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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

25 MAY 1993

Chemical No: 128829
Case No: 3021
Barcode Nos: D177575, D176494, D174258, D165024
EFGWB Nos: 92-0803, 92-0734, 92-0510, 91-0762

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Imazapyr (List C) - Phase 4 Review

From: Patricia Ott, Chemist, Review Section 1
Environmental Fate and Ground Water Branch
Environmental Fate and Effects Division (H7507C) *Patricia Ott*

Through: Paul J. Mastradone, Chief, Review Section 1
Environmental Fate and Ground Water Branch
Environmental Fate and Effects Division (H7507C) *Paul J. Mastradone*

Henry Jacoby, Branch Chief
Environmental Fate and Ground Water Branch
Environmental Fate and Effects Division (H7507C) *Henry Jacoby*

To: Kathryn Davis, PM 52
Special Review and Reregistration Division (H7508W)
and
Robert Taylor, PM 25
Registration Division (H7505C)

Attached is the environmental fate and ground water Phase 4 review package for the List C chemical imazapyr. The package contains an environmental fate assessment, Table A, and reviews of environmental fate studies received by EFGWB.

According to the LUIS report (03/31/92), imazapyr has 4 use patterns: Terrestrial Food (persimmon), Terrestrial Non-Food (fallow land, uncultivated agricultural areas, airports, lawns, hedgerows, outdoor industrial areas, rights-of-way, paths and patios (one homeowner product), recreational areas, private roads and sidewalks, golf course turf, etc.), Forestry and Aquatic Non-Food (drainage systems e.g., non-irrigation ditchbanks). Additionally, the registrant has proposed new aquatic uses in areas such as swamps, bogs, marshes, potholes, wetlands, and intermittently flooded areas. Label restrictions include not using on food or feed crops, not discharging effluent into sewage systems without notifying the sewage treatment plant authority, not



discharging effluent into lakes, streams, ponds, estuaries, oceans or public water (NPDES license restriction), and not applying product through any type of irrigation system. Imazapyr can be applied by ground or aerial application and formulation types include emulsifiable concentrate, soluble concentrate/liquid, and liquid--ready-to-use.

Because of the lack of key data on field formation of imazapyr degradates, neither the qualitative nor quantitative environmental fate assessment can be completed at this time. However, based on acceptable and supplemental laboratory studies and supplemental field data, EFGWB believes that imazapyr dissipates via leaching and transport to surface water. Contamination of ground water by imazapyr is possible.

Two terrestrial field dissipation studies identifying significant imazapyr degradates are necessary. These will allow EFGWB to determine qualitatively and quantitatively the relative rates of imazapyr dissipation through transport (surface and ground water) and degradation. In addition, because leaching appears to be an important route of dissipation, a new leaching and adsorption/desorption study is needed to assess the mobility of imazapyr in soil. Finally, to support proposed new aquatic uses, two aquatic dissipation studies are needed to assess the dissipation of imazapyr in typical use areas (swamps, bogs, marshes, potholes, wetlands, and intermittently flooded areas). See DERs for details.

The status of the data requirements is summarized below:

<u>Data Requirement</u>	<u>Use Pattern</u>	<u>Status</u>
161-1 Hydrolysis	All uses	Satisfied (MRID #00132359)
161-2 Aqueous Photolysis	All uses	Satisfied (MRID #00131617)
161-3 Soil Photolysis	Terr. Food Forestry	Satisfied (MRID #40003713)
162-1 Aerobic Soil Metab.	Terrestrial Forestry	Satisfied (MRID #41023201)
162-2 Anaerob Soil Metab.	Terrestrial	Satisfied (MRID #00131619)
162-3 Anaer. Aq. Metab.	Aquatic Forestry	Satisfied (MRID #40003712)
162-4 Aerobic Aq. Metab.	Aquatic	Satisfied (MRID #41002301)
163-1 Leaching Ads./Des.	All uses	Unsatisfied ¹
164-1 Terr. Field Dissip	Terrestrial	Partial (MRID #42192101) Partial (MRID #42192102)
164-2 Aqua. Field Diss	Aquatic	Unsatisfied ²
164-3 Forest Field Dis	Forestry	Satisfied (MRID #40003714) (MRID #40003704)
165-4 Fish Bioaccumul.	Terrestrial	Satisfied (Acc #258899)
201-1 Droplet Size Spec.	Aerial Herb.	In review
202-1 Drift Field Eval.	Aerial Herb.	In review

1. The submitted study (MRID #00131620) was considered unacceptable because the soils were sieved through a 0.5 mm mesh screen, which removed a significant portion of the sand fraction.
2. The submitted study (MRID #41891501) provides supplemental information. See DER for details.

