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To: Robert Taylor
 Product Manager 25
 Registration Division (7505C)

From: Anthony F. Maciorowski, Chief
 Ecological Effects Branch/EFED (7507C)

Attached, please find the EEB review of...

Reg./File # : 000352-00541
 Chemical Name : Quizalofop p-ethyl
 Type Product : Herbicide
 Product Name : Assure II
 Company Name : DuPont de Nemours & Co, Inc.
 Purpose : Review of terrestrial phytotoxicity study -
 Tier 1 seed germination and Tier 1 & 2 seedling emergence and
 vegetative vigor.
 Action Code : 001 Date Due : 06/15/94
 Reviewer : Tracy L. Perry

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

| GDLN NO | MRID NO | CAT | GDLN NO | MRID NO | CAT | GDLN NO | MRID NO | CAT |
|---------|---------|-----|---------|---------|-----|----------|-----------|-----|
| 71-1(A) | | | 72-2(A) | | | 72-7(A) | | |
| 71-1(B) | | | 72-2(B) | | | 72-7(B) | | |
| 71-2(A) | | | 72-3(A) | | | 122-1(A) | 431253-01 | S |
| 71-2(B) | | | 72-3(B) | | | 122-1(B) | 431253-01 | S |
| 71-3 | | | 72-3(C) | | | 122-2 | | |
| 71-4(A) | | | 72-3(D) | | | 123-1(A) | 431253-01 | S |
| 71-4(B) | | | 72-3(E) | | | 123-1(B) | 431253-01 | S |
| 71-5(A) | | | 72-3(F) | | | 123-2 | | |
| 71-5(B) | | | 72-4(A) | | | 124-1 | | |
| 72-1(A) | | | 72-4(B) | | | 124-2 | | |
| 72-1(B) | | | 72-5 | | | 141-1 | | |
| 72-1(C) | | | 72-6 | | | 141-2 | | |
| 72-1(D) | | | | | | 141-5 | | |

Y=Acceptable (Study satisfied Guideline)/Concur
 P=Partial (Study partially fulfilled Guideline but
 additional information is needed
 S=Supplemental (Study provided useful information but Guideline was
 not satisfied)
 N=Unacceptable (Study was rejected)/Nonconcur



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

APR 21 1994

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Quizalofop p-ethyl: Review of terrestrial plant studies.

FROM: *for* Anthony F. Maciorowski, Chief
Ecological Effects Branch
Environmental Fate and Effects Division (7507C) *Stephen J. Urban 4/21/94*

TO: Robert Taylor, PM 25
Fungicide-Herbicide Branch
Registration Division (7505C)

As part of the registration process for quizalofop p-ethyl, the registrant has submitted the following terrestrial plant study to fulfill guideline numbers 122-1a,b and 123-1a,b:

McKelvey, R.A. 1994. Influence of Quizalofop P-Ethyl on Seed Germination, Seedling Emergence and Vegetative Vigor of Several Terrestrial Plants. Project IN No. AMR 2744-93. Conducted by E.I. du Pont de Nemours and Company, Newark, DE. Submitted by E.I. du Pont de Nemours and Company, Wilmington, DE. MRID No. 431253-01.

EEB has evaluated this study and classified it as supplemental due to: 1) lack of negative control, and 2) insufficient information demonstrating that the concentration of acetone used in the study does not inhibit plant growth (see attached DER).

The rationale given for excluding a negative control in this study was that "it has been established in previous testing that no inhibition occurs as a result of residual acetone in the carrier control (DuPont Report No. AMR 2624-93, AMR 2688-93, AMR 2720-93)." These reports, however, were rejected by EEB (1/12/94) as information was lacking on the concentration of acetone used and the number of concentrations tested. If the registrant sufficiently addresses the questions raised in the acetone study review, then the phytotoxicity studies conducted with quizalofop p-ethyl may be upgraded to core.

If you have any questions, please contact Tracy Perry at 305-6451 or Henry Craven at 305-5320.



