Nov. 20, 1984

DYNAMAC
CORPORATION

PENDIMETHALIN

TASK 2: ENVIRONMENTAL FATE AND EXPOSURE ASSESSMENT

CONTRACT NO. 68-01-6679

FINAL REPORT

NOVEMBER 20, 1984

SUBMITTED TO:

Environmental Protection Agency
Arlington, Virginia 22202

SUBMITTED BY:

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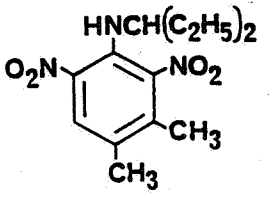
ENVIRONMENTAL FATE AND EXPOSURE ASSESSMENT

Pendimethalin

PROWL, PENOXYN, PENOXALIN, STOMP, HERBADOX, NICOCYAN, ACCOTAB, CYNOFF, AC 92,553, PAY-OFF, GO-GO-SAN



N-(1-ETHYLPROPYL)-3,4-DIMETHYL-2,6-DINITRO-BENZENAMINE

Pendimethalin is a selective herbicide registered for use on a variety of field and vegetable crop and aquatic food crop (rice) sites for the control of annual grasses and certain broadleaf weeds. Soybeans (~45%), cotton (~33%), and corn (~8%) account for the majority of the domestic usage, Application rates range from 0.5 to 2.0 lb ai/A. Pendimethalin may be formulated with oxyfluorfen. Single active ingredient formulations consist of 10% G, 60% WP (dispersible granular), and 3 and 4 lb/gal EC. Pendimethalin may be applied using ground equipment or aircraft. It may be soil incorporated or surface applied. It may also be foliarly-applied to tobacco and applied to soybeans in irrigation water (24c). Applicators need not be certified or under the direct supervision of applicators certified to apply pendimethalin.

Available data are insufficient to fully assess the environmental fate of pendimethalin and the exposure of humans and nontarget organisms to pendimethalin.

[^{14}C]Pendimethalin (>99% pure), at 0.51 and 5.1 ppm, was stable to hydrolysis for up to 4 weeks in sterile, distilled water (buffered at pH 5, 7, and 9) at 20-25 C (Zulalian and Eisner, 00106777-A).

Under aerobic conditions, [^{14}C]pendimethalin residues degraded slowly in sandy loam, loamy sand, and silt loam soils treated with [^{14}C]pendimethalin (radiochemically pure) at ~1 lb ai/A and maintained in the greenhouse (incubation conditions unspecified) (Barringer, et al., 00046281; Zulalian, et al., 00106782). After 180 days of incubation, radioactive residues in these soils ranged from 73 to 83% of applied.

[^{14}C]Pendimethalin (purity unspecified), sprayed at 1.5 lb ai/A on a 3-inch deep bed of Wisconsin silt loam soil (8° slope), did not move in appreciable quantities from the area of application after three ~1.3-inch simulated rainfalls (Dupre, 00046290). Approximately 61% of the radioactivity originally applied was recovered from the soil of the treated area, 8% had migrated downslope, 0.05% was recovered from the runoff water and sediment, and <0.01% was recovered from the leachate. Aged (30-day) residues of [^{14}C]-pendimethalin were immobile in a sandy loam soil column after leaching with 22.5 inches of water over a 45-day period. All of the recovered radioactivity (~71% of applied) was found in the top 3 inches of the 12-inch soil column (O'Grodnick and Dupre, 00046289). No [^{14}C]pendimethalin residues were detected (<0.01 ppm or <0.1% of applied) in the leachate.

[^{14}C]Pendimethalin (>99% pure), applied at ~1 lb ai/A to the top 2 inches of a New Jersey sandy loam soil confined in the field in stainless steel cylinders, dissipated slowly with a half-life of 6-16 months (Barringer, et al., 00046281; Zulalian, et al., 00106782). Movement of pendimethalin residues into lower soil depths was minimal, with <3% of the applied radioactivity found at the 2- to 6-inch depth at 180 days, and <6% found at the 3- to 12-inch depth at 480 days. At 180 days after treatment, parent pendimethalin accounted for 64% of the applied radioactivity. Four minor degradates were identified, thirteen were unidentified, and none were present at >1.3% of the applied. Pendimethalin residues dissipated with an initial half-life of ~7-14 days in the upper 6 inches of a clay loam soil and 2 uncharacterized soils in Minnesota, and a silt loam soil in Nebraska treated with pendimethalin (3 lb/gal EC) at 1.5-2.0 lb ai/A (Bodnarchuk, et al., 00029032, 00046295-D,

