3-29-93

DP Barcode :D174646, D174649 (NOTE: 2 bean sheets attached)
PC Code No. :080803
EFGWB Out :3/24/93

TO: Walter Waldrop
Product Manager # 71
Special Review and Reregistration Division (H7508W)

FROM: Elizabeth Behl, Head
Ground Water Technology Section
Environmental Fate & Ground Water Branch/EFED (H7507C)

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

Attached, please find the EFGWB review of...

Reg./File # :

Common Name : Atrazine and Simazine

Product Name : Aatrex and Princep

Company Name : Ciba-Geigy Corp.

Purpose : Registrant has submitted a generic protocol for a modified large-scale retrospective ground-water monitoring study they plan to conduct in at least 20 states. Analysis of degradates will be included.

Type Product : Herbicide

Action Code : 635 EFGWB #(s): 92-0519, 92-0542 Total Review Time = 8 days

EFGWB Guideline/MRID/Status Summary Table: The review in this package contains...

161-1		162-4		164-4		166-1	
161-2		163-1		164-5		166-2	
161-3		163-2		165-1		166-3	
161-4		163-3		165-2		167-1	
162-1		164-1		165-3		167-2	
162-2		164-2		165-4		201-1	
162-3		164-3		165-5		202-1	

Y = Acceptable (Study satisfied the Guideline)/Concur P = Partial (Study partially satisfied the Guideline, but additional information is still needed)
S = Supplemental (Study provided useful information, but Guideline was not satisfied) N = Unacceptable (Study was rejected)/Non-Concur

DP BARCODE: D174646 REREG CASE #

CASE: 819248 DATA PACKAGE RECORD DATE: 03/26/93
SUBMISSION: S411815 BEAN SHEET Page 1 of 1

* * * CASE/SUBMISSION INFORMATION * * *

CASE TYPE: REREGISTRATION ACTION: 635 PROPOSED TEST PROT SUBM
CHEMICALS: 080803 Atrazine (ANSI) 100.00 %

ID#: 080803
COMPANY:
PRODUCT MANAGER: 71 WALTER WALDROP 703-308-8062 ROOM: CS1 3B3
PM TEAM REVIEWER: VENUS EAGLE 703-308-8045 ROOM: CS1 33B5
RECEIVED DATE: 02/07/92 DUE OUT DATE: 05/17/92

* * * DATA PACKAGE INFORMATION * * *

DP BARCODE: 174646 EXPEDITE: N DATE SENT: 02/19/92 DATE RET.: / /
CHEMICAL: 080803 Atrazine (ANSI)
DP TYPE: 001 Submission Related Data Package
ADMIN DUE DATE: 05/19/92 CSF: N LABEL: N

ASSIGNED TO	DATE IN	DATE OUT
DIV : EFED	02/20/92	/ /
BRAN: EFGB	02/21/92	03/26/93
SECT: GTS	02/22/92	03/26/93
REVR : MBARRETT	02/22/92	03/26/93
CONTR:	/ /	/ /

* * * DATA REVIEW INSTRUCTIONS * * *

ATTENTION: Betsy Behl

Attached is Ciba-Geigy's proposed protocol for split sampling groundwater monitoring program with states for Atrazine. Please note that Ciba has requested a meeting. Talk to you soon!

* * * ADDITIONAL DATA PACKAGES FOR THIS SUBMISSION * * *

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL
174649	EFGB/GTS	02/19/92	05/19/92	Y	N	N

2

DP BARCODE: D174649 REREG CASE #

CASE: 819248 DATA PACKAGE RECORD DATE: 03/26/93
SUBMISSION: S411815 BEAN SHEET Page 1 of 1

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DIV : EFED	02/20/92	/ /
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SECT: GTS	02/20/92	03/26/93
REVR : MBARRETT	02/21/92	03/26/93
CONTR:	/ /	/ /

* * * DATA REVIEW INSTRUCTIONS * * *

Please review Ciba-Geigy's proposed protocol for split sampling groundwater monitoring program with states for Atrazine. Please note, they have requested a meeting.

