

REVIEW NO.

EEB REVIEW

16 SEP 1986

SHAUGHNESSY NO.	CHEMICAL & FORMULATION	% AI
125401	2-(2-chlorophenyl)-methyl-4-4-	
	dimethyl-3-isoxazolidinone	

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EEB REVIEW

Command Herbicide (FMC 57020)

100.0 Submission Purpose and Label Information

100.1 Submission Purpose and Pesticide Use

The registrant (FMC Corporation) has applied for registration of Command 4EC and 6EC as herbicides for use on soybeans. Recently reviewed studies (estuarine/marine fish acute and shrimp acute) were submitted in response to EEB's request for additional data needed to develop a hazard assessment.

100.2 Formulation and Information

See EEB review of November 29, 1984.

100.3 Application Methods, Directions, Rates

See EEB review of November 29, 1984.

100.4 Target Organisms

Target organisms are annual grass and broadleaf weeds. See EEB review of November 29, 1984, for appended labels listing target species.

100.5 Precautionary Labeling

See EEB review of November 29, 1984.

101.0 Hazard Assessment

101.1 Discussion

Labeling Information

See EEB review of November 29, 1984.

Crop Distribution and Density

See EEB review of November 29, 1984.

Exposure Use Analysis

See EEB review of November 29, 1984.

101.2 Likelihood of Adverse Effects to Nontarget Organisms

Terrestrial Organisms

As discussed in the original review, data reviewed in EEB indicated that Command herbicide is low in toxicity to birds and mammals. Also, the pesticide will be applied only once, at or before planting. In view of these factors, significant hazards to nontarget terrestrial organisms are not anticipated from the proposed use on soybeans.

Aquatic Organisms

On the basis of previously reviewed data, EEB has determined that no acute or chronic hazards to populations of freshwater aquatic organisms are anticipated from the use of Command herbicide on soybeans. For detailed discussion see EEB reviews of November 29, 1984, and February 4, 1986.

With regard to estuarine/marine testing, EEB initially deferred any decision pending receipt of environmental fate data. Subsequent discussion with EEB personnel indicated that these tests should be required for the soybean use. The decision to require tests on estuarine/marine organisms was indicated in an EEB review of July 17, 1985.

The registrant then submitted data from three studies on estuarine/marine organisms: acute toxicity test on pink shrimp; acute toxicity test on Atlantic silverside; and oyster shell deposition test. EEB completed review of the three studies in February 1986.

The oyster shell deposition study was determined to be a "Core" study. Comparison of the data from this study with EAB's estuarine EEC indicated that no hazard to estuarine organisms would be expected. However, the other two studies were determined to be invalid. Thus, EEB indicated that the shrimp and estuarine fish requirements were not fulfilled.

The registrant has recently submitted data from two studies on estuarine/marine organisms (mysid shrimp and sheepshead minnow) to fill the remaining data requirements. EEB's review of the studies indicates that both studies are "Core" and satisfy the data requirements. The 96-hour LC₅₀ for Command technical was 0.566 mg/L for mysid shrimp and 40.6 mg/L for sheepshead minnow. EAB estimated the estuarine EEC to be 0.005 ppm. On

the basis of these figures, no hazard to estuarine organisms would be expected from the proposed use on soybeans.

101.3 Endangered Species Considerations

No hazard to endangered/threatened species of birds, mammals, or aquatic organisms is expected from the proposed use. See EEB reviews of November 29, 1984, and February 4, 1986, for discussions.

101.4 Adequacy of Toxicity Data

With the submission of the two valid estuarine/marine studies, all the data requirements have been fulfilled.

101.5 Adequacy of Labeling

See EEB review of November 29, 1984.

102.0 Classification

Not performed. Not requested by Product Manager.

103.0 Conclusions

EEB has reviewed the additional data submitted to support registration of Command herbicide for use on soybeans. On the basis of all the data reviewed to date, EEB concludes that the proposed use of Command on soybeans should not result in significant hazard to birds, mammals, freshwater fish and invertebrates, or estuarine/marine fish and invertebrates.

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DATA EVALUATION RECORD

1. Chemical: FMC 57020 (Command)
2. Test Material: Technical, 92.94% ai
3. Study Type: Estuarine/Marine Fish 96-hour Acute Toxicity Test.

