

US EPA ARCHIVE DOCUMENT

D171612
DPBARCODE (RECORD)
110201
SHAUGHNESSY NO

REVIEW NO.

EEB REVIEW

DATE IN: 12/02/91 OUT: 12/11/91

CASE # : 220773 REREG CASE # : _____
SUBMISSION # : S407396 LIST A, B, C, D.
ID # : 055947-UG

DATE OF SUBMISSION 11/22/91

DATE RECEIVED BY EFED 11/25/91

SRRD/RD REQUESTED COMPLETION DATE 03/21/92

EEB ESTIMATED COMPLETION DATE 12/09/91

SRRD/RD ACTION CODE/TYPE OF REVIEW 115 NC-NON-FOOD/FEED USE

MRID #(S) _____

DP TYPE 001 SUBMISSION RELATED DATA PACKAGE

PRODUCT MANAGER, NO. JOANNE MILLER, 23

PRODUCT NAME(S) BARRICADE

TYPE PRODUCT F R I N H D HERBICIDE

COMPANY NAME SANDOZ CROP PROTECTION CORPORATION

SUBMISSION PURPOSE REVISED LABELING

INCLUDE USE(S) TURF, LANDSCAPE ORNAMENTALS

COMMON CHEMICAL NAME PRODIAMINE

**ADDENDUM TO EEB RISK ASSESSMENT FOR PRODIAMINE
ON TURF AND LANDSCAPE ORNAMENTALS (8/13/91)**

Sandoz Crop Protection Corporation has revised the prodiamine labeling for use on turf and landscape ornamentals to include risk reduction measures (see attached label). Sandoz has also submitted information in an effort to quantify potential exposure of prodiamine to terrestrial organisms. This information, however, is not completely appropriate for use in the following risk assessment; for example, in the Weed Science article (1991, Vol. 39:97-103) cited by the sponsor, the application equipment used to apply pendimethalin to turf was not typical of equipment likely to be used by commercial applicators or homeowners. Therefore, the residues reported immediately upon application are likely to be different.

100.3 Application Methods, Directions and Rates

Directions for use and methods of application have changed from the previous review. The maximum yearly rate of 1.5 lbs a.i./A remains the same, however this amount may no longer be applied in one application. The rate is now limited to a maximum of 0.75 lbs a.i./A per application with a maximum of two applications per year. These applications must be separated by at least 60 days.

101 Hazard Assessment

101.2 Likelihood of Adverse Effects on Nontarget Organisms

Terrestrial Organisms

Data suggest that prodiamine is practically nontoxic to birds on an acute oral and a dietary basis: $LD_{50} = 2250$ mg/kg and $LC_{50} = >10,000$ ppm for the bobwhite quail.

At a maximum rate of 0.75 lbs a.i./A, the following maximum/typical residue levels would be expected immediately after application:

<u>Substrate</u>	<u>Residue (ppm)</u>	
	<u>Maximum</u>	<u>Typical</u>
short range grass	180.0	93.7
long grass	82.5	69.0
leaves and leafy crops	93.8	26.2
forage (alfalfa and clover)	43.5	24.7
pod containing seeds	9.0	2.2
fruit	5.3	1.1

The major substrates of concern on turf are short grass and forage (which represents small seeds and/or insects). While the estimated maximum residue on forage could be 43.5 ppm (typical residues = 24.7 ppm), the actual residue is most likely lower than this as part of the chemical is intercepted by grass. Results of the pendimethalin study in Weed Science showed 95% of the pesticide intercepted by the turf. The only way to determine actual residues is to do a turf residue monitoring study using equipment employed by homeowners and commercial applicators. The rate at which these residues degrade over time can also be answered by this study.

Both the maximum and typical residues on short grass exceed the NOEL (no-effect-level) of 5 ppm [LOEL (lowest-effect-level) = 50 ppm] in an avian reproduction study on another member of the dinitroaniline family of compounds. However, several factors will further reduce the residues over time: photolysis, increase in grass biomass and subsequent mowings.

Acute hazards to nontarget terrestrial organisms (including endangered species) are not expected from the proposed use since the estimated environmental concentrations (EEC) are less than 1/5 and 1/10 LC₅₀ for the bobwhite quail.