* * * ADDITIONAL DATA PACKAGES FOR THIS SUBMISSION * * *

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL
174646	EFGB/GTS	02/19/92	05/19/92	Y	N	N

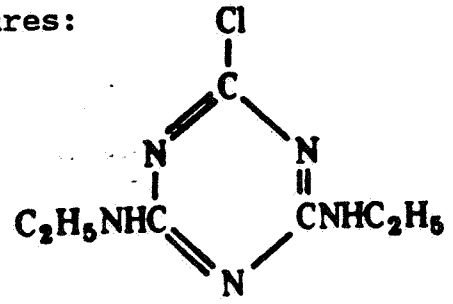
1. CHEMICAL:

Chemical names 6-chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine and 6-chloro-N,N'-diethyl-1,3,5-triazine-2,4-diamine.

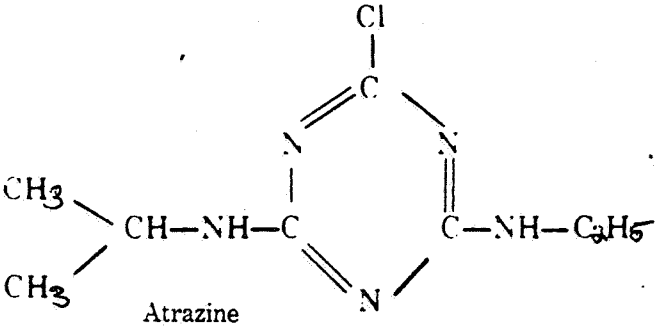
Common names: Atrazine, Simazine

Trade names: Aatrex, Princep

Structures:



Simazine



Atrazine

2. TEST MATERIAL: formulated products.

3. STUDY/ACTION TYPE

Review of a generic protocol for modified large-scale retrospective ground-water monitoring studies in at least 20 states.

4. STUDY IDENTIFICATION:

Balu, K. 1992. Split-sample ground-water monitoring study for atrazine and its major degradation products in the United States. Ciba-Geigy Corp., Greensboro, NC. Protocol was signed 2/3/92 and made available to the Ground-Water Section in late March.

5. REVIEWED BY:

Michael R. Barrett, Ph.D. Signature: _____
Chemist
OPP/EFED/EFGWB/Ground-Water Section Date: 3/26/93

6. APPROVED BY:

Elizabeth Behl Signature: _____
Acting Section Chief
OPP/EFED/EFGWB/Ground-Water Section Date: 3/26/93

7. CONCLUSIONS:

According to Ciba-Geigy, the objective of this program is to address the presence of atrazine and simazine residues in broad geographic regions (in cooperation with state agencies); they did not define more specifically the overall purpose of this study. We believe from our review of the proposed protocol that the primary benefit of this study will be to ascertain the relative impact on ground water of atrazine and simazine and their major metabolites (deethyl atrazine, deisopropyl atrazine which is the same as deethyl simazine, diaminochloro s-triazine, hydroxy atrazine, and hydroxy simazine). Ciba-Geigy expects to sample primarily, but not exclusively, from drinking water wells. The primary deficiency in the protocol is the very limited treatment given to the examination of hydrogeologic and land use factors which may be associated with the occurrence of these herbicides in ground water. Examination of the influence of these factors on the occurrence of atrazine and simazine in ground water is also made more difficult by the emphasis on sampling of existing drinking water wells which may not include an adequate sample of shallow ground water in surficial aquifers.

While we agree with the registrant that the approach they have outlined will substantially address existing data gaps concerning the relative impact of parent and metabolites on ground water currently used for drinking, we are much less certain that the proposed study will substantially increase our knowledge about the potential for movement of these residues into ground water.

Recent studies have more adequately addressed the relationship of ground-water pesticide residue data to site-specific information. For example, refer to a study by the USGS Maryland District in the Delmarva Peninsula (Pesticides in Shallow Ground Water in the Delmarva Peninsula, M.T. Koterba, W.S.L. Banks, and R.J. Shedlock, approved for publication in 1993 in the Journal of Environmental Quality). Also of interest may be a statistically designed monitoring study by the University of Iowa (not published yet) examining issues of temporal variability of pesticide residues in ground water in a Cooperative Agreement with EPA's Office of Research and Development (Project Officer: Matt Lorber, Tel. 202-260-8924).

