121301

Date Out EAB: APR 08 1986

To: A. Heyward
Product Manager 17
Registration Division (TS-767)

From: Samuel M. Creeger, 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.: 100-ALU

Chemical: Cyromazine

Type Product: Insecticide

Product Name: Trigard

Company Name: Ciba-Geigy

Submission Purpose: Field data supporting use on lettuce, celery and chrysanthemums

ACTION CODE: 101

Date In: 4/26/85

EAB # 5568

Date Completed: APR 08 1986

TAIS (level II) Days

3.0

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

Monitoring study requested by EAB: /__/

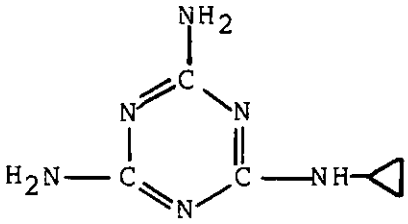
Monitoring study voluntarily conducted by registrant: /__/

2021042

1. CHEMICAL:

Common name: Cyromazine
Chemical name: N-cyclopropyl-1,3,5-triazine-2,4,6-triamine

Structure:



2. TEST MATERIAL:

The test material used was Trigard® 75W Insecticide/EPA File Symbol 100-ALU. The material was not radio-labelled for the field dissipation study.

3. STUDY/ACTION TYPE:

The four field dissipation studies submitted are to be used in support of the pending registrations of Trigard® 75W Insecticide on chrysanthemums, and celery and lettuce. Four volumes were submitted, each containing a separate field study using cyromazine as Trigard® 75W Insecticide on a different soil type.

4. STUDY IDENTIFICATION:

Volume I-Sandy Loam Soil Dissipation Study conducted in Fresno, California
Volume II-Silty Loam Soil Dissipation Study conducted in York, Nebraska
Volume III-Peat Soil Dissipation Study conducted in Palm Beach, Florida
Volume IV-Sandy Soil Dissipation Study conducted in Indian River, Florida
Author: L. Ballantine
Company: Ciba-Geigy

5. REVIEWED BY:

Catherine Eiden
Section # 1
EAB

Catherine Eiden
Date: 3/28/86

6. APPROVED BY:

Sam Creeger, Chief
Section # 1
EAB

Sam M Creeger
Date: ~~3/28/86~~ APR 08 1986

2

7. CONCLUSIONS:

Ciba-Geigy has submitted four studies on the field dissipation of cyromazine and melamine in four soil types. These studies are to be used in support of pending registration actions for cyromazine on celery and lettuce grown in a muck or peat soil, and for chrysanthemums grown in an amended soil of 1/3 peat + 1/3 sand + 1/3 perlite. The application rate in all studies was 5 lb.ai/A (40 X the actual 1/8 lb.ai/A normally used). Based on these four studies submitted:

1. These data do not satisfy the field dissipation requirement needed in support of registration on celery and lettuce grown in a muck or peat soil, because the depth of leaching of melamine residues was not defined.

Detectable cyromazine residues (above 0.05 ppm) did not persist at the 12-18" depth. They do persist at 1 ppm in the 0-6" depth. Detectable melamine residues (0.20 ppm) persisted at the 12-18" depth at the end of one year. EAB realizes that this high residual cyromazine and melamine is because of the increased application rate of cyromazine (40 X); therefore, a new study is needed with an application rate of cyromazine closer to that actually used.

2. EAB cannot determine whether or not cyromazine or melamine residues or both will leach in an amended soil of 1/3 sand + 1/3 muck + 1/3 perlite used for growing chrysanthemums.

The registrant states that the four studies, which included a study on a sand loam, a silt loam, a sand and a peat or muck soil, "would closely parallel the results to be expected for use on the amended soil".

a) The sand loam and silt loam soil studies indicate no build up or persistence of cyromazine or melamine above the 0.05 ppm detection limit below the 0-6" depth. There is some movement of melamine to the 12-18" depth, but all residues dissipate below detection limit at the 12-18" depth after one year. The depth of leaching is defined in these 2 soils.

b) The muck or peat soil study indicates melamine residues persisting at the 12-18" depth at the end of one year. The leaching front or depth of leaching for melamine is not defined in this soil.

c) The sand soil study indicates both cyromazine and melamine residues at the 12-18" depth at the end of one year. The leaching fronts of neither chemical is defined.

Because the fate of cyromazine and melamine, as regards leaching, is not the same for all of these soils, the effects of an amended soil on cyromazine leaching is unclear. Does an amended soil behave more like a sand loam, a silt loam, a sand or a peat soil? Does perlite increase or decrease the sorptivity of the amended soil; does it increase or decrease the permeability?

