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OFFICE OF PREVENTION, PESTICIDES AND TOXIC SUBSTANCES

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MEMORANDUM

SUBJECT: Experimental Use Permit for Isoxaflutole on Corn

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The registrant, Rhone Poulenc Ag Company, has applied for an Experimental Use Permit (EUP) to experimentally use isoxaflutole (5-cyclopropyl-4-(2-methanesulphonyl-4-trifluoromethyl benzoyl)isoxazole) on corn. The Environmental Risk Characterization Branch (ERCB) has limited concern regarding the EUP for the use of isoxaflutole on corn in fifteen (15) Midwest and Central Atlantic states because of the low amount of acres to be treated (maximum of 4,990 acres) and the widely-spaced distribution of fields across the 15 states. The submitted laboratory studies on environmental fate and transport, and ecological effects do not suggest appreciable risk from the EUP to terrestrial and aquatic environments, and nontarget organisms, including endangered species. Although isoxaflutole and its transformation products have the potential to leach to groundwater and runoff to surface water, the submitted information suggests the environmental impact of parent isoxaflutole to water resources would be minimal because it dissipates rapidly in soil and water media. The proposed low application rate (2-4 ounces of product per acre; 0.1875 lb ai/A) may reduce the magnitude of this compound in the environment.

Discussions with the registrant indicate the primary transformation product RPA-202248 is also an active ingredient with herbicidal properties. Information on the environmental fate (persistence and mobility) and ecological toxicity of the primary transformation products (RPA-202248, RPA-203328, RPA-205834) of isoxaflutole is not currently available; therefore, additional environmental fate and ecological toxicity studies are recommended for Section 3 registration (see Section D of Attachment 1).

EXECUTIVE SUMMARY

The submitted studies from Rhone-Poulenc Ag Company are acceptable to support the Environmental Fate and Ecological Effects data requirements for the EUP on corn (Terrestrial Food Crop use pattern). The following Environmental Fate data requirements for the EUP are satisfied: 161-1: Hydrolysis; 162-1: Aerobic Soil Metabolism; and 163-1: Mobility (Leaching/Sorption). The 165-4: Bioaccumulation in Fish data requirement is waived based on the reported octanol/water partition coefficient (K_{ow}) of 219 which is lower than the test requirement criteria of 1,000.

Based on acceptable laboratory study information, parent isoxaflutole degrades by abiotic hydrolysis and rapidly dissipates via microbially-mediated metabolism. Although the mobility of parent isoxaflutole varies from mobile to relatively immobile in the tested soils and isoxaflutole is assumed to have limited potential to volatilize, rapid dissipation in both soil and water reduces the potential for parent isoxaflutole being transported to either ground water or surface water. Using results of the aged soil column leaching tests, the primary transformation product RPA-202248 appears to be mobile. The submitted laboratory studies suggest RPA-202248 is more persistent than the parent isoxaflutole.

The following Ecological Effects data requirements for the EUP are satisfied: 71-1: Avian LD_{50} (two species); 71-2: Avian LC_{50} (two species); 72-1: Fish LC_{50} (bluegill and trout); and 72-2: LC_{50} for *Daphnia magna*. The ecological toxicity data indicate parent isoxaflutole is practically nontoxic to birds. Since LC_{50}s were not calculated from the toxicity tests with fish and aquatic invertebrates (i.e., all results being "greater than" values), toxicity to these organisms cannot be characterized. However, the data indicate isoxaflutole is no more than moderately toxic to fish and aquatic invertebrates with all LC_{50} values being much greater than 1 mg/l (ppm).

Additional environmental fate and ecological effects information will be necessary to improve the risk assessment of parent isoxaflutole and its primary transformation products (e.g., RPA-202248 which is also an active ingredient, etc.) for Section 3 registration. The registrant has submitted an acute aquatic invertebrate test with the transformation product RPA-203328 which is in review; however, ecological toxicity information for the primary transformation products of isoxaflutole is not currently available. The registrant is presently conducting Terrestrial Field Dissipation studies monitoring parent isoxaflutole (RPA-201772) and its primary transformation products (RPA-202248, RPA-203328, RPA-205834). The field studies should provide information on the environmental fate of the primary

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transformation products of isoxaflutole under actual field use conditions.