The proposed study does not meet the statistical definition of a survey (A detailed examination of a "population" of wells using [1] a selection process, the rules and operations by which some members of the population are included in the sample taken; and [2] an estimation process for computing sample statistics which are estimators of values for the entire group being sampled from. See Leslie Kish, 1965, Survey Sampling, John Wiley & Sons, p. 4.). We do not believe that it is necessary to follow a statistical design for the study to have value, but the lack of such a design could make it more difficult to make scientifically defensible conclusions. Without a design it may be more difficult to definitively answer some outstanding questions on

factors associated with the occurrence of these pesticides in ground water. There are, however, benefits of not following a statistical design, including reduced cost of the study and more flexibility in working with the states.

8. RECOMMENDATIONS:

GWTS generally concurs with the criteria for well selection proposed by the registrant on pp. 11-13 of their protocol. However, the criteria should be amplified or modified as follows:

- Include, but do not limit studies to drinking water wells. Inclusion of observation or monitoring wells may provide information on the distribution of pesticides in the shallow portions of surficial aquifers which may not be adequately represented in drinking water well surveys.

- Select wells for sampling for which information on characteristics of the aquifer tapped, well depth, screening interval, construction materials, hydraulic conductivity, etc. can be readily obtained. If wells without such information are sampled, then results should be compared to a set of wells from the survey area for which such information is known.

- Whenever possible, incorporate components of studies to examine spatial and temporal variability in residues. For example, monthly sampling could be conducted at sites with some evidence of detectable atrazine or simazine residues. (more frequent sampling may be required when pesticides move very rapidly to ground water such as occurs in areas with karst features extending to the surface). Sets of nested wells should examine spatial variation in residues from the upper surface of the aquifer to much greater depths, if appropriate (i.e., if detectable residues might occur).

- Information should be obtained on the types of crops grown (and names of pesticides applied, if possible) or other land uses within 100 to 300 meters of the wellhead for at least the last five years. The well selection process should take into account the feasibility of obtaining such information. Also obtain county simazine / atrazine use information or infer it from crop acreages and data on market share. Note that evidence of local use is more critical for simazine which has a much lower overall use and a more diffuse use pattern than atrazine.

- Design the state surveys to maximize the possibilities for generalizations about the occurrence of the analytes in ground water and in drinking water wells. This will involve stratification of surveys to increase the possibility of detection by increased sampling in strata (geographic areas or well types) expected to be more susceptible to contamination

by atrazine or simazine. Avoid selecting wells for sampling solely on the basis of a history of previous detections.

- Design studies to define geographic regions and aquifer types with the highest rates of contamination of ground water by atrazine or simazine. Determine geographic trends in the difference between the characteristics of ground water sampled with observation wells and that sampled with drinking water wells.

Furthermore, the registrant must regularly keep EPA (appropriate regional offices as well as the Ground Water Technology Section, EFGWB, EFED, OPP) informed of the progress of these studies:

- Progress reports must be submitted at intervals not to exceed six months. These must include summaries of protocols for each state as they are developed, pertinent information about key personnel involved in each state study, and summaries of data collected. GWTS prefers a consolidated submission rather than one for each state study. These progress reports are for informational purposes; no formal review is anticipated until the final reports are received.

All data should be analyzed whenever possible to determine the relationship of single or multiple variables to the likelihood of a detection of atrazine or simazine. This includes:

- irrigation method, timing, and quantity
- depth to the top of the aquifer
- depth of well screening interval
- unconfined or confined aquifers
- presence or absence of use of the herbicides in the immediate vicinity (e.g., within 100-300 meters)
- pounds of the herbicides used in the general vicinity (e.g. at the county level)
- corn production in the vicinity
- soil type
- extent of karst features, other fractured rock, or fractured soil structure
- local recharge of aquifer inferred from rainfall, irrigation, and evapotranspiration data
- geologic description of aquifer (including measurement of transmissivity, hydraulic conductivity, and specific yield)

