase of this study was very rapid (half-life of 17 days) relative to degradation in the four aerobic soils in Study 4. The ^{14}C distribution in the soil extracts (Table 3) shows that there is no substantial difference between the patterns of degradate formation before and after flooding. The MC-15598 degradate was found both before and after flooding in this study, but was not identified as an aerobic soil degradate in Study 4.

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These data do not fulfill data requirements because the conditions under which the soil was aged (aerobic or anaerobic) are not clearly defined. In, addition, the mass balance (~67% ^{14}C recovery after a combined 28 days unflooded and 56 days flooded incubation) is not adequate. The photocopies of the autoradiographs submitted were not clear enough to confirm adequate separation of degradates. More ledgible copies should be resubmitted.

Table 3. Distribution of ^{14}C in extracts from aerobically aged and anaerobically incubated soil treated with [^{14}C]acifluorfen.[a]

Sample	TLC solvent system[b]	% of total ^{14}C					
		MC-10109	MC-14621	MC-10879	MC-15598	MC-10108	Origin
28 Day Aerobic	A	12.0	7.3	6.3	7.5	1.8	32.7
	B	13.2	8.3	2.5	3.1	2.7	32.3
28 Day Anaerobic	A	4.1	12.0	7.8	3.2	1.2	35.1
	B	6.3	10.9	4.9	5.1	4.4	45.0
56 Day Anaerobic	A	4.6	7.6	9.3	5.3	0.4	32.5
	B	4.2	8.5	6.0	6.1	1.3	37.6

[a] [^{14}C]Acifluorfen uniformly labeled in the nitrophenyl ring.
[b] Subsamples of each extract analyzed by TLC using two solvent systems: A - chloroform:acetic acid (9:1) and B - toluene: tetrahydrofuran:acetic acid (45:30:1).

4.6 STUDY 6

Gemma, A.A., and J.P. Wargo. October, 1982. The metabolic fate of ^{14}C-MC-10978 in New Jersey loamy sand soil. Rhone-Poulenc, Inc., Monmouth Junction, New Jersey. ASD Report No. 82/051. Acc. No. 071324.

No new data have been submitted. Previously, (Dynamac Corp., March 1983 and August, 1983) no conclusions were made from the results of this study because the range of total ^{14}C recoveries was unacceptably wide. The petitioner has replied by stating that in this type of experiment, where vegetation intercepts a portion of the applied pesticide, recoveries from the soil are expected to vary from 50-200% of the intended application. As such, this study is not designed to provide the accuracy needed for a soil metabolism study. The scale in which this study was conducted (column 56 cm in diameter) precludes its use as a terrestrial field dissipation study. Therefore, the data from this study will be utilized as supplementary information.

4.10 STUDY 10

Norris, F.A., and C.C. Ku. April, 1981. Field dissipation and leaching studies. Mobil Chemical Company. Progress Memorandum PME-81.48. Acc. No. 071325.

The registrant has not addressed the critical deficiencies of this study. Therefore, this study is still considered scientifically invalid for reasons stated in previous reviews. Additional experiments have been submitted in conjunction with this study. This newly submitted data is reviewed independently in Study 16.

4.12 STUDY 12

Gemma, A. A., J. P. Wargo, Jr., and G. Heinzelmann. September, 1982. Tackle greenhouse rotational crop study: The potential uptake of ^{14}C MC 10978 in various crops from soil treated with ^{14}C MC 10978 . Rhone-Poulenc, Inc., Monmouth Junction, New Jersey. ASD Report No. 82/046. Acc. No. 071326.

The applicant has provided the information requested in the last review (Dynamac Corp., August, 1983) of this data. The plot area was 2 ft^2, the purity of the test substance was >98%, and the rate of application was confirmed to be 0.16 lb ai/A. However, this treatment rate simulates an actual use at only 0.50 lb ai/A, which is not adequate for the proposed maximum application rate of 0.75 lb ai/A.

These data indicates that acifluorfen applied to soybean seedlings at 0.5 lb ai/A does not result in the accumulation of detectable (<0.02 ppm) residues in rotational root crops (radishes), leafy vegetables (spinach), or grain from cereal crops (wheat) planted 12 months after treatment. Residues were found in wheat forage (0.03 ppm) and straw (0.04 ppm). The parent, and the MC-10879 and MC-10074 degradates were identified as components of the residues in wheat. The MC-10108 and MC-14621 degradates could have constituted a portion of the residues, but the TLC analyses performed are insufficient to confirm the presence of these degradates. If these data are to be used to establish an unrestricted rotational crop interval at 12 months for applications of acifluorofen to soybeans at ≤0.5 lb ai/A, the identification of degradates must be confirmed by analyses other than the TLC methodology that has been submitted.

