UNDATED

DATA EVALUATION RECORD

1. **CHEMICAL:** Molinate.
Shaughnessey No. 041402.

2. **TEST MATERIAL:** Ordram 8-E (91.4% ai w/w). S-ethyl hexahydro-1 H-azepine-1-carbo Sample ID No. 11240-38.

3. **STUDY TYPE:** Non-Target Plants: Seedling Emergence & Vegetative Vigor Phytotoxici Tier 2. Species Tested: Soybean, Sugar beet, Oilseed rape, Teaweed, Velve mustard, Corn, Winter wheat, Wild oat, Purple nutsedge.

4. **CITATION:** Farmer, D. and L. Canning. 1990. Molinate: A Glasshouse Study of Pre Post-Emergence Effects on Terrestrial Non-Target Plants. Laboratory Project Report No. RJ0863B. Conducted by ICI AGROCHEMICALS, Bracknell, Berkshire, RG12 UK. Submitted by ICI Americas, Inc., Wilmington, DE. EPA MRID No. 416136-11.

5. **REVIEWED BY:**

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7. **CONCLUSIONS:**
Seedling Emergence: This study is not scientifically sound and does not meet th for a Tier 2 seedling emergence test using non-target plants. Control germinati for white mustard, velvetleaf, teaweed, winter wheat, and wild oat (i.e., < obtained from

these studies are considered invalid. Therefore, only 5 species were considered

For seedling emergence, the NOECs calculated were the maximum labeled rate for except purple nutsedge. The NOEC for this species was 0.56 kg ai/ha. Since th response by nutsedge, it was possible to calculate EC values for this species. not included in this report.

For seedling damage, the NOEC values were the EC_{10} values. Generally, damage to was evident by 7 days and remained the same throughout the study period. The m species by the end of 21 days was purple nutsedge with NOEC, EC_{25}, and EC_{50} value 0.30, and 1.00 kg ai/ha, respectively.

For dry weight, the NOEC values were obtained through analysis of variance pro

most sensitive species with respect to dry weight was purple nutsedge. The 28-d for this species was 0.56 kg ai/ha. Although there were dose related responses, not calculated for plant dry weight data.

Vegetative Vigor: This study is scientifically sound but does not meet the requi 2 vegetative vigor test using non-target plants. The NOEC values (taken from EC_1 calculated from the vegetative vigor data. The most sensitive species after 28 to plant damage was soybean, with EC_{10}, EC_{25}, and EC_{50} values of <0.0158, 0.25, a ai/ha, respectively.

The dry weight NOEC values were obtained through analysis of variance procedures sensitive species with respect to dry weight was soybean. The 28-day NOEC v species was 0.56 kg ai/ha. Although there were dose related responses, EC val calculated for plant dry weight data.

8. **RECOMMENDATIONS**: Two-fold progressions are required for compound application for studies. For all parameters measured, EC and NOEC values need to be determined. should be obtained through use of analysis of variance with a known rate which i different from the control rather than through regression analysis. The emergence study should be conducted with 10 species in separate pots.

9. **BACKGROUND**:

10. **DISCUSSION OF INDIVIDUAL TESTS**: N/A.

11. **MATERIALS AND METHODS**:

A. **Test Plants**:
Dicotyledon plants were represented by six species from four families (sugar beet, oilseed rape, teaweed, velvetleaf, and white mustard). Monoco were represented by four species from two families (i.e., corn, wild oat, purple nutsedge). Cultivars were provided in the report.

B. **Test System**:
Seedling Emergence: Each treatment and control replicate consisted of two containing five plant species. One tray contained "warm" climate species contained "cool" climate species. Ten seeds of each crop were planted i trays (37 x 23 x 7.5 cm) filled with 5 cm of sandy loam compost. Corn, soybean, oilseed rape, and sugar beet seeds were sown and covered with compost. The remainder of the seeds (nutlets for purple nutsedge) were t covered with an additional 1 cm of compost (i.e., sowing depth of 2 cm for weeds). The compost was not watered prior to spray application so that al exposed to the herbicide upon imbibition. After spraying, the seed trays before being transferred to a glasshouse. The plants were top-watered tw not allowed to become water-logged or dry.

