

DP Barcode : D186691  
 PC Code No : 106401  
 EEB Out : NOV 29 1993

To: WALTER WALDROP PM 71  
 Product Manager  
 Special Review and Reregistration Division (H7508W)

From: Anthony F. Maciorowski, Chief  
 Ecological Effects Branch/EFED (H7507C)

Attached, please find the EEB review of...

Reg./File # : 106401 REREG CASE NO: 0223, LIST A RED  
 Chemical Name : DIFENZOQUAT METHYL SULFATE  
 Type Product : \_\_\_\_\_  
 Product Name : \_\_\_\_\_  
 Company Name : \_\_\_\_\_  
 Purpose : REVIEW USES OF DIFENZOQUAT AND INDICATE  
 STATUS OF DATA REQUIREMENTS, PREPARE EEB SCIENCE CHAPTER  
 FOR REREGISTRATION ELIGIBILITY DOCUMENT  
 Action Code : 606 Date Due : 6-1-93  
 Reviewer : REXRODE Date In EEB: 1-15-93

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT
71-1(A)			72-2(A)			72-7(A)		
71-1(B)			72-2(B)			72-7(B)		
71-2(A)			72-3(A)			122-1(A)		
71-2(B)			72-3(B)			122-1(B)		
71-3			72-3(C)			122-2		
71-4(A)			72-3(D)			123-1(A)		
71-4(B)			72-3(E)			123-1(B)		
71-5(A)			72-3(F)			123-2		
71-5(B)			72-4(A)			124-1		
72-1(A)			72-4(B)			124-2		
72-1(B)			72-5			141-1		
72-1(C)			72-6			141-2		
72-1(D)						141-5		

Y=Acceptable (Study satisfied Guideline)/Concur  
 P=Partial (Study partially fulfilled Guideline but additional information is needed)  
 S=Supplemental (Study provided useful information but Guideline was not satisfied)  
 N=Unacceptable (Study was rejected)/Nonconcur

DP BARCODE: D186691

REREG CASE #

CASE: 819395  
SUBMISSION: S433474

DATA PACKAGE RECORD  
BEAN SHEET

DATE: 01/13/93  
Page 1 of 1

\* \* \* CASE/SUBMISSION INFORMATION \* \* \*

CASE TYPE: REREGISTRATION ACTION: 606 DATA PACKAGE  
CHEMICALS: 106401 Difenzoquat methyl sulfate 100.00 %

ID#: 106401

COMPANY:

PRODUCT MANAGER: 71 WALTER WALDROP 703-308-8062 ROOM: CS1 3B3

PM TEAM REVIEWER: TERRI STOWE 703-308-8043 ROOM: CS1 3D5

RECEIVED DATE: 01/13/93 DUE OUT DATE: 04/13/93

\* \* \* DATA PACKAGE INFORMATION \* \* \*

DP BARCODE: 186691 EXPEDITE: Y DATE SENT: 01/13/93 DATE RET.: / /

CHEMICAL: 106401 Difenzoquat methyl sulfate

DP TYPE: 001 Submission Related Data Package

ADMIN DUE DATE: 03/24/93 CSF: N LABEL: N

ASSIGNED TO	DATE IN	DATE OUT
DIV : EFED	1/19/93	/ /
BRAN: EEB	1/15/93	/ /
SECT:	/ /	/ /
REVR :	/ /	/ /
CONTR:	/ /	/ /

\* \* \* DATA REVIEW INSTRUCTIONS \* \* \*

ATTN.: FOR IMMEDIATE REVIEW - DIFENZOQUAT MINI-RED PACKAGE

Please review the Difenzoquat Mini-RED package that includes the LUIS report, FACT sheet, ALISS Report, Status Report, General Info. and CORT Report. If you have any questions, please contact me at 308 - 8043.

THANK YOU!!!

\* \* \* ADDITIONAL DATA PACKAGES FOR THIS SUBMISSION \* \* \*

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL
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DP BARCODE: D186691

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CHEMICAL: 106401 Difenzoquat methyl sulfate  
DP TYPE: 001 Submission Related Data Package  
ADMIN DUE DATE: ~~03/24/93~~ 6-1-93 CSF: N LABEL: N

ASSIGNED TO	DATE IN	DATE OUT
DIV : EFED	1/15/93	/ /
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF  
PREVENTION, PESTICIDES AND  
TOXIC SUBSTANCES

MEMORANDUM: D186691

**Subject:** Difenzoquat Methyl Sulfate List A Red 11/25/93  
**From:** Anthony F. Maciorowski, Chief *A. F. Maciorowski*  
Ecological Effects Branch  
Environmental Fate and Effects Division (H7507C)  
**To:** Walter Waldrop PM 71  
Product Manager  
Special Review and Reregistration Division (H7508W)

