

Date Out EFB: 15 MAR 1984

TO: Robert Taylor
Product Manager
Registration Division
TS-767

FROM: Sam Creeger, Chief 
Review Section No. 1
Exposure Assessment Branch
Hazard Evaluation Division

Attached please find the environmental fate review of:

Reg./File No.: 241-ETG

Chemical: 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid and 2-propanamine

Type Product: Herbicide

Product Name: Arsenal

Company Name: American Cyanamid

Submission Purpose: New chemical for use on non-cropland areas

ZBB Code: (3)(c)(7)

ACTION CODE: 115

Date in: 11/30/83

EFB # 4088

Date Completed: 3/7/84

TAIS (level II) Days

61 8.5

Deferrals To:

 Ecological Effects Branch

 Residue Chemistry Branch

 Toxicology Branch

1.0 INTRODUCTION

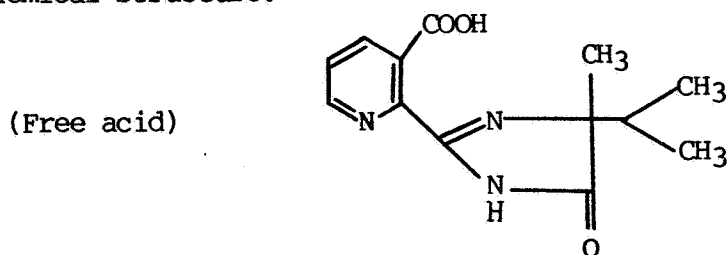
American Cyanamid Company has submitted an application for registration of the new herbicide Arsenal for use on non-cropland areas.

1.1 Chemical

Common/code name: CL 243,997 or AC 243,997 (free acid) and CL-253,925 or AC 253,925 (salt)

Chemical name: 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid (acid) with 2-propanamine (salt).

Chemical structure:



Note: Salt of AC 243,997 (or AC 253,925) is AC 243,997 with 2-propanamine.

2.0 DIRECTIONS FOR USE

Complete use directions are appended to this review. Briefly, 2 - 6 pints Arsenal per acre (0.5 - 1.5 lb. a. i. per acre) is applied for control of most annual and perennial grasses and broadleaf weeds on non-cropland areas such as railroad, utility and pipeline rights-of-way, utility pole sites, tank farms, fence row, storage areas and other similar areas.....Do NOT use on food or feed crops..... or lawns, walks, driveways, tennis courts or similar areas.

3.0 DISCUSSION OF DATA

All data reviewed here are included in submission with Accession No. 251505.

- 3.1 CL 243,997 Herbicide: The Hydrolysis of Carbon-14 labeled CL 243,997. 5/28/82. M. Hussain. Cyanamid Report No. PDM 19-8. Exhibit 1.

Procedure

0.01M buffer solutions: citrate (pH 5), phosphate (pH 7) and borate (pH 9), and distilled water (pH 5.2) were fortified with 50 ppm carboxyl-¹⁴C-CL 243,997 and maintained in the dark under constant temperature of 25°C.

At selected intervals over a 30-day test period, samples were taken and analyzed. Analysis for total ^{14}C recovery was by LSC. Aliquots were spotted onto TLC plates and developed in two dimensions. After development, location of ^{14}C was by autoradiography. Separated ^{14}C spots were scraped from plates and total ^{14}C determined by LSC. Parent CL 243,997 was spotted onto plates as a known standard.

Results

The author reports recovery of applied ^{14}C ranged from 99.9% to 101.4% over the 30 day test period. After the 30 day test period, 99% of the applied ^{14}C was recovered as parent CL 243,997 from the pH 5, pH 7 and distilled water solutions. At pH 9, after 30 days incubation, 92.7% was recovered as parent CL 243,997 and 6.9% recovered as the degradation product CL 243,974. See Table 1.

Assuming pseudo first-order kinetics, the author calculated the half-life at pH 9 to be 325 days. The author concluded that hydrolysis was not a major route of degradation for CL 243,997 in the environment.

Conclusions

EAB accepts the conclusion of the author that CL 243,997 is stable to hydrolysis. CL 243,997 will be stable in the aquatic environment.