During the experiment, glasshouse conditions were set at 24°C/70% RH day, RH night for both climate species.

Vegetative Vigor: Velvetleaf, purple nutsedge, oilseed rape, white mustar and teaweed were initially sown in a peat/perlite mix in seed trays and l into new 7.5 cm polypropylene pots containing the appropriate compost. T species (i.e., soybean, corn, wild oat, and winter wheat) were sown direc cm pots.

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After application, plants were moved to a glasshouse. Pots were watered

and care was taken not to wet the foliage. The glasshouse conditions were in the emergence test.

During the post-emergence test, all plant species were fed with the balan "Vitafeed-S" (N:P:K = 17.5:10:13.5) at 8, 14, and 22 days after chemical application. The "Vitafeed-S" was added to the watering system at rates of

Winter wheat and wild oat in the post-emergence test were treated for mild days, respectively, after test application. The mildew was treated with ingredient - 28% ethirimol); diluted 6 ml to 1000 ml of water and sprayed t

All applications were made using a hydraulic track-sprayer fitted with stainless steel 8001E nozzle. Pressure was measured at 30 psi and the vol was 200 l/ha. The nozzle height was 30 cm for preemergence (emergence applications and 50 cm for postemergence applications (vegetative vigor stu

The temperature and relative humidity of the glasshouse were maintained conditions as those for the seedling emergence study.

C. **Dosage:** Molinate was applied at the rates of 0, 0.00875, 0.0350, 0.140, 0. 4.48 kg ai/ha to all plant species for the seedling emergence test and 0, 0.252, 0.56, 2.24, and 4.48 kg ai/ha for the vegetative vigor test. A st highest rate was made by adding an appropriate volume of distilled water t amount of the molinate formulation. In both pre and post-emergence t solutions of the highest rate were used to prepare the five lower concentr dilution.

D. **Design:**

Seedling Emergence: Each crop/treatment combination was replicated three 10 seeds/tray, 3 trays/treatment level). Treatments and controls were ass seedling emergence. The total number of seedlings emerged and number of maximum emergence were recorded for each species per replicate. At 7, 14, days, each replicate tray was observed for plant development and damage o using a rating scale from 0-9 (Table 5 - attached). For each species, e each rate was observed separately, but the ten (or less) seedlings that were assessed together to
give an overall damage score. Observations of symptomology were also recor

At 28 days after application, growth stage for each species in each recorded according to a growth stage key. The seedlings were then harvest the stem at soil level; dry weight was assessed as mg per plant by drying of each species separately to constant weight in an oven at
75°C.

Vegetative Vigor: Plants were organized as replicate blocks with replicat largest plants and replicate C the smallest. Each of the 3 replicates in of 2 controls and 6 treatments, each having 5 plants (except wild oat and which had 6 plants). The growth stage at application was recorded for ea each replicate.

Visual assessments of damage and symptoms in comparison with controls wer out at 4, 7, 14, and 28 days after application. Growth stage was assesse 28 days. After 28 days, plants were harvested at the soil level and dr weight at 75°C. Dry weights were then recorded.

E. **Statistics:** "Damage assessments were analyzed using a dose-response of per damage on $\log_e$ (rate). Dose-response of curves were estimated using re-weighted maximum likelihood regression of the logit transformation of $\log_e$ (rate). Log_e EC_{10}, EC_{25}, and EC_{50} estimates were obtained from the li back-transformed to produce actual values (rates causing 10%, 25%, and 50% respectively).

Since the control plants were not recorded for damage but used as a refer which treatment effects were assessed, it is not possible to calculate Effect Level (NOEL) by looking for statistical differences between cont plants at low rates of the chemical. The concentration which caused 10% d) was therefore taken as the NOEL and calculated for each species for eac this study, non-treatment related plant variation was taken as 10% withi scoring system, thus it was proposed that the EC_{10} represents the level effect, greater than natural variation, would be apparent in the field.

