Date Out EFB: JUN 17 1980

To: Product Manager LaRocca (15)
TS-767

Through: Dr. Gunter Zweig, Chief
Environmental Fate Branch

From: Review Section No. 1
Environmental Fate Branch

FILE COPY

Attached please find the environmental fate review of:

Reg./File No.: 241-EUP-93

Chemical: AMDRO

Type Product: I

Product Name: AMDRO

Company Name: American Cyanamid

Submission Purpose: EUP for new chemical (fire ant compound)

ZBB Code: Sect 5

Action Code: 262

Date in: 5/5/80

EFB#: 446

Date Completed JUN 17 1980

Deferrals To:

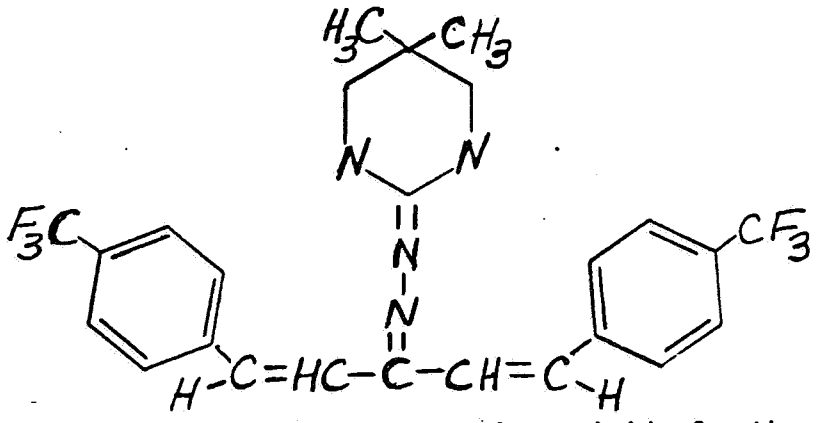
[X] Ecological Effects Branch

[ ] Residue Chemistry Branch

[ ] Toxicology Branch

1.0 American Cyanamid has submitted environmental fate data for review to remove existing data gaps in support of future registration.

1.1 AMDRO = tetrahydro-5,5-dimethyl-2(1H)-pyrimidone(3-(trifluoromethyl)phenyl)-1-(2-(4-(trifluoromethyl)phenyl)ethenyl)-2-propenylidene)hydrazone, AC 217,300, CL 217,300



1.2 AMDRO is being developed as an insecticide for the control of imported fire ants.

2.0 Discussion of Data

2.1 CL 217,300: Determination of partition coefficient in n-octanol-water solvent system. S.H. Caballa. Report PD-M Volume16-5, 3/16/79, American Cyanamid Company, Agricultural Research Division, Princeton, New Jersey. Accession No. 242308.

Experimental Procedure

The n-octanol-water partition coefficient of Cl 217,300 was measured using ^{14}C-[benzylic] labeled Cl 217,300 at initial octanol concentrations of 0.1, 0.5, and 1.0 ppm. Suitable procedures were used, and final measurement was by LSC.

Results

Partition coefficients of 203, 204, and 212 were obtained for the 0.1, 0.5, and 1.0 ppm starting concentrations, respectively. In an attached summary, partition coefficents of ca. 3,000 to 17,000 were obtained when starting octanol concentrations of 10 to 1,000 ppm were employed. This suggests that the limited ability of water to dissolve Cl 217,300 was reached, with the excess chemical going into the organic phase.

Conclusions

There is no point of disagreement with either methods or results. However, the moderate coefficients seem at odds with the very low water solubility (ca. 5-7 ppb) cited elsewhere in the submission. The two properties are normally well-correlated. The partition coefficient is not an environmental chemistry data requirement but will be used to help interpret submitted fish accumulation studies.