The Ecological Effects Branch (EEB) has completed its review of difenzoquat uses for reregistration (Phase V RED). EEB has prepared a science chapter and has indicated the status of data requirements for this compound. The evaluation of studies for this chemical were considered in the context of EEB and ASTM Standard Evaluation Procedures, as well as, current Branch policy, expected use patterns and a value added consideration. Difenzoquat acute toxicity values to birds and aquatic organisms suggests that this compound presents only a slight to moderate potential for toxicity. Chronic toxicity to fish and wildlife has not been evaluated directly, but appears to be slight as noted by mammalian chronic testing. No further testing on fish and wildlife will be required at this time. EEB has no information on the toxicity of difenzoquat to non-target plants. However, since this compound is a herbicide, the registrant will be required to complete Tier II Plant Testing. These studies include 123-1 (a) Seed Germination/Seed Emergence, 123-1 (b) Vegetative Vigor, and 123-2 Aquatic Plant Growth.



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**DIFENZOQUAT METHYL SULFATE**  
**Ecological Effects Topical Summary**

Effects on Birds

Three studies were evaluated under this topic. The Guideline Requirements 71-1(a), 71-2(a) and 71-2(b) are fulfilled for difenzoquat.

Two avian dietary studies, 71-2(a) and 71-2(b) and one avian oral study 71-1(a) are required in order to establish toxicity of a compound to birds.

In order to establish the toxicity of difenzoquat to birds the following studies were evaluated: two dietary studies, 71-2(a) Bobwhite quail (Colinus virginianus) LC50 = 4,640 ppm, (# 52458); 71-2(b) mallard duck (Anas platyrhynchos) LC50 = 10,388 ppm, (# 37928); and one oral study, 71-1(a) mallard duck (Anas platyrhynchos) LD50 = 1,577 mg/kg (# 58830).

Precautionary Labeling

No labeling statement for birds is necessary at this time.

Effects on Freshwater Fish

Three studies were evaluated under this topic. The Guideline Requirements for freshwater fish, 72-1(a) and 72-1(c), are fulfilled for this compound.

The minimum data requirements for establishing the acute toxicity of difenzoquat to freshwater fish are the results from two 96-hour studies with the technical grade material. These studies are to be performed with one coldwater species (preferably rainbow trout) and one warmwater species (preferably bluegill sunfish).

Test results for freshwater species include 72-1(c) acute rainbow trout (Oncorhynchus mykiss) LC50 = 694 mg/L (# 37926) and 72-1(a) acute bluegill (Lepomis macrochirus) LC50 = 46.5-696 mg/L (# 37926; # DIF0601).

Precautionary Labeling

No labeling statement for fish is necessary at this time.

### Effects on Freshwater Invertebrates

One study was evaluation under this topic. Guideline Requirement 72-2(a) is fulfilled for this compound.

The minimum data requirements for establishing the acute toxicity of a pesticide to freshwater invertebrates is determined through a 48-hour EC50 study using the technical active ingredient. This study is to be performed on one freshwater aquatic invertebrate (preferably Daphnia magna).

The acute study 72-2(b) on Daphnia magna produced an EC50 = 2.63 ppm (# 57909).

### Precautionary Labeling

No labeling statement for aquatic invertebrates is necessary at this time.

### Effects on Beneficial Insects

Difenzoquat is non-toxic to honey bees (no deaths when a dose equivalent of 36 lb/A was administered).

### Plant Protection

No studies were evaluation under this topic. However, Guideline Requirements have not been fulfilled for this compound.

Since, difenzoquat is to be used as an herbicide that is applied aerially, there is a potential for direct exposure of the toxicant to terrestrial and aquatic plants. In order to evaluate toxicity of this compound to plants, Tier II Plant Testing will be required. These studies include 123-1(a) Seed Germination/Seedling Emergence, 123-2(b) Vegetative Vigor, and 123-2 Aquatic Plant Growth.

### Precautionary Labeling

No labeling statement for plants is required at this time.

DIFENZOQUAT METHYL SULFATE  
Ecological Effects Disciplinary Review

I. Ecological Effects Profile

A. Manufacturing Use

1) Avian Studies

Avian toxicity requirements have been fulfilled with two dietary studies, 71-2(a) Bobwhite quail LC50 > 4,640 ppm, 71-2(b) Mallard LC50 > 10,388 ppm, and one oral study, 71-1(a) Bobwhite quail LD50 = 1,577 mg/kg. All avian dietary studies show that the compound is practically non-toxic to birds, while the oral toxicity study shows a slight toxicity.