4.13 STUDY 13

Gemma, A. A., J.P. Wargo, and G. Heinzelmann. September, 1982. Tackle field rotational crop study: The potential uptake of ^{14}C-MC 10978 in various crops grown under field conditions in soil treated with ^{14}C-MC 10978. Rhone-Poulenc, Inc., Monmouth Junction, New Jersey. ASD Report No. 82/042. Acc. No. 071326.

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Spare, W.C., F. Dillon, and C. Hutchinson. October, 1982. Field metabolism studies with ^{14}C-MC 10978. Prepared for Rhone-Poulenc, Inc. by Biospherics, Inc., Rockville, Maryland. Report No. 349. Acc. No. 071326.

In the review of this information by Dynamac (August, 1983) a line from the bottom of page 15 was inadvertantly deleted. This sentence should read: "The registrant has confirmed that the application rate was 0.18 lb ai/A instead of the intended rate of 0.5 lb ai/A."

This study provides useful information on the uptake of acifluorfen residues by rotational crops. However, data requirements cannot be met by this study because of the low application rate, (0.18 lb ai/A). To conform to guidelines, the application rate should be at the proposed maximum rate (0.75 lb ai/A). The registrant has proposed using data from soil dissipation studies to replace the soil analyses normally required in a rotational crop accumulation study. Data from aerobic soil metabolism or terrestrial field dissipation studies could be utilized for soil residue analyses in the rotational crop studies only if these studies clearly demonstrate that acifluorfen residues are below detection within 12 months after application. At present neither the metabolism nor the dissipation studies demonstrate nondetectable residues occurring within a year.

4.15 STUDY 15

Thompson, C. M., and W. Cranor. January, 1981. Uptake, depuration and bioaccumulation of ^{14}C-MC 10978 by bluegill sunfish (Lepomis macrochirus). Submitted to Mobil Oil Corporation by Analytical BioChemistry Laboratories Inc., Columbia, Missouri. ABC Report No. 26610. Acc. No. 071327.

The registrant has submitted a request to waive requirements for identifying metabolites in fish because of the low bioaccumulation factor. In a previous review of this data (Dynamac, August, 1983) it was stated that metabolite identification would not be required unless the low levels of residue found in the fish (~5 ppm whole fish, 1.2 ppm fillet) were considered to be of toxicological concern. The decision to waive requirements for metabolite identification is deferred to the Toxicology Branch.

STUDY 16

Guyton, C.L. October, 1983. Soil dissipation data on Tackle® under field conditions. Rhone-Poulenc, Inc. Monmouth Junction, New Jersey. ASD Report No. 83/025. Acc. No. 252764.

Procedure

Acifluorfen, 2AS (aqueous sodium formulation, 2 lb ai/gal) was applied to soybean plots in Greenville, MS and Geneseo, IL at 0.75 lb ai/A and in Mansfield, IL and Fuqua Varina, NC at 0.75 and 1.5 lb ai/A. All applications were made by ground spray in either June or August, 1982. Soils

in the plots are characterized in Table 4, and plot treatment data is given in Table 5. Three of the plot areas were treated with one or more pesticides in addition to acifluorfen. One experimental site was treated only with acifluorofen. Plots were sampled by collecting an unspecified number of cores from each plot. Cores were segmented into 0- to 3- and 3- to 6-inch segments and were pooled by depth for analysis. All samples were maintained at 0°F until analyzed. Sampling intervals varied with site. A control plot was established at each site and was sampled as were the treated plots. Rainfall was measured at each experimental site, but soil and air temperature data were not reported.

Methods

Each soil sample was homogenized. A subsample (20 g) was then extracted with methanol:water (1:1) for 20 minutes. The extract was filtered and then adjusted to pH 1 with HCl. The acidified extract was partitioned twice with methylene chloride, and the combined organic phases were rotovaped to dryness. The residue was taken up in methanol and was analyzed by HPLC to quantify acifluorfen (acid and salt forms). The mobile phase was acetic acid:water:methanol (1:39:60), and detection was by absorption at 280 nm. All recoveries were corrected for soil moisture. A detection limit of 0.05 ppm was reported. Trials with fortified samples gave recoveries of 77.5-116.0% (95.6±8.9% average).

