DATA EVALUATION RECORD

CHEM 080808 Propazine §161-3

FORMULATION--00--ACTIVE INGREDIENT

STUDY ID 441848-06
Mobley, G.S. 1994. Soil Surface Photolysis of [^{14}C]Propazine in Artificial Light. Laboratory Project Identification: PTRL Project No.:852. Unpublished study performed by PTRL East, Inc., Richmond, KY and submitted by Griffin Corporation, Valdosta, GA

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A. CONCLUSIONS/SUMMARY

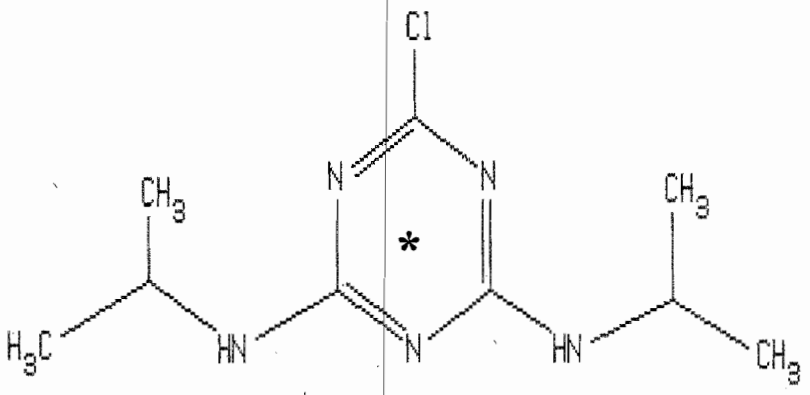
(1) The study was submitted to support registration of an end use product and to provide data that may be used toward fulfillment of Subdivision N (161-3) environmental fate requirements on soil photolysis of propazine. The study was found to be acceptable.

(2) Radiolabeled propazine was applied to a sandy loam (sand 67%, silt 23%, clay 10%; organic carbon 1.0%; pH 6.8) at a concentration of 19.5 ppm and irradiated for a 12-hour cycle using a xenon arc lamp followed by 12-hour dark cycle for 30 days. Irradiated and dark control samples were collected after 0, 7, 14, 21, and 30 days. The soil photolysis half-life under an artificial light was estimated at 199 days and the half-life of the dark control was 211 days. Two degradates, propazine-2-hydroxy and atrazine-desethyl, were detected but each accounted for <1% of applied radiocarbon. Another unidentified degradation product was detected and accounted for <2% of applied radiocarbon. The mean material balance throughout the study was 93.6 ± 1.3% (± std. deviation).

(3) The results indicated that soil photolysis would not contribute significantly to the degradation of propazine in the environment.

B. TEST MATERIAL

The chemical structure of radiolabeled propazine used in the study is shown below:



* denotes site of radiolabel

It has a radiochemical purity of 99.53% and a specific activity of 130.7 uCi/mg. The solubility of propazine was reported to be 8.6 mg/L at 20 °C.

C. SOIL DESCRIPTION

Sandy loam was collected from Huntington Series soil (A soil horizon) in Fayette County, Kentucky. The soil has the following characteristics: pH 6.8, 1.0 % organic carbon, bulk density 1.24 g/cc, Cation Exchange capacity 5.5 meq/100 g, textural classification: 67% sand, 23% silt, and 10% clay. The soil was allowed to air dry and sieved through a 2-mm screen. The soil was biologically viable with the following microbial population density in total colony forming units (CFU) / g of soil: aerobic bacteria = 2.6 E+06, actinomycetes = 4.1 E+06, and fungi = 1.4 E+04. This same soil type was used in the aerobic soil metabolism study of propazine (MRID# 441848-07).

