UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

02 MAR 1984

MEMORANDUM

SUBJECT: Comment on leaching of the cyromazine and metabolite melamine

TO: Tim Gardner
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No leaching data are available for the cyromazine metabolite melamine, by itself. However, in the 30 day aged soil leaching study for the parent ^{14}C-cyromazine, 44% of the radioactivity (^{14}C) was retained in a sandy soil (Collombey sand, 87% sand, 10.3% silt and 2.8% clay, 2.2% organic matter, pH 7.8) column, 12% in the upper 2 cm while the remainder was evenly distributed in the other sections of the column. Approximately 51% leached through the soil column. TLC analysis of the eluate showed that 18% of the leachate ^{14}C was cyromazine and 29% was the degradate melamine.

In a silt loam soil (Les Evouettes silt loam, 38.4% sand, 49.4% silt, 12.2% clay, 3.6% organic matter, pH 6.1), under the same conditions as the above, no ^{14}C was found in the leachate. However, ^{14}C residues were found in the other sections of the column.

Soil metabolism studies show that melamine forms in soil and is a stable degradate of cyromazine.

Based on the above data, EAB concludes that melamine will be mobile in sand soils and moderately mobile in silt loam soils.

EAB has requested that a field dissipation study be conducted with monitoring the soil for the presence of the metabolite melamine to determine its leaching potential.

ADDENDUM TO CYROMAZINE LEACHING COMMENTS MEMORANDUM

The following is in response to your further request for data on cyromazine.

1.0 Summary of Environmental Characteristics

1.1 Adsorption and Leaching

Cyromazine and melamine have potential to leach in soils low in organic matter. Cyromazine and aged cyromazine residues are considered mobile in sand soils and moderately mobile in silt loam soils.

1.1.1 Adsorption

Cyromazine showed slight to moderate adsorption to soil.

Cyromazine adsorption K values:

K value	Soil Type	% Soil Organic Matter
0.5	sand soil	2.2 (moderate organic matter content)
2.4	sandy clay loam	5.6
3.9	silt loam	3.6
17	organic	17 (high organic matter content)

1.1.2 Soil Column Leaching

Cyromazine and aged cyromazine residues are mobile in sand soils and moderately mobile in silt loam soils. After 30 days aging, ^{14}C residues of cyromazine were found throughout the columns of both soils. Both cyromazine and melamine were found in leachate of the sand soil column.

1.2 Microbial breakdown

Cyromazine degrades by microbial activity to melamine under aerobic soil conditions. Aerobic soil half-life is estimated to be 1.3 to 2 years. Melamine appears to be stable to further degradation. However, in the field cyromazine may leach to depths beyond the area of microbial degradation thereby resluting in a longer half-life.

1.3 Photodecomposition

Cyromazine is stable to photolysis without sensitizer present. With acetone present as sensitiser, photolytic half-life is about 10 hours. Melamine is the photodegradation product of cyromazine.

1.4 Bioaccumulation

Cyromazine residues do not appear to bioaccumulate in fish.

1.4.1 Flow-Through System

Bluegill sunfish had a mean maximum bioaccumulation factor for cyromazine residues of <1X in edible tissue over the first 3 days of exposure (the maximum uptake period) and in non-edible tissue over the 28 day exposure period.

Depuration half-life was 3-7 days for residues in non-edible tissues. Residues were non-detectable in edible tissues during the depuration period.

1.4.2 Static System

Bluegill sunfish had a bioaccumulation factor of <1X in edible and non-edible tissues and in whole fish.

1.5 Hydrolysis

Cyromazine is stable to hydrolysis in buffered solutions at pH 5, 7, and 9.

PESTAN LEACHING MODEL FOR MELAMINE

At your further request, EAB considered the leaching of melamine using the PESTAN LEACHING MODEL. A quick check of CIBA-Geigy's choice of input parameters shows that we would choose different values. More time is needed for additional work.

1.0 For this determination, the MODEL assumes constant degradation independent of soil depth. In the field, this is not the case, microbial populations decrease rapidly begining at the 2-3 feet depth.

2.0 For the EAB run, several input parameters are different than those in the CIBA-Geigy PESTAN LEACHING MODEL run:

2.1 EAB assumes that the application of 0.05 lb/A application of cyromazine equates to 0.05 lb/A application of melamine (or 0.055 kg/Ha).

