12/5/86

120301

Date Out EAB: _____

To: Werdig
Product Manager 50
Registration Division (TS-767)

From: Herbert Manning Ph.D., Acting Chief
Environmental Chemistry Review Section 1
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)

Attached please find the environmental fate review of:

Reg./File No.: _____

Chemical: Thidiazuron

Type Product: Herbicide

Product Name: _____

Company Name: NOR-AM

Submission Purpose: Ground Water Data Call In

ACTION CODE: 495

Date In: 01/04/86

EAB # 6480

Date Completed: _____

TAIS (level II) Days

7.00

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

Monitoring study requested by EAB: ☐

Monitoring study voluntarily conducted by registrant: ☐

REGISTRATION DIVISION DATA REVIEW RECORD

13572

Confidential Business Information — Does Not Contain National Security Information (E.O. 12065) 4-1-86

1. CHEMICAL NAME: Thidiazuron

2. IDENTIFYING NUMBER	3. ACTION CODE	4. ACCESSION NUMBER	TO BE COMPLETED BY PM
120301	495	256174	5. RECORD NUMBER: 190646
			6. REFERENCE NUMBER:
			7. DATE RECEIVED (EPA): 12/7/84
			8. STATUTORY DUE DATE:
			9. PRODUCT MANAGER (PM): Werdig/Whiteley
			10. PM TEAM NUMBER: 50

14. CHECK IF APPLICABLE

- ☐ Public Health/Quarantine
- ☐ Minor Use
- ☐ Substitute Chemical
- ☐ Part of IPM
- ☐ Seasonal Concern
- ☐ Review Requires Less Than 4 Hours

SY.

TO BE COMPLETED BY PCB

11. DATE SENT TO HED/TSS: 04/01/86

12. PRIORITY NUMBER: 20

13. PROJECTED RETURN DATE: 05/01/86

15. INSTRUCTIONS TO REVIEWER

A. HED
- ☐ Total Assessment - 3(c)(5)
- ☐ Incremental Risk Assessment - 3(c)(7) and/or E.L. Johnson memo of May 12, 1977.

B. SPRD (Send Copy of Form to SPRD PM)
- ☐ Chemical Undergoing Active RPAR Review
- ☐ Chemical Undergoing Active Registration Standards Review

C. ☐ BFSD

D. ☐ TSS/RD

E. ☒ Other (Ground water)

F. INSTRUCTIONS: Screen attached Environmental Fate data submitted in response to the Ground Water Call-In. Note: the attached data is being resubmitted as requested.

16. RELATED ACTIONS

17. 3(c)(1)(D)
- ☐ Use Any or All Available Information
- ☐ Use Only Attached Data
- ☐ Use Only the Attached Data for Formulation and Any or All Available Information on the Technical or Manufacturing Chemical.

18. REVIEWS SENT TO
- ☐ TB
- ☐ EEB
- ☐ EF
- ☐ PL
- ☐ RCB
- ☐ EFB
- ☐ CH
- ☐ BFSD

19.	To	TYPE OF REVIEW	NUMBER OF ACTIONS: Registration	Petition	EUP	SLN	Sec. 18	Inert	MNR. USE	Other
HED		TOXICOLOGY								
HED		ECOLOGICAL EFFECTS								
HED		RESIDUE CHEMISTRY								
HED	X	ENVIRONMENTAL DATE ATTN: Sam Creeger								
RD/TSS		CHEMISTRY								
RD/TSS		EFFICACY								
RD/TSS		PRECAUTIONARY LABELING								
BFSD		ECONOMIC ANALYSIS								

20. ☐ Label Submitted with Application Attached

21. ☐ Confidential Statement of Formula

22. ☐ Representative Labels Showing Accepted Uses Attached

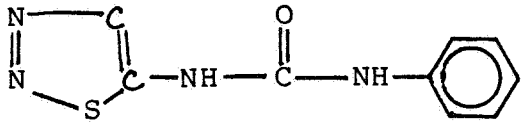
23. Date Returned to RD (to be completed by HED)

24. Include an Original and 4 (four) Copies of This Completed Form for Each Branch Checked for Review.

1. CHEMICAL:

Common name: Thidiazuron
Chemical name: 1-phenyl-3-(1,2,3-thidiazol-5-yl)-urea

Structure:



Thidiazuron

2. TEST MATERIAL:

Test materials are described in each of the studies screened/reviewed.

3. STUDY/ACTION TYPE:

These data were submitted under the Ground-Water-Data-Call-In for screening/review of the environmental fate data.

4. STUDY IDENTIFICATION: Accession # 256174.

Determination of the Hydrolysis Rate of 5-N-phenylcarbamoyl-1,2,3-thidiazole. NOR-AM. December 1984.

Photolysis of SN 49537 in Water. NOR-AM. December 1984.