It was not reported whether the solutions had been sterilized before being fortified with CL 243,997. However, this observation will not effect the conclusion that CL 243,997 is stable to hydrolysis.

- 3.2 ARSENAL Herbicide (AC 243,997): Photolysis of Carbon-14 labeled AC 243,997 [Nicotinic acid, 2-(4-isopropyl)-4-methyl-5-oxo-imidazolin-2-yl-] in Aqueous Media. 9/15/83. M. Mallipudi. Cyanamid Report No. PD-M Volume 20-20. Exhibit 2.

Procedure

Distilled water was fortified to 25 ppm with carboxyl- ^{14}C and carbonyl- ^{14}C -AC 243,997. 0.05M Buffer solutions of pH 5 (phosphoric acid phthalate) and pH 9 (boric acid) were fortified with carboxyl- ^{14}C -AC 243,997 (AC 243,997 has a reversible ionizable carboxyl group, $\text{pK}_a = 3.6$). Solutions were continuously irradiated with Xenon arc light

using borosilicate filter to simulate natural sunlight. Solutions were maintained at 25°C during the exposure period. Irradiation conditions were comparable to noon summer sunlight at Chicago, IL. Compressed air flowed over the solution to and through ethylene glycol trap (for organic soluble volatiles) and 3N NaOH (CO₂) trap. Non-irradiated samples were maintained as controls.

After specified exposure periods (from 0 hour to 10 days) aliquots were taken for analysis. Aliquots were either spotted directly onto TLC plates or reacted with acidified 2,2-dimethoxypropane to convert aqueous residues to organic soluble residues. Residues were tentatively identified by co-chromatography of known standards in a two-dimensional TLC system. Identity of compounds was confirmed by MS and NMR analyses. ¹⁴C material balance was determined by LSC. ¹⁴CO₂ volatilized was confirmed by BaCl₂ precipitation.

Results

The author reported that, in distilled water 92.5% of the applied carboxyl-¹⁴C-AC 243,997 remained in solution while only 23.4 % remained of the applied carbonyl-¹⁴C-AC 243,997 after 10 days irradiation. The ¹⁴C lost from carbonyl-¹⁴C AC 243,997 was found to ¹⁴CO₂. See Table II.

Of the 92.5% remaining from the carboxy-¹⁴C, 2.7% was parent, 29.7% and 22.7% were identified as metabolites CL 119,060 and CL 19,140, respectively. Two minor products (<1% of applied ¹⁴C) identified as CL 17,226 and CL 119,039 were found. Also numerous unknowns, including ones designated Unknowns 1 and 2, were observed. However, none accounted for >10% of applied ¹⁴C. See Table III and Figure 1 for metabolite identification.

Of the 23.4% remaining from the carbonyl-¹⁴C remaining in distilled water, 4.4% was parent and Unknown 1 accounted for 9.5% of the applied ¹⁴C. Numerous minor unknowns were observed. The ¹⁴C lost from the solution was determined to be ¹⁴CO₂. No organic volatiles were observed. See Table IV.

In a separate study, after 12 days irradiation, 7.2 % of the carboxyl ¹⁴C label was found in the NaOH (volatilized as CO₂) and 92.5% remained in aqueous solution. After 10 days irradiation, 41.8% of the carbonyl-¹⁴C label was found in NaOH trap and 57.3% remained in the water. ¹⁴CO₂ was confirmed by BaCO₃ precipitation. See Table V.

Carboxyl ¹⁴C-AC 243,997 also degraded in the pH 5 and pH 9 buffer solutions. Control experiments showed no degradation during the exposure period.

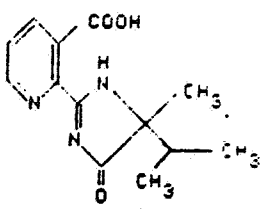
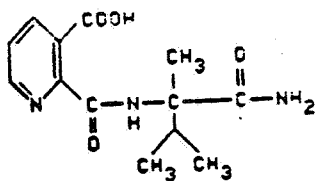
The author concluded that data show that the imidazolin portion of the AC 243,997 molecule photodegrades rapidly to CO₂.

