125401
SHAUGHNESSY NO.

REVIEW NO.

EEB BRANCH REVIEW

DATE: IN August 13, 1984 OUT 29 NOV 1984

FILE OR REG. NO. 279-GNLE, 279-GNLG, 279-GNLU

PETITION OR EXP. PERMIT NO.

DATE OF SUBMISSION August 3, 1984

DATE RECEIVED BY HED August 9, 1984

RD REQUESTED COMPLETION DATE November 27, 1984

E. ESTIMATED COMPLETION DATE November 20, 1984

RD ACTION CODE/TYPE OF REVIEW 105/New Chemical

TYPE PRODUCT(S): I, D, H, F, N, R, S Herbicide

DATA ACCESSION NO(S).

PRODUCT MANAGER NO. J. Yowell(25)

PRODUCT NAME(S) Command Technical

Command 6EC, Command 4EC

COMPANY NAME FMC Corporation

SUBMISSION PURPOSE Proposed full registration of formulating use label and 2 end-use products for use on soybeans.

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

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EEB BRANCH REVIEW

FMC 57020 (Command)

100 Submission Purpose and Label Information

100.1 Submission Purpose and Pesticide Use

The registrant (FMC Corporation) has applied for registration of Command technical (formulating use) and Command 4EC and 6EC as herbicides for use on soybeans, to control annual grass and broadleaf weeds.

100.2 Formulation Information

(From Confidential Statement of Formula)

4EC

[redacted]

* Variable, depending on purity (potency) of technical
** Variable

6EC

[redacted]

* Variable, depending on purity (potency) of technical
** Variable

100.3 Application Methods, Directions, Rates

Please refer to appended labels.

100.4 Target Organisms

Target organisms are annual grass and broadleaf weeds. Please refer to appended labels for lists of species.

100.5 Precautionary Labeling

INERT INGREDIENT/MANUFACTURING PROCESS INFORMATION HAS BEEN DELETED.

Formulating Use Product

Do not discharge into lakes, streams, ponds or public waters unless in accordance with an NPDES permit. For guidance, contact your regional office of the Environmental Protection Agency.

4EC and 6EC

Do not contaminate water by cleaning of equipment or disposal of wastes. Do not apply directly to any body of water.

101 Hazard Assessment

101.1 Discussion

Labeling Information

Command (4EC/6 EC) is a selective herbicide which may be used as a preemergence surface applied or preplant incorporated treatment for control of weeds in soybeans. Command may be used alone or tank-mixed with other soybean herbicides. Water or liquid fertilizer may be used as a carrier.

Apply Command alone or in tank mix combinations by ground equipment, using a finished spray volume of 10 to 40 gallons of water per acre. May be applied broadcast or in band applications. For band applicaion, the labels provide formulas for calculation of rates and volumes required.

Following are the use instructions and rate information, taken directly from the labels. Labels also contain this information for Command/herbicide combinations; these combinations will not be discussed in this review.

4EC

Preemergence Broadcast Application: Use Table 1 to select the recommended rate of Command 4 EC herbicide based on soil texture and percent organic matter. Apply as a broadcast spray during planting, or as a separate operation after planting but before weeds or soybeans emerge.

Table 1: Command 4 EC Alone

Preemergence Broadcast Rates Per Acre (Pints)		
Soil Texture*	Less than 3% Organic Matter	3% or Greater Organic Matter
Course (light) soils: (sand, loamy sand, sandy loam)	1.5-2	2
Medium soils: (loam, silt loam, silt, sandy clay, sandy clay loam)	2	2-2.5
Fine (heavy) soils: (silty clay, clay loam, silty clay loam, clay)	2-2.5	2-2.5

*Select lower to higher rates within the ranges noted based on lighter to heavier soil types (e.g., sand, loamy sand, sandy loam) within a textural group, and increasing organic matter levels.

Band Application: Apply Command 4 EC Herbicide at a broadcast equivalent rate and volume per acre. Use the rates from the Preemergence Broadcast Application directions above (Table 1) and adjust rate and total spray volumes by using the formulas in the General Application Instructions portion of this label.

Preplant Incorporated Application Use Table 2 to select the recommended rate of Command 4 EC Herbicide. Apply Command 4 EC to the soil surface and uniformly incorporate. Select equipment suited accordingly for shallow or deeper incorporation.

Table 2: Command 4EC Alone

Preplant Incorporated Rates Per Acre (Pints)

Soil Texture*	Less than 3% Organic Matter	3% or Greater Organic Matter
Course (light) soils: (sand, loamy sand, sandy loam)	1.5-2	2-2.5
Medium soils: (loam, silt loam, silt, sandy clay, sandy clay loam)	2-2.5	
Fine (heavy) soils: (silty clay, clay loam, silty clay loam, clay)	2-2.5	

*Select lower to higher rates within the ranges noted based on lighter to heavier soil types (e.g., sand, loamy sand, sandy loam) within a textural group, and increasing organic matter levels.

