Shaughnessy No.: 128821

Date Out of EAB: JUN 17 1987

To: Robert Taylor
Product Manager 25
Registration Division (TS-767)

From: Therese Dougherty, Chief
Review Section #1
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)

Attached, please find the EAB review of...

Reg./File # : 241-EOO

Chemical Name: Imazapyr

Type Product : Herbicide

Product Name : Arsenal

Company Name : American Cyanamid

Purpose : Registration for Forestry (New Use)

Action Code(s): _____

EAB #(s) : 70133

Date Received: 12/8/86

TAIS Code: _____

Date Completed: JUN 17 1987

Total Reviewing Time: 1 day

Deferrals to:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

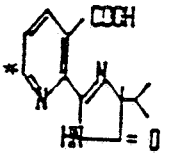
Monitoring study requested by EAB: _____

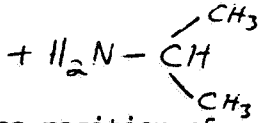
Monitoring study voluntarily conducted by registrant: _____

1. CHEMICAL: Common name: Imazapyr

Chemical name: 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl) nicotinic acid with 2-propanamine

Trade name(s): Arsenal





Denotes position of radiolabel (both studies)

2. TEST MATERIAL: ^{14}C- or ^{13}C-Imazapyr (see structure above)

3. STUDY/ACTION TYPE: Anaerobic aquatic and soil photolysis

4. STUDY IDENTIFICATION:

Sanders, P., ARSENAL herbicide, imazapyr (AC 243,997): Anaerobic Aquatic Degradation. 10/16/86. Report No. PD-M Volume 23-26. Volume 16. American Cyanamid Company. Acc. No. 400037-12.

Mangels, g., AC 243,997: Soil Photolysis. 10/30/86. Report No. PD-M 23-39. Volume 17. American Cyanamid Company. Acc. No. 400037-13.

American Cyanamid Co. Summary of Environmental Fate Studies. 11/14/86. Volume 13. Acc. No. 400037-09.

5. REVIEWED BY:

Stephen J. Simko
Chemist
EAB/HED/OPP

Signature: S. Simko
6/17/87

6. APPROVED BY:

T. Dougherty
Chief, Section 1
EAB/HED/OPP

Signature: Thomas M. Dougherty
JUN 17 1987

7. CONCLUSIONS:

Anaerobic Aquatic Metabolism:

No measurable degradation of imazapyr occurred during the 3 month experiment. The majority (70-72%) of the radioactivity remained in the aqueous phase of the samples. Recoveries were at or near 100%. Parent compound accounted for greater than or equal to 96% of the radioactivity with the remainder unknown.

This study cannot be accepted because the TLC method used was not adequate to positively detect all degradation products. Only parent was used as standard for the TLC procedure. Results from TLC should also be confirmed by another procedure.

Soil Photolysis:

After four weeks of irridation, 86% of the applied remained as parent imazapyr. The half-life was calculated to be 149 days based on a 24 hour constant light exposure. There were at least five unidentified degradates formed, none of which accounted for greater than 10% of the applied dose.

This study cannot be accepted because the TLC method used was not adequate to positively detect all degradation products. Only parent was used as standard for the TLC procedure. Results from TLC should also be confirmed by another procedure.

8. RECOMMENDATIONS:

The studies submitted for this review (anaerobic aquatic metabolism and aquatic metabolism) were not satisfactory. Additional data/analysis is needed to show whether or not the TLC fraction identified in both studies as parent compound contained any undetected degradates.

It should be noted that imazapyr fate data idicates leaching potential, hydrolytic and soil persistence and the potential to reach ground water. An aged adsorption/desorption study gave K values of 3.8, 2.1, 1.7 and 4.9 for sandy loam, loamy sand, clay loam and silt loam soils, respectively.

The following data requirements are based on forrestry use and on the data summary in the EAB review dated 10/7/86.

Data Requirements Satisfied

-Hydrolysis
-Mobility
-Aqueous photolysis
-Fish accumulation

Additional Data Gaps

-Aerobic soil metabolism - a study using ^{14}C-labeling in another portion of the molecule is needed to better define and identify degradation products.

-Field dissipation - another study is needed giving adequate sampling at sufficient depth to define the extent of leaching. The depth of leaching should be defined and samples should be analyzed for 2 feet below the level where residues are detected. The level of sensitivity for soil residues should be about 10 ppb. The maximum recommended application rate must be used. In addition to the parent compound, degradates found in the aerobic soil metabolism study + CL 252,974 should be measured.

-Forrestry

9. BACKGROUND:

These studies were submitted in support of registration of imazpyr for forestry use. Directions specify foliar application at a maximum rate of 3 pints per acre (Arsenal contains 4 lbs ai/gal).

