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ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: Joanne Miller, PM #23
Registration Division (H7507C)

From: Akiva Abramovitch, Section Chief
Chemical Review Section #3
Environmental Fate & Ground Water Branch/EFED (H7507C)

Thru: Henry Jacoby, Chief
Environmental Fate & Ground Water Branch/EFED (H7507C)

Henry Jacoby 8/16/93

Attached, please find the EFGWB review of...

DP Barcode:	D185559		
Common Name:	Hydrogen cyanamide	**Trade name:**	Alzodef, Dormex
Company Name:	SKW Trostberg		
ID #:	54555		
Purpose:	Review of Data Submitted for the New Chemical Hydrogen Cyanamide.		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
Plant Growth Regulator	100	93-0219	6 days

STATUS OF STUDIES IN THIS PACKAGE:

Guideline #	MRID	Status[1]
161-2	42178409	A
162-1	42178410	A
162-2	42178412	U
163-1	42178414, 5	A
164-1	Waived	W

STATUS OF DATA REQUIREMENTS:

	Status[2]
161-2	S
162-1	S
162-2	P
163-1	S
164-1	W

[1]Study Status Codes: A=Acceptable U=Upgradeable C=Ancillary I=Invalid.
[2]Data Requirement Status Codes: S=Satisfied P=Partially satisfied N=Not satisfied R=Reserved.

1. CHEMICAL: Common name:

Cyanamide.

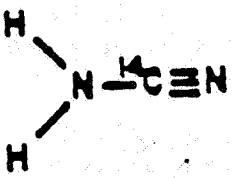
Chemical name(s):

Hydrogen cyanamide, carbamonitrile, amidocyanogen, and cyanogenamide.

Trade name(s):

Alzodef, Dormex, and SKW 83010.

Structure:



Formulations:

Emulsifiable concentrate (51%).

Physical/Chemical properties:

Molecular formula: CH_2N_2.
Molecular weight: 42.04.
Physical state: Colorless, hygroscopic crystals.
Melting point: 45-46 °C.
Vapor pressure (20 °C): 5×10^{-3} Torr.
Solubility (20 °C): 4.59 kg/L water. Soluble in alcohols, phenols, amines, ethers, and ketones. Sparingly soluble in benzene and halogenated hydrocarbons.

2. TEST MATERIAL:

Studies 1-3, and 5: Active ingredient.
Study 4: Emulsifiable concentrate.

3. STUDY/ACTION TYPE:

Review of photodegradation in water, aerobic soil metabolism, anaerobic soil metabolism, and soil mobility (column leaching and batch equilibrium) studies.

4. STUDY IDENTIFICATION:

Römbke, J. 1990. Determination of the soil column leaching of Alzodef. Project No. BE-EA-77-89-01-LEA2. Unpublished study performed by Battelle Europe, Frankfurt, Germany, and submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg AG, Trostberg, Germany. (42178415)

2

Rüdel, H. 1990. Determination of the adsorption/desorption of hydrogencyanamide. Project No. SKW-01/7-13. Unpublished study performed by Fraunhofer-Institut für Umweltchemie und Okotoxikologie, Schmallenberg, Germany, and submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg AG, Trostberg, Germany. (42178414)

Schmidt, J. 1990a. Aerobic soil metabolism of ^{14}C-cyanamide. ABC Final Report No. 38438. Unpublished study performed by ABC Laboratories, Inc., Columbia, MO, and submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg Ag, Trostberg, Germany. (42178410)

Schmidt, J. 1990b. Anaerobic soil metabolism of ^{14}C-cyanamide. ABC Final Report No. 38439. Unpublished study performed by ABC Laboratories, Inc., Columbia, MO, and submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg Ag, Trostberg, Germany. (42178412)

Schmidt, J. 1990c. Preliminary study of the aerobic soil metabolism of ^{14}C-hydrogencyanamide. ABC Final Report No. 38234. Unpublished study performed by ABC Laboratories, Inc., Columbia, MO, and submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg Ag, Trostberg, Germany. (41566505)

Schmidt, J.M. 1991a. Determination of the aqueous photolysis rate of ^{14}C-cyanamide. ABC Laboratories' Final Report No. 39035. Unpublished study performed by ABC Laboratories, Inc., Columbia, MO, and submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg AG, Trostberg, Germany. (42178409)

Schmidt, J. 1991b. Supplemental report of the aerobic soil metabolism of ^{14}C-cyanamide. ABC Final Supplemental Report No. 384381. Unpublished study performed by ABC Laboratories, Inc., Columbia, MO, and submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg Ag, Trostberg, Germany. (42178411)

