Shaughnessy No.: 128501

Date Out of EAB: SEP 22 1987

To: Robert Taylor
Product Manager 25
Registration Division (TS-767)

From: Therese M. Dougherty, Chief
Review Section #1
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)

Attached, please find the EAB review of...

Reg./File # : 476-EEEL, 476-EEEA

Chemical Name: SC-0224

Type Product : Herbicide

Product Name : SULFOSATE

Company Name : Stauffer

Purpose : Review Data to Assess the Leaching Potential of Sulfosate.

Date Received: 8/11/87

Action Code(s): 121

Date Completed: SEP 22 1987 EXPEDITE

EAB #(s) : 70760-61

Days: 3.5

Deferrals to: ____ Ecological Effects Branch

____ Residue Chemistry Branch

____ Toxicology Branch

Monitoring study requested by EAB: /__/

Monitering study voluntarily conducted by registrant: /__/

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 13 1987

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Request for Expeditious Review
Sulfosate (SC-0224)

FROM: Edwin F. Tinsworth, Director
Registration Division (TS-767C)

TO: Anne L. Barton, Acting Director
Hazard Evaluation Division (TS-769C)

Stauffer Chemical Company has requested an expeditious review of three interim reports on the leaching potential of the trimethylsulfonium (TMS) moiety of sulfosate. The reports were routed to HED on August 10, 1987. Sulfosate is a new chemical, proposed for noncropland use. Doug Campt previously directed that any additional data be expedited so that a final Agency decision could be made on the sulfosate registrations prior to next year's use season. The requested due date is September 25, 1987.

→ MSI
cc EAB

30860
30861

2

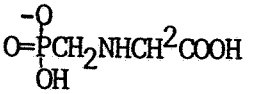
1.a CHEMICAL: SULFOSATE (See 2, below). SC-0224

1.b Physical Properties:

Not included in this submission.

2. TEST MATERIAL:

97% radiochemically pure, specific activity 20 mCi/mmol [^{14}C-TMS] SC-0224



3. STUDY/ACTION TYPE:

Review of soil data in support of registration of sulfosate for non-crop herbicidal uses.

4. STUDY IDENTIFICATION: Acc. # 40277801-3.

1) [^{14}C-Cation] SC-0224 Soil Leaching and Adsorption/Desporption by C.J. Spillner, July 1987.
2) Addendum II: SC-0224-Anaerobic Soil Metabolism Study: Fate of the Trimethyl Sulfonium Moiety by J.B. McBain, July, 1987.

5. REVIEWED BY:

Akiva D. Abramovitch, Ph.D.
Chemist
Environmental Chemistry Review Section 1/EAB/HED/OPP

Akiva Abramovitch

Date: SEP 22 1987

6. APPROVED BY:

Therese M. Dougherty, Chief
Supervisory Chemist
Environmental Chemistry Review Section 1/EAB/HED/OPP

Therese M. Dougherty

Date: SEP 22 1987

7. CONCLUSIONS:

EAB already accepted that the CAP moiety is not likely to leach and contaminate ground water. Therefore, the summary below only adresses the environmental fate data of the TMS moiety needed for making assessment of its leaching potential. TRIMETHYL SULFONIUM

The TMS moiety is stable in water at pH 5 and 7 in both sunlight exposed and non-exposed samples and undergoes degradation at pH 9 only under sunlight. Degradation of the TMS moiety to CO_2, under anaerobic conditions proceeds with a half life of about 2 months based on the $^{14}CO_2$ evolution and was even faster under aerobic conditions with a half life of less than a month (the EAB review of June 30, 1986 indicated that 66% of the radiolabeled TMS was converted to $^{14}CO_2$ within 28 days). It is realized that half-lives based on CO_2 evolution represent the maximum and thus half-lives of 2-3 weeks under aerobic conditions are likely to be more representative. However, EAB finds the half-life of 3 days reported by the registrant as unreasonable since it represents only the "parent" TMS and not the "extractable" TMS. EAB is also aware of the difficulties in obtaining a more accurate half-life for the extractable TMS.