00046295-E; Bodnarchuk, et al., 00046295-C). Residues which remained in the soil were persistent, dissipating 41-82% in the following year. Residues dissipated with a half-life of 28-89 days in the upper 3 inches of sandy clay loam soils in North Carolina and Texas, and the upper 6 inches of sandy clay loam soil in Texas treated with pendimethalin (3 lb/gal EC) at 0.5-1.0 lb ai/A (Potts, et al., 00046295-F; Potts, et al., 00046295-L; Jakowlew, et al., 00046295-K). Residues dissipated with a half-life of 54-150 days in the upper 3 inches of silty clay loam soil in Illinois after two applications of pendimethalin (3 lb/gal EC) at 2-8 lb ai/A (Jakowlew, et al., 00046295-A, 00029035). Residues dissipated with a half-life of 91-184 days in the upper 3 inches of silt soil in Mississippi and the upper 6 inches of sandy loam soil in California treated with pendimethalin (3 lb/gal EC) at 1.0 and 0.43 lb ai/A, respectively (Jakowlew, et al., 00046295-I; Jakowlew, et al., 00046295-N). Residues dissipated with a half-life of 149-362 days in the upper 6 inches of silty clay loam soil in Arizona treated with pendimethalin (3 lb/gal EC) at 0.5-1.0 lb ai/A (Jakowlew, et al., 00046295-M). Little downward movement of the pendimethalin residues was observed (Bodnarchuk, et al., 00046295-D, 00046295-E; Potts, et al., 00046295-F; Potts, et al., 00046295-L; Jakowlew, et al., 00046295-A, 00029035; Jakowlew, et al., 00046295-I).

In a greenhouse, [^{14}C]Pendimethalin residues accumulated in cotton and soybean plants that were planted in a sandy loam soil 4 months after treatment with [^{14}C]pendimethalin (purity >98%) at ~1 lb ai/A (Zulalian and Eisner, 00046279). Maximum [^{14}C]pendimethalin residues in cotton and soybean plants (entire above soil portion) were 0.145 ppm (day 32) and 0.337 ppm (day 16), respectively. At 132 days after planting, [^{14}C]pendimethalin residues were 0.016 ppm in cotton seeds, and 0.060 ppm in soybean seeds. [^{14}C]Pendimethalin residues accumulated in beet plants that were planted in a silt loam soil 6 months after treatment with [^{14}C]pendimethalin (purity unspecified) at 1.5 lb ai/A in a greenhouse (Barringer and Eisner, 00046283). At 30, 90, and 150 days after planting, [^{14}C]pendimethalin residues were 0.21, 0.09, and 0.04 ppm, respectively. Pendimethalin accounted for 52% of the radioactivity extracted from beet plants sampled at day 30, with 6 and ≤7% accounted for by 4-[1-(ethylpropyl)amino]-2-methyl-3,5-dinitrobenzyl alcohol and three unidentified degradates, respectively.

In the field, neither pendimethalin residues (uncharacterized) nor 4-[1-(ethylpropyl)amino]-2-methyl-3,5-dinitrobenzyl alcohol (CL 202,347) accumulated (<0.05 ppm) in the foliage of corn, soybeans, wheat, oats, or cotton, or the tops and roots of beets grown 25-120 days (average ~45 days) in a variety of loam soils, ranging in texture from sandy loam to clay loam, treated the previous year with pendimethalin (3 lb/gal EC) (Bohn, et al., 00106777-C, 00106777-E, 00106777-L; Bohn, et al., 00106777-K; Bohn, et al., 00106777-G; Boughton, et al., 00106777-J, 00106777-M; Boughton, et al., 00106777-D, 00106777-F; Potts, et al., 00106777-I). Pendimethalin residues were <0.60 in the surface 3-6 inches of soil at the time of planting.