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

10.1 STUDY IDENTIFICATION:

Sanders, P., ARSENAL herbicide, imazapyr (AC 243,997): Anaerobic Aquatic Degradation. 10/16/86. Report No. PD-M Volume 23-26. American Cyanamid Company. Volume 16. Acc. No. 400037-12.

MATERIALS AND METHODS:

Ring labeled ^{14}C-imazapyr (spec. act. 44.01 mcCi/mg, 98% pure) was used to treat fourteen sediment/water samples at a application rate equivalent to 1.5 lb/A. Each sample contained 341 ug of ^{14}C-imazapyr, 9 grams of sediment and 94 ml of lake water. The sediment/water samples were taken from Stony Tavern Lake, NJ, and had a pH of 6.8. The sediment analysis was as follows: sand 93.2%, silt 2.0%, clay 4.8%, OM 1.4%, OC 0.8%, CEC 3.0 and pH 5.6. The samples were kept in chambers which were flooded with nitrogen and kept in the dark at 19-22 C. Duplicate samples were analyzed at 0, 1, 2 and 3 months. Samples were centrifuged and extracted using aqueous 0.1 N NaOH:methanol (50:50, v/v). Samples were radioassayed and analyzed by two dimensional TLC.

REPORTED RESULTS:

No measurable degradation of imazapyr occurred during the 3 month experiment. The majority (70-72%) of the radioactivity remained in the aqueous phase of the samples. Recoveries were at or near 100%. Parent compound accounted for greater than or equal to 96% of the radioactivity with the remainder unknown.

DISCUSSION:

This study cannot be accepted because the TLC method used was not adequate to positively detect all degradation products. Only parent was used as standard for the TLC procedure. Results from TLC should also be confirmed by another procedure.

Table 1. TLC Determination of recovered radioactivity.

Time (months)	% Imazapyr	% Unknown	% Origin
0	97	2	1
1	98	2	0
2	98	2	0
3	96	2	2

10.2 STUDY IDENTIFICATION:

Mangels, g., AC 243,997: Soil Photolysis. 10/30/86. Report No. PD-M 23-39. American Cyanamid Company. Volume 17. Acc. No. 400037-13.

MATERIALS AND METHODS:

A solution of ring labeled ^{14}C-imazapyr (5.11 mg), ^{13}C-imazapyr (13.32 mg) and unlabeled imazapyr was prepared in 50 ml of acetnitrile yielding a specific activity of 7.61 uCi/mg. Eighteen plates were prepared using Princeton sandy loam soil eight of which were used as controls. The remainder were treated with 2.6 ml of the prepared mixture yielding a rate equivalent to 1.5 lb/A. The samples were covered with a petri dish cover and placed in a Mallory environmental chamber which was kept at 25 C. The samples were irradiated with a Atlas Xenon Arc lamp (6,000 watts) with inner and outer borosilicate filters. The intensity of the light at 48 cm was 114,349 mcwatts/cm^2. See tables for the light spectrum graph.

At weekly intervals two irradiated and two control plates were removed and the soil was extracted three times with 75 ml of 0.1N NaOH. The extracts were combined and acidified to pH 2.5 with HCl. This mixture was extracted several times with ethyl acetate and/or methylene chloride, then filtered to remove the precipitated humic acids. Samples were radioassayed at various stages and residues were identified using one dimensional TLC.

REPORTED RESULTS:

Recoveries at each sample interval indicate there was no loss of radioactivity during the experiment. After four weeks of irridation, 86% of the applied remained as parent imazapyr. The half-life was calculated to be 149 days based on a 24 hour constant light exposure. There were at least five unidentified degradates formed, none of which accounted for greater than 10% of the applied dose.

DISCUSSION:

This study cannot be accepted because the TLC method used was not adequate to positively detect all degradation products. Only parent was used as standard for the TLC procedure. Results from TLC should also be confirmed by another procedure.

This study used a light source that adequately simulated natural sunlight.