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ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: Kathryn Davis, PM #52
 Special Review and Reregistration Division (H7508W)
 and
 Robert Taylor, PM 25
 Registration Division (H7505C)

From: Paul J. Mastradone, Ph.D., Section Head *PJM*
 Chemistry Review Section 1
 Environmental Fate & Ground Water Branch/EFED (H7507C)

Thru: Henry Jacoby, Chief *HJ*
 Environmental Fate & Ground Water Branch/EFED (H7507C)

Attached, please find the EFGWB review of...

Common Name:	Imazapyr	Trade name:	CHOPPER, ARSENAL
Company Name:	American Cyanamid		
ID #:	I28829-00024I,-00299		
Purpose:	List C, Phase 4 review; review data in support of proposed new aquatic uses.		
Type Product:	Action Code:	EFGWB #(s):	Review Time:
Herbicide	604	92-0803, 0734, 0510, 91-0672	17 days

STATUS OF STUDIES IN THIS PACKAGE:

Guideline #	MRID	Status ¹
161-1	00132359	A
161-2	00131617	A
161-3	40003713	A
162-2	00131619	A
162-3	40003712	A
163-1	00131620	I
164-1	42192101	U
164-1	42192102	U
164-3	40003714	A
164-2	41891501	C

**STATUS OF DATA REQUIREMENTS
 ADDRESSED IN THIS PACKAGE:**

Guideline #	Status ²
161-1	S
161-2	S
161-3	S
162-2	S
162-3	S
163-1	N
164-1	P
164-3	S
164-2	N

¹Study Status Codes: A=Acceptable U=Upgradeable C=Ancillary I=Invalid.
²Data Requirement Status Codes: S=Satisfied P=Partially satisfied N=Not satisfied R=Reserved W=Waived.

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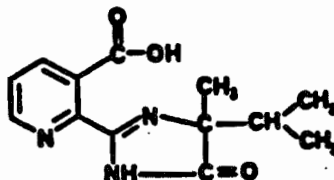
1.0 CHEMICAL:

Common name: Imazapyr

Trade names: ARSENAL, CHOPPER

Chemical name: 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid

Structure:



2-(4'-Isopropyl-4'-methyl-5'-oxo-2'-imidazolinyl) nicotinic acid
(AC 243,997)

2.0 TEST MATERIAL: n/a

3.0 STUDY/ACTION TYPE: List C, Phase 4 review

4.0 STUDY IDENTIFICATION: see attached bibliography of 11 reviewed studies

5.0 REVIEWED BY:

Patricia Ott
Chemist
Section #1, EFGWB/EFED

Signature: Patricia Ott
Date: 24 MAY 1993

A. Jones
Agronomist
Section #1, EFGWB/EFED

Signature: A. Jones
Date: 24 MAY 1993

6.0 APPROVED BY:

Paul J. Mastradone, Ph.D.
Section Chief
Section #1, EFGWB/EFED

Signature: Paul J. Mastradone
Date: 24 MAY 1993

7.0 CONCLUSIONS:

7.1 Most of the environmental fate data requirements needed to support the current uses of imazapyr have been fulfilled. The status of the data requirements are as follows:

Environmental Fate Data Requirements:

<u>Data Requirement</u>	<u>Use Pattern</u>	<u>Status</u>
161-1 Hydrolysis	All uses	Satisfied (MRID #00132359)
161-2 Aqueous Photolysis	All uses	Satisfied (MRID #00131617)
161-3 Soil Photolysis	Terr. Food Forestry	Satisfied (MRID #40003713)
162-1 Aerobic Soil Metab.	Terrestrial Forestry	Satisfied (MRID #41023201)
162-2 Anaerob Soil Metab.	Terrestrial	Satisfied (MRID #00131619)
162-3 Anaer. Aq. Metab.	Aquatic Forestry	Satisfied (MRID #40003712)
162-4 Aerobic Aq. Metab.	Aquatic	Satisfied (MRID #41002301)
163-1 Leaching Ads./Des.	All uses	Unsatisfied ¹
164-1 Terr. Field Dissip	Terrestrial	Partial (MRID #42192101) Partial (MRID #42192102)
164-2 Aqua. Field Diss	Aquatic	Unsatisfied ²
164-3 Forest Field Dis	Forestry	Satisfied (MRID #40003714) (MRID #40003704)
165-4 Fish Bioaccumul.	Terrestrial	Satisfied (Acc #258899)
201-1 Droplet Size Spec.	Aerial Herb.	In review
202-1 Drift Field Eval.	Aerial Herb.	In review