3. EAB concludes that in the California sand loam and the Nebraska silt loam soils with the given soils, climate, and depths to the water table neither cyromazine nor melamine will persist in the soils at >0.05 ppm at the 12-18" depth at the end of one year, even at the exaggerated application rate of 5 lb.ai/A (40 X). Leaching below 18" is also not expected in these California and Nebraska soils.

4. EAB concludes that in the sand soil in Florida with the given soils, climate and depth to the water table conditions cyromazine and melamine residues will reach ground water at 0.1 ppm. This concentration is because of the high application rate (40 X) and the 1-2 feet depth to the water table.

8. RECOMMENDATONS:

A Section 18 was granted on November 2, 1983 for cyromazine use on celery and lettuce in Florida. Restrictions and conditions associated with that Section 18 included that cyromazine be applied at 1/8 lb.ai/A on celery with up to 12 applications per cropping period for a cumulative highest use rate of 1.5 lb.ai/A. on celery per cropping period. Since at least 3 cropping periods for celery are possible in a year, 4.5 lb.ai/A of cyromazine could be applied to celery in a year. Therefore, the exaggerated use rate of 5 lb.ai/A is possible over a year's period and would constitute the highest label use rate. The submitted studies used an application rate of 5 lb.ai/A all at once; this resulted in an exaggerated residual concentration of cyromazine in soil. It would be more realistic, if the cyromazine were applied as directed at 1/8 lb.ai/A per application at intervals of 7 days between applications with up to 12 applications per cropping period, i.e., an application schedule that mimics reality.

1. To satisfy EAB concerns over the use of cyromazine on lettuce and celery, it is recommended that a new field dissipation study be conducted. The application rate of cyromazine should closely approximate a realistic application schedule for cyromazine on lettuce/celery. The results obtained with a 40 X application rate (all at once) may be unrealistic, leading one to conclude that very high concentrations of cyromazine and melamine may persist and leach under certain conditions. The soil used should be a peat or muck soil as before. Sample to a depth of 0-3 feet, initially, until such time that detectable residues appear at the 3 feet depth, then deeper sampling will be necessary to define the depth of leaching. The depth of the leaching front should be defined within the capability of the analytical techniques.

2. To satisfy EAB concerns over the use of cyromazine on chrysanthemums, it is recommended that a new field dissipation study be conducted. The study should be conducted on one soil in which chrysanthemums are typically grown (such as an amended soil).

Use a less exaggerated application rate, something closer to an actual application schedule. Sample to a depth of 0-3 feet, initially, until such time that detectable residues are found in the 3 feet depth, then sample deeply enough to define the leaching front.

In a previous EAB review on cyromazine use on celery and lettuce dated 2/5/85, and on cyromazine use on chrysanthemums dated 2/1/85, the following recommendations were made:

3. An aerobic soil metabolism study in a muck soil, a sand loam or a silt loam soil or other soil that is representative of the intended use is needed.

4. An anaerobic soil metabolism study in a muck soil, a sand loam or silt loam soil or other soil representative of the intended use is needed.

No new data were included with this submission; therefore, these previous recommendations still apply and are needed to complete the data requirements for the environmental fate of cyromazine.

5. An irrigation schedule is needed for those studies using irrigation in Nebraska and California. When did irrigation begin? At what intervals was irrigation applied and in what amounts?

9. BACKGROUND:

In these submitted studies a broadcast application of cyromazine is made to bare soil and then incorporated. The application rate used in these studies is 5 lb.ai/A (all at once). The normal use rate is 1/8 lb.ai/A per application to be applied at 7 day intervals up to 12 X on celery, 8 X on lettuce per cropping period. The studies use an exaggerated rate which is expected to result in an unrealistic worst-case situation.

10.1 DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

A. STUDY IDENTIFICATION:

Volume I-Sandy Loam Soil Dissipation Study conducted in Fresno, California. by L. Ballantine

B. MATERIALS AND METHODS:

Cyromazine was spray broadcast onto bare soil and then soil incorporated at 5 lb.ai/A. Soils were sampled before application of cyromazine, on the day of application (t_0) and thereafter according to the following schedule: 15, 34, 60, 120, 181, 271, 366. Samples were taken in 6 inch increments down to 18 inches. The 0-6 inch depth was sampled at all sampling intervals; the 6-12 inch depth was sampled at each sampling interval from day 60 on; the 12-18 inch depth was sampled from day 181 on. Duplicate soil plots were treated and sampled at the same times. Samples were composited from the two soil plots. One soil core was taken/sampling interval/plot. Soils were sampled with a 2.2 cm soil plugger.
Both cyromazine and melamine were analyzed for in the soil samples taken. Melamine is the major soil metabolite of cyromazine. The percent recovery for cyromazine from soil varied from 60-108%; the percent recovery varied from 65-109% for melamine. The detection limit for the method is 0.05 ppm.

