US EPA ARCHIVE DOCUMENT
TO: D. Stubbs/L. Pemberton
   Product Manager 41
   Registration Division (TS-767C)

FROM: Patrick Holden, Chief
   Ground-Water Section
   Environmental Fate & Ground-Water Branch/EFED (TS-769C)

THRU: Henry Jacoby, Chief (Acting)
   Environmental Fate & Ground-Water Branch/EFED (TS-769C)

Attached, please find the EFGWB review of:

Reg./File #: 89-LA-05

Chemical Name: Dimethazone

Type Product: Herbicide

Company Name: FMC Corporation

Purpose: Review of application for specific exemption under
FIFRA Section 18 for use on sweet potatoes in Louisiana.

Date Received: 4/28/89            ACTION CODE: 510
Date Completed: 6/21/89            EFGWB #(s): 90547
Monitoring study requested:       Total Review Time: 1 day
Monitoring study voluntarily:_____

Deferrals To: ______ Biological Effects Branch
               ______ Science Integration & Policy Staff, EFED
               ______ Non-Dietary Exposure Branch, HED
               ______ Dietary Exposure Branch, HED
               ______ Toxicology Branch, HED
1. **Product Name**: Command
2. **Identifying Number**: 89-1A-05
3. **Record Number**: 244432
4. **Action Code**: 510
5. **MRID/Accession Number**: 
6. **Study Guideline or Narrative**: 

7. **Reference No.**: 89-1A-05
8. **Date Rec'd (EPA)**: 4/25/89
9. **Prod/Review Mgr/DCI**: Stork/Sambrak
10. **PM/RM Team No.**: 41
11. **Date to HED/EFED/RD/BEAD**: 4/28/89
12. **Proj Return Date**: 5/13/89
13. **Date Returned to RD/GRRD**: 

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**Instructions**

Please update last year's review if tox input will be needed please call ASAP.

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14. **Check Applicable Box**
   - Adverse 6(a)(2) Data (405)
   - Generic Data (Reregistration)(660)
   - Special Review Data (870)
   - Product Specific Data (Reregistration)(655)

15. **No. of Individual Studies Submitted**: 
16. **Have any of the above studies (in whole or in part) been previously submitted for review?**
   - Yes (Please identify the study(ies))
   - No

17. **Related Actions**: 

18. **To**
   - HED
   - EFED
   - SRRD
   - RD
   - BEAD

19. **Type of Review**
   - Science Analysis & Coordination
   - Toxicology/HFA
   - Toxicology/IR
   - Dietary Exposure
   - Nondietary Exposure
   - Ecological Effects
   - Environmental Fate & Groundwater
   - Special Review
   - Reregistration
   - Generic Chemical Support
   - Insecticide-Rodenticide
   - Fungicide-Herbicide
   - Antimicrobial
   - Product Chemistry
   - Precautionary Labeling
   - Economic Analysis
   - Analytical Chemistry
   - Biological Analysis

20. **Reviews Also Sent to**
   - SAC
   - TOX/HFA
   - TOX/IR
   - DEB
   - EEB
   - EFGWB
   - SR
   - RER
   - GSC
   - IR
   - FH
   - AM

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**Data Review Criteria**

A. Policy Note No. 31
   - 1 = data which meet 6(a)(2) or meet 3(c)(2)(B) flagging criteria

B. Section 18
   - 1 = data in support of section 6 in lieu of section 18

C. Inert Ingredients
   - 1 = data in support of continued use of List 1 Inert

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**EPA Form 8570-17 (Rev. 11-88)**

**Previous editions are obsolete.**

**White - Data Coordinator**
**Pink - PM/RM/DCI**
**Yellow - Data Review Section**
**Green - Return with completed review**

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**Confidential Statement of Formula**
**Label Attached**

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**908**
APPLICATION FOR EXEMPTION UNDER
FIFRA SECTION 18

1. CHEMICAL:

Chemical name: 2- (2-chlorophenyl)-methyl-4-4-dimethyl-3-isoxazolidinone
Common name: Dimethazone (FMC 57020)
Structure:

2. TEST MATERIAL:

Not Applicable.

3. STUDY/ACTION TYPE:

Review of application for specific exemption in accordance with FIFRA Section 18.

