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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
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OFFICE OF  
PESTICIDES AND TOXIC  
SUBSTANCES

MEMORANDUM

SUBJECT: Review of Phase 4 Package for Permethrin

EFGWB Numbers: 91-0115 and 91-0116

Chemical Barcode: 109701

DP Barcode: D157560 and D157876

Case Number: 2510

TO: Amy Rispin, Chief  
Science Analysis and Coordination Staff  
Environmental Fate and Effects Division (H7507C)

FROM: Richard J. Mahler, Hydrologist *Richard J. Mahler*  
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THRU: Henry Jacoby, Chief *Henry Jacoby*  
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Permethrin (3-(phenoxyphenyl) methyl ( $\pm$ ) cis-trans-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropane carboxylate, approximately 60% trans and 40% cis or 75% trans and 25% cis) is an active ingredient manufactured as 1.67 to 86.96% technical grade chemical used to formulate wettable powders, granular products, dusts, impregnated materials, liquid-ready to use products, soluble concentrate liquids, pressurized liquids, smokes, Ultra Low Volume products and emulsifiable concentrates. The various formulations are registered as acaricides, biochemical control products (pheromones, insect growth regulators, attractants or feeding stimulants), repellents and repellent/feeding depressants and insecticide for use on a variety of field, tree, vegetable and ornamental crops, as well

as use in greenhouses, lath houses, indoor landscaping, home gardens and as a wood preservative. This pesticide is a synthetic pyrethroid insecticide that controls a broad range of insect pests by contact and stomach poison activity. A Label Use Information System (LUIS) report was received on 3/1/91.

The Phase 4 review package, less the LUIS report, for the list B chemical Permethrin was provided to EFGWB on 11/7/90. EFGWB has reviewed the use pattern and maximum application rates information as gleaned from LUIS report dated 2/19/91. Based on this information and comparing it with the data requirements as listed in 40 CFR Section 158.290, EFGWB concludes that the use patterns being supported are terrestrial food/feed and non-food crops, aquatic food and non-food crop, greenhouse food and non-food crop, indoor food and non-food, residential indoor and outdoor, and indoor medical. The maximum application rates, taken from the LUIS report are dependent on use, crop and timing of application. The maximum rate/application can be as high as 0.5 and 4.1 lb ai/A, respectively, for terrestrial food (alfalfa) and terrestrial non-food (ornamental and/or shade trees) uses, with repeat applications allowed when needed (The LUIS report is not clear on the maximum number of repeat applications allowed).

The Phase 4 package received by EFGWB contained 2 summaries of the following studies (Original study MRID/Summary MRID) which were previously reviewed and judged as being acceptable. The DERs (except for Chemical Identity 160-5) are attached:

CHEMICAL IDENTITY--160-5 (MRID 40955301/92142002,  
40955302/92142005)  
HYDROLYSIS--161-1 (MRID 102043, 112936/92142047)  
PHOTOLYSIS IN WATER--161-2 (MRID 40242801/92142048)  
PHOTOLYSIS ON SOIL--161-3 (MRID 73990<sup>1</sup>, 40190101,  
40201601/92141049).

The following studies, including MRIDs, were listed in the summary of registrant's Phase 2 response as previously submitted acceptable studies in which raw data was available. However, the registrant must have withdrawn the studies for review by EFGWB, since they indicated in the Phase 3 response they would submit new studies and did not provide summaries:

AEROBIC SOIL METABOLISM--162-1 (MRID 100806, 110630,  
110668, 158880)

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<sup>1</sup> This MRID number was listed in the registrant's phase 2 response as being related to a permethrin photodegradation in soil study. However, the blow backs received from the Document Services Center indicated that this was an interim report on the stability of Sencor and is not related to Permethrin.

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ANAEROBIC SOIL METABOLISM--162-2 (MRID 110663, 110668, 110676)  
LEACHING AND ADSORPTION/DESORPTION--163-1 (MRID 90054, 102042, 112937)  
TERRESTRIAL FIELD DISSIPATION--164-1 (MRID UNKNOWN)  
CONFINED ROTATIONAL CROP--165-1 (MRID 90067, 90067)  
BIOACCUMULATION IN AQUATIC NON-TARGET ORGANISMS--165-5 (MRID 99882, 71249, 71035)<sup>2</sup>

The package also contained a summary of previously submitted Bioaccumulation in Fish studies (165-4, MRID 41300401, 41300402, 41300403/92142050) which will be reviewed by EFGWB in Phase 5 of the reregistration process.