The study included other general information as to soil characteristics (See Results section), ground water depth (20-30 feet), furrow irrigation used in total as 9.5 inches/14 months, and all climate data.

The analytical method for determining the concentration of cyromazine and melamine in soils used in this study has a limit of detection of 0.05 ppm for cyromazine and 0.04 ppm for melamine. In principle, residues of cyromazine and melamine in soil are extracted by refluxing the samples with a mixture of glacial acetic acid: methanol: 1.0 N sodium acetate. An aliquot of the extract is evaporated to dryness and cleaned up by silica gel, cation and anion exchange chromatography. Cyromazine and melamine are determined by High Performance Liquid Chromatography (HPLC) on a Zorbax-NH_2 column using 90% acetonitrile: water as the mobile phase and UV detection at 214 nm.

B. REPORTED RESULTS:

Fresno, California (sand loam)

Time (days)	[Cyromazine] ppm at depths 0-6"	6-12"	12-18"	[Melamine] ppm at depths 0-6"	6-12"	12-18"
Before appl.	<0.05			<0.05		
0	0.39			<0.05		
15	0.46			0.19		
34	0.26			0.15		
60	0.93	<0.05		0.36	0.09	
120	0.35	<0.05		0.29	0.10	
181	0.62	<0.05	<0.05	0.74	0.17	0.08
271	0.07	<0.05	<0.05	0.44	0.20	<0.05
366	<0.05	<0.05	<0.05	0.59	0.16	<0.05

t1/2 = 98.7 days (half-life) in the 0-6" depth
k = -0.007 $days^{-1}$ (decay rate) "
r = 0.80459 (correlation coefficient)

Soil characteristics: Sand loam with %s,s,c = 55.2,34.8,10.0; %OM = 1.3; BD = 1.5 g/ml. Soil moisture fluctuated between 8.5-14% during the 1 year study.

D./E. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS

The extent of leaching of cyromazine has been defined. Based on the study results no detectable residues of cyromazine moved below the 0-6 inch depth. The degradation of cyromazine was followed down to below the detection limit. On day 366, the composited soil samples showed a concentration of <0.05 ppm. Cyromazine has a half-life of 100-110 days in the 0-6 inch depth. Melamine, however, was shown to build up in the 0-6" soil depth and persist at 0.59 ppm at the end of a year. Melamine residues were also present in the 6-12 inch depth at the end of a year at 0.16-0.20 ppm. This level remained constant in the soil for approximately 6 months. No residues of melamine were detected in the 12-18 inch depth at the end of a year. No half-lives could be calculated for melamine as the concentrations fluctuated as melamine increased and decreased as cyromazine was converted. Repeated applications of cyromazine may lead to a build up of melamine residues, but no leaching past the 6-12" depth after a one-time application of 5 lb.ai/A (40 X) within one year was indicated.

10.2

A. STUDY INDENTIFICATION:

Volume II-Silty Loam Soil Dissipation Study conducted in York, Nebraska. by L. Ballantine.

B. MATERIALS AND METHODS:

Same as Section B. under 10.1. The depth to the water table is 75 feet. Percent recovery for cyromazine is 65-77%, for melamine, 55-83%.

C. REPORTED RESULTS:

York, Nebraska (silt loam)

Time (days)	[Cyromazine] ppm at depths 0-6"	6-12"	12-18"	[Melamine] ppm at depths 0-6"	6-12"	12-18"
Before Appl.	<0.05			<0.05		
0	0.82, 1.1, 1.3,1.7			0.18,0.28, 0.18,0.11		
18	2.2			0.49		
29	1.5			0.55		
62	1.6			1.1		
125	0.52	<0.05		0.96	0.07	
187	0.63	"	0.07	1.0	0.05	0.12
309	0.72	"	<0.05	1.2	0.11	0.10
368	0.55	"	"	1.2	<0.05	<0.05,0.10
368	0.62	"		1.3		

$t_{1/2}$ = 236 days (half-life) in the 0-6" depth
$k = -0.00294$ days^{-1} (decay rate) "
$r = 0.8019$ (correlation coefficient)

Soil characteristics: silt loam with %s,s,c = 13.7,55.7,30.6; %OM = 2.7; BD = 1-1.21 g/ml; %FC = 17.8-20.0; pH = 6.5. Depth to the water table is 75 feet.