PD-M Volume 19-8

Table I Distribution of Carbon-14 CL 243,997 Related Radioactivity (parent and metabolite) in pH 9.0 Buffer Solution at the End of the Various Sampling Periods

Sampling Period (Days)	Distribution of Radioactivity on TLC Plate		
	CL 243,997	CL 252,974	Other Radioactive Areas*
0	98.6	0	1.5
2	98.0	0	2.0
12	95.8	3.0	1.2
19	93.9	5.1	1.0
26	93.4	6.0	0.6
30	92.7	6.9	0.4

* At least two undifferentiated radioactive areas.

CL No.	Chemical Name	Chemical Structure
243,997	Nicotinic acid, 2-(5-isopropyl-5-methyl-4-oxo-2-imidazolin-2-yl)-	
252,974	Nicotinic acid, 2-[(1-carbamoyl-1,2-dimethylpropyl)-carbamoyl]-	

NOTE: This and all inserted Tables/Figures were taken from Registrant's submission.

**CYANAMID**

American Cyanamid Company
Agricultural Research Division
Princeton, New Jersey

PD-M Volume 20-20

Table IX. Radioactivity Remained in Distilled Water after Exposure of
Distilled Water with Carbon-14 AC 243,997 to Simulated Sunlight

<u>Time (Days)</u>	<u>Percent of Applied Radioactivity Remaining</u>	
	<u>Carboxyl Label</u>	<u>Carbonyl Label</u>
0	100.0	100.0
1	100.4	77.4
2	100.4	60.9
3	101.2	47.8
4	100.1	41.7
5	97.8	37.2
6	97.2	33.3
7	97.4	30.2
8	94.7	27.3
9	94.8	25.6
10	92.5	23.4

NMM

Decline of both labeled AC 243,997 in distilled water followed first-order kinetics. Half-life calculations were reported:

Photolytic Half-Lives of AC 243,997

¹⁴ C Label Position/ Solution	Exposure Period	
	24 hour	12 hour [*]
Carboxyl/distilled water	1.9	3.7
" /pH 5 Buffer	2.7	5.3
" /pH 9 Buffer	1.3	2.5
Carbonyl/distilled water	2.3	4.5

*Calculated from the 24 hour continuous exposure half-life times 2.

Conclusion

EAB accepts the author's conclusion that AC 243,997 will photodegrade in aqueous solution with a half-life ranging from 1.3 -2.7 days (based on continuous 24 hr irradiation) and from 2.5 to 5.3 days (based on a 12 hr irradiation period). EAB Decline Program verified reported half-lives.

- 3.3 ARSENAL Herbicide (AC 243,997): Aerobic Soil Metabolism of Carboxyl Carbon-14 Labeled AC 243,997 [Nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl-)] in Sandy Loam Soil. 9/12/83. M. Mallipudi. Cyanamid Report No. PD-M Vol 20-17. Exhibit 3.

Procedure

Sieved (to 1 mm) Princeton sandy loam soil (58.8% sand, 30.8% silt, 10.4% clay, 1.8% organic matter, pH 5.3, CEC= 8.5 meg/100 gm) was fortified with carboxyl-C¹⁴-AC 243,997 at rate of 1 lb./acre. AC 243,997 was added in sufficient water to bring soil moisture to 75% of 0.33 bar. Soil was maintained in flasks covered with foil to exclude light. Humified compressed air passed over soil surface and through ethylene glycol trap (for volatile organics) and 3N NaOH (for volatilized CO₂). Note: To aid in MS identification of residues, a known ratio of C¹³-:C¹²-AC 243,997 was used with the C¹⁴-AC-243,997.

Soil samples were taken after 1, 2, 4, 6, 9, and 12 months incubation. Residues were extracted with dichloromethane then with solvent mixture: methanol/water/HCl. The methanol solvent mixture was partitioned with dichloromethane.

Residues were analyzed by TLC and tentatively identified by co-chromatography of known standards. Identity was confirmed by MS. The C^{14} material balance was determined by LSC of aliquots and combustion of soil.

