To: R. Taylor  
Product Manager 25  
Registration Division (TS-767)

From: Samuel M. Creeger, Chief  
Review Section No. 1  
Exposure Assessment Branch  
Hazard Evaluation Division (TS-769)

Attached please find the environmental fate review of:

Reg./File No.: 279-GNLE, -GNLG and -GNLU

Chemical: FMC 57020

Type Product: Herbicide

Product Name: COMMAND Herbicide

Company Name: FMC

Submission Purpose: Response to previous review to support use on soybeans

Date In: 9/26/85  
Date Completed: DEC 10 1985

Action Code: 105  
EAB #: 5966-5968

TAIS (level II)  
Days 0.5

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

Monitoring study requested by EAB: [ ]

Monitoring study voluntarily conducted by registrant: [ ]
1. **INTRODUCTION**

   In the previous review of FMC 57020 dated August 27, 1985, several questions were asked regarding the aqueous and soil photolysis studies. Also, in the July 2, 1985 review, a detailed modeling assessment referenced in an earlier letter was requested. All data requirements will be satisfied when the above issues are satisfactorily addressed.

2. **DISCUSSION**

   The specific questions are:

   (1) **Does the glassware (ampoules, flasks and glass tops used in the tests transmit sunlight without any absorption?**

   (2) **What is the fate of the isoxasolidine ring of FMC 57020 molecule? What data is used to support the degradation pathway of the isoxasolidine ring proposed in Fig. 6 (pg. 19 of the August 27, 1985 review)?**

   (3) **Provide the structure of "arylamide", one of the claimed phototransformation products.**

   (4) **Submit the detailed modeling assessment referenced in the EEC analysis attached to the March 19, 1985 FMC letter.**

   The registrant has adequately responded to the above issues as follows:

   (1) **The quartz and borosilicate (Pyrex) glassware used adequately transmitted the incident light. See the attached transmission spectra.**

   (2) **The proposed photodegradation pattern of the isoxasolidine moiety of FMC 57020 is reasonable. See the attached information.**

   (3) **The FMC report misspelled "arylamide". The correct spelling is "arylimide" and its structure is:**

   ![Arylimide Structure](image)

   (4) **Carolyn K. Offutt, Chief of the Modeling and Guidelines Section in EAB, has stated that no further modeling information is needed.**
3. CONCLUSIONS/RECOMMENDATIONS

All environmental fate data requirements have been satisfactorily fulfilled in support of the use of PNC 57020 (herbicide) on soybeans.

[Signature]

Samuel M. Creeger
December 11, 1985
Section #1/EAB
Hazard Evaluation Division
PHOTODEGRADATION - WATER

1. Does the glassware transmit sunlight without absorbing the light?

This issue was addressed in Report No. P-1135, p.5. All glassware used in these studies (both indoor & outdoor tests), except Test No. 5 in Table 1 in which quartz flasks were used, were all borosilicate (i.e., Pyrex) glass which allows transmission of light wavelength greater than 290 nm. As stated in Material Information provided by Corning Glass Works, this glass showed UV cutoff at <240 nm. In visible and infrared range, no absorption of incident light was observed (Attachment 1).

2. What is the fate of the isoxazolidine ring when exposed to sunlight?

In a prior report (P-0869) submitted to EPA, FMC provided a detailed explanation on structure elucidation of all isolated photodegradation products, including the heterocyclic degradates isoxazolidinone, hydroxy pivalic acid, and arylimide. The products were identified thru various derivatization techniques (TMS and CH₂N₂) and GC/MS analysis.

Some brief summaries of structure elucidation work (as in Report No. P-0869) are outlined in the following:

**Hydroxy Pivalic Acid**

\[
\begin{align*}
\text{OH} & \quad \text{CH}_2\text{N}_2 \\
\text{H} & \quad \text{CH}_3\text{O} \\
\text{BSTFA} & \quad \text{OTMS}
\end{align*}
\]

**Chemical Ionization**

[Graph showing chemical ionization]
CI MASS SPECTRUM OF BIS-TMS DERIVATIVE OF HYDROXYPIVALIC ACID

![Mass Spectrum Diagram]

\[ \text{M}^+ - 118 \rightarrow \text{M}^* - 262 \rightarrow \text{M}^* - 173 \]

\[ \text{O} - \text{H} \rightarrow \text{OTMS} \rightarrow -\text{OTMS} \]

\[ \text{m/z 179} \]
**Isoxazolidinone**

\[
\text{CH}_3\text{N}_2 + \text{NM} \rightarrow \text{CH}_3\text{N} = \text{N} = \text{CH}_3
\]

**FMC 57091**

**FIGURE 15**

EI/MS TOTAL ION CHROMATOGRAM OF ETHYL ACETATE FRACTION TREATED WITH DIAZOMETHANE.

<table>
<thead>
<tr>
<th>Peak</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Methyl-hydroxy pivalate</td>
</tr>
<tr>
<td>2.</td>
<td>Methyl FMC 57091</td>
</tr>
<tr>
<td>3.</td>
<td>FMC 57091 methyl methoxypivalate</td>
</tr>
<tr>
<td>4.</td>
<td>2-Chloroacetophenone</td>
</tr>
<tr>
<td>5.</td>
<td>Methyl-2-chloro benzoate</td>
</tr>
<tr>
<td>6.</td>
<td>Unknown</td>
</tr>
<tr>
<td>7.</td>
<td>Methyl-p-methylbenzene sulfonate</td>
</tr>
<tr>
<td>8.</td>
<td>Methyl arylimide</td>
</tr>
<tr>
<td>9.</td>
<td>Photo-product</td>
</tr>
<tr>
<td>10.</td>
<td>FMC 57020</td>
</tr>
<tr>
<td>11.</td>
<td>FMC 57019</td>
</tr>
</tbody>
</table>

**FIGURE 20**

EI/CI MASS SPECTRA OF THE METHYLATED DERIVATIVE OF FMC 57091.

**Electron Impact**

**Chemical Ionization**
Arylimide

FIGURE 18
EI/Cl-MASS SPECTRA OF TMS DERIVATIVE OF IMIDE PHOTODEGRADATE

Electron Impact

Chemical Ionization

m/z 296

m/z 282

m/z 226 (Cl)

m/z 186
The degradation pathway was proposed in a prior submitted report (P-0869, p. 30) except the volatile degrade, i.e., CO₂ which was identified in this report, therefore, it was added to this degradation pathway (Attachment 2). Also, hydroxy pivalamidine was not isolated and identified per se but proposed as a logical intermediate from isoxazolidinone to hydroxy pivalic acid.

\[ \text{Hydroxy Pivalamidine} \]

**PHOTODEGRADATION - SOIL**

Structure of arylimide -

Complete structure elucidation of arylimide was reported in FMC Report No. P-0869 (also see page 4).