Results

Terrestrial field dissipation. Acifluorfen dissipated from a silt loam soil in Greenville, MS with an estimated half-life of ~59 days (estimated by reviewer using first order kinetics, r^2=0.98). Rainfall during the first three months totaled 14.9 inches, but leaching of acifluorfen below 3 inches in the soil was negligible (Table 6).

Dissipation studies for combination products and tank mixes. Table 7 summarizes the dissipation data for three sites. Acifluorfen applied to a silt loam soil in Geneseo, IL dissipated with a half-life of ~235 days (estimated by reviewer using first order kinetics, r^2=0.70). In the silt loam at Mansfield, IL treated at 0.75 lb ai/A dissipation was apparent, but the rate of loss could not be quantified. The estimated half-life of the 1.5 lb ai/A application was 101 days (r^2= 0.87). Day zero samples were not collected from the North Carolina site, and thus the rate of acifluorfen decline cannot be estimated. Leaching of acifluorfen residues below the top 3 inches of soil was insignificant when applied at 0.75 lb ai/A . However, a substantial portion of the acifluorfen appeared to have leached into the 3-to 6-inch depth in the soil when applied at 1.50 lb ai/A.

Table 4. Soil Characteristics.

Location	Textural class	Sand	Silt	Clay	OM[a]	pH	CEC[b] (meg/100g)
		%					
Greenville, MS	silt loam	24	59	17	2.4	5.9	7.8
Geneseo, IL	silt loam	17	56	27	3.5	5.5	--
Mansfield, IL	silt loam	18	55	27	2.3	5.9	--
Fuqua Varina, NC	sandy loam	--	--	--	--	--	--

[a] Organic matter.
[b] Cation exchange capacity.

Table 5. Plot treatment data.

Location	Plot size	Replications	Treatment date[a]	Other treatments
Greenville, MS	50x50 ft	1	8/9/82	None
Geneseo, IL	40x50 ft	1	6/25/82	Lasso 4 EC (3 lb ai/A) and Sencor 4F (0.5 lb ai/A) 5/28/82
Mansfield, IL	4 rows x 50 ft	1	8/3/82	Dual (2 lb ai/A) 8/3/82
Fuqua Varina, NC	4 rows x 50 ft	4	6/8/83	Lasso (3 lb ai/A) 5/25/82

[a] Date that acifluorfen was applied at 0.75 and 1.5 lb ai/A.

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Table 6. Dissipation of acifluorfen from a silt loam in Greenville, Mississippi treated at 0.75 lb ai/A.

Interval after application (days)	Residues (ppm)[a] 0-3	3-6
0	0.42	0.00
8	0.45	0.00
14	0.32	0.07
30	0.26	0.00
98	0.14	0.08
179	0.00	0.00

[a] Residues of intact acifluorfen at 0- to 3- and 3- to 6-inch depths in soil.

Table 7. Dissipation of acifluorfen from three sites treated at 0.75 lb ai/A each.

Geneseo, IL[a]			Mansfield, IL[b]			Fuqua Varina, NC[c]		
Time (days)	Residues (ppm)[d] 0-3	3-6	Time (days)	Residues (ppm) 0-3	3-6	Time (days)	Residues (ppm) 0-3	3-6
0	0.50	0.00[e]	0	1.23	0.00	7	0.29	0.24
7	0.22	0.06	14	0.14	0.07	13	0.32	0.00
14	0.32	0.06	30	0.51	0.08	28	0.00	0.00
31	0.33	0.00	86	0.26	0.13	122	0.00	0.00
87	0.21	0.08				199	0.00	0.00
151	0.18	0.00						
367	0.12	0.00						

[a] Rainfall during the first 3 months totalled 11.7 inches.
[b] Rainfall during the first 3 weeks totalled 1.3 inches.
[c] Rainfall during the first month totalled 5.9 inches.
[d] Residues of intact acifluorfen at 0- to 3- and 3- to 6-inch depth in soil.
[e] Values reported as 0.00 are assumed to be >0.05 ppm.

Conclusions

Terrestrial Field Dissipation. Acifluorfen applied at 0.75 lb ai/A dissipated with a half-life of ~2 months from a silt loam soil. Leaching was neglible and it must be assumed that losses resulted largely from degradation. To satisfy data requirements, temperature data must be submitted. The slope of the plots and the likelihood of runoff occurring during the study must be indicated, and the crop management scheme (were crops harvested? when? etc.) should be submitted.