Viable microbial populations were measured after 2, 6, and 9 months incubation.

Results

The author reports recovery ranged from 98.4 to 102.4% of applied C^{14} . Approximately 14% of the applied C^{14} was found as $^{14}CO_2$ and 86% remained in soil after 12 months incubation. No other volatilized products were found. After 12 months, 82% of the ^{14}C was extracted from the soil of which 66.2% was identified as parent material. A small percent of ^{14}C in the aqueous phase was not identified. Over the 12 month incubation period, non-extractable material accounted for 6.6 (at 6 months) to 14.0% (at 12 months) of the total ^{14}C applied. See Table VI and Figure 2.

The author calculated the rate constant for degradation of AC 243,997 to equal $0.04067 \text{ month}^{-1}$ and the half-life to equal 17 months. The author concluded that AC 243,997 was slowly degraded by soil microbial populations to CO_2 in sandy loam soil maintained under aerobic conditions in the laboratory.

Little or no effect on microbial populations was observed.

Conclusion

EAB accepts the author's conclusion that carboxyl- ^{14}C -AC 243,997 will degrade to $^{14}CO_2$ under aerobic soil conditions with a half-life of approximately 17 months (verified by EAB Decline Program analysis). No degradation products, other than CO_2 , were identified.

EAB concludes that the soil metabolism of AC 243,997 has not been sufficiently characterized. An additional soil metabolism study using AC 243,997 radio-labeled in another portion of the molecule is needed. This study is necessary to identify other soil degradation products.

EAB notes the author did not report the temperature at which the study was conducted.

- 3.4 ARSENAL Herbicide (AC 243,997): Anaerobic Soil Metabolism of Carboxyl Carbon - ^{14}C AC 243,997 [Nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)] in Sandy Loam Soil. 7/1/83. M. Mallipudi. Cyanamid Report No. PD-M Volume 20-15. Exhibit 4.

Procedure

Sieved (to 1 mm) Princeton sandy loam soil (See 3.3, above, for soil characteristics) was fortified with carboxyl- C^{14} -AC 243,997

at rate of 1 lb. a. i./acre. AC 243, 997 was added in sufficient water to bring soil moisture to 75% of 0.33 bar. Flasks were wrapped with foil and maintained under aerobic conditions for 30 days. After aging, soil was flooded with water to depth of 3 inches and flasks flushed with nitrogen gas.

Soil samples were analyzed after 1 and 2 months anaerobic incubation. Water was pulled from soil by suction-filter. Soil was flushed with water. The aqueous phase was acidified and reacted with excess 2,2-dimethoxypropane (to convert aqueous soluble residues to organic soluble residues). Residues were analyzed by TLC and tentatively identified by co-chromatography of known standards. Identity was confirmed by MS.

Note: A known ratio of C¹³- and C¹²-AC 243,997 was used with the C¹⁴-AC 243,997 to aid in identifying residues by MS.

Results

The author reported recovery of 109.4% and 107.6% of applied C¹⁴ after 1 and 2 months incubation, respectively. The C¹⁴ partitioned between the water and soil phases in ratio of 3:1. Greater than 91% of the soil residues were extractable. No degradation products were found in soil or water phases. All ¹⁴C extracted was identified as parent material.

The author concluded that the anaerobic soil metabolism of AC 243,997 was characterized by no changes in both total C¹⁴ and in concentration of parent AC 243,997.

Conclusion

EAB accepts the author's conclusion that AC 243,997 did not degrade in sandy loam soil maintained under anaerobic conditions in the laboratory. EAB considers AC 243,997 to be stable in the soil environment under anaerobic conditions.

EAB notes the author did not report the temperature at which the soil was incubated.

- 3.5 ARSENAL Herbicide (AC 243,997): Adsorption and Desorption Coefficient for Soils. 9/15/83. M. Mallipudi. Cyanamid Report No. PD-M Volume 20-18. Exhibit 5.

Procedure

Sieved Princeton sandy loam soil (see 3.3, above for soil characteristics) was fortified with carboxyl-¹⁴C-AC 243,997 at rate of 1 lb a. i/A.

