United States
Environmental Protection
Agency

Office of Prevention, Pesticides
and Toxic Substances
(7501C)

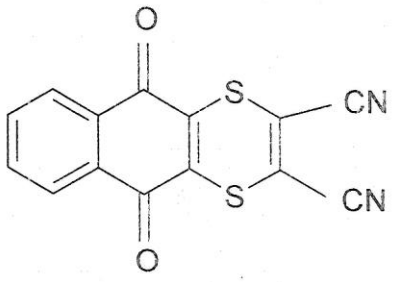
Pesticide Fact Sheet

Name of Chemical: **Dithianon**
Reason for Issuance: **New Chemical**
Date Issued:

1. DESCRIPTION OF CHEMICAL

Generic Name:	Dithianon (5,10-dihydro-5,10-dioxonaphtho(2,3-b)-1,4-dithiin-2,3-dicarbonitrile
Common Name:	Dithianon
Trade Names:	Delan® 750 WP, Delan® 750 SC, Delan® 700 WDG, Delan® 500 SC, Ventugan 50SC
Chemical Class:	Quinone Fungicide
EPA Chemical Code:	099201
Chemical Abstracts Service (CAS) Number:	3347-22-6
Registration Status:	Not registered, Import Tolerance Established
Pesticide Type:	Fungicide
U.S. Producer:	BASF Corporation

Chemical Structure:



Tolerances Established

Tolerances were established in the 40 CFR 180 for pome fruit (apples and pears) at 5 ppm; and dried hops at 100 ppm. There are currently no established Canadian or Mexican MRLs for dithianon.

Use Pattern and Formulations

Dithianon is a broad spectrum multi-site protectant fungicide used outside the U.S. for control of apple and pear scab, black rot, rust, and leaf spot diseases in pome fruit, and Peronospora in hops. There are no U.S. registrations or proposed registrations of dithianon in the U.S. at this time.

Dithianon is registered for foliar uses on pome fruit in Japan, Australia, New Zealand, South Africa, the UK, Spain, Austria, France, Germany, Italy, Turkey, Israel, Argentina, Brazil, and Chile. Dithianon is registered for foliar use on hops in Germany. Codex Maximum Residue Levels (MRLs) have been established for residues of dithianon in or on pome fruit at 5 mg/kg and hops at 100 mg/kg; the proposed tolerances on imported commodities are harmonized with established MRLs. There are currently no established Canadian or Mexican MRLs for dithianon.

SCIENCE FINDINGS

Available product chemistry and toxicology data supporting the proposed tolerance are summarized below:

Physical Chemical Structure:

Test Compound Nomenclature.	
Common Name	Dithianon
Empirical Formula	$C_{14}H_4N_2O_2S_2$
Company Experimental Names	CL37114, WL49890, SAG 107, CME 107, IT-931
IUPAC Name	5,10-dihydro-5,10-dioxonaphtho(2,3-*b*)-1,4-dithi-in-2,3-dicarbonitrile
CAS Name	5,10-dihydro-5,10-dioxonaphtho(2,3-*b*)-1,4-dithiin-2,3-dicarbonitrile
CAS Registry Number	3347-22-6
Chemical Class	Quinone fungicide
Known Impurities of Concern	None
End-Use Products (EUPs)	There are no products currently registered in the U.S.; the products identified in the petition were Delan7 750 WP, Delan7 750 SC, Delan7 700 WDG, Delan7 500 SC, and Ventugan 50SC.

Physicochemical Properties of the Technical Grade Test Compound.		
Parameter	**Value**	**Reference**
Melting Point/Range (°C)	216	MRID 44092604
pH (at 20°C)	4.4 to 4.8 (1% wt/wt aqueous dispersion).	MRID 44092604
Density (g/cm^3 at 20°C)	1.58	MRID 44092604
Water Solubility (at 20°C)	Nearly insoluble (roughly 0.02 mg/100 mL).	MRID 44092604
Solvent Solubility (at 20°C)	Acetone 1.76 g/100 mL Dichloromethane 2.01 g/100 mL Ethyl acetate 0.77 g/100 mL Hexane 0.96 mg/100 mL Methanol 0.08 g/100 mL Toluene 1.59 g/100 mL	MRID 44092604
Vapor Pressure (Pa at 25°C)	2.71×10^{-9}	MRID 44092604
Dissociation Constant (pK_a)	Not available (insufficient solubility in water).	MRID 44092604
Octanol/Water Partition Coefficient (Log [K_{OW}])	3.2 ± 0.3	MRID 44092604
UV/Visible Absorption Spectrum	Not provided.	