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6EC

Preemergence Broadcast Application: Use Table 1 to select the recommended rate of Command 6 EC Herbicide Based on soil texture and percent organic matter. Apply as a broadcast spray during planting, or as a separate operation after planting but before weeds or soybeans emerge.

Table 1: Command 6 EC Alone

Preemergence Broadcast Rates Per Acre (Pints)

Soil Texture*	Less than 3% Organic Matter	3% or Greater Organic Matter
Course (light) soils: (sand, loamy sand, sandy loam)	1-1.4	1.4
Medium soils: (loam, silt loam, silt, sandy clay, sandy clay loam)	1.4	1.4-1.6
Fine (heavy) soils: (silty clay, clay loam, silty clay loam, clay)	1.4-1.6	1.4-1.6

*Select lower to higher rates within the ranges noted based on lighter to heavier soil types (e.g., sand, loamy sand, sandy loam) within a textural group, and increasing organic matter levels.

Band Application: Apply Command 6 EC Herbicide at a broadcast equivalent rate and volume per acre. Use the rates from the Preemergence Broadcast Application directions above (Table 1) and adjust rate and total spray volumes by using the formulas in the General Application Instructions portion of this label.

Preplant Incorporated Application: Use Table 2 to select the recommended rate of Command 6 EC Herbicide. Apply Command 6 EC to the soil surface and uniformly incorporate. Select equipment suited accordingly for shallow or deeper incorporation.

Table 2: Command 6 EC Alone

Preplant Incorporated Rates Per Acre (Pints)

Soil Texture*	Less than 3% Organic Matter	3% or Greater Organic Matter
Course (light) soils: (sand, loamy sand, sandy loam)	1-1.4	1.4-1.6
Medium soils: (loam, silt loam, silt, sandy clay, sandy clay loam)	1.4-1.6	
Fine (heavy) soils: (silty clay, clay loam, silty clay loam, clay)	1.4-1.6	

*Select lower to higher rates within the ranges noted based on lighter to heavier soil types (e.g., sand, loamy sand, sandy loam) within a textural group, and increasing organic matter levels.

On the basis of the use rates outlined in the above tables, the ranges of active ingredient per acre are as follows:

4 EC: 0.75 to 1.25 lb A.I./acre
6 EC: 0.75 to 1.20 lb A.I./acre

Command may also be used, alone or in combination with other herbicides, for weed control in minimum tillage or no-tillage soybeans. For use rates, refer to attached labels.

Note - Maximum recommended use rates for Command, when used in combination with other herbicides, are not as high as the maximum recommended rates for Command used alone. Thus, maximum rates of A.I./acre are covered in the above tables.

Crop Distribution and Density

According to the 1978 Census of Agriculture, the leading soybean-producing states, with approximate acreage, are as follows: Illinois (9.3 million); Iowa (7.5 million); Missouri (5.2 million); Arkansas (4.6 million); Indiana (4.1 million); Ohio (3.9 million); Minnesota (3.7 million); Mississippi (3.7 million); Louisiana (3 million); and Tennessee (2.1 million). Other states with more than 1 million acres of soybeans include Alabama, Georgia, Kansas, Kentucky, Nebraska, North Carolina, and South Carolina. Total soybean acreage in the United States, in 1978, was approximately 64.4 million acres.

Exposure Use Analysis

Application of this herbicide is by ground equipment, with spray being directed to the soil surface. This should minimize exposure of nontarget terrestrial areas.

Due to the large acreage of soybeans in the U.S., spread over a wide geographic area, exposure of aquatic environments is possible. In view of the fact that substantial soybean acreage is located in coastal counties, exposure of estuarine environments is of special concern.

101.2 Likelihood of Adverse Effects to Nontarget Organisms

Terrestrial Organisms

Data submitted by the registrant indicate that FMC 57020 is practically non-toxic to birds on both an acute oral basis and a dietary basis. The available data on rats suggest that the chemical also has a low mammalian acute toxicity. Thus, significant acute hazards to populations of nontarget terrestrial organisms are not anticipated from the use of FMC 57020 on soybeans.

Chronic hazards to avian and mammalian species are also unlikely, due to the fact that probability of exposure is low, and due to the fact that FMC 57020 will only be applied once, at or before planting.

No data were submitted on the toxicity of FMC 57020 to honeybees. However, based on the fact that the proposed soybean use represents a low exposure situation for honeybees, no significant bee hazard is expected from this use.