4. STUDY IDENTIFICATION:


Submitted by: Bob Odom, Commissioner
Louisiana Department of Agriculture & Forestry
P.O. Box 94302
Baton Rouge, LA 70804-9302

Identifying No.: 89-LA-05
Action Code: 510
Record Number: 244,432
Date Sent to EFED: 4/28/89

5. REVIEWED BY:

W. Martin Williams
Hydrologist
OPP/HED/EFED/Ground-Water Section

Signature: [Signature]
Date: 6/22/89

6. APPROVED BY:

Patrick W. Holden
Section Head
OPP/HED/EFED/Ground-Water Section

Signature: [Signature]
Date: 6/22/89

7. CONCLUSIONS:
Dimethazone is both mobile and persistent in soil and water. Environmental fate properties are not unlike those of atrazine in soil and water. Atrazine has been shown to leach to ground water at low concentrations as a result of normal field use (40 ppb maximum, typically less than 1 ppb). Since dimethazone is significantly less toxic than atrazine and application rates in this request are lower than typical application rates for atrazine, it is unlikely that dimethazone will leach to ground water at levels of toxicological concern resulting from uses in accordance with this Section 18.

8. RECOMMENDATIONS: PLEASE CONTACT TOXICOLOGY BRANCH, NRD FOR CONCURRENCE.

EFGWB does not object to this Section 18 on the basis of ground water concerns.

However, as a precaution, based on the mobility and persistence of dimethazone in soil and water, it is recommended that dimethazone not be used in hydrogeologically vulnerable conditions defined as having very permeable (sandy) soils, ground water less than 30 feet, and/or soil conditions conducive to preferential flow conditions (e.g., karst terrain).

9. BACKGROUND:

The applicant requests the use of Command 4EC at a rate of 1.0 to 1.5 lb ai/A once per year to control broadleaf weeds in sweet potatoes. The treated area would cover 10,000 acres starting May 1989 through July 1989. The ineffectiveness of alternative methods of control are discussed in the application. Total quantity of active ingredient required is 15,000 lb (3,750 gallons).

10. DISCUSSION:

Table 1 compares soil and chemical attributes for dimethazone (USEPA 1985) to criteria used to assess leaching potential (Cohen et al. 1984). Table 1 illustrates that dimethazone is both mobile and persistent in the environment.

The leaching potential of dimethazone is compared to 13 high volume use pesticides in Table 2. The Retardation and Attenuation Factors in Table 2 were obtained using the interactive computer program CHEM RANK (Nofziger et al. 1988). The Retardation Factor is an index of mobility and is a function of the bulk density, organic carbon content, field capacity, and porosity of the soil as well as of the organic carbon-water partition coefficient and Henry’s Law constant of the pesticide. The Attenuation Factor reflects the proportion of the applied compound that will reach a defined control depth in the soil and is based on the Retardation Factor, decay rate (soil degradation half-life), and recharge rate.

Pesticide mobility in an idealized sandy clay loam soil (20% clay, 20% silt, and 60% sand) was simulated with CHEM RANK to derive the results in Table 2. A control depth of 1.0 meter and overly conservative (intense) recharge rate of 10 mm/day were used in the model to calculate the Attenuation Factor. Two soil horizons were defined, with the first horizon being between 0.0 and 0.15 m, and the second horizon between 0.15 and 1.0 m. Respective characteristics of these two horizons were: organic carbon contents of 1.2 and 0.4% and bulk densities of 1.4 and 1.5 gram/cc. Both horizons were defined as having a field capacity of 20% and a porosity of 45% (by volume). A detailed discussion of Table 2 is presented by Barrett and Williams (1989).
Dimethazone is ranked in Table 2 according to leaching potential as defined by the Attenuation Factor. Dimethazone is ranked below carbofuran (a very mobile chemical based on its low organic carbon-water partition coefficient) but above simazine, 2,4-D, and atrazine. 2,4-D is very mobile but relatively nonpersistent. Atrazine and simazine are both mobile and persistent. Mobility and persistence as reflected by the organic carbon-water partition coefficients and soil half-lives, respectively, are similar for dimethazone, atrazine, and simazine.