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DATA EVALUATION RECORD

1. **CHEMICAL:** Quizalofop p-ethyl.
Shaughnessey No. 128711.
2. **TEST MATERIAL:** Ethyl(R)-2-[4-[6-chloro-2-quinoxalin-2-yl)oxy]-phenoxy]propionate; DuPont ID # IN-79376; Lot No. 52; 97.6% active ingredient; composition not reported.
3. **STUDY TYPE:** 122-1 & 123-1. Non-Target Plants: Seed Germination, Seedling Emergence, and Vegetative Vigor Phytotoxicity Test - Tiers 1 & 2. Species Tested: Onion, corn, wheat, sorghum, sugar beet, soybean, pea, tomato, rape and cucumber.
4. **CITATION:** McKelvey, R.A. 1994. Influence of Quizalofop P-Ethyl on Seed Germination, Seedling Emergence and Vegetative Vigor of Several Terrestrial Plants. Project IN No. AMR 2744-93. Conducted by E.I. du Pont de Nemours and Company, Newark, DE. Submitted by E.I. du Pont de Nemours and Company, Wilmington, DE. MRID No. 431253-01.

5. **REVIEWED BY:**

Tracy L. Perry
Wildlife Biologist
Ecological Effects Branch

Signature: *Tracy L. Perry*
Date: 4/20/94

6. **APPROVED BY:**

Henry T. Craven, M.S.
Supervisor, Section 4
Ecological Effects Branch

Signature: *Henry T. Craven*
Date: 4/21/94

7. **CONCLUSIONS:** Tier 1 and 2 phytotoxicity testing of quizalofop p-ethyl on 10 terrestrial plant species was found to be scientifically sound but does not fulfill guideline requirements 122-1 and 123-1. This study is unacceptable due to lack of the use of negative controls and insufficient information demonstrating that the concentration of acetone used in the study does not inhibit plant growth.

No significant differences in percent germination were observed for any species tested at the maximum application rate. The most sensitive species in seedling emergence testing was onion (a monocot) based on NOEC, LOEC, EC₂₅ and EC₅₀ values of 0.110, 0.220, 0.199 and 3.01 oz ai/A for shoot weight. The most sensitive species in vegetative vigor testing was sorghum (a monocot) based on NOEC, LOEC, EC₂₅, and

EC₅₀ values of 0.00688, 0.0138, 0.0118 and 0.0148 oz ai/A for root weight.

8. RECOMMENDATIONS: N/A.

9. BACKGROUND:

10. DISCUSSION OF INDIVIDUAL TESTS: N/A.

11. MATERIALS AND METHODS:

A. Test Plants: Dicotyledon plants were represented by six species from five families (i.e., sugarbeet, soybean, pea, tomato, rape and cucumber). Monocotyledon plants were represented by four species from two families (i.e., corn, wheat, sorghum and onion). Cultivars, seed sources and lot numbers were provided in the report.

B. Test System:

Seed Germination: One or more circles of filter paper were placed in the bottom of glass petri plates (150 mm in diameter x 20 mm in height). To initiate each germination test, the stock solution was added to the test vessel, the acetone was allowed to evaporate, and a pH 7 buffer was added to obtain the desired test substance concentration. Twenty seeds of each crop were added to each petri plate. The plates were randomly placed in an incubator set at 25°C. Seeds were allowed to germinate for five days in the dark.

Seedling Emergence: Twenty seeds of each crop were planted in 8 inch plastic tubs filled with steam-sterilized, sand amended (20% added by volume) Matapeake sandy loam soil (pH 6.2, organic matter 1.4%). Sugar beet, tomato, rape and onion were planted at a depth of 1.0 cm. Corn, wheat, sorghum, soybean, pea and cucumber were planted at a depth of 2.5 cm. Test solution was applied as a preemergence soil surface application using a rotating belt lab sprayer calibrated to deliver 40 gal/A. Plants were watered as needed from the top with domestic tap water. The plants were allowed to emerge in a greenhouse in natural sunlight supplemented with metal halide lamps (16 hours of light/day). For each species, replicate pots from each treatment were randomly placed within a block. The temperature ranged between 21 and 39°C.