Aquatic Organisms

Results from freshwater organism toxicity studies show FMC 57020 to be slightly toxic to fish, with reported LC_{50}'s of 19 mg/l for rainbow trout and 34 mg/l for bluegill sunfish. The daphnid study indicates that the chemical is moderately toxic to aquatic invertebrates (48-hr. LC_{50} = 5.2 mg/l).

Although the registrant apparently performed an aquatic exposure analysis for the proposed use, the study was not submitted. Information submitted by the registrant does indicate that FMC 57020 is stable to hydrolysis, and that it has a potential for leaching in certain soil types. In the absence of material supporting the registrant's EEC, EEB used the scenario developed in the soybean cluster approach. Based on this scenario, the aquatic EEC would be 0.028 ppm at the highest application rate. Although this does not exceed 0.01 of the daphnid LC_{50}, requirement for an aquatic invertebrate life-cycle study may be indicated, based on the preliminary data which indicate persistence in water, coupled with an extensive use pattern. EEB will defer the decision to require the life-cycle study, pending receipt of the registrant's aquatic exposure analysis and EAB's finalized fate review.

As noted above, substantial soybean acreage is located in coastal areas. This presents a potential for FMC 57020 to enter the estuarine environment. Again, the decision to require testing on estuarine/marine organisms will be deferred, pending receipt of environmental fate data.

101.3 Endangered Species Considerations

Terrestrial

There are a number of endangered/threatened species of birds located in the counties reported to produce soybeans. However, on the basis of the avian dietary LC_{50} (>5620 ppm), no hazard to endangered/threatened avian species is expected from the proposed use of FMC 57020 on soybeans.

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With regard to endangered/threatened mammals, the EEB cluster approach indicates that habitat for mammals in unlikely to be sprayed or significantly contaminated from soybean pesticide use. Thus, no hazard to endangered/threatened species of mammals is expected from the proposed use.

Aquatic

To assess the potential hazard to endangered/threatened species of aquatic organisms from soybean use, EEB used the scenario developed in the soybean cluster approach. Based on this scenario, the aquatic EEB would be 0.028 ppm at the highest rate of application of FMC 5702 on soybeans. This value is well below the aquatic endangered species trigger, and indicates that no hazard to endangered/threatened species of aquatic organisms would be expected from the proposed use. However, EEB will defer any final decision in this matter, pending receipt of the aquatic EEC calculations developed by the registrant and a finalized EAB review of fate data.

101.4 Adequacy of Toxicity Data

For discussion of possible additional data requirements, see Sec. 101.2, above.

101.5 Adequacy of Labeling
Formulating-Use Label

The statement under Environmental Hazards should be amended to read as follows:

"Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or public waters unless this product is specifically identified and addressed in an NPDES permit. Do not discharge effluent containing this product to sewer systems without previously notifying the sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA."

End-Use Labels

The statement under Environmental Hazards should be amended to read as follows:

Do not contaminate water by cleaning of equipment or disposal of wastes. Do not apply directly to water or wetlands.

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102 Classification

Classification deferred pending receipt of additional data.

103 Conclusions

EEB has reviewed the proposed registration of FMC 57020 (Command) for use on soybeans. EEB is unable to complete a risk assessment for this use because pertinent environmental fate data are lacking. In order to assess the risks associated with this use, EEB requires: (1) an examination of the registrant's EEC by EAB and, possibly, development of a new EEC by EAB; and (2) a finalized review of the environmental fate data by EAB.

Note - Percent a.i. for FMC 57020 technical was reported as 88.8% in the aquatic LC_{50} studies. Percent a.i. was not reported in any of the avian studies. For purposes of evaluation, EEB assumed that percent a.i. was 88.8% for the avian studies, as well. The registrant should verify this.

Allen W. Vaughan 11/29/84
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EEB/HED

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Addendum to review 11/29/84

Chemical : FMC 57020 (Command)

Proposed use : Soybean herbicide

The completed environmental fate review for this proposed use was received in EEB 11/28/84. The EAB review indicates that a number of environmental data requirements, including aquatic and soil photolysis, have not been satisfied. As these data are needed to complete the aquatic organism hazard assessment, the conclusions reached in the current EEB review still stand. (See EEB review, Sec. 103, Conclusions.)

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DATA EVALUATION RECORD

1. CHEMICAL: FMC 57020

2. FORMULATION: Technical - 88.8%

3. CITATION: Beavers, J. B., and R. Fink. 1982. Acute oral LD_{50} - Bobwhite quail - FMC 57020 technical (Project No. 104-153, FMC Study No. A82-656.) Reference #19 in EPA Acc. No. 248475. Unpublished study prepared by Wildlife International Ltd., Subm. by FMC Corp., October 1, 1982.