EPA has no record of ground-water monitoring for dimethazone. Ground-water monitoring data for chemicals having similar environmental fate characteristics can be used to estimate maximum potential concentrations from the use of dimethazone. Carbofuran, simazine, 2,4-D, and atrazine have been detected in various studies in ground water as a result of normal field use (Williams et al. 1988). Concentrations have been reported as high as 176 ppb for carbofuran, 9.1 ppb for simazine, 49.5 ppb for 2,4-D, and 40 ppb for atrazine. Extensive monitoring has occurred for atrazine—more than the other pesticides. Except in conditions of very high hydrogeologic vulnerability (e.g., permeable soils, ground water less than 30 feet, and/or karst terrain), most atrazine concentrations in ground water associated with normal agricultural use fall in the sub-part per billions range (Barrett and Williams, 1989).

Table 2 illustrates that application rates for dimethazone are generally less than those of atrazine by a factor of 2 to 4. Application rates for this Section 18 are 1.0 to 1.5 lb ai/A compared to typical application rates of 2 to 4 lb ai/A for atrazine. Based on the lower application rates and similar environmental fate behavior, is unlikely that dimethazone will result in higher concentrations in ground water than atrazine.

Dimethazone is substantially less toxic than carbofuran, simazine, 2,4-D, and atrazine. Although EPA’s Office of Drinking Water has not proposed a health advisory level for dimethazone, a surrogate lifetime health advisory of 300 ppb can be calculated from the reference dose (RfD) of 0.043 mg/kg/day (USEPA 1989) based on assuming a human having an average weight of 70 kg consumes two liters of water per day of which 20 percent is drinking water. This is the standard approach used by the Office of Drinking Water in calculating long-term health advisory levels. This surrogate standard of 300 ppb is significantly higher than the maximum concentration of 40 ppb detected to date for atrazine in ground water as a result of agricultural use.
REFERENCES


### Table 1: Leaching Assessment for Dimethazone

<table>
<thead>
<tr>
<th>Property</th>
<th>Ranges</th>
<th>Criteria</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorption Partition Coeff.</td>
<td>1.54 - 6.85</td>
<td>&lt;5.0, &lt;1.0 or 2.0</td>
<td>Moderate to Significant</td>
</tr>
<tr>
<td>Solubility</td>
<td>1110 ppm</td>
<td>&gt;30 ppm</td>
<td>Significant</td>
</tr>
<tr>
<td>Hydrolysis Half-Life</td>
<td>Stable</td>
<td>&gt;25 weeks</td>
<td>Significant</td>
</tr>
<tr>
<td>Photolysis Half-Life</td>
<td>Soil - Stable</td>
<td>&gt;1 week</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Water - 88 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerobic Soil Half-Life</td>
<td>28 - 173 days</td>
<td>&gt;2-3 weeks</td>
<td>Significant</td>
</tr>
<tr>
<td>Henry’s Law Constant</td>
<td>4.07E-8 atm-M3/mol</td>
<td>&lt;1.0 E-2 atm-M3/mol</td>
<td>Significant</td>
</tr>
</tbody>
</table>

**Overall Assessment:** Dimethazone is both mobile and persistent

**Computation of Henry’s Law Constant:**

\[ KH = \frac{CS}{P} \]

\[ P = \text{Vapor Pressure} = 1.44 \times 10^{-4} \text{ Torr} = 1.895 \times 10^{-7} \text{ atm} \]

\[ CS = \text{Solubility} = 1110 \text{ ppm} = 0.00111 \text{ gm/M3} \]

\[ = 0.00111 \text{ gm/M3} \times (1 \text{ mole/239.7 gm}) = 4.631 \text{ mole/M3} \]

\[ KH = \frac{CS}{P} = \frac{4.631}{1.895 \times 10^{-7}} = 2.444 \times 10^7 \text{ mole/(M3-atm)} \]

\[ 1/KH = 4.092 \times 10^{-8} \text{ (M3-atm/mole)} \]
Table 1. Environmental Chemistry Characteristics and Leaching Potential Ranking of Some Commonly Used Pesticides

