081901 Completed MAR 30 1984

EEB Chemical Profile

Chlorothalonil

100 Fish and Wildlife Toxicity

100.1 Minimum Requirements

100.1.1 Avian Acute Oral LD50

Species	Test Material	Results	Author	Date	MRID#	Category
Mallard Duck	96%	LD50 > 4640 mg/kg	Fink	1977	00036753	Core

100.1.2 Avian Dietary LC50

Species	Test Material	Results	Author	Date	MRID#	Category
Mallard Duck	Tech	LC50 = 21,500 ppm	Dieterich	1965	00039146	Core
Mallard Duck	96%	LC50 > 10,000 ppm	Shults	1979	00030389	Core
Bobwhite	96%	LC50 > 10,000 ppm	Shults	1979	00030388	Core
Mallard	DS-3701	LC50 = 2000 ppm	Beavers	1981	RIOCHL03	Core
Bobwhite	DS-3701	LC50 = 1746 ppm	Beavers	1981	RIOCHL04	Core
Mallard	DS-3701 (87%)	LD50 = 158 mg/kg	Beavers	1978	00030395	Core

100.1.3 Fish Acute LC50

Species	Test Material	Results LC50	Author	Date	MRID#	Category
Rainbow trout	96% Chloro	47 ppb	Shults	1980	00056486	Core
Bluegill	96% "	62 ppb	Shults	1980	00041439	Core
Rainbow trout	Tech "	250 "	Dieterich	1965	00039145	Suppl
Bluegill	Tech "	386 "	Dieterich	1965	00039145	Suppl
Channel catfish	Tech "	430 "	Dieterich	1965	00039145	Suppl
Channel catfish	96% "	43 "	Shults	1980	00030390	Core
Bluegill	99.7% "	84 "	Szalkowski	1979	00029410	Core
Rainbow trout	75% Chloro	152 ppb	Pitcher	1972	00087304	Invalid
Rainbow trout	75% "	103 ppb	Pitcher	1972	00087303	Invalid
Bluegill	75% "	167 ppb	McCann	1973	00087258	Invalid
Bluegill	98% "	51 "	Pitcher	1976	RIOCHL01	Core
Bluegill	Tech DS-3701	45 ppm	Szalkowski	1979	00029415	Core
Bluegill	99% DS-3701	16 ppm	Buccafusco	1977	00030393	Core

100.1.4 Aquatic Invertebrate LC50

Species	Test Material	Results	Author	Date	MRID#	Category
Daphnia magna	Tech*	70 ppb	LeBlanc	1977	00068754	Core
Daphnia magna	DS-3701 (99%)	26 ppm	LeBlanc	1977	RIOCHL02	Core

* Chlorothalonil

100.2 Additional Terrestrial Laboratory Tests

Species	Test Material	Results	Author	Date	MRID#	Category
Mallard	99.6%*	NEL > 50 ppm	Fink	1976	00041441	Core
Bobwhite	99.6%*	NEL > 50 ppm	Fink	1976	00041440	Core

100.3 Additional Aquatic Laboratory Tests

Species	Test Material Chloro.	Results	Author	Date	MRID#	Category
Fathead minnow	96%	(>3<6.5 ppb)	Shults /	1980	00030391	Core

The estimated 96-hr. LC_{50} under flowthrough conditions with measured concentrations was 23 ppb (95% C.L. = 20 to 26 ppb). Parameters measured and affected that determined effects to reproduction were: Number of spawns of F_0 generation fish; and number of F_1 eggs per spawn of F_0 generation fish.

Daphnia magna	99.8%*	(>39<79ppb)**	Suprenant	1981	RIOCHL05	Core

* Chlorothalonil

** Number F_1 offspring significantly reduced at these levels. Reported concentrations are calculated based on the measured concentrations which were less than 79% of nominal throughout the study.