2) Aquatic Studies

Aquatic testing on freshwater organisms show that difenzoquat is slightly to practically non-toxic to fish and moderately toxic to invertebrates. Test results for freshwater fish include 72-1(c) Acute Fish (rainbow trout) LC50 = 694 mg/L and 72-1(a) Acute Fish (bluegill) LC50 = 46.5 mg/L. Acute studies on freshwater invertebrates include 72-2(b) Daphnia magna EC50 = 2.63 ppm.

Ecological Effects Risk Assessment

Use Pattern

Difenzoquat methyl sulfate is currently registered on two crops, wheat and barley. A Special Local Need is also present on alfalfa seed crops in Kings County, California. According to EPA's Qualitative Use Assessment (QUA) for this compound, about 1% of the barley and wheat crops are presently being treated with this pesticide, with the predominate use areas in the north central, and western United States (maximum acreage 8,313,000 and 77,286,000, respectively). The pesticide is applied once per growing season at rates of 0.6 to 1.0 lbs ai/A using ground and aerial application.

Fate Assessment

Fate information on difenzoquat shows that this compound is a quaternary salt which is highly water soluble and stable to hydrolytic conditions. This compound strongly adsorbs to soil particles and does not leach or runoff. The major route of degradation appears to be photolysis (3-day half-life) to yield the demethylated tertiary amine analog (volatile and only slightly toxic). Difenzoquat does not accumulate in fish (metabolically inert) and does not persist in an aquatic environment.

## Risk Assessment

Difenzoquat is applied to crops once per growing season at rates of 0.6 to 1.0 lbs ai/A. Although the mode of action for this herbicide is not currently understood, difenzoquat is readily absorbed but not metabolized or degraded by plants. The only pest claim for this compound is for the control of wild oats (Avena fatua).

Difenzoquat acute toxicity values to birds and aquatic organisms suggest that this compound presents a slight to moderate potential for toxicity to wildlife. These acute values are as follows: mallard ducks (LC50 = 10,388 ppm), bobwhite quail (LC50 = 4,640 ppm), bluegill (LC50 = 46.5 - 696 ppm), rainbow trout (LC50 = 76-99 ppm) and Daphnia (LC50 = 2.6 ppm). Difenzoquat is non-toxic to honey bees (no deaths when a dose equivalent of 36 lb/A was administered).

Difenzoquat chronic toxicity to fish and wildlife appears to be slight. Testing conducted on mammalian species (rats) showed that through the major routes of exposure (dermal and inhalation), the following toxicological characteristics were noted:

- 1) Subchronic toxicity: Systemic NOEL was 2,500 ppm. No compound related effects were observed in 90-day feeding study.
- 2) Oncogenicity: Negative at the 5,000 ppm level in rats.
- 3) Teratogenicity: Negative for teratogenicity, fetotoxicity and maternal toxicity in rats at 2,500 ppm.
- 4) Reproduction: A 3-generation rat reproduction study found the parental NOEL was equal to or greater than 2,500 ppm and reproductive/developmental NOEL was 500 ppm.

## Aquatic Risk

The aquatic risk from difenzoquat exposure was evaluated by comparing the preliminary estimated environmental concentrations (PEEC) with EEB's Regulatory Risk Criteria (ie. runoff PEEC > 1/2 LC50 Daphnia; 0.37 ug/L > 2.6 ppm), as well as, difenzoquat toxicity information and use pattern. The EEC's for this herbicide were calculated by using a farm pond scenario and a maximum rate of 1.0 lb ai/A for simulated ground and aerial application to 6 feet of water. These values were noted in Appendix I and are summarized as follows:



- 1) Ground Application = runoff 12.2 ug/L (0.012 ppm)
- 2) Aerial Application = runoff 7.3 ug/L (0.007 ppm)  
drift 3.05 ug/L (0.003 ppm)

The current uses of difenzoquat on wheat, alfalfa and barley appear to result in low toxic impact on aquatic organisms. This conclusion is based upon the following information: 1) moderate to slight toxicity of the herbicide to fish and aquatic invertebrates; 2) PEEC values that suggest no risk (these values are at least 2 orders of magnitude below the levels of concern); 3) restriction of one application per season; 4) three day photolytic 1/2 life; 5) difenzoquat is unlikely to accumulate in water or sediments to levels that could trigger chronic effects; 6) mammalian data do not indicate chronic effects.