4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: October 23, 1984

6. TEST TYPE: Avian single-dose oral LD_{50}
A. Test species: Bobwhite quail

7. REPORTED RESULTS:
As there was no mortality at the highest dosage tested (2510 mg/kg), acute oral LD_{50} is estimated to be greater than 2510 mg/kg.

8. REVIEWER'S CONCLUSIONS:

This study is scientifically sound and meets the guideline requirements. The estimated LD_{50} value of greater than 2510 mg/kg indicates this material is practically non-toxic to bobwhite quail.

Materials and Methods

Test Procedures

Two weeks prior to study initiation, birds were placed in test pens and allowed to acclimate themselves. At the end of this period, birds were randomly assigned to treatment and control groups, using 5 birds of each sex per group, as outlined below:

Treatment	Pens	Birds/Pen	Dosage level (mg/kg)
Control	1	10	Corn oil only
Experimental	5	10	398, 631, 1000, 1590, 2510

Experimental material was dispersed in corn oil. Dosing was by intubation directly into the crop via a stainless steel catheter. Each bird was weighed and dosed on the basis of mg material per kg body weight. Control birds received a corresponding volume of corn oil only.

Body weights were recorded individually at initiation and by pen at 3 days, 7 days, and at termination of the study. Feed consumption was measured, but is presented as an estimate due to the unavoidable wastage by the birds.

Symptoms of toxicity and mortality were recorded daily throughout the study.

Statistical Analysis

As there was no mortality in any of the treatment or control birds, no statistical analysis was performed.

Discussion/Results

All birds survived the 14-day observation period. There was no apparent difference in feed consumption between treated and control birds. Birds receiving 1590 or 2510 mg/kg exhibited a slight body weight loss at the day 3 interval. No other signs of toxicity were observed.

Reviewer's Evaluation

A. Test Procedures

Test procedures were sound and followed recommended protocol (EPA guidelines.)

B. Statistical Analysis

No analysis was performed, as there was no mortality.

C. Discussion/Results

This study is scientifically sound and meets the guideline requirements.

D. Conclusions

1. Category - Core
2. Rationale - Study fulfills the guideline requirements.
3. Reparability - N/A

DATA EVALUATION RECORD

1. CHEMICAL: FMC 57020

2. FORMULATION: Technical - 88.8%

3. CITATION: Beavers, J. B., and R. Fink. 1982. Acute oral LD_{50} - Mallard duck - FMC 57020 technical (Project No. 104-154, FMC Study No. A 82-657.) Reference #20 in EPA Acc. No. 248475. Unpublished study prepared by Wildlife International Ltd., Subm. by FMC Corp., October 1, 1982.

4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: October 24, 1984

6. TEST TYPE: Avian single-dose oral LD_{50}
A. Test species: Mallard duck

7. REPORTED RESULTS:
As there was no mortality at the highest dosage tested (2510 mg/kg), acute oral LD_{50} is estimated to be greater than 2510 mg/kg.

8. REVIEWER'S CONCLUSIONS:

This study is scientifically sound and meets the guideline requirements. The estimated LD_{50} value of greater than 2510 mg/kg indicates this material is practically non-toxic to mallard duck.

Materials and Methods

Test Procedures

Two weeks prior to study initiation, birds were placed in test pens and allowed to acclimate themselves. At the end of this period, birds were randomly assigned to treatment and control groups, using 5 birds of each sex per group, as outlined below:

Treatment	Pens	Birds/Pen	Dosage level (mg/kg)
Control	1	10	Corn oil only
Experimental	5	10	398, 631, 1000, 1590, 2510

Experimental material was dispersed in corn oil. Dosing was by intubation directly into the crop via a stainless steel catheter. Each bird was weighed and dosed on the basis of mg material per kg body weight. Control birds received a corresponding volume of corn oil only.

Body weights were recorded individually at initiation and by pen at 3 days, 7 days, and at termination of the study. Feed consumption was measured, but is presented as an estimate due to the unavoidable wastage by the birds.

Symptoms of toxicity and mortality were recorded daily throughout the study.

Statistical Analysis

As there was no mortality in any of the treatment or control birds, no statistical analysis was performed.

Discussion/Results

All birds survived the 14-day observation period. Birds receiving 2510 mg/kg exhibited a slight body weight loss at day 7 and reduced feed consumption during the first 7 days of the study. No other signs of toxicity were observed.

Reviewer's Evaluation

A. Test Procedures

Test procedures were sound and followed guideline recommendations.

B. Statistical Analysis

No analysis was performed, as there was no mortality.

C. Discussion/Results

This study is scientifically sound and meets the guideline requirements.