The following studies<sup>3</sup> are required to support terrestrial use groups:

AEROBIC SOIL METABOLISM--162-1  
ANAEROBIC SOIL METABOLISM--162--2  
ANAEROBIC AQUATIC METABOLISM--162-3  
LEACHING AND ADSORPTION/DESORPTION--163-1  
LABORATORY VOLATILITY--163-2  
FIELD DISSIPATION FOR TERRESTRIAL USES--164-1  
CONFINED ACCUMULATION IN ROTATIONAL CROPS--165-1  
ACCUMULATION IN FISH--165-4

In addition to the above, the following studies are required to support aquatic use groups:

AEROBIC AQUATIC METABOLISM--162-2  
AQUATIC FIELD DISSIPATION--164-2  
ACCUMULATION IN IRRIGATED CROPS--165-3

The following studies are reserved:

PHOTOLYSIS IN AIR--161-4  
FIELD VOLATILITY--163-3  
LONG-TERM SOIL DISSIPATION--164-5  
LONG-TERM AQUATIC DISSIPATION-164-5  
FIELD ACCUMULATION IN ROTATION CROPS--165-2

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<sup>2</sup> The registrants stated in their Phase 3 response that the data to fulfill the aquatic non-target organism study also fulfills Guideline #72-7(a)-Simulated or Actual Field Testing for Aquatic Organisms.

<sup>3</sup> EFGWB recommends that the registrant be notified that the environmental fate of both the cis and trans isomers of permethrin and degradates should be elucidated; or acceptable evidence should be presented that shows there is little, if any, difference in the environmental fate of the two isomers.

BIOACCUMULATION IN AQUATIC NON-TARGET--165-5  
GROUND WATER--SMALL PROSPECTIVE--166-1  
GROUND WATER--SMALL RETROSPECTIVE--166-2  
GROUND WATER--LARGE RETROSPECTIVE--166-3  
SURFACE WATER--FIELD RUNOFF-167-1  
SURFACE WATER--SURFACE WATER MONITORING--167-2  
DROPLET SIZE SPECTRUM--201-1  
DRIFT FIELD EVALUATION--202-1

The LUIS report (containing the general chemical and the aggregate reports) and summary table of the status of environmental fate data requirements are attached.

PHASE IV ENVIRONMENTAL FATE SUMMARY TABLE FOR PERMETHRIN<sup>1</sup>

Chemical Code : 109701      Reviewer: Richard J. Mahler, EFGWB  
Pesticide Type: Acaricide, Insecticide, Biochemical, Repellent and Repellent/Feeding Depressant      Date: 3/29/91

Uses: Terrestrial Food, Feed and Non-Food Crop; Aquatic Food and Non-Food (Outdoor) Crop; Greenhouse Food and Non-Food Crop; Indoor Food, Non-Food, Medical and Residential; Outdoor Residential

	Submitted Studies/Addendums	DER/Addendum Review/Summary Identification	DER/Addendum Review/Summary Review Conclusions	Additional Data/Info Required?
<b>PRODUCT CHEMISTRY:</b>				
160-5. Chemical ID	40955301 40955302	92142002 92142005	Satisfies	No <sup>1</sup>
<b>DEGRADATION-LAB:</b>				
161-1. Hydrolysis	102043 112936	DER (No EFGWB #/7/31/78) DER (No EFGWB #/7/31/78)	Satisfies	No
<b>Photodegradation:</b>				
161-2. In Water	402428012	DER (70684/3/25/88; 80890, 80891, -92/9/20/88; 90045, 90046, -47, -48, -49/2/24/89)	Satisfies	No
161-3. On Soil	40190101 40201601	DER (70684/3/25/88)		No
161-4. In Air	None <sup>a</sup>	None		Reserved <sup>2</sup> <sub>b</sub>
<b>METABOLISM-LAB:</b>				
162-1. Aerobic Soil	100806, 110630 110668, 158880	Studies Withdrawn <sup>c</sup>		SWBSubmitted <sup>3</sup> <sub>d</sub>

<sup>1</sup> EFGWB recommends that the registrant be notified that the environmental fate of both cis and trans isomers of permethrin and degradates should be elucidated; or acceptable evidence should be presented that shows there is little, if any, difference in the environmental fate of the two isomers.