Terrestrial Risk

The available data shows that difenzoquat is slightly to practical non-toxic to birds. In order to predict plant residues, the maximum application rate of 1 lb ai/A at one application per season will be used as follows:

	<u>ppm</u>
short grass	240
long grass	110
leafy crops	125
small insects	58
large insects	12
grain	10
fruit	7

The expected residues do not trigger adverse effects to avian or mammalian species from the present registered uses of this herbicide. Adverse chronic effects to birds are not expected from exposure to this compound because of its low acute avian toxicity values, the low mammalian toxicity and the use restriction of one application per season.

Plant Risk

EEB has no information on the toxicity of difenzoquat to non-target plants. However, since this compound is a herbicide, the registrant will be required to complete Tier II Plant Testing. These studies include 123-1 (a) Seed Germination/Seed Emergence, 123-1 (b) Vegetative Vigor, and 123-2 Aquatic Plant Growth.

Endangered Species

"The Endangered Species Protection Program is expected to become final in early 1994. Limitations on the use of difenzoquat methyl sulfate will be required to protect endangered and threatened species, but these limitations have

not been defined (and may be formulation specific). OPP anticipates that consultation with the Fish and Wildlife Service will be conducted in accordance with the species-based priority approach describe in the Program. After completion of consultation, registrants will be informed if any required label modifications are necessary. Such modifications would most likely consist of the generic label statement referring pesticide users to use limitations contained in county Bulletins." Although the Endangered Species Protection Program has not been finalized, it can be assumed that endangered plant species occurring in counties where wheat and barley are grown may be affected from exposure to this herbicide.

#### Precautionary Labeling

Outdoor Use: " 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."

#### Conclusions

Difenzoquat methyl sulfate is currently registered on two crops, wheat and barley and a Special Local Need also present on alfalfa seed crops in Kings County, California. The pesticide is applied once per growing season at rates of 0.6 to 1.0 lbs ai/A using ground and aerial application in order to control wild oats (Avena fatua). Fate information on difenzoquat shows that this compound is a quaternary salt which is highly water soluble and stable to hydrolytic conditions. This compound strongly absorbs to soil particles and does not leach or runoff. The major route of degradation appears to be photolysis (3-day half-life) to yield the demethylated tertiary amine analog (volatile and only slightly toxic). Difenzoquat does not accumulate in fish (metabolically inert) and does not persist in an aquatic environment.

Difenzoquat acute toxicity values to birds and aquatic organisms suggests that this compound presents only a slight to moderate potential for toxicity. Chronic toxicity to fish and wildlife has not been evaluated directly, but appears to be slight as noted by mammalian chronic testing. No further testing on fish and wildlife will be required at this time.

EEB has no information on the toxicity of difenzoquat to non-target plants. However, since this compound is a herbicide, the registrant will be required to complete Tier II Plant Testing. These studies include 123-1 (a) Seed Germination/Seed Emergence, 123-1 (b) Vegetative Vigor, and 123-2 Aquatic Plant Growth (Rexrode 305-5578).

Appendix I - PEEC Calculations for Difenzoquat Methyl Sulfate Use on Barley and Wheat

I. Ground Application

Assumptions:

2.0% runoff  
10 acre drainage basin  
1.0 lb ai/A of Difenzoquat

(A) Runoff

$1.0 \text{ lb ai/A} \times 0.02 \times 10 \text{ A} = 0.2 \text{ lbs ai total runoff}$   
PEEC of 1 lb ai, direct application to 1 A pond,  
6 ft deep = 61 ug/L  
Therefore, EEC =  $\frac{61 \text{ ug/L}}{1 \text{ lb ai}} \times 0.2 \text{ lb ai} = 12.2 \text{ ug/L}$

II. Aerial Application

Assumptions

2.0% runoff  
60% application efficiency  
10 acre drainage basin  
5% drift  
1.0 lb ai/A of Difenzoquat

(A) Runoff

$1.0 \text{ lb ai/A} \times 0.6 \times 0.02 \times 10 \text{ A} = 0.12 \text{ lb ai found in total runoff (7.3 ug/L)}$

(B) Drift

$1.0 \text{ ai/A} \times 0.05 = 0.05 \text{ lbs ai in total drift}$   
Therefore, EEC =  $\frac{61 \text{ ug/L}}{1 \text{ lb ai}} \times \frac{0.05 \text{ lb ai}}{1} = 3.05 \text{ ug/L}$