D. Conclusions

1. Category - Core
2. Rationale - Study fulfills the guideline requirements.
3. Reparability - N/A

DATA EVALUATION RECORD

1. CHEMICAL: FMC 57020

2. FORMULATION: Technical - 88.8%

3. CITATION: Beavers, J. B., and R. Fink. 1982. Eight-day dietary LC_{50} - Bobwhite quail - FMC 57020 technical (Project No. 104-151, FMC Study No. A82-658.) Reference #21 in EPA Acc. No. 248475. Unpublished study prepared by Wildlife International Ltd., Subm. by FMC Corp., October 1, 1982.

4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: October 24, 1984

6. TEST TYPE: Avian dietary LC_{50} test
A. Test species: Bobwhite quail

7. REPORTED RESULTS:

There was one incidental death at the 1000 ppm dose level on day 6. No other mortalities occurred at any concentration level tested, and all other birds were normal in appearance and behavior throughout the test period. As there was no mortality at the highest dosage tested (5620 ppm), LC_{50} is estimated to be greater than 5620 ppm.

8. REVIEWER'S CONCLUSIONS:

This study is scientifically sound and meets the guideline requirements. The estimated LC_{50} value of greater than 5620 ppm indicates this material is practically non-toxic to bobwhite quail.

Materials and Methods

Test Procedures

At 14 days of age, birds were randomly assigned to the following treatment groups without regard to sex:

Treatment	Pens	Birds/Pen	Dosage level (mg/kg)
Control	5	10	Basal diet only
Dieldrin	5	10	15.9, 25.1, 39.8, 63.1, 100.0
Experimental	5	10	562, 1000, 1780, 3160, 5620

Experimental material and dieldrin were dispersed in corn oil and incorporated into standard gamebird starter ration. Birds were exposed to the appropriate dietary concentrations for 5 days, and then maintained on toxicant-free diet for a three-day observation period. Control birds received basal diet throughout the study.

Body weights were recorded by pen at initiation and termination of the study. Feed consumption was recorded by pen during the five-day exposure period. Feed consumption was measured, but is presented as an estimate due to the unavoidable wastage by the birds.

Symptoms of toxicity and mortality were recorded daily throughout the study.

Statistical Analysis

As there was no mortality in the control or in the FMC 57020 groups (with the exception of one incidental death), no analysis was performed.

Discussion/Results

As shown in the tables below, there was no mortality in treated birds or in controls, with the exception of one incidental death at the 1000 ppm dose level.

FMC 57020 Technical

Concentration ppm	Time of Death (Day) 1	2	3	4	5	6	7	8
562	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
1000	0/10	0/10	0/10	0/10	0/10	1/10	1/10	1/10
1780	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
3160	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
5620	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10

LC_{50} is estimated to be greater than 5620 ppm.

CONTROLS

Concentration ppm	Time of Death (Day) 1	2	3	4	5	6	7	8
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10

The authors reported no symptoms of toxicity or behavorial abnormality in birds treated with FMC 57020. Also, there was no apparent effect on feed consumption or body weight gain at any dose level tested.

Reviewer's Evaluation

A. Test Procedures

Test protocol followed that recommended in EPA pesticide guidelines.

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B. Statistical Analysis

There was no mortality on which to base a statistical analysis.

C. Discussion/Results

This study is scientifically sound and meets the guideline requirements.

D. Conclusions

1. Category - Core
2. Rationale - Study meets the guideline requirements.
3. Repairability - N/A

DATA EVALUATION RECORD

1. CHEMICAL: FMC 57020

2. FORMULATION: Technical - 88.8%

3. CITATION: Beavers, J. B., and R. Fink. 1982. Eight-day dietary LC_{50} - Mallard duck - FMC 57020 technical (Project No. 104-152, FMC Study No. A82-659.) Reference # 22 in EPA. Acc. No. 248475. Unpublished study prepared by Wildlife International Ltd., subm. by FMC Corp., October 1, 1982.

4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: October 24, 1984

6. TEST TYPE: Avian dietary LC_{50} test
A. Test species: Mallard duck

7. REPORTED RESULTS:

FMC 57020 did not cause any overt symptoms of toxicity at any dose level tested, and there were no mortalities. As there was no mortality at the highest level tested (5620 ppm), LC_{50} is estimated to be greater than 5620 ppm.

8. REVIEWER'S CONCLUSIONS:

This study is scientifically sound and meets the guideline requirements. The estimated LC_{50} value of greater than 5620 ppm indicates this material is practically non-toxic to mallard duck.

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Materials and Methods

Test Procedures

At 14 days of age, birds were randomly assigned to the following treatment groups without regard to sex:

Treatment	Pens	Birds/Pen	Dosage level (mg/kg)
Control	5	10	Basal diet only
Dieldrin	5	10	72, 100, 139, 193, 269
Experimental	5	10	562, 1000, 1780, 3160, 5620

Experimental material and dieldrin were dispersed in corn oil and incorporated into standard gamebird starter ration. Birds were exposed to the appropriate dietary concentrations for 5 days, and then maintained on toxicant-free diet for a three-day observation period. Control birds received basal diet throughout the study.