Acute Toxicity Profile for Dithianon.					
Test Material* [% ai]	**Guideline Number**	**Study Type**	**MRID Number**	**Results**	**Toxicity Category**
Technical Product	**870.1100**	Acute oral - rat	44092605	LD_{50} (_+_) = 702 mg/kg (95% C.I. = 597-893 mg/kg)	III
Technical Product	**870.1200**	Acute dermal - rat	Not applicable for proposed use pattern (Import tolerance).		
Technical Product	**870.1300**	Acute inhalation - rat	Not applicable for proposed use pattern (Import tolerance).		

Acute Toxicity Profile for Dithianon.					
Test Material* [% ai]	**Guideline Number**	**Study Type**	**MRID Number**	**Results**	**Toxicity Category**
Technical Product	**870.2400**	Acute eye irritation - rabbit	Not applicable for proposed use pattern (Import tolerance).		
Technical Product	**870.2500**	Acute dermal irritation - rabbit	Not applicable for proposed use pattern (Import tolerance).		
Technical Product	**870.2600**	Skin sensitization - guinea pig	Not applicable for proposed use pattern (Import tolerance).		

Subchronic, Chronic, and Other Toxicity Profile for Dithianon.				
Guideline Number	**Study Type/ *Classification***	**MRID Number**	**Doses**	**Results**
870.3100	90-Day oral toxicity rodents - rat *Acceptable/guideline*	44092606	0, 30, 180, 1080 ppm **M:** 0, 2.53, 14.64, 86.66 mg/kg/day **F:** 0, 2.97, 16.32, 99.53 mg/kg/day	**NOAEL** = 14.64/16.32 mg/kg/day (M/F) **LOAEL** = 86.66/99.53 mg/kg/day (M/F) based on decreased body weights and overall body weight gains in both sexes.
870.3150	90-Day oral toxicity in nonrodents - dog *Acceptable/guideline*	44092607	0, 40, 200, 1000 ppm **M:** 0, 0.63, 2.95, 12.58 mg/kg/day **F:** 0, 0.66, 3.00, 12.61 mg/kg/day	**NOAEL** = 2.95/3.00 mg/kg/day (M/F) **LOAEL** = 12.58/12.61 mg/kg/day (M/F) based on decreased body weights (F only), decreased body weight gains and food consumption (M&F), and increased alkaline phosphatase activity (M&F).
870.3700	Developmental toxicity in rodents - rat *Acceptable/guideline*	44092611 44092612	0, 20, 50, 70, 100 mg/kg/day Dosing period: GD 6-15	**Maternal** **NOAEL** = 20 mg/kg/day **LOAEL** = 50 mg/kg/day based on decreased body weights, body weight gains, and food consumption. At 100 mg/kg/day, 5/25 dams died between GD 13 and 17. **Developmental** **NOAEL** = 20 mg/kg/day **LOAEL** = 50 mg/kg/day based on increased incidence of total litter loss (20-42% at ≥ 50 mg/kg/day) and post-implantation loss due to early resorptions (showed decidual or placental tissues only). At 100 mg/kg/day, weights of the