D./E. REVIEWER'S DISCUSSION AND INTERPRETATION OF RESULTS:

The extent of leaching for cyromazine has been defined in this Nebraska silt loam soil. Movement to the 0-6" depth and persistence up to one year at 0.62 ppm was shown. No movement past the 0-6" depth was shown for either the 6-12" or 12-18" depth soil samples. Cyromazine was shown not to leach in the field past the 0-6" depth. Melamine residues were present in the 0-6" depth at 1.3 ppm at the end of one year. At the lower depths melamine residues dissipated to <0.05 ppm by the end of one year, below detection limit. Movement of melamine past the 0-6" depth to the 6-12" and 12-18" depths was shown; however, melamine was shown not to persist at these lower depths.

8

10.3

A. STUDY IDENTIFICATION:

Volume III-Peat Soil Dissipation Study conducted in Palm Beach, Florida. by L. Ballantine.

B. MATERIALS AND METHODS:

Same as Section B. under 10.1. The percents recovery on cyromazine and melamine were, respectively, 69-101% and 62-96%. The lower recoveries on melamine were consistent.

C. REPORTED RESULTS:

Time (days)	[Cyromazine] ppm at depths 0-6"	6-12"	12-18"	[Melamine] ppm at depths 0-6"	6-12"	12-18"
Before Appl.	<0.05			<0.05		
0	4.9,3.6			<0.05,0.08		
15	2.8			<0.05		
30	2.9			0.59		
61	1.9	0.11		0.29	<0.05	
120	4.3	0.13		1.8	<0.05	
150	4.8	0.09	0.37	4.1	0.07	0.15
272	1.1	0.43	<0.05	2.8	1.0	0.88
365	1.0	<0.05	<0.05	3.2	0.34	0.20

t1/2 = 210 days (half-life) in the 0-6" depth
k = -0.003 $days^{-1}$ (decay rate)
r = 0.734 (correlation coefficient)

Soil characteristics: peat with %OM = 72-80 and % silicates = 17-27; BD = 0.30-0.40 g/ml; %FC = 41-53.

D./E. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

The leaching front for cyromazine residues has been defined. Cyromazine residues are 1.0 ppm at the end of one year in the 0-6" depth. Movement to lower depths is shown, but all residues of cyromazine dissipate to below detection limit (<0.05 ppm) within one year's time. There is persistence in the upper 0-6" depth, but not below this. Melamine residues are 3.2 ppm at the end of one year. Residues below 1.0 ppm are present in both the 6-12" and 12-18" depths. The leaching front has not been defined for melamine residues in this soil. The depth to the water table in this Florida setting was not given in the report.

10.4

A. STUDY IDENTIFICATION:

Volume IV-Sandy Soil Dissipation Study conducted in Indian River, Florida. by L. Ballantine.

B. MATERIALS AND METHODS:

Same as in Section B. under 10.1. The percent recoveries on cyromazine and melamine varied from 63-125%. The depth to the water table is 1-2 feet.

C. REPORTED RESULTS:

Time (days)	[Cyromazine] ppm at depths 0-6"	6-12"	12-18"	[Melamine] ppm at depths 0-6"	6-12"	12-18"
Before Appl.	<0.05			<0.05		
0	1.3,2.6			0.07,0.14		
14	2.4			0.96		
30	1.0			0.67		
59	0.70			0.73		
122	0.25	0.20		0.34	0.30	
183	0.24	0.11	0.11	0.33	0.08	0.09
274	0.13	0.14	0.10	0.37	0.11	0.10
365	0.20	0.17	0.09	0.62	0.47	0.11

t1/2 = 83-93.3 days (half-life) in the 0-6" depth
k = -0.007 day^{-1} (decay rate) "
r = 0.8725 (correlation coefficient)

Soil characteristics: sand with %s,s,c = 94,2.6,3.4; %OM = 22.3; pH = 4.4; BD = 1.34 g/ml; %FC = 7-9.

D./E. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

The depth of leaching or the leaching front has not been defined for this soil. Detectable residues are found at all depths. The rapid disappearance of cyromazine and melamine residues in this soil compared to the other soil types involved in these studies may be because of leaching. The water table is within 1-2 feet of the soil surface. In this setting, cyromazine and melamine will reach ground water. Use of either would present a ground-water contamination problem. This particular environment and use rate (40 X) provides a worst-case situation for groundwater contamination.

10

11. COMPLETION OF ONE LINER:

No one-liner begun at this time.

12. CBI:

No CBI was included with this package.