[^{14}C]Pendimethalin residues accumulated in crayfish, with 0.29, 0.048, and 0.33 ppm detected in whole crayfish, edible, and visceral tissues, respectively, after a 14-day exposure period (McAllister, et al., 00071124). Crayfish were exposed in tanks containing silt loam soil treated with [^{14}C]-pendimethalin (purity >99%), at 1 lb ai/A, that had been aged aerobically for 14 days and then equilibrated with aerated well water for 3 days. After a 7-day depuration period, [^{14}C]pendimethalin residues declined to 0.16, 0.014, and 0.16 ppm in whole crayfish, edible, and visceral tissues, respectively.

Dermal and ocular exposure due to splashing may occur during mixing and loading operations with the EC formulations. Exposure from the G formulations is expected to be mainly dermal. Inhalation and dermal exposures may occur during opening and pouring of the WP (dispersible granular) formulation; also, dermal, ocular, and ingestion exposures may result from splashing during dilution, mixing, and loading operations. All such exposures are expected to be minimized by use of gloves, respirators, and other protective clothing. Application by aircraft increases the potential for exposure of humans and nontarget organisms to pendimethalin due to spray drift and volatilization. However, data are not available to fully assess such exposures. Currently, no federal or state reentry intervals have been established.

Reported pesticide incidents involving pendimethalin alone between 1966 and 1980 include two involving human injury (both requiring medical at-

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tention) and one involving environmental contamination. One human exposure incident resulted from accidental exposure during mixing/loading, and the second resulted from exposure during application.

In summary, pendimethalin is stable to hydrolysis at pH 5, 7, and 9. Pendimethalin residues are persistent in a variety of soils under both greenhouse and field conditions. Between 73 and 83% of the pendimethalin applied to a variety of soils remained undegraded after 180 days of incubation under aerobic conditions (unspecified) in the greenhouse. In the field, pendimethalin residues dissipated with an initial half-life of 7-262 days in a variety of soils treated at 0.43-8.0 lb ai/A; however, residues remaining in the soil after the initial degradation were persistent, dissipating only an additional 41-82% during the next year. Pendimethalin and pendimethalin residues are not readily leached or mobile in runoff. In greenhouses, [^{14}C]pendimethalin residues (uncharacterized) accumulated to ≤0.34 ppm in cotton, soybeans and beets grown in soil treated 4-6 months before planting with [^{14}C]pendimethalin at 1-1.5 lb ai/A. In the field, neither pendimethalin residues (uncharacterized) nor 4-[1-(ethylpropyl)-amino)-2-methyl-3,5-dinitrobenzyl alcohol (CL 202,347) accumulated (<0.05 ppm) in the foliage of ~45-day-old corn, soybeans, wheat, oats, and cotton, or the foliage and roots of beets rotated into soils treated the previous year with pendimethalin. Pendimethalin residues did accumulate in crayfish to ≤0.33 ppm after 14 days of exposure, but decreased ~50% during depuration.

The following data are required (EPA Data Requirements for Registering Pesticides, 1983) to fully assess the environmental fate and transport of, and the potential exposure to pendimethalin: photodegradation studies in water, and on soil; ~~and in air;~~ aerobic soil and aerobic and anaerobic aquatic metabolism studies; leaching and adsorption/desorption studies; laboratory and field volatility studies; terrestrial, aquatic, and long-term field dissipation studies; accumulation studies on rotational crops, irrigated crops, and fish; ~~and rotary studies.~~

Hydrolysis studies: One study (Zulalian and Eisner, 00106777-A) was reviewed and considered to be scientifically valid. This study fulfills data requirements by showing that pendimethalin is stable to hydrolysis for ≥4 weeks in buffered solutions (pH 5, 7, and 9) at 20-25 C.

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Photodegradation studies in water: One study was reviewed (Zulalian, et al., 00046296) and cannot be validated because no explanation was provided to account for the greater loss of radioactivity from the control solution than from the sunlight-exposed solution. Additionally, this study would not fulfill data requirements because the test solutions were not buffered or maintained at 25 ± 1 C, an insufficient description of natural sunlight was provided, photolysis was not studied under sterile conditions, and a materials balance was not provided. All data are required.