The goal of these analyses is to sort out factors which will enable one to reliably predict where atrazine or simazine contamination of ground water is more likely. For example, a hypothesis to be tested could be something like the following:

Given that all of the following are true -
- o atrazine use in the county is high
- o atrazine has been used within 300 feet of the well head

- o well construction is sound
- o point sources such as pesticide spills within 50 feet of the well are not evident
- o a well draws water from an unconfined aquifer;

then can it be shown that atrazine residues leached from the surface will be found at some level in unconfined aquifers at less than a 200-foot depth (or some other depth chosen a priori)?

There is a large body of data demonstrating the leaching of atrazine to ground water at numerous locations throughout the United States. Data for simazine are much less abundant, but do confirm that this compound also can frequently leach to ground water. Given the abundance of evidence for field leaching of these compounds, small-scale ground-water monitoring studies are not critically needed to answer the question of whether these compounds would reach ground water under real field conditions. Therefore, small-scale monitoring studies will not be required if acceptable completed surveys or large-scale monitoring studies are completed.

GWTS defers to the Environmental Chemistry Review sections of EFGWB to provide a response to the registrant's request to waive requirements for additional field dissipation studies for these compounds.

9. BACKGROUND:

Ciba-Geigy Corp. is proposing to voluntarily conduct monitoring programs in at least 20 states as a cooperative effort with each state. Ciba-Geigy originally proposed to retrospectively examine residues of atrazine parent and four of its major degradates. They presumably hope that these monitoring efforts will serve to alleviate any other ground-water monitoring study requirements for atrazine by the Agency, stating in their generic protocol: "This study... is undertaken in lieu of performing additional soil field dissipation studies (164-1) and small-scale prospective ground-water studies (166-1)" (page 8). In a meeting with Special Review & Reregistration Division (SRRD) and EFGWB personnel on April 7, 1992 Ciba-Geigy proposed that their split sampling program be extended to analyze for simazine residues as well and would like the Agency to accept their study design in lieu of the requirements for new field dissipation and ground-water monitoring studies for simazine imposed in a September 12, 1991 Data Call-In. The rest of this review refers to this protocol in terms of both atrazine and simazine ground-water monitoring even though the document, which was submitted in February 1992, only specifically addresses sampling for atrazine.

10. DISCUSSION:

Ciba-Geigy proposes to sample 50 to 100 wells in each of at least 20 states for atrazine and simazine residues. State officials will have a "certain amount of discretion" in the selection of wells for sampling in their state. The criteria for selection of wells are very loosely written, apparently to allow flexibility to address different priorities of officials in each state. Priority will be given to sampling wells: (1) with previous detections of atrazine or simazine, (2) located in areas with high hydrogeologic vulnerability, and (3) located in high use areas. The only specific definition of any of these selection criteria given is for ground-water depth (areas with water tables less than 50 feet from the land surface). Rural drinking water wells will be given selection priority. Wells selected for sampling will be located throughout all use areas for the pesticide within the state. Use of an experimental design to insure the wells selected are representative of all use areas is not proposed in the submitted protocol.

Ciba-Geigy apparently wants state cooperation with this monitoring study because it reduces their cost, enhances their working relationship with state personnel, and helps lay the groundwork for future work on State Management Plans. However, as they admit, to achieve maximum cooperation with the states, they have come up with a loosely designed study the results of which cannot be extrapolated to make conclusions about contamination of ground water in general or drinking water throughout the state. We understand these concerns and appreciate the difficulty in coming up with a detailed protocol such as normally submitted for small-scale prospective or retrospective ground-water monitoring studies. There are some further details that are important to be included, however, as discussed below.

The protocol does not indicate how, as each state plan is developed, it will be submitted to USEPA/OPP. Each state will undoubtedly develop their own specific protocol based upon their own needs. The GWTS does not believe it is feasible or necessary to approve each individual state plan. GWTS does, however, believe that it would be useful to know, in summary form, what the specific objectives will be as each state study is developed. This could be done through brief (2 pages per state) but specific progress reports submitted at least once every six months, and through periodic update meetings with the registrant to discuss the progress of the studies.