Body weights were recorded by pen at initiation and termination of the study. Feed consumption was recorded by pen during the five-day exposure period. Feed consumption was measured, but is presented as an estimate due to the unavoidable wastage by the birds.

Symptoms of toxicity and mortality were recorded daily throughout the study.

Statistical Analysis

As there was no mortality in the control or in the FMC 57020 groups, no analysis was performed.

Discussion/Results

As noted above, there was no mortality in the controls or in any of the FMC 57020 treatment groups. Authors reported that all birds were normal in appearance and behavior throughout the test period. Also, FMC 57020 had no apparent effect on feed consumption or body weight gain at any dose level tested.

Reviewer's Evaluation

A. Test Procedures

Test protocol followed EPA pesticide guidelines, with the exception that test birds were 14 days old at initiation of the test (recommended age for mallard is 5-10 days.)

B. Statistical Analysis

There was no mortality on which the base a statistical analysis.

C. Discussion/Results

This study is scientifically sound and meets the guideline requirements.

D. Conclusions

1. Category - Core
2. Rationale - Study meets the guideline requirements
3. Repairability - N/A

DATA EVALUATION RECORD

1. CHEMICAL: FMC 57020

2. FORMULATION: Technical (88.8%)

3. CITATION: Rhoderick, J.C. 1982. Static acute toxicity study of FMC 57020 technical to bluegill sunfish (Biospherics Project No. 82-E-087-B, FMC Study No. A82-661.) Reference #24 in EPA Acc. No. 248475. Unpublished study prepared by Biospherics, Incorporated, subm. by FMC Corp., October 1, 1982.

4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: October 30, 1984

6. TEST TYPE: Acute Toxicity test for freshwater fish.
A. Test species: Bluegill sunfish

7. REPORTED RESULTS:

The 96-hour LC_{50} with confidence intervals for bluegill sunfish is 34 (29-40) mg/l. The 96-hour no-effect level was determined to be 8.9 mg/l.

8. REVIEWER'S CONCLUSIONS:

This study is scientifically sound and meets the guideline requirements. The LC_{50} value of 34 mg/l indicates this material is slightly toxic to bluegill sunfish.

Materials and Methods

Test Procedures

Bluegill sunfish used in this test were obtained from a commercial hatchery in Connecticut. They were maintained in the Biospherics laboratory for at least 2 weeks prior to testing. Mortalities in the stock culture over this period were less than 2%. Forty-eight hours before test initiation the fish were taken off feed, and no food was provided thereafter.

Dilution water for the test was obtained from a well, and was vigorously aerated before use.

Test practices followed those recommended by the Committee on Methods for Toxicity Tests with Aquatic Organisms (1975), except that replicate concentrations were not used. The definitive test was conducted in 19.6 liter glass carboys, each containing 15 liters of dilution water. Five concentrations and two controls (negative and acetone solvent) were tested, nominal concentrations of test material being 4.4, 8.9, 18, 36 and 71 mg/l A.I. Ten fish were introduced at random into each of the test and control vessels.

Mortalities among the test fish, and any observable abnormal behavioral responses, were noted and recorded every 24 hours. The no-effect concentration was determined, by observation, at 96 hours.

Statistical Analysis

The LC_{50} and 95% confidence limits were determined by the Litchfield and Wilcoxon method. LC_{50} calculations are based on nominal concentrations of the test material.

Discussion/Results

The following table shows mortality data in relation to concentrations:

Test material Nominal Conc. (mg/l A.I.)	Percent mortality			
	24 Hour	48 Hour	72 Hour	96 Hours
Control	0	0	0	0
Solvent Control	0	0	0	0
4.4	0	0	0	0
8.9	0	0	0	0
18	0	0	0	0
36	0	40	60	60
71	80	100	100	100

The no-effect concentration for all observation periods was 8.9 mg/l. Loss of equilibrium was observed at 24, 72, and 96 hours for those fish exposed to 71, 36, or 18 mg/l A.I., respectively.

Reviewer's Evaluation

A. Test Procedures

Procedures were sound and followed EPA (Stephan's) methodology, with the exception that replicate concentrations were not used.

B. Statistical Analysis

The attached print-out (from EEB-TOXANAL Computer program) shows an LC_{50} value calculated according to the binomial method. This figure (32.9709) indicates no significant problem with the analysis presented in the study.

C. Discussion/Results

This study is scientifically sound and meets the guideline requirments.