Species	Test Material	Results	Author	MRID#	Category
Sheepshead minnow	Tech	96-hr LC_{50} = 32 ppb	Ward /	RIOCHL07	Core
Pink Shrimp	Tech	96-hr LC_{50} = 165 ppb	Ward	RIOCHL08	Core
Dungeness crab	75%	96-hr LC_{50} = 140 ppb	Armstrong	05001356	Invalid

* There is presently no requirement for a test on crabs; the LC_{50} was adjusted so it is the equivalent of a 100% a.i. value.

100.4 Field Study

Based on the toxicity data chlorothalonil was expected to have both acute and chronic effects on fish. Therefore a field study was required. It has been completed (Shults, 1981) but does not fulfill the requirements. The purpose of the study was to show that chlorothalonil could be used on soybeans without killing fish or showing up as residues in adjacent aquatic habitats. The problems with the study were that: the site did not represent typical soybean scenario, i.e., the pond was too big for the treated area; there were apparent adverse effects but the researchers attributed the mortality to an eye parasite. The study does not fulfill the requirements and should be reconducted. However, it does provide useful information showing that chlorothalonil will leave the field with runoff and probably through drift, even when it is applied with ground equipment.

Study revalidated to "acceptable (i.e. fulfills guideline requirements)

101. General Toxicology

The following is a summary listing of numerous toxicological study results reviewed by the Toxicology Branch. (1/14/80, D. Ritter, TOX/HED)

Old Chlorothalonil Mammalian Toxicity Data*	
acute rat oral LD_{50}	> 10,000 mg/kg
acute dog oral LD_{50}	> 5,000 mg/kg
acute rabbit dermal LD_{50}	> 10,000 mg/kg
rabbit eye irritation	transient irritation
acute rabbit inhalation LC_{50}	>4.7 mg/l
rabbit teratogenic	negative at 62.5 mg/kg (highest level fed)
16-week dog feeding	NEL < 250 ppm
4-month rat feeding	NEL < 250 ppm
2-year dog feeding	NEL < 0.15% (1500 ppm)
2-year dog feeding	NEL 60 ppm
2-year rat feeding	NEL < 0.5% (5,000 ppm)
18-month rat feeding	NEL < 0.05% (500 ppm)
2-year rat feeding	NEL 60 ppm
3-generation rat reproduction	NEL 15000 ppm (reproduction) NEL 1500 ppm (lactation)
Metabolite Data (DS-3701, 4-hydroxy-2,5,6-trichloroisophthalonitrile)	
acute rat oral LD_{50}	male 422 mg/kg female 242 mg/kg
acute dog oral LD_{50}	100 mg/kg
acute rat oral LD_{50}	332 mg/kg
4-month rat feeding	NEL 100 ppm
90-day dog feeding	NEL <50 ppm
3-generation rat reproduction	NEL not established

According to the 1/14/80 review by Ritter, Chlorotholonil is a demonstrated carcinogen in rats.

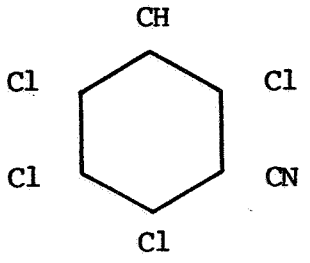
* Personal communication with Dave Ritter of Toxicology Branch (3/13/84) revealed that much of this data has subsequently been rejected and new one-liners will be available soon.

102 Physical and Chemical Properties

102.1 Chemical Name

2,4,5,6-Tetrachloroiosophthalonitrile

102.2 Structural Formula



102.3 Common Name

Chlorothalonil

101.4 Trade Name

Bravo 500

101.5 Molecular Weight

265.9

101.6 Physical State

Chlorothalonil is a white, tasteless, crystalline solid. The techical grade has a slight pungent odor, while the pure chemical is odorless.

101.7 Solubility

A 25°C (77°F) Chlorothalonil is soluble in:

Acetone	2%
Water	0.6 ppm
Xylene	8%

103 Behavior in the Environment

103.1 Soils

Chlorothalonil degrades at a moderate rate in most soils, with a half-life of less than 30 days. Lack of moisture tends to slow down this degradation process. Rate of breakdown increases as temperature rises from 21°C to 39°C. DS-3701 (4-hydroxy-2,5, 6-trichloroiosophthalonitrile) is the major metabolite of chlorothalonil. It is extremely persistent, with no dissipation of this product observed without 90 days, and leaches in many types of soils.