The registrant states that wells with known detections of atrazine or simazine will be given priority in the well selection process (p. 10 of protocol). This criterion for well selection has the benefit of increasing the chances that there will be measurable amounts of these herbicides again present and allowing for a comparison with the amounts of metabolites. However, this should not be an overriding criterion for well selection. Other

criteria for well selection are at least as important, including: a design which provides an estimate of the extent of atrazine or simazine contamination of specific aquifers, an understanding of the relationship of detections to local atrazine or simazine use, and the ability to obtain specific information on the characteristics of the wells sampled from. Without careful attention to such selection criteria, this study will be subject to the same deficiencies as has been characteristic of numerous other past studies: the data will not be able to be reliably used as a basis for inference about general trends in atrazine or simazine contamination of ground water. Only with a careful attention to study design will conclusions be possible about the regions with greatest problems and local conditions which lead to the maximum likelihood of contamination.

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
ATRAZINE
Last Update on March 15, 1993
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer: MRB	Section Head: GB	Date: 3/26/93

Common Name:ATRAZINE
Smiles Code:Cl-c(nc(n1)NCC)nc1NC(C)C
PC Code # : 80803 CAS #:1912-24-9 Caswell #:

Chem. Name :2-CHLORO-4-(ETHYLAMINO)-6-(ISOPROPYLAMINO)-s-TRIAZINE

Action Type:Herbicide

Trade Names:AATREX NINE-0
(Formul'tn):G;P/T;WP;DF;EC;FC;SC/L
Physical State: COLORLESS CRYSTLS

Use Patterns (% Usage) :TERRESTRIAL FOOD, TERRESTRIAL NON-FOOD, FORESTRY

Empirical Form: $C_8H_{14}ClN_5$
Molecular Wgt.: 215.69 Vapor Pressure: 3.00E -7 Torr
Melting Point : 176 °C Boiling Point: N/A °C
Log Kow : 2.68 pKa: @ °C
Henry's : 2.58E -9 Atm. M3/Mol (Measured) 2.58E -9 (calc'd)

Solubility in ...					Comments
Water	33.00E	ppm	@20.0	°C	
Acetone	E	ppm	@	°C	
Acetonitrile	E	ppm	@	°C	
Benzene	E	ppm	@	°C	
Chloroform	E	ppm	@	°C	?
Ethanol	E	ppm	@	°C	
Methanol	E	ppm	@	°C	
Toluene	E	ppm	@	°C	
Xylene	E	ppm	@	°C	
	E	ppm	@	°C	
	E	ppm	@	°C	

Hydrolysis (161-1)
[V] pH 5.0:STABLE
[V] pH 7.0:STABLE
[V] pH 9.0:STABLE
[ ] pH :pH 5-10: 42 - >1000 DAYS
[ ] pH :
[ ] pH :

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Photolysis (161-2, -3, -4)
[V] Water:Direct photolysis is not an important degradation
[ ] :process for atrazine. Stable to direct photolysis for
[ ] :30 days
[ ] :

[ ] Soil :
[ ] Air :

Aerobic Soil Metabolism (162-1)
[S] 146 DAYS, CALIFORNIA LOAM
[V] 21 DAYS SiLm, 9% OM, pH 5.5
[S] PERCENT VS TIME IN TENN. SOIL

	DAYS;	25	100	180
[ ]	CO2	.7	9.3	12.1
[ ]	EXTRACT.	72.6	42.5	28.8
[ ]	ATR+METAB.	50.3	9.9	5.4

Anaerobic Soil Metabolism (162-2)
[S] 159 DAYS IN SANDY LOAM
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Anaerobic Aquatic Metabolism (162-3)
[V] 608 DAYS FOR COMBINED WATER/
[ ] SEDIMENT (330 DAYS IN SEDIMENT
[ ] AND 578 DAYS IN WATER ALONE).
[ ] (sandy clay sediments)
[ ]
[ ] This study can be used to fulfill 162-2 requirements.
[ ]

