Date Out:

Chemical Code: 129099
DP Barcode: D200228

ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: Dennis Edwards, Jr., PM # 19
Registration Division (7508W)

From: Betsy Behl, Section Head
Ground Water Technology Section
Environmental Fate & Ground Water Branch/EFED (7507C)

Thru: Henry Jacoby, Chief
Environmental Fate & Ground Water Branch/EFED (7507C)

Attached, please find the EFGWB review of...

Common Name:	Imidacloprid	Trade name:	NTN 33893, Bay NTN 33893
Company Name:	Miles, Inc.		
ID #:			
Purpose:	Review "Submission Related Data Package" for Imidacloprid		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
Insecticide	001		4 days

STATUS OF STUDIES IN THIS PACKAGE:

Guideline #	MRID	Status[1]
None		C

STATUS OF DATA REQUIREMENTS ADDRESSED IN THIS PACKAGE:

Guideline #	Status[2]
-	-

[1]Study Status Codes: A = Acceptable, U = Upgradeable, C = Ancillary, I = Invalid

1. CHEMICAL:

Chemical name: 1-((6-Chloro-3-pyridinyl)methyl)-4,5-dihydro-N-nitro-1H-imidazol-2-amine
Common name: Imidacloprid
Trade name(s): NTN 33893, Bay NTN 33893
Structure:

2. TEST MATERIAL:

Not Applicable.

3. STUDY/ACTION TYPE:

Review Submission Related Data Package

4. STUDY IDENTIFICATION:

Title: Degradation and Translocation of Imidacloprid (NTN 33893) Under Field Conditions on a Lysimeter

Author: e. Hellpointner

Identifying No.: 129099
DP Barcode: D200228
Date Sent to EFED: 3/9/94

5. REVIEWED BY:

Kevin J. Costello
Signature: _____
Hydrologist
OPP/EFED/EFGWB/Ground-Water Section
Date _____

6. APPROVED BY:

Betsy Behl
Signature: EBehl
Section Head
OPP/EFED/EFGWB/Ground-Water Section

7. CONCLUSIONS

Miles submitted the results of a German lysimeter leaching study to EFGWB in support of a requested waiver of prospective ground-water monitoring study requirements. The results of the lysimeter study indicate that imidacloprid (NTN) is unlikely to leach under the conditions of the study. Only 0.024 and 0.037% of applied radioactivity was detected in leachate from the bottom of the 1.1 m soil column. The majority of the radioactivity remaining in the soil column after two years was bound to the soil, unextractable.

The small mass of leached radioactivity is consistent with the results of field dissipation studies, in which all of the NTN remained in the top 12 inches of the soil column after a 1 year study. However, the results are apparently inconsistent with laboratory-derived persistence and mobility data. The aerobic soil-metabolism half-life of NTN has been determined to be greater than 1 year, and the partition coefficient (Kd) of NTN ranges from 0.956 in sand soils to 3.45 in a loam soil.

A possible explanation for the results of the study stems from the application of NTN directly to seed potatoes set in the ground. It is possible that localized increased microbiologic activity caused localized anaerobic conditions, under which NTN has a half-life of 27 days. It is also conceivable that the NTN was less able to leach simply because it was applied directly to organic matter.

With these possibilities in mind, EFGWB considers this lysimeter study data to be useful in evaluating the leaching potential of NTN applied as a covering on seed potatoes **only.** Other modes of application, such as by surface spraying, or by soil incorporation other than seed treatment, would not likely result in the concentration of NTN in areas of localized anaerobic conditions.

Simulations of the application of NTN and seven alternative pesticides to tomatoes in California and potatoes in Wisconsin using the PATRIOT screening model indicated that NTN would pose a far greater potential to leach than the other chemicals. However, the estimated Health Advisory Level for NTN is substantially higher when compared to HAL's for the other chemicals that were predicted to leach under the same conditions.

8. RECOMMENDATIONS

1. Based on the study described in this submission, EFGWB recommends that the prospective ground-water monitoring study be reserved for seed-coating applications of NTN.

2. The registrant should perform two small-scale prospective ground water studies (worst-case and typical conditions) to evaluate the leaching potential of NTN when applied by soil-incorporation (non-seed-treatment). The registrant should provide EFGWB with information regarding which crops are expected to account for the major uses of NTN, to facilitate study design. The addition of new uses in the future may require the performance of additional ground-water studies.

3. NTN is currently registered for use in several countries in Europe and Asia. Miles should share ground-water monitoring for NTN from abroad with OPP, in order to facilitate the evaluation of the chemical's potential to leach.

9. BACKGROUND

Environmental Fate Studies

While the results of environmental fate studies in the NTN registration package indicate that the chemical is persistent and mobile enough to leach to ground water, the results are not conclusive. Aerobic soil metabolism studies indicate that NTN is highly persistent, with a half-life greater than a year. Partition coefficients for NTN range from below 1.0 for a sand

soil, to 4.7 in a silt loam, indicating NTN should be as mobile as other pesticides previously shown to leach. However, NTN was not seen to leach below 12 inches in field dissipation studies in California, Georgia, and Minnesota.

