

US EPA ARCHIVE DOCUMENT

DATA EVALUATION RECORD

1. **CHEMICAL:** Sulfosate. Shaughnessey Number: 128501.
2. **TEST MATERIAL:** ICIA0224 (TOUCHDOWN): N-phosphonomethylglycine trimethylsulphonium salt. Soluble concentrate (4LC-E) formulation; formulation number YF7712; WRC reference 10602-37-3; Ecology and Soil Science Section reference no. 88/11. Measured content of 41.4% w/w of active ingredient.
3. **STUDY TYPE:** Non-target plants: Seed germination/Seedling Emergence-Tier 2. Species tested: Zea mays, Triticum arvense, Glycine max, Brassica napus, Beta vulgaris, Avena fatua, Cyperus rotundus, Cassia obtusifolia, Galium aparine, Xanthium spinosum.
4. **CITATION:** Shaw, J.L., P.J.L. Cory, and R.A. Brown. 1989. ICIA0224: Pre and Post-Emergence Effects on Non-Target Plants. Conducted by ICI Agrochemicals, Jealotts Hill Research Station, Berkshire, UK. Submitted by ICI AMERICAS Inc. Agricultural Products, Wilmington, Delaware. EPA Accession No. 411114-03.
5. **REVIEWED BY:**

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Date: August 23, 1989
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6. **APPROVED BY:**

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7. **CONCLUSIONS:** This study is scientifically sound and fulfills some of the guideline requirements for a Tier 2 phytotoxicity test of seed germination/seedling emergence on

non-target plants and the guideline requirements for a Tier 2 phytotoxicity test of vegetative vigor. Despite some deviations from the protocols, the test data are sufficient to draw valid conclusions. Pre-emergence application at the maximum label rate of 4.48 kg ai/ha had no detrimental effect on seed germination and seedling phytotoxicity of any crop. Post-emergence application caused mortality of all crops at the maximum label rate and at 1.25 kg ai/ha. A Tier 3 test is triggered by these results.

8. **RECOMMENDATIONS:** N/A.

9. **BACKGROUND:** N/A.

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., Glycine max, Brassica napus, Beta vulgaris, Cassia obtusifolia, Galium aparine, and Xanthium spinosum. Monocotyledon plants were represented by four species from two families (i.e., Avena fatua, Triticum arvense, Zea mays, and Cyperus rotundus. Cultivars, where applicable, but not seed source were provided in the report.

B. **Test System:**

Pre-emergence test: Seeds, 10 to 15 in number, were placed in single rows of one species in plastic seed trays (37 x 23 x 7.5 cm) in loamy sand (soil analysis is shown in report). One day after sowing, the trays were treated with ICIA0224; control replicates were not sprayed. The trays were maintained in a glasshouse under monitored conditions for 28 days. Maximum and minimum temperatures and relative humidities are provided in the report. Natural daylight was supplemented with mercury vapor lamps to give a 14 hour photoperiod.

Post-emergence: Plants were grown in 7.5 cm diameter polypropylene pots of loamy sand soil. Soils used differed according to the optimum growth requirements of the individual plant species. Analyses are provided in the report. The number of plants/pot varied according to the size of the plant species and ranged from 1 to 3. ICIA0224 was applied at the three-leaf stage and the plants then maintained in the glasshouse under monitored

conditions for 19 days. Maximum and minimum temperatures and relative humidities are provided in the report. Natural daylight was supplemented with mercury vapor lamps to give a 14 hour photoperiod. Plants were top watered as needed, carefully avoiding the wetting of foliage.

Applications were made for both tests using a hydraulic travelling-boom track sprayer that had been calibrated to deliver the desired spray volume.

- C. **Dosage:** For both pre and post-emergence testing, the test solution was applied at the maximum label rate of 4.48 kg ai/ha (active ingredient per hectare). Other doses applied for the pre-emergence test included 1.00, 0.50, 0.25, and 0.05 kg ai/ha. Doses for the post-emergence test included 1.25, 0.25, 0.05, 0.01, and 0.002 kg/ha. Serial dilutions with distilled water were used to prepare the lower concentrations.

D. **Design:**

Pre-emergence Test. There were three replicates of 10 or 15 seeds of each species for each ICIA0224 rate and 8 replicates for the control. Each treatment and control consisted of two seed trays each containing five species. Treatments were randomized and the glasshouse layout was a random block design with controls systematically placed along the blocks. Seedlings were counted 14 or 22 days after spraying depending on when emergence for a species had ceased. Visual assessments of percentage damage were made 14, 21, and 28 days after spraying. A 7-category damage assessment scale is provided in the report. Growth stages which were assigned a numerical code and defined in the report (e.g. first leaf unfolded = 11) were determined 28 days after treatment. Dry weight of aerial parts (oven dried at 75° C to constant weight) were determined at 28 days.

Post-emergence test. There were three replicates of five plants of each species for each ICIA0224 rate and for each control. Treatments were randomized and glasshouse layout was a random block design with controls systematically placed along the blocks. Percentage damage was visually assessed at 5, 7, 12, and 19 days after treatment. Damage categories are defined in the report. Symptomology descriptions were recorded at 3, 4, 5, 7, 12, and 19 days after treatment. Growth stages of individual plants were recorded 7 and 19 days

after treatment. Dry weights of green aerial parts were measured at 19 days after treatment. Plants were oven dried at 75° C to constant weight.