Although chronic effects to terrestrial organisms cannot be assessed at this time due to lack of data (avian reproduction study), the proposed labeling changes, coupled with factors that will lower initial residues over time, serve to reduce potential chronic risks.

Aquatic Organisms

Based on the results of acute toxicity studies to freshwater fish and invertebrates (LC₅₀ > 552 ppb for bluegill; LC₅₀ > 829 ppb for rainbow trout; and LC₅₀ > 658 ppb for daphnia), prodiamine is not expected to pose a significant acute hazard to freshwater organisms at its limit of solubility in water (13 ppb). Acute toxicity to estuarine organisms cannot be determined at this time due to lack of data.

SWRRB (Simulator for Water Resources on Rural Basins), a computer model, was used to simulate runoff of prodiamine on turf. In simulation, the pesticide was applied at 0.75 lbs a.i. per acre twice a year (60 day interval), during March-April, for 8 years (1971-78). The soil photolysis value of 2.4 days was employed (see attachment). Using this method, an initial mean residue value of 0.13 ppb was determined in a six foot pond, approximately one acre in surface area.

Although the chronic toxicity base is incomplete, the existing data indicate that prodiamine is not expected to pose a significant chronic hazard to freshwater invertebrates. A supplementary chronic daphnia study shows the NOEL to be 1.5 ppb and the LOEL to be 2.6 ppb. As the EEC of 0.13 ppb falls

below the NOEL, adverse chronic effects to daphnia are not expected. However, a repeat chronic daphnia study may refute the assumption of no risk.

Chronic toxicity to freshwater fish cannot be determined at this time due to lack of data (fish early-life stage). Comparing the results of a fish early-life stage study to a chronic daphnia study for another dinitroaniline compound, the fish was 7x more sensitive. Should this be the case for prodiamine, the NOEL would be approximately 0.21 ppb. This value is above the initial EEC of 0.13 ppb which would indicate minimal risk.

101.4 Adequacy of Toxicity Data

Data are sufficient to assess acute risks of the use of prodiamine to nontarget terrestrial and aquatic species, with the exception of estuarine species. Data are not sufficient to assess the chronic risks to nontarget organisms. In order to complete the risk assessment for the use of prodiamine on turf, the following studies must be submitted:

- 72-3(a) Acute Estuarine/Marine Toxicity Fish
- 72-3(b) Acute Estuarine/Marine Toxicity Mollusc
- 72-3(c) Acute Estuarine/Marine Toxicity Shrimp
- 71-4(a) Avian Reproduction - Quail
- 71-4(b) Avian Reproduction - Mallard
- 72-4(a) Fish Early-Life Stage
- 72-4(b) Aquatic Invertebrate Life Cycle

A chronic estuarine organism study (on the most sensitive species) is in reserve pending the results of the 3 acute estuarine/marine studies, the freshwater fish early-life stage and the repeat chronic daphnia study. A turf residue monitoring study is also in reserve pending the results of the avian reproduction studies.

103 Conclusions

Use of prodiamine is not expected to adversely affect nontarget organisms on an acute basis. Chronic risk to freshwater invertebrates is also not expected. Although EEB is unable to assess the chronic risk to avian and fish species at this time, the label rate of 0.75 lb a.i. with a second application no sooner than 60 days later greatly reduces the potential for chronic risk to both terrestrial and aquatic organisms.

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Prodiamine / Yazoo turf

(A) $\left\{ \begin{array}{l} 0.75 \text{ lb/A} \text{ (Reduced from } 1.5 \text{ lb/A), One appl.} \\ \text{Foliar } t_{1/2} = 2.4 \text{ da (changed from soil incorporation)} \end{array} \right.$

<u>Yr</u>	<u>g/H</u>	<u>kg/10H (± 100)</u>	<u>ppb (x50)</u>	<u>Rank</u>
1971	0.099	0.00099	0.0495	(7)
1972	0.292	0.00292	0.1460	(2)
1973	0.206	0.00206	0.1030	(4)
1974	0.681	0.00681	0.3405	(1)
1975	0.070	0.00070	0.0350	(8)
1976	0.169	0.00169	0.0845	(5)
1977	0.107	0.00107	0.0535	(6)
1978	0.272	0.00272	0.1360	(3)