Degradation of SN 49537 (Thidiazuron) in an Activated Loamy Sand. NOR-AM. December 1984.

Report on the Degradation of SN 49537 (Thidiazuron) in Soil-Anaerobic Metabolism. NOR-AM. December 1984.

Mobility of SN 49537 (Thidiazuron) After Aging in a Loamy Sand. NOR-AM. December 1984.

Mobility of SN 80178 (Thidiazuron Photoproduct) in Four Soils. NOR-AM. December 1984.

Field Dissipation in Soil. NOR-AM. December 1984.

Adsoprtion/Desorption of Thidiazuron in Soil and Sediment. NOR-AM. December 1984.

Photodegradation of Thidiazuron on Soil Surfaces. NOR-AM. December 1984.

Mobility of Phenyl-^{14}C-Thidiazuron in Three Soils. NOR-AM. December 1984.

5. REVIEWED BY:

Catherine Eiden
Section # 1
EAB

Catherine E. Eiden
Date: 11/28/86

6. APPROVED BY:

Herb Manning, Ph.D.
Acting Section Chief
Section # 1
EAB

Herbert J. Manning
Date: 12/5/86

7. CONCLUSIONS:

EAB cannot conclusively determine Thidiazuron's leaching potential. Some of the studies described here are inadequate, more data may be required and the results reevaluated. Upon submission of the information requested below, a final assessment can be made.

1. Hydrolysis - (161-1): Thidiazuron is stable to hydrolysis. The study is useful for the purposes of the screen/review.

2. Photolysis (161-2): A half-life (t1/2) of was calculated. The photoproduct is stable. The study is not accepted. Registrant must perform a new study using natural sunlight for comparison with the old study using a light source with a hundredfold greater intensity than sunlight.

3. Photolysis (161-3): A t1/2 of < 1 hour was calculated. The photoproduct formed, declined.
The study is accepted as useful for the screen/review.

4. Aerobic (162-1): A t1/2 of 26 days was calculated. (The study used biologically activated soils). A t1/2 of 144 days was calculated for a non-activated soil. The study is acceptable providing the information below is submitted.

   a. Was the study conducted in the dark?
   b. See question in Section 10.

5. Anaerobic (162-2): Thidiazuron degrade under aerobic and anaerobic conditions. The t1/2 was calculated to be < 30 days. The study is acceptable for the purposes of the screen providing submission of the following data:

   a. Identification of degradation products > 10 percent.
   b. Residue decline curves.

   Otherwise, a new study will be required to identify the degradate > 10%.

6. Leaching (163-1):

   All column leaching studies are acceptable for the purposes of the screen. The adsorption/desorption study is acceptable; however, no data on desorption were submitted. These data should be submitted as percent desorption in order to complete the package. Thidiazuron nor its degradates is espected to leach.

7. Field Dissipation (164-1):

   These studies are accepted for the purposes of the screen; however, the amount of irrigation water used, the schedule of irrigation, and type of irrigation used were only described for the Fresno, California, bare soil study. Was irrigation used for the other studies? If so, how much, when, and how applied? These data should be submitted before full acceptance of 164-1 can be made.

8. RECOMMENDATIONS:

The registrant should comply with all points discussed under Conclusions as to study redo's and information submission. Otherwise, the Data Call-In package remains incomplete and this product faces cancellation.

9. BACKGROUND:

Thidiazuron is a plant growth regulator (defoliant). Used as a cotton defoliant.

10. DISCUSSION OF INDIVIDUAL STUDIES:

10.1

A. STUDY IDENTIFICATION:

Determination of the Hydrolysis Rate of 5-N-phenylcarbamoyl-1,2,3-thidiazole. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

Thidiazuron in aqueous solution was subjected hydrolysis in 1 N HCl and 1 N NaOH for 24 days at room temperature. Under these rigorous conditions, Thidiazuron exhibited no sign of hydrolytic breakdown. Then an aqueous solution of Thidiazuron was heated for 3 hours at 50 °C in acid and base solutions. Under these conditions, Thidiazuron hydrolyzed completely in base with aniline as a degradate; it was stable in acid.

C. RESULTS

Hydrolysis

pH	t 1/2(y)	$k(h^{-1})$	at 25 °C
5	1.7×10^{4}	4.6×10^{-9}	
7	1.7×10^{6}	4.6×10^{-11}	
9	1.7×10^{8}	4.6×10^{-13}	

D/E. DISCUSSION/CONCLUSIONS

The data presented above are an extrapolation from the data gathered under the conditions described above. It can be stated that Thidiazuron is stable to hydrolysis between pHs 5-9 and at 25 °C.

The study is acceptable for the purposes of the screen/review.