1. The submitted study (MRID #00131620) was considered unacceptable because the soils were sieved through a 0.5 mm mesh screen, which removed a significant portion of the sand fraction.
2. The submitted study (MRID #41891501) provides supplemental information because the studies were conducted in shallow ponds in Florida and Louisiana during summer and imazapyr's undergoes aqueous photolysis. The rapid dissipation shown may not be representative of dissipation rate in proposed new use sites (swamps, bogs, marshes, potholes, wetlands and intermittently flooded areas).

7.2 Although the environmental fate data base is nearly complete for imazapyr, it is not possible at this time to develop a complete qualitative or quantitative environmental fate assessment. The field studies are incomplete because photodegradates were not monitored. The only identifiable degradation process of imazapyr that is rapid enough to yield detectable degradates is aqueous photolysis. The lack of degradate identification and quantification prohibits confirmation on the actual route of dissipation of imazapyr. More importantly, there are no acceptable mobility data on imazapyr and its photodegradates. These data are necessary to provide a complete environmental fate assessment of imazapyr and its degradates.

7.3 Laboratory information on the degradation of imazapyr indicate it is stable to most routes of degradation. Only aqueous photolysis proceeded rapidly ($t_{1/2}$ = 2.5-5.3 days) with identifiable degradates of 2,3-pyridinecarboxylic acid, 7-hydroxy-furo[3,4b]pyridin-5 (7H)one, quinolinimide and furo[3,4-b]pyridin-5-(7H)-one. Soil photolysis proceeded much more slowly with a half-life of 149 days and no single degradate was >10% of the applied. Also there was slow microbial-mediated mineralization in aerobic soil metabolism studies. See attached DER's.

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- 7.4 Unacceptable mobility studies indicate that imazapyr was mobile to highly mobile (K_d 1.7 to 4.9). Deficiencies in the mobility studies included oversieving of soils and inordinately high organic matter contents in two of the soils. This would enhance binding capacity of soils and limit apparent mobility of imazapyr. See attached DER.
- 7.5 The results of field dissipation studies indicate that a major route of imazapyr dissipation was through mobility to surface and possibly groundwater. Laboratory information on the degradation of imazapyr indicates that only aqueous photolysis proceeded at a rapid enough rate to yield identifiable degradates. These degradates were not analyzed for in the terrestrial field dissipation studies and hence limit any interpretation on field degradation processes. The forestry dissipation studies indicated that the primary route of dissipation of imazapyr was due to transport in surface water and movement down the soil profile. Although none of the field studies appeared to indicate a clear pattern of leaching, imazapyr was detected to a depth of 24 inches in the terrestrial field studies and to a depth of 20 inches in both forestry dissipation studies. However, imazapyr was predominately found in surface 12 inches of soil.
- 7.6 Based on review of the environmental fate data base by the Ground Water Section of EFGWB, imazapyr has shown no clear pattern of leaching, however, it exhibits the characteristics of compounds known to leach. Therefore, the Ground Water Section suggests the following ground water advisory be placed on the label:
- "This chemical demonstrates the properties and characteristics associated with chemicals detected in ground water. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination."
- 7.7 Aquatic dissipation and aerobic aquatic metabolism data of imazapyr photoproducts were submitted in support of registration for proposed new use on sites such as swamps, bogs, marshes, potholes, wetlands, and intermittently flooded areas. The studies were not conducted in representative sites and therefore do not support the proposed new use. See Studies 11 and 12 for details.

Environmental Fate Assessment

Based on acceptable, supplemental, and unacceptable data, a preliminary qualitative environmental fate assessment for imazapyr is possible at this time. Additional information is needed for complete qualitative and quantitative assessments. The major route of dissipation of imazapyr appears to be through transport to ground and surface waters.