Only 13% of the applied [^{14}C-TMS] SC-0224 was Extractable with water after three days of aerobic incubation and these extractable TMS residues have adsorption/desorption K values ranging between 1.69-3.68 in the four soils studied. Individual K values were 1.69 for Keeton loam and 2.22 for Columbia sand. Much higher K values were obtained for parent TMS. Less than 1% of the aged sulfosate applied to Columbia sand and Sorrento loam soil columns leached through the columns when 20 inches of water was applied at once to both soils and only some movement of radiolabeled aged TMS residues occurred beyond the 0-6 cm layer to the 6-12 cm layer. These results do not indicate that the TMS moiety is likely to leach significanly beyond 6 inches even in a sandy soil.

The soil column leaching and the adsorption/desorption data were provided to supplement field dissipation data that were inconclusive and did not provide the necessary data on the TMS moiety to convince EAB that leaching is not likely to occurr. However, the additional data provided by the registrant on TMS indicate a more moderate propensity for leaching than originally noted and a reasonably fast degradation in soil under both aerobic and anaerobic conditions to CO_2 with a half life of less than 2 months based on the $^{14}CO_2$ evolution. Therefore, it can be concluded that the TMS residues are not likely to leach and contaminate groundwater under actual use condition.

The PRZM study was not used for our assessment for reasons cited in the attached review by the groundwater team (see appendix).

8. RECOMMENDATIONS:

The additional data provided by the registrant diminished EAB concern about potential leaching of TMS residues. Therefore, EAB concurs with the proposed registration of sulfosate.

9. BACKGROUND:

A. Introduction: This submission is in response to environmental fate data requirements for registration set forth on sulfosate in a March meeting between the Registrant, D. Campt, E. Tinsworth and representatives of EAB.

B. Directions for Use: See label in earlier submissions. The maximum application rate of the active ingredient is 4 lb/acre.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

A. Study Identification: [^{14}C-Cation] SC-0224 Soil Leaching and Adsorption/ Desorption by C.J. Spillner, July, 1987 at Stauffer Chemical Company in California.

B. Materials and Methods:

Five soils were used for these studies and were fully characterized as shown in the attached table (appendix).

To obtain soil aged TMS residues, Sorrento loam soil samples were placed in a 1 liter biometer flask in the dark at 25°C and treated with [^{14}C-TMS] SC-0224 at 21 ppm (6.6 ppm TMS). After three days, the half-life point

under aerobic conditions, the flasks were disassembled and a fraction of the soil was frozen to be used later in the aged soil leaching column. A fraction of the soil from another sample was analyzed by combustion and another fraction was placed in a filtering apparatus and extracted with water which was then analyzed by TLC using silica, cellulose and cation exchange plates.

Batch Equilibrium Study was conducted on the aqueous filtrate. The aqueous filtrate was diluted with 0.01N $CaSO_4$ to 1000x, 100x, 10x, and 1x stock solutions of actual concentrations of 0.516, 0.0501, 0.00494, and 0.000509 ppm TMS stock solutions. Stock solutions of the parent compound at the above concentrations were also prepared. Batch equilibrium was performed by combining 2.5 grams of soil with 10 ml of the above solutions in teflon centrifuge tubes and shaking them for two hours. The two hour equilibrium time was established in an earlier test. After equilibrium was established, the supernatant solution obtained after centrifugation at 12,500 x g for 10 minutes, was decanted and assayed by LSC. The amount of radioactive material adsorbed to the soil was determined by the difference between the initial and the final amount of radioactive material in the water. After each adsorption run, the decanted solution was replaced with a fresh 0.01N $CaSO_4$ solution to determine the desorption of material from the soil.

Column leaching studies were conducted in three glass columns of 3.5 cm i.d. in diameter. Five sections of each column were packed with about 450 g of columbia sand. At the top of each column 50 gm of Sorrento soil containing 3 day aged residues of the [^{14}C-TMS]-SC 0224 (aged residues at the half-life point). Each column was saturated from the bottom with 0.01N $CaSO_4$ solution and then leached in one portion with 20 inches of water (490 ml/3.14 x 1.75^2). The leachate was collected in 50 ml fractions and analyzed by LSC. When leaching stopped, the columns were dismantled and the soil fractions were analyzed by combustion for the total amount of radiolabeled material.

C. Reported Results:

Adsorption/Desorption: The aqueous soil extract at the half-life point contained 13% of the applied radioactive material which was 98% radiolabeled TMS. K values were calculated using the Freundlich equation for both the test material and the aqueous extract. Lower K values in the range of 1.69-3.68 were obtained for the extract in comparison to K values of 9-21 for the parent, though both contained the radiolabeled TMS moiety. The K values for desorption were 3.67-8.96. Detailed results are included in the attachments in the appendix.