This study suggests that acifluorfen is degraded at a moderate rate and is not mobile in soil. However, the soil metabolism and mobility studies indicate that acifluorfen is broken down slowly in soil and is readily leached by percolating water. The petitioner must explain these apparent discrepancies.

Dissipation studies for combination products and tank mixes. At the present time there are no requirements for this data. Therefore, this portion of the study will be considered ancillary data.

If this data is utilized to fulfill future data requirements the following deficiencies must be addressed: Day zero residue recoveries and a description of the soil characteristics must be submitted for the Fugua Varina site. Temperature and rainfall data must be submitted for the duration of each study at all experimental sites. Data on the slope of the plots and the likelihood of runoff occurring during the study must be submitted, and the crop management scheme should be described for all plots.

EXECUTIVE SUMMARY

Only additions to or alterations of the conclusions in previous reviews (Dynamac Corp., March, 1983 - Accession No. 071323-071327 and August, 1983 - Accession No. 250467) of the environmental fate and exposure assessment data on acifluorfen are discussed here.

Aciflurofen in aqueous solution exposed to UV radiation (285-375 nm, @ 40-45°C) is readily degraded. The half-life is estimated to be ~8 days if aciflurofen is exposed to natural sunlight (11-12 hour/day). Numerous degradates are formed, but none are produced in >10% yield. The most abundant degradate (<6.6%) was identified as 4-[2-chloro-4-(trifluoromethyl) phenoxy]-1-nitrobenzene. Loss of parent or photodegradates from solution via volatilization was negligible (<4% over 216 hours of irradiation).

Greenhouse studies have demonstrated that the uptake of acifluorfen by rotational crops (spinach, wheat, and radishes) decreases with aging of residue in soil. Residues in food and feed commodities planted 12 months after treatment at 0.5 lb ai/A were not detected (<0.02 ppm) in spinach, radishes, or wheat grain. Residues in wheat straw, and forage were 0.03 and 0.40 ppm, respectively. Constituents of the residue taken up by wheat included the parent and the desnitro (MC-10879) and decarboxy (MC-10074) analogs of acifluorfen. Trace amounts of the methylcarboxy (MC-10108) and amino (MC-14621) analogs may have been in wheat straw residues, but this was not confirmed. Field trials with low application rates (0.18 lb ai/A) demonstrated that the accumulation of residues was low (<0.03 ppm) in soybeans, beets, and lettuce planted >4 months after pesticide treatment.

Acifluorfen applied at 0.75 lb ai/A to a silt loam in Mississippi dissipated with a tentative half-life of 59 days (environmental conditions not completely characterized). Leaching of the parent below 3 inches in the soil was negligible during the 179-day study. The dissipation of acifluorfen in two silt loam soils in Illinois receiving multi-pesticide treatments was somewhat slower; half-lives were 101-235 days. Loss of residues by leaching was negligible when acifluorfen was applied at 0.75 lb ai/A, but some downward movement of residues from 1.50 lb ai/A treatment was observed. The rainfall data were not sufficient to adequately characterize leaching potential.

The field dissipation study indicates that acifluorfen is relatively immobile and is degraded at a moderate rate. Results from mobility trials demonstrated that acifluorfen is mobile, and tentative results from aerobic soil metabolism data suggests that aciflourfen is only very slowly degraded. These apparent contradictions have not been resolved.

RECOMMENDATIONS

Available data are insuffucient to fully assess the environmental fate of acifluorfen as well as the potential for exposure of humans and nontarget organisms to acifluorfen. The submission of data to fulfill registration requirements (Subparts N and K) is summarized below:

Hydrolysis studies: One study (Norris and Hassell, November, 1980, Acc. No. 071323) was submitted and reviewed. The study was scientifically valid and satisfied all data requirements. No further data are required.

Photodegradation studies in water: One study (Somma et al., September, 1982, Acc. No. 071324) was submitted and reviewed. The study is scientifically valid and fulfills data requirements. No further data are required.

Photodegradation studies on soil: One study (Gerecke and Wargo, August, 1982, Acc. No. 071323) was submitted and reviewed. The study is scientifically valid and is in compliance with data requirements. No further data are required.

Photodegradation studies in air: No studies were submitted; all data are required.