Additional study submissions for both Environmental Fate and Ecological Effects testing not required for the EUP are currently in review. A list of the studies in review is summarized in the Environmental Assessments section (Section C of Attachment 1).

Attached to this memorandum (Attachment 1) is the ERCB Experimental Use Permit Evaluation Report for isoxaflutole. Attachment 1 is organized into Sections A-G. Section A describes the background for the experimental herbicide. Section B provides details for the proposed EUP program. Section C relates the current state-of-knowledge environmental assessment based on the studies submitted for the EUP by the registrant, Rhone Poulenc Ag Company. Section D describes environmental fate and effects issues for Section 3 registration. Section E relates the conclusions and recommendations from the evaluation of the EUP. Section F identifies the ERCB team members who worked on this task. Section G lists the citations from studies submitted by the registrant. Attachment 2 is the Data Evaluation Records for the environmental fate and transport guideline studies. Attachment 3 is the Data Evaluation Records for the ecological effects guideline studies.

ATTACHMENT 1. Evaluation of the Experimental Use Permit for Isoxaflutole
Environmental Risk Characterization Branch Report

This report summarizes the environmental fate and ecological effects data evaluations for the Experimental Use Permit (EUP) for Isoxaflutole (RPA-201772), an experimental herbicide intended for broad spectrum weed control in corn. The report is organized into Sections A-G listed below.

SECTION	CONTENTS
A	Background of Isoxaflutole Experimental Herbicide
B	Experimental Use Permit for Isoxaflutole
C	Environmental Assessment
D	Environmental Fate and Effects Issues for Section 3 Registration
E	Conclusions and Recommendations
F	ERCB Task Members for the Isoxaflutole EUP
G	References

A. BACKGROUND OF ISOXAFLUTOLE EXPERIMENTAL HERBICIDE

Isoxaflutole (5-cyclopropyl-4-(2-methanesulphonyl-4-trifluoromethyl benzoyl)isoxazole) is the new active ingredient in the herbicidal product RPA 201772 75WDG, currently under development by Rhone-Poulenc Ag Company. Isoxaflutole will be formulated as a 75% water dispersible granule product. According to the summary document (No MRID#) submitted by the registrant, isoxaflutole is a member of a new class of herbicides named benzoylisoxazoles and is intended to control both grasses and broadleaf weeds in corn. The reported mode of action for isoxaflutole is prevention of carotenoid biosynthesis by inhibiting the enzyme 4-hydroxyphenylpyruvate dioxygenase which catalyses the formation of quinones.

B. EXPERIMENTAL USE PERMIT FOR ISOXAFLUTOLE

The registrant, Rhone Poulenc Ag Company, has applied for an EUP to experimentally use isoxaflutole (5-cyclopropyl-4-(2-methanesulphonyl-4-trifluoromethyl benzoyl)isoxazole) on a maximum of 4,990 acres of corn in fifteen (15) Midwest and Central Atlantic states (see Table 1). The EUP for isoxaflutole will be conducted in 1996. Each EUP field location would be a maximum of 40 acres. The proposed maximum use rate is 0.1875 lb ai/A. During the 1996 field season, the total application of isoxaflutole will consist of approximately 1,170 pounds of formulated product (935 lbs of active ingredient).

According to the proposed testing program, application rates for preemergent control will be

2.0-2.5 ounces of product per acre, and application rates for preplant control will be 2.75-4.0 ounces of product per acre. Preplant application timing will be 15-30 days before corn is planted. Isoxaflutole will also be tested in tank mixes with other corn herbicides. Fields would be treated with a single application of isoxaflutole, either preemergence or preplant, using **ground spray equipment only**. Aerial application is **not** being requested for this EUP.