Soil Column: Less than 1% of the applied radiolabeled material was eluted with 490 ml water which correspond to 20 inches of water. Detailed experimental data are included in the appendix.

D. Study Author's Conclusions:

In addition to the conclusions listed in the results, above, the registrant emphasized that elution of the TMS moiety through soil columns was insignificant. The lower K values for adsorption for the [^{14}C-TMS] SC-0224 extracted from the soil than the parent [^{14}C-TMS]-SC-0224 was attributed to the formation of ^{14}C-TMS complexed with soil residues to reduce its adsorption behavior.

E. Reviewer's Discussions and Interpretation of Study Results:

The soil column leaching study is accepted with the receipt of the written correction to the text concerning the discrepancy between the height of water applied to the column as reported by the registrant and the calculated value based on the volume of water applied and the 5 cm i.d. size of the column reported in the initial text. As discussed in the telephone conference between the reviewer and Mr. Riggs and Dr. Spillner of Stauffer, the correction was already introduced into the text and it corresponds to the application of 20 inches of water to the columns. The study is acceptable.

The batch equilibrium study appear to provide valid scientific results which will be used to assess the leaching potential of the TMS moiety. The reviewer noted that the Keeton loam soil had a lower K value than the Columbia sand although the Columbia sand had lower OM% and CEC. However, the Keeton loam soil had a much higher Electrical Conductivity (EC) and the mobility of the extractable TMS might thus be correlated with the salt concentration in the soil.

10.2 A. Study Identification: Addendum II: SC-0224-Anaerobic Soil Metabolism Study: Fate of the Trimethyl Sulfonium Moiety by J.B. McBain, July, 1987.

B. Materials and Methods:

See EAB review of June 26, 1987.

C. Reported Results:

See EAB review of June 26, 1987.

D. Study Author's Conclusions:

The registrant addressed questions raised by the EAB review of June 26, 1987 concerning the fate of the TMS moiety, and their response is attached to the appendix.

E. Reviewer's Discussions and Interpretation of Study Results:

The reviewer finds the registrant's comments acceptable. In addition, the results of the anaerobic data on the TMS moiety will become of a lesser importance with the relatively low leachability of the TMS moiety demonstrated in 10.1, above.

The registrant keeps refering to the half life of the TMS in both aerobic and anaerobic soil as three days based on the dissipation of the parent [^{14}C-TMS] SC-0224. However, the rate of generation of $^{14}CO_2$ appears to be a better measure of the half life and it can be safely determined at less than one month under aerobic conditions (the EAB review of June 30, 1986 indicated that 66% of the radiolabeled TMS was converted to $^{14}CO_2$ within 28 days).

11. COMPLETION OF ONE LINER:

Not completed.

12. CBI APPENDIX:

None.

Title: Evaluation of PRZM simulations of TMS Cation

The PRZM simulations submitted are unacceptable and the results should not be considered conclusive. The primary reason for this conclusion is an underestimation of the half-life for the TMS cation moiety of sulfosate. The reviewer for the studies upon which the 3-day half-life estimate was based, Akiva Abramovitch, indicated that the half-life as determined by evolution of $^{14}CO_2$ was more in the order of 1 month. Realizing that this estimate of 1 month represents an upper bound on the potential half-life for TMS, he indicated that a half-life between 3 days and 1 month would be appropriate for the TMS cation. I would recommend that a 2-week half-life is more appropriate for PRZM simulations.

Other comments are:

1) The k_{oc} estimates for TMS are reasonable, based on the leaching studies (batch equilibrium, column leaching). I would note, however, that for evaluation of TMS on the soil type modeled, only the lowest k_{oc} would be considered for leaching potential. The application rate of TMS is also appropriate.

2) The soil type modeled is appropriate.