With the exception of photolysis, acceptable laboratory data indicate that imazapyr is stable to most routes of degradation (hydrolysis, aerobic and anaerobic soil metabolism, aerobic and anaerobic aquatic metabolism). The compound undergoes aqueous photolysis, with a half-life of 2.5-5.3 days. Two major photolytic degradates found were 2,3-pyridinecarboxylic acid and 7-hydroxy-furo[3,4b] pyridin-5 (7H)-one which

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comprised a maximum of 22.7% and 9.7% of the applied radioactivity, respectively. In contrast to aqueous photolysis, the soil photolysis half-life is much longer ($t_{1/2} \approx 149$ days). Unacceptable laboratory mobility data indicate that imazapyr is mobile in most soils. The study was deemed unacceptable due to fine-seiving of soils and excessive organic matter contents, both of which would limit imazapyr's mobility.

Bare ground field studies produced conflicting dissipation information. Supplemental field dissipation information indicated that imazapyr dissipated with half-lives of 64-143 days. No degradates were monitored in the field studies. Also, it should be noted that although no clear pattern of leaching was noted, imazapyr residues were detected as deep as 18-24 inches in soils. The route(s) of dissipation were not clear from these studies. In supplemental aquatic field dissipation studies submitted in support of proposed new uses on swamps, bogs, and similar areas, imazapyr dissipated with half-lives of 1.9-3.7 days. Since the studies were conducted in shallow ponds in Florida and Louisiana during summer months, aqueous photolysis was the likely route of dissipation.

Acceptable forestry dissipation data indicated that imazapyr had a half-life of 12-44 days, with the major route of dissipation reported to be surface transport. Additionally, imazapyr was detected to a depth of 16-20 inches in both studies. Imazapyr does not appear to accumulate in fish.

8. RECOMMENDATIONS

Because of the lack of key data on field formation of imazapyr degradates, neither the qualitative nor quantitative environmental fate assessment can be completed at this time. However, based on acceptable and supplemental laboratory studies and supplemental field data, EFGWB believes that imazapyr dissipates via leaching and transport to surface water. Contamination of ground water by imazapyr is possible.

Additionally, two terrestrial field dissipation studies identifying significant imazapyr degradates are necessary. These will allow EFGWB to determine qualitatively and quantitatively the relative rates of imazapyr dissipation through transport (surface and ground water) and degradation. Also, two aquatic dissipation studies conducted at typical use sites are needed to assess the dissipation of imazapyr under the proposed new use conditions (swamps, bogs, marshes, potholes, wetlands, and intermittently flooded areas).

In addition, because leaching appears to be an important route of dissipation, a new leaching and adsorption/desorption study is needed to assess the mobility of imazapyr in soil. Imazapyr was mobile in the supplemental study submitted even though the soils were sieved to 0.5 mm and two soils had high organic matter contents. (In one soil with 4.6% organic matter sieved to 0.5 mm, a K_d of 1.7 was reported).

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9. BACKGROUND:

Imazapyr is a systemic herbicide registered for terrestrial food, terrestrial non-crop, aquatic non-crop, and forestry uses, according to the LUIS report.

10. REVIEW OF INDIVIDUAL STUDIES: see attached DER's

11. COMPLETION OF ONE-LINER: Updated one-liner attached.

12. CBI APPENDIX: NA

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REFERENCES

The following studies were reviewed:

American Cyanamid Company. 1991. Aquatic Dissipation Studies and Related Data. Laboratory Report CY41. MRID #418915-01. (This MRID includes an aerobic aquatic metabolism study of imazapyr photoproducts and is reviewed on a separate DER.)

Hussain, M., and M. Mallipudi. 1982. CL 243,997 Herbicide: The hydrolysis of carbon-14 labeled CL 243,997. Project No. 0493. Report No. PD-M 19-8. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (00132359)

Mallipudi, M., B. Knoll, M. Bullock, P. Stanley-Millner, S. Stout, A. deCunha, W. Millen, and P. Mowery. 1983. Arsenal herbicide (AC 243,997): Photolysis of carbon-14 labeled AC 243,997 [Nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-] in aqueous media. Project No. 0493. Report No. PD-M Vol. 20-20. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (00131617)

Mallipudi N.M., B. Knoll, S. Stout, and A. daCunda. 1983. Arsenal herbicide (AC 243,997): Anaerobic soil metabolism of carboxyl carbon-14 labeled AC 243,997 [nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-yl)] in sandy loam soil. Project No. 0493. Report No. PD-M. Vol. 21-15. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (00131619)

