US EPA ARCHIVE DOCUMENT

(40)

DP Barcode : D183062
PC Code No : 101101
EEB Out : MAR 8 1993

To: Walter Waldrop
Product Manager 71
Special Review and Reregistration Division (H7508W)

From: Anthony F. Maciorowski, Chief
Ecological Effects Branch/EFED (H7507C)

Attached, please find the EEB review of...

Reg./File # : 101101-
Chemical Name : Metribuzin
Type Product : Herbicide
Product Name : Sencor
Company Name : Miles Inc.
Purpose : Submission of nontarget plant data submitted under 6(a)(2) in support of reregistration.

Action Code : 625 Date Due : 10/25/92
Reviewer : H. Mansfield Date In : 10/01/92

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)		
71-2(B)			72-3(B)			122-1(B)		
71-3			72-3(C)			122-2		
71-4(A)			72-3(D)			123-1(A)	424478-03 424478-03	S Y
71-4(B)			72-3(E)			123-1(B)	424478-03	Y
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

DATA EVALUATION RECORD

1. **CHEMICAL:** Metribuzin (Sencor). Shaughnessey No. 101101.

2. **TEST MATERIAL:** Metribuzin technical; Batch No. 9147215; 91.3% active ingredient.

3. **STUDY TYPE:** 123-1. Non-Target Plants: Seed Germination, Seedling Emergence & Vegetative Vigor Phytotoxicity Test - Tier 2. Species Tested: Soybean, Cotton, Pea, Cucumber, Turnip, Tomato, Corn, Wheat, Onion, Sorghum.

4. **CITATION:** Burge, C.L. 1992. Tier 2 Seed Germination, Seed Emergence, and Seedling Vigor Nontarget Phytotoxicity Study Using Metribuzin. Laboratory ID No. SE201601. Conducted by Miles Inc., Stilwell, KS. Submitted by Miles Inc., Kansas City, MO. EPA MRID No. 424478-03.

5. **REVIEWED BY:**

Heather N. Mansfield, Zoologist
Ecological Effects Branch
Environmental Fate and Effects Division

Signature: Heather Mansfield
Date: 3/2/93

6. **APPROVED BY:**

Norman J. Cook, Head, Section 2
Ecological Effects Branch
Environmental Fate and Effects Division

Signature: Norman J. Cook
Date: 3.8.93

7. **CONCLUSIONS:** The seed germination study is scientifically sound, but does not fulfill the guideline requirements for either a Tier 1 or Tier 2 non-target plant study. (To fulfill Tier 1 data requirements, the plants must be tested up to the maximum label rate. A precise EC_{25} and NOEC must be found to satisfy Tier 2 data requirements.)

The seedling emergence study is scientifically sound and fulfills the guideline requirements for a Tier 2 non-target plant study, except for cotton, in which case the results are not scientifically sound and do not fulfill the guideline requirements. Cotton was invalid due to less than 70% control emergence.

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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Sencor--Data Evaluation & 6(a)2 Data
Barcodes: D183062
ID No: 101101

FROM: Anthony F. Maciorowski, Chief
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

TO: Walter Waldrop, PM 71
Reregistration Branch
Special Review/Reregistration Division (H7508W)

BACKGROUND

Miles Inc. submitted Tier 2 terrestrial plant studies to fulfill guideline 123-1:

Burge, C.L. 1992. Tier 2 Seed Germination, Seed Emergence, and Seedling Vigor Nontarget Phytotoxicity Study Using Metribuzin. Laboratory ID No. SE201601. Conducted by Miles Inc., Stilwell, KS. Submitted by Miles Inc., Kansas City, MO. EPA MRID No. 424478-03.

CONCLUSIONS

The seed germination study is scientifically sound, but does not fulfill the guideline requirements for a Tier 2 non-target plant study because a precise EC_{25} and NOEC were not found. The study did indicate that use rates of up to .45 lbs a.i./acre do not effect the germination of representative species. The registrant should repeat this study and either indicate that there are no unacceptable effects up to the maximum use rate (Tier 1) or find the EC_{25} and NOEC (Tier 2).

