VALIDATION SHEET

FORMULATION:

% a.i. SC CHEMICAL NAME
Technical (98.7% a.i.) Permethrin PP557
and
25% Emulsifiable Concentrate
JF 5855

Validator: R. Balcomb Date: Oct. 26, 1977
Test Type: Acute Toxicity and Reproduction Studies of Daphnia magna
Test ID #: ES-K


VALIDATION CATEGORY: I. Acute toxicity to first instar Daphnia magna: Core
II. Acute toxicity to Daphnia ephippia: Supplemental

RESULTS:

Summary

I. The EC\textsubscript{50} of Permethrin to first instar Daphnia magna was determined:

<table>
<thead>
<tr>
<th></th>
<th>Technical</th>
<th>25% Concentrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hr. EC\textsubscript{50}</td>
<td>2.1 ppb a.i.</td>
<td>0.6 ppb a.i.</td>
</tr>
<tr>
<td>48 hr. EC\textsubscript{50}</td>
<td>1.8 ppb a.i.</td>
<td>0.8 ppb a.i.</td>
</tr>
</tbody>
</table>

II. 48-hour EC\textsubscript{50} of Permethrin to the ephippia of Daphnia magna

a. Ephippia dried prior to exposure to Permethrin: 0.034 mg/L
b. Ephippia dried after exposure to Permethrin: 0.108 mg/L

VALIDATION CATEGORY/RATIONALE:

I. The study of the acute toxicity of Permethrin to Daphnia magna was determined core as it generally adhered to guidelines and statistical methods were appropriate and accurate.

II. The study of the toxicity of Permethrin to Daphnia ephippia was deemed supplemental information as such testing is not required nor was it requested. In addition, this report cannot qualify as a reproduction or life-cycle study as there was not continuous exposure of the organisms to the pesticide.

CATEGORY REPAIRABILITY/RATIONALE:

Part I: NA
Part II: NA
Details and Discussion

I. Acute Toxicity of Permethrin to Daphnia magna

The acute toxicity of Permethrin (PP557) to first instar Daphnia magna was determined. The Daphnia were 12 hours old (± 12 hr.) and were tested at concentrations ranging from 100 mg/L a.i. down to 0.01 µg/L a.i. plus controls. The Daphnia were held at 18°C (± 1°C), were not aerated or fed during the experiment and were allotted ten organisms per beaker. At each concentration level, three test groups were formed with each group containing six beakers of Daphnia (Ref. 1). Survival assessments were made after 24 and 48 hours. This determination was made by gently agitating each beaker and recording the number not free swimming after 5 seconds as affected.

The EC₅₀ values and their 95% confidence limits were calculated statistically using linear regression on log concentration plotted against a logit transformation of the Daphnia response.

<table>
<thead>
<tr>
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<th>EC₅₀ ppb a.i.</th>
<th>95% Conf. Limits</th>
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<tbody>
<tr>
<td>Technical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 hour</td>
<td>2.06</td>
<td>1.65-2.53</td>
</tr>
<tr>
<td>48 hour</td>
<td>0.6</td>
<td>0.53-0.67</td>
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<td>48 hour</td>
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These data were recomputed by this reviewer and a 48 EC₅₀ value of 0.58 µg/L was determined for the technical material and 0.65 µg/L for the formulated product. These values approximate those of the experimenters.

II. Acute Toxicity and Reproduction Studies on Ephippia

Ephippia are the resting eggs of Daphnia. The toxicity of PP557 to this life cycle stage of Daphnia was investigated by exposing the ephippia to concentrations of technical PP557 ranging from 0.001 mg/L to 100 mg/L plus controls for 48 hours. After exposure, the ephippia were rinsed and stored in dechlorinated tap water (20°C) until hatching 4-5 days later.

The ephippia were stimulated to an early hatch in the laboratory by drying them for 24 hours. This condition was incorporated into the experimental design by having two test series. In test series A the ephippia were exposed to PP557 after drying and in test series B ephippia were exposed to PP557 before drying.
In both tests the EC<sub>50</sub> value was statistically calculated from the number of free swimming first instar Daphnia hatched in the treatment and control groups. The log/logit transformations were used as before.

<table>
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<td>Test A:</td>
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The experimenter did not supply a percent affected for each treatment level. When the reviewer calculated these data from the Table 6 and then computed an EC<sub>50</sub> value, the result obtained was at slight variance with that presented in the paper (i.e., for test A: 0.034 ppm vs. 0.056 ppm (0.045 - 0.069 ppm)).

In both cases, with the technical and formulated product, a marked reduction in survival of hatched ephippia occurred: for the technical at 0.1 ppm 85% of the hatched ephippia died, and for the formulated product at 1 ppm the % of hatched ephippia was reduced. The study on formulated product was conducted using ephippia that were exposed to FMC 33297 without being preconditioned by drying. This indicates that under most normal conditions, free swimming Daphnia could be killed before producing ephippia, and any ephippia produced may be killed.

A third portion of this study was conducted comparing toxicity of PP557 (FMC 33297) in a static bioassay and in a bioassay in the presence of soil. The soil type (pear tree soil) had a pH 7. (Chemical 25% a.i.)

| Test Soil pH 7 | EC<sub>50</sub> = 1.1 ppb (.84-1.45 ppb) 95% C.L. |
| Test Standard Water | EC<sub>50</sub> = .45 ppb (.35-.61 ppb) 95% C.L. |

The researcher concludes from these studies that FMC 33297 will kill most free swimming Daphnia, but ephippia will be unharmed at normal application rates, will hatch and reproduce thus re-establishing the colony.

**Reviewer Comment**

This section takes exception to the researcher's second conclusion. This study has demonstrated that after exposure for 48 hrs., at normal application rates, Daphnia may re-establish their numbers from surviving ephippia. Under field conditions, however, we may well expect exposure to continue for weeks or months. It is impossible, we believe, to make such field predictions from short laboratory exposures. Secondly, the ephippia were hatching into untreated water, whereas under field conditions they may not have this advantage. It is our opinion, therefore, that parathrin poses a strong threat to Daphnia in treated areas and that the ephippia stage does not offer sufficient protection to offset this threat.

**Reference**

103.4.3 Aquatic Invertebrate

FORMULATION:

% a.i. - Technical (98.7% a.i.) and 25% Emulsifiable Concentrate JF 5855

Chemical Name: Permethrin PP557

VALIDATOR: R. Balcomb

DATE: October 26, 1977

TEST TYPE: Acute Toxicity and Reproduction Studies of Daphnia Magna

TEST ID NO: ES-K


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VALIDATION CATEGORY/RATIONALE:

I. The study of the acute toxicity of Permethrin to Daphnia Magna was determined core as it generally adhered to guidelines and statistical methods were appropriate and accurate.

II. The study of the toxicity of Permethrin to Daphnia Ephippia was deemed supplemental as insufficient information was supplied concerning the method of EC_{50} calculation. In addition, this report can not qualify as a reproduction or life-cycle study as there was not continuous exposure of the organisms to the pesticide.

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Ephippia EC50
ICI Report Series
TMS 1955B Jan 1977
FMC 33297
P557 Tech

O'Brian

By Finney Probit
Ignore CHI2

2.104   . M
7.639   YINT
2.987   LW M
603.411 CHI2

0.056   EC50
0.045   LDCL
0.069   UPCL

0.014   LD10
0.010   LDCL
0.018   UPCL

0.226   LD90
0.161   LDCL
0.318   UPCL