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Date Out EFB: MAR 24 1980

To: Product Manager Jacoby (21)
TS-767

Through: Dr. Gunter Zweig, Chief 19
Environmental Fate Branch

From: Review Section No. 1 RW Cook
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: 239-EUTU

Chemical: captan

thiabendazole

Type Product: Fungicide

Product Name: Orthocide plus

Company Name: Chevron Chemical Division

Submission Purpose: New mixture

EFB #271

Action Code 11

ZBB Code: Sec 3

Date in: 10/3/79

Date Completed MAR 24 1980

Deferrals To:

☐ Ecological Effects Branch

☐ Residue Chemistry Branch

☐ Toxicology Branch

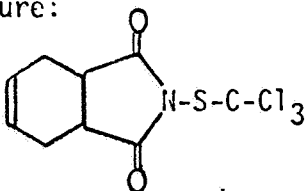
1. Introduction

Chemical Name and Type Pesticide: Captan, N-(trichloromethylthio-4-cyclohexene-1,2-dicarboximide, 9.5% a.i.; Thiabendazole, 2-(4-thiazolyl)benzimidazole, 0.5% a.i. Fungicide

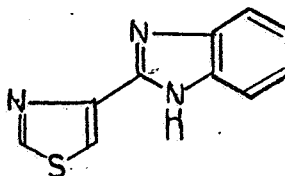
Trade Names: ORTHOCIDE-Plus, ORTHOCIDE-MERTECT

Chemical Structure:

Captan:



Thiabendazole:



The applicant requests registration for a new product, ORTHOCIDE Plus, that contains 9.5% Captan (and 0.5% related derivatives) and 0.5% Thiabendazole, as a specifically formulated dust product for use on cut potato seed pieces.

2. Directions for Use

Potatoes (Seed Pieces): Damp-Off, Fusarium Seed Rot and as an aid in reduction of Rhizoctonia Stem Canker - 3/4 lb. per 100 lbs. of cut seed pieces applied with a conventional dusting apparatus or in such a way to give even coverage on all cut pieces.

Do not use treated seed pieces for food or feed purposes.

3. Discussion of Data

Soil Persistence

Captan and Thiabendazole Residues in Soil in Which Potato Tubers were Grown from Seed Pieces Treated with ORTHOCIDE Plus, Chevron Chemical Co., Acc. #241044, September 14, 1979.

Experimental Procedure

The potato seed pieces were treated at the rate of 1.2 oz. of captan and 0.06 oz. of thiabendazole per cwt. of seed pieces in 1978 and planted in field trials in New York, New Jersey and Mississippi. Soil samples were taken at two levels: 0 to 6 inches depth and 6 to 12 inches depth and composited. The samples were taken at the following intervals:

1. Postemergence (43 to 49 days)
2. Mid-season (78 to 100 days)
3. Harvest (112 to 155 days)

The soil samples were frozen and shipped by air to the residue laboratory for analysis for captan and thiabendazole. Methods of analyses: Captan, GLC method RM-1F-2 that used a flame detector in addition to an electron capture detector; thiabendazole, gas chromatography using detectors for nitrogen and sulfur. Also cited was a procedure using ethyl acetate extraction and spectrophotofluorimeter analysis.

Results

No captan residues were detected in the soil. Detectable levels of thiabendazole were found in only one test, T-4409. The levels found were very low, 0.03 and 0.02 ppm, just slightly over the limit of detection of 0.01 ppm for these samples. Residue data are summarized in the table which follows.

Conclusions

Residues were not detected in soil samples at either sampling depth after planting treated cut potato seed pieces. It should be noted that the amounts used were 0.075 ppm of captan and 0.0037 ppm of thiabendazole.

Anaerobic Soil Metabolism

Anaerobic Soil Metabolism of Carbonyl-¹⁴C Captan, D.E. Pack, Chevron Chemical Co., File No. 721.14, Sept. 14, 1979, Acc. #241044.