Subchronic, Chronic, and Other Toxicity Profile for Dithianon.				
Guideline Number	**Study Type/ *Classification***	**MRID Number**	**Doses**	**Results**
				surviving fetuses were decreased.
870.3700	Developmental toxicity in nonrodents - rabbit *unacceptable/guideline*	44092613 44092614	0, 10, 25, 40 mg/kg/day Dosing period: GD 6-18, beginning prior to implantation.	The Maternal **NOAEL** and **LOAEL** could not be determined due to improper gavage techniques, which resulted in abortions and deaths. The **developmental NOAEL and LOAEL** could not be determined due to excessive pre-implantation loss (44%, 38%, 32%, and 58% per group in the 0, 10, 25, and 40 mg/kg/day dose levels, respectively). High pre-implantation loss alters litter size, fetal weights, and other parameters, hindering the ability to assess post implantation loss. Additionally, the number of litters was insufficient to meet guideline requirements, due to high maternal mortality.
870.3800	Reproduction and fertility effects - rat *Acceptable/guideline*	44092615	0, 35, 200, 600 ppm **M:** 0, 2.2, 12.6, 37.8 mg/kg/day **F:** 0, 2.5, 14.5, 42.7 mg/kg/day	**Parental/Systemic** **NOAEL** = 12.6/14.5 mg/kg/day (M/F) **LOAEL** = 37.8/42.7 mg/kg/day (M/F) based on decreased body weights, body weight gains, and food consumption during pre-mating. **Reproductive** **NOAEL** = 37.8/42.7 mg/kg/day (M/F) **LOAEL** = Not determined. **Offspring** **NOAEL** = 37.8/42.7 mg/kg/day (M/F) **LOAEL** = Not determined.
870.4100	Chronic toxicity - rodents	See 870.4300. This study includes requirements of both 870.4100 and 870.4200.		
870.4100	Chronic toxicity - dog *Acceptable/guideline*	44092608	0, 40, 200, 1000 ppm **M:** 0, 1.5, 6.7, 37.1 mg/kg/day **F:** 0, 1.6, 7.6, 35.0	**NOAEL** = 6.7/7.6 mg/kg/day (M/F) **LOAEL** = 37.1/35.0 mg/kg/day (M/F) based on increased absolute and relative liver and kidney

Subchronic, Chronic, and Other Toxicity Profile for Dithianon.				
Guideline Number	**Study Type/ *Classification***	**MRID Number**	**Doses**	**Results**
			mg/kg/day	weights, increased alkaline phosphatase, decreased blood urea nitrogen, hepatocellular hytrophy, histiocyte pigmentation, and renal pigmentation (M&F).
870.4200	Carcinogenicity - rat	See 870.4300. This study includes requirements of both 870.4100 and 870.4200.		
870.4200	Carcinogenicity - mouse *Acceptable/guideline*	44092609 44092610	0, 20, 100, 500 ppm **M:** ~ 0, 3, 15, 75 mg/kg/day **F:** ~ 0, 3, 15, 75 mg/kg/day Doses were estimated using the conversion ratio.	**NOAEL** = ~ 15 mg/kg/day (M&F) **LOAEL** = ~ 75 mg/kg/day (M&F) based on increased mortality (M), increased kidney weights, (M&F), and increased incidences and severity of kidney lesions (chronic nephropathy, cortical cysts, tubular dilatation, and infarct) in both sexes. *No evidence of carcinogenicity*
870.4300	Combined chronic toxicity/ carcinogenicity - rat *Acceptable/guideline*	44092616 44092617 44092618	0, 20, 120, 600 ppm **M:** ~ 0, 1, 6, 30 mg/kg/day **F:** ~ 0, 1, 6, 30 mg/kg/day Doses were estimated using the conversion ratio.	**NOAEL** = ~ 6 mg/kg/day (M&F) **LOAEL** = ~ 30 mg/kg/day (M&F) based on decreased body weight gain and increased relative to body kidney weights (M&F), grossly observed kidney lesions in males (irregular surfaces, pale kidneys, cysts, and enlarged kidneys) and females (masses), and non-neoplastic lesions of the kidney in males (tubular nephrosis, renal cysts, and end-stage kidney lesions) and females (tubular nephrosis, proliferative tubles, and glomerulonephropathy). ***Evidence of carcinogenicity:*** renal adenomas and carcinomas observed in 600 ppm females.
870.5100	Gene mutation - bacterial reverse mutation assay *Acceptable/guideline*	44092619 44280401	0.1 - 333.3 µg/plate (-S9) 10 - 3333.3 µg/plate (+S9)	Negative.
870.5100	Gene mutation - bacterial reverse mutation assay	44092619 44280402	1 - 333.3 µg/plate (-S9) 33.3 - 3333.3 µg/plate	Negative.

