DYNAMAC
CORPORATION

SIMAZINE ADDENDUM

Final Report

Task 2: Environmental Fate and Exposure Assessment

Contract No. 68-01-6679

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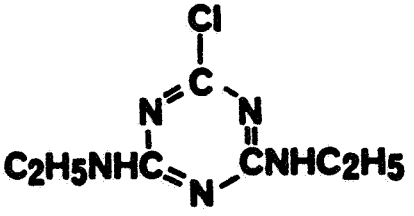
Submitted to:
Environmental Protection Agency
Arlington, VA 22202

Submitted by:
Dynamac Corporation
Enviro Control Division
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

Simazine Addendum

SIMAZINE, AQUAZINE, CEKUSAN, FARMCO SIMAZINE, FRAMED, GESATOP, PRINCIP, PRIMATOL S, SIMADEX, SIMANEX, SIM-TROL.



2-Chloro-4,6-bis(ethylamino)-s-triazine

[^{14}C]Simazine (purity unspecified), at 1.12 ppm, was relatively stable to photolysis in unbuffered deionized water (initial pH unspecified), with ~88% of the applied radioactivity remaining as parent after 30 days of irradiation (Bowman, No MRID). In a 1% acetone solution, [^{14}C]simazine degraded with a half-life of 12-24 hours. 2-Chloro-4-ethylamino-6-amino-1,3,5-triazine was the major degradate formed, accounting for ~80% of the applied radioactivity after 30 days of irradiation.

Simazine (purity unspecified) adsorption increased directly with soil organic matter content and CEC. Freundlich K values ranged from 4.66 for loam (2.9% organic matter, CEC 20.6 meq/100 g) to 0.36 for the loamy sand (0.3% organic matter, CEC 5.9 meq/100 g) (Warren, 1984a, No MRID). Desorption K values were consistently higher than those for adsorption indicating that the adsorption process was not completely reversible. As the soil organic matter and CEC values decreased, the adsorption decreased and desorption increased.

[^{14}C]Simazine (purity unspecified) was moderately to very mobile in four soils; after leaching 12-inch soil columns with 20 inches of water, 57.5, 12.8, 10.6,

and 3.5% of the applied radioactivity remained in the top 2 cm of Iowa-3 loam, New York loam, Iowa-1 loam, and Missouri loamy sand soil columns, respectively (Warren, 1984b, No MRID). Recovery of radioactivity in the leachate ranged from <0.01% of the applied (Iowa-3 loam) to 85.2% (Missouri loamy sand).

Aged (30 days) residues of simazine (>99% pure) were mobile in sand leached with 0.5 inch of water for 45 days (Guth, 1978, No MRID). In the leachate, 42% of the applied radioactivity was recovered, with 28% being parent compound and 3.7% being 2-chloro-4-ethyl-amino-6-amino-1,3,5-triazine. In silt loam soil leached similarly, 8.7% of the applied radioactivity was recovered in the leachate, of which 6.6% was parent simazine and 0.8% was 2-chloro-4-ethyl-amino-6-amino-1,3,5-triazine.

Aged (30-day) residues of [^{14}C]simazine (purity unspecified) were relatively mobile in loamy sand soil columns (12-inches high) leached with 20 inches of water over a 29 day period (Warren, 1984c, No MRID; Warren, 1985, No MRID). Soil in the columns retained 43.9 to 47.4% of the applied radioactivity while 52% was recovered in the leachate.

Aged (294 days) residues of [^{14}C]simazine (>99% pure) were slightly mobile in loamy sand and silt loam soil (Guth, 1983, No MRID). Soil columns (11.8-inch height) leached with 8 inches of water retained 67.2 and 65.7% of the applied radioactivity in the upper 4 inches (10 cm) of the loamy sand and silt loam soil, respectively.

The following represents the data currently required (EPA Data Requirements for Registering Pesticides, 1983) to fully assess the environmental fate and transport of, and the potential exposure to simazine based on the data submitted for the Simazine Registration Standard dated March 1, 1984 and this addendum: photodegradation studies in water and on soil; aerobic soil metabolism studies; anaerobic and aerobic aquatic metabolism studies; leaching and adsorption/desorption studies; terrestrial, aquatic, and possibly long-term field dissipation studies; and accumulation studies on crops.

