

EEB

Shaughnessy No.: 080807

Date Out of EAB: 03/08/88

TO: Richard F. Mountfort
Product Manager 23
Registration Division (TS-767C)

FROM: Patrick W. Holden, Team Leader *PWH*
Ground-Water Team
Exposure Assessment Branch
Hazard Evaluation Division (TS-769C)

Attached, please find the EAB review of...

Reg./File # : _____
Chemical Name: Simazine
Type Product : Herbicide
Product Name : Princep
Company Name : Ciba-Geigy Corp.
Purpose : Updated Assessment of Leaching Potential

Date Received: 01/26/88

Action Code: 661

Date Completed: 02/23/88

EAB # (s): 80058 to 80063

Monitoring study requested: _____

Total Reviewing Time: 8h

Monitoring study voluntarily: In progress

Deferrals to: _____ Ecological Effects Branch
_____ Residue Chemistry Branch
_____ Toxicology Branch

Confidential Business Information—
Does Not Contain National Security Info. (E.O. 12065)

PACK No.: 34894
RTAOLI Hed

IDENTICAL NAME: *Simazine*

(RD PROVIDE)
SHAQUINESSY NO.
080807-1

Identifying Number	Action Code	Reference Number	Record Number	Study Guideline or Narrative Description	Reg. Std. Review Submission Criteria (SEE BELOW)	Accession Number	(HED/BUD/TSS Complete) Study found to be Acceptable (A)/ Unacceptable (U) for review or reviewer comment
100-541	661	99		<i>Simazine Reg. Std.</i>	2	262641	205, 946
100-541	661	99		<i>Groundwater</i>	2	262642	205, 947
100-541	661	99		<i>Data</i>	2	262644	205, 948
100-541	661	99			2	262643	205, 949
100-541	661	99			2	256317	205, 950
100-541	661	99			2	262643	205, 951

PRODUCT MANAGER (PM) or REVIEW MANAGER (RM) AND NUMBER:

PM/RM TEAM MEMBER AND NUMBER:

Richard F. Mountfort, PM-23

Robert J. Keady, Team 23

DATE RECEIVED (EPA):

RD BRANCH CHIEF INITIALS:

CHECK APPLICABLE BOX:

- ☐ Adverse 6(a)(2) Data (405,406) ☐ Product Specific Data (Reregistration) (655,656)
☐ Suspect Data (415,416) ☒ Generic Data (Reregistration) (660,661)
☐ IBT Data (485,486) ☐ Special Review Data (870,871)

NUMBER OF INDIVIDUAL STUDIES SUBMITTED:

HAVE ANY OF THE ABOVE STUDIES (in whole or in part) BEEN PREVIOUSLY SUBMITTED FOR REVIEW? (circle: yes or no) If yes, please identify the study(ies):

TO BE COMPLETED BY RSERB

DATE SENT TO HED/BUD/TSS: *10-21-84*

PRIORITY NUMBER: *50*

PROJECTED RETURN DATE: *12-21-84*

RELATED ACTIONS:

Re: Simazine Reg. Std - issued 4/13/84

INSTRUCTIONS:

*Simazine Groundwater Data - for HED/EPA
 Review in accordance with Policy Note #31
 Refer to attached note to P.M. 1/2/85
 Report 10-16-84 from Frank Keady, RD, F.H.B. Please review
 the attached studies and related information.*

DATE RETURNED TO RD (HED/BUD/TSS PROVIDE):

REVIEWS SENT TO:

HED: ☐ /SLS ☐ /TB ☐ /RCD ☒ /FAB ☐ /EIB

RD: ☐ /TSS

BUD: ☐ /EAB ☐ /SSB

TO:	TYPE OF REVIEW	NUMBER OF ACTIONS		
		Reregistration	Special Review	Other
	Toxicology			
	Ecological Effects			
	Residue Chemistry			
	☒ Exposure Assessment	6		
	Product Chemistry			
	Efficacy			
	Precautionary Labeling/Acute Tox.			
	Science Support			
	Economic Analysis			

FOR DATA SUBMITTED UNDER A REGISTRATION STANDARD: Review Submission Criteria

Policy Note #31

- 1 = data which meet 6(a)(2) or meet 3(c)(2)(B) flagging criteria
 ② = data of particular concern
 3 = data necessary to determine tiered testing requirements

NOTE TO TSS:
Return 1 Copy To RSERB

INCLUDE AN ORIGINAL AND FOUR (4) COPIES OF THIS COMPLETED FORM FOR EACH BRANCH CHECKED FOR REVIEW.