Subchronic, Chronic, and Other Toxicity Profile for Dithianon.				
Guideline Number	**Study Type/ *Classification***	**MRID Number**	**Doses**	**Results**
	Acceptable/guideline		(+S9)	
870.5300	Cytogenetics - *in vitro* mammalian cell gene mutation test (CHL Cells) *Unacceptable/guideline*	44092619 44280403	0, 20, 50, 100, 200 µg/ml (-S9) 60, 150, 300, 600 µg/ml (+S9)	Negative. This study is unacceptable due to inadequate cyctotoxicity at the HDT.
870.5300	Cytogenetics - *in vitro* mammalian cell gene mutation test (CHO Cells) *Acceptable/guideline*	44092619 44280404	**Trial 1**: 0.03-1.33 g/ml (-S9); 0.33-1.33 g/ml (+S9). **Trial 2**: 0.33-1.00 g/ml (-S9); 0.33-1.33 g/ml (+S9). **Trial 3**: 0.10-1.33 g/ml (+S9). **Trial 4**: 0.03-1.00 g/ml (-S9); 0.10-1.33 g/ml (+S9).	Negative.
870.5375	Cytogenetics - *in vitro* mammalian cell chromosome aberration test *Acceptable/guideline*	44092620 44280405	**7 hours fixation**: 0 or 600 ng/ml (-S9): 0 or 5000 ng/ml (+S9). **18 hours fixation**: 0, 25, 500, 600 ng/ml (-S9); 0, 500, 1000, 5000 ng/ml (+S9). **28 hours fixation**: 0 or 300 ng/ml (-S9); 0 or 3500 ng/ml (+S9).	Mutagenic: Evidence of structural chromosome aberrations induced over background.
870.5385	Cytogenetics - mammalian bone marrow chromosomal aberration test (rats). *Acceptable/guideline*	44092620 44280406	0, 22.3, 106.0, 393.5 mg/kg	Negative.
870.5395	Cytogenetics - mammalian erythrocyte micronucleus test (mice) *Unacceptable/guideline*	44092620 44280407	0, 1, 10, 100 mg/kg	Negative. This study is unacceptable due to missing information on test material purity.
870.5550	Other effects - unscheduled DNA synthesis in mammalian	44092621	0, 0.1, 1.0, 5.0, 10.0, 15.0, or 20.0 g/ml for 3 hours.	Negative.

Subchronic, Chronic, and Other Toxicity Profile for Dithianon.				
Guideline Number	**Study Type/ *Classification***	**MRID Number**	**Doses**	**Results**
	cells in culture (rats) *Acceptable/guideline*			
870.7485	Metabolism and pharmacokinetics - rat *Acceptable/guideline*	44092622 44092623	**(1)** 10 or 50 mg/kg radiolabeled, single dose by oral gavage. **(2)** 10 mg/kg/day unlabeled, 14 days by oral gavage, PLUS 10 mg/kg radiolabeled, single dose by oral gavage. **(3)** 10 mg/kg/day radiolabeled, 7 days by oral gavage.	**Absorption:** Rapid. Dithianon was detected in plasma within 15 min. As measured in urine and bile, 31-43% was absorbed. Not dose-dependent. **Distribution:** Besides the GI tract, highest levels in kidneys. Also detected in liver, plasma, and whole blood. Not detected in brain or spinal cord. No sex-related differences. **Metabolism:** Rapidly and completely degraded to many, mostly polar, compounds. 15 fractions isolated from urine, >25 fractions from feces, many from kidneys and liver. Only 1 fraction was >5% of the radioactivity from the single administered dose; that was a glucuronic acid conjugate found in the 8-24 hr urine sample. No sex-related differences. **Excretion:** No bioaccumulation. The radioactivity recovered within 120 hours was 64-72% of the administered dose in feces, 27-31% in urine, <0.7% cage wash, <0.2% in carcass, 0% in exhaled air. Bile was a minor excretion pathway, with only 7.2-11.6% of the administered dose recovered in the bile. The terminal half-life was 46-57 hrs. No sex- or dose-related differences.