Aerobic Aquatic Metabolism (162-4)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Environmental Fate & Effects Division
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ATRAZINE
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Soil Partition Coefficient (Kd Freund.) (163-1)

	Sd	Si	Cl	%OM	pH	Kads	Kdes	
[ ]								
[V]	25	33	42	4.8	5.9	2.46	9.12	Sharkey Clay (from MD)
[V]	96	2	2	0.9	6.5	0.20	1.51	Sassafras Sand (from MD)
[V]	63	20	17	1.9	7.5	0.79	7.27	Sequatchie Sandy Loam (from MD)
[V]	44	47	9	0.8	6.7	0.73	4.76	Hesperia Loam (from CA)
[ ]	(Kd values for degradates in "Degradation Products"; same soils)							

Soil Rf Factors (163-1)

	SOIL	ATRAZ	G-28279	G-28273
[ ]				
[S]	SAND	1.0	.98	1.0
[S]	SdLm	.57	.16	.72
[S]	SiLm	.67	.18	.39
[S]	SiClLm	.51	?	.43
[ ]				

Laboratory Volatility (163-2)
[ ]
[ ]

Field Volatility (163-3)
[ ]
[ ]

Terrestrial Field Dissipation (164-1)
[S] IN THE 0-6" DEPTH, ATRAZINE DECREASED WITH TIME BUT AT
[ ] GREATER DEPTHS IT GRADUALLY INCREASED.
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Aquatic Dissipation (164-2)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Forestry Dissipation (164-3)
[S] Leaf Foliage 13d Leaf Litter 66d
[ ]

Environmental Fate & Effects Division
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Long-Term Soil Dissipation (164-5)
[ ]
[ ]

Accumulation in Rotational Crops, Confined (165-1)
[S] Residues show accumulation after 1-yr. post-treatment.
[ ]

Accumulation in Rotational Crops, Field (165-2)
[ ]
[ ]

Accumulation in Irrigated Crops (165-3)
[ ]
[ ]

Bioaccumulation in Fish (165-4)
[V] Max BCF 7.7x (edible), 12x (inedible), 15x (whole fish)
[V] Depuration 74% (edible), 76%(inedible) 78% (whole fish)

Bioaccumulation in Non-Target Organisms (165-5)
[ ]
[ ]

Ground Water Monitoring, Prospective (166-1)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Small Scale Retrospective (166-2)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Large Scale Retrospective (166-3)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Miscellaneous Data (158.75)
[ ] 29 of 34 states sampled report detections in ground water-
[ ] Non-point contamination of many wells- Max. conc. reported: 3000
[ ] ppb-WI; 1500-NY; 1470-KS; 1102-WI probable point source origin

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
ATRAZINE
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Field Runoff (167-1)
[ ]
[ ]
[ ]
[ ]

Surface Water Monitoring (167-2)
[V] 14-Midwestern surface waters sampled (3/86-11/87)
[ ] Max. conc.= 30.5 ug/L; max. mean conc.= 8.2 ug/L; second highest
[ ] mean conc.= 3.3 ug/L. In 11/336 samples over 3-locations concs.
[ ] were greater than 10 ug/L.

Spray Drift, Droplet Spectrum (201-1)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Field Evaluation (202-1)
[ ]
[ ]
[ ]
[ ]

Degradation Products

ADSORPTION AND DESORPTION VALUES OF PRINCIPAL DEGRADATES:

			G-28273		G-28279		G-30033	
SOIL	%OM	pH	Kads	Kdes	Kads	Kdes	Kads	Kdes
clay	4.8	5.9	1.56	7.80	2.73	12.36	1.10	8.14
sand	0.9	6.5	0.16	-	0.16	-	0.06	-
SdLm	1.9	7.5	0.65	8.06	0.51	15.28	0.36	11.19
loam	0.8	6.7	0.36	6.87	0.27	6.98	0.21	3.9

(Sd, Si. and Cl percentages for the above soils are listed in mobility studies, 163-1 for parent atrazine; Soil series names are also given there)
G-28273= "fully dealkylated atrazine"
G-28279= "deisopropylated atrazine"
G-30033= "desethylated atrazine"
G-34048= Hydroxy atrazine
Kad for "G-34048" Clay (389.6); Sand (1.98); SdLm (6.52); Lm (12.1) [for same soils as above]. Dealkylated degradates are more mobile than hydroxy atrazine, but the latter is mobile in sand.

