

US EPA ARCHIVE DOCUMENT

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To: Product Manager - 23 Mountfort  
TS-767

From: Dr. Willa Garner <sup>111</sup>  
Chief, Review Section No.1  
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: 239-1663

Chemical Diquat dibromide

Type Product: Aquatic Herbicide

Product Name: Ortho Diquat

Company Name: Chevron

Submission Purpose: Review of Environmental Chemistry Data

ZBB Code: \_\_\_\_\_

ACTION CODE: 400

Date in: \_\_\_\_\_

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Date Completed: MAR 5 1981

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Deferrals To:

63

5

\_\_\_\_\_ Ecological Effects Branch

\_\_\_\_\_ Residue Chemistry Branch

\_\_\_\_\_ Toxicology Branch

## 1.0 INTRODUCTION

### 1.1 Purpose

Chevron Chemical Company submitted environmental chemistry data requirements requesting amended registration of diquat dibromide to include the following revisions when used as an aquatic herbicide [File No. 239-1663, submitted on 8/17/77].

- (a) Change in the dosage rate to floating and emerged weeds from a maximum of 1.5 lbs ai/surface acre to 2 lbs ai/surface acre/ application.
- (b) Add the following weed species to the list of floating and emerged weeds being controlled: Duckweed, Pennwort, and marginal weeds such as cattails.
- (c) Add the following weed species to the list of submersed weeds: Coontail, Elodea, Pondweeds, and Watermilfoil.
- (d) Add algae to the list of submersed, floating, and emerged weeds.
- (e) Allow use of X-77 Ortho Spreader at the rate of 1 pt/100 gallons of spray.
- (f) No change in the recommendation for repeat application, in which case, the maximum currently registered dosage per year is 8 lbs ai/surface acre.

### 1.2 Background

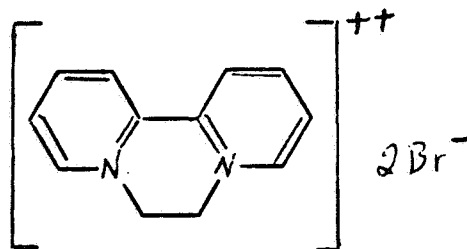
Diquat dibromide is currently registered for the following uses [EPA Reg. No. 239-1663, approved on 5/2/76]:

- (a) An aquatic herbicide at a maximum dosage of 8 lbs ai/surface acre.
- (b) A contact herbicide for non-crop use.
- (c) A harvest aid (desiccant) of several crops which are: alfalfa, clover, grain sorghum, and soybean.
- (d) An inhibitor of floral initiation of sugarcane grown in Florida, Hawaii, and Puerto Rico.

### 1.3 Chemical

Common name : Diquat dibromide  
Trade name : Ortho diquat  
Type : Herbicide, aquatic, plant growth regulator, and desiccant.  
Chemical formula : 6,7-Dihydrodipyrido [1,2 - a: 2', 1' - c] pyrazinedium dibromide - 35.5% (2 lbs ai/gal).

Structural formula



1.4 Previous Reviews

PP IF - 1101	4/9/74
PP IF - 1073	3/6/75
239-1663	9/10/75
PP5F1648	9/18/75
239-1663	11/28/78

2.0 USE DIRECTIONS (Aquatic use)

- (a) Submersed weeds infesting still ponds, lakes, ditches, laterals, waterways, or portions thereof. To control: Bladderwort, Coontail, Elodea, Naiad, Pondweeds, Watermilfoil and algae. Use 2-4 lbs ai/surface acre. Apply by pouring directly from the container into the water while moving slowly over the surface in a boat.
- (b) Floating weeds including Pennywort, Salvinia, Waterhyacinth, waterlettuce, duckweed, cattails, and algae; use 1.0 - 2.0 lbs ai/surface acre.

Use 150 to 200 gallons of water per acre plus 1 pt. Ortho X-77 Spreader (non-ionic) as an overall spray. For aerial application, use 7.5 gallons of water per acre plus 1 pt. Ortho X-77 Spreader per 100 gallons spray solution.

*Retreatment may be necessary to obtain season long control.*

3.0 DISCUSSION OF DATA

Environmental Chemistry data submitted were contained in Vol. II, submitted on 8/17/77, filed on 8/22/77 under accession No. 231428 and registration No. 239 - 1663.

Data submitted were reviewed by Enviro Control Inc., a contractor from Rockville, Maryland on January 16, 1981. The 81 page review was entitled: "Task 1 R: Review of Diquat, Contract No. 68-01-5830, submitted to EPA, by Enviro Control Inc., One Central Plaza 11300 Rockville Pike, Rockville, Maryland 20852".