AC 243,997 was added in sufficient water to bring soil moisture to 75% of 0.33 bar. Soil flasks were wrapped in foil and maintained at 25° C for 30 days under aerobic conditions. Compressed humidified air passed over soil and through ethylene glycol trap (for volatilized organics) and 3 N NaOH trap (for CO₂). After aerobic incubation, soil was extracted with acidified methanol solution. Extracted ¹⁴C was redissolved into 0.01M calcium chloride solution to form solutions of 0.5, 0.25, 0.05 and 0.025 ppm concentration.

Air-dried, sieved (to 1 mm) Princeton sandy loam, Delaware loamy sand, North Dakota clay loam and Wisconsin silt loam soil samples (see Table VII for soil characteristics) were added to the above solutions and shaken for 48 hours at 25° C. Samples were centrifuged and aliquots of aqueous phase analyzed by LSC and TLC. ¹⁴C material balance was determined by LSC of aliquots and ¹⁴CO₂ from combustion of soil.

For desorption, aliquots of the 0.01 M calcium chloride solution was added to the centrifuged soil and shaken for 48 hours at 25° C. Afterward, samples were centrifuged and ¹⁴C in aqueous phase was assayed by TLC. ¹⁴C material balance was determined by LSC.

Results

The author reported that, at end of incubation period, 99% of the applied ¹⁴C was in the soil (i.e., < 1% volatilized as ¹⁴CO₂) and 95.5% was extracted as unchanged parent AC 243,997. Unextracted soil residues accounted for 9.2% of the total ¹⁴C applied.

Adsorption coefficients (K) and 1/n constants were calculated using freundlich equation:

Adsorption Coefficients (K)

Soil Type	K	1/n
Princeton sandy loam	3.8	1.3
Delaware loamy sand	2.1	1.6
North Dakota clay loam	1.7	1.3
Wisconsin silt loam	4.9	1.3

The author reported that 38-57%, 61-79%, 41-51% and 28-45% of the adsorbed ¹⁴C desorbed from the sandy loam, loamy sand, clay loam and silt loam, respectively. See Table VIII.

The author concluded that AC 243,997 had low soil adsorption potential and the desorption data showed a high potential for desorption. Also, the author noted that the acidic nature of the sandy loam and loamy sand soils may have enhanced adsorption and thus higher K values due to pKa (3.6) of AC 243,997.

Conclusion

EAB accepts the author's conclusion that AC 243,997 will have low potential for soil adsorption and high potential for desorption. These conclusions suggest that AC 243,997 will have a potential for leaching. The soil adsorption coefficient (K) ranges from 1.7 to 4.9. Desorption coefficient was not calculated from the data.

EAB notes that the study used aged residues only. However, since data have been presented which show AC 243,997 to be stable in the soil over the 30 day ageing period, the study also satisfies the requirement for unaged leaching study.

- 3.6 ARSENAL Herbicide (AC 243,997): Field Dissipation of Carbon 14 Labeled AC 243,997 [Nicotinic acid, 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-]. 9/15/83. M. Mallipudi. Cyanamid Report No. PD-M Volume 20-19. Exhibit 6.

Procedure

A field plot of Princeton sandy loam soil* (weed cleared) was treated uniformly on soil surface with carboxyl- ^{14}C -AC 243,997 at rate of 1.0 lb. a. i/A. At intervals of 0, 48, 109, 169, 357 days after treatment, soil samples were taken at depths 0-3, 3-6, 6-9 and 9-12 inches.

^{14}C residues in soil was determined by LSC of $^{14}\text{CO}_2$ recovered from combustion of soil sample.

Results

Rainfall data presented showed that 43.3 inches of total rainfall occurred during the period of the study.

The author reports that total ^{14}C residues on the 0-12 inch depth declined from 1.11 ppm at day 0 to 0.31 ppm in one year. Approximately 97% (0.68 ppm) and 81% (0.25 ppm) of the recovered ^{14}C was found in the top 6 inches of soil at 169 and 357 days after treatment, respectively. Small amounts of ^{14}C (0.06 ppm or 19% of the total found at day 357) was found in the 6 to 12 inch depth 357 days after treatment. See Table IX

* See Section 3.3, above for soil characteristics.