11. COMPLETION OF ONE-LINER: N/A

12. CBI APPENDIX: No CBI is included.

Figure 1. Spectral Emission of the Borosilicate Filtered Xenon-Arc Lamp

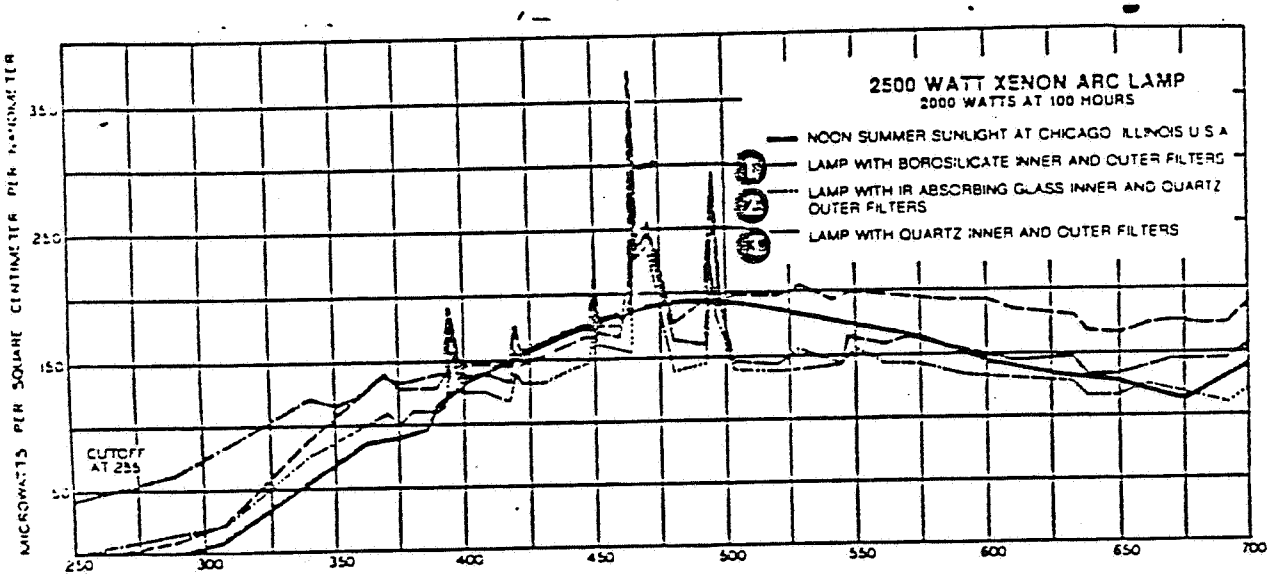


Table 1. Chemical and Physical Properties of the Sandy Loam Soil

Soil obtained at the Agricultural Research Center, American Cyanamid, West Windsor, N.J.

Texture	Sandy Loam
% Sand	55.6
% Silt	33.2
% Clay	11.2
pH	6.4
C.E.C.	8.4
%O.M.	1.6
%O.C.	0.8

Analysis Performed by Roger E. Haines Company
Cotton Exchange Building
Memphis, Tennessee 38103

Table 2. Recoveries of Radioactivity with Time

Time	Sample	Rep	ug Recovered	% Recovery	Av. % Recovery
0-Time		A	1237	100.3	100.0
		B	1230	99.7	
1-Week	Irradiated	A	1270	103.0	98.7
		B	1165	94.5	
	Control	A	1263	102.4	101.0
		B	1230	99.7	
2-Week	Irradiated	A	1233	100.0	104.5
		B	1344	109.0	
	Control	A	1306	105.8	106.5
		B	1322	107.2	
3-Week	Irradiated	A	1339	108.5	106.4
		B	1285	104.2	
	Control	A	1343	108.9	105.5
		B	1258	102.0	
4-Week	Irradiated	A	1209	98.0	99.5
		B	1246	101.0	
	Control	A	1362	110.4	105.2
		B	1232	99.9	

Table 3. Distribution of Radioactivity with Partitioning and % Parent in each Phase and Total % Parent Recovered

Time	Sample	Rep	% Organic	% Parent in Organic	% Recovered as Parent in Organic	% Aqueous	% Parent in Aqueous	% Recovered as Parent in Aqueous	Total % Parent
0-Time		A	95.5	100	95.5	4.5	49.0	2.2	97.6
		B	95.1	100	95.1	4.9	54.3	2.7	97.5
1-Week	Irradiated	A	91.8	100	91.8	8.2	29.1	2.4	93.9
		B	92.4	100	92.4	7.6	31.8	2.4	94.6
	Control	A	93.3	100	93.3	6.7	37.4	2.5	95.3
		B	93.3	100	93.3	6.7	35.3	2.4	95.3
2-Week	Irradiated	A	86.5	100	86.5	13.5	14.8	2.0	88.0
		B	86.1	100	86.1	13.9	15.1	2.1	87.7
	Control	A	93.6	100	93.6	6.4	27.8	1.8	95.1
		B	94.0	100	94.0	6.0	27.0	1.6	95.3
3-Week	Irradiated	A	86.3	100	86.3	13.7	13.9	1.9	87.7
		B	83.9	100	83.9	16.1	12.9	2.1	85.4
	Control	A	93.6	100	93.6	6.4	27.6	1.8	95.0
		B	93.4	100	93.4	6.6	26.3	1.7	94.8
4-Week	Irradiated	A	84.8	100	84.8	15.2	15.7	2.4	86.6
		B	84.5	100	84.5	15.5	15.5	2.4	86.4
	Control	A	95.0	100	95.0	5.0	41.8	2.1	96.7
		B	94.4	100	94.4	5.6	40.4	2.2	96.3