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

MEMORANDUM

SUBJECT: Sencor--Data Evaluation & 6(a)2 Data
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FROM: Anthony F. Maciorowski, Chief
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

TO: Walter Waldrop, PM 71
Reregistration Branch
Special Review/Reregistration Division (H7508W)

BACKGROUND

Miles Inc. submitted Tier 2 terrestrial plant studies to fulfill guideline 123-1:

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CONCLUSIONS

The seed germination study is scientifically sound, but does not fulfill the guideline requirements for a Tier 2 non-target plant study because a precise EC_{25} and NOEC were not found. The study did indicate that use rates of up to .45 lbs a.i./acre do not effect the germination of representative species. The registrant should repeat this study and either indicate that there are no unacceptable effects up to the maximum use rate (Tier 1) or find the EC_{25} and NOEC (Tier 2).

CONCURRENCES

SYMBOL	H7507C	H7507C	H7507C					
SURNAME	[illegible]	Cook	[illegible]					
DATE	3/2/93	3.8.93	3.8.93					

The seedling emergence study is scientifically sound and fulfills the guideline requirements for a Tier 2 non-target plant study, with the exception of cotton. The cotton study was invalid due to less than 70% control emergence. Only the study with cotton should be repeated.

The vegetative vigor study is scientifically sound and fulfills the guideline requirements for a Tier 2 non-target plant study.

Calculations (see attachment) indicate that all of the current use rates of metribuzin pose a hazard to nontarget terrestrial plants. Hazard is expected for use rates ≥ 0.1 lbs a.i., and current use rates range from 0.13 lbs a.i./acre (for pre-emergent soybeans) to 4 lbs a.i./acre (for sugarcane).

Tier 3 plant testing will be required for use rates ≥ 0.1 lbs a.i./acre pending development of a guidance document.

If there are any questions, please contact Heather Mansfield at 305-5064.

CALCULATIONS

An application of only 0.18 lbs a.i./acre is necessary to indicate a risk to nontarget terrestrial plants: For an unincorporated ground application of metribuzin at a rate of 0.18 lbs a.i./acre, an EEC of 0.009 was calculated:

0.18 lbs a.i./A	x	0.05 (5% runoff)	x 1 acre	=	0.009 lbs a.i. potentially impacting an adjacent 1 acre site

most sensitive dicot EC_{25} = 0.009 lbs a.i./acre
most sensitive monocot EC_{25} = 0.020 lbs a.i./acre

For foliar applications, application rates $\geq$ 0.1 lbs a.i./acre indicate a risk to nontarget terrestrial plants:

0.1 lbs a.i./acre	x	0.05 = (5% drift)	0.005 lbs a.i. potentially impacting an adjacent 1 acre site

most sensitive dicot EC_{25} = 0.005 lbs a.i./acre
most sensitive monocot EC_{25} = 0.017 lbs a.i./acre

The vegetative vigor study is scientifically sound and fulfills the guideline requirements for a Tier 2 non-target plant study.

Seed Germination: By the end of 5 days, the maximum reduction in germination was 13%, which was observed at the highest rate of test material on tomato. Germination of all test species was not significantly reduced in comparison to the controls. The NOEC for all species was 0.45 lb ai/A. The EC_{25} and EC_{50} for all species were >0.45 lb ai/A. No abnormal effects were observed.

Seedling Emergence:

Percent emergence: Turnip was the most sensitive dicot species, with an NOEC and LOEC of 0.007 and 0.014 lb ai/A, respectively. Onion was the most sensitive monocot species, with an NOEC and LOEC of 0.014 and 0.028 lb ai/A, respectively.

Percent survival: By 21 DAT, turnip and onion were again the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.007, 0.014, 0.009, and 0.034 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.014, 0.028, 0.020, and 0.066 lb ai/A, respectively.

Plant height: Cucumber and onion were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for cucumber exposed to metribuzin were 0.014, 0.028, 0.029, and 0.032 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.014, 0.028, 0.024, and 0.038 lb ai/A, respectively.