Schmidt, J. 1991c. Supplemental report of the anaerobic soil metabolism of ^{14}C-cyanamide. ABC Final Supplemental Report No. 384391. Unpublished study performed by ABC Laboratories, Inc., Columbia, MO, and submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg Ag, Trostberg, Germany. (42178413)

Siemer, S.R. 1991. Field dissipation of hydrogen cyanamide (Dormex) in soil. Submitted by Siemer and Associates, Inc., Fresno, CA, for SKW Trostberg Ag, Trostberg, Germany. (42178416)

5. REVIEWED BY:

James A. Breithaupt
Agronomist, Review Section 3
EFGWB/EFED/OPP

Signature: James Breithaupt
Date: 8/12/93

6. APPROVED BY:

Akiva D. Abramovitch
Chief, Review Section 3
EFGWB/EFED/OPP

Signature: Akiva Abramovitch
Date: AUG 12 1993

7. CONCLUSION:

Hydrogen cyanamide is in the process of registration for use on desert grapes only. The data present in our files is sufficient to support the desert grape use. The desert grape use involves relatively dry conditions. Therefore, it is unlikely that leaching to lower soil depths will occur under this use with the rapid degradation in aerobic soil. The degradates are short-lived, ubiquitous, low molecular weight organic nitrogen compounds that can be readily incorporated into the metabolism of microbes and higher plants.

The 161-1, 161-2, 162-1, and 163-1 data requirements are satisfied in this review. The anaerobic soil metabolism (162-2) study may be upgraded (see instructions in this section). The 164-1 data requirement is waived in this review since no additional information on the fate of hydrogen cyanamide would be gained. Should the registrant pursue other registered uses, concern about leaching of degradates may require satisfying the 162-2 and 164-1 data requirements.

The spray drift study submitted in this package (MRID 42178424, Guideline 202-1) has been transferred to DP Barcode D193965, and will be formally reviewed by the Surface Water Section.

Aqueous photolysis (161-2, MRID 42178409, DER 1, Acceptable)

Hydrogen cyanamide photodegraded with half-lives of 29 days in pH 5 and 39 days in pH 7 aqueous solutions that were continuously irradiated with an artificial light source (xenon lamp) for 30 days at approximately 25 °C. The only degradate detected in the study was urea. The calculated half-lives were 116 and 139 days in the pH 5 and 7 dark control samples, respectively.

Aerobic soil metabolism (162-1, MRID 42178410, DER 2, Acceptable)

Hydrogen cyanamide degraded with an effective half-life of 3 days in sandy loam soil that was incubated in darkness at 23-25 °C and 70-75% of field moisture capacity. CO_2 was the major degradate; dicyanodiamide was the only minor degradate. Dicyanodiamide degraded with a half-life of 4.1 days.

Anaerobic soil metabolism (162-2, MRID 42178412, DER 3, Upgradeable)

The 162-2 study may be upgraded to acceptable if the registrant characterizes and identifies the 17 % of applied radioactivity identified as origin material.

Hydrogen cyanamide degraded with a half-life of 35 days in sandy loam soil that was incubated in darkness at 25 °C under anaerobic conditions

(nitrogen and flooding) for 60 days following a 12-hour aerobic incubation period. During the anaerobic portion of the study, CO_2 was the only major degradate. Four minor nonvolatile degradates were identified as dicyanodiamide, guanylurea, guanidine, and urea, which either remained constant or increased under anaerobic conditions. The degradates were primarily associated with the flood water throughout the study.

Leaching-adsorption-desorption (163-1, supplemental data)

The 163-1 data requirement is satisfied with the combination of the two supplemental soil mobility studies in this review (DER's 4 and 5). Hydrogen cyanamide was shown to be very mobile in sandy, sandy loam, and silt loam soils.

Unaged soil column leaching (163-1, MRID 42178415, DER 4)

The unaged soil column leaching study demonstrates the mobility of hydrogen cyanamide in soil. Hydrogen cyanamide was detected at 0.08-2.9% of the applied amount in the leachate from columns of sand, loamy sand, and sandy loam soil that were leached with 20 cm (7.8 inches) of water.

The EFGWB memorandum dated 11/27/92 stated that this soil column leaching study would satisfy the unaged mobility data requirement for the use of hydrogen cyanamide in desert grapes. Only 7.8 inches (20 cm) of water were applied to the soil in this study, which is less than the 20 inches of water required by the current guidelines. However, the 7.8 inches applied in this study was sufficient to show leaching of hydrogen cyanamide.

