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Date Out EFB: JAN 19 1982

To: Product Manager 21 Jacoby
TS-767

From: Dr. Willa Garner WG
Chief, Review Section No. 1
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: 677-313

Chemical: Chlorothalonil

Type Product: Fungicide

Product Name: Bravo

Company Name: Diamond Shamrock

Submission Purpose: Use on stone fruits

ZBB Code: 3(c)(7)

ACTION CODE: 335

Date in: 11/8/81

EFB # 73

Date Completed: JAN 19 1982

TAIS (level II)	Days
63	8

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

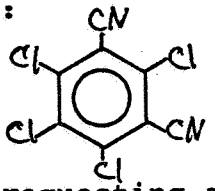
_____ Toxicology Branch

1.0 Introduction

Chemical Name and Type Pesticide: Chlorothalonil, tetrachloroisophthalnitrile, 40.4% ai, Fungicide.

Trade Name: BRAVO 500 Agricultural Fungicide.

Chemical Structure:



The applicant is requesting an amended, conditional registration for chlorothalonil (BRAVO 500) to add stone fruits (Apricots, Cherries, Nectarines, Peaches, Plums, and Prunes) to the label.

2.0 Directions for Use

See attached pages.

3.0 Discussion of Data

A list of the 10 submitted studies is attached.

3.1 EFFECT OF PESTICIDE ON MICROBES

3.1.1 Effect of 2,4,5,6-tetrachloroisophthalonitrile (chlorothalonil, DS-2787) Upon the Microbil Utilization of Selected Macromolecules in Soil, Contract Laboratory: Union Carbide Report Document No. 326-3EI-79-0009-001, p. 416, part II, Vol IX, Acc. # 070468.

Experimental Procedure

The effect of chlorothalonil upon the utilization of protein, pectin, cellulose and starch by soil microorganisms was assessed using sandy loam and clay loam soils fortified with chlorothalonil at a rate equivalent to the recommended field rate (2.5 ppm) and at a rate equivalent to ten times (25 ppm) the recommended field rate.

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No. Data Submitted In This Petition:

1.	Anaerobic Soil Metabolism of Daconil	17
2.	Accumulation, Distribution and Depuration of ^{14}C-2,4,5,6-Tetrachloroisophthalonitrile (Chlorothalonil, DS-2787) in Bluegill Sunfish (Lepomis Macrochirus) Under Flow Through Aquatic Conditions. Document No. 079-3EI-80-0120-001	23
3.	Characterization and Quantitation of ^{14}C Residues in Water and Fish Exposed to ^{14}C 2,4,5,6-Tetrachloroisophthalonitrile (Chlorothalonil, DS-2787) In a Flow Through Aquatic System. Document No. 116-4EI-81-0016-003	86

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4.	Accumulation, Distribution and Depuration of ^{14}C-Residues of ^{14}C-2,4,5,6-Tetrachloroisophthalonitrile (Chlorothalonil, DS-2787) In Channel Catfish (Ictalurus Punctatus) Under Static Aquatic Conditions. Document No. 077-3EI-80-0205-003	192
	Characterization of ^{14}C-Residues in Water, Soil and Fish Exposed to ^{14}C-2,4,5,6-Tetrachloroisophthalonitirle (Chlorothalonil, DS-2787) In A Static Aquatic System. (Study in progress but report not yet available will be submitted later)	-
5.	Accumulation, Distribution and Depuration of ^{14}C-4-Hydroxy-2,5,6-Trichloroisophthalonitrile (DS-3701) in Bluegill Sunfish (Lepomis Macrochirus) Under Flow Through Aquatic Conditions. Document No. 115-3EI-80-0176-001	279
6.	Characterization and Quantitation of ^{14}C- Residues in Water and Fish Exposed to ^{14}C-4-Hydroxy-2,5,6-Trichloroisophthalonitrile (DS-3701) In A Flow Through Aquatic System. Document No. 268-3EI-79-0031-002	344
7.	Effect of 2,4,5,6-Tetrachloroisophthalonitrile (Chlorothalonil, DS-2787)Upon the Microbial Utilization of Selected Macromolecules in Soil. Document No. 326-3EI-79-0009-001	416
8.	Effect of 2,4,5,6-Tetrachloroisophthalonitrile (Chlorothalonil, DS-2787) Upon Soil Dehydrogenase Activity. Document No. 329-3EI-79-0012-001	609

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9. Effect of 2,4,5,6-Tetrachloroisophthalonitrile (Chlorothalonil, DS-2787) Upon Non-Symbiotic Nitrogen Fixing Soil Microorganisms.
Document No. 327-3EI-79-0010-001 683

10. Effect of 2,4,5,6-Tetrachloroisophthalonitrile (Chlorothalonil, DS-2787) Upon Nitrogen Transformation in Soil.
Document No. 328-3EI-79-0011-001 799

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_____ 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.