TABLE 1. ISOXAFLUTOLE EUP FIELD TEST LOCATIONS
(Source: Rhone Poulenc EUP Proposed Testing Program)

State	No. of Tests	Acres	Maximum Pounds Active Ingredient to be Applied
Iowa	23	910	170
Illinois	14	560	105
Nebraska	14	560	105
Minnesota	14	560	105
Indiana	14	560	105
Kansas	7	280	53
Ohio	8	320	60
South Dakota	4	160	30
Wisconsin	5	200	37
Missouri	2	80	15
Kentucky	4	160	30
New York	4	160	30
Michigan	7	280	53
Maryland	2	80	15
Pennsylvania	3	120	23
TOTALS:	125	4990	935

C. ENVIRONMENTAL ASSESSMENT

1. Ecological Toxicity Data

The ecological toxicity data indicate parent isoxaflutole is practically nontoxic to birds. Since LC_{50}s were not calculated from the toxicity tests with fish and aquatic invertebrates (i.e., all results being "greater than" values), toxicity to these organisms cannot be characterized. However, the data indicate isoxaflutole is no more than moderately toxic to fish and aquatic invertebrates with all LC_{50} values being much greater than 1 mg/l (ppm). The Ecological Effects toxicity data and data requirements which are satisfied (listed by guideline and MRID#) are shown in Table 2.

TABLE 2. ECOLOGICAL EFFECTS TOXICITY DATA FOR PARENT ISOXAFLUTOLE (RPA-201772)

Ecological Effects Guidelines	Species	LC_{50} or LD_{50}	Study Evaluation	MRID #
71-1 Avian LD_{50}	Bobwhite	>2150 mg ai/kg body wt.	Acceptable/Core	43573231
71-1 Avian LD_{50}	Mallard	>2150 mg ai/kg body wt.	Acceptable/Core	43573232
71-2 Avian LC_{50}	Bobwhite	>4255 mg ai/kg feed (ppm)	Acceptable/Core	43573233
71-2 Avian LC_{50}	Mallard	>4255 mg ai/kg feed (ppm)	Acceptable/Core	43573234
72-1 Fish LC_{50}	Bluegill	>4.5 mg/l	Acceptable/Core	43573235
72-1 Fish LC_{50}	Trout	>1.7 mg/l	Acceptable/Core	43573236
72-2 LC_{50} Aquatic Invertebrate	*Daphnia magna*	>1.5 mg/l	Acceptable/Core	43573237

The following Ecological Effects data requirements are currently in review and not required for the EUP:

Guideline	Data Requirement	MRID #
72-3(a)	Sheepshead Minnow acute	43573238
72-3(b)	Oyster acute	43573239
72-3(c)	Mysid acute	43573240
72-2(a)	*Daphnia magna* acute (RPA 203328)	43573241
123-1(a,b)	Terrestrial plant, seedling emergence/vegetative vigor	43573242
123-2	Aquatic plant (*Selenastrum capricornutum*)	43573243
123-2	Aquatic plant (*Naviicula pelliculosa*)	43573244
123-2	Aquatic plant (*Anabena flos-aquae*)	43573245

Guideline	Data Requirement (cont'd)	MRID #
123-2	Aquatic plant (*Lemna gibba*)	43573246
123-2	Aquatic plant (*Skeletonema costatum*) EC	43573247
141-1	Bee LD_{50}	43573248

Attachment 3 is the Data Evaluation Records for the ecological effects guideline studies. Information on the ecological toxicity of the transformation products of parent isoxaflutole is not available at this time.

2. Environmental Fate and Transport Assessment

Based on the information provided by acceptable laboratory study submissions, parent isoxaflutole degrades by abiotic hydrolysis and is rapidly dissipated via microbially-mediated metabolism. Although isoxaflutole is mobile to relatively immobile in the laboratory tested soils and is assumed to have limited potential to volatilize (based on the reported vapor pressure of 7.5×10^{-9} mm Hg and Henry's Law Constant of 1.84×10^{-10} torr m^3/mol), rapid degradation in both soil and water reduces the potential for parent isoxaflutole being transported to either ground water or surface water.