Plant dry weight: Turnip and wheat were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.007, 0.014, 0.008, and 0.014 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for wheat exposed to metribuzin were 0.014, 0.028, 0.024, and 0.031 lb ai/A, respectively.

Phytotoxicity: By 21 DAT, turnip was the most sensitive dicot species, with an NOEC and LOEC of 0.007 and 0.014 lb ai/A, respectively. Onion and wheat were equally the most sensitive monocot species, with an NOEC and LOEC of 0.014 and 0.028 lb ai/A, respectively.

Vegetative Vigor:

Percent survival: By 21 DAT, turnip and onion were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.022,

0.045, 0.028, and 0.042 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.022, 0.045, 0.031, and 0.042 lb ai/A, respectively.

Plant height: Turnip and onion were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.006, 0.011, 0.023, and 0.027 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.011, 0.022, 0.019, and 0.027 lb ai/A, respectively.

Plant dry weight: Turnip and onion were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.003, 0.006, 0.005, and 0.011 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.011, 0.022, 0.017, and 0.021 lb ai/A, respectively.

Phytotoxicity: By 21 DAT, turnip was the most sensitive dicot species, with an NOEC and LOEC of 0.003 and 0.006 lb ai/A, respectively. Onion was the most sensitive monocot species, with an NOEC and LOEC of 0.011 and 0.022 lb ai/A, respectively.

8. RECOMMENDATIONS: The seedling germination should be repeated. The seedling emergence study with cotton should also be rerun.

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., soybean, cotton, tomato, pea, turnip, and cucumber). Monocotyledon plants were represented by four species from two families (i.e., corn, sorghum, wheat, and onion). Cultivars and seed sources were provided in the report.

B. Test System:

Seed Germination: Two circles of 9-cm blotter paper were placed in plastic petri dishes (100 x 15 mm). Test solutions were prepared in 5% methanol/95% deionized water. Twelve ml of test or control solution were added to each plate of soybean, cotton, pea, cucumber, corn, sorghum, and wheat seed. Ten ml of these solutions were used for plates of tomato, turnip, and onion seed. The plates were allowed to stand for one hour before seed addition to allow for methanol evaporation. After evaporation, ten seeds of each crop were placed on the blotter. Plates were

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placed in a growth chamber with no illumination for five days. Temperature was 25°C and the relative humidity was 60-70%.

Seedling Emergence: Five seeds of each crop were planted into plastic pots (10.5 cm diameter, 9.5 cm tall) containing a pasteurized loam soil with 2.8% organic matter (pH 6).

All applications were made in a spray booth equipped with an 8002-E nozzle. The plants were placed in an area measuring 1.89 x 2.58 ft (i.e., 4.88 ft^2). A spray height of 13.5 inches above the surface and a volume of 35 gallons per acre were used. The nozzle pressure was 30 psi. After spraying, the plants were placed in a greenhouse and periodically hand-watered until the seeds germinated. After germination, trickle irrigation was used. The average amount of water applied during the study was 31 ml/pot. The temperature and relative humidity in the greenhouse were 12-41°C and 14-100%, respectively.

Vegetative Vigor: Ten seeds sown per pot (10.5 cm diameter, 9.5 cm tall) were allowed to grow for 9 to 16 days to allow the plants to reach the 1-3 true leaf stage. Plants were thinned to five per pot before treatment application. The spray application was performed as stated in the seedling emergence section. After treatment, the plants were placed in a greenhouse maintained under the same temperature and irrigation regimes as the emergence plants.

Photoperiod ranged from 14 to 15 hours of light per day during the studies and was supplemented with artificial lighting on cloudy days. Light intensity for both studies averaged 4342 footcandles.