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Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
ATRAZINE
Last Update on March 15, 1993
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Comments

It is likely that Atrazine is more persistent in ground water than in most soils under typical conditions.
Koc values for Atrazine in clay = 87
SAND = 39
SANDY LOAM = 70
LOAM = 155

Anaerobic conditions slow down the rate of degradation of atrazine. Atmospheric transport of atrazine has been reported, but the mechanism of transport is not well understood at this time.

References: EFGWB SRR Science Chapter;EPA REVIEWS
Writer : SCT PJH SLL

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
SIMAZINE
Last Update on March 15, 1993
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer: MRB	Section Head: GB	Date: 3/26/93

Common Name: SIMAZINE
Smiles Code: Cl-c(nc(n1)NCC)nc1NCC
PC Code # : 80807 CAS #: 122-34-9 Caswell #:

Chem. Name : 2-CHLORO-4,6-BIS(ETHYLAMINO)-s-TRIAZINE

Action Type: Herbicide

Trade Names: AQUAZINE; CEKUSAN; GESATOP; PRIMATOL S; PRINCEP; SIMADEX
(Formul'tn): WP 80%; WATER DISP. GARN.; LIQUIFIEDS; GRANULES
Physical State:

Use : CONTROL OF MOST ANNUAL GRASSES AND BROADLEAF WEEDS IN CORN,
Patterns :ESTABLISHED ALFALFA, ESTABLISHED BERMUDA GRASS,CHERRIES,
(% Usage) :PEACHES, CITRUS, CANEBERRIES, CRANBERRIES, GRAPES, APPLES
:

Empirical Form: $C_7H_{12}ClN_5$
Molecular Wgt.: 201.66 Vapor Pressure: 6.10E -9 Torr
Melting Point : °C Boiling Point: °C
Log Kow : 2.51 pKa: @ °C
Henry's : 3.20E-10 Atm. M3/Mol (Measured) 4.62E-10 (calc'd)

Solubility in ...				Comments
Water	3.50E	ppm	@20.0 °C	
Acetone	E	ppm	@ °C	
Acetonitrile	E	ppm	@ °C	
Benzene	E	ppm	@ °C	
Chloroform	E	ppm	@ °C	
Ethanol	E	ppm	@ °C	
Methanol	E	ppm	@ °C	
Toluene	E	ppm	@ °C	
Xylene	E	ppm	@ °C	
	E	ppm	@ °C	
	E	ppm	@ °C	

Hydrolysis (161-1)
[V] pH 5.0:STABLE
[V] pH 7.0:STABLE
[V] pH 9.0:STABLE
[ ] pH :
[ ] pH :
[ ] pH :

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Photolysis (161-2, -3, -4)
[V] Water:Direct photolysis is not an important degradation
[ ] :mechanism for simazine; stable during 30-day exposure
[ ] :
[ ] :

[ ] Soil :
[ ] Air :

Aerobic Soil Metabolism (162-1)

	SOIL	APPL	% FC	T1/2
[S]	SdLm	2 MG/KG	98.3	36 DAYS
[ ]	SdLm	8 MG/KG	56.9	234 DAYS

[ ] (BOTH AT 15 C; AT 25 C AND 75%
[ ] FC, T1/2 EXPECTED = 60 DAYS)
[S] AT APPL OF 4 LB AIA TO LmSd,
[ ] T1/2 = 16.3 WEEKS

Anaerobic Soil Metabolism (162-2)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Anaerobic Aquatic Metabolism (162-3)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Aerobic Aquatic Metabolism (162-4)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

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Soil Partition Coefficient (Kd) (163-1)