D. Conclusions

1. Category - Core
2. Rationale - Study meets guideline requirements.
3. Repairability - N/A

BLUEGILL SUNFISH ACUTE LC50 FMC 57020

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
71	10	10	100	.0976563
36	10	6	60	37.6953
18	10	0	0	.0976563
8.9	10	0	0	.0976563
4.4	10	0	0	.0976563

THE BINOMIAL TEST SHOWS THAT 18 AND 71 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 32.9709

...EN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE
PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE
NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

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DATA EVALUATION RECORD

1. CHEMICAL: FMC 57020

2. FORMULATION: Technical (88.8%)

3. CITATION: Rhoderick, J.C. 1982. Static acute toxicity of FMC 57020 technical to rainbow trout (Biospherics Project No. 82-E-087-R, FMC Study No. A82-660.) Reference #23 in EPA Acc. No. 248475. Unpublished study prepared by Biospherics, Incorporated, subm. by FMC Corp, October 1, 1982.

4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: October 29, 1984

6. TEST TYPE: Acute Toxicity test for freshwater fish.
A. Test species: Rainbow trout

7. REPORTED RESULTS:

The 96-hour LC_{50} with confidence intervals for rainbow trout is 19 (16-22) mg/l. The 96-hour no-effect level was determined to be 8.9 mg/l.

8. REVIEWER'S CONCLUSIONS:

This study is scientifically sound and meets the guideline requirements. The LC_{50} value of 19 mg/l indicates this material is slightly toxic to rainbow trout.

Materials and Methods

Test Procedures

Rainbow trout used in this test were reared from eggs obtained from a commercial hatchery. They were hatched and maintained in the laboratory until they reached acceptable bioassay size. In the stock culture over the 2-week period prior to testing no mortalities occurred. Forty-eight hours before test initiation the fish were taken off feed, and no food was provided thereafter.

Dilution water for the test was obtained from a well, and was vigorously aerated before use.

Test practices followed those recommended by the Committee on Methods for Toxicity Tests with Aquatic Organisms (1975), except that replicate concentrations were not used. The definitive test was conducted in 35-liter aquaria, each containing 30 liters of dilution water. Five concentrations and two controls (negative and acetone solvent) were tested, nominal concentrations of test material being 4.4, 8.9, 18, 36 and 71 mg/l A.I. Ten fish were introduced at random into each of the test and control vessels.

Mortalities among the test fish, and any observable abnormal behavioral responses, were noted and recorded every 24 hours. The no-effect concentration was determined, by observation, at 96 hours.

Statistical Analysis

The LC_{50} and 95% confidence limits were determined by the Litchfield and Wilcoxon method. LC_{50} calculations are based on nominal concentrations of the test material.

Discussion/Results

The following table shows mortality data in relation to concentrations:

Test material Nominal Conc. (mg/l A.I.)	Percent mortality			
	24 Hour	48 Hour	72 Hour	96 Hours
Control	0	0	0	0
Solvent Control	0	0	0	0
4.4	0	0	0	0
8.9	0	0	0	0
18	10	20	20	40
36	30	60	90	100
71	100	100	100	100

The no-effect concentration for all observation periods was 8.9 mg/l. Loss of equilibrium prior to death was behavioral observation at 24 and 48 hours at the 18 and 36 mg/l A.I.

Reviewer's Evaluation

A. Test Procedures

Procedures were sound and followed EPA (Stephan's) methodology, with the exception that replicate concentrations were not used.

B. Statistical Analysis

The attached print-out (from EEB-TOXANAL Computer program) shows an LC_{50} value calculated according to the binomial method. This figure (19.6537) indicates no significant problem with the analysis presented in the study.

C. Discussion/Results

This study is scientifically sound and meets the guideline requirments.

D. Conclusions

1. Category - Core
2. Rationale - Study meets guideline requirements.
3. Repairability - N/A

VAUGHAN FMC 57020 RAINBOW TROUT ACUTE LC50

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
71	10	10	100	.0976563
36	10	10	100	.0976563
18	10	4	40	37.6953
8.9	10	0	0	.0976563
4.4	10	0	0	.0976563

THE BINOMIAL TEST SHOWS THAT 8.9 AND 36 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 19.6537

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

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DATA EVALUATION RECORD

1. CHEMICAL: FMC 57020

2. FORMULATION: Technical (88.8%)

3. CITATION: Graney, R.L. 1982. Static acute toxicity study of FMC 57020 technical to Daphnia magna (Biospherics Project No. 82-E-087-D, FMC Study No. A82-662.) Reference #25 in EPA Acc. No. 248475. Unpublished study prepared by Biospherics, Incorporated, subm. by FMC Corp., October 1, 1982.

4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: October 30, 1984

6. TEST TYPE: Acute Toxicity test for freshwater aquatic inverte brate.
A. Test species: Daphnia magna

7. REPORTED RESULTS:

The 48-hour LC_{50} with confidence intervals for Daphnia magna is 5.2 (4.4-6.1) mg/l. The 48-hour no-effect level was determined to be 0.4 mg/l.