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10.2
A. STUDY IDENTIFICATION:

Photolysis of SN 49537 in Water. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

A mercury high-pressure lamp was used to irradiate solutions of thidiazuron in water. A solidex glass tube was used to remove wavelengths of UV radiation below 290 nm. The irradiated solution was kept at 24 to 25 °C with a cooling jacket and a thermostatically controlled heat exchanger. To provide an even radiation of the solution it was circulated at 90 L/hr. Radiation intensity was 1.7×10^6 erg/cm^2·sec. Sunlight intensity in Ohio at noon on a clear day = 8.0×10^4 erg/cm^2 sec·* The lamp is clearly 100-fold as intense as sunlight. Thidiazuron was dissolved in deionized water at 15.9 and 23.5 mg/L, near but below saturation. For analysis, aliquots were removed and rotovaped under vacuum to a residue, which was taken up in methanol and analyzed by GC. No thidiazuron was found in the water distillate, and no recoveries on the method were given for thidiazuron.

C. RESULTS

Rate constants were calculated. The half-life = The study was conducted for 410 minutes only.

The photoproduct is found to be stable at 90 °C (pH 1-14). It was stable at 120 °C (10% decomposition after 54 days, no pH given). No data, graphs, or calculations were submitted.

D/E. DISCUSSION/CONCLUSIONS

The study is not acceptable for the purposes of GWDCI because the light source intensity was 100-fold greater than natural sunlight, the wavelength spectra of the light source was not compared to sunlight nor was the effect of the glass filter shown. Because the light source is questionable and photolysis may actually be as rapid in sunlight as with the Hg lamp, a new study using natural sunlight is necessary.

10.3
A. STUDY IDENTIFICATION:

Photodegradation of Thidiazuron on Soil Surfaces. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

Radiolabeled thidiazuron was used for soil photolysis studies. The light source used was an XBF 2500 W/1 Xenon arc lamp equipped with a metallic reflector and water-cooled. Wavelengths below λ = 290 nm were filtered out by a Duran 50 glass filter in combination with a WG 295 glass filter. The total irradiance of the lamp was measured as E = 221 mW/cm^2

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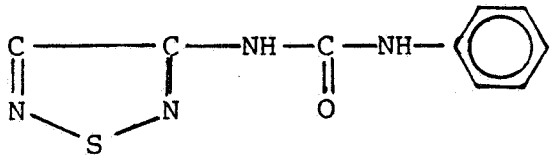
(three times the irradiance of natural sunlight at 50 °N). An added precaution was taken to expose the glass filter to UV-light before the experiment and avoid a change in the absorption characteristics of the filter known as solarisation during the experiment.

A comparison of the light source plus filters vs. natural sunlight was provided. In the range of 300 to 330 nm the two sources are very similar in radiant energy emitted. The 15 uL portions of thidiazuron methanol containing 16.5 ug of thidiazuron were sprayed onto 3 x 4 cm segments of a 20 x 20 cm TLC plate coated with 0.5 mm layer of soil. The soil is characterized as a sandy loam; no other information is given. Soil plates were dried at 80 °C for 12 hours after application of the soil slurry. The thidiazuron used was 1-phenyl-3-[5-^{14}C)1,2,3-thidiazol-5-yl]-urea with a specific activity of 74 MBq/mmol (2.0 mCi/mmol). This corresponds to a 137 g/ha application (typical of agricultural use). The solution was sprayed onto the soil surface. Temperatures did not exceed 30 °C during the experiment. Six segments were treated: three exposed and three covered with aluminum foil. To detect $^{14}CO_2$ and volatiles, the irradiation chamber was hooked up to ethanolamine and ethylene-glycol traps.

Samples were taken at 0.25, 0.50, 1, 2, 4, and 18 hours. Samples were extracted with methanol/acetone (1:1) in an ultrasonic bath; extracts were pooled and radioassayed; dried samples were combusted in O_2 and TLC was used to identify the degradates; and a solvent system of hexane, dichloromethane, ethylacetate, and methanol as 40:30:25:5 was used. Ethylacetate was used as a second solvent system. Two products were identified: thidiazuron and SN 79173.

Structure



In later experiments with different doses of thidiazuron applied to the soil, HPLC analysis was used to identify degradates. Soil method recoveries averaged 90.3 percent. Loss was attributed to spraying technique and confirmed by experiments giving a 91 percent recovery in the rinses from glass plates that were sprayed with 15 uL, rinsed, and analyzed.

C. RESULTS:

Time (hr)	Irradiated + Dark -	Thidiazuron (%)	SN 79173 (%)
0.25	+	56.4	22.5
	-	83.4	-
0.50	+	42.8	27.9
	-	76.8	-
1.0	+	35.7	27.0
	-	73.7	-
2.0	+	23.8	36.7
	-	78.2	-
4.0	+	25.0	25.6
	-	71.9	-
18.0	+	19.5	9.5
	-	67.2	-

D/E. DISCUSSION/CONCLUSION:

Half-life = < 1 hour (estimated), 0.4 hour (calculated). ← Data, graphs, and calculations were provided. The data show the increase in photoproduct and its decline. Under dark conditions the photoproduct does not form. At a higher dose rate, the half-life of the parent is increased and the rate of decline of the photoproduct decreases. Both compounds are more persistent to photolysis at higher dose rates. Dark samples had the same rate of decline as the lower-dosed dark samples.