D. TEST METHODOLOGY

(1) Soil Photolysis: Radiolabeled propazine was applied to microbially active sandy loam soil in Petri dishes that yielded a final concentration of 19.5 ppm. Autoclaved HPLC-grade water was uniformly dispensed onto the soil surface to bring the soil to 75% of field

capacity at 0.33 bar. The Petri dishes with the treated soil layers were kept in the temperature-controlled chambers, which in turn were placed in the irradiation chamber with two xenon arc lamps filtered through borosilicate glass to filter out wavelengths less than 290 nm. The dishes were irradiated for a 12-hour cycle followed by a 12-hour dark cycle for 30 days. The intensity of the xenon lamps was measured continuously at 10-minute intervals with datalogger. The spectral distribution of emitted light from the xenon lamps was determined at the beginning and end of the study, and later compared with that of natural sunlight. Ambient air was drawn through the test system into a sequence of traps consisting of one polyurethane foam plug and two foil-covered glass dispersion tubes containing ethylene glycol and sodium hydroxide for collecting volatile compounds and CO_2, respectively. An identical set of samples was not irradiated and served as dark controls. The temperature of both the irradiated and dark control samples were maintained at approximately 25 ^{0}C. The temperature was monitored and recorded daily.

(2) Sampling: Duplicate soil samples from irradiated and dark control chambers were taken after 7, 14, 21, and 30 days and immediately extracted. Volatile traps were sampled after 7, 14, 21, and 30 days. The traps were replaced on days 7, 14, and 21. No sample storage stability study was conducted because the samples were immediately analyzed after sample collection.

(3) Extraction: The collected soil samples were extracted using acetonitrile:water(9:1,v:v) mixture and then centrifuged at approximately 10,000 rpm for about 10 minutes. The procedure was repeated using the same extractant and refluxing for one hour. For samples collected on days 14,21, and 30, further extraction was done using methanol:concentrated NH_4OH(1:1,v:v) in a one-hour reflux. The extracts were pooled and then filtered. Polyurethane foam plugs were extracted once with acetonitrile.

(4) Analysis: Subsamples of air-dried extracted soils were combusted and then analyzed by Liquid Scintillation Counting (LSC). Aliquots of ethlyene glycol, NaOH, and foam plug extracts were radioassayed directly by LSC. Extracts of soil samples were analyzed by the High Performance Liquid Chromatography (HPLC) and Tin Layer Chromatography (TLC). Prior to sample analysis, [^{14}C]propazine fortified with nonradiolabeled reference standard mixture of propazine and its potential degradates was injected to HPLC. Two-dimensional TLC was used with two solvent systems to confirm the characterization of propazine and its degradates.

E. REPORTED RESULTS

The half-life of propazine under irradiated conditions was estimated at 199 days from the linear regression of ln % of applied dose vs time with a correlation coefficient of 0.963. Using similar calculation procedure, the half-life for dark control was 211 days (correlation coefficient = 0.931). Propazine appeared relatively stable and underwent very little or negligible photolytic degradation. Two degradation products present in trace

quantities were detected: propazine-2-hydroxy that accounted for 0.4% of the applied radiocarbon and atrazine-desethyl that accounted for 0.6% of the applied radiocarbon. The volatile trapping solutions accumulated < 0.1% of the initial radiocarbon dose. The material balance for the irradiated and dark control samples ranged from 91.0 to 98.6%, with a mean of 94.1 ± 1.8% (± std. deviation).

F. REVIEWER'S DISCUSSION AND COMMENTS

(1) The linear regression analysis (Table XII) yielded a rate constant of 3.5 E-3 for the irradiated samples and 3.3 E-3 for the dark control samples. The first-order kinetic plot (Figure 15) showed that the degradation under irradiated and dark conditions are almost practically the same. Both the values of the rate constants and the degradation plot strongly suggest that the observed degradation happened in the dark. Any degradation under the artificial light was very small and may be considered negligible if the limit of experimental error was considered.

(2) A close examination of the light spectra of the xenon arc lamp taken before (7/28/94) and at the end (9/16/94) of the study and that of natural sunlight (5/11/94) indicated that the solar intensity is generally slightly higher than the lamp intensity. It would have been better had the natural sunlight spectrum was measured in a typical use area during the use or application season. In this way, a more appropriate comparison between the light spectra of the xenon arc lamp and that of natural sunlight can be made.

STUDY AUTHOR'S CONCLUSIONS INCLUDING PERTINENT TABLES AND FIGURES

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