8-9-76

EEE BRANCH REVIEW

DATE: IN _____ OUT _____ IN 7/1/76 OUT 8/9/76 IN _____ OUT _____

FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. 2139-EUP-22

PETITION OR EXP. PERMIT NO. 6G1807

DATE DIV. RECEIVED June 3, 1976

DATE OF SUBMISSION

DATE SUBMISSION ACCEPTED

TYPE PRODUCT(S): I, D, H, F, N, R, S Plant growth regulator - defoliant

PRODUCT MGR. NO. SRS

PRODUCT NAME(S) SN 49537-50WP

COMPANY NAME NOR-AM

SUBMISSION PURPOSE EUP on cotton

CHEMICAL & FORMULATION 1-phenyl-3-(1,2,3-thiadiazol-5-yl) urea (SN-49537)

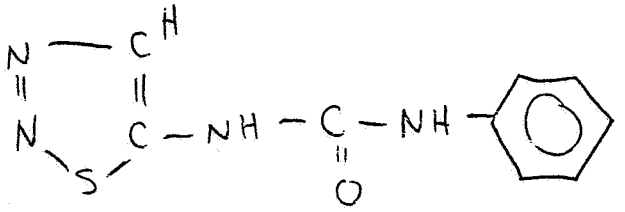
1.0 Introduction

1.1 A permit is being sought for SN-49537, a new pesticide, as a cotton defolient. Testing will involve seven states, 240 acres and 120 lbs. of the 50WP formulation.

1.2 Physical and chemical properties -

Empirical formula: $C_9H_8N_4OS$

Structural formula:



Molecular weight: 220.2

Appearance: colorless crystals

Odor: odorless

Volatility: low

Melting point: 213°C with decomposition

Vapor pressure: $3 \cdot 10^{-11}$ Torr (25°C)

Solubility in various solvents:

Water	20 ppm
Methanol	0.45 g/100 ml
Acetone	0.8 g/100 ml
Ethyl acetate	0.08 g/100 ml
Chloroform	13 ppm
Benzene	35 ppm
Hexane	6 ppm
Cyclohexanone	21 g/100 ml
Dimethylsulfoxide	>50 g/100 ml
Dimethylformamide	>50 g/100 ml

2.0 Directions for Use

2.1 Apply 0.05 - 0.~~5~~4 lbs. ai/A by ground or air. Use higher rates at periods of low temperatures.

2.2 Apply to mature cotton plants when 70% or more of the bolls are open and at least 14 days prior to anticipated picking.

2.3 Dispose of leftover solution by burying in non-cropland away from water supplies. Bury or burn empty bag.

3.0 Discussion of Data

3.1 Disappearance of SN 49537 in United States Soils (Preliminary Report - tab E-1)

Two fields were treated with SN 49537 50WP at 0.5 lb. ai/A and were analyzed. Soil characteristics are:

	California Sandy Loam	Georgia Loamy Sand
ph	5.6	5.8-6.1
% org. matter	1.8	1.9
% sand	68	83
% silt	28.4	10.5
% clay	3.4	6.5

Results

Aniline containing residues, including parent SN 49537, found (ppm)

Weeks	Calif. Sandy Loam 0-3"	Calif. Sandy Loam 3-6"	Georgia Loamy Sand 0-3"	Georgia Loamy Sand 3-6"
0	0.37	0.25	0.57	0.18
1	0.29	0.16	0.32	0.17
2	0.30	ND	0.22	0.24
4	ND	ND	NA	NA

ND = <0.10 ppm
NA = Not available

Conclusions

Since the method determined all aniline containing residues, a halflife for just the parent could not be determined.

(The method converted aniline-containing residues to aniline by alkaline hydrolysis. The aniline was then extracted and brominated to 2, 4, 6 - tribromoaniline which could be quantitated by ECGC).

3.2 Preliminary Report on Aerobic Degradation of SN 49537 in Soil (tab E-2) - radiolabeled

The German standard soil "2.2 Neuhofen" (ph = 6.8, organic C = 1.85%, clay = 9.3%, silt = 6.5% and exchange capacity = 4.6 mval/100 g) was fortified with UL-^{14}C-phenyl-SN 49537 at 2 ppm, moistened to 86% and transferred to biometer flasks.

$^{14}CO_2$ was collected, soil was extracted with acetone and MeOH and separated into humic and ~~fubic~~ fulvic fractions and the soil was combusted.