Toxicological Endpoints

Summary of Toxicological Doses and Endpoints for Dithianon to be Used in Human Health Risk Assessments.			
Exposure Scenario	**Dose Used in Risk Assessment and UF**	**FQPA SF and Level of Concern for Risk Assessment**	**Study and Toxicological Effects**
Acute Dietary (females 13-49 years of age)	NOAEL = 20 mg/kg/day UF = 1000 [a] **Acute RfD** = 0.02 mg/kg/day	FQPA SF = 1 **aPAD** = acute RfD / FQPA SF = 0.02 mg/kg/day	**Developmental toxicity study in rats** LOAEL = 50 mg/kg/day based on post-implantation loss due to early resorptions
Acute Dietary (general population, including infants and children)	None	None	**Not selected** No appropriate dose and endpoint could be identified for these population groups.
Chronic Dietary (all populations)	NOAEL = 6 mg/kg/day UF = 1000 [a] **Chronic RfD** = 0.006 mg/kg/day	FQPA SF = 1 **cPAD** = chronic RfD / FQPA SF = 0.006 mg/kg/day	**Combined chronic toxicity/oncogenicity study in rats** LOAEL = 30 mg/kg/day based on decreased body weight gains and increased relative to body kidney weights (M&F), grossly observed kidney lesions in males (irregular surfaces, pale kidneys, cysts, and enlarged kidneys) and females (masses), and non-neoplastic lesions of the kidney in males (tubular nephrosis, renal cysts, and end-stage kidney lesions) and females (tubular nephrosis, proliferative tubules, and glomerulonephropathy).
Incidental Oral (all durations)	None	None	**Not selected** Tolerance on imported commodities - no proposed uses would result in residential exposure in the US.
Dermal (all durations)	None	None	**Not selected** Tolerance on imported commodities - no proposed uses would result in residential or occupational exposure in the US.
Inhalation (all durations)	None	None	**Not selected** Tolerance on imported commodities - no proposed uses would result in residential or occupational exposure in the US.

UF = uncertainty factor, FQPA SF = FQPA safety factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, PAD = population adjusted dose (a = acute, c = chronic) RfD = reference dose, MOE = margin of exposure, LOC = level of concern, N/A = Not Applicable. a Additional 10x database uncertainty factor for lack of an acceptable developmental rabbit study.

Food Quality Protection Act Considerations

Based on the hazard and exposure data, the dithianon risk assessment team has recommended that the special FQPA SF be reduced to 1X because there are no/low concerns with regard to pre- and/or postnatal toxicity, and residual uncertainty has been addressed. This recommendation is based on the following:

(1) residual uncertainty concerning the lack of an acceptable developmental toxicity study in rabbits has been addressed through the use of a 10X database uncertainty factor (UF_{DB});
(2) there is no indication of increased quantitative or qualitative susceptibility of rats to *in utero* and/or postnatal exposure to dithianon;
(3) the dietary food exposure assessment utilizes average residues from crop field trials and 100% crop treated information for all commodities; by using these screening-level assessments, chronic exposures/risks will not be underestimated; and
(4) there are no existing or proposed residential uses for dithianon at this time

Exposure Assessment

Acute and chronic dietary assessments were conducted using Dietary Exposure Evaluation Model (DEEM-FCID™, version 2.03), which uses food consumption data from the USDA's Continuing Surveys of Food Intake by Individuals (CSFII) from 1994 to 1998. An acute end-point was selected for only one population subgroup, females 13-49, for reproductive effects. The acute dietary assessment was based on tolerance-level residues, empirical processing factors for apple and pear juices, and 100% crop treated. The chronic analysis uses anticipated (average) residues from field trial data and assumes 100% crop treated for pome fruit and hops. Exposure to dithianon would originate from food only, because the proposed tolerances would only be established on imported commodities. With no proposed U.S. registration, there is no expectation that dithianon residues would occur in surface or ground water sources of drinking water. The dietary analyses indicate that the expected acute and chronic dietary exposures to dithianon are below the Agency's level of concern (100% of the PAD). Females 13-49 had a risk estimate which was below the Agency's level of concern, utilizing 66% of the acute population adjusted dose (aPAD) at the 95th percentile of exposure. For chronic dietary (food only) exposure to dithianon, the most highly exposed subgroup is all infants (< 1 year), which utilized 55% of the cPAD. Chronic dietary risk to all other subgroup is less than that of all infants (<1 year). The general U.S. population utilizes 12% of the cPAD.