This study is acceptable for the purposes of the screen.

10.4

A. STUDY IDENTIFICATION:

Degradation of SN 49537 (Thidiazuron) in an Activated Loamy Sand. NOR-AM. December 1984.

B. Materials and Methods

Radiolabeled N-phenyl-N'-(5-^{14}C)-thiadiazol-5-yl urea, specific activity of 18.62 uCi, and purity of > 96 percent.

The soil used was a loamy sand that was biologically activated by growing alfalfa in it, harvesting the alfalfa, and sieving the soil. (Presumably, these soils are stored prior to use.) Thidiazuron was added to soil as 5 mg/kg dry soil; 50 g soil aliquots were spiked. The 50 g soil samples were placed in flasks hooked up to trapping solutions for CO_2 (0.1 N KOH). The soil samples were kept at 75 percent field capacity and 25 °C in a constant climate chamber. Soils were sampled at

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14, 72, 161, 273, and 359 days. The trapping solutions were sampled periodically and changed. Soil had percent sand, silt, and clay (ssc) = 86.7, 8.3, 5.0; percent OM = 4.0; pH = 6.6; CEC = 11.2 meq/100 g; and WHC = 36%. Toluene was used to extract the soil samples in combination with ultrasonic vibration for 15 minutes, a second extraction with acetone and shaking for 30 minutes, and a third extraction with acetone and sonication for 15 minutes. A soxhlet extraction was used with methanol for 24 hours. An NaOH extraction was used to separate fulvic and humic fractions of the soil (24 hours). Finally, soil samples were dried and combusted.

Radioactivity was measured with LSC. Two TLC solvent systems were used to identify the degradates in the concentrated organic extracts: acetone/diethyl ether, 1 + 1 (v/v); and acetic acid, ethyl ester/dimethyl foramide, 9 + 1 (v/v). Once developed, the TLC plates were covered with X-ray film for autoradiography. Radioactive spots were scraped off and measured by LSC.

C. RESULTS:

After 359 days, 18 percent of the initial radioactivity was mineralized, 47 percent was bound, and 21 percent was detected as 1,2,3-thiadiazol-5-yl-urea. Several other metabolites were formed but did not individually amount to > 2 percent. They were not identified. CO_2 evolved at 359 days and accounted for 17.5 percent of the initial radioactivity.

A handwritten degradation curve was fitted to the data and a half-life of 26 days was calculated.

D/E. DISCUSSION/CONCLUSIONS:

The study is acceptable for the purposes of the screen/review providing that the following information is provided:

- Was the study conducted in the dark?
- A second aerobic metabolism study was presented. This study calculated a t 1/2 = 144 days. All experimental conditions were the same; however, no mention was made of biologically activating the soil used. Is this the difference? Was the soil stored prior to use in the second experiment?

10.5

A. STUDY IDENTIFICATION:

Report on the Degradation of SN 49537 (Thidiazuron) in Soil-Anaerobic Metabolism. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

Soils were prepared as described above under "Aerobic" and then flooded immediately. The water/soil mixture was deoxygenated with N_2 gas. Traps of KOH were used for trapping the CO_2 evolved. The flasks were sampled at 30, 62, 90, and 120 days. The soil used was a "Neuhofen 2.2" (different from the soil used in the aerobic experiment described above) with percent ssc = 83, 6.5, 9.3; percent OM = 3.2, pH = 6.8.

Soils were extracted and analyzed as described above.

Day	[CO_2] (%)	Thidiazuron (%)	Bound (%)	Unknowns
30	0.07	29.7	39.6	
60	0.03	35.3	47.2	
90	0.06	25.2	60.0	
120	0.04	35.5	46.6	

C. RESULTS:

A half-life of < 30 days was estimated. The unknowns (five) were all < 10 percent, except for one. This unknown was not identified but amounted up to 12.8 percent by day 30 and decreased to 8.9 percent by day 120.

D/E. DISCUSSION/CONCLUSIONS:

The anaerobic study did not identify the degradation products > 10 percent, did not include graphs of decline curves for the anaerobic conditions, and did not allow the pesticide to age for 30 days under aerobic conditions prior to establishing anaerobic conditions. The study is however useful for the purposes of the screen/review.