	Sd	Si	Cl	%OM	Kads	Kdes
[ ]						
[V]	25	33	42	4.8	4.31	9.34
[V]	96	2	2	0.9	.65	2.25
[V]	63	20	17	1.9	1.27	6.20
[V]	44	47	9	0.8	.48	.78
[ ]						

Soil Rf Factors (163-1)
[S] MODERATELY TO VERY MOBILE
[ ] IN 4 SOILS; SOILS ON LEFT
[ ] RETAINED 58, 13, 11, AND 4%
[ ] IN TOP 2 CM OF COLUMN WASHED
[ ] WITH 20" WATER.
[S] .96 IN SdLm; .31 IN SiLm

Laboratory Volatility (163-2)
[ ]
[ ]

Field Volatility (163-3)
[ ]
[ ]

Terrestrial Field Dissipation (164-1)
[S] PHYTOTOXIC RESIDUES EQUIV, TO SIMAZINE AT 0.6 LB/ACRE
[ ] REMAINED IN THE SURFACE FOOT OF A FURROW-IRRIGATED SiLm
[ ] SOIL FOR A YEAR AFTER THE LAST OF 6 ANNUAL APPL. OF 1 LB/A.
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Aquatic Dissipation (164-2)
[S] SIMAZINE RESIDUES APPEARED TO PERSIST FOR 3 YRS IN THE SOIL
[ ] ON SIDES AND BOTTOMS OF IRRIGATION DITCHES TREATED AT 22.4
[ ] KG/HA.
[S] DISSIPATION IN 7 LAKES RECEIVING APPL OF .25 OR .50 PPM,
[ ] T1/2'S RANGED FROM 60 TO 700 DAYS.
[ ]

Forestry Dissipation (164-3)
[ ]
[ ]

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Long-Term Soil Dissipation (164-5)
[ ]
[ ]

Accumulation in Rotational Crops, Confined (165-1)
[ ]
[ ]

Accumulation in Rotational Crops, Field (165-2)
[ ]
[ ]

Accumulation in Irrigated Crops (165-3)
[ ]
[ ]

Bioaccumulation in Fish (165-4)
[S] RAINBOW TROUT BCF FOR SIMAZINE = .9 - 2.3 X; BCF FOR 2
[ ] DEGRADATES RANGED FROM 0.5 TO 8.5 X.

Bioaccumulation in Non-Target Organisms (165-5)
[S] GREEN SUNFISH DO NOT BIOACCUMULATE SIMAZINE; SAME
[ ] FOR BLUEGILL, CATFISH, AND BASS.

Ground Water Monitoring, Prospective (166-1)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Small Scale Retrospective (166-2)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Large Scale Retrospective (166-3)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Miscellaneous Data (158.75)
[ ] Simazine residues have been detected in ground-water in 14 states
[ ] (Data from Pesticide Monitoring Section-EFGWB)
[ ] LAND. IN PENNA. THE RANGE WAS FROM .2 TO 3.40 PPB.

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Field Runoff (167-1)
[ ]
[ ]
[ ]
[ ]

Surface Water Monitoring (167-2)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Droplet Spectrum (201-1)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Field Evaluation (202-1)
[ ]
[ ]
[ ]
[ ]

Degradation Products

See chart in folder for identification of code names
% Radioactivity in aged soil samples treated with simazine at 10 kg/ha (see study #7 for details):

COMPOUND	LOAMY SAND	SILT LOAM
Simazine	63.4	55.2
G-28279	3.7	3.9
G-28273	1.1	0.7
G-30414	ND	11.0
GS-17792	ND	1.7

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Comments

SOIL	COEFF.	SIMAZINE	G-28273	G-28279	G-30414
1	Kads	4.31	1.56	2.73	483
2	"	.65	.16	.16	8.48
3	"	1.27	.65	.51	27.40
4	"	.48	.36	.27	42.40
1	Kdes	9.34	7.79	12.36	423
2	"	2.25	(too limited to tell)		25.5
3	"	6.20	8.06	15.28	318
4	"	.78	6.87	6.98	125

(Soil compositions, and simazine ads. and des., shown on page 2)

Reported Koc = 103.
pKb = 12.35

References: EPA REVIEWS
Writer : PJH

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