The following four pages (4p7 ) were copied from Chevron's submission showing a list of all documents submitted. On 11/13/80, Enviro Control was asked to review references 2.1 - 2.8; 3.1 - 3.6; 4.1; 5.1 - 5.8. Request for review of Tab 2.1 was later deleted at the request of Enviro Control because of missing technical information. Similarly, Tab 3.6 was not reviewed because it was simply a literature review. Tab 5.2 was reviewed, however, because of missing some information, evaluation of the dissipation study could not be made.

Environmental chemistry data reviewed by Environ Control dealt with the followings:

- 3.1 Soil Adsorptions  
Reviewed in pages 1-15 of Environ Control report of 1/16/81.
- 3.2 Photodegradation  
Reviewed in pages 16-34 of Environ Control report of 1/16/81.
- 3.3 Fate in Plants  
Reviewed in pages 35-43 of Environ Control report of 1/16/81.
- 3.4 Fate in Soil  
Reviewed in pages 44-78 of Environ Control report of 1/16/81
- 4.0 DATA GAPS  
Environmental Chemistry data gaps for the currently registered, aquatic noncrop uses are:
  - (a) Fish accumulation study.
  - (b) Field dissipation (aquatic noncrop use).
- 5.0 CHEVRON'S REQUEST  
According to Mr. James Stone (PM-23), Chevron's request to amend diquat aquatic uses are presently incorporated on the registered label approved on 5/2/76.
- 6.0 CONCLUSIONS  
Chevron Chemical Company must comply with Environmental Chemistry data gaps to satisfy Diquat's aquatic noncrop uses.

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Review Section #1  
Environmental Fate Branch  
Hazard Evaluation Division

12.03 RESIDUE CHEMISTRY DATA TO SUPPORT LABEL AMEND-  
MENT FOR Diquat Water Weed Killer (EPA Reg. No. 239-1663)

Volumes II and III (Metabolism Studies)

TABLE OF CONTENTS

<u>List of Documents</u>	<u>Reference Number</u>	<u>Page Number</u>
	<u>Volume II</u>	
Metabolism Summary	1.1	1
2. <u>Soil Adsorption</u>		
Baldwin, B.C. and Knight, B.A.G. "Fate of Diquat in Soils: Survey of Present Knowledge" ICI Plant Protection Ltd. Report No. TMJ 224 [November 1967].	2.1 <i>delete</i>	10
Tucker, B.V., Pack, D.E. and Ospenson, J.N. "Adsorption Of Bipyridylum Herbicides In Soil" Journal of Agricultural and Food Chemistry, 15, 1005 [1967].	2.2 ✓	18
Helling, C.S. and Turner, B.C. "Pesticide Mobility: Determination By Soil Thin-Layer Chromatography" Science, 162, 562 [November 1968].	2.3 <i>Was not reviewed by KIV (7/20)</i>	
Tucker, B.V. "Diquat Leaching In Soil" Chevron Chemical Company, Ortho Division Report, File No. 721.2 [December 1970].	2.4 ✓	22
Riley, D., Gratton, R.P. and Wilkinson, W. "Diquat: Physicochemical Behavior and Herbicidal Activity Of Residues In Soil" ICI Plant Protection Ltd. Report No. AR 2372 A [November 1972].	2.5 ✓	23
Newby, S.E. and Riley, D. "Diquat: Physicochemical Behavior And Herbicidal Activity Of Residues In Soil (Addendum to Report AR 2372 A)" ICI Plant Protection Ltd. Report No. TMJ 1223 A [October 1975].	2.6	44

<u>List of Documents</u>	<u>Reference Number</u>	<u>Page Number</u>
Riley, D. and Edwards, M.J. "Paraquat And Diquat: Uptake Of Soil Residues By Plants" ICI Plant Protection Ltd. Report No. TMJ 918 A [September 1973].	2.7	51
Newman, J.F. "Diquat: Biological Effects And Residues In Soil And Crops In A High Rate Field Trial On A Loamy Sand" ICI Plant Protection Ltd. Report No. TMJ 1225 A. [October 1975].	2.8	62
<u>3. Photodegradation</u>		
Slade, P. and Smith, A.E. "Photochemical Degradation Of Diquat" Nature, <u>213</u> , No. 5079, 919 [March 1967].	3.1	72
Smith, A.E. and Grove, J. "Photochemical Degradation of Diquat In Dilute Aqueous Solution And On Silica Gel" Journal of Agricultural And Food Chemistry, <u>17</u> , No. 3, 609 [May-June 1969].	3.2	77
Baldwin, B.C. and Willis, N. "Bipyridylum Herbicides: The Photochemical Degradation of Diquat On Soil Surfaces" ICI Plant Protection Ltd. Report No. TMJ 1147 B [February 1975].	3.3	82
Smith, A.E. "Bipyridylum Herbicides: The Photochemical Complex Formed From Diquat After Its Application To Plants and Paper" ICI Plant Protection Division Report No. A 126, 881 [December 1967].	3.4	87
Leahey, J.P., Griggs, R.E. and Allard, G.B. "Diquat: Residues Of Diquat And Its Photoproducts On Barley and Oats After Desiccation With <sup>14</sup> C-Diquat" ICI Plant Protection Ltd. Report No. AR 2478 B [November 1973].	3.5	105
Cavell, B.D. "Diquat: A Review Of Its Photo-degradation" ICI Plant Protection Division Report No. TMJ 1433 B [November 1976].	3.6. <i>delete</i>	137