Dithianon is not intended for use in public, residential, or occupational settings; also, there is no expectation that exposure to dithianon residues would occur via water consumption. Therefore, risk assessments for drinking water, residential, aggregate, and occupational exposures were not performed.

Summary of Data Gaps

(1) **Toxicology**

Information concerning the purity of Batch No. 162/83 of dithianon, used in MRID 44092620, Study 3 (MRID 44280407, QA/QC Draft Study Report) is required.

(2) **Residue Chemistry**

The Agency examined the residue chemistry database for dithianon. The registrant must submit additional information pertaining to the directions for use and the crop field trials, and must submit a revised Section F.

(3) ***860.1340 Residue Analytical Methods***

A confirmatory method must be submitted for the proposed tolerance-enforcement method for pome fruit, HPLC/UV Method #HUK 460/38-01R. Alternatively, an interference study (demonstrating that none of the other pesticides registered on pome fruit interfere with the determination of dithianon) may be submitted.

(4) ***860.1500 Crop Field Trials***

(4a) Additional information should be submitted for the apple trials conducted in Brazil and the pear trials conducted in Australia and New Zealand (trials in Appleby, Nelson only). The petitioner should provide the application rates calculated in terms of lb ai/A and/or kg ai/ha

(4b) Because the major pome fruit importing countries have changed significantly since the submitted field trials were conducted, additional confirmatory field trials from Argentina and Chile should be conducted. The petitioner should conduct two field trials with apples in Argentina, two field trials with apples in Chile, and one field trial with pears in Argentina. However, EPA is not requiring these data in conjunction with the current petition, but will require the additional pome fruit field trials if and when a request is submitted for any new uses and/or new tolerance.

(5) ***860.1500 Proposed Tolerances***

The Agency has determined that the terminal residue of concern in plant and ruminant commodities is dithianon *per se*. The tolerance expression proposed in this petition is appropriate.

Codex MRLs have been established for pome fruit at 5 mg/kg, and hops at 100 mg/kg; the proposed tolerances (without US registration) on imported commodities are harmonized with

established MRLs. Codex MRLs have also been established for cherries, grapes, mandarins, and pomelos. There are currently no established Canadian or Mexican MRLs for dithianon.

It is noted that there are currently no dithianon registrations in the US. The proposed tolerances (without US registration) should be revised to reflect the correct commodity definitions, Fruit, Pome, Group 11 and Hop, Dried cones. The petitioner must submit a revised Section F for PP#6E4781 to reflect these changes.

(6) ***860.1650 Submittal of Analytical Reference Standards***

The available dithianon standard at the EPA National Pesticide Standards Repository is old and must be replenished.

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DISCLAIMER: The information presented in this Pesticide Fact Sheet is for informational purposes only and may not be used to fulfill data requirements for pesticide registration and reregistration.

Appendix I

GLOSSARY OF TERMS AND ABBREVIATIONS

ai	Active Ingredient
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
EUP	Experimental Use Permit
FFDCA	Federal Food, Drug and Cosmetic Act
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FQPA	Food Quality Protection Act
HED	Health Effects Division, Office of Pesticide Programs
HPLC/UV	
K_{ow}	Octanol/Water Partition Coefficient
LD_{50}	Median Lethal Dose. A statistically derived single dose that can be expected to cause death in 50% of the test animals when administered by the route indicated (oral, dermal, inhalation.) It is expressed as a weight of substance per unit weight of animal, e.g., mg/kg.
LOAEL	Lowest Observed Adverse Effect Level
LOC	Level of Concern
mg/kg/day	milligrams per kilogram (body weight) per day
mg/L	Milligrams per Liter
MOE	Margin of Exposure
Ml	
Mrl	
NA	Not Applicable
Ng/ml	
NOAEL	No Observed Adverse Effect Level
OPP	EPA Office of Pesticide Programs
OPPTS	EPA Office of Prevention, Pesticides and Toxic Substances
PAD	Population Adjusted Dose
ppb	Parts Per Billion
ppm	Parts Per Million
pk_a	Disassociation Constant
REI	Restricted Entry Interval
RfD	Reference Dose
SF	Safety Factor
TGAI	Technical Grade Active Ingredient
UF	Uncertainty Factor
UF_{DB}	
µg	Micrograms
µg/L	Micrograms per Liter
USDA	United Stated Department of Agriculture