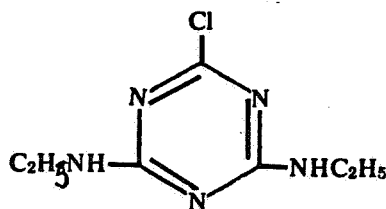
1. Chemical:

Common name - Simazine

Chemical name - 2-chloro-4,6-bis
(ethylamino)-s-triazine

Trade name - Princep; Gesatop; Primatol

Structure -



2. Test Material: N/A

3. Study/Action Type:

Request for updated review of ground-water data for simazine by Frank T. Sanders, RD, FHB.

4. Study ID:

1. Ciba-Geigy Corporation (1986a). Reports of investigations made with respect to the environmental fate of simazine in private well water in Glenn and Tulare Counties. Submitted September 23, 1986 by Ciba-Geigy Corporation, Greensboro, NC (EPA Accession No. 265159).

2. Ciba-Geigy Corporation (1986b). Reports of investigations made with respect for the environmental fate of simazine containing products. Contents: results of first two sampling intervals - ground-water monitoring program for simazine. Submitted August 22, 1986 by Ciba-Geigy Corporation, Greensboro, NC (EPA Accession No. 264442).

[Citations for other studies discussed in this review are included in the discussion section.]

5. Reviewed By: Michael R. Barrett
Chemist
Ground-Water Team
EAB/HED

Signature: *M Barrett*

Date: *3/4/88*

6. Approved By: Patrick W. Holden
Team Leader
Ground-Water Team
EAB/HED

Signature: *Patrick W. Holden*

Date: *3/4/88*

7. Conclusion:

Simazine has environmental fate characteristics that indicate it has some potential to leach to ground water. The new studies reviewed here do not change this conclusion, but do provide additional information on specific sites where simazine does occur in ground water after currently registered agricultural uses. The available data indicate simazine does leach to ground water in certain sites of particularly high hydrogeologic vulnerability and may be found at concentrations of up to a few ppb in the ground water at such sites. The current Ground-Water Advisory Statement on the Simazine Registration Label (Appendix A) is still considered to be appropriate, based upon available data.

8. Recommendations:

Simazine has already been determined to leach to ground water and a Ground-Water Advisory Statement has been added to the Simazine Registration Label (see Appendix). None of the newly submitted environmental fate studies or ground-water monitoring studies provide data which could contradict the previous recommendations from EAB or the current language of the Ground Water Advisory Statement. The registrant must submit additional data for periodical analysis of simazine at the 10 sites for which retrospective ground-water monitoring data have already been submitted for two sample periods. If these data are unavailable or insufficient then additional sampling for residue analysis at monthly intervals for at least 1 year will be required (cf. the Small-Scale Retrospective Ground-Water Monitoring Study design outlined in the draft Guidance Document).

9. Background:

Simazine is a herbicide used for weed control in corn, citrus, deciduous fruit and nuts, olives, perennial grasses grown for pasture, etc.; and is also used for control of algae and submerged weeds in ponds. An update of the status of ground-water monitoring research and the leaching assessment of simazine has been requested by Frank Sanders, RD, FHB.

10. Discussion:

A large volume of environmental fate data for simazine has been reviewed in recent years and these data indicate simazine might leach to ground water (Table 1). Hydrolysis, adsorption, Henry's law constant, and soil persistence data

all are within the bounds of pesticides known to leach to ground water. Although simazine was found to have some photolytic instability on soil, this apparently is insufficient to significantly reduce its leaching potential since it was found to be relatively persistent in soil in field and laboratory studies. The water solubility of simazine is low compared to most pesticides found to leach to ground water. This should limit the availability of simazine for leaching and might increase the time required for simazine to reach ground-water after application to the soil surface as compared to other leaching pesticides.