E. Statistics: Damage assessments were analysed using a dose-response of percentage damage on log of the application rate. Dose-response curves were linearized by taking the logit transformation of percentage damage. The slope and intercept of these lines were calculated by linear regression and Log EC₂₅ and Log EC₅₀ were obtained from the regression line and back-transformed to produce the values reported. The no observed effect levels (NOELs) were calculated using a pooled estimate of variance from a two-way ANOVA on the arc sin square-root of the percentage damage or average percentage of control weight or percentage seeds emerged. Least significant differences for comparison of means were calculated at the 5% significance level to determine differences between the treatments and the controls.

12. REPORTED RESULTS: The authors reported that pre-emergence applied ICIA0224 did not affect seedling emergence and no treatment related damage was observed during growth. No-effect levels were greater than the maximum label rate of 4.48 kg ai/ha. Post-emergent spraying resulted in phytotoxicity which increased with time and with treatment rate. Application at the maximum label rate resulted in plant death in all species. Nineteen days after application, mean EC₂₅ and EC₅₀ values ranged from 0.06-0.28 and 0.12-0.69 kg ai/ha, respectively (Table 4 and Table 5, attached). No-effect levels for phytotoxicity were between 0.25 and 0.002 kg ai/ha (Table 6, attached). No-effect levels for dry weight ranged between <0.002 and >0.25 kg ai/ha (Table 7, attached).

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES: The authors concluded pre-emergence applied ICIA0224 did not affect seedling emergence and no treatment related damage was observed during post-emergence growth.

Phytotoxicity following post-emergence spraying with ICIA0024 increased with time and with treatment rate. Post-emergence application at the maximum label rate resulted in plant death in all species. Mean EC₂₅ and EC₅₀ values ranged from 0.06-0.28 and 0.12-0.69 kg ai/ha, respectively. NOELs were between 0.25 and 0.002 kg ai/ha.

A quality assurance statement was included in the report.

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

- A. Test Procedure:** The test procedure was generally in accordance with EPA Subdivision J guidelines for a Tier 2 seed germination/seedling emergence test on non-target plants, but there were some deviations. Seed germination was not tested separately from seed emergence and radicle length was not measured. Growth stages of seedlings were scored, but no comparison, statistical or otherwise, was reported between growth stages of control plants and treated plants. Therefore, these measurements were not useful in judging treatment effects. Seedling emergence of Xanthium spinosum was low (0-20%) for treated and control seeds, so that the test for this species was not valid.

The difference in the application rates tested for the post-emergence test was five-fold rather than two-fold as required by the guidelines. Phytotoxicity for most of the species tested jumped from 0%-30% (mostly 0%) at an application rate of 0.01 kg ai/ha to 15%-98% at the next highest application rate of 0.05 kg ai/ha. Dry weight of aerial tissue did not differ between control and treated plants for the lower two rates, decreased approximately 30%-60% at the next highest rate, and 100% mortality occurred at 1.25 and 4.48 kg ai/ha. Clearly, the treatment rates should have followed the guidelines and been more closely spaced. Moreover, the test should have been repeated using more levels between treatment rates of 0.25 and 1.25 to determine EC₂₅ and EC₅₀ values.

B. Statistical Analysis:

Pre-emergence test. The author did not conduct statistical analyses of percent seedling emergence. Inspection of the data showed that there were no effects on seed germination and no phytotoxicity from pre-emergence treatments applied at or below the maximum label rate.

Post-emergence test. The logit analysis that provided EC₂₅ and EC₅₀ values and no-effect levels was not valid given the non-linear responses at the treatment ranges tested. An ANOVA for treatment effects on aerial tissue dry weight with post hoc contrast of each treatment with the control was conducted by the reviewer. Analysis was conducted on the dry weights, not on percent of control weight as conducted by the author. The ANOVA is

attached to this report. Treatments 5 and 6 are not included because these treatments caused 100% mortality for all species. The ANOVA for Beta vulgaris was not significant. For all other species, the weights of plants treated with the lower three application rates did not differ from the control, but treatment 4 caused significant reduction in dry weight.

C. Discussion/Results:

Pre-emergence test. No phytotoxicity was observed on treated seedlings. Inspection of the data indicated no effect on seedling emergence at the rates tested. A separate seed germination test was not conducted.

Post-emergence test. The application rates had five-fold differences. Rates should have been more closely spaced at the range where effects jumped from approximately 0 to severe damage and mortality. Growth stages were reported, but not analyzed to determine treatment effect (statistical analysis of these measurements would have been difficult, because they were discrete categories). Despite these flaws in the test, it is clear that significant damage to all species resulted from an application rate of 0.25 kg ai/ha and that mortality resulted from an application rate of 1.25 kg ai/ha and from the maximum application rate of 4.48 kg ai/ha. Therefore, the results of the report are acceptable for decision-making.

D. Adequacy of the Study:

(1) **Classification:** Core

(2) **Rationale:** The study deviates as explained above from the approved protocol for a Tier 2 test of seed germination/seedling emergence on non-target plants and incorporates a Tier 2 test of vegetative vigor on non-target plants. The information presented is sufficient to determine that application at the maximum label rate is 100% detrimental to all species tested.

(3) **Repairability:** N/A

15. **COMPLETION OF ONE-LINER:** N/A

Sulfosate ecological effects review

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