Results

1) Distribution of Applied ^{14}C activity (%)

Day	SN 49537	Bound	Unknown	Origin	$^{14}CO_2$	Total
0	96.5	3.5	1.6	-	-	101.6
7	74.4	23.3	0.6	1.2	0.1	99.6
14	73.6	26.5	-	-	0.2	100.3
30	71.3	29.8	-	-	0.9	102.0
60	61.9	33.0	0.2	1.4	2.1	98.6
91	55.4	39.2	0.2	0.8	4.9	101.0

2) ^{14}C residues in the ~~fubic~~ fulvic acid fraction were 5.3 - 9.6% and 10-11.1% in the humic acid fraction.

Conclusions

1) The halflife of SN 49537 under aerobic soil degradation is 3-4 months based on analyses of extractable material.

2) Bound residues steadily increase. At 91 days 39.2% of the initial activity is bound.

3) Less than 9% of the initial activity is released as $^{14}CO_2$ indicating some stability of the ring.

3.3 Preliminary Report on Anaerobic Degradation of SN 49537 in Soil (tab E-2, page 5) - labeled

The German standard soil "2.2 Neuhofen" (pH = 6.8, organic C = 1.85%, clay = 9.3%, silt = 6.5% and exchange capacity = 4.6 mval/100 g) was fortified at 2 ppm with UL - ^{14}C-phenyl-SN 49537 and transferred to biometer flasks. The soil was then waterlogged and covered to 2-3 cm. with deoxygenated water. Water and soil phases and soil fractions were analyzed.

Results

1) % Distribution of applied ^{14}C activity

Day	SN 49537	Bound	Unknown	Origin	$^{14}CO_2$	Total
30	29.7	39.6	31.2	0.6	0.07	101.2
62	35.3	47.2	17.6	1.0	0.03	101.1

2) The unknown fraction showed 6 spots on TLC.

3) About 0.5% of the initial activity was found in the water.

4) 8.2-8.5% of the activity was found in the humic acid fraction and 13.2-15.6% in the fubic acid fraction.

Conclusions

1) The halflife of SN 49537 under anaerobic soil degradation is reached in less than 1 month based on analyses of extractable material.

2) Bound residues are high (40% at day 30).

3) Practically no $^{14}CO_2$ was liberated under the anaerobic conditions.

3.4 Leaching of SN 49537 in Soil Columns (tab E-3) (radiolabelled study) - preliminary report

Four PVC columns (4" id) were filled each to 12" with one of the following soils.

Soil Characteristics	Soil Types: Florida Sand	Miami Silty Loam	Drummer Silty Clay Loam	Sumner Sandy Loam
pH range	6.8-7.0	7.4-7.6	7.8-8.0	7.4-7.6
Organic content	1.1%	1.8%	5.7%	2.4%
Moisture Content (as received)	9%	16%	20%	17%
% Coarse Sand*	38%	16%	15%	40.5%
% Fine Sand*	53.5%	32%	15%	28%
% Silt*	3%	32%	30.5%	12%
% Clay*	2%	13%	27%	8.5%

The top surface of the packed soil column was treated with an acetone solution of the labeled SN 49537 [N-phenyl-N'-([5-^{14}C]-1,2,3-thiadiazole-5-yl)urea] to an equivalent dosage of 0.5 lb/A.

6 A- in of tab water (1237 ml) was added over 5 days (247 ml/day).

Results

1) There were no cases of aniline-containing metabolites, including SN 49537, found in the percolation water.

2) No other results were submitted.

Conclusions

This study is not satisfactory. We prefer to have 20" of water passing through the column at a rate of 1" per hour. We also need the results of the soil analyses.

3.5 Leaching of SN 49537 (tab E-4) labeled

Glass columns were filled with air dry 2.2 Neuhofen soil (pH = 6.8, organic C = 1.85%, clay = 9.3%, silt = 6.5%, exchange capacity = 4.6 mVal/100 g, water capacity = 27 g/100 g air dry soil). The soil surface was fortified with labeled SN 49537 [N-phenyl-N'- ([5-^{14}C]-1,2, 3-thiadiazole-5-yl)-urea], (50 mg) to an equivalent of 255 gm/h (0.228 lb/A).

Three methods of fortification were used:

Experiment 1: About 4 g of soil were treated with 47.5/ug radioactive substance. This soil was put on top of the dry soil column, followed by 1/2 cm of non-radioactive soil.

Experiment 2: The soil treated with radioactive SN 49537 (50/ug) was put on top of prewetted soil columns (moistened to the maximum water holding capacity) and then covered with 1/2 cm of non-radioactive soil.