Monitoring data in a number of localities have indicated the presence of simazine in ground water. For example, in 1984 the California State Water Resources Control Board reported that simazine had been found in seven counties (D.B. Cohen and G.W. Bowes, 1984, Water Quality and Pesticides: A California Risk Assessment Program, Vol. 1). In 1983, the United States Geological Survey reported simazine at concentrations of 0.2 to 3.4 $\mu\text{g/L}$ (ppb) in ground water at depths up to 125 feet in several locations in Pennsylvania (J.W. Buchanan, W.C. Loper, W.P. Schaffstall, and R.A. Hainly, 1984; Water Resources Data, Pennsylvania Water Year 1983, Vol. 2; Susquehanna and Potomac River Basins). Ciba-Geigy Corporation (1986) recently submitted reports by the California Department of Food and Agriculture of simazine in private well water in two counties; simazine was found in 70 of 258 wells at 0.1 to 1.4 ppb. Fifty-four of these detections of simazine were from wells located in Tulare County where "simazine is commonly used in groves and orchards where flood/furrow irrigation methods are practical." Ciba-Geigy Corporation (1986) has also submitted a report (No. EIR-86017) of ground-water monitoring studies they conducted in CA, MI, FL, DE, IL, IN, and WV. Simazine was detected in 4 of 10 locations at 0.25 to 1.4 ppb (Table 2); the depth to the ground water was < 30 feet at 9 of 10 of the test locations (Table 3). Most of the detections of simazine were in heavily irrigated areas of CA or karst areas of WV. Past use history in these areas were: (i) Fresno County, CA - simazine used in an orange grove for 19 years; (ii) Tulare County, CA - simazine applied twice yearly for at least 3 years to groves; and (iii) Jefferson County, WV - simazine applied for 9 years to a corn field. The other test locations also had a history of simazine use for several years.

11. Completion of One-Liner for Study:

The Exposure Assessment Branch one-liner for simazine should be edited as follows:

CHEMICAL AND PHYSICAL PROPERTIES

<u>Molecular wt.</u>	<u>Aqueous Solubility</u>	<u>Vapor Pressure</u>	<u>Partition Coef.</u>	
			<u>K_{OW}</u>	<u>Henry's (atm-L/mol)</u>
<u>201.66</u>	<u>3.5 PPM (°)20 °C</u>	<u>6.1x10⁻⁹ (°)20 °C</u>	<u> </u>	<u>3.26x10⁻⁷</u>

Soil Adsorption Coefficient

<u>Soil Type</u>	<u>pH</u>	<u>% Soil O.M. or O.C.</u>	<u>K_d</u>	<u>K_{om}</u>	<u>K_{OC}</u>	<u>Soil TLC Mobility Class</u>
<u>Plainfield sand</u>	<u> </u>	<u>OM 0.8</u>	<u>1.8</u>	<u> </u>	<u>377</u>	<u>(5)</u> (1)=Immobile (2)=Low
<u>Calif. sandy loam</u>	<u> </u>	<u>OM 3.0</u>	<u>2.9</u>	<u> </u>	<u>162</u>	<u>(2)</u> (3)=Low to Mod.
<u>Miss. silt loam</u>	<u> </u>	<u>OM 2.1</u>	<u>1.3</u>	<u> </u>	<u>108</u>	<u>(3)</u> (4)=Moderate (5)=Mobile
<u>Hagerstown clay loam</u>	<u> </u>	<u>OM 2.5</u>	<u>3.2</u>	<u> </u>	<u>214</u>	<u>(2)</u>

Hydrolysis

<u>pH</u>	<u>temp.</u>	<u>T 1/2</u>
<u>5</u>	<u>20 °C</u>	<u>stable</u>
<u>7</u>	<u>20 °C</u>	<u>stable</u>
<u>9</u>	<u>20 °C</u>	<u>stable</u>
<u>5</u>	<u>30 °C</u>	<u>44 days</u>

Photolysis

	<u>t 1/2</u>	<u>pH</u>
<u>Air:</u>	<u>>> 2.5 day</u>	<u> </u>
<u>Soil:</u>	<u>1 day</u>	<u> </u>
<u>Water:</u>	<u> </u>	<u> </u>
	<u> </u>	<u> </u>