2.2 CL 217,300: Biodegradability, Environmental Fate and Ecological Magnification of Carbon-14 Labeled Cl 217,300 in a Model Ecosystem., S.H. Caballa, American Cyanamid Co., Princeton, NJ, 5/22/79, Report PD-M, Volume 16-11, Accession No. 242308.

This study was given a brief review in 241-EUP-93 9G2271, 10/11/79 and, since the model ecosystem is not a data requirement, will not be further reviewed here. It is of note that the bioaccumulation of Cl 217,300 observed in mosquito fish (Gambusia) of 95 is fairly close to that obtained with catfish in the required static study (51.4 fold in whole fish).

2.3 ^{14}C-AC 217,300, Channel Catfish, Ictalurus punctatus (Rafinesque), Bioconcentration Study, prepared by Union Carbide Corporation, Environmental Services, Tarrytown, NY 10591, Report AMCY/217,300/BCCC/041680; American Cynamid Company, Agricultural Research Division, Princeton, N.J. Accession No. 242308.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

Experimental Procedure

A fairly standard experimental protocol was followed. Two hundred liters of soil (sandy loam) was treated with 13.572 mg of ^{14}C-AC217,300 (22.98 uci/mg, position of ^{14}C and purity unspecified) on [redacted]. This was equivalent to 12.0 g a.i/acre or three times the current use rate. Half the material was incorporated in the upper one inch of soil and one-half remained on the soil surface. After aging for one week outdoors, the soil was flooded with 1850 l water (0.4 m depth) and aged for another two weeks outdoors in polyethylene tanks at ambient temperatures (mean temperature 22.2°C) and photoperiod (mean solar radiation 0.23 cal/cm^2/min). The study was conducted July-September. After three weeks aging, channel catfish were added to both the treated tank and untreated tank at 1.01 g fish/liter, with average fish weight 6.8 g. Samples of soil were taken prior to flooding. After flooding, soil and water were taken 1, 7, and 14 days after flooding. During uptake; fish, water, and soil samples were taken at 0, 1, 3, 7, 10, 14, 17, 22, 26, and 30 days. Fish were analyzed as whole fish, edible and non-edible tissue. At 30 days, remaining fish were transferred to clean flowing water for two week depuration rate measurement.

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All analysis was done by liquid scintillation counting with fish and soil analyzed following sample oxidation trapping $^{14}CO_2$. No chemical analyses were done. Whole fish values were based on 4 fish per sample. Edible and non-edible values were weighted averages of 10 fish per sample.

Results

The mean ^{14}C residue level in the water during the uptake phase was 0.407 ± 0.082 ppb with a range of 0.228 to 0.483 ppb (all values are equivalent to parent AC-217,300). Mean soil levels were 33.9 ± 15.5 ppb, with the large variation attributed to the method of application in discrete [redacted] leading to a heterogenous composition in the soil. Variation of up to 10-fold or more was seen in the fish samples as well. Considering this variation, there is no distinguishable difference in fish residue levels between sampling intervals. This was attributed to the possibility that some of the catfish may have consumed radiochemically-treated [redacted]

No fish died in either the treated or control tanks over the period of the study. Bioconcentration factors (ppb fish/ppb water) observed were 3.24 on day 1 to 51.4 on day 3 for whole fish, and 17.8 on day 22 to 66.3 on day 26 for non-edible tissue. Taking into account the sample variations, equilibrium residue levels were probably reached rapidly and maintained through the end of the uptake study, although fluctuations do not permit designating the true bioaccumulation factor within the above-listed limits.

1.57 on day 1 to 31.5 on day 26 for edible tissue,

Depuration was somewhat slow, with declines of 53.9%, 46.2% and 51% from maximum levels in whole fish, edible and non-edible tissues respectively, after 1 day of depuration. However, after 14 days of depuration, 27.9%, 48.7%, and 31.4% of the maximum residue level remained in whole fish, edible tissue, and non-edible tissue, respectively.

It is of interest that algae analyzed for ^{14}C in the first and last week of exposure showed bioconcentration factors of 1510 and 5480.