The author concluded that the results indicated that AC 243,997 has low potential to leach under field conditions.

Conclusion

EAB concludes that total ^{14}C residues dissipated slowly from soil when applied to soil surface as ^{14}C -AC 243,997. Using EAB's Decline Program analysis of the data presented, the calculated half-life of total ^{14}C residues is approximately 210 days (7 months), $r^2 = .812$.

Identity of the ^{14}C residues in the soil was not conducted.

While the authors concluded that AC 243,997 had low potential to leach under the conditions of the field study, 19% of the recovered ^{14}C was found in the 6-12 inch depth 357 days after treatment.

EAB considers this study ancillary. Too few samples were taken at the beginning of the study to show that residues did not leach before the 48 day sample (second sample) was taken. Also, sampling was not done to sufficient depth to define extent of leaching.

- 3.7 CL 243,997: Residues of CL 243,997 in Soil (POST, NY, 1981) (C-2026). 6/4/82. G. Picard and A. Tafuro. Cyanamid Report No. C-2030. Exhibit 7.

Procedure

CL 243,997 was applied at rates of 0.125, 0.25, 0.5 and 1.0 lb. a. i./A to annual grasses and broadleaf weeds covering the soil (uncharacterized) plot. Soil samples were taken at 0, 14, 32, 62, 96, 127 and 160 days after treatment. Samples were taken at 0-4, 4-8 and 8-12 inches soil depth and frozen for later analysis.

Analysis of soil was by Method M-1205 (See Section 3.12, below for complete description) with a reported sensitivity of 0.05 ppm.

Results

Total rainfall of 18.5 inches was reported as occurring during 150 days of the 160 day test period. An additional 4.3 inches rain fell from the interval 150 to 180 days.

The authors report that residues declined to below detectable limits in the 0-12 inch soil layer 96 days after treatment. In the 0-4 inch layer, residues declined from 0.2 ppm at day 0 to 0.08 ppm by day 62 and to non-detectable (< 0.05 ppm) by day 96. See Table X.

The authors note that the grass/weed cover may have prevented more of the CL 243,997 from contacting the soil surface.

Conclusion

EAB concludes that the data indicated that CL 243,997 dissipated in soil under field conditions. However, using the EAB Decline Program, no reliable half-life estimate can be generated from the data. Using either the sum of residues in the 0-12 inch layer or data from the 0-4 inch layer alone, half-life estimates with $r^2 = 0.082$ and $r^2 = .469$, respectively, are generated.

EAB notes a typographical error in the reported "period covered" (in the title) as "from: 05/06/82 to 03/15/82". Table I of the report mentions the date of application as 05/06/81. The date 05/06/82 (as the beginning of the period covered) in the title appears to be incorrect.

Also, EAB notes the soil was not characterized in the report.

EAB considers this study as ancillary data. The data reported are too scattered to provide a decline curve for CL 243,997 under field conditions.

- 3.8 CL 243,997. Residues of CL 243,997 in Soil (POST, MD. 1981) (C-2026). 9/7/83. C. Elenewski and A. Tafuro. Cyanamid Report No. C-2029.1. Exhibit 8.

Procedure

CL 243,997 was applied to a bare silt loam soil (2.5%-2.6% organic matter, pH 6.3) at rate of 1 lb. a. i./A. Soil samples at depths 0-4, 4-8 and 8-12 inches were taken at 0, 14, 31, 60, 92 and 175 days after treatment.

Soil samples were analyzed by Method M-1205 (See Section 3.12, below for a brief description) with a reported method sensitivity of 0.05 ppm.

Results

A total of 13.3 inches rainfall was reported as occurring during the first 60 days of the 175 day test period of the study.

The authors report that CL 243,997 residues declined from 0.44 ppm at day 0 to 0.08 ppm in the 0-4 inch soil layer 60 days after treatment. Residues in the 4-8 and 8-12 inch layers ranged from 0.08 ppm to non-detectable (<0.05 ppm). Residues in soil samples taken 92 and 175 days after treatment were reported as non-detectable. See Table XI.