Experiment 3: 50 g of soil were treated with 50/ug of radioactive SN 49537, moistened to 150% maximum water holding capacity and stored in the dark at 20°C for 40 days.

This soil was then put on top of the prewetted soil columns (cf. experiment 2) and covered with 1/2 cm of non-radioactive soil.

Percolation time was 8-10 ml/hr (about 1/4 inch/hr) and a total of 1100-1400 ml of water was added to each column over 5-6 days.

One day after leaching was complete, the columns were sectioned and the soil analyzed by combustion.

Results

Exp. #	% of Original Activity in Percolate	0-5 cm	5-10 cm	10-20 cm	20-30 cm	Total
1	0.45	67.6	0.1	0.1	0.2	68.5
2	0.34	88.3	0.3	0.4	0.5	89.8
3	1.97	61.1	1.1	0.5	0.1	64.8

Conclusions

1) SN 49537 does not leach significantly.

2) Note the low recoveries.

3.6 Uptake of SN 49537 from Soil by Soybeans and Alfalfa (tab E-5) radiolabeled lab study

A sandy loam soil was fortified to 0.25 ppm, incubated for 7 days, and then planted to soybeans and alfalfa. After four weeks at 25°C in the greenhouse, the plants were divided into roots and aerial portions and analyzed for activity by combustion. ^{14}C-phenyl ring labeled SN 49537 was used.

Results

	Activity found in plants (ppm of fresh wt.) Aerial portion	Root portion
Soybeans	0.016	0.201
Alfalfa	0.021	0.195

Conclusions

This does not satisfy our requirement for a crop rotation uptake study pending submission of additional information on the actual interval between treatment and planting of a rotational crop

3.7 Hydrolysis

SN 49537 showed no decomposition in 1N NaOH (pH 1) for 24 hours and no decomposition in 1N HCl refluxing for three hours.

At pH 14 and 50°C the halflife is 7.35 days.

Conclusions

Data showing hydrolysis at pH 5, 7 and 9 was not submitted.

4.0 Conclusions

Aerobic soil degradation - halflife 3-4 months, (extractable material) 40% bound at 3 months.

Anaerobic soil degradation - halflife < 1 month (extractable material) 40% found at 1 month, no release of CO_2 from the ring.

Leaching - no significant leaching.

Hydrolysis - stable at pH 1 for 24 hours, halflife at ph 14 (50°C) is 7.35 days, no date submitted at pH 5, 7, and 9.

Subsequent crops - when planted 7 days after treatment, ^{14}C residues are taken up by soybeans and alfalfa, nature of residues was not determined.

5.0 Recommendations:

5.1 We cannot concur with the experimental use. Data submitted are insufficient to assess the hazard to rotational subsequent crops planted on treated areas.

5.2 Data of the following type will be needed:

A rotational crop uptake study using radiolabeled material.

1. For crops rotated immediately after harvest of a crop in the treated area, the pesticide is to be aged in a sandy loam soil under aerobic conditions for about 120 days, then the soil planted to a root crop, small grain, and a vegetable. The root crop is required; however, crops in two other crop groupings may be substituted for the small grain and vegetable.

2. For crops rotated the following year after treatment, the pesticide is to be aged in the soil for one year prior to planting. Crops should be as above.

3. If significant residues are found, then actual field studies using non-labeled pesticide will be required. Such data must be obtained under actual agricultural practice.

4. If residues are found in rotational and/or subsequent crops in the field, then a labeling restriction will be needed. This restriction will take the form of a time interval from application to planting of rotational crops such that residues will not occur in the rotational crop.

5. Cover crops can be rotated if label restrictions are such that the cover crop is plowed under and not grazed.

6. If the agricultural practice is such that a treated crop area is rotated with another crop that will result in another treatment of the pesticide to the same area, residue data will be required on the second crop. The rotational crop is to be grown under actual use conditions.

5.3 For purposes of this permit only, a label restriction against the planting of rotational/subsequent crops on treated areas for 12 months following the last application of SN 49537 would be acceptable in lieu of the completed crop uptake studies described in 5.2 above.

5.4 All environmental chemistry data as required by Section 3 of the Regulations must be either submitted or referenced prior to registration.

Reviewed 8/18/76

Ronald E. Nye, Jr. 8/9/76

Samuel M. Creeger Aug 18, 1976

Samuel M. Creeger 7/21/76
Environmental Chemistry Section
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AO Schlosser overview