Species tested: Sheepshead minnow (Cyprinodon variegatus)

4. Study ID: Barrows, M.E. (1986) Acute Toxicity of FMC 57020 to Sheepshead Minnow (Cyprinodon variegatus). Prepared by Battelle New England Marine Research Laboratory, Duxbury, MA. Submitted by FMC Corp., Princeton, NJ. EPA Registration Nos. 279-3053 and 279-3054. EPA Accession No. 263081.

5. Reviewed By: Allen W. Vaughan
Entomologist
EEB/HED

Signature: *Allen W. Vaughan*

Date: 9/16/86

6. Approved By: Norman Cook
Supervisory Biologist
EEB/HED

Signature: *Norman Cook*

Date: 9.16.86

7. Conclusions:

This study is scientifically sound, and shows the 96-hour LC₅₀ for Command technical to C. variegatus to be 40.6 mg/L.

This study fulfills the Guideline requirement for an acute toxicity test on an estuarine/marine fish species.

8. Recommendations: N/A.

9. Background:

This study, an acute toxicity test on estuarine/marine fish, was submitted in support of registration.

10. Discussion of Individual Studies: N/A.

11. Materials and Methods:

- a. Test Animals were juvenile Cyprinodon variegatus obtained from Battelle's parent stock. Based on data provided in the report, mean weight per fish was 0.17725 gm at test termination.
- b. Test System: FMC 57020 was dissolved in pesticide-grade acetone and metered to the continuous-flow diluter using a peristaltic pump. Similarly, acetone was metered to a solvent control treatment at a final concentration of 0.36 milliliters (mL) per liter of dilution water, the highest concentration of solvent present in any treatment. In addition, a dilution water control, receiving only dilution water, was tested in parallel with test treatments.

The test design included five test concentrations, a control, and a solvent control. Each of these seven treatments was composed of two true replicates: test aquaria that had no water connections. Replicate tanks were glass, 2.5-gallon aquaria fitted with standpipe drains at a height of 9.5 cm, allowing an aquarium volume of test solution of approximately 4.5 L. The diluter system provided 10.8 L of test solution per aquarium per hour with two complete test solution exchanges per hour.

The test began when 28 crystallizing dishes containing the juvenile minnows were distributed by random assignment to each of the 14 test aquaria. Because each dish held five minnows, each treatment replicate received 10 minnows, for a total of 20 individuals per treatment; thus, 140 juvenile minnows were exposed during the test.

Throughout the test, each test chamber received combinations of test material and dilution water at a continuous flow rate greater than 160 milliliters/minute. For each replicate, temperature, salinity, dissolved oxygen, and pH were measured at approximately 0, 24, 48, 72, and 96 hours. Temperature was measured hourly in one concentration. A photoperiod of approximately 16 hours light:8 hours dark with a 30-minute phase-in period was maintained throughout the test. Daily observations were made in each test chamber throughout the test, noting the activity, behavior, and mortality of the minnows. Test animals were not fed during the 96 hours of testing and fecal material was removed using a Pasteur pipet at the

time of daily observations. In addition, the presence of precipitates, surface slick, or any other unusual condition was noted and recorded in the project file.

- c. Dose: Flow-through bioassay using measured concentrations; acetone solvent.
- d. Design: Five concentrations (nominal = 4.7, 9.4, 18.8, 37.5, and 75.0 mg/L; measured = 3.4, 6.9, 13.4, 27.5, and 59.9 mg/L), plus control and solvent control (0.36 mL/L acetone); 2 reps. per dose level, 10 fish per rep.
- e. Statistics: An estimated 96-hour LC₅₀ for sheepshead minnow was calculated using an LC₅₀ computer program developed by Dr. Charles Stephan, Environmental Protection Agency, Duluth, MN, as described in SOP No. 7-006-01, "Calculation of LC₅₀ and EC₅₀ in Toxicological Studies." The binomial test method was used to calculate the LC₅₀. The mean measured concentrations of FMC 57020, as determined by HPLC analysis of test water sampled on Day 0, 1, 2, 3, and 4 for each treatment, were used to calculate the LC₅₀.

12. Reported Results:

The 96-hour LC₅₀ = 40.6 mg/L for technical FMC 57020 and juvenile sheepshead minnows. All fish exposed to the mean measured concentration of 59.9 mg/L died within 24 hours. No other test group experienced any mortality or other signs of intoxication at any time during the test.

13. Study Authors' Conclusions/QA Measures:

96-hour LC₅₀ = 40.6 mg/L (95% C.I. = 27.5 to 59.9 mg/L).