Unaged batch equilibrium (163-1, MRID 42178414, DER 5)

No more than 2 % of the applied hydrogen cyanamide was adsorbed at all intervals to sandy, sandy loam, and silt loam soils.

The batch equilibrium study demonstrates a lack of adsorption to soil particles. Only one concentration of test substance was studied instead of the normally-required 4 concentrations to determine Freundlich K_{ads}, K_{des}, and K_{oc} values. Adsorption of hydrogen cyanamide was so limited that Freundlich K-values would not accurately quantify the mobility of hydrogen cyanamide.

Terrestrial Field Dissipation (164-1, MRID 42178416)

The 164-1 data requirement for hydrogen cyanamide may be waived in this review since conducting a field dissipation study would not provide any additional information on the fate of hydrogen cyanamide. Hydrogen cyanamide degrades too rapidly in aerobic soil ($T_{1/2}$ of $\leq$3 days) to allow useful results from a field dissipation study.

The information submitted under the 164-1 guideline in this review is not a new field dissipation study, but a compilation of literature articles and submitted laboratory studies primarily dealing with metabolism, uptake, and efficacy of hydrogen cyanamide. These articles and submitted studies adequately demonstrate that hydrogen cyanamide degrades rapidly ($T_{1/2}$=3 days) in soil to dicyanodiamide, urea and ammonia. Hydrogen cyanamide and

its degradates are mobile in soil. However, the rate of degradation and metabolism of hydrogen cyanamide and its degradates should exceed the rate of leaching under most environmental conditions.

Drift Field Evaluation (202-1, MRID 42178424, Supplemental data)

The 202-1 studies in this review (MRID 42178424) provide supplemental data and do not satisfy the guideline at this time because the maximum wind velocities were only 4 miles/hour and no Droplet Size Spectra (201-1) studies were submitted. These studies may be upgraded to become partially acceptable with submission of additional field data and the Droplet Size Spectra. Additionally, the Agency needs 202-1 studies conducted at wind velocities that approximate 10 miles/hour to determine drift potential under the wind conditions to be stipulated on the label. A more detailed review and the associated DER's will be provided for the current submission of 202-1 data. The review and DER's will be identified by the new DP Barcode D193965.

ENVIRONMENTAL FATE ASSESSMENT

Aerobic soil metabolism is the only apparent means of degradation of hydrogen cyanamide. Hydrogen cyanamide rapidly degrades in aerobic soil with an effective half-life of 3 days to the degradates CO_2 and dicyanodiamide. Dicyanodiamide degraded with a half-life of 4 days to the commonly-applied fertilizer degradates urea and ammonia. Hydrogen cyanamide and its degradates are potentially mobile in soil since they are miscible in water and were primarily associated with the aqueous phase in both the anaerobic soil metabolism and batch equilibrium studies in this review. However, the use of hydrogen cyanamide should not pose a significant, additional ground water threat since the parent compound is not persistent, and the degradates are short-lived, ubiquitous, low molecular weight organic nitrogen compounds that can be readily incorporated into the metabolism of microbes and higher plants.

8. RECOMMENDATIONS:

(1) The aqueous photolysis (161-2, MRID 42178409), aerobic soil metabolism (162-1, MRID 42178410), and leaching-adsorption-desorption (163-1, MRID's 42178414, 42178415) data requirements are satisfied in this review.

(2) The anaerobic soil metabolism study (162-2, MRID 42178412) may be upgraded if the registrant characterizes and identifies the radioactivity from the soil extracts that remained at the origin of the TLC plates.

(3) Terrestrial field dissipation (164-1) may be waived in this review since hydrogen cyanamide degrades very rapidly ($T_{1/2}$=3 days) in aerobic soil. Therefore, conducting a field dissipation study would not provide any additional information on the fate of hydrogen cyanamide.

(4) The 202-1 studies in this review (MRID 42178424) provide supplemental data and do not satisfy the guideline at this time because the maximum wind velocities were only 4 miles/hour and no Droplet Size Spectra (201-1) studies were submitted. These studies may be upgraded to become partially

acceptable with submission of additional field data and the Droplet Size Spectra. Additionally, the Agency needs 202-1 studies conducted at wind velocities that approximate 10 miles/hour to determine drift potential under the wind conditions to be stipulated on the label. A more detailed review and the associated DER's will be provided for the current submission of 202-1 data. The review and DER's will be identified by the new DP Barcode D193965.