Laboratory Degradation (half-life)Soil Aerobic t 1/21 to 6 months
110 days at 25 °C and
70% FC in silt soil
with 1.3% O.C.Aquatic Aerobic t 1/2

 Soil Anaerobic t 1/28 to 12 weeks loamy sandAquatic Anaerobic t 1/2

12. CBI Appendix: N/A

Table 1. Environmental fate-related characteristics for simazine compared with those of typical leaching pesticides as outlined in the Ground Water Monitoring Guidelines

Name of Characteristic	Simazine Characteristic	Proposed EPA Standards for leaching pesticides
Hydrolysis half-life, days	(30 °C, pH 5) = 44 (20 °C, pH 5 to 9) = >> 28 ^a	> 175
K _d	0.36 to 4.66 ^b 1.3 to 3.2 for parent; 0.2 to 1.1 & 0.1 to 0.8 for the dealkyl. products; and 0.1 to 0.8 for hydroxysimazine ^c	< 5, usually less than 1 or 2
K _{oc}	108 to 377 ^c	
Water solubility, mg/L	3.5 at 20 °C ^d	> 30
Henry's law constant, (atmos-L/mol)	3.26 x 10 ^{-7e}	< 10
Photolysis half-life, days	On glass >> 2.5 (natural light), > 6 (artificial light) ^e > 1 (sunlight) ^f	> 7
Soil persistence-half-life, days	36 to 178 at 25 to 30 °C and 57% field capacity or unspecified soil water content ^g 110 at 25 °C and 70% of field capacity (silt with 1.26% organic carbon) ^h 20 to 90 in field studies in FL, MO, and OR ⁱ	> 14 or 21

- a Simazine Registration Standard (SRS), August 24, 1983, p. 2.
- b Simazine Registration Standard Addendum (SRSA), April 24, 1985, p. 1.
- c These data are from the following reports submitted by Ciba-Geigy Corporation, Greensboro, NC (EPA Accession No. 262643):
1. Yu, W.C. (1986) Determination of Adsorption/Desorption Constants of Simazine. Cambridge Analytical Assoc. Project No. 59-2A.
 2. Blair, J.E. (1986) Determination of the Mobility of Simazine in Selected Soils by Soil Thin Layer Chromatography. Hazleton Laboratories Study No. 6015-301.
 3. Yu, W.C. (1986) Determination of Adsorption/Desorption Constants of G-28279. Cambridge Analytical Assoc. Project No. 59-4A.
 4. Blair, J.E. (1986) Determination of the Mobility of G-28279 in Selected Soils by Soil Thin Layer Chromatography. Hazleton Laboratories Study No. 6015-304.
 5. Yu, W.C. (1986) Determination of Adsorption/Desorption Constants of G-28273. Cambridge Analytical Assoc. Project No. 59-5A.
 6. Blair, J.E. (1986) Determination of the Mobility of G-28273 in Selected Soils by Soil Thin Layer Chromatography. Hazleton Laboratories Study No. 6015-305.
 7. Yu, W.C. (1986) Determination of Adsorption/Desorption Constants of G-30414. Cambridge Analytical Assoc. Project No. 59-3A.
 8. Blair, J.E. (1986) Determination of the Mobility of G-30414 in Selected Soils by Soil Thin Layer Chromatography. Hazleton Laboratories Study No.
- d Weed Science Society of America, 1983, Herbicide Handbook, Champaign, IL, p. 434.
- e SRS, p. 2.
- f Blair, J.E. (1986) Interim Report: Photodegradation of simazine on soil. Study No. 6015-205 conducted by Hazleton Laboratories America, Inc., and submitted by Ciba-Geigy Corporation, Greensboro, NC (EPA Accession No. 262642).

^g SRS, p. 3.

^h Eligehausen, H. (1985) Aerobic and aquatic metabolism studies on simazine, Report No. EIR-85031. Study conducted by Research and Consulting Co. Ag, Itingen, Switzerland; and submitted by Ciba-Geigy Corporation, Greensboro, NC (EPA Accession No. 262644).