<u>List of Documents</u>	<u>Reference Number</u>	<u>Page Number</u>
<u>4. Fate In Plants</u>		
Slade, P. "Bipyridylum Herbicides: The Degradation of Diquat After Its Application To Plants" ICI Plant Protection Division Report No. A126, 360 [February 1966].	4.1	154
<u>5. Fate In Soil</u>		
Tucker, B. V. "Diquat Stability In Soil" Chevron Chemical Company, Ortho Division, Report File No. 721.2 [March 1972].	5.1	170
Baldwin, B. C. and Gratton, R. P. "Bipyridylum Herbicides: Residues Of Diquat In Soils Following Field Application Of PEGLONE". ICI Plant Protection Ltd. Report No. AR 2333 B [June 1972].	5.2 <i>delete</i>	175
Baldwin, B. C. and Griggs, R. E. "Bipyridylum Herbicides: The Fate Of Carbon-14 Labelled Diquat In Soil Under Field Conditions" ICI Plant Protection Ltd. Report No. AR 2336 B [November 1972].	5.3	188
Baldwin, B. C. and Lawson, S. Z. "Bipyridylum Herbicides: Fate Of Carbon-14 Labelled Diquat In Soil Under Field Conditions (Addendum to Report Report AR 2336 B)" ICI Plant Protection Ltd. Report No. TMJ 867 B [March 1973].	5.4	212
Hill, I. R. "Diquat: Degradation Of Diquat And Its Photoproducts In Soil" ICI Plant Protection Ltd. Report No. AR 2573 A [January 1975].	5.5	225
Prashad, S. and Newby, S. E. "Diquat: Leaching Of Diquat Plus Its Photoproducts In Soil" ICI Plant Protection Division Report No. AR 2691 B [October 1976].	5.6	266
Leahey, J. P., Allard, G. B. and Burgess, J. G. "Diquat: The Uptake Of Diquat And Its Photoproducts From Soil By Plants" ICI Plant Protection Ltd. Report No. AR 2517 B [March 1974].	5.7	302



<u>List of Documents</u>	<u>Reference Number</u>	<u>Page Number</u>
<u>5. Fate In Soil (Cont'd.)</u>		
Leahey, J.P. and Carpenter, P.K. "Diquat: Uptake Of Diquat And Its Photoproducts From Soil By Plants" ICI Plant Protection Ltd. Report No. AR 2621 A [September 1975].	5.8	322
<u>6. Fate In Animals</u>		
		<u>Volume III</u>
Litchfield, M.H., Daniel, J.W. and Longshaw, S. "The Tissue Distribution Of The Bipyridylum Herbicides Diquat And Paraquat In Rats and Mice" Toxicology 1, 155 [1973].	6.1	334
Mills, I.H. "Diquat: Disposition And Metabolism In The Rat" ICI Central Toxicology Laboratory Report No CTL/P/214 [January 1976].	6.2	345
Griggs, R.E. and Davis, J.A. "Diquat: Excretion And Metabolism In A Goat" ICI Plant Protection Ltd. Report No. AR 2585 A [March 1975].	6.3	363
Leahey, J.P., Gatehouse, D.M., Carpenter, P.K. and Benwell, M. "Diquat: Metabolism and Residues In A Cow" ICI Plant Protection Division Report No. AR 2698 A [November 1976].	6.4	381
Leahey, J.P. and Hemingway, R.J. "Diquat: A Study of The Metabolism And Residues In Hens And Their Eggs" ICI Plant Protection Ltd. Report No. AR 2438B [July 1973].	6.5	406
Leahey, J.P. "Diquat: Residues In The Tissues Of Rats And A Goat Dosed With Diquat And Its Photoproducts" ICI Plant Protection Ltd. Report No. AR 2503 [January 1974].	6.6	419
Leahey, J.P., Burgess, J.G. and Mills, I. "Diquat: Residues In The Tissues Of Rats Dosed With Diquat And Its Photoproducts For 20 Days" ICI Plant Protection Ltd. Report No. AR 2566 A [December 1974].	6.7	434