C. Dosage: Metribuzin was applied at rates of 0.03 to 0.45 lb active ingredient (ai)/acre (A) to all plant species for the germination study. These rates corresponded to solution concentrations of 0.084 to 1.35 ppm ai. Based on preliminary results, rates applied to soil for the emergence study ranged from 0.014 to 0.225 lb ai/A. A study continuation was required for turnip emergence with rates of 0.00175-0.007 lb ai/A. Rates applied to plants for the vegetative vigor study ranged from 0.0028 to 0.090 lb ai/A.

The emergence and vigor solutions were prepared by dissolving the test material in a 10% methanol/90% deionized water solution. A solvent control (5% methanol solution for the germination study, and 10% methanol for the remaining studies) and negative control (deionized water only) were also prepared.

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D. Design: All studies were conducted using randomized complete block designs.

Seed Germination: Each crop/treatment combination was replicated four times (i.e., 10 seeds/plate, 4 plates/ species). After five days of incubation, the number of germinated seeds was recorded. A germinated seed was distinguished as having a radicle length of 5 mm or greater.

Seedling Emergence: Each crop/treatment combination was replicated eight times (i.e., 5 seeds/pot, 8 pots/ treatment level). Treatment and control emergence counts were made at 7 and 14 days after treatment (DAT). Phytotoxicity ratings were recorded at 7, 14, and 21 DAT. Twenty-one DAT, surviving plant number and height were recorded. Plants in each replicate were cut at the soil level and dried in aluminum foil sheets at 70°C for 48 hours for weight measurement.

The phytotoxicity ratings evaluated five observable toxic effects: 0%-indicates no effect; 20%-indicates slight plant effect; 40%-indicates a moderate effect (e.g., mild stunting or chlorosis); 60%-indicates a severe effect with recovery possible; 80%-indicates a total plant effect (very poor vigor); and 100%-indicates plant death.

Vegetative Vigor: Each crop/treatment combination was replicated four times (i.e., 5 plants/pot, 4 pots/ treatment). Treatment and control phytotoxicity ratings were made 7, 14 and 21 DAT. The scale used was identical to the seedling emergence test. Twenty-one DAT, surviving plant number and height were recorded. Plants in each replicate were cut at the soil level and dried in aluminum foil sheets at 70°C for 48 hours for weight measurement.

For both the emergence and vegetative vigor studies, the highest rate solutions were sampled to determine the amount of test material present at time of application. Analyses were conducted using high pressure liquid chromatography.

E. Statistics: Descriptive statistics [standard deviation and Duncan's multiple range test ($p \leq 0.05$)] for each percentage parameter were calculated using Gylling Pesticide Research Manager, version 4 software. Analysis of variance coupled with Dunnett's test ($p \leq 0.05$) was used to analyze height and weight data. Percent effect was determined by comparing the treatment means to control (negative, solvent, or pooled) means. All data were analyzed on a replicate basis. Non-linear regression was used to determine the EC_{25} and EC_{50} values.

12. REPORTED RESULTS:

Seed Germination: Germination of treated plants was not significantly different from the controls. No abnormal growth was observed for any species. The no-observed-effect concentration (NOEC) was 1.35 ppm ai (0.45 lb ai/A) for all species.

Since metribuzin functions as a photosynthetic inhibitor, no effects were expected to be observed until the plants became photosynthetically active. This test verified this assumption.

Seedling Emergence:

Percent emergence: By 14 DAT, two species (pea and soybean) were not affected by metribuzin application. Turnip emergence was significantly reduced at all rates and consequently, a continuation study was conducted. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

> pea = soybean (0.225) < tomato = corn = sorghum (0.113) < cotton = cucumber = wheat (0.028) < onion (0.014) < turnip (0.007).

Percent survival: By 21 DAT, pea and soybean again were not affected by metribuzin application. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

> pea = soybean (0.225) < tomato = corn (0.113) < sorghum (0.056) < cotton = wheat (0.028) < onion = cucumber (0.014) < turnip (0.007).

The EC_{25} and EC_{50} values for those species demonstrating greater than 45% inhibition are presented in Table 45 (attached).

Plant height: Pea, tomato, and soybean height were not reduced by metribuzin application. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

> pea = soybean = tomato (0.225) < sorghum = corn (0.056) < cotton = wheat = turnip (0.028) < onion = cucumber (0.014).