Photodegradation studies on soil: Two studies were reviewed; one study (Parochetti and Dec, 05001076) cannot be validated because the sampling protocol was inadequate (only one sampling interval, soil TLC plates were not analyzed immediately after treatment to confirm application rates, and no attempt was made to collect volatiles). In addition, this study would not fulfill data requirements because the intensity of the natural sunlight was not reported and the study was not conducted for 30 days or one half-life of pendimethalin. The second study (Zulalian, et al., 00046296) is scientifically invalid because: Experiment 2 - the dark controls were not maintained at the same temperature as the samples exposed to natural sunlight and volatilization losses were not determined (no materials balance); and Experiment 1 - the analytical methods were not consistent throughout the study. These photodegradation studies do not fulfill data requirements because: Experiment 1 - the test soils were insufficiently characterized, a materials balance was not provided, and the natural sunlight was not characterized; and Experiment 2 - photolysis was studied on glass plates and not on soil, an insufficient description of natural sunlight was provided, and a materials balance was not determined. All data are required.

Photodegradation studies in air: No data were submitted, ~~but all~~ NO data are required.

Aerobic soil metabolism studies: Three studies were reviewed; one study (Haugwitz, 00046295-B) is scientifically invalid because the sampling protocol was inadequate to accurately assess the aerobic metabolism of pendimethalin. Additionally, this study would not fulfill data requirements because the incubation temperature was not provided and it could not be

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determined whether aerobic conditions were maintained throughout the test period. A second study (Barringer, et al., 00046282) is scientifically invalid because the sampling protocol was inadequate to provide data for accurately establishing the pattern of decline of pendimethalin and patterns of formation and decline of degradates. In addition, this study would not satisfy data requirements because treated soil was not maintained at a constant temperature between 18 and 30 C and a materials balance could not be determined. The third study (Barringer, et al., 00046281; Zulalian, et al., 00106782) is scientifically valid but does not fulfill data requirements because the incubation conditions were not reported, radioactive residues were not characterized, and soil samples were not taken for analysis immediately after treatment. All data are required.

Anaerobic soil metabolism studies: One study was reviewed (Barringer, et al., 00046282) and is scientifically invalid because the sampling protocol was inadequate (no immediate posttreatment sample) to provide data for accurately establishing the pattern of decline of pendimethalin and patterns of formation and decline of degradates. In addition, this study would not satisfy data requirements because treated soil was not maintained at a constant temperature between 18 and 30 C and a materials balance could not be determined. No data are required pending submission of acceptable anaerobic aquatic metabolism studies which can replace this requirement.

Anaerobic aquatic metabolism studies: No data were submitted, but all data are required.

Aerobic aquatic metabolism studies: One study was reviewed, (Marei, et al., 00067293) and is scientifically invalid because the sampling protocol was insufficient to provide data for accurately establishing the pattern of decline of pendimethalin and patterns of formation and decline of degradates in water and sediment. In addition, this study would not fulfill data requirements because the water used (distilled water) was not representative of water at an intended use site, the soil/water samples were not maintained at a constant temperature between 18 and 30 C, and the test substance used was not technical grade. All data are required.

Leaching and adsorption/desorption studies: Three studies were reviewed; one study (Barringer, et al., 00046288) is scientifically invalid because

the materials balance was too low (63-69% of the applied radioactivity was recovered) and the analytical methods used to determine radioactive residues were inconsistent (two techniques used). In addition, this study would not fulfill data requirements because the experimental protocol (leaching soil columns under suction) was not appropriate for assessing the mobility of pendimethalin in soil. The second study (O'Grodnick and Dupre, 00046289) is scientifically valid but does not satisfy data requirements because it is unlikely that the treated soil was maintained at a constant temperature (greenhouse conditions) during the aging process and [^{14}C]pendimethalin residues were not characterized. The third study (Dupre, 00046290) is scientifically valid, but does not fulfill data requirements because the method used was not one of the three recommended (i.e., soil TLC, column leaching, or batch equilibrium) for assessing pesticide mobility in soil. All data are required.

Laboratory volatility studies: One study was reviewed (Parochetti, et al., 05001077) and is scientifically invalid because the sampling protocol (one sampling interval) and the experiment duration were inadequate to accurately assess the volatility of pendimethalin from soil. In addition, this study would not fulfill data requirements because the test substance used was not completely characterized, portions of the experiment were conducted at temperatures higher (50 C) than would be encountered during normal use, and air concentrations were not reported. All data are required.

Field volatility studies: No data were submitted, but all data are required.