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PHASE IV ENVIRONMENTAL FATE SUMMARY TABLE FOR PERMETHRIN (cont'd)

Submitted	DER/Addendum	Studies/ Addendums	DER/Addendum Review/Summary Identification	Additional Review/Summary Review Conclusions	Data/Info Required?
<u>METABOLISM-LAB (cont'd):</u>					
162-2.	Anaerobic Soil	110663, 110668 110676	Studies Withdrawn Study Withdrawn		SWBSubmitted <sup>4</sup>
162-3.	Anaerob. Aquat.	None	None		SWBSubmitted <sup>5</sup>
162-4.	Aerobic Aquatic	None	None		SWBSubmitted <sup>6</sup>
<u>MOBILITY STUDIES:</u>					
163-1.	Leaching and Adsorp./Desorp.	90054, 102042	Studies Withdrawn		SWBSubmitted <sup>7</sup>
163-2.	Volatil. (Lab)	None	None		Yes <sup>8</sup>
163-3.	Volatil. (Field)	None	None		Reserved <sup>9</sup>
<u>DISSIPATION-FIELD:</u>					
164-1.	Terrestr. (Soil)	None	Studies Withdrawn		SWBSubmitted <sup>10</sup>
164-2.	Aquat. (Sediment)	None	None		Yes <sup>11</sup>
164-3.	Forestry	None	None		No <sup>12</sup>
164-4.	Combin./Tank Mix	None	None		No <sup>13</sup>
164-5.	Long Term Terr.	None	None		Reserved <sup>14</sup>
164-5.	Long Term Aqua.	None	None		Reserved <sup>15</sup>
<u>ACCUMULATION STUDIES:</u>					
165-1.	Conf. Rot. Crops	90067, 900681	Studies Withdrawn		SWBSubmitted <sup>16</sup>

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PHASE IV ENVIRONMENTAL FATE SUMMARY TABLE FOR PERMETHRIN (Cont'd)

Submitted Studies/Addendums	DER/Addendum Review/Summary Identification	DER/Addendum Review/Summary Conclusions	Additional Data/Info Required?
<u>ACCUMULATION STUDIES (cont'd):</u>			
165-2. Field Rot. Crops 90065, 102101, 102186	Studies Withdrawn		Reserved <sup>17</sup>
165-3. Irrigated Crops None	None		Yes <sup>18</sup>
165-4. Fish (Lab) 41300401, 41300402, 41300403	92142050 92142050		SI Review <sup>19</sup>
165-5. Aqua. Non-target Organ. (Field) 47041, 47042, 96584	None		Reserved <sup>20</sup>
<u>GROUNDWATER MONITORING:</u>			
166-1. Small Prospect.	None		Reserved <sup>21</sup>
166-2. Small Retrospect.	None		Reserved <sup>21</sup>
166-3. Large Retrospect.	None		Reserved <sup>21</sup>
<u>SURFACE WATER:</u>			
167-1. Field Runoff	None		Reserved <sup>22</sup>
167-2. Surface Water Monitoring	None		Reserved <sup>22</sup>
<u>SPRAY DRIFT:</u>			
201-1. Droplet Spect.	None		Reserved <sup>23</sup>
202-1. Field Spray Drift Eval.	None		Reserved <sup>23</sup>



DEFINITIONS:

- a. None indicates that the registrant did not list any studies or addendums in their phase 2 and/or 3 responses for the data requirements. In addition EFGWB has no record of any studies or study/addendum combinations satisfying or partially satisfying the data requirements.
- b. Reserved indicates that the data requirement is being held in reserve since other information is needed to decide whether or not to impose the data requirements.
- c. Study/Studies Withdrawn indicates that there are no DERs or summaries available for the study identified by MRID # in the first column/same row, but that the registrant has indicated in their Phase 3 response that another study will be submitted.
- d. SWBSubmitted indicates that one or more studies will be submitted by the registrant as indicated in their Phase 3 response.
- e. SIRReview indicates that one or more studies is currently in review or will be reviewed during Phase 5 of the reregistration process.