10.6

A. STUDY IDENTIFICATION:

Mobility of Phenyl-^{14}C-Thidiazuron in Three Soils. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

Several column leaching studies were submitted. All the study approaches were similar as follows:

Glass cylinder columns (5 cm i.d., 30 cm long) were assembled using 2, 5, and 10 cm segments. All colums were filled with air-dried soils, packed, and drenched with water by subirrigation. Excess water was allowed to drip from the columns so that the soils reached field capacity.

Radiolabeled thidiazuron (5-N-[U^{14}C]-phenylcarbamoylamino) - 1,2,3-thiadiazole) was used in all experiments with a purity varying between > 96 to 99 percent and varying specific activities. Soils in the columns were treated with thidiazuron dissolved in methanol at 30 ug/ai and then subjected to a 6-day continuous irrigation (10 cm/day) for a total of 60 cm (23.6") or 1200 mL. All soil columns were run in triplicate with a control. After irrigation, the columns were sliced up, soil segments extracted with methanol and vibration, and the extracts were measured by LSC. Dried soil column segments were combusted to measure bound ^{14}C residues through the evolution of $^{14}CO_2$. LSC measurement was performed on Packard Tri-Carb spectrometers. A Packard Tri-Carb oxidizer (306) was used for combustion. Carbosorb was the trapping agent for $^{14}CO_2$.

C. RESULTS:

	Type Soil	% ssc	WHC	% OM	pH	(%) Leached*	in 6 cm*	(%) Recovere
o+	Loamy sand	86, 7, 7	30	3.32	5.7	1.15	82.5	85.2
o+	Loamy sand	80, 14, 6	30	1.70	5.0	1.80	83	88.4
o+	Muck sand	94, 3, 3	57	11.4	7.0	0.17	88.8	96.0
o	Sandy loam	70, 14, 15	-	1.77	5.9	0.40	93.4	94.9
a	Loamy sand	89, 9, 2	27	3.2	6.8	0.45	67.6	68.0
b	Loamy sand	89, 9, 2	27	3.2	6.8	0.34	88.3	89.5

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a This soil was placed in columns in triplicate plus one control column and 50 ug/ai thidiazuron was added to the top of the column and then covered with 1/2 cm soil. Soil not prewetted.

b Same as a, but thidiazuron was incorporated into soil and then added to the column and covered with 1/2 cm of nonradioactive soil.

o Labeling on the carbonyl portion of thidiazuron for all soils gave very similar leaching results.

+ These soils were treated with 50 ug/ai and leached. The increased dose did not increase the amount of leaching in the LS soils. A slight increase was seen in the muck sand; 0.50 percent of applied activity leached.

* Arithmetic average of the three columns. All columns were close in results obtained, i.e., reproducible results were obtained.

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D/E. DISCUSSION/CONCLUSIONS:

In all of these column studies, the majority of the radioactivity (> 80 percent) is in the top 4 to 6 cm of soil. The thidiazuron is tightly bound in the upper portion of the soil columns. Very little leaching occurred even under worst-case lab conditions, though packing of columns destroys any wormhole or macropore flow effects on leaching. The study is accepted for the purposes of the screen/review.

10.7

A. STUDY IDENTIFICATION:

Mobility of SN 49537 (Thidiazuron) After Aging in a Loamy Sand. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

Radiolabeled thidiazuron with a specific activity of 2.12 Bq/mg and a purity of 99 percent was spiked into 50 g of soil and incubated in the dark at 75 percent water holding capacity (WHC) at 24 °C for 30 days. Samples were prepared in triplicate with one control. After aging, the soil was placed on top of columns filled with similar untreated soil. Columns were prepared in triplicate as described in the leaching section above. Columns were irrigated for 45 days with 25 mL (0.5 inch) per day. Leachates were analyzed by LSC. After leaching, the columns were sliced, segments of soil were extracted with methanol and vibration, and measured by LSC. Dried soils were combusted for $^{14}CO_2$ measurement as previously described.

C. RESULTS:

Soil	% ssc	pH	% OM	% WHC	% Leached	% in 6 cm	% Recovery
Loamy sand*	87, 8, 5	6.6	4.0	36	0.31	102.9	104
Loamy sand	87, 8, 5	6.6	4.0	36	0.50	105.6	109
Loamy sand	87, 8, 5	6.6	4.0	36	0.69	93.0	95

* To show reproducibility, the column values are shown here unaverage
No mention was made of prewetted columns.

Mineralization of Thidiazuron was reported to be 5 percent at 75 days

D/E. DISCUSSION/CONCLUSIONS

The study is acceptable for the purposes of the screen/review. Diazinon nor its degradates are expected to leach; however, columns were not pre-wetted in this study.

10.8
A. STUDY IDENTIFICATION:

Mobility of SN 80178 (Thidiazuron Photoproduct) in Four Soils. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

A leaching study was performed using the thidiazuron photoproduct. All methods are as previously described in the above studies on leaching. Columns were set up in triplicate and leached as described.