103.2 Water

Chlorothalonil does not hydrolyze under acid or neutral conditions, while it hydrolyzes to DS-3701 or DS-19221 (3-cyano -2,4,5,6-tetrachlorobenzamide) in basic solution with one-half life of 35 days. DS-3701 is stable to hydrolysis.

103.2 Plant

Chlorothalonil apparently does not translocate from soil into plants. Both chlorothalonil and DS-3701 are stable to photodegradation on surfaces which would include plant surfaces. Crops treated with chlorothalonil have been analyzed, with residues up to 6 ppm at preharvest intervals less than, and application rates higher than those proposed for soybeans.

103.4 Animal

The bioconcentration of chlorothalonil in bluegill plateaus at 60 to 200X in edible tissues and 900 to 3000X in nonedible tissues. DS-3701's bioconcentration in bluegill plateaus at 50X in edible tissues and 250X in non-edible tissues. Residues of both parent and metabolite declined in their respective tests to less than 50% of plateau concentration after 7 to 10 days in clean water.

103.5 Microorganisms

After reviewing the EFB file on this fungicide, it is not clear whether any acceptable data on the effects of microorganisms on chlorothalonil is available.

104 Uses and Special Concerns

Chlorothalonil is a non-systemic protectant fungicide used to control foliar diseases of vegetable and ornamental crops. It is also registered for peanuts, soybeans, papaya, passion fruit, application to seeds of cotton, and as a antimildew and antifouling paint additive. It can be applied to crops as a spray or dust via ground or aerial application. Treatment may also be done by overhead irrigation systems.

Use Sites and Use Rates

The following summarizes the chlorothalonil use sites and rates compiled from labels of federally-registered products.

Crop	lb ai/acre[1/]
Vegetables:	
Beans	2.2
Dry Beans	1.5
Navy	
Pinto	
Kidney	
Lima	
Blackeye	
Broccoli	1.2
Brussels sprouts	1.2 to 1.5
Cabbage	1.2
Carrots	1.2 to 1.5
Cauliflower	1.2
Celery	0.8 to 2.3
Corn (sweet)	1.2 to 1.5
Cucumbers	1.2 to 1.5
Melons[2/]	1.2 to 1.5
Onions	1.2 to 2.3
Vegetables:	
Potatoes	0.8 to 1.2
Pumpkins	1.2 to 1.5
Squash	1.2 to 1.5
Tomato	1.4 to 2.3
Watermelons	1.2 to 1.5
Field Crops:	
Peanuts	0.8 to 1.2
Soybeans	0.8 to 1.8

Fruit:	
Citrus	5.7[4/]
Passion fruit[3/]	1.4
Papaya	1.6 to 3.0
Stone fruit	3 to 4
Peach	
Nectarine	
Apricot	
Cherry	
Plum	
Prune	
Seed Treatment:	
Cotton	0.8 to 1.2 oz/ 100 lb seed.
Ornamentals:	
Conifers	2.0 to 6.4
Turf	3.8 to 7.5
Outdoor	1.1 to 1.5
Greenhouse	0.04 lb/1000 sq. ft. area
Bluegrass (for seed)	1.5
Industrial Use:	
Paints and stains	2.4 to 11.5 lb/100 gallon paint
Lumber treatment	
Other:	
Antifouling paints	

1/ Exceptions as noted.
2/ Includes cantaulopes, honeydew melons, and muskmelons.
3/ Hawaii only.
4/ Registration No. 677-313, not registered for it yet.

Field Kills

One field kill in Texas (1/14/76) involving chlorothalonil was reported to the Pesticide Incident Monitoring System. Approximately 200 to 300 fish including carp, shad, perch and catfish were killed when spray equipment rinse water was emptied into a small lake which drained into a stream. Water and fish samples were taken from the lake and analyzed. Chlorothalonil was found at concentrations of 0.275 ppm in the water sample and 0.250 in the fish sample.