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_____ FIFRA registration data.

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Assays were made at 0,3,7,14,21,28, and 56 days after application. Biopolymer degradation was determined by monitoring evolved $^{14}CO_2$ with LSC. Microbial populations were enumerated at begining, midterm and end of study using a modified dilution plate procedure. Table 1 gives soils characteristics.

Results

Generally, any observed effects of chlorothalonil upon the microbial utilization of protein, pectin and cellulose were subtle and no specific trends were observed. Chlorothalonil did, however, have a stimulatory effect upon the utilization of starch. This effect appeared to be dose related. Based upon results of this study, chlorothalonil will not adversely effect those soil microorganisms responsible for the key microbial process of utilization of macromolecules. No adverse effect upon the microbial population was observed. See Tables 2 and 3.

Conclusions

Chlorothalonil did not inhibit biopolymer degradation or microbial populations in the two test soils of this study.

3.1.2 Effect of 2,4,5,6-Tetrachloroisophthalnitrile (Chlorothalonil, DS-2787) Upon Soil Dehydrogenase Activity, Contract Laboratory: Union Carbide, Document No. 329-3EI-79-0012-001, p. 609, Part II, Vol IX, Acc. # 070468.

Experimental Procedure

The effect of chlorothalonil upon soil dehydrogenase activity was assessed using sandy loam and clay loam soils fortified with chlorothalonil at a rate equivalent to the field application rate and at a rate equivalent to ten times the field application rate. Dehydrogenase activity was assayed 1,3,7,14,21,28, and 56 days after application. Microbial populations were deterimed after 0, 28, and 56 days. Enzyme activity was determined colorimetrically. Table 4 shows soil characteristics.

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Results

At a rate equivalent to the field application rate, chlorothalonil did not generally effect dehydrogenase activity in sandy loam soil; at ten time the field application rate, a depression in dehydrogenase activity was observed at Days 3, 7 and 21. In clay loam soil the effect of chlorothalonil upon dehydrogenase activity was subtle and no trends were observed. Based upon result of this study, the use of chlorothalonil under actual field conditions will not result in any long term detrimental effects on those soils microorganisms responsible for dehydrogenase activity. There was no significant inhibition of the microbial populations. Data are summarized in Tables 5 and 6.

Conclusions

Chlorothalonil, at the field application rate, did not significantly decrease dehydrogenase activity.

3.1.3 Effect of 2,4,5,6-tetrachloroisophthalonitrile (chlorothalonil, DS-2781) Upon Non-symbiotic Nitrogen-Fixing Soil Microorganisms, Contract Laboratory: Union Carbide, Document No. 327-3EI-79-0010-001, p. 683, Part II, Vol IX, Acc. No # 070468.

Experimental Procedure

The effect of chlorothalonil upon non-symbiotic nitrogen fixing soil microorganisms was assessed using sandy loam and clay loam soils fortified with chlorothalonil at a rate equivalent to the field application rate and at a rate equivalent to ten times the field application rate. Soil characteristics were the same as in Table 4 Section 3.1.2. Soil Samples were stored at about 22°C. Aerobic samples were flushed 3X each week with CO_2-free, water-saturated air. Anaerobic samples were similarly flushed with water-saturated nitrogen gas. Dextrose was periodically added to the samples prior to purging with the appropriate gas. Seven days after dextrose addition acetylene was added. Acetylene reduction to ethylene was measured by GLC at 0, 6, 24, and 48 hours after being added. The microbial population and diversity were also determined.

Results

In sandy loam soil fortified with chlorothalonil at a rate equivalent to the field application rate, there was an initial inhibition in aerobic nitrogen fixation and generally stimulatory effects on anaerobic nitrogen fixation.

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At a rate equivalent to ten times the field application rate, there was an inhibitory effect on aerobic nitrogen fixation at Days 0, 21 and 28 and an inhibitory effect on aerobic nitrogen fixation at Days 0, 21 and 28 and an inhibitory effect on anaerobic nitrogen fixation through Day 21 of the study.

In clay loam soil fortified with chlorothalonil at a rate equivalent to the field application rate, there was no effect on either aerobic or anerobic nitrogen fixation. At a a rate equivalent to ten times the field application rate, a stimulatory effect on both aerobic and anaerobic nitrogen fixation was observed. See Table 7 and 8.

Conclusions

Chlorothanil did not cause any significant or long term inhibition of nitrogen fixation.

3.1.4 Effect of 2,4,5,6-tetrachloroisophthalonitrile (chlorothalonil DS-2787) Upon Nitrogen Transformation in Soil, Contract Laboratory: Union Carbide, Document No. 328-3EI-79-0011-001, p. 799, Part II, Vol. IX, Acc. # 070468.