Information from the abiotic hydrolysis study indicated parent isoxaflutole degraded hydrolytically with half-lives of 11 days, 20 hours, and 3 hours in pH 5, 7, and 9 buffer solutions, respectively. In the aqueous photolysis study, parent isoxaflutole degraded with a calculated half-life of 6.7 days, and the only significant transformation products were two photolytic rearrangements products with the same molecular weight (Transformation product 20) and hydration products (Transformation product 14, hydrated Transformation product 20). Soil photolysis was not considered an important means of degradation as demonstrated by similar half-lives of 23 and 20 hours shown in irradiated soil [pH 7.1, 1.3% Organic Carbon (OC)] and in dark controls, respectively. Results of the aerobic soil metabolism study indicates microbial-mediated metabolism is an important process for dissipation of parent isoxaflutole. The aerobic soil metabolism half-lives were 30 hours in sandy loam soil (pH 6.6, 0.9% OC) and 56 hours in clay soil (pH 5.9, 4.5% OC). The identified transformation products in both the soil photolysis and aerobic soil metabolism studies were RPA-202248 and RPA-203328, and these primary transformation products formed in approximately the same quantities in both studies. Transformation product RPA-202248 was found at maximum concentrations of 52-79% of the applied in the two tested soils; RPA-203328 was reported at maximum concentrations of 30-65% of the applied in the two soils. Parent isoxaflutole degraded rapidly in the anaerobic aquatic metabolism study with a half-life of <2 hours in water, and parent isoxaflutole was not detected after 2 hours in water, and was not detected in the sediment at any time. In the anaerobic aquatic metabolism study, transformation product RPA-202248 formed rapidly and partitioned from 69% of applied in water at 6 hours to 52-57% on sediment from 28-365 days. The calculated half-life for

RPA-202248 in water was 316 days. Bound residues increased from 0.18% at zero time to 17% by 365 days.

TABLE 3. ENVIRONMENTAL FATE DATA SUMMARY FOR ISOXAFLUTOLE (RPA-201772)

GUIDELINE #	DATA REQUIREMENT	ENVIRONMENTAL FATE AND TRANSPORT SUMMARY	STUDY EVALUATION	MRID#
161-1	Hydrolysis	Degrades rapidly via hydrolysis: Half-lives ($t_{1/2}$) of 11.1 days @pH 5, 20.1 hours @ pH 7, and 3.2 hours @ pH 9.	Acceptable (Satisfied)	43573254
161-2	Photodegradation in water	Degrades by aqueous photolysis: $t_{1/2}$ of ≈6.7 days in pH 5 test solution.	Acceptable (Satisfied)	43588004
161-3	Photodegradation on soil	Stable to photolysis on sandy loam soil.	Acceptable (Satisfied)	43588005
162-1	Aerobic soil metabolism	Rapidly metabolized: $t_{1/2}$s of 30 and 56 hours on sandy loam and clay soils, respectively.	Acceptable (Satisfied)	43588006
162-3	Anaerobic aquatic metabolism	Rapidly metabolized: $t_{1/2}$ <2 hours for parent isoxaflutole; primary transformation product RPA-202248 was a maximum of 69% at 6 hours in water, binding to sediment (≈50%) reported from 28-365 days	Acceptable (Satisfied)	43588007
163-1	Mobility/Sorption (Batch Equilibrium Method)	Mobile to relatively immobile: K_{ads}s ranged from 0.5-14.4, adsorption increased with increased organic carbon content.	Acceptable (Satisfied for unaged batch equilibrium method)	43588009
163-1	Mobility/Sorption (Aged Soil Column Leaching Test)	RPA-202248 appears to be mobile. In the aged soil column leaching with 5 soils or sediments; RPA-201772 converted primarily to transformation product RPA-202248 (43-90% of the applied in leachate)	Acceptable (Partially Satisfied)	43588008
163-2	Laboratory volatility	Based on the low vapor pressure and Henry's Law Constant, limited volatility is assumed.		
163-3	Field volatility			
164-1	Terrestrial field dissipation	Studies currently being conducted		
165-4	Bioaccumulation in fish	Assumed negligible based on the K_{ow} of 219 for parent isoxaflutole.	Waiver request accepted	