Conclusion

The soil used in the study was not completely characterized.

No field half-life was reported by the authors. EAB, using the EAB Decline Program, calculated the half-life to be approximately 21 days ($r^2 = .952$) under the field conditions.

Soil samples were not taken to sufficient depth to define extent of leaching.

- 3.9 CL 243,997: Residues of CL 243,997 in soil (PRE; NJ, 1980) (C-1819). 7/1/81. G. Picard and P. Orwick. Cyanamid Report No. C-1880). Exhibit 9.

Procedure

A sandy loam soil (1.7% organic matter, pH 6.0) was treated with 1.5 kg a. i./A. Soil samples at depths 0-3, 3-6 and 6-10 inches were taken 33 and 206 days after treatment.

Soil samples were analyzed by method M-1131 (See Section 3.11, below, for a brief description) with a reported method sensitivity of 0.05 ppm.

Results

A total rainfall of 19.9 inches was reported as occurring over the 180 days of the test period.

The authors report that 0.15 ppm CL 243,997 residues were found in the 0-3 inch soil layer and non-detectable residues in the 3-10 inch layer 33 days after treatment. Residues were non-detectable at all depths (0-10 inches) 206 days after treatment. See Table XII.

Conclusion

The authors did not completely characterize the soil used in this study.

EAB notes that a typographical is reported either in the (page 1) brief description of application rate (1.5 kg a. i./A) or in Table I (page 3) of the report (where the application rate is listed as 1.5 lb. a. i./A). However, EAB concludes that too few sampling periods (2) were taken to adequately describe the decline of CL 243,997 residues in this study.

- 3.10 CL 243,997: Residues of CL 243,997 in Soil (PRE, MI 1980) (C-1819)
7/1/81. G. Picard and P. Orwick. Cyanamid Report No. C-1878.
Exhibit 10.

Procedure

A sandy loam soil (uncharacterized) was treated with 1.5 lb. a. i./A. Random soil samples at depths 0-4, 4-8, and 8-12 inches were taken 173 days after treatment. Soil samples were analyzed by Method M-1131 (See section 3.11, below, for a brief description) with reported method sensitivity pf 0.05 ppm.

Results

The authors report non-detectable residues were found in soil at all depths 173 days after treatment.

Conclusion

EAB considers this study ancillary. Too few samples (1) were taken to adequately define the dissipation of CL 243,997 in this study. Also, Sampling was not done to sufficient depth to define extent of leaching.

- 3.11 CL 243,997. Validation of GC Method M-1131 for the Determination of CL 243,997 Residues in Soil. 2/25/81. G. Picard. Cyanamid Report No. C-1819. Exhibit 11.

Procedure

Briefly: Soil samples are extracted with 0.1 N HCl in 50/50 methanol-water solution and filtered. The solution is brought to pH 6.5 with NaOH, filtered then partitioned. The pH of the upper fraction is readjusted to pH 2 and partitioned with methylene chloride and then evaporated to dryness. The residues are redissolved in methanol and trimethylanilinium hydroxide (for on-column methylation) added. Analysis is by GC equipped with nitrogen sensitive detector.

Results

The author reported average recovery of 90% (range 75.5 to 99.1%) at fortification levels ranging from 0.05 - 1.0 ppm. The reported validated method sensitivity is 0.05 ppm.

EAB Note: From the reported recovery values, EAB calculates the average recovery to be 85.2%, not 90% as the author reports. However, this recovery value (85.2%) is acceptable.

- 3.12 CL 243,997: Validation of GC Method M-1205 for the Determination of CL 243, 997 Residues in Soil. 5/25/82. G. Picard. Cyanamid Report No. C-2026. Exhibit 12.

Procedure

Briefly, the procedure for this method is essentially the same as that described in Section 3.11, above. However, in this method the 0.5N HCL in 50/50 methanol solution is brought to pH 2 with NaOH during the extraction process. The solution is partitioned with pH 7 buffer and partitioned again with methylene chloride. The residues are analysed by GC equipped with a N-P secific detector.