Mallipudi, M., D. Hewel, B. Knoll, and P. Stanley-Millner. 1983. Arsenal herbicide (AC 243,997): Adsorption and desorption coefficients for soils. Project No. 0493. Report No. PD-M Vol. 20-18. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (00131620)

Mangels, G. 1986. AC 243,997: Soil photolysis. Laboratory Report No. PD-M 23-39. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (40003713)

Michael, J.L. 1986. Fate of Arsenal in forest watersheds after aerial application for forest weed control. Laboratory Report No. FS-SO-4105-1.20. Unpublished study performed by the U.S. Forest Service, Auburn, AL, and submitted by American Cyanamid Company, Princeton, NJ. (40003714)

Picard, G. 1986. Arsenal herbicide (CL 243,997): Validation of HPLC method M-1612 for the determination of CL 243,997 residues in pine twigs, green leaves and forest litter. Laboratory Report No. C-2782. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (40003704)

Sanders, P. 1986. Arsenal herbicide, imazapyr (AC 243,977): Anaerobic aquatic degradation. Laboratory Report No. PD-M Vol. 23-26. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (40003712)

York, C. 1992b. The rate of dissipation of CL 243,997 in Oregon soil. Laboratory Report No. C-3766. ABC Final Report No. 38975. Unpublished study performed by Collins Agricultural Consultants, Inc., Hillsboro, OR; analyses by Analytical Bio-Chemistry Laboratories, Inc., Columbia, MO, and American Cyanamid Company, Princeton, NJ; and submitted by American Cyanamid Company, Princeton, NJ. (42192101)

York, C. 1992a. The rate of dissipation of CL 243,997 in North Carolina soil. Laboratory Report No. C-3767. ABC Final Report No. 39324. Unpublished study performed by Chemtrol Scientific Testing, Edenton, NC; analyses by Analytical Bio-Chemistry Laboratories, Inc., Columbia, MO, and American Cyanamid Company, Princeton, NJ; and submitted by American Cyanamid Company, Princeton, NJ. (42192102)

PHASE IV ENVIRONMENTAL FATE SUMMARY TABLE FOR MAZAPYR

Chemical Code : 128829 Reviewer: Patricia Ott, EFED/EFGWB
Pesticide Type: Herbicide Date: 05/24/93
Uses (LUIS 03/31/92): Terrestrial Food & Non-food, Aquatic, Forestry

Submitted Studies/Addendums	DER/Addendum Review/Summary Identification	DER/Addendum Review/Summary Review Conclusions	Additional Data/Info Required?
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PRODUCT CHEMISTRY

160-5. Chemical ID No¹

DEGRADATION-LAB:

161-1. Hydrolysis 00132359 (AMJ;05/24/93) Satisfies No

Photodegradation:

161-2. In Water 00131617 (PO;05/24/93) Satisfies No

161-3. On Soil 40003713 (PO;05/24/93) Satisfies No

161-4. In Air None NA^f

METABOLISM-LAB:

162-1. Aerobic Soil 41023201 (CF;07/11/89) Satisfies No

162-2. Anaerob. Soil 00131619 (PO;05/24/93) Satisfies No

162-3. Anaerob. Aqua. 40003712 (PO;05/24/93) Satisfies No

162-4. Aerobic Aqua. 41002301 (CF;07/11/89) Satisfies No²

PHASE IV ENVIRONMENTAL FATE SUMMARY TABLE FOR IMAZAPYR

	Submitted Studies/ Addendums	DER/Addendum Review/Summary Identification	DER/Addendum Review/Summary Review Conclusions	Additional Data/Info Required?
<u>MOBILITY STUDIES:</u>				
163-1.	Leaching and Adsorp./Desorp.	00131620 (AWJ;05/24/93)	DNS/NSa1v/Supp	Yes ³
163-2.	Volatil.(Lab)	None ^e		NA ^f
163-3.	Volatil.(Field)	None ^e		NA ^f
<u>DISSIPATION-FIELD:</u>				
164-1.	Terrestr.(Soil)	42192101 42192102	(PO;05/24/93) (PO;05/24/93)	Yes ⁴ Yes ⁴
164-2.	Aquat.(Sediment)	41891501	(AWJ;05/24/93)	Yes ⁵
164-3.	Forestry	42192102	(PO;05/24/93)	No
164-4.	Combin./Tank Mix	None ^e		NA ^f
164-5.	Long Term Terr.	None ^e		Reserved ⁶
<u>ACCUMULATION STUDIES:</u>				
165-1.	Conf. Rot. Crops	None ^e		NA ^f
165-2.	Field Rot. Crops	None ^e		NA ^f