10. DISCUSSION

Miles performed this lysimeter study for imidacloprid in accordance with German study guidelines, as part of the registration package for use in Germany. The lysimeters cores consisted of 1.1 meters of native sandy loam soil, with a surface area of 1 square meter, collected intact in a steel frame and transported to the study area. NTN was applied as a seed treatment on potatoes at an application rate of 520 g a.i./ha, which is greater than the 0.5 lb/acre on the United States label. Over the two-year study period, 66 inches of total precipitation and irrigation were applied to the field, greater than the local 20-year average of 58 inches, and the German guideline requirement of 800 mm per year. After the potatoes were harvested, the plot was rotated to wheat and then barley.

Over the two year duration of the lysimeter study, 0.024 and 0.037 % of the applied radioactivity was detected in the leachate collected at the bottom of the two lysimeter cores, respectively. This translates to a parent equivalents concentration of 0.069 and 0.081 ppb.

A possible explanation for the results of the study stems from the mode of application used for the lysimeter test. NTN was applied to seed potatoes set in the ground, by spraying one side of the potato, turning it, then spraying the other side. It is possible that localized increased microbiologic activity in the vicinity of the treated seed potatoes greatly increased biologic oxygen demand (BOD), causing localized anaerobic conditions. With an anaerobic half-life of 27 days, NTN under these conditions would degrade much more quickly, potentially to a degradate much more likely to strongly bind to the soil. It is also conceivable that the NTN was less able to leach simply because it was applied directly to organic matter (the seed potatoes).

PATRIOT Modeling

The pesticide leaching screening model PATRIOT was used to compare estimated relative leaching potential between NTN and possible alternatives for use on vegetables. A simulation was compiled to model the leaching of NTN and 7 alternatives when applied to tomatoes on the Delhi soil series in California. The 10-year simulation was run using historical weather data provided in the database from the Sacramento weather station.

The results of these simulated applications predicted far greater leaching of NTN than any of the alternatives considered. PATRIOT predicted an annual average leaching of 19.3% of NTN applied to the simulated 177 cm water table. Of the remaining chemicals, only methomyl was predicted to leach at all, at an annual average rate of 2.1%. No leaching was predicted for dimethoate, methamidophos, disulfoton, endosulfan, oxamyl, or permethrin.

Similarly, NTN was predicted to leach at a greater rate than 9 alternatives simulated for potatoes in Wisconsin, including aldicarb and carbofuran. PATRIOT predicted an annual average leaching of 6.1% of NTN applied to the simulated 128 cm water table. Of the remaining chemicals, only carbofuran, aldicarb and oxamyl were predicted to leach, at rates of 2.2, 1.9% and 0.6%, respectively.

Although NTN was predicted in the screening model to be most likely to leach, it poses a lesser chronic risk than the other chemicals predicted to leach. The lifetime Health Advisory Level for NTN has been estimated to be 525 ppb. The Office of Water has set Maximum Contaminant Levels of 10 ppb and 40 ppb, respectively, for aldicarb and carbofuran. The Lifetime Health Advisory Level for both methomyl and oxamyl is 200 ppb.

Scenario Number	Soil Number	Soil Name	Pesticide Name	Crop Name	Unit Leach (Kg/Ha)
1	22911	PLAINFIELD	ALDICARB	POTATOES	0.019
2	22911	PLAINFIELD	METHAMIDOPHOS	POTATOES	0.000
3	22911	PLAINFIELD	DISULFOTON	POTATOES	0.000
4	22911	PLAINFIELD	PHORATE	POTATOES	0.000
5	22911	PLAINFIELD	CARBOFURAN	POTATOES	0.022
6	22911	PLAINFIELD	AZINPHOS-METHYL	POTATOES	0.000
7	22911	PLAINFIELD	OXAMYL	POTATOES	0.006
8	22911	PLAINFIELD	ENDOSULFAN	POTATOES	0.000
9	22911	PLAINFIELD	PERMETHRIN	POTATOES	0.000
10	22911	PLAINFIELD	IMIDACLOPRID	POTATOES	0.061

Scenario Number	Soil Number	Soil Name	Pesticide Name	Crop Name	Unit Leach (Kg/Ha)
1	1591	DELHI	DIMETHOATE	TOMATOES	0.000
2	1591	DELHI	METHOMYL	TOMATOES	0.021
3	1591	DELHI	METHAMIDOPHOS	TOMATOES	0.000
4	1591	DELHI	DISULFOTON	TOMATOES	0.000
5	1591	DELHI	ENDOSULFAN	TOMATOES	0.000
6	1591	DELHI	OXAMYL	TOMATOES	0.000
7	1591	DELHI	PERMETHRIN	TOMATOES	0.000
8	1591	DELHI	IMIDACLOPRID	TOMATOES	0.193