C. RESULTS:

	Soil	% ssc	% OM	pH	% WHC	(%) Leached	(%) in 5 cm	(%) Recove
German	2.1*	94, 2.6, 3.5	0.82	6.6	24	2.0	64.03	89.3
"	2.2	86, 6.5, 7.3	3.3	5.7	30	0.19	83.2	85.0
	LS	88, 8, 4	1.93	5.2	30	0.64	81.5	97.0
	Compost	85, 7.5, 7	6.90	6.0	66	0.08	96.9	98.3

* Arithmetic averages from three columns showing reproducibility.

D/E. DISCUSSION/CONCLUSIONS:

In the low CM soil, leaching increases as does the distribution down the column of thidiazuron.

All of these studies are acceptable for the purposes of the screen.

10.9
A. STUDY IDENTIFICATION:

Adsoprtion/Desorption of Thidiazuron in Soil and Sediment. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

Solutions of thidiazuron were made up in 0.01 M $Ca(NO_3)_2$ in boiled-deionized water at 0.1, 1, 5, 10, and 20 ppm. Radiolabeled thidiazuron was used (> 96%) with a specific activity of 2.50×10^6 Bq/mg. The soil:water ratio is 1:8. Adsorption to the tube walls was < 2% of thidiazuron. Soil plus solution were placed in centrifuge tubes. The slurries were incubated

in a shaker-bath for 24 hours at 20 °C, centrifuged, and 1 mL aliquots were counted in triplicate by LSC. Another 4 mL of equilibration solution was discarded and $Ca(NO_3)_2$ solution was added for desorption. After 3 hours of shaking, the desorption solutions were centrifuged and analyzed.

C. RESULTS:

The data were applied to the Freundlich equation. The results are shown below.

Soil	% ssc	% OM	pH	K	1/n
2.2	85, 6.4, 8.8	3.77	5.6	21.3	0.74
River sand	99, 0.8, 0.2	0.57	6.6	2.22	0.87

D/E. DISCUSSION/CONCLUSIONS:

Graphs and data were presented. On a low organic matter soil of mostly sand content there is no adsorption. No desorption data were presented.

10.10

A. STUDY IDENTIFICATION:

Field Dissipation in Soil. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

Field dissipation studies were carried out in several soil types. They were all performed in similar fashion as described below. In all cases, residues of thidiazuron dissipated to below detection limit (0.1 ppm) before reaching the 6- to 12-inch depth. This would indicate that thidiazuron is not a strong leacher; however, with an minimum detection limit (MDL) of 100 ppb, residues below this are easily missed. And residues of < 100 ppb in deeper soil depths are not uncommon.

In general, there were three treatments of all plots as follows: 1) 0.5 lb ai/A once annually, 2) 0.5 lb ai/A once annually repeated in 2 years, and 3) untreated control. Each plot was replicated for a total of six 10' x 10' plots. The thidiazuron was applied in water and incorporated 2 to 3 inches into the soil. All plots were bare soil plots. Plots were sampled with a soil probe at 10 random sites throughout each

of the plots to a depth of 12 inches in 3-inch increments. Samples were frozen immediately until analysis. Sampling intervals were as follows: 1) before application; 2) day 0 (immediately after application) and days 7 and 14; 3) 1, 4, 8, and 12 months after application; and 4) day 0 and 1, 4, 8, and 12 months after the second annual application.

Soil descriptions, climate descriptions, and irrigation schedules are given. The water table was measured at 55 to 60 feet. Several plots in different states were treated and sampled. Plot characteristics and sampling results follow.

Sprinkler and flood irrigation were used as outlined in detail below.

April 22, 1976 - Treated
June 17, 1976 - Sprinkled 3 hours, approximately 0.75 inches.
June 24, 1976 - Sprinkled 3.5 hours, approximately 0.87 inches.
July 2, 1976 - Sprinkled 1.5 hours, approximately 0.37 inches.
July 14, 1976 - Sprinkled 3 hours, approximately 0.75 inches.
July 20, 1976 - Sprinkled 2.5 hours, approximately 0.62 inches.
July 27, 1976 - Sprinkled 2.5 hours, approximately 0.62 inches.
August 3, 1976 - Sprinkled 1.5 hours, approximately 0.37 inches.
August 10, 1976 - Flood-irrigated 1 hour, approximately 1.0 inch.
August 18, 1976 - Flood-irrigated 1/3 hour, approximately 0.33 inches.
August 30, 1976 - Flood-irrigated 1 hour, approximately 1.0 inch.
November 3, 1976 - Flood-irrigated 1 hour, approximately 1.0 inch.
A total of 7.68 inches.