Parent isoxaflutole was very mobile in sand and sandy loam soils, moderately mobile in sandy loam soil, and essentially immobile in silty clay soil and loam sediment. Adsorption was shown to be reversible in all the soils studied with adsorption and desorption values that were comparable. Freundlich K_{ads} values were 0.51 for sand soil (0.5% OC), 1.2 for the sandy loam (0.9% OC), 2.2 for the loam soil (2.4% OC), 9.3 for the silty clay soil (7.5% OC), and 14.4 for the loam sediment (8.7% OC). Adsorption appears to increase with increased soil organic carbon content. A Freundlich K_{des} value could not be calculated for the sand soil since all of the adsorbed material desorbed in one step. Freundlich K_{des} values were 2.6 for the sandy loam (0.9% OC), 2.0 for the loam soil (2.4% OC), 13.4 for the silty

clay soil (7.5% OC), and 10.4 for the loam sediment (8.7% OC). Freundlich K_{oc} values were 101, 131, 93, 123, and 165 for adsorption and (none for sand soil), 284, 82, 179, and 119, respectively. The 1/N values were 1.0, 0.90, 0.94, 0.95, and 0.92 for adsorption and (none for sand soil), 0.93, 1.02, 0.95, and 0.90 for desorption, respectively.

Aged [^{14}C]isoxaflutole residues were very mobile in sand, sandy loam, and clay loam soils with 0.1, 1.3, and 2.0% OC, respectively. Parent isoxaflutole was generally not found below 6 cm of soil depth, and was not detected in the leachate from any soil. The primary residue in the leachate was transformation product RPA-202248 (**isoxaflutole with the isoxazole-ring opened**) at 90, 43, and 75% of applied radioactivity in the sand, sandy loam, and clay soils, respectively. In addition to the high percentage of RPA-202248 reaching the leachate in the above soils, the remainder was uniformly distributed within the length of the columns. Although only 1.8 and 1.2% of applied radioactivity reached the leachate in the silty clay soil and loam sediment with 7.5 and 8.5% OC, the radioactive residues were relatively uniform in concentration down to 9 inches of the 12 inch soil column. In the sandy loam soil, the transformation product RPA-203328 (2-methanesulfonyl-4-trifluoromethyl benzoic acid, **dealkylated RPA-202248**) reached an average of 6.8% in the leachate, but was not found in the leachate from any other soil. No volatility of unaged or aged residues was observed in any study, with the exception of CO_2 in the aerobic soil metabolism study.

The primary transformation product RPA-202248 is mobile based on the aged soil column leaching tests and appears to be more persistent. The registrant is currently conducting Terrestrial Field Dissipation studies with monitoring of parent isoxaflutole (RPA-201772) and its primary transformation products (RPA-202248, RPA-203328, RPA-205834). The field studies should provide additional information on the persistence of the primary transformation products of isoxaflutole under actual field use conditions.

The following Environmental Fate data requirements have been satisfied:

Guideline	Data Requirement	MRID #
161-1	Hydrolysis	43573254
161-2	Photodegradation in Water	43588004
161-3	Photodegradation on Soil	43588005
162-1	Aerobic Soil Metabolism	43588006
162-3	Anaerobic Aquatic Metabolism	43588007
163-1	Mobility (Unaged Leaching/Sorption)	43588009

The following Environmental Fate data requirements have been partially satisfied:

Guideline	Data Requirement	MRID #
163-1	Mobility (Aged Leaching/Sorption)	43588008

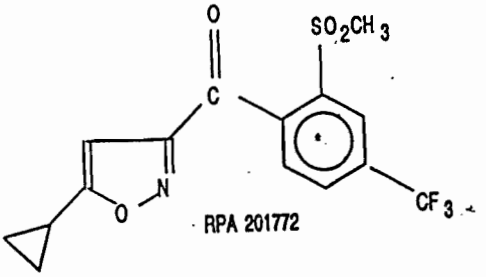
The Mobility (Aged Leaching/Sorption) data requirement is partially satisfied because the aged soil column leaching study suggests transformation product RPA-202248 is mobile. Information from the registrant indicates RPA-202248 is also an active ingredient; therefore, batch equilibrium tests are needed to determine adsorption coefficients (K_ds) for this primary transformation product.