Status of Data Requirements

Satisfied:

Hydrolysis (161-1); Literature data, EFGWB 85-806, 11/21/85. Hydrogen cyanamide is stable to hydrolysis at pH's 5, 7,and 9.

Aqueous Photolysis (161-2); MRID 42178409, EFGWB 93-0219, this review. There were half-lives of 29 days in pH 5 and 39 days in pH 7 aqueous solutions. The calculated half-lives were 116 and 139 days in the pH 5 and 7 dark control samples, respectively. The single degradate identified was urea.

Aerobic Soil Metabolism (162-1); MRID 42178410, EFGWB 93-0219, this review. There was an effective half-life of 3 days in sandy loam soil. CO_2 was the major degradate; dicyanodiamide was the only minor degradate. Dicyanodiamide degraded with a half-life of 4.1 days.

Leaching-Adsorption-Desorption (163-1)

Batch Equilibrium (163-1); MRID 42178414, EFGWB 93-0219, this review. A maximum of 2 % of parent compound was adsorbed in a batch equilibrium study.

Soil Column Leaching (163-1); MRID 42178415, EFGWB 93-0219, this review. Between 0.8-2.9 % of the applied dose was found in the supernatant from 7.8 inches of added water.

Unsatisfied:

Droplet Size Spectrum (201-1, required on 7/20/92).

Upgradeable:

Anaerobic Soil Metabolism (162-2); MRID 42178412, EFGWB 93-0219, this review. Half-life of 35 days in anaerobic sandy loam soil. CO_2 was the only major degradate. Four minor nonvolatile degradates were identified as dicyanodiamide, guanylurea, guanidine, and urea, which either remained constant or increased under anaerobic conditions. The degradates were primarily associated with the flood water throughout the study.

Drift Field Evaluation (202-1). The registrant has submitted a Drift Field Evaluation study (MRID 42178424) that will be formally reviewed by the Surface Water Section under the new DP Barcode D193965.

Waived:

Terrestrial Field Dissipation (164-1); MRID 42178416, EFGWB 93-0219, this review. Hydrogen cyanamide degrades too rapidly in aerobic soil ($T_{1/2}$ of $\leq$3 days) to allow useful results from a field dissipation study.

9. BACKGROUND:

A. Introduction

B. Directions for Use

Hydrogen cyanamide is a contact herbicide/growth regulator registered for use to control early postemergent broadleaf weeds in alliums and bulb flowers, and to remove side shoots and inhibit sprouting in hops and vines. Hydrogen cyanamide is not intended to be tank-mixed with other materials, with the exception of a nonionic surfactant to aid in wetting and promote uniform response. Single active ingredient formulations include emulsifiable concentrate (51%). Currently, cyanamide is being registered for use on grapes to promote uniform budbreak in the spring (i.e., during January) after pruning. According to label restrictions, it is to be used only on desert-grown grapes in the California counties of Imperial, Riverside, and San Bernardino, and the Arizona counties of Maricopa, Pinal, and Yuma. The maximum proposed application rate is 17.2 lb ai/A. Hydrogen cyanamide is toxic to both fish and bees.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

Refer to attached reviews.

11. COMPLETION OF ONE-LINER: One-liner was updated.

12. CBI APPENDIX:

All data reviewed here are considered "company confidential" by the registrant and must be treated as such.

Subject: Accession 421784-24. Status of Hydrogen Cyanamide Spray Drift Studies.

From: Robert Hitch, Ecologist, R. Hitch
Surface Water Section
Environmental Fate and Groundwater Branch

To: James Breithaupt, Agronomist,
Chemical Review Section
Environmental Fate and Groundwater Branch

THRU: Henry Nelson, Ph.D, Chief, H Nelson
Surface Water Section
Environmental Fate and Groundwater Branch

This memorandum addresses the immediate questions concerning the Spray Drift data requirements for hydrogen cyanamide. A formal review will be forwarded by the end of the month.

Hydrogen Cyanamide is used as a plant growth regulator in grapes.

SKW Trostberg AG submits this study to satisfy the requirement for a Drift Field Evaluation 202-1. The accession describes three Drift Field Evaluation tests conducted in the Coachella Valley of California.

CONCLUSIONS

The studies in this accession can not meet the requirement for a Drift Field Evaluation (FIFRA guideline 202-1). They are judged to be supplemental. They can not be accepted by the Agency without the support of Droplet Size Spectra studies (FIFRA guideline 201-1) and these have not be submitted. Additionally, the maximum sustained wind in the Drift Field Evaluations was four miles per hour and the Agency needs studies at higher wind velocities which more realistically reproduce real worst case working conditions.