Conclusions

This study demonstrates that aged residues of AC 217,300 do not accumulate significantly in catfish. The study does not totally satisfy data requirements because the identity of the water, soil, and fish residues was not determined.

2.4 American Cyanamid Company, ^{14}C-AC 217,300, Bluegill Sunfish, Lepomis macrochirus Rafinesque Bioconcentration Study, prepared by Union Carbide Corporation, Environmental Services, Tarrytown, NY 10591, Report AMCY/217,300/BCBG/041780; American Cyanamid Company, Agricultural Research Division, Princeton, NH 08540. Accession No. 242308.

Experimental Procedure

A standard continuous-flow exposure protocol was followed. The test ^{14}C-AC217,300 was delivered to the exposure tank at a rate to give a nominal "concentration" of 0.0227 ppm (ca. 1/10 of 96-hr Lc_{50} to bluegills). The study was done at 22°C under conditions minimizing photodegradation, for 30 days. Initial biological loading was 1.26 g fish/l. There were 4.1 volumes of water turned over per day in the exposure tank. A solvent-only control was run also. Fourteen fish and also water were sampled at 0, 1, 3, 7, 10, 14, 22, and 30 days of exposure. Four fish were analyzed whole, and ten were dissected into edible and non-edible portions for analysis. The fish remaining at 30 days were transferred to clean, flowing water for depuration, with sampling tims of 1, 3, 7, 10, and 14 days. Fourteen fish analyzed as above were taken at each sampling interval. Fish samples were analyzed for ^{14}C content after tissue combustion, forming $^{14}CO_2$ which was quantified by scintillation counting.

Results

The mean concentration of test chemical over the thirty day study was 0.00286 ppm, much less than the theoretical 0.0227 ppm. This is not surprising since the water solubility of AC 217,300 is about 5 ppb. Much of the test material evidently precipitated from solution or absorbed to glass or perhaps even the surface of the fish. Uptake into the fish was linear and continued through the study reaching levels of 119 ppm, 41.8 ppm, and 117 ppm in whole fish, edible tissue, and non-edible tissues. The maximum bioconcentration factors were actually reached on day 22 due to low water concentrations (0.00244 ppm) on that day compared to 30 days (0.00441 ppm). The 22 day bioconcentration factors were 34,900 in whole fish, 11,900 in edible tissue, and 35,900 in non-edible tissue. Three percent of the exposed fish died, compared to none in the control tank. ^{14}C residues were slowly and steadily depurated. At the end of 14 days of depuration, residues in whole fish were 53.9 percent of the maximum, in edible tissues 47.1 percent, and in non-edible tissues 51.5 percent.

Conclusions

It is difficult to draw conclusions about this study. On the surface it indicates that AC 217,300 had a very high potential for accumulation in fish (over 10^4 fold). However, it may just be indicative that fish provide a good surface for precipitation or adsorption of AC 217,300 when introduced to water in excess of solubility limits. The fish may also have inadvertently ingested solid AC 217,300. Certainly, the results contrast with the rather low octanol-water partition coefficient reported for this chemical. It is my opinion that the study was performed in such a manner as to prevent any meaningful interpretation of the results and must therefore be considered either invalid or indicative of an exceedingly high bioaccumulation potential.

2.5 The Photolysis of Carbon-14 Labeled CL 217,300, I.P. Kapoor, American Cyanamid Co., 9/13/79, no report no. given. Accession No. 242308.

Experimental Procedure

Carbon-14 labeled Cl 217,300 (benzylic or pyrimidinyl labeled) was formulated as [redacted] and exposed to artificial (0.212 cal cm^{-2})or actual sunlight. No method of analysis was specified. No dark controls were performed.

Results

The half-life was stated to be 3.2 hours under artificial light and 1.0 hour under sunlight. No degradates were analyzed off the [redacted]

Conclusions

Unless information on controls and analytical methodology can be provided, this study must be considered invalid. The protocol does not address a data requirement in any event.