Results

The author reports a method sensitivity of 0.05 ppm with average recovery of 91% (range 83.6 to 95.9%) at fortification levels of 0.05 to 2.0 ppm.

Note: Extractability of ^{14}C residues of CL 243,997 from treated field soil at intervals from 0 to 300 days were reported. However, no experimental details accompanied the results.

4.0 EXECUTIVE SUMMARY

- 4.1 AC 243,997 is stable to hydrolysis.
- 4.2 AC 243,997 will photodegrade in aqueous solution with a half-life of 2.5 to 5.3 days.
- 4.3 Data show carboxyl- ^{14}C -AC 243,997 degrades slowly in soil maintained under aerobic soil conditions with a half-life of approximately 17 months. However, degradation products, other than CO_2 , were not identified. The soil metabolism of AC 243,997 has not been adequately defined. A study using AC 243,997 radio-labeled in another position of the molecule is necessary. This study is needed to identify possible soil degradation products.
- 4.4 AC 243,997 is stable in soil maintained under anaerobic conditions.
- 4.5 Data show AC 243,997 has a moderate leaching potential. The adsorption coefficient K ranges from 1.7 in a clay loam soil (4.6% organic matter) to 4.9 in a silt loam soil (4.6% organic matter). Data indicate that the adsorbed AC 243,997 will desorb from soil.
- 4.6 Field dissipation data indicate that AC 243,997 declines under field conditions. One study (3.6, above) shows that ^{14}C -AC 243,997 residues had a half-life of 7 months in a sandy loam soil. With surface application, 19% of the applied residues were found in the

6-12 inch layer of soil. However, residues were not identified. and too few samples were taken at the beginning of the study to show that residues did not leach before the second sample period (48 days later). Also, sampling was not done to sufficient depth to define extent of leaching.

Another study (3.8, above) using unlabeled AC 243,997 indicated AC 243,997 had a half-life of approximately 21 days under field conditions. However, it is not known whether soil samples were analyzed for degradation products.

Other studies submitted are considered ancillary.

EAB does not consider the field dissipation of AC 243,997 to be adequately defined.

4.7 No fish accumulation study was submitted.

4.8 No data on the environmental fate of 2-propanamine were submitted.

5.0 RECOMMENDATION

5.1 EAB does not consider the environmental fate of AC 243,997 as being adequately defined for registration of the proposed use.

5.2 The soil metabolism of AC 243,997 has not been adequately defined. An additional soil metabolism study is necessary. This study should use AC 243,997 radio-labeled in another position of the molecule other than the carboxyl moiety. This study is needed to identify possible soil degradation products other than CO₂. Soil should be sampled at sufficient times early in the study to detect possible soil degradation products.

5.1 The field dissipation of AC 243,997 has not been adequately defined for the proposed use. One unlabeled study showed AC 243,997 had a field half-life of 21 days. However, no degradation products were identified and sampling was not done to sufficient depth to define extent of leaching.

To support the proposed use, an additional field dissipation study is needed. Application should be according to label directions using the formulated product. Sufficient soil samples should be taken at the beginning of the study to define the leaching potential of AC 243,997 residues at the beginning of the study. Soil samples should be analyzed for the degradation products found in the additional soil metabolism study requested in 5.2, above. The soil should be adequately characterized and environmental conditions recorded during the test period.

- 5.2 A fish accumulation study is needed to support registration. However, the registrant may request a waiver of the fish accumulation study with adequate justification.
- 5.4 The registrant should be informed that, if additional terrestrial uses (e. g. field crop uses) are proposed for AC 243,997 in the future, then an additional field dissipation study must be submitted. This study should be conducted for a sufficient length of time to define the degradation and leaching of AC 243,997. The soil should be analyzed for the degradation products found in the additional soil metabolism study requested in 5.2, above. Subpart N of the Environmental Fate Guidelines should be consulted.
- 5.5 No data were submitted using the 2-propanamine salt of AC 243,997. The registrant should also be informed that either data on the environmental fate of 2-propanamine or request for waiver supported by adequate justification must be submitted.



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