The EC_{25} and EC_{50} values for those species demonstrating greater than 45% inhibition are presented in Table 45.

Plant dry weight: Tomato and soybean dry weight were not reduced by metribuzin application. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

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soybean = tomato (0.225) < pea (0.113) < onion = corn (0.056) < sorghum (0.028) < cotton = wheat = cucumber (0.014) < turnip (0.007).

The EC_{25} and EC_{50} values for those species demonstrating greater than 45% inhibition are presented in Table 45.

Phytotoxicity: By 21 DAT, soybean did not demonstrate signs of phytotoxicity that were significantly different from those of the control. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

soybean (0.225) < pea = tomato (0.113) < sorghum = corn (0.056) < cotton = wheat = cucumber = corn = onion (0.014) < turnip (0.007).

The EC_{25} and EC_{50} values were not determined for phytotoxicity.

Vegetative Vigor:

Percent survival: By 21 DAT, cotton, pea, soybean, tomato, corn, and sorghum were not affected by metribuzin application. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

cotton = pea = soybean = tomato = corn = sorghum (0.09) < cucumber = wheat (0.045) < onion = turnip (0.0225).

The EC_{25} and EC_{50} values for those species demonstrating greater than 45% inhibition are presented in Table 46 (attached).

Plant height: Pea, cotton, soybean, tomato, corn, and sorghum height were not reduced by metribuzin application. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

pea = cotton = soybean = tomato = corn = sorghum (0.09) < wheat (0.045) < cucumber (0.0225) < onion (0.0112) < turnip (0.0056).

The EC_{25} and EC_{50} values for those species demonstrating greater than 45% inhibition are presented in Table 46.

Plant dry weight: Pea, tomato, and corn dry weight were not reduced by metribuzin application. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

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corn = tomato = pea (0.09) < soybean = sorghum (0.045) < wheat (0.0225) < onion = cucumber (0.0112) < cotton = turnip (0.0028).

The EC_{25} and EC_{50} values for those species demonstrating greater than 45% inhibition are presented in Table 46.

Phytotoxicity: By 21 DAT, pea, soybean, tomato, corn, and sorghum did not demonstrate signs of phytotoxicity that were significantly different from those of the control. The NOECs (in order of increasing sensitivity) for the ten test species (in lb ai/A) are:

soybean = pea = tomato = corn = sorghum (0.09) < wheat = cotton (0.0225) < cucumber = onion (0.0112) < turnip (0.0028).

The EC_{25} and EC_{50} values were not determined for phytotoxicity.

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES: No conclusions other than those previously stated were made by the study author.

The Quality Assurance (QA) Unit of Miles Inc., was responsible for the assurance of compliance with Good Laboratory Practice (GLP) Standards as set forth in 40 CFR Part 160. Statements of compliance with GLPs and QA were enclosed.

The analytical appendix included in the report indicated that the amount of active ingredient was present at the desired concentration in the emergence and vigor solutions (range of 91 to 104% of nominal). A QA Unit statement was included in the appendix.

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

A. Test Procedure: The study procedures generally followed the Subdivision J and SEP guidelines, except for the following:

The maximum labeled rate for metribuzin was not reported.

For all studies, no raw data were submitted.

The slopes of the regression curves were not reported.

B. Statistical Analysis: The reviewer could not verify the NOEC values due to the absence of raw data. However, the reviewer does not believe that this deviation influences the overall results upon review of the percent inhibition at the reported rates.

No statistical analyses were conducted on germination data since no dose responses were observed. The most sensitive monocot and dicot species and parameter for the emergence study were wheat dry weight and turnip dry weight, respectively. The most sensitive monocot and dicot species and parameter for the vegetative vigor study were onion dry weight and turnip dry weight, respectively. Probit analysis was used to verify the EC values. Generally, the reviewer's values were similar or slightly less conservative than those of the author (see attached printouts).