Experimental Procedure

The effect of chlorothalonil upon nitrogen transformation was assessed using sandy loam and clay loam soils fortified with chlorothalonil at a rate equivalent to the field application rate and at a rate equivalent to ten times the field application rate. Soil characteristics were the same as in Table 4 Section 3.1.3.

Results

In sandy loam soil fortified with chlorothalonil at a rate equivalent to the field application rate the effects on nitrogen transformation were subtle and isolated. At a rate equivalent to ten times the field application rate, there was a consistent inhibitory effect on nitrogen tranformation which occurred to a lesser degree with time, thus indicating recovery of the soil microbial system.

In clay loam soil fortified at a rate equivalent to the field application rate inhibition of nitrogen transformation was isolated and no trends were observed. At a rate equivalent to ten times the field application rate, inhibition of nitrogen transformation was not observed after Day 21 of the study. Table 9 summarizes the results.

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Based upon results of this study, nitrogen transformation was inhibited in soils fortified with chlorothalonil at a rate equivalent to ten times the field application rate. However, at actual use rates under field conditions, it is predicted that chlorothalonil will not have any long term adverse effects on those microorganism responsible for the key microbial process of nitrogen transformation.

Conclusion

Chlorothalonil inhibited nitrogen transformation at the field application rate, but the effect was not uniformly observed.

These four studies on the effects of chlorothalonil on microbes were reviewed because they had been specifically requested in a previous review (5/26/78). They were found to be acceptable. The final version (July 7, 1981) of the guidelines, however, does not now require microbial data.

3.2 FISH ACCUMULATION

3.2.1 Accumulation, Distribution and Depuration of ^{14}C-Residues of ^{14}C-2,4,5,6-Tetrachloroisophthalonitrile (Chlorothalonil, DS-2787) In Channel Catfish (Ictalurus Punctatus) Under Static Aquatic Conditions, Contract Laboratory: Analytical Bio Chemistry, p. 192, Document No. 077-3EI-80-0205-003, Part I, Vol. IX, Acc. #070467.

Experimental Procedure

A sandy loam soil was fortified with ^{14}C-chlorothalonil at a nominal concentration of 10 ppm, equivalent to an application rate of 10 pounds active ingredient per acre. The soil was transferred to a stainless steel tank and maintained for 30 days under conditions of ambient temperature and a 15% to 20% moisture content.

After the 30 day "aging" period, water was added to the test system and the system was allowed to equilibrate for three days. After equilibration, channel catfish (Ictalurus punctatus) were added and exposed to the test system for a 26 day accumulation period. At conclusion of the accumulation period, the remaining channel catfish were transferred to aquaria and exposed to uncontaminated flowing water for a 14 day depuration period.

During the "aging", equilibration, accumulation and depurphases phases of the study, appropriate samples of soil, water and fish were taken and assayed for ^{14}C-residues by LSC.

Results

A study was conducted to evaluate the potential for accumulation, distribution and depuration of ^{14}C-residues in channel catfish exposed to a static aquatic system containing ^{14}C-chlorothalonil and its ^{14}C-degradation products in soil. In this study the maximum mean ^{14}C-residue accumulated in the whole fish, fillet and visceral tissues were 1.9 ppm, 0.83 ppm and 2.4 ppm, respectively. Based upon the concentration of ^{14}C-residues in water, the maximum accumulation factors were 16X for whole fish, 9.4X for fillet and 25X for visceral tissues. Upon exposure to uncontaminated water, more than 80% of the accumulated ^{14}C-residues was depurated from the fish tissues. Based upon results of this study, the residue of chlorothalonil and its degradation products in soil have a low potential for accumulation in aquatic organisms.

Conclusion

Channel catfish did not significantly accumulate Chlorothalonil.

This study was reviewed because it was specifically requested, but it is not part of our guidelines anymore (final version July 7, 1981).

4.0 Recommendation

EFB does not concur with the proposed addition of stone fruits to the BRAVO label, since one of the data requirements for orchard crops, leaching, still has not been satisfied with a valid laboratory study (our review of 2/6/81).

The anaerobic soil metabolism study (No. 1) that was submitted with this petition, was previously reviewed (4/27/76) and found deficient.

The four flow-through fish accumulation studies (Nos. 2,3, 5,6) using Bluegill Sunfish were not reviewed, since this data requirement had previously been satisfied.

The channel catfish fish accumulation study (No. 4) and the microbial studies (Nos. 7-10) were reviewed (and found satisfactory) because they had been specifically requested, but they are not now a part of our guidelines (final version July 7, 1981).

Herbert L. Manning

Herbert L. Manning, Ph.D.
Review Section #1
EFB/HED