2.6 AMDRO Fire Ant Insecticide CL 217,300: The Hydrolysis of Carbon-14 Labeled CL 217,300, B.L. Reichert, American Cyanamid Company, Agricultural Research Division, Princeton, NJ 3/17/80, Report PD-M, Volume 16-29. Accession No. 242308.

Experimental Procedure

Due to limited water solubility (5-7 ppb); 10 ppm solutions of AC 217,300 were prepared in 30% 1,2-dimethoxyethane (DME)/buffer at pH 3.3, 6.4 and 9.2. Pyrimidyl and benzylic ^{14}C labeled chemicals were employed. Samples were shaken at 35°C in the

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dark. The water samples were placed on TLC plates and analyzed by two-dimensional TLC/autoradiography. Radioactive spots were quantified by scintillation counting. Hydrolysis products were characterized by co-chromatography and mass spectrometry.

Results

The hydrolytic half-lives obtained (averaging results from the two separate ^{14}C labels) were pH 3.33 - 22.6 days; pH 6.4 - 4.4 days; pH 9.2 - 4.8 days. Eight degradates plus labeled material remaining at the TLC plate origin were observed. None of the major degradates were identified. A minor degrate (6.6% or less) was identified as CL 98,724 (1,5-bis(α,α,α-trifluoro-p-tolyl)-1,4-pentadien-3-one). Another (only at pH 9.2, 2.7%) was identified as α,α,α-trifluoro-p-toluic acid.

Conclusions

CL 217,300 appears to hydrolyze fairly rapidly under environmental pH conditions. The true rate may be even faster since comparison with another pesticide indicated that DME retarded hydrolysis somewhat. This is only conjecture, however.

Deficiencies of the study relative to the guidelines include: no major degradates are identified, only one initial concentration and temperature study is examined, no distilled water study was performed.

Until such time as the above data deficiencies are removed, the provided data, while useful, cannot be used in support of registration.

3.0 Executive Summary and Conclusions

3.1 AMDRO has an intermediate n-octanol-water partition coefficient (ca. 206).

3.2 Aged residues of AMDRO do not accumulate greatly in catfish. The maximum accumulation factor for edible tissue was 31.5, for non-edible tissue 66.3, and for whole fish 51.4. Residues were incompletely depurated within two weeks.

3.3 No conclusions may be drawn from the continuous flow fish accumulation study due to flaws in design of the study. If valid, the study indicates AMDRO has an enormous potential for accumulation in fish.

3.4 AMDRO appears susceptible to hydrolysis under environmental conditions, with a half-life of 4.4 days at pH 6, 35°C and in the presence of 30% dimethoxyethane.

AMDRO does not appear to pose a fish accumulation problem when allowed to age under environmental conditions. However, a conclusion cannot be made concerning the ability of AMDRO itself to accumulate, based on the submitted data. The data suggest that the potential for accumulation is very high. However, this contrasts with the only moderate octanol/water partition coefficient. On the other hand, the very low water solubility (5 ppb) is consistent with a high accumulation potential. Because the study was performed in excess of water solubility, the high fish accumulation may be an artifact, and not reflective of environmental conditions.

4.0 Recommendations

4.1 All of the environmental chemistry data required by the Section 3 regulations will be required at the time of registration.

4.2 EFB defers to EEB the need for a confirming continuous flow fish accumulation study performed under valid conditions. Due to rapid degradation and the particular use rate and pattern, EFB views that a potential for accumulation exists ony where AMDRO is directly discharged into receiving waters without treatment (assuming that bioaccumulation potential is great, as suggested by the submitted study).

4.3 Identification of major hydrolysis products is required. Although these data were submitted as an EUP, they are really in support of a future conditional registration request. Given the proposed use rate and pattern of AMDRO, EFB views the catfish accumulation study to be sufficient to judge the accumulation potential in aquatic organisms.

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