Terrestrial field dissipation studies: Twenty studies were reviewed; eight were invalid and twelve were valid. Two hardcopies were combined and reviewed as one study because one hardcopy (00106782) presented the protocol and results for the first 6 months of the experiment, and the second hardcopy (00046281) presented the results for the remaining 10 months of the experiment. Two additional hardcopies were combined and reviewed as one study because one hardcopy (00029035) was an interim report and the second hardcopy (00046295-A) was a final report on the same field experiment. Two studies (Bodnarchuk, et al., 00029033; Potts et al., 00046295-J) are scientifically invalid because the sampling protocol was inadequate to accurately

assess the dissipation of pendimethalin from soil. In addition, these studies would not fulfill data requirements because the test soil was not completely characterized, field test data including rainfall data were insufficiently provided, no pretreatment soil samples were taken and a nonspecific analytical method was used. Two studies (Jakowlew, et al., 00029034; Moyer, et al., 00106777-B) are scientifically invalid because the sampling protocol was inadequate to accurately assess the dissipation of pendimethalin from soil. In addition, these studies would not fulfill data requirements because the test soil was not completely characterized, field test data including rainfall data were insufficiently provided, a nonspecific analytical method was used and no pretreatment soil samples were taken (00106777-B). A fifth study (Tondreau, 00029031) is scientifically invalid because the sampling protocol and initial concentrations of pendimethalin in the soil were inadequate to accurately assess the dissipation of pendimethalin from soil, and the data presented were too variable to interpret. In addition, this study would not fulfill data requirements because the test soil and test substance were not characterized, meteorological data including rainfall were not provided, a nonspecific analytical method was used, and no pretreatment soil samples were taken. A sixth study (Bodnarchuk, et al., 00046295-G) is scientifically invalid because the sampling protocol following the 1972 application of pendimethalin was inadequate and the concentration of pendimethalin residues in soil following the 1973 application of pendimethalin were too variable to accurately assess the dissipation of pendimethalin from soil. Additionally, this study would not fulfill data requirements because meteorological data including rainfall data were insufficiently provided, a nonspecific analytical method was used, and no pretreatment soil samples were taken. A seventh study (Jakowlew, et al., 00046295-H) is scientifically invalid because pendimethalin residues in soil samples were too variable to accurately assess the pattern of decline of pendimethalin and patterns of formation and decline of degradates in soil. In addition, this study would not fulfill data requirements because a nonspecific analytical method was used, meteorological data including rainfall amounts were incomplete, and no pretreatment soil samples were taken. An eighth study (Boughton, et al., 00046295-0) is scientifically invalid because the data were too variable to accurately establish rates of dissipation of pendimethalin from field plots. In addition, the study would not fulfill data requirements because the irrigation data provided were insufficient, a nonspecific analytical method was used, and no pretreatment soil samples were taken. A ninth study (Barringer, et al.,

00046281; Zulalian, et al., 00106782) is valid but does not fulfill data requirements because the test substance was not a typical end-use product, pretreatment soil samples were not collected from the intended application site, and field test data were incomplete. Two studies (Jakowlew, et al., 00046295-I; Bodnarchuk, et al., 00046295-C) are valid but did not fulfill data requirements because a nonspecific analytical method was used, meteorological data including rainfall were incomplete, and no pretreatment soil samples were taken. Three studies (Potts, et al., 00046295-L; Potts, et al., 00046295-F; Bodnarchuk, et al., 00029032) are valid but did not fulfill data requirements because the test soil was not completely characterized, a nonspecific analytical method was used and no pretreatment soil samples were taken. Two studies (Bodnarchuk, et al., 00046295-E; Bodnarchuk, et al., 00046295-D) are valid but did not fulfill data requirements because the test soil was not completely characterized, meteorological data including rainfall data were insufficiently provided, a nonspecific analytical method was used and no pretreatment soil samples were taken. One study (Jakowlew, et al., 00046295-N) is valid but does not fulfill data requirements because field test data including irrigation data were insufficiently provided, a nonspecific analytical method was used and no pretreatment soil samples were taken. Two studies (Jakowlew, et al., 00046295-K; Jakowlew, et al., 00046295-M) are valid but did not fulfill data requirements because the test soil was not completely characterized, field test data including irrigation data were insufficiently provided, a nonspecific analytical method was used, and no pretreatment soil samples were taken. One study (Jakowlew, et al., 00046295-A; Jakowlew, et al., 00029035) is valid but does not fulfill data requirements because the test soil was not completely characterized, meteorological data including rainfall were insufficiently provided, pretreatment and immediate posttreatment soil samples were not taken, and a nonspecific analytical method was used. All data are required.