The report was reviewed by Quality Assurance Units of Battelle New England and FMC's Toxicology Department.

14. Reviewer's Discussion and Interpretation of the Study:

- a. Test Procedures: Procedures were in accordance with protocols recommended in the Guidelines and in HED Standard Evaluation Procedure for the estuarine/marine fish acute study. The only significant deviation was in the weight of the test fish, which was much lower than that recommended in the protocols.

As this would only serve to increase the sensitivity of the test organisms, it is not considered to detract from the study.

- b. Statistical Analysis: Analyses conducted by the authors were identical to the methods used by EEB to analyze this type of data. Review of the data entry and completed analyses submitted by the authors indicates that the methods were appropriate and that the results of the analyses support the authors' conclusions.
 - c. Discussion/Results: This study is scientifically sound, and shows the following values for Command technical effect on sheepshead minnow:
 - 96-hour LC₅₀ = 40.6 mg/L (slightly toxic)
 - 95% C.I. = 27.5 to 59.9 mg/L.
 - d. Adequacy of Study:
 - 1. Classification: Core.
 - 2. Rationale: SEP protocol; technical material.
 - 3. Reparability: N/A.
15. Completion of One-Liner for Study:
One-liner for this study completed September 3, 1986.
16. CBI Appendix: N/A.

TABLE 4. The Effect of FMC 57020 on the Sheepshead Minnow (Cyprinodon variegatus) during a 96-h Acute Toxicity Test in a Flow-Through System

Concentrations of FMC 57020 (mg/L)		% Mortality ^a		
Nominal	Measured	24-h	48-h	96-h
Control	0.0	0	0	0
Solvent Control	0.0	0	0	0
4.7	3.4	0	0	0
9.4	6.9	0	0	0
18.8	13.4	0	0	0
37.5	27.5	0	0	0
75.0	59.9	100	100	100

^a Values presented are based on observations from combined replicates; N = 20

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DATA EVALUATION RECORD

1. Chemical: FMC 57020 (Command)
2. Test Material: Technical, 92.94% ai
3. Study Type: Acute Toxicity Test for Estuarine and Marine Organisms (Shrimp 96-hour Acute Toxicity Test)

Species tested: Mysidopsis bahia.

4. Study ID: Williams, J.W. (1986) Acute Toxicity of FMC 57020 to the Mysid Mysidopsis bahia. Prepared by Battelle New England Marine Research Laboratory, Duxbury, MA. Submitted by FMC Corp., Princeton, NJ. EPA Registration Nos. 279-3053 and 279-3054. EPA Accession No. 263080.

5. Reviewed By: Allen W. Vaughan
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Date: *9/16/86*

6. Approved By: Norman Cook
Supervisory Biologist
EEB/HED

Signature: *Norman Cook*

Date: *9.16.86*

7. Conclusions:

This study is scientifically sound, and shows the 96-hour LC₅₀ for Command technical to Mysid shrimp to be 0.566 mg/L.

This study fulfills the Guideline requirement for an acute toxicity test on an estuarine/marine invertebrate.

8. Recommendations: N/A.

9. Background:

This study was submitted in support of registration.

10. Discussion of Individual Studies: N/A.

11. Materials and Methods:

- a. Test animals were juvenile Mysidopsis bahia obtained from Battelle's parent stock. Test organisms were less than 24 hours old at test initiation.
- b. Test System: The test methods for the 96-hour flow-through mysid test were based on the study protocol "Acute Toxicity of FMC 57020 to the Mysid Mysidopsis bahia (2/21/86)," an adaptation of "Conducting Acute Toxicity Tests with Fishes, Macroinvertebrates, and Amphibians" (ASTM Standard Practice No. E729, 1980) and Amendment 1 (3-18-86) to the protocol. Details of the test methods can be obtained by reference to these documents.

Nominal concentrations of FMC 57020 for the definitive toxicity test were 3.17, 1.58, 0.79, 0.40, and 0.20 mg/L based on the results of a range-finding test and toxicant pump flow-rate determinations. FMC 57020 was dissolved in pesticide grade acetone and metered to the continuous-flow diluter using a peristaltic pump. Similarly, acetone was metered to a solvent control treatment at a final concentration of 0.34 milliliters (mL) per liter of dilution water. In addition, a dilution water control, receiving only dilution water, was tested in parallel with test treatments.