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PHASE IV ENVIRONMENTAL FATE SUMMARY TABLE FOR MAZAPYR

Submitted Studies/Addendums	DER/Addendum Review/Summary Identification	DER/Addendum Review/Summary Conclusions	Additional Data/Info Required?
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ACCUMULATION STUDIES (continued):

165-3. Irrigated Crops	None ^e		NA ^f
165-4. Fish	258899	(JHJ; 10/07/86)	No
165-5. Aqua. Non-target Organisms (Field)	None ^e		NA ^f

GROUNDWATER MONITORING:

166-1. Small Prospect.	None ^e		No ⁷
166-2. Small Retresp.	None ^e		No ⁷
166-3. Large Retresp.	None ^e		No ⁷

SURFACE WATER:

167-1. Field Runoff	None ^e		No ⁷
167-2. Surf. Monitoring	None ^e		No ⁷

SPRAY DRIFT:

201-1. Droplet Spect.			Yes ⁸
202-1. Field Spray Drift Eval.			Yes ⁸

KEY DEFINITIONS:

a) Reviewable = placed in the third column to indicate that based upon a review of the summary identified by MRID# in the second column/same row, EFGWB concludes that the study identified by MRID# in the first column/same row may possibly satisfy or partially satisfy the data requirement, or could possibly be salvageable to do so. Therefore, the study should be reviewed in Phase V.



- b) Study Withdrawn = placed in the second column to indicate that there are no DERs or summaries available for the study identified by MRID# in the first column/same row, but that the registrant has indicated in their Phase III response that another study will be submitted.
- c) DNS/NSalv./Supp. = placed in the third column to indicate that the study or addendum identified by MRID# in the first column/same row does not satisfy (DNS) the data requirement, does not appear to be salvageable (NSalv.) to do so with the submission of additional information or limited data. The results of the study can be used for supplemental information (Supp.).
- d) DNS/Salv./Supp. = placed in the third column to indicate that the study or addendum identified by MRID# in the first column/same row does not satisfy (DNS) the data requirement, but could possibly be salvageable (Salv.) to do so with the submission of additional information or limited data. The results of the study can be used for supplemental information (Supp.).
- e) None = placed in the first column to indicate that the registrant did not list any studies or addendums in their Phase II and/or III responses for the given data requirement. In addition, EFGWB has no record of any studies or study/addendum combinations satisfying or partially satisfying the data requirement.
- f) NA = placed in last (4th) column to indicate that the data requirement is not applicable to the uses listed in the LUIS report.
- g) SWBSubmitted = placed in the final (4th) column to indicate that one or more studies will be submitted by the registrant as indicated in their Phase III response.

FOOTNOTES:

1. Unless noted otherwise, the following product chemistry information was obtained from the EFGWB one-liner database.

Molecular formula:	C ₆ H ₂₄ N ₄ O ₃
Molecular weight:	320.39
Vapor Pressure:	1.1 X 10 ⁻⁸ mm Hg (acid) (From USDA/SCS/ARS/CES Pesticide Properties Database)
Solubility (water):	Soluble
Log octanol/water partition coef:	0.11

- 2. In addition to data on parent, a study of aerobic aquatic metabolism of photodegradates was submitted.
- 3. Acceptable mobility data on imazapyr and its photodegradates are needed for a complete environmental fate assessment of imazapyr and its degradates.

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- 4 This study is upgradeable. If additional information is submitted, the study may be used toward satisfying the data requirement. See DER for details.
5. Aquatic dissipation studies were submitted in support of proposed new uses. The studies provide supplemental information. New studies are needed to support aquatic uses. See DER for details.
6. Long-term soil dissipation studies are reserved pending the results of acceptable terrestrial field dissipation studies.
7. Ground water and surface water studies are not required at this time. However, mobility to surface and ground water may be a major route of imazapyr dissipation in the environment. The Ground Water Section of EFGWB suggests the following advisory be placed on the label:

"This chemical demonstrates the properties and characteristics associated with chemicals detected in ground water. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination."
8. Droplet size spectrum and drift field evaluation data are required when aerial applications (rotary and fixed wing) and mist blower or other methods of ground application are proposed and it is estimated that the detrimental effect level of those nontarget organisms expected to be present would be exceeded. These data are required for all herbicides which are applied aerially. These data are required for imazapyr.

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