8. REVIEWER'S CONCLUSIONS:

This study is scientifically sound and meets the guideline requirements. The LC_{50} value of 5.2 mg/l indicates this material is moderately toxic to daphnids.

Materials and Methods

Test Procedures

Daphnia magna used in this test came from the Biospherics Incorporated Laboratory stock cultures. Stock cultures are maintained at 20±2°C. in 10-gallon aquaria. Twenty-four hours prior to testing, adults with full brood chambers were isolated into well water. The following morning the newly released instars were removed with a pipette and transferred to a separate holding vessel. One hour before the test they were fed, and no food was provided thereafter.

Dilution water for the test was obtained from a well, and was vigorously aerated before use. As first-instar daphnids survived in the water for 48 hours without feeding, its quality was judged acceptable for bioassay purposes.

Test practices followed ASTM's standard methods and methods recommended by the Committee on Methods for Toxicity Tests with Aquatic Organisms (1975). The definitive test was conducted in 250-ml beakers containing 200 ml of test solution. Five concentrations and a control were tested, nominal concentration of the test material being 0.4, 1.1, 2.7, 6.2, and 13.3 mg/l A.I. There were 4 replicates of 10 daphnids per container; daphnids were randomly introduced into the beakers. Mortalities were recorded at 24 and 48 hours.

Statistical Analysis

The LC_{50} and 95% confidence limits were determined by the moving average method. LC_{50} calculations are based on nominal concentrations of the test material.

Discussion/Results

The following table shows mortality data in relation to concentrations:

	Percent mortality						
		Solvent	Test material nominal concentration (mg/l A.I.)				
	Control	Control	0.4	1.1	2.7	6.2	13.3
24 Hour	0	0	0	2.5	0	10.0	35.0
48 Hour	0	2.5	0	2.5	7.5	52.5	100.0

Mortality at the 1.1 mg/l level was the same as the solvent control (2.5%). However, it was impossible to determine if this mortality was random or toxicant-induced. Therefore, the 48-hour no-effect level was 0.4 mg/l. The compound exerted no observable sublethal effects on the daphnids' swimming behavior.

Reviewer's Evaluation

A. Test Procedures

Procedures were sound and followed the recommended method of EPA (Stephan) and ASTM.

B. Statistical Analysis

The attached print-out (from EEB-TOXANAL computer program) shows an LC_{50} value calculated according to the moving average method (5.16 mg/l) and the probit method (5.38 mg/l.) These figures indicate no significant problem with the analysis presented in the study.

C. Discussion/Results

This study is scientifically sound and meets the guideline requirements.

D. Conclusions

1. Category - Core
2. Rationale - Study meets guideline requirements.
3. Repairability - N/A

NOTE: THERE WAS CONTROL MORTALITY, BUT AT LEAST ONE
OF THE LOWER CONCENTRATIONS HAD ZERO MORTALITY.
THEREFORE, ABBOTT'S CORRECTION IS NOT APPLICABLE.

FMC 57020 DAPHNID ACUTE LC50

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
13.3	40	40	100	.0976563
6.2	40	21	52.5	37.6953
2.7	40	3	7.5	.0976563
1.1	40	1	2.5	.0976563
.4	40	0	0	.0976563

BECAUSE THE NUMBER OF ORGANISMS USED WAS SO LARGE, THE 95 PERCENT CONFIDENCE INTERVALS CALCULATED FROM THE BINOMIAL PROBABILITY ARE UNRELIABLE. USE THE INTERVALS CALCULATED BY THE OTHER TESTS.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 5.96004

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
3	.0269857	5.16321	4.43174	6.0936

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
6	.929617	4.98886	1.84602E-03

SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.

SLOPE = 4.20893
95 PERCENT CONFIDENCE LIMITS = .150821 AND 8.26704

LC50 = 5.37889
95 PERCENT CONFIDENCE LIMITS = .537166 AND 37.0666

LC10 = 2.68505
95 PERCENT CONFIDENCE LIMITS = 1.11321E-08 AND 4.76782

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DATA EVALUATION RECORD

1. CHEMICAL: FMC 57020

2. FORMULATION: Not reported

3. CITATION: Dickinson, P.R. 1982. Nontarget plant studies: Compilation of FMC 57020 greenhouse activity toward crop and weed species (Bio-Laboratory Report No. M-4828.), Reference # 26 in EPA Acc. No. 248475. Unpublished study subm. by FMC Corp., October 1, 1982.

4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: November 5, 1984

6. TEST TYPE: Nontarget plant toxicity

Nontarget plant data are not required under CFR, Part 158 for this use (soybeans.) These data will not be reviewed at this time.