Aerobic soil metabolism studies: Four studies were submitted and reviewed. One study (Gemma and Wargo, October, 1982, ASD Report No. 82/053, Acc. No. 071324) is scientifically invalid because of improper sample storage and erratic recovery of soil residues. A second study (Piznik and Wargo, September, 1982, Acc. No. 071324) was scientifically invalid because it could not be demonstrated that the study was conducted under aerobic conditions. Additional information is required to evaluate the third study (Wargo, July, 1982, Acc. No. 071324). The MS spectra must be resubmitted and discrepancies in the data must be explained or corrected. The fourth study (Gemma and Wargo, October, 1982, ASD Report No. 82/053, Acc. No. 071324) was not adequately designed to provide the required data. This study is considered to be supplemental information.

Anaerobic soil metabolism studies: Two studies were submitted and reviewed. One study (Wargo, July , 1982, Acc. No. 071324) was submitted as supplementary information, not intended to fulfill data requirments. The second study (Piznik and Wargo, September, 1982, Acc. No. 071324) was not scientifically valid because of the inadequate mass balance. In addition, the validity of the aerobic portion of this study has not been verified. All data are required.

Anaerobic aquatic metabolism studies: No data were submitted, but these studies are not required because acifluorfen does not have a forestry, aquatic, or aquatic impact use.

Aerobic aquatic metabolism studies: No data were submitted, but these studies are not required because acifluorfen does not have an aquatic or aquatic impact use.

Leaching and adsorption/desorption studies: Two studies were submitted. One study (Norris and Miller, December, 1980, Acc. No. 071235) is scientifically valid and fulfills all data requirements. The second study (Norris and Guardigli, May, 1982, Acc. No. 071325) supplies supplementary data. No further data are required.

Laboratory and field volatility studies: No data were submitted. Requirements for these data depend upon toxicity data, product chemistry data, soil adsorption data, and methods of application.

Terrestrial field dissipation studies: Two studies were submitted and reviewed. One study (Norris and Ku, April, 1981, Acc. No. 071325) is scientifically invalid because the data were variable and inaccurate; samples appeared to be contaminated with acifluorfen. The second study (Guyton, October, 1983, Acc. No. 252764) was scientifically valid. However, guidelines requirements were not satisfied because the plot description was incomplete and temperature data were not reported. All data are required.

Aquatic field dissipation studies: No data were submitted, but no data are required because acifluorfen does not have an aquatic or an aquatic impact use.

Forestry dissipation studies: No data were submitted, but no data are required because acifluorfen does not have a forestry use.

Long-term field dissipation stuides: No data were submitted. Requirments for these data depend upon the results from the terrestrial field dissipation data.

Confined accumulation studies on rotational crops: Two studies were submitted, reviewed, and found to be scientifically valid. One (Gemma et al., September, 1982, ASD Report No. 82/042, Acc. No. 071326 and Spare et al., October, 1982, Acc. No. 071326) does not fulfill data requirements because the application rate was too low. The second study (Gemma et al., September, 1982, ASD Report No. 82/046, Acc. No 071326) fulfills the data requirements for a maximum application rate of 0.50 lb ai/A with a 12 month rotational crop interval for root crops, leafy vegetable crops, and grain from cereal crops. Data requirements have not been fully satisfied for wheat straw and forage because the metabolite identification has not been confirmed. Additional studies must be submitted to establish rotational crop intervals for application at 0.75 lb ai/A.

Field accumulation studies on rotational crops: No data were submitted. Data may be required if the issues raised in the confined accumulation studies on rotational crops are not satisfactorily addressed.

Accumulation studies on irrigated crops: No data were submitted; however, data are not required because acifluorfen has no aquatic food crop or aquatic noncrop use, is not used in and around holding ponds used for irrigation purposes, and has no uses involving effluents or discharges to water used for crop irrigation.

Laboratory studies of accumulation in fish: One study (Thompson and Cranor, January, 1981, Acc. No. 071327) was submitted and reviewed. The study is scientifically valid and partially fulfills data requirements by providing data on the quantity of acifluorfen residues accumulated in fish. The required characterization of residues in fish may be waived if the levels of residues are sufficiently low to be of no toxicological concern. Judgement is deferred to the Toxicological Branch.

Field accumulation studies on nontarget organisms: No data were submitted; however requirements for these studies depend upon the results from laboratory studies of accumulation in fish and toxicological data.

Reentry studies: One worker exposure study has been submitted, but has not been reviewed by Dynamac.

Ancillary studies reviewed:

Static studies of accumulation in fish (Forbis and Boudreau, March, 1981, Acc. No. 071327).

Methods evaluation studies (Ku and Miller, November, 1980. Acc. No. 071325 and Ku and Norris, May, 1981, Acc. No. 071325).

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