Aquatic field dissipation studies: No data were submitted, but all data are required.

Forestry dissipation studies: No data were submitted; however, no data are required because currently pendimethalin has no registered forestry uses.

Dissipation studies for combination products and tank mix uses: Six studies were reviewed; all are invalid. Three hardcopies were combined and reviewed as one study because one hardcopy (00071126) contained the protocol and results for the experiment, a second hardcopy (00058834) contained method M-0631 for the extraction and GLC analysis of pendimethalin residues, and a third hardcopy (000711229) contained method M-1114 for extraction and GLC analysis of 4[(1-ethylpropyl)amino]-3,5-dinitro-o-toluic acid. Three studies (Devine, et al., 00106806; Bodnarchuk, et al., 00030693; American Cyanamid Company, 00106798) are invalid because the variability in the data indicates that the sampling and/or analytical protocols were insufficient to provide reliable data for assessing the dissipation of pendimethalin alone, or in combination with other pesticides. Two studies (Devine, et al., 00106805; American Cyanamid Company, 00106829) are invalid because the sampling intervals were inadequate to accurately assess the dissipation of pendimethalin alone, or in combination with other pesticides. One study (American Cyanamid Company, 00071126; Boughton, 00058834; Manuel, 00071129) was invalid because the experimental design did not adequately provide for comparing the dissipation of pendimethalin applied alone or in combination with propanil. Data requirements for combination products and tank mix uses currently are not being imposed for this Standard.

Long-term field dissipation studies: No data were submitted, but all data are required.

Confined accumulation on rotational crops: Two studies were submitted; one study (Zulalian and Eisner, 00046279) is scientifically valid but does not fulfill data requirements because descriptions of plant growth and growth conditions were not provided, residues in plants were not characterized, and residues in soil were not determined. A second study (Barringer and Eisner, 00046283) is scientifically valid but does not fulfill data requirements because descriptions of plant growth and growing conditions were not provided, [^{14}C]pendimethalin residues in the soil were not determined, and residues in plants were characterized only at day 30. All data are required.

Field accumulation studies on rotational crops: Eleven studies were reviewed; one study (Bohn, et al., 00106777-H) is scientifically invalid

because no soil samples were analyzed to confirm the application of pendimethalin to the soil. Additionally, this study would not fulfill data requirements because the test soil was not characterized, field test data including rainfall were not provided, and a nonspecific analytical method was used. A second study (Bohn, et al., 00106777-C) is scientifically valid but does not fulfill data requirements because the test soil was not completely characterized, a nonspecific analytical method was used, field test data were not provided, and immediate posttreatment and day of harvest soil samples were not analyzed. Seven studies (Boughton, et al., 00106777-D; Bohn, et al., 00106777-E; Boughton, et al., 00106777-J; Bohn, et al., 00106777-K; Bohn, et al., 00106777-L; Boughton, et al., 00106777-M; Potts, et al., 00106777-I) are valid but did not fulfill data requirements because field test data including rainfall were not provided, the test soil was not completely characterized, a nonspecific analytical method was used, and immediate posttreatment and day of harvest soil samples were not analyzed. Two studies (Boughton, et al., 00106777-F; Bohn, et al., 00106777-G) are valid but did not fulfill data requirements because field test data were insufficient, immediate posttreatment and day of harvest soil samples were not analyzed to confirm application rates, and a nonspecific analytical method was used. All data are required.

Accumulation studies on irrigated crops: No data were submitted, but all data are required.