<table>
<thead>
<tr>
<th>Rank</th>
<th>Common Name</th>
<th>Use</th>
<th>Health Standard (ppb)</th>
<th>Typical Application Rate (lb./acre)</th>
<th>Henry's Law Constant (atm-m3/mol)</th>
<th>Organic Carbon Water Partition Coefficient (ml/g O.C.)</th>
<th>Retardation Factor</th>
<th>Degradation Half-Life (days)</th>
<th>Attenuation Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbofuran</td>
<td>I</td>
<td>40</td>
<td>0.90</td>
<td>8.10 E-09</td>
<td>25.5</td>
<td>2.0</td>
<td>42</td>
<td>5.2 E-01</td>
</tr>
<tr>
<td>2</td>
<td>Simazine</td>
<td>H</td>
<td>4</td>
<td>2.00 - 4.00</td>
<td>3.68 E-10</td>
<td>144.0</td>
<td>6.5</td>
<td>75</td>
<td>3.0 E-01</td>
</tr>
<tr>
<td>3</td>
<td>2,4-D</td>
<td>H</td>
<td>70</td>
<td>0.25 - 2.00</td>
<td>3.17 E-02</td>
<td>33.0</td>
<td>2.3</td>
<td>16</td>
<td>1.4 E-01</td>
</tr>
<tr>
<td>4</td>
<td>Atrazine</td>
<td>H</td>
<td>3</td>
<td>2.00 - 4.00</td>
<td>3.20 E-09</td>
<td>160.0</td>
<td>7.1</td>
<td>60</td>
<td>1.3 E-01</td>
</tr>
<tr>
<td>5</td>
<td>Metribuzin</td>
<td>H</td>
<td>200</td>
<td>0.25 - 1.00</td>
<td>2.33 E-10</td>
<td>95.0</td>
<td>4.6</td>
<td>30</td>
<td>1.2 E-01</td>
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<tr>
<td>6</td>
<td>Cyanazine</td>
<td>H</td>
<td>10</td>
<td>1.00 - 4.00</td>
<td>3.17 E-12</td>
<td>168.0</td>
<td>7.4</td>
<td>20</td>
<td>5.9 E-03</td>
</tr>
<tr>
<td>7</td>
<td>Metolachlor</td>
<td>H</td>
<td>100</td>
<td>1.50 - 3.00</td>
<td>9.16 E-09</td>
<td>200.0</td>
<td>8.6</td>
<td>20</td>
<td>2.5 E-03</td>
</tr>
<tr>
<td>8</td>
<td>Alachlor</td>
<td>H</td>
<td>2</td>
<td>1.50 - 4.00</td>
<td>3.24 E-08</td>
<td>190.0</td>
<td>8.2</td>
<td>14</td>
<td>2.9 E-04</td>
</tr>
<tr>
<td>9</td>
<td>Carbaryl</td>
<td>I</td>
<td>700</td>
<td>1.50</td>
<td>1.85 E-05</td>
<td>229.0</td>
<td>9.7</td>
<td>7</td>
<td>4.3 E-09</td>
</tr>
<tr>
<td>10</td>
<td>Butylate</td>
<td>H</td>
<td>350</td>
<td>3.00 - 6.00</td>
<td>8.26 E-06</td>
<td>540.0</td>
<td>22.0</td>
<td>12</td>
<td>1.5 E-11</td>
</tr>
<tr>
<td>11</td>
<td>Malathion</td>
<td>I</td>
<td>--</td>
<td>0.90</td>
<td>1.20 E-07</td>
<td>1790.0</td>
<td>69.0</td>
<td>1</td>
<td>0.0 E-00</td>
</tr>
<tr>
<td>12</td>
<td>Methyl parathion</td>
<td>I</td>
<td>2</td>
<td>0.50</td>
<td>6.12 E-07</td>
<td>7330.0</td>
<td>280.0</td>
<td>4</td>
<td>0.0 E-00</td>
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<tr>
<td>13</td>
<td>Trifluralin</td>
<td>H</td>
<td>2</td>
<td>0.50 - 1.00</td>
<td>1.62 E-04</td>
<td>9850.0</td>
<td>3830.0</td>
<td>70</td>
<td>0.0 E-00</td>
</tr>
</tbody>
</table>

1 (H)erbicide, (I)nsecticide
2 Drinking water Maximum Contaminant Level or lifetime Health Advisory level (USEPA 1989)