Hydrolysis studies: No data were submitted for this addendum; however, based on data submitted for the Simazine Registration Standard dated March 1, 1984, no additional data are required.

Photodegradation studies in water: One study was reviewed (Bowman, No MRID) that is scientifically valid, but does not fulfill data requirements because the temperature was unspecified, the purity of the test substance was not reported, the experiment was not conducted in buffered solutions, and the artificial light source was not related to natural sunlight irradiation. All data are required.

Photodegradation studies on soil: One study was reviewed (Burkhard, No MRID) that is scientifically invalid because the sampling protocol was inadequate (one sampling interval) to accurately establish the pattern of decline of simazine and patterns of formation and decline of degradates on irradiated soil. In addition, this study would not fulfill data requirements because the test substance was not completely characterized, and the test soil was not demonstrated to be representative of soils in the United States. All data are required.

Photodegradation studies in air: No data were submitted for this addendum; however, no data are required because of the low vapor pressure of simazine.

Aerobic soil metabolism studies: No data were submitted for this addendum; however, based on data submitted for the Simazine Registration Standard dated March 1, 1984, a study is needed providing information on incubation periods of up to one year to fully delineate the patterns of formation and decline of simazine degradates and to identify any additional products which may form.

Anaerobic soil metabolism studies: No data were submitted for this addendum; however, based on data submitted for the Simazine Registration Standard dated March 1, 1984, no additional data are required.

Anaerobic aquatic metabolism studies: No data were submitted for this addendum; however, all data are required.

Aerobic aquatic metabolism studies: No data were submitted for this addendum; however, all data are required.

Leaching and adsorption/desorption studies: Five studies were reviewed. Two hardcopies were combined for one study because one hardcopy (Warren, 1985, No MRID) contained two additional replicates of the experiment performed in the other hardcopy (Warren, 1984c, No MRID). The portion of this study pertaining to soil columns A, B, and C is scientifically invalid because the recovery of

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[^{14}C]simazine was too low (67, 67 and 57% for columns A, B, and C, respectively). The portion of the study pertaining to soil columns D and E is scientifically valid. This study does not fulfill data requirements because simazine degradates in the soil column after leaching were not identified, K_d values were not reported, and the soil aging conditions were not reported. The remaining four studies are scientifically valid; one study (Guth, 1983, No MRID) does not fulfill data requirements because the soil columns were not eluted with a sufficient amount of water to fully assess simazine mobility in soil, K_d values were not presented, the test soils were not demonstrated to be representative of those in the United States, and the aging period for the treated soil samples was too long. The second study (Guth, 1978, No MRID) does not fulfill data requirements because K_d values were not reported, radioactive residues in the soil columns were not characterized, and the test soils were not demonstrated to be representative of those in the United States. The third study (Warren, 1984b, No MRID) does not fulfill data requirements because the test substance was not completely characterized, and K_d values were not reported. The remaining valid study (Warren, 1984a, No MRID) partially fulfills data requirements by providing information on the mobility of simazine (unaged) in two loam and two loamy sand soils. Based on data submitted for the Simazine Registration Standard dated March 1, 1984, a study is needed providing information on the leaching of simazine soil degradation products including adsorption/desorption studies.

Laboratory volatility studies: No data were submitted for this addendum; however, no data are required because of the low vapor pressure of simazine.

Field volatility studies: No data were submitted for this addendum; however, no data are required because of the low vapor pressure of simazine.

Terrestrial field dissipation studies: No data were submitted for this addendum; however, based on data submitted for the Simazine Registration Standard, dated March 1, 1984, data on the dissipation of simazine in silt loam (NE, NY, OH) and fine sandy loam (CA) applied as a WP or SC/L are acceptable. A study is needed providing information on the dissipation of simazine products representing each formulation category and the formation and decline of degradates in soils treated at maximum label rates to support each use and major geographical use area.