Laboratory studies of pesticide accumulation in fish: Two studies were reviewed; one study (Kapoor, et al., 00046293) cannot be validated. The portion of the first study, in which catfish were exposed to pendimethalin, cannot be validated because of discrepancies in the data on the bioaccumulation of pendimethalin in fish. The portion of the study in which guppies were treated is scientifically invalid because the sampling protocol and experimental design were inappropriate to accurately assess the bioaccumulation of pendimethalin in fish. This study would not fulfill data requirements because: Experiment 1 - a static rather than flow-through exposure system was used, residues in catfish viscera were analyzed only once during depuration, and immediate posttreatment soil and water samples were not analyzed; and Experiment 2 - a static rather than flow-through exposure system was used, the pond water was not characterized and the guppies were not characterized. A second study (McAllister, et al., 00071124) is valid but does not fulfill data require-

ments because the test substance was formulated as an EC prior to use, a nonspecific analytical method was used, a static rather than a flow-through exposure system was used, and an invertebrate species, crayfish, was tested rather than a species of fish. All data are required.

Field accumulation studies of aquatic nontarget organisms: No data were submitted, but no data are required because pendimethalin has no forestry, aquatic noncrop, or aquatic impact uses.

Reentry studies: No data were submitted, ~~but all~~ No data ~~may be~~ are required.

Exposure studies: One study (Moyer, et al., 00029344) was reviewed and is scientifically invalid because the experimental design was inadequate to establish spray droplet size and drift of pendimethalin after aerial application on a fallow field.

Label Restrictions

Pending the submission of rotational crop data do not use pendimethalin on rice fields in which crayfish and catfish farming included in the cultural practice, and do not plant crops other than those with registered pendimethalin uses for food or feed in pendimethalin-treated soil.

Pending the submission of irrigated crop data do not use water containing pendimethalin residues from rice cultivation to irrigate crops used for food or feed which are not registered for use with pendimethalin.

References (All Studies Reviewed by Dynamac Corporation)

American Cyanamid Company. 1978. Amounts of residues of Prowl, its metabolite (CL 202,347), Metribuzin (Sencor or Lexone) and Eptam in soil. Compilation; unpublished study received Oct. 5, 1978 under 241-243; CDL:097435-A. (00106798)

American Cyanamid Company. 1981. Prowl pendimethalin (CL 92,553/4EC) combination: Residues of CL 92,553 and CL 99,900 in water: Report No. C-1801. Compilation; unpublished study, including Report Nos. C-1804 and C-1805, received Jan. 22, 1981 under 241-243; CDL:099889-E. (00071126)

American Cyanamid Company. 1978. Residues of Prowl herbicide. Compilation; unpublished study received Aug. 14, 1979 under 241-243; CDL:23894-B; 241020. (00106829)

Barringer, D.F., Jr., and S.K. Eisner. 1974. CL 92,553: Metabolism IX. Uptake and residues of radioactivity in red table beets grown in soil with aged residues of carbon-14 labeled CL 92,553 (Prowl herbicide). A rotational crop study: Project No. 2-463. Unpublished study received Sep. 27, 1974 under 5F1556; submitted by American Cyanamid Co., Princeton, NJ; CDL: 094475-J. (00046283)

Barringer, D.F., Jr., M.I. Haugwitz, and S.K. Eisner. 1974. CL 92,553: Metabolism XIII. The behavior of CL 92,553 (Prowl herbicide) in soil, Part III. Anaerobic studies: Project No. 2-463. Unpublished study received Sep. 27, 1974 under 5F1556; submitted by American Cyanamid Co., Princeton, NJ; CDL: 094475-I. (00046282)

Barringer, D.F., Jr., M.I. Haugwitz, S.B. Jakowlew, et al. 1974. CL 92,553: A study of the leaching of CL 92,553 (Prowl herbicide) from four different soil types: Project No. 2-463. Unpublished study received Sep. 27, 1974 under 5F1556; submitted by American Cyanamid Co., Princeton, NJ; CDL:094674-B. (00046288)

Barringer, D.F., Jr., J. Zulalian, and S.K. Eisner. 1974. CL 92,553: Metabolism XI. The behavior of CL 92,553 (Prowl herbicide) in soil, Part II. A 16-month field-exposure study: Project No. 2-463. Unpublished study received Sep. 27, 1974 under 5F1556; submitted by American Cyanamid Co., Princeton, NJ; CDL:094475-H. (00046281)

Bodnarchuk, D., M. Laporta, C. Potts, et al. 1975. Summary -- Prowl and Banvel -- residues in corn plants. Unpublished study received Dec. 23, 1975 under 241-243; submitted by American Cyanamid Co., Princeton, NJ; CDL:230428-A. (00030693)

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