C. RESULTS:

1. In Fresno, California, in a Hanford fine sandy loam (fsl) the following characteristics were seen.

	Depth 0 - 7"	7 - 16"	16 - 44"	44 - 72"
Organic carbon - content (%)	.44	.22	.10	.06
Soil pH (in distilled H_2O)	6.4	6.5	6.7	6.8
Moisture held at 15 atmos. (%)	2.8	2.6	2.0	2.0
% sand	60.5	59.0	62.9	57.0
% silt	32	34	32	39
% clay	8	7	5	4
?????? exchange capacity (???? per 100 grams of soil)	12	15	18.3	17.3

Information taken from the Soil Survey - East Fresno Area, California - 1971.

The results below were obtained from sampling:

Time after Application, Months	Residue in Soil, lb ai/A 0-3"	3"-6"	6"-9"	9"-12"	Accum. Precip., Inches	Cumulative Irri., Inches*
0	0.62	<0.10	<0.10	<0.10	0	0
1/4	0.42	0.10	-	<0.10	0.3	0
1/2	0.49	<0.10	-	<0.10	0.3	0
1	0.43	<0.10	<0.10	0.12	0.3	0
4	0.17	<0.10	0.13	<0.10	0.8	5.7
8	0.12	<0.10	<0.10	<0.10	2.5	7.7

* Sprinkle irrigation through August 5, 1976 (3 1/2 months after application). Flood irrigation during the remainder of the test.

2. In Moultrie, Georgia, in a Tifton sandy loam (sl) with the following characteristics:

Soil Type	% ssc	% OM	CEC (meq / 100 g)	pH	FC (1/3 bar)
Georgia sl	76, 15.6, 8.4	< 1.0 - 1.6	5.6	5.4	8.7%

The following residues were found after sampling:

Time After Application, Months	Residue in Soil, lb ai/A 0-3"	3"-6"	6"-9"	9"-12"	Cumulative Precipitation, Inches
0	0.57	0.18	<0.10	<0.10	0
1/2	0.46	<0.10	<0.10	<0.10	1.7
1	0.36	<0.10	<0.10	<0.10	6.1
4	0.30	<0.10	<0.10	0.10	43.5
8	0.48	0.10	<0.10	<0.10	55.0
12	0.37	<0.10	<0.10	<0.10	70.0

No irrigation schedule was included. No mention of irrigation was made.

In Friars Point, Mississippi, a Commerce silt loam (SiL) was planted to cotton under normal use conditions and sprayed with thidiazuron as DROPP 50 WP at 0.5 lb ai/A on October 14, 1976 as a defoliant. Cotton was harvested afterwards. Soil samples were taken at 0 to 6 and 6 to 12 inches immediately after application, 12 weeks, and 17 weeks after defoliating treatment with thidiazuron.

Soil Type	% ssc	% OM	pH	Available Water Holding Capacity-AWH
Commerce SiL	43.4, 37, 29.6	1.4	6.6 - 7.8	17-18%

These soils pond occasionally.

The sampling results are given below.

Date of Soil Sampling	Time After Application(mos.)	lb ai/A 0-6"	lb ai/A 6"-12"	Cumulative Rainfall(in.
October 14, 1976	0 (immediately after application)	0.10	< 0.10	0
January 15, 1977	3 (6 weeks after incorporation of cotton stalks)	0.19	< 0.10	9.00
February 23, 1977	4 (Before planting new crop in the spring)	0.19	< 0.10	9.92

In Alamo, Texas, in a sandy clay loam planted to cotton, thidiazuron was used as a defoliant prior to cotton harvest. The soil is described as a Hildago sandy clay loam with pH = 7.9 to 8.4 and percent OM = 1 to 1.5. No percent ssc was given. Soils were not adequately described. Irrigation practices were not mentioned.

The results are given below.

Time After Application, Months	Residue in Soil 0-6"	Residue in Soil 6"-12"	Cumulative Rainfall Inches
0-(Immediately after application)	0.10	-	0
1 1/2 (5 days after incorporation of cotton stubble)	<0.10	<0.10	4.12
7 3/4 (at harvest of rotational crop)	<0.10	<0.10	23.99

In Fresno, California, and in Moultrie, Georgia, in the same soils previously described for the bare soil test plot studies, plots planted to cotton under normal use conditions were treated with thidiazuron at 0.5 lb ai/A for defoliation prior to harvest. Normal cultural practices were mentioned, but not described in detail, i.e., irrigation amounts.

Soil, air temperature, and humidity measurements were taken. Soils were sampled 0 to 6 and 6 to 12 inches deep and frozen until analysis.

The results below are for Fresno, California, and Moultrie, Georgia, respectively.