C. Discussion/Results: Since measured concentrations were within the range of expected concentrations, the reviewer believes that the nominal rates reported herein are representative of actual rates applied. The author reported the 95% confidence intervals in terms of ppm in the spray solution rather than on a lb ai/A basis. The limits in terms of lb ai/A can be determined by multiplying the ppm concentrations by 3.0 $x10^{-4}$.

Seed Germination: By the end of 5 days, the maximum reduction of germination was 13%, which was observed at the highest rate of test material on tomato. Germination of all test species was not significantly reduced in comparison to the controls. The NOEC for all species was 0.45 lb ai/A. The EC_{25} and EC_{50} for all species were >0.45 lb ai/A. No abnormal effects were observed.

Seedling Emergence:

Percent emergence: Since the emergence of the cotton control plants was less than 70%, the results from this species are invalid.

Although the EC values were not determined for percent emergence, the reviewer determined that seedling survival was just as sensitive as seedling emergence to demonstrate the effect of the test material. Turnip was the most sensitive dicot species, with an NOEC and LOEC of 0.007 and 0.014 lb ai/A, respectively. Onion was the most sensitive monocot species, with an NOEC and LOEC of 0.014 and 0.028 lb ai/A, respectively.

Percent survival: By 21 DAT, turnip and onion were again the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.007, 0.014, 0.009, and 0.034 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.014, 0.028, 0.020, and 0.066 lb ai/A, respectively.

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Plant height: Cucumber and onion were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for cucumber exposed to metribuzin were 0.014, 0.028, 0.029, and 0.032 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.014, 0.028, 0.024, and 0.038 lb ai/A, respectively.

Plant dry weight: Turnip and wheat were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.007, 0.014, 0.008, and 0.014 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for wheat exposed to metribuzin were 0.014, 0.028, 0.024, and 0.031 lb ai/A, respectively.

Phytotoxicity: By 21 DAT, turnip was the most sensitive dicot species, with an NOEC and LOEC of 0.007 and 0.014 lb ai/A, respectively. Onion and wheat were equally the most sensitive monocot species, with an NOEC and LOEC of 0.014 and 0.028 lb ai/A, respectively.

Vegetative Vigor:

Percent survival: By 21 DAT, turnip and onion were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.022, 0.045, 0.028, and 0.042 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.022, 0.045, 0.031, and 0.042 lb ai/A, respectively.

Plant height: Turnip and onion were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.006, 0.011, 0.023, and 0.027 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.011, 0.022, 0.019, and 0.027 lb ai/A, respectively.

Plant dry weight: Turnip and onion were the most sensitive dicot and monocot species, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for turnip exposed to metribuzin were 0.003, 0.006, 0.005, and 0.011 lb ai/A, respectively. The NOEC, LOEC, EC_{25}, and EC_{50} for onion exposed to metribuzin were 0.011, 0.022, 0.017, and 0.021 lb ai/A, respectively.

Phytotoxicity: By 21 DAT, turnip was the most sensitive dicot species, with an NOEC and LOEC of 0.003 and 0.006 lb ai/A, respectively. Onion was the most sensitive monocot species, with an NOEC and LOEC of 0.011 and 0.022 lb ai/A, respectively.

The seed germination study is scientifically sound but does not fulfill the guideline requirements for a Tier 2 non-target plant study since an NOEC and an EC_{25} were not found.

The seedling emergence study is scientifically sound and fulfills the guideline requirements for a Tier 2 non-target plant study, except for cotton, in which case the results are not scientifically sound and do not fulfill the guideline requirements due to <70% control emergence.

The vegetative vigor study is scientifically sound and fulfills the guideline requirements for a Tier 2 non-target plant study.

D. Adequacy of the Study:

(1) Classification: Seed Germination - Supplemental.

Seedling Emergence - Core for all species except cotton, which is invalid.

Vegetative Vigor - Core.

(2)Rationale: The germination study is classified as supplemental because a precise EC_{25} and NOEC were not found. The test also would not satisfy Tier 1 germination guidelines as the plants were not tested to the maximum labeled rate. Cotton was invalid due to less than 70% control emergence. Although the EC and NOEC values for some plants were not determined, the values for the most sensitive monocot and dicot species were determined in the emergence and vigor studies.