ⁱ These data are from the following reports submitted by Ciba-Geigy Corporation, Greensboro, NC (EPA Accession No. 262645):

1. Koch, D.A. (1986) Six Month Field Dissipation Study on Simazine (Princep 4G) for Terrestrial Use: Red Raspberries. ABC Report No. 33292.
2. Koch, D.A. (1986) Six Month Field Dissipation Study on Simazine (Princep 4G) for Terrestrial Use: Citrus. ABC Report No. 33294.
3. Koch, D.A. (1986) Six Month Field Dissipation Study on Simazine (Princep 80W) for Terrestrial Uses on Corn (No-Till). ABC Report No. 33291.
4. Koch, D.A. (1986) Six Month Field Dissipation Study on Simazine (Princep 80W) for Terrestrial Use: Citrus. ABC Report No. 33293.
5. Ross, R.H. Six Month Field Dissipation Data for Princep (Simazine) 80W and 4G. Ciba-Geigy Corporation Report No. EIR-86009.

Table 2. Summary of simazine residues (ppb) for two sampling intervals at the ten simazine use sites.

<u>County</u>	<u>State</u>	<u>Type of Well</u>	<u>Simazine Residues (PPB)</u>	
			<u>Round 1</u> <u>2/15-4/9/86</u>	<u>Round 2</u> <u>5/27-6/6/86</u>
Fresno	CA	Shallow	1.3-1.7	0.69-1.4
Tulare	CA	Shallow	1.2-1.3	0.41-0.66
Sussex	DE	Shallow	< 0.25	< 0.25
		Deep	< 0.25	< 0.25
Hardee	FL	Shallow	< 0.25	< 0.25
		Deep	< 0.25	< 0.25
Palm Beach	FL	Shallow	< 0.25	< 0.25
		Deep	< 0.25-0.27 ^a	< 0.25
Winnebago	IL	Shallow	< 0.25	< 0.25
		Deep	< 0.25	< 0.25
Jackson	IN	Shallow	< 0.25	< 0.25-1.3 ^b
		Deep	< 0.25	< 0.25
Van Buren	MI	Shallow	0.27-0.34	< 0.25
		Deep	< 0.25	< 0.25
Berrien	MI	Shallow	< 0.25	< 0.25
		Deep	< 0.25	< 0.25
Jefferson	WV	No. 1	< 0.25	0.29-0.34
		No. 2	0.36-0.42	0.39-0.51

^aThe 0.27 initially detected residue was not confirmed by alternate detector or by GC/MS.

^bThe primary sample was < 0.25. The registrant indicated that the duplicate sample was 1.3 ppb by both detectors but is suspect and may have been contaminated during sampling or during preparation. A fortification sample was low by a comparable amount.

Table 3. Summary of the water table depths and well screen locations for ten simazine well locations

<u>County</u>	<u>State</u>	<u>Depth to Water (Ft.)</u>		<u>Screen Depth Below Water Table in Shallow Well (Ft.)^a</u>	
		<u>Round 1</u>	<u>Round 2</u>	<u>Round 1</u>	<u>Round 2</u>
Fresno	CA	17.0	19.4	7.0	4.6
Tulare	CA	16.6	19.6	0.7	0
Sussex	DE	11.8	11.1	5.7	6.4
Hardee	FL	4.0	6.6	7.0	4.4
Palm Beach	FL	3.0	2.5	12.3	12.8
Winnebago	IL	6.2	12.2	11.8	5.8
Jackson	IN	6.4	7.0	9.2	8.6
Van Buren	MI	28.4	32.1	8.4	4.7
Berrien	MI	5.6	11.7	13.4	7.3
Jefferson	WV	60	62	1.0	0

^aNumbers denote the difference between the water table and the top of the well screen. A "0" means the water table is below the top of the screen.

APPENDIX

Simazine Registration Label Ground Water Advisory Statement:

Simazine is a chemical which was travel (seep or leach) through soil and can contaminate ground water which may be used as drinking water.

Simazine has been found in ground water as a result of agricultural use.

Users are advised not to apply simazine where the water table (ground water) is close to the surface and where the soils are very permeable, i.e., well drained soils such as loamy sands.

Your local agricultural agencies can provide further information on the type of soil in your area and the location of ground water.