Experimental Procedure

Oakley loamy soil (0.M. 1.4%) aliquots were placed in Mason jars, 100 ml water added, and the jars flushed with nitrogen. The jars were sealed and allowed to stand (25 C) for 8 weeks to become anaerobic. Samples were fortified with ¹⁴C-captan (about 6 ppm), reflushed with nitrogen, sealed, and reincubated in dark.

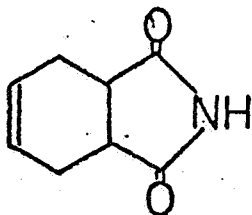
• Captan and Thiabendazole Residues (ppm) in
Soil in Which Potato Tubers were Grown from
Seed Pieces Treated with ORTHOCIDE-MERTECT 10-0.5 Seed Protectant

Test Number Location Date	Oz. Active/cwt.		Interval from Application (days)	Sampling Depth (inches)	ppm found	
	ORTHOCIDE	MERTECT			Captan	Thiabendazole
T-4408 Mississippi 1978	1.2	0.06	43	0-6	0.00 0.00	0.00 0.00
				6-12	0.00 0.00	0.00 0.00
			78	0-6	0.00 0.00	0.00 0.00
				6-12	0.00 0.00	0.00 0.00
			112	0-6	0.00 0.00	0.00 0.00
				6-12	0.00 0.00	0.00 0.00
T-4409 New York 1978	1.2	0.06	49	0-6	0.00 0.00	0.00 0.00
				6-12	0.00 0.00	0.00 0.00
			100	0-6	0.00 0.00	0.00 0.00
				6-12	0.00 0.00	0.00 0.00
			155	0-6	0.00 0.00	0.00 0.00
				6-12	0.00 0.00	0.00 0.00
T-4410 New Jersey 1978	1.2	0.06	48	0-6	0.00 0.00	0.00 0.00
				6-12	0.00 0.00	0.00 0.00
			84	0-6	0.00 0.00	0.00 0.00
				6-12	0.00 0.00	0.00 0.00
			140	0-6	0.00	0.00
				6-12	0.00	0.01

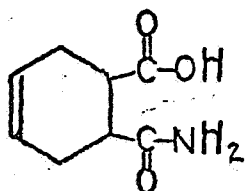
Results

Less than 9% of the dose was given off as $^{14}\text{CO}_2$ in 9 months. CO_2 was the only volatile metabolite. Captan was completely degraded after one week. The four major metabolites identified were:

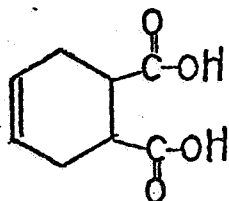
THPI: cis-4-cyclohexene-1,2-dicarboximide



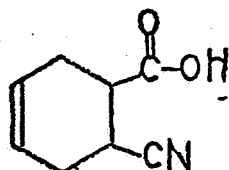
THPAm: cis-6-carboxy-3-cyclohexenecarboxamide



THPAI: cis-4-cyclohexene-1,2-dicarboxylic acid



THCY: cis-6-cyano-3-cyclohexenecarboxylic acid



Conclusion

Anaerobic degradation of captan yielded four metabolites and very little evolved HCO_2 . Comment was made in the study that the anaerobic conditions created for 8 months were extreme and would probably never occur in nature. Aerobic degradative processes have been shown (95% CO_2 evolved over 9 months) to more completely break down captan.

Metabolite characterization was accomplished by:

1. extraction of water with ethyl acetate and LSC analysis.
2. acidification of soil, ethyl acetate extractions, LSC analysis.
3. combustion of soil residue in Packard oxidizer.
4. metabolite quantitation by TLC and LSC.
5. identification by cochromatography and GC/MS.

The system to collect $^{14}\text{CO}_2$ involved a source of nitrogen, saturation with water, passage over soil sample, drying, absorption, and LSC analysis.

4. Executive Summary

Captan and thiobendazole residues were not found in soil. Anaerobic degradation of captan yielded four metabolites and very little evolved $^{14}\text{CO}_2$.

5. Recommendation

EFB concurs with the proposed use of ORTHOCIDE Plus as a potato seed piece protectant, since small amounts will be used and the environmental fate is known.

Herbert L. Manning

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