For seedling emergence and final dry weights, values were recorded for control pl case NOELs were calculated by contrasting control and treated plants. Pri seedling count data were transformed using an arc-sine transformation. A t way analysis of variance (randomized block design) was performed to obtain of the within-plot error. This was used in the calculation of Least Sig (LSD) values (comparison of two means) at the 5% and 1% significance leve turn were used to estimate NOELs. The NOEL was taken to be the highest rate, at and below which there was no significant difference from the contr

12. **REPORTED RESULTS:**

Seedling Emergence: No effect concentrations were calculated for each spec emergence compared to controls (Table 6, attached). The results showed that greater than the highest application rate (4.48 kg ai/ha) for all species exce had an NOEC of 0.56 kg ai/ha. There were no significant treatment effects in th taken for the emergence of each species.

Percent damage was monitored 7, 14, 21, and 28 days after application. Treatmen evident 7 days after treatment and remained the same throughout the test perio NOECs (Table 7, attached), in increasing sensitivity, for the ten species (in kg

corn = sugar beet = oilseed rape (>4.48) < winter wheat (1.59) < soybean (0 nutsedge (0.17) < wild oat (0.16) < velvetleaf (0.11) < teaweed (0.06).

By the end of the study (28 days) three species (sugar beet, winter wheat, and values greater than 4.48 kg ai/ha and these same three species plus oilseed r values greater than the maximum rate. The EC_{25} and EC_{50} values are listed in Ta (attached).

Table 10 (attached) gives the NOECs of the dry weight measurements taken at 2 application. The results from the above ground dry weight measurements demonst species (oilseed rape, corn, sugar beet, and winter wheat) had NOECs greater ai/ha. The NOECs for the remaining species in increasing sensitivity are (in kg

soybean (2.24) < teaweed = wild oat = purple nutsedge (0.56) < velvetleaf (0.14).

White mustard emergence was very poor and subsequently the results for this spe reported.

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Vegetative Vigor: Eight of ten species were affected by postemergent molinate

less than the maximum application rate. Winter wheat and purple nutsedge were treatments up to the maximum labeled rate. Corn and wild oat started to recove All dicots were affected with damage increasing with time.
The 28-day NOEC values (Table 11, attached) were taken to be the EC_{10} values emergence study. These values, in increasing sensitivity, are (in kg ai/ha):

winter wheat = purple nutsedge (>4.48) < wild oat (3.25) < corn (1.55) < suga teaweed (0.70) < oilseed rape (14 DAA, 0.36) < velvetleaf (0.15) < white mu soybean (0.06).

By the end of 28 days (14 for oilseed rape), only five of the six dicot specie than 25% damage and only three of these sustained damage greater than 50 predominant symptom caused by molinate application was stunt and necrosis. The EC_{50} values at day 28 are listed in Tables 12 & 13 (attached).

Dry weight was unaffected for six species. The NOEC values for the remaining 14, attached), in increasing sensitivity are (in kg ai/ha):

teaweed = corn = white mustard (2.24) < soybean (0.56).

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**
Preemergence applications of molinate as the EC formulation "Ordram 8-E" up to recommended field application rate (4.48 kg ai/ha) reduced emergence of only purple nutsedge. However, eight of the ten species sustained damage followin sugar beet and corn were unaffected. The order of increasing sensitivity based o values was soybean, wild oat, oilseed rape, purple nutsedge, winter wheat, velvetleaf. The relative sensitivities for reductions in dry weight were the s noted that the NOEC values were closer to the EC_{25} values than the EC_{10} values.

Postemergent applications of molinate up to 4.48 kg ai/ha did not affect winter nutsedge. Soybean, velvetleaf, and white mustard were the most sensitive spec pre-emergence test, plant yield NOECs were more similar to damage EC_{25} values. Y species were unaffected up to the maximum application rate, soybean was the mo species with a dry weight NOEC value of 0.56 kg ai/ha.

The Quality Assurance Unit of ICI Agrochemicals was responsible for the a compliance with Good Laboratory Practice (GLP) Standards. Both statements of co GLPs and QA were enclosed.