Vegetative Vigor: Dillen and Lockwood, standard 15 cm diameter x 15 cm depth pots were used for this test. For each sugar beet, pea and rape replicate, 2 pots with 3 plants each were used. For each soybean, tomato, cucumber and corn replicate, 6 pots with 1 plant per pot were treated. For each onion, wheat and sorghum replicate, 1 pot with 6 plants was treated. The same growth medium, planting depth, application

methods and growth conditions used in the seedling emergence test were employed in this study, with the exception of the greenhouse temperature ranging from 17 to 38°C. For each species, replicate pots from each treatment were randomly placed within a block.

When plants reached the minimum growth for application, the test solution was applied. The minimum growth for the plant species tested were as follows: sugar beet - 4-5 leaves; soybean and sorghum - 3-4 leaves; corn and wheat - four leaves; tomato, rape, cucumber, onion and pea - 13 cm height.

- C. **Dosage:** For the Tier I seed germination, seedling emergence and vegetative vigor tests, quizalopof p-ethyl was applied at the maximum use rate of 1.76 oz ai/A (0.330 mg ai/L, assuming 1 lb ai/A = 3 mg/L). For the Tier II seedling emergence test (onion, corn wheat and sorghum), the test material was applied at 0.110, 0.220, 0.440, 0.880 and 1.76 oz ai/A. For the Tier II vegetative vigor tests: onion and pea were tested at 0.110, 0.220, 0.440, 0.880 and 1.76 oz ai/A; corn and wheat were tested at 0.00543, 0.00815, 0.0122, 0.0183 and 0.0275 oz ai/A; sorghum was tested at 0.00172, 0.00344, 0.00688, 0.0138, and 0.0275 oz ai/A. Solutions used for each test were analyzed to verify the concentration of the test substance. The measured test concentrations ranged from 97% to 103% of the nominal value (Table I). Therefore, nominal values were used to calculate the rate response curves.

In the seed germination, seedling emergence and vegetative vigor tests, acetone was used to dissolve the test substance. No negative control was used, however, as previous testing by the sponsor showed that no inhibition occurs as a result of residual acetone in the carrier control. In the vegetative vigor studies, 0.05% X-77 surfactant was also used.

D. **Design:**

Seed Germination: Each treatment/crop combination was replicated six times (i.e., 20 seeds/plate, 6 plates/treatment level). After 5 days of incubation, the seeds were removed from the petri plates and the radicle lengths were measured. Seeds were considered germinated if the radicle was ≥ 5 mm long. Physical appearance of seedlings was recorded.

Seedling Emergence: Each treatment/crop combination was replicated four times (i.e., 20 seeds/pot, 4 pots/treatment level). At 7 and 14 days, data were collected on number of seedlings emerged, mean shoot heights and seedling appearance. At 14 days only, composite shoot dry weight (plant sections dried for a minimum of 48 hours at 70°C) was recorded.

Temperature and relative humidity were measured in the growth

chamber during the growth period.

Vegetative Vigor: Each treatment/crop combination was replicated four times. Individual shoot heights and observations of plant appearance were measured and recorded at one and three weeks after treatment. At three weeks only, composite shoot and composite root dry weight were measured and recorded.

Temperature and relative humidity were measured in the growth chamber during the growth period.

- E. Statistics: For Tier 1 tests, standard procedures were used to calculate the mean and standard error for each treatment. The method for ratios with unequal variances was used to calculate percent inhibition and its 95% confidence intervals. Welch's t-test for ratios was used to test the null hypothesis of 25% or greater inhibition at the 90% confidence level.

For Tier 2 tests, the data was first transformed to promote equality among the variances. The transformed data was subjected to the William's test to determine the NOEL at the 95% confidence level. The EC_{25} and EC_{50} values were calculated through probit analysis of the untransformed data.

12. REPORTED RESULTS:

Seed Germination: No significant differences in percent germination were observed for any species tested at the maximum application rate. Therefore, Tier 2 testing was not required. A summary of the data is presented in Table III (attached).

Seedling Emergence: No significant differences in height, weight or percent emergence were observed for the species tested at the Tier 1 level (sugar beet, soybean, pea, tomato, rape and cucumber). Therefore, Tier 2 testing was not required. Summaries of the data are presented in Tables V, VII and IX (attached).

Onion, corn, wheat and sorghum were tested at the Tier 2 level based on preliminary range-finding and efficacy tests. The most sensitive species was onion based on a EC_{25} of 0.199 oz ai/A for shoot weight. Summaries of the data are presented in Tables XXI, XXIII, XXV and XXVII (attached).