2.2 Bulk density of the sand soil is 1.3 gms/cc.

2.3 The degradation rate coefficient is $0.00004/hr^{-1}$. This value is based on half-life of 2 years and the fact that degradation will be slower at deeper soil depths.

3.0 EAB used the 5,000 ppm water solubility for melamine provided by CIBA-Geigy as well as the $k_d = 0.04$. EAB files do not contain water solubility data for melamine.

3.0 Results

Based on the input parameters given on the attached PESTANS LEACHING MODEL run:

3.1 After 13 months, a peak level of 0.46 ppb melamine residues would be present at depth of 14.7 feet. Residues of 0.033 ppb would be present as far down as 55 feet after one year.

3.2 After 26 months, a peak level of 0.094 ppb melamine residues would be present at depth of 25.7 feet. Residues of 0.014 would be present as far down as 62.3 feet after 26 months

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3.3 After 34 months, 0.024 ppb melamine residues would be present at depth of 40.3 feet. Residues of 0.011 ppb would be present as far down as 69.7 feet after 34 months.

3.4 Leaching of residues at levels greater than 0.01 ppb was not found to occur at depths greater than 69.7 feet.

3.5 In event that cyromazine is used in soils of greater porosity than represented here by this model and in event of higher recharge and/or slower degradation, leaching of more residues to lower depths would occur.

3.6 Note: EAB can not ascertain if these values are greater or less than the detection limits of an analytical method used to measure melamine.

MELAMINE/CHICKEN/GEORGIA

Model: PESTAN
Date: 3/2/84
Solubility = 5000 ppm
Recharge Rate = .0145 cm/hr
Sorption Constant = .04
Degr. Rate Coeff. = .00004 /hr
Bulk Density = 1.3 gms/cc
Soil Porosity = .395 cc/hr

Char. Curve Coeff. = 4.05
Dispersion Coeff. = 12.1 cm2/hr
Proj. Water Content = 0.27
Pore Water Velocity = .054cm/hr
Pollutant Velocity = .045cm/hr
Length of Slug = .000cm

Equivalent to .0549911 kg a.i./Ha

SOLUTION CONCENTRATIONS in PPM [ppB]

At Day...	0	130	260	390	520	650	780	910	1040	1170	1300
0 cm	0.96	[1.5]	[.49]	[.30]	[.099]	[.036]	[.014]	[.013]			
110 cm		[1.6]	[.60]	[.20]	[.099]	[.060]	[.029]				
220 cm		[1.7]	[.65]	[.36]	[.18]	[.048]	[.029]	[.017]			
330 cm		[1.3]	[.65]	[.26]	[.079]	[.12]	[.043]	[.017]			
440 cm		[.90]	[.65]	[.46]	[.079]	[.14]	[.036]	[.013]	[.013]		
550 cm		[.45]	[.38]	[.30]	[.26]	[.11]	[.058]	[.031]	[.021]		
660 cm		[.27]	[.49]	[.33]	[.040]	[.060]	[.065]	[.035]	[.013]		
770 cm		[.090]	[.33]	[.30]	[.22]	[.13]	[.094]	[.026]	[.011]		
880 cm			[.11]	[.20]	[.16]	[.084]	[.058]	[.017]	[.016]		
990 cm			[.11]	[.16]	[.099]	[.072]	[.043]	[.044]			
1100 cm			[.054]	[.098]	[.12]	[.11]	[.043]	[.026]	[.021]		
1210 cm				[.098]	[.059]	[.060]	[.051]	[.017]	[.024]		
1320 cm				[.033]	[.059]	[.048]	[.043]	[.017]			
1430 cm				[.033]	[.059]	[.060]	[.036]	[.022]	[.013]	[.013]	
1540 cm				[.033]	[.040]	[.036]	[.036]	[.022]			
1650 cm				[.033]	[.020]	[.012]	[.014]	[.017]	[.013]		
1760 cm						[.012]	[.029]		[.013]		
1870 cm						[.024]	[.014]	[.013]	[.011]		
1980 cm								[.013]			
2090 cm					[.020]				[.011]		
2200 cm											

| = VALUES LESS THAN OR EQUAL TO 0.01 ppB