FOOTNOTES:

- 1. The chemical identity data are complete for permethrin. The following product chemistry data were provided to support an environmental fate profile for permethrin:

	<u>Cis Isomer</u>	<u>Trans Isomer</u>
Molecular Weight:	391.3	391.3
Empirical Formula:	$C_{21}H_{20}O_3Cl_2$	$C_{21}H_{20}O_3Cl_2$
Melting Point:	55.7-56.3	45.7-46.3
Solubility:	0.2 ppm	0.13 ppm
Vapor Pressure:	$2.15 \times 10^{-8}$ torr	$0.69 \times 10^{-8}$ torr
$K_{ow}$ :	$1.259 \times 10^6$	$1.259 \times 10^6$
$pK_a$ :	N/A	N/A

- 2. The photodegradation in air study is reserved pending results of the laboratory volatility study.
- 3. The registrant indicated in the Phase 2 response that a new aerobic soil metabolism study would be submitted.

4. The registrant indicated in the Phase 2 response that a new anaerobic soil metabolism study would be submitted. EFCWB notes that an acceptable anaerobic aquatic metabolism study can substitute for the anaerobic soil metabolism study; however, the opposite is not possible.
5. The registrant indicated in the Phase 2 response that a new anaerobic aquatic metabolism study would be submitted.
6. The registrant indicated in the Phase 3 response the a new aerobic aquatic metabolism study would be submitted.
7. The registrant indicated in the Phase 3 response that a new leaching and adsorption/desorption study would be submitted.
8. The registrant indicated in the Phase 3 response that the laboratory volatility study was not required. However, they did not offer any explanation of why it was not required, nor did they request a waiver for the study. Therefore, the laboratory volatility study is required.
9. The field volatility study is reserved pending results from an acceptable laboratory volatility study.
10. A field dissipation study was referenced in the registrant's Phase 2 response and listed as "Previously submitted acceptable study. Raw data are available." However, the registrant apparently withdrew the study since the Phase 3 response indicated registrant would submit new terrestrial field dissipation studies and no MRID #s were listed.
11. This study is required at the present time since permethrin has aquatic food and non-food (outdoor) crop uses.
12. This study is not required at the present time since permethrin has no forestry uses.
13. Combination/tank mix study is not being imposed at this time.
14. The registrant indicated in the Phase 2 response that a long term field dissipation study was not required. However, they did not offer any explanation of why it was not required, nor did they request a waiver for the study. Therefore, the long term field dissipation study is reserved pending the receipt of acceptable field dissipation studies.

15. Long term aquatic field dissipation data requirement is reserved pending receipt of acceptable aquatic field dissipation data.
16. Two confined rotational crop studies were referenced in the registrant's Phase 2 response and listed as "previously submitted acceptable study. Raw data available." However, the registrant apparently withdrew the studies since the Phase 3 response indicated that the registrant would submit a new study.
17. Three field rotational crop studies were referenced in the registrant's Phase 2 response and listed as "Previously submitted acceptable study. Raw data available." However, the registrant apparently withdrew the studies since the Phase 3 response indicated that the registrant would submit a new study. EFGWB notes that the field rotational crop study is reserved pending results from an acceptable crop rotational study.
18. Accumulation in irrigated crops data requirements are required at this time since permethrin has aquatic food and non-food uses.
19. Three fish accumulation studies including a summary were received by EFGWB and will be reviewed in Phase 5 of the reregistration process.
20. The registrants stated in their Phase 3 response that the data to fulfill the aquatic non-target organism study also fulfills Guideline #72-7(a)-Simulated or Actual Field Testing for Aquatic Organisms. EFGWB notes that this data requirement is reserved pending review of an acceptable fish accumulation study.
21. Ground water monitoring studies are reserved pending review of acceptable environmental fate studies.
22. If projected aquatic residues, based on modeling scenarios, are of environmental concern, this study may be required.
23. In general, droplet spectrum and field spray drift information will be required if one of the following criteria are met:
  1. Human exposure - The chemical is classified as being in Toxicity Category I or II for human acute inhalation or dermal effects studies;
  2. Aquatic animal wildlife exposure - The chemical is used in close proximity to aquatic systems and five percent of the applied quantity yields a greater than ten percent mortality for aquatic animal species. This is based on the fact that about one to five percent of an applied pesticide can drift

100 yards (100 meters) in a ten knot (4.5 m/s) wind when applied about ten feet above the crop canopy. Terrestrial wild animal situations are based on human toxicity criteria given above; or

3. Wild and cultivated plant exposure - The chemical is used in close proximity to sensitive plants, as noted in phytotoxicity testing, including endangered and threatened species, that may be found within 100 to 500 yards (100 to 500 meters) downwind.