Attachment 2 is the Data Evaluation Records for the environmental fate and transport guideline studies.

Chemical and Physical Properties of Isoxaflutole and its Transformation Products

Common name: Isoxaflutole (RPA-201772)

Structure:

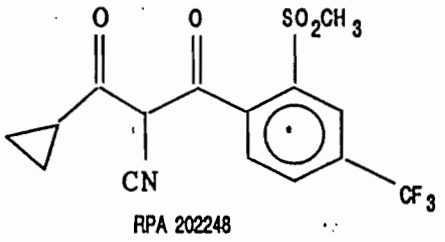


Physical/Chemical properties:

Trade name(s): None.
Chemical name: 5-cyclopropyl-4-(2-methanesulphonyl-4-trifluoromethyl benzoyl)isoxazole.
Molecular formula: $C_{15}H_{12}F_3NO_4S$
Molecular weight: 359.32
Physical state: White powder
Odor: None
Solubility (25°C): 3.5 mg/L water
Octanol/Water Coefficient: 219
Vapor Pressure: 1 x 10^{-6} Pa; 7.5 x 10^{-9} mm Hg
Henry's Law Constant: 1.84 x 10^{-10} torr m^3/mol

Transformation product RPA-202248 (isoxaflutole with the isoxazole-ring opened)

Structure:



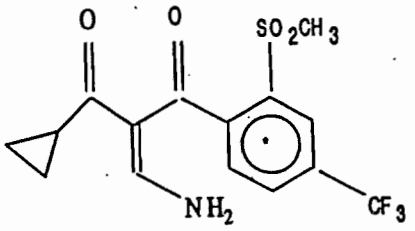
RPA 202248

Physical/Chemical properties:

Trade name(s): None.
Chemical name: 2-cyano-3-cyclopropyl-1-(2-methylsulphonyl-4-trifluoromethylphenyl) propan-1,3-dione
Molecular formula: $C_{15}H_{12}F_3NO_4S$
Molecular weight: 359.32
Physical state: Pale pink powder
Odor: Slight
Solubility (25°C): 300 mg/L water
Octanol/Water Coefficient: 0.40

Transformation product RPA-205834 (cyano-hydrated RPA-202248)

Structure:



RPA 205834

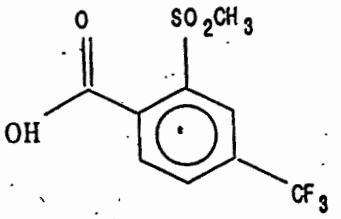
Physical/Chemical properties:

Trade name(s): Not Applicable
Chemical name: 2-aminomethylene-1-cyclopropyl-3-(2-methylsulphonyl-4-trifluoromethyl-phenyl)propan-1,3-dione
Molecular formula: $C_{14}H_{14}F_3NO_4S$
Molecular weight: 361
Physical state: White crystals

Odor: None
Solubility (25°C): 14 mg/L water
Octanol/Water Coefficient: 40.9

Transformation product RPA-203328 (dealkylated RPA-202248 and RPA-205834)

Structure:



RPA 203328

Physical/Chemical properties:

Trade name(s): Not Applicable
Chemical name: 2-methanesulphonyl-4-trifluoromethyl benzoic acid
Molecular formula: $C_9H_7F_3NO_4S$
Molecular weight: 268.2
Physical state: Yellow, needle-like crystals
Odor: None
Solubility (25°C): ≈8000 mg/L water
Octanol/Water: 0.61

3. Exposure and Risk Characterization

Exposure from the use of isoxaflutole on corn in fifteen (15) Midwest and Central Atlantic states is expected to be insignificant because of the limited amount of acres treated (maximum of 4,990 acres) and the widely-spaced distribution of fields which may be treated across 15 states. The submitted studies on ecological effects, and environmental fate and transport suggest minimal risk from the EUP to terrestrial and aquatic environments, and nontarget organisms, including endangered species. Isoxaflutole and its transformation products have the potential to leach to groundwater and runoff to surface water; however, the submitted laboratory information suggests the environmental impact to water resources from parent isoxaflutole will be slight because it dissipates rapidly in soil and water media. Furthermore, the proposed low application rate (2-4 ounces of product per acre; 0.1875 lb ai/A) may reduce the magnitude of this compound in the environment.