Appendix II

Dithianon Bibliography

MRID	Citation Reference
44092604	Jungblut, H.; Ost, W.; Vogel, W. (1993) Physical and Chemical Characteristics: Dithianon Fungicide: Lab Project Number: 107AX-119-005: CEA 6428: CEA 6427. Unpublished study prepared by Shell Agrar GmbH & Co. KG: RCC Umweltchemie AG; Shell Forschung Gmb/H/SFS-CES. 228 p.
44092605	Ullmann, L. (1993) Acute Oral Toxicity Study With Dithianon in Rats: Lab Project Number: 076487. Unpublished study prepared by Research & Consulting Co. 55 p.
44092606	Leuschner, F.; Neumann, B. (1989) 90-Day Feeding Study of Dithianon...in Sprague-Dawley Rats: Lab Project Number: 3836/86. Unpublished study prepared by LPT Laboratory of Pharmacology and Toxicology. 346 p.
44092607	Leuschner, F.; Neumann, B. (1990) 90-Day Feeding Study of Dithianon...in Beagle Dogs: Lab Project Number: 3837/86. Unpublished study prepared by LPT Laboratory of Pharmacology and Toxicology. 204 p.
44092608	Clay, H. (1991) Dithianon: 52 Week Oral (Dietary Administration) Toxicity Study in the Beagle: Lab Project Number: 5939-460/20: 460/20: P3532D. Unpublished study prepared by Hazleton UK. 270 p.
44092609	Brown, D. (1990) Dithianon: 80 Week Oral (Dietary Administration) Carcinogenicity Study in the Mouse: Lab Project Number: 460/16: P3353D. Unpublished study prepared by Hazleton UK. 976 p.
44092610	Brown, D. (1987) Dithianon: 4 Week Oral (Dietary Administration) Dose Range-Finding Study in the Mouse: Lab Project Number: 460/15: 5478-460/15. Unpublished study prepared by Hazleton UK. 63 p.
44092611	Mueller, W. (1993) Dithianon: Oral (Gavage) Teratogenicity Study in the Rat: Lab Project Number: 460-043. Unpublished study prepared by Hazleton Laboratories Deutschland GmbH. 270 p.
44092612	Muller, W. (1993) Dithianon: Preliminary Oral (Gavage) Embryotoxicity Study in the Rat: Lab Project Number: 460-042. Unpublished study prepared by Hazleton Laboratories Deutschland GmbH. 177 p.
44092613	Mueller, W. (1990) Dithianon: Oral (Gavage) Teratogenicity Study in the Rabbit: Lab Project Number: 460-045. Unpublished study prepared by Hazleton Laboratories Deutschland GmbH. 181 p.
44092614	Mueller, W. (1993) Dithianon: Oral (Gavage) Embryotoxicity Study in the Rabbit: Lab

Project Number: 460-044. Unpublished study prepared by Hazleton Laboratories Deutschland GmbH. 113 p.

44092615 Osterburg, I. (1993) Dithianon: Two Generation Oral (Dietary Administration) Reproduction Toxicity Study in the Rat: Lab Project Number: 460-030. Unpublished study prepared by Hazleton Laboratories Deutschland GmbH. 983 p.

44092616 Brown, D. (1991) Dithianon: 104 Week Oral (Dietary Administration) Carcinogenicity and Toxicity Study in the Rat: Lab Project Number: 460/14. Unpublished study prepared by Hazleton UK. 1826 p.

44092617 Price, S. (1993) Dithianon: Short-Term Study on the Renal Cell Turnover in the Female Sprague-Dawley Rat: Lab Project Number: 20/91/TX: RI93/TOX/0006. Unpublished study prepared by Robens Institute, University of Surrey. 111 p.

44092618 Price, S. (1991) Short-Term Study (7 Days) on the Nephrotoxicity of Dithianon on Male and Female Sprague-Dawley Rats: Lab Project Number: RI91/0306: 9/91/TX. Unpublished study prepared by Robens Institute, University of Surrey. 94 p.

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