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

A. **Test Procedure:** The seedling emergence and vegetative vigor studies follow and subdivision J guidelines except for the following:

White mustard, teaweed, velvetleaf, winter wheat, and wild oat had poor em < 70% for the controls). Therefore, there was only five species tested fo study. Guidelines require that 10 species be tested.

The emergence studies were conducted using 2 trays per replicate; each tr 5 plant species. This can result in competition between species and lea results. Each plant species should have been grown in a separate pot or tr

No solution or spray calculations were included in the report.

No EC values were determined for dry weight for either study or for pur percent emergence.

The NOEC values given in the report are EC_{10} values. Using EC_{10} values as values is not considered acceptable by the EPA.

The lower rates for the emergence and vegetative vigor test are four-fold the next highest rate. Subdivision J and SEP guidelines require that the more than two-fold.

The last paragraph on page 10 of the report states that appropriate napropamide were added to distilled water. This is a typographical error molinate rather than napropamide.

B. **Statistical Analysis:** Statistical analysis was conducted on purple nutsedg sensitive species parameter) 21-day damage for the seedling emergence st probit and Dunnett's tests to determine EC and NOEC values, respective nutsedge was used even though other species had lower reported EC and NOEC These other species had poor emergence and the data obtained from them considered valid. The reviewer obtained a higher value for the NOEC, and values for the ECs. The reviewer's EC_{25} and EC_{50} values of 0.3 and 1.0 kg respectively, will be taken to be the correct values. The NOEC will be ta ai/ha.

Data for 28-day soybean damage (the most sensitive species parameter) vegetative vigor study was calculated with the same tests. The NOEC obt reviewer is much less than the authors'. The NOEC was determined to be 1 lowest rate tested (0.0158 kg ai/ha). The EC_{25} and EC_{50} values obtained by are more conservative than those obtained by the reviewer. The values a 1.11 kg ai/ha, respectively. These two values will better protect non-tar be taken to be the correct EC values.

C. **Discussion/Results:**

Seedling Emergence:

Percentage of Emerged Seedlings: The NOECs determined from this test maximum labeled rate (4.48 kg ai/ha) for all species except purple nutsedg for this species was 0.56 kg ai/ha. Since there was a dose response by nu possible to calculate EC values for this species. However, they are not report.

Seedling Damage: The NOEC values were the EC_{10} values. Generally, dama seedlings was evident by 7 days and remained the same throughout the stu The most sensitive species by the end of 21 days was velvetleaf with EC_{10}, EC_{50} values of 0.11, 0.21, and 0.39 kg ai/ha, respectively.

Plant Weight: The dry weight NOEC values were obtained through analysis procedures by the author. The most sensitive species with respect to dr velvetleaf. The 28-day NOEC value for this species was 0.14 kg ai/ha. A were dose related
responses, EC values were not calculated for plant dry weight data.

Vegetative Vigor:

Plant Damage: The NOEC values (taken from EC_{10} values) were calculated fro vegetative vigor data. The most sensitive species after 28 days with r

damage was soybean, with EC_{10}, EC_{25}, and EC_{50} values of 0.06, 0.25, and 1.1 ai/ha, respectively.

Plant Weight: The dry weight NOEC values were obtained through analysis procedures by the author. The most sensitive species with respect to dr soybean. The 28-day NOEC value for this species was 0.56 kg ai/ha. Alt were dose related responses, EC values were not calculated for plant dry we

This study is not scientifically sound and does not fulfill the guidelin Tier 2 seedling emergence and vegetative vigor tests using non-target plant

D. **Adequacy of the Study:**

(1) **Classification:** Seedling emergence - Invalid.
Vegetative vigor - Supplemental.

(2) **Rationale:** The EC values for the seedling emergence and vegetative v studies were not calculated for percent emergence or dry weight d emergence test was conducted on only 5 species rather than ten. should be rated so that analysis of variance can be used to determin values for the plant damage sections. The lower application rates been two-fold rather than four-fold.

(3) **Repairability:** Two-fold progressions are required for compound appli all studies. For all parameters measured, EC and NOEC values nee determined. The emergence study should be conducted with 10 spe separate pots with propagules that have acceptable germination (i.e., > 70%).

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