Range 0.035 ~ 0.345
Med. 0.1030

(B) $\left\{ \begin{array}{l} 0.75 \text{ lb/A (" ") Two appl. (60-d. interval)} \\ \text{Foliar } t_{1/2} = 2.4 \text{ da} \end{array} \right.$

<u>Yr</u>	<u>g/H</u>	<u>kg/10H (± 100)</u>	<u>ppb (x50)</u>	<u>Rank</u>
1971	0.212*	0.00212	0.1060	(6)
1972	0.306	0.00306	0.1530	(2)
1973	0.216	0.00216	0.1300	(4)
1974	0.725	0.00725	0.3625	(1)
1975	0.101*	0.00101	0.0505	(8)
1976	0.179	0.00179	0.0895	(7)
1977	0.238*	0.00238	0.1190	(5)
1978	0.286	0.00286	0.1430	(3)

Range 0.0505 ~ 0.3625
Med. 0.1376

* Runoff after 2nd appl.

* Pdamine, dat

Crabgrass emergence / US

3/15 ~ 4/15
(94) (103)

Prodiaminol

$K_d = 181.6 \rightarrow 2996.4$

water-in

$K_s = 0.0122$

App Eff 90% of 1.5 lb ai.
got to soil.

$K_{oc} = K_d \times \frac{100}{2} = 181.6 \times 50 = 9080$

$K_d = K_{oc} \times \frac{33\%}{100\%} = 9080 \times \frac{33}{100} = 2996.4$

Tazoo turf 1.5 lb march ~ Apr.

Crabgrass emergence

Mar. 15 ~ Apr. 15

Yr	J.D.	θ/H	$K_d/10H (\times 100)$	ppb ($\times 50$)	Rank
1971	85	0.401	0.00401	0.2005	(7)
1972	84	0.825	0.00825	0.4125	(3)
1973	96	0.687	0.00687	0.3435	(4)
1974	100	2.834	0.02834	1.4170	(1)
1975	86	0.187	0.00187	0.0935	(8)
1976	86	0.413	0.00413	0.2065	(6)
1977	91	0.455	0.00455	0.2275	(5)
1978	99	1.108	0.01108	0.554	(2)

Range 1.417 ~ 0.09

Med. 0.3435 ppb

Diamine 1, DAT

App rate = 0.75 lb/A Two app

Fol. $t_{1/2}$ = 2.4 da

Diamine 2, DAT

App rate = 0.75 lb/A Two app

Fol. $t_{1/2}$ = 2.4 da

2 yrs

4 yrs

Table 2. Estimated Concentrations of Prodiamine (ppm) after Application to Turf at 0.75 lb a.i./A.

mm.?
on base ground
or
on turf?

DAYS ^{1/}	LEAF TISSUE ^{2/ 2/}	THATCH ^{2/}	SOIL 0-2.5 MM) ^{4/}
0	47.36	0.132	0.019
1	35.48208	0.098894	0.018753
5	11.17889	0.031157	0.017797
10	2.638677	0.007354	0.016671
20	0.147014	0.000409	0.014628
30	0.008190	0.000022	0.012835
40	0.000456	0.000001	0.011262
50	0.000025	0.000000	0.009881
60	0.000001	0.000000	0.008670
70	0.000000	2.2E-10	0.007607
80	0.000000	1.2E-11	0.006675
90	0.000000	6.8E-13	0.005857
100	1.4E-11	3.8E-14	0.005139

- ^{1/} Values at T=0 are 0.5 x the measured concentrations of pendimethalin following a single application at 1.5 lb a.i./A (Weed Sci. 1991, 39, 97-103).
- ^{2/} (-_{1/2} leaf and thatch = 2.4 days (based on mean soil photolysis, n=2); this is a worst-case scenario for estimating environmental persistence because (-_{1/2} = 20 min. for aqueous photolysis, which may be more appropriate for leaf tissue.
- ^{3/} Residues in leaf tissue are not corrected for removal by mowing.
- ^{4/} (-_{1/2} soil = 53 days (based on a mean of 2 field dissipation and 2 laboratory metabolism studies.

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