Vegetative Vigor: No significant differences in height, shoot weight, root weight or total weight were observed for the species tested at the Tier 1 level (sugar beet, soybean, tomato, rape and cucumber). Therefore, Tier 2 testing was not required. Summaries of the data are presented in Tables XII, XIV and XVI (attached).

Onion, corn, pea, wheat and sorghum were tested at the Tier 2 level based on preliminary range-finding and efficacy tests. The most sensitive species overall was sorghum based on an EC₂₅ value of 0.0118 for root weight. Summaries of the data are presented in Tables XXIX, XXXI, XXXIII and XXXVII (attached).

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**

" This study demonstrated that no germination inhibition occurred at the maximum use rate of 1.76 oz ai/acre for any of the species tested." From the results of the seedling emergence part of the study, it was concluded that "the estimated EC₂₅ is greater than the EEC for aerial application (0.088 oz ai/acre) for all ten species." For the vegetative vigor part of the study, it was concluded that "effects of 25% or greater on nontarget species from foliar deposition with a surfactant are possible if significant non-target deposition ($\geq 5\%$ of maximum use rate) occurs during the application of quizalofop p-ethyl for three of the monocotyledonous plants tested. Both the EEC for aerial and ground applications exceed the EC₂₅ for one or more measured parameters for corn, wheat, and sorghum."

The study complied with Good Laboratory Practice (GLP) Regulations (40 CFR Part 160) with the exception of the water characterization and soil analysis methodology.

14. **REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:**

A. **Test Procedure:** Test procedures were generally in accordance with Subdivision J Guidelines with the following exceptions:

- * A negative control was not included in any of the tests.
- * Raw data on temperature and light intensity was not submitted.

B. **Statistical Analysis:** Statistical analyses were conducted on the most sensitive species and parameter for all three tests. Means were compared using analysis of variance and Williams' test. The NOEL/LOEL values are the same as the author's. The EC values obtained by the reviewer (using probit analysis) are in general agreement with those of the author. However, an extra decimal place was mistakenly added to corn shoot height in the vegetative vigor test. The EC₅₀ and EC₂₅ values should read 0.028 and 0.024 oz ai/acre, respectively (see attached).

C. **Discussion/Results:** The rationale given for excluding a negative control in this study was that "it has been established in previous testing that no inhibition occurs as a result of residual acetone in the carrier control (DuPont

Report No. AMR 2624-93, AMR 2688-93, AMR 2720-93)." These reports, however, were rejected by EEB (1/12/94) as information was lacking on the concentration of acetone used and the number of concentrations tested. If the registrant sufficiently addresses the questions raised in the acetone study review, then the phytotoxicity studies conducted with quizalofop p-ethyl may be upgraded to core.

No significant differences in percent germination were observed for any species tested at the maximum application rate. Therefore, Tier 2 testing was not required.

The most sensitive species in seedling emergence testing with quizalofop p-ethyl was onion (a monocot) based on NOEC, LOEC, EC₂₅ and EC₅₀ values of 0.110, 0.220, 0.199 and 3.01 oz ai/A for shoot weight. This chemical did not appear to have an effect on dicot seedling emergence as none of the species tested were advanced to the Tier 2 level.

The most sensitive species in vegetative vigor testing with quizalofop p-ethyl was sorghum (a monocot) based on NOEC, LOEC, EC₂₅, and EC₅₀ values of 0.00688, 0.0138, 0.0118 and 0.0148 oz ai/A for root weight. This chemical did not appear to have an effect on dicot vegetative vigor as only pea was advanced to the Tier 2 level; the lowest EC₂₅ for pea was determined to be 1.77 oz ai/acre for shoot weight.

D. Adequacy of the Study:

- (1) **Classification:** Supplemental.
- (2) **Rationale:** Lack of negative control and insufficient information demonstrating that the concentration of acetone used in the study does not inhibit plant growth.
- (3) **Repairability:** Yes, pending registrant's response to EEB's review of report on acetone toxicity to terrestrial plants.

15. Completion of One-Liner: Yes, 4/20/94.