(3)Repairability: No

15. COMPLETION OF ONE-LINER: Yes, 12-15-92.

Metribuzin

Page____ is not included in this copy.

Pages 17 through 20 are not included.

The material not included contains the following type of information:

____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

✓ FIFRA registration data.

____ The document is a duplicate of page(s) _____.

____ The document is not responsive to the request.

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

Emergence - turnip dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0028		
EC 5.00	0.0046		
EC10.00	0.0059		
EC15.00	0.0070		
EC50.00	0.0145		
EC85.00	0.0302		
EC90.00	0.0359		
EC95.00	0.0464		
EC99.00	0.0749		

$y = 11.00 + 3.27(x)$

y = probit % inhibition

x = log (rate)

EC_{25} = 0.009 lb ai/A

Emergence - wheat dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0102	0.0000	0.0216
EC 5.00	0.0149	0.0000	0.0275
EC10.00	0.0181	0.0000	0.0320
EC15.00	0.0208	0.0000	0.0360
EC50.00	0.0367	0.0054	0.2188
EC85.00	0.0649	0.0375	13026.7822
EC90.00	0.0743	0.0423	246462.2030
EC95.00	0.0908	0.0492	19751060.0000
EC99.00	0.1321	0.0627	%76555084000.0000

$y = 11.00 + 4.14(x)$

$x = \log(\text{rate})$

y = probit % inhibition

$EC_{25} = 0.025$ lb ai/A

Veg. Vigor
~~Emergence~~ - turnip dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0005	0.0002	0.0009
EC 5.00	0.0015	0.0009	0.0023
EC10.00	0.0027	0.0017	0.0038
EC15.00	0.0040	0.0028	0.0054
EC50.00	0.0212	0.0169	0.0275
EC85.00	0.1109	0.0745	0.1940
EC90.00	0.1640	0.1043	0.3126
EC95.00	0.2930	0.1712	0.6362
EC99.00	0.8700	0.4305	2.4264

$y = 7.41 + 1.44(x)$

y = probit % inhibition

$x = \log(\text{rate})$

$EC_{25} = 0.0073$ lbai/A

Veg. Vigor - onion dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0068		
EC 5.00	0.0102		
EC10.00	0.0127		
EC15.00	0.0146		
EC50.00	0.0270		
EC85.00	0.0500		
EC90.00	0.0578		
EC95.00	0.0717		
EC99.00	0.1073		

$y = 11.69 + 3.88(x)$

y = probit % inhibition

$x = \log$ (rate)

$EC_{25} = 0.018$ lb ai/A

Ecological Effects Branch One-Liner Data Entry Form

Chemical Metribuzin **Shaughnessy No.** 101101 **Pesticide Use** Herbicide

MOST SENSITIVE TERRESTRIAL VEG. GERM/EMERGE	% AI	EC_{25} (95%CL)	DAYS	NOEC/LOEC lbs/A* or ppm	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC	
MONOCOT	91.3			* ai					
1. Wheat		0.024 (0.020-0.027)	21	0.014/0.028	1992/1992	Core for all species except cotton	MI*	MM	H. Manbrin
2.									
DICOT	91.3								
1. Turnip		0.008 (0.004-0.012)	21	0.007/0.014	1992/1992	Core for all species except cotton	MI*	MM	H. Manfred
2.									

VEGETATIVE VIGOR	% AI	EC_{50} (95%CL)	DAYS	NOEC/LOEC* lbs/A	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC
MONOCOT	91.3			* ai				
1. Onion		0.017 (0.008-0.026)	21	0.011/0.022	1992/1992	Core	MI*	MM
2.								
DICOT	91.3							
1. Turnip		0.005 (0.003-0.007)	21	0.003/0.006	1992/1992	Core	MI*	MM
2.								

COMMENTS: * Miles Incorporated (Mobay)

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