Date: 10/12/93

Case No: 819395

Chemical No: 106401

PHASE IV

DATA REQUIREMENTS FOR  
ECOLOGICAL EFFECTS BRANCH

Difenzoquat Methyl Sulfate

Data Requirements	Composition <sup>1</sup>	Use Pattern <sup>2</sup>	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
<b>6 Basic Studies In Bold</b>					
<b>71-1(a) Acute Avian Oral, Quail/Duck</b>	TGAI	AB	Y	# 58830	N
71-1(b) Acute Avian Oral, Quail/Duck	(TEP)				
<b>71-2(a) Acute Avian Diet, Quail</b>	TGAI	AB	Y	# 52458	N
<b>71-2(b) Acute Avian Diet, Duck</b>	TGAI	AB	Y	# 37928	N
71-3 Wild Mammal Toxicity					
71-4(a) Avian Reproduction Quail	TGAI	AB	N		N
71-4(b) Avian Reproduction Duck	TGAI	AB	N		N
71-5(a) Simulated Terrestrial Field Study					
71-5(b) Actual Terrestrial Field Study					
<b>72-1(a) Acute Fish Toxicity Bluegill</b>	TGAI	AB	Y	# 37926; DIF0601	N
72-1(b) Acute Fish Toxicity Bluegill	(TEP)				
<b>72-1(c) Acute Fish Toxicity Rainbow Trout</b>	TGAI	AB	Y	# 37926	N
72-1(d) Acute Fish Toxicity Rainbow Trout	(TEP)				
<b>72-2(a) Acute Aquatic Invertebrate Toxicity</b>	TGAI	AB	Y	# 57909	N
72-2(b) Acute Aquatic Invertebrate Toxicity	(TEP)				
72-3(a) Acute Estu/Mari Tox Fish	TGAI	AB	N		N
72-3(b) Acute Estu/Mari Tox Mollusk	TGAI	AB	N		N
72-3(c) Acute Estu/Mari Tox Shrimp	TGAI	AB	N		N

\* In Bibliographic Citation column Indicates study may be upgradeable

PHASE IV  
 DATA REQUIREMENTS FOR  
 ECOLOGICAL EFFECTS BRANCH

Difenzoquat Methyl Sulfate

Date: 10/12/93  
 Case No: 819395  
 Chemical No: 106401

Must Additional  
 Data Be Submitted  
 under FIFRA3(c)(2)(B)?

Does EPA Have  
 Data To Satisfy  
 This Requirement?  
 (Yes, No)

Use  
 Pattern<sup>2</sup>

Composition<sup>1</sup>

Bibliographic  
 Citation

Data Requirements

72-3(d) Acute Estu/Mari Tox Fish	(TEP)	AB	N	N
72-3(e) Acute Estu/Mari Tox Mollusk	(TEP)	AB	N	N
72-3(f) Acute Estu/Mari Tox Shrimp	(TEP)	AB	N	N
72-4(a) Early Life-Stage Fish	(TEP)	AB	N	N
72-4(b) Life-Cycle Aquatic Invertebrate	(TEP)	AB	N	N
72-5 Life-Cycle Fish				
72-6 Aquatic Org. Accumulation	(TEP)	AB	N	N
72-7(a) Simulated Aquatic Field Study				
72-7(b) Actual Aquatic Field Study				
122-1(a) Seed Germ./Seedling Emerg.	TGAI	AB	N	N
122-1(b) Vegetative Vigor	TGAI	AB	N	N
122-2 Aquatic Plant Growth	TGAI	AB	N	N
123-1(a) Seed Germ./Seedling Emerg.	TGAI	AB	N	Y <sup>3</sup>
123-1(b) Vegetative Vigor	TGAI	AB	N	Y <sup>3</sup>
123-2 Aquatic Plant Growth	TGAI	AB	N	Y <sup>3</sup>
124-1 Terrestrial Field Study				
124-2 Aquatic Field Study				
141-1 Honey Bee Acute Contact				
141-2 Honey Bee Residue on Foliage				
141-5 Field Test for Pollinators				

\* In Bibliographic Citation column indicates study may be upgradeable

1. Composition: TGA= Technical grade of the active ingredient; PAIRA = Pure active ingredient, radiolabeled; TEP= Typical end-use product.

2. Use Pattern: A = Terrestrial Feed Crop; B = Terrestrial Food Crop; C = Terrestrial Non-Food Crop; D = Aquatic Food Crop; E = Aquatic Non-Food Outdoor; F = Aquatic Non-Food Industrial; G = Aquatic Non-Food Residential; H = Greenhouse Food Crop; Greenhouse Non-Food Crop; J = Forestry; K = Outdoor Residential; L = Indoor Food; M = Indoor Non-Food; N = Indoor Medical; O = Indoor Residential; Z = Use Group for Site 0000.

3. Terrestrial use, high solubility and aerial application of difenzoquat methyl sulfate has triggered Tier II Plant testing.

\* In Bibliographic Citation column indicates study may be upgradeable