The submitted environmental fate and ecological toxicity data is acceptable for the EUP;

however, additional testing is needed to characterize the exposure and risk for Section 3 registration. Information on the environmental fate (persistence and mobility) and ecological toxicity of the primary transformation products (RPA-202248, RPA-203328, RPA-205834) of isoxaflutole is not currently available.

D. ENVIRONMENTAL FATE AND EFFECTS ISSUES FOR SECTION 3 REGISTRATION

Preceding the Section 3 application for full registration, the complete data package for the experimental herbicide isoxaflutole must be screened using the New Chemical Screening Process as directed in the OPP guidance document. The following subsections describe the recommendations for additional Ecological Effects and Environmental Fate testing and the rationale for requesting each study.

1. Ecological Effects Testing

Based on the submitted environmental fate information for primary transformation product RPA-202248, the ERCB recommends the following additional ecological tests be conducted using the primary transformation product(s) (e.g., RPA-202248):

Guideline	Data Requirement
71-2	Avian Dietary LC_{50} (one species)
72-1	Fish Acute LC_{50} (one species)
72-2	Aquatic Invertebrate Acute
72-3(c)	Shrimp Acute EC_{50}

The following Ecological Effects data requirements are held in RESERVE:

Guideline	Data Requirement
71-4	Avian Reproduction (Mallard and Bobwhite)
72-4	Fish Early Life Stage and Aquatic Invertebrate Life Cycle Test

The 71-4 Avian Reproduction studies are pending based on the results of the mammalian testing and additional environmental fate information. If testing yields chronic NOEL's which are exceeded by exposure, the avian reproduction tests will likely be required.

The 72-4 Fish Early Life Stage and Aquatic Invertebrate Life Cycle Tests are pending based on the results of acute toxicity testing and additional environmental fate information. If aquatic exposure exceeds 0.01 of the resulting LC_{50}s or EC_{50}s, chronic ecological effects

testing may be required.

The additional environmental fate information may provide a better indication of which transformation product(s) should be tested. The registrant is currently conducting Terrestrial Field Dissipation studies with monitoring of parent isoxaflutole (RPA-210772) and its primary transformation products (RPA-202248, RPA-203328, RPA-205834). The field studies should provide additional information on the persistence of the primary transformation products of isoxaflutole under actual field use conditions.

2. Environmental Fate Testing

Based on the results of the aged soil column leaching study, the transformation product RPA-202248 appears to be mobile in soil. The registrant should conduct a batch equilibrium study using transformation product RPA-202248 (which is also considered an active ingredient by the registrant) to determine the mobility of this primary transformation product. The batch equilibrium study will determine sorption coefficients (K_ds) and may also be used for computer simulation modeling of the fate and transport of parent isoxaflutole and transformation product RPA-202248. Computer simulation modeling would help to assess the fate and transport of parent isoxaflutole and its transformation products and the potential exposure to surface water and ground water resources. Based on the presence of a carboxylic acid functional group on transformation product RPA-203328, the ERCB hypothesizes this compound will be mobile in the soil environment. The registrant may want to verify or refute this hypothesis by conducting additional mobility studies such as batch equilibrium studies on this transformation product. Additional environmental fate information on the persistence of RPA-202248 and other transformation products will be evaluated from the terrestrial field dissipation studies currently being conducted.

E. CONCLUSIONS/RECOMMENDATIONS

1. The ERCB has limited concern regarding the Experimental Use Permit (EUP) for the use of isoxaflutole on corn in fifteen (15) Midwest and Central Atlantic states because of the limited amount of acres treated (maximum of 4,990 acres) and the distribution of fields which may be treated across 15 states. The submitted studies on ecological effects, and environmental fate and transport do not suggest appreciable risk from the EUP to terrestrial and aquatic environments, and nontarget organisms, including endangered species.