Aquatic field dissipation studies: No data were submitted for this addendum; however, based on data submitted for the Simazine Registration Standard, dated

March 1, 1984, data on the dissipation of simazine in pond water in New York and Nebraska are acceptable. A study is needed providing information on the dissipation of simazine in the soil/sediment phase of the aquatic environment, and on the formation and decline of degradates in the aquatic environment. Data are also needed to support all other aquatic and aquatic impact uses including, but not limited to, drainage ditch banks, swimming pools and cooling water systems.

Forestry dissipation studies: No data were submitted for this addendum; however, all data are required.

Dissipation studies for combination products and tank mix uses: No data were submitted for this addendum, however, no data are required because data requirements for combination products and tank mix uses are currently not being imposed for this Standard.

Long-term field dissipation studies: No data were submitted for this addendum; however, all data may be required to support uses on field or vegetable crops if data from aerobic soil metabolism/terrestrial field dissipation studies indicate that 50% dissipation of residues will not occur before a subsequent application to the same use sites.

Confined accumulation studies on rotational crops: No data were submitted for this addendum; however, all data are required.

Field accumulation studies on rotational crops: No data were submitted for this addendum; however, all data are required.

Accumulation studies on irrigated crops: No data were submitted for this addendum; however, all data are required.

Laboratory studies on pesticide accumulation in fish: No data were submitted for this addendum; however, based on data submitted for the Simazine Registration Standard dated March 1, 1984, all data requirements have been met.

Field accumulation studies on aquatic nontarget organisms: No data were submitted for this addendum; however, no data are required since laboratory studies indicate that simazine does not accumulate significantly in fish tissue.

Exposure studies: One study was reviewed, and two hardcopies were combined for this review (Roux Associates, Inc., 1984a, No MRID; Roux Associates, Inc., 1984b, No MRID) because they both pertained to the same pesticide monitoring survey. This study cannot be validated because the sampling protocols and analytical methods were not reported.

Reentry studies: No data were submitted for this addendum; however, no data are required.

Label Restriction

Pending the submission of crop rotation data, it is suggested that crops other than those with registered simazine uses be restricted from being planted in simazine-treated soil.

References (All Studies Reviewed)

Bowman, B.R. 1984. Determination of the photolysis rate constants and degradation products of simazine. Unpublished study received Oct. 17, 1984 under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255085. (No MRID)

Burkhard, N. 1978. Photolysis of simazine (Gesatop) on soil surfaces under artificial sunlight conditions; Project report 54/78. Unpublished study received Oct. 17, 1984 under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255085. (No MRID)

Guth, J. A. 1978. Leaching characteristics of aged ^{14}C-simazine (Gesatop) residues in two standard soils; Project Report 47/78. Unpublished study received Oct. 17, 1984, under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255085. (No MRID)

Guth, J. A. 1983. Leaching characteristics of aged residues of ^{14}C-simazine (G-27692, Primatol) in two soils. Unpublished study received Oct. 17, 1984, under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255085. (No MRID)

Roux Associates, Inc. 1984a. Sensitivity analysis of areas where simazine has been reported in ground water. Unpublished study received Dec. 5, 1984 under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255834. (No MRID)

Roux Associates, Inc. 1984b. Survey of activities in selected states regarding monitoring for pesticides in ground water. Unpublished study received Dec. 5, 1984 under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255833. (No MRID)

Warren, J. 1984a. Determination of adsorption/desorption constants of ^{14}C simazine. Unpublished study received Oct. 17, 1984, under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255085. (No MRID)

Warren, J. 1984b. Leaching characteristics of parent simazine. Unpublished study received Oct. 17, 1984, under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255085. (No MRID)

Warren J. 1984c. Leaching characteristics of aged simazine; Final report #31831. Unpublished study received Oct. 17, 1984, under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 255085. (No MRID)

Warren J. 1985. Leaching characteristics of aged simazine (supplementary investigation for ABC Project No. 31831); Final report #32483. Unpublished study received Jan. 23, 1985 under 100-541; submitted by Ciba-Geigy Corporation, Greensboro, NC. Accession No. 256317. (No MRID)