The test design included five test concentrations, a control, and a solvent control. Each of these seven treatments was composed of two true replicates: test aquaria that had no water connections. Replicate tanks were glass, 2.5-gallon aquaria fitted with self-starting siphons that ensured water exchange with the individual retention chambers. Each of these 14 test aquaria held two retention-chambers constructed of glass Petri dishes 10 centimeters (cm) in diameter with 15-cm-high collars of 500 μ m Nitex.

The test began when 15 mL plastic beakers containing the juvenile mysids were distributed by random assignment to each of the 28 test retention chambers. Because each retention chamber held five mysids, each treatment replicate received 10 mysids, for a total of 20 mysids per treatment, and thus, 140 < 24-hour-old mysids were exposed during the test.

Throughout the test, each test chamber received combinations of test material and dilution water at a continuous flow rate greater than 160 milliliters/minute. For each replicate, temperature, salinity, dissolved oxygen, and pH were measured at approximately 0, 24, 48, 72, and 96 hours. Temperature was measured hourly in one concentration. A photoperiod of approximately 16 hours light:8 hours dark with a 30-minute phase-in period was maintained throughout the test. Daily observations were made in each test retention chamber throughout the test, noting the activity, behavior, and mortality of the mysids. The mysids in each retention chamber were fed 1 mL of concentrated brine shrimp (Artemia salina) nauplii once daily, excluding the 96-hour interval.

- c. Dose: Flow-through bioassay using measured concentrations; acetone solvent.
- d. Design: Five concentrations (nominal = 3.17, 1.58, 0.79, 0.40, and 0.20 mg/L; measured = 3.339, 1.664, 0.834, 0.419, and 0.215 mg/L), plus control and solvent control (0.34 mL/L acetone); 2 reps. per dose level, 10 shrimp per rep.
- e. Statistics: A 96-hour LC₅₀ for mysids was calculated using an LC₅₀/EC₅₀ computer program developed by Dr. Charles Stephan, Environmental Protection Agency, Duluth, MN, as described in SOP No. 7-006-02, "Calculation of LC₅₀ and EC₅₀ in Toxicological Studies." The probit method was used to calculate the LC₅₀. The mean measured concentrations of FMC 57020, as determined by HPLC analysis on Day 0, 1, 2, 3, and 4 for each treatment, were used to calculate the LC₅₀.

12. Reported Results:

The 96-hour LC₅₀ = 0.566 mg/L for technical FMC 57020 and juvenile mysid shrimp. All shrimp exposed to the mean measured concentrations of 1.664 and 3.339 mg/L died within 96 hours. No mortality was noted at the lowest dose level (0.215 mg/L). Control and solvent control mortalities were 5% and 0%, respectively.

13. Study Authors' Conclusions/QA Measures:

96-hour LC₅₀ = 0.566 mg/L (95% C.I. = 0.490 to 0.662 mg/L).

The report was reviewed by Quality Assurance Units of Battelle New England and FMC's Toxicology Department.

14. Reviewer's Discussion and Interpretation of the Study:

a. Test Procedures: Procedures were in accordance with protocols recommended in the Guidelines and in the HED Standard Evaluation Procedure for the estuarine/marine invertebrate acute study. No significant deviations were noted.

b. Statistical Analysis: Analyses conducted by the authors were identical to the methods used by EEB to analyze this type of data. Review of the data entry and completed analyses submitted by the authors indicates that the methods were appropriate and that the results of the analyses support the authors' conclusions.

c. Discussion/Results: This study is scientifically sound, and shows the following values for Command technical effect on mysid shrimp:

96-hour LC₅₀ = 0.566 mg/L (highly toxic).

95% C.I. = 0.490 to 0.662 mg/L.

d. Adequacy of Study:

1. Classification: Core.

2. Rationale: SEP protocol; technical grade ai test.

3. Reparability: N/A.

15. Completion of One-Liner for Study:

One-liner for this study completed September 3, 1986.

16. CBI Appendix: N/A.

TABLE 4. Effect of FMC 57020 on the Mysid Mysidopsis bahia During a 96-Hour Exposure in Flowing Seawater

Concentrations of FMC 57020 (mg/L)		% Mortality			
Nominal	Mean Measured	24-h	48-h	72-h	96-h
Control	0.001	0	0	0	5
Solvent Control	0.004	0	0	0	0
0.20	0.215	0	0	0	0
0.40	0.419	0	0	5	10
0.79	0.834	0	55	80	95
1.58	1.663	5	100	100	100
3.17	3.339	100	100	100	100

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