2. Isoxaflutole and its transformation products have the potential to leach to groundwater and runoff to surface water; however, the submitted information suggests the environmental impact to water resources from parent isoxaflutole will be slight because it dissipates rapidly in soil and water media. Also, the EUP requests a limited amount of

widely-spaced fields to be treated at the proposed low application rate of 2-4 ounces of product per acre (0.1875 lb ai/A).

4. The ecological toxicity studies indicate parent isoxaflutole is practically nontoxic to birds. Since LC_{50}s were not calculated from the toxicity tests with fish and aquatic invertebrates (i.e., all results being "greater than" values), toxicity to these organisms cannot be characterized. However, the data indicate isoxaflutole is no more than moderately toxic to fish and aquatic invertebrates with all LC_{50} values being much greater than 1 mg/l (ppm).

6. Based on the apparent mobility and persistence of the primary transformation product RPA-202248 from the laboratory studies, additional testing is recommended to assess the environmental fate and effects of the primary transformation product(s) for Section 3 registration. The ERCB recommends a batch equilibrium study be conducted with transformation product RPA-202248 to determine its mobility. The ERCB also recommends the following additional ecological tests be conducted using the primary transformation product(s)(e.g., RPA-202248): 71-2 Avian Dietary LC_{50} (one species); 72-1 Fish Acute LC_{50} (one species); 72-2 Aquatic Invertebrate Acute; and 72-3(c) Shrimp Acute EC_{50}.

6. The attached DERs report the data summaries for each Environmental Fate and Ecological Effects data requirement.

F. ERCB TASK MEMBERS

James Breithaupt, M.S. (University of Arkansas)	Agronomist, ERCB/EFED
Michael Davy	Agronomist, ERCB/EFED
Daniel Rieder	Biologist (Team Leader), ERCB/EFED
William R. Effland, Ph.D. (Iowa State University)	Soil Scientist, ERCB/EFED

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RUN No. 1 FOR isoxaflutole (parent) INPUT VALUES

RATE (#/AC) ONE(MULT)	APPLICATIONS NO.-INTERVAL	SOIL KOC	SOLUBILITY (PPM)	% SPRAY DRIFT	INCORP DEPTH(IN)
.140(.140)	1 1	122.0	6.2	1.0	.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
2.40	2	N/A	6.70- 822.09	.60	.60

GENERIC EECs (IN PPB)

PEAK GEEC	AVERAGE 4 DAY GEEC	AVERAGE 21 DAY GEEC	AVERAGE 56 DAY GEEC
3.02	1.09	.21	.08

RUN No. 2 FOR RPA 202248 INPUT VALUES 80%

RATE (#/AC) ONE(MULT)	APPLICATIONS NO.-INTERVAL	SOIL KOC	SOLUBILITY (PPM)	% SPRAY DRIFT	INCORP DEPTH(IN)
.110(.110)	1 1	92.0	300.0	1.0	.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
186.00	2	N/A	.00- .00	89.00	89.00

GENERIC EECs (IN PPB)

PEAK GEEC	AVERAGE 4 DAY GEEC	AVERAGE 21 DAY GEEC	AVERAGE 56 DAY GEEC
4.59	4.53	4.19	3.62

100 %

RUN No. 1 FOR isoxaflutole and RPA 202248 INPUT VALUES

RATE (#/AC) ONE (MULT)		APPLICATIONS NO.	INTERVAL	SOIL KOC	SOLUBILITY (PPM)	% SPRAY DRIFT	INCORP DEPTH (IN)
.140	.140	1	1	92.0	300.0	1.0	.0

FIELD AND STANDARD POND HALFLIFE VALUES (DAYS)

METABOLIC (FIELD)	DAYS UNTIL RAIN/RUNOFF	HYDROLYSIS (POND)	PHOTOLYSIS (POND-EFF)	METABOLIC (POND)	COMBINED (POND)
119.00	2	N/A	6.70- 822.09	89.00	80.31

GENERIC EECs (IN PPB)

PEAK GEEC	AVERAGE 4 DAY GEEC	AVERAGE 21 DAY GEEC	AVERAGE 56 DAY GEEC
5.82	5.74	5.27	4.49
4.66	4.59	4.22	3.59

100 %

0.14

0.11

3.59 (→ x 0.8)