FRESNO, CALIFORNIA

Time After Application, Months	Residue in Soil, lb ai/A 0-6"	6"-12"	Cumulative Rainfall(i
0 (Immediately after treatment)	0.10	<0.10	-
2 (6 weeks after incorporation of cotton stubble)	<0.10	<0.10	0.72
4 (before planting new crop in the spring)	<0.10	<0.10	1.91

MOULTRIE, GEORGIA

Time After Application, Months	Residue in Soil, lb ai/A 0-6"	6"-12"	Cumulativ Rainfall(
0 (Immediately after treatment)	0.16	<0.10	-
1 3/4 (Approximately 6 weeks after incorporation of cotton stubble)	<0.10	<0.10	8.10
3 1/2 (before planting new crop in the spring)	<0.10	<0.10	14.08

D/E. DISCUSSION/CONCLUSIONS:

Only the Commerce silt loam soil in Mississippi showed a persistence above detection limit for a period of 4 months. None of the plots showed a movement above or at the detection limit below 6 inches.

10.11

A. STUDY IDENTIFICATION:

Degradation of SN 80178 in activated loamy sand. NOR-AM. December 1984.

B. MATERIALS AND METHODS:

Radio-labelled Sn 80178 1-[U-^{14}C-]-phenyl-3-(1,2,5-thidiazole-3-yl) urea with a specific activity of 13.1 uCi and a purity of 99% was spiked into a German standard soil (2.2) with a % s,s,c = 86.7,8.3,5.0; %O.M. = 4.0; pH = 6.6; %WHC = 36; CEC = 11.2. The soil was activated as in the aerobic metabolism study. Then, the soils were dosed with SN 80178 at 110 ppm and placed in flasks equipped with side arm traps containing 0.1 N KOH for trapping evolved CO_2. The flasks were stored in the dark at 25 °C. Soil aliquots and trapping solutions were sampled on 0,12,21,56,103,180, 264, and 359th days.

The aliquots were extracted with toluene and sonication, twice, then with acetone and sonication, and soxhlet with methanol. A second series of extractions were performed with alkaline solutions (NaOH) to separate humic and fulvic fractions of the soils.

All organic extracts were pooled and radioassayed by LSC. TLC on silica gel plates was used to identify degradates.

C. RESULTS:

Day	$^{14}CO_2$	SN 80178	Bound	Total
0	---	89.2	3.7	94.1
12	8.2	68.6	18.1	96.7
21	18.0	47.3	27.3	94.4
56	41.0	17.8	28.2	88.1
105	52.8	13.0	24.4	91.6
180	58.3	13.7	21.1	93.6
264	62.6	11.3	18.9	93.9
359	66.9	7.0	20.3	95.1

Unknowns (4) were noted, but not identified, as individually they accounted for $\leq$ 0.4% of the applied product between days 0-359. Half-life =

D/E. DISCUSSION/CONCLUSION:

The study passes the screen/review. Degradation curves were included. EAB calculated the half-life based on the above data. The photoproduct nor its breakdown products are persistent, but are metabolized to CO_2 and soil bound. There is an initial rapid breakdown phase. (t1/2 is based on a first order decay rate, which is valid for the first stages of decay only).

10.12

A. STUDY IDENTIFICATION:

Mobility of SN 80 178 in four soils. NOR-AM. December 1978.

B. MATERIALS AND METHODS:

Radio-labelled SN 80 178 with a specific activity of 48.1 uCi and 99% purity was used and applied to the tops of soil columns of four different soils prepared in triplicate. The columns were constructed of glass in 5 cm, 5 cm, 10 cm and 10 cm segments with 5 cm i.d.s. A total of 1200 ml was applied at 7-10 ml/hour for 6 days. (A total of 20 inches would equal 1000 ml). No mention was made of pre-wetting the columns. Leachate was collected every 24 hours. After leaching, the soil columns were cut, removed and extracted with methanol, and then dried and combusted. Extracts were radio-assayed by LSC.

C. RESULTS:

Soil Type	%s,s,c	%OM	pH	%WHC	*%leached	% in 5 cm	%recovere
German 2.2	94,2.5,3.5	0.83	6.6	24	2.0	†52.62	89.82
German 2.1	86,6.5,7.3	3.36	5.7	30	0.19	83.28	84.99
CA.loam sand	88,7.5,4.1	1.95	5.2	30	0.64	81.51	96.96
compost	85,7.5,7.2	7.0	6.0	66	0.08	96.91	98.31

* Arithmetic averages of three columns.
† 31% in the next segemnt, 5-10 cm depth.

D/E. DISCUSSION/CONCLUSIONS:

Very little leaching of the photoproduct was shown; however, the columns were not pre-wetted. In the results from the leaching study with thidiazuron in soil columns, leaching incresed above 1% of that applied in pre-wetted columns versus non-pre-wetted columns. Pre-wetting enhances leaching as part of the worst-case conditions. Despite this, EAB concludes that the photoproduct is not a potential leacher.

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11. ONE-LINER:

No one-liner completed at this time.

12. CBI:

No CBI submitted with this package.