3) For future PRZM submissions, significantly more detail on PRZM parameters would be appropriate in order to evaluate the simulation results. This detail includes:

- all PRZM parameters, such as soil characteristics, crop characteristics, soil zone delineations, etc. This can be submitted in tabular form, or the direct PRZM output, which lists all model input, can be submitted;

- average annual water balance results should be submitted, including: rainfall, irrigation (if added), runoff, evapotranspiration, and recharge below the root zone;

- average annual pesticide balance results should also be submitted, including: rate applied, amount decayed, amount in runoff water, amount leaching below the root zone, amount present in profile at the end of each year. Because of the numerical solution techniques, an exact balance (i.e., rate applied = all other amounts) may not be obtained.

Matthew Lorber

Matthew Lorber, Acting Team Leader
Ground Water Team, EAB/HED (TS-769c)
Sep. 21, 1987

7

Sulfosate environmental fate/exposure assessment review

Page _____ is not included in this copy.

Pages 8 through 19 are not included in this copy.

The material not included contains the following type of information:

___ Identity of product inert ingredients

___ Identity of product impurities

___ Description of the product manufacturing process

___ Description of product quality control procedures

___ Identity of the source of product ingredients

___ Sales or other commercial/financial information

___ A draft product label

___ The product confidential statement of formula

___ Information about a pending registration action

X FIFRA registration data

___ The document is a duplicate of page(s) _____

___ The document is not responsive to the request

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

SC-0724

REGISTRATION DIVISION DATA REVIEW RECORD

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

1. CHEMICAL NAME SULFOSATE

2. IDENTIFYING NUMBER	3. ACTION CODE	4. ACCESSION NUMBER
476-EEEL	121	40277801
EEEA	121	40277802
		40277803

TO BE COMPLETED BY PM

5. RECORD NUMBER: 201 226/201 222
6. REFERENCE NUMBER: 1
7. DATE RECEIVED (EPA): 7-27-87
8. STATUTORY DUE DATE:
9. PRODUCT MANAGER (PM): TAYLOR K. M. Hen
10. PM TEAM NUMBER: 25

TO BE COMPLETED BY PCB

11. DATE SENT TO HED/TSS: 8-11-87
12. PRIORITY NUMBER: 49
13. PROJECTED RETURN DATE: 11-27-87

14. CHECK IF APPLICABLE

- ☐ Public Health/Quarantine
- ☐ Minor Use
- ☐ Substitute Chemical
- ☐ Part of IPM
- ☐ Seasonal Concern
- ☐ Review Requires Less Than 4 Hours

15. INSTRUCTIONS TO REVIEWER

A. HED
- ☐ Total Assessment - 3(c)(5)
- ☐ Incremental Risk Assessment - 3(c)(7) and/or E.L. Johnson memo of May 12, 1977.

B. SPRD (Send Copy of Form to SPRD PM)
- ☐ Chemical Undergoing Active RPAR Review
- ☐ Chemical Undergoing Active Registration Standards Review

C. ☐ BFSD
D. ☐ TSS/RD
E. ☒ Other

F. INSTRUCTIONS Review interim reports on soil column leaching and batch equilibrium adsorption/desorption and computer model simulations on leaching potential of TMS cation. See EFAB review dated 6/26/87.

16. RELATED ACTIONS

17. 3(c)(1)(D)
- ☐ Use Any or All Available Information
- ☐ Use Only Attached Data
- ☐ Use Only the Attached Data for Formulation and Any or All Available Information on the Technical or Manufacturing Chemical.

18. REVIEWS SENT TO
- ☐ TB
- ☐ EEB
- ☐ EF
- ☐ PL
- ☐ RCB
- ☒ EFB
- ☐ CH
- ☐ BFSD

19. To	TYPE OF REVIEW	Registration	Petition	EUP	SLN	Sec. 18	Inert	MNR. USE	Other
HED	TOXICOLOGY								
HED	ECOLOGICAL EFFECTS								
HED	RESIDUE CHEMISTRY								
HED X	ENVIRONMENTAL FATE	2							
RD/TSS	CHEMISTRY								
RD/TSS	EFFICACY								
RD/TSS	PRECAUTIONARY LABELING								
BFSD	ECONOMIC ANALYSIS								

20. ☐ Label Submitted with Application Attached
21. ☐ Confidential Statement of Formula
22. ☐ Representative Labels Showing Accepted Uses Attached
23. Date Returned to RD (to be completed by HED)
24. Include an Original and 4 (four) Copies of This Completed Form for Each Branch Checked for Review.

EPA Form 8570-13 (Rev. 11-81) PREVIOUS EDITIONS ARE OBSOLETE.