CHLOROTHALONIL (081)

The first draft was prepared by Mr Christian Sieke, Federal Institute for Risk Assessment, Berlin, Germany

EXPLANATION

Chlorothalonil is a non-systemic fungicide first evaluated by JMPR in 1974 and a number of times subsequently. It was recently reviewed for toxicology by the 2009 and 2010 JMPR within the periodic review program of the CCPR. For the parent substance an ADI of 0-0.02 mg/kg bw and an ARfD of 0.6 mg/kg bw were established. In addition to the parent substance an ADI of 0-0.008 mg/kg bw and an ARfD of 0.03 mg/kg bw were established for the metabolite SDS-3701. In 2010 the JMPR also considered the toxicity of the soil metabolite R611965, however due to the lower toxicity compared to the parent compound, estimation of a separate ADI and ARfD was considered unnecessary.

The 2010 JMPR recommended the following residue definition for chlorothalonil:

Definition of the residue for compliance with MRL for plant commodities: *chlorothalonil*

Definition of the residue for estimation of dietary intake for plant commodities: *chlorothalonil*

SDS-3701 (2,5,6-trichloro-4-hydroxyisophthalonitrile), all considered separately.

Definition of the residue for compliance with MRL and for estimation of dietary intake for animal commodities: *SDS-3701 (2,5,6-trichloro-4-hydroxyisophthalonitrile).*

In 2012 the JMPR evaluated additional uses for chlorothalonil in banana, chard, chicory, endive, spring onion, spinach, and peas.

The current Meeting received new information on use patterns for chlorothalonil in multiple crops supported by additional analytical methods, storage stability data and supervised field trials.

RESIDUE ANALYSIS

Analytical methods

For chlorothalonil and its metabolite SDS-3701 two additional analytical methods were provided for plant matrices.

Method GRM005.01A (Chaggar, 2006, CLTA10_269 & CLTA10_270)
Crop samples are extracted by homogenisation with acetone; 5M sulphuric acid solution (95:5 v/v) and then centrifuged. For chlorothalonil determination, aliquots were diluted with water followed by solid phase extraction (SPE) clean-up. Chlorothalonil was analysed by gas chromatography with mass selective detection (GC-MSD). For the determination of R182281, aliquots were diluted with acetonitrile:water and quantified by high performance liquid chromatography with triple-quadrupole mass spectrometric detection (LC-MS/MS). Target markers are m/z: 266 → 264 and m/z: 266 → 268 for chlorothalonil and m/z: 245 → 182 and m/z: 245 → 175 for SDS-3701.

Table 1 Recovery data for method GRM005.01A measuring chlorothalonil and SDS-3701 plant matrices

Matrix	Fortification level (mg/kg)	n	Recovery range (%)	Recovery, mean (%)	RSD (%)	Analyte, reference
Apple	0.01	5	92-98	95	2	Chlorothalonil, Chaggar, 2006, CLTA10_269 & CLTA10_270, m/z: 266 → 264
	0.1	5	75-81	78	4	
Peach	0.01	5	103-109	105	2	
	0.1	5	91-111	100	8	
Grape	0.01	5	83-94	88	6	
	0.1	5	96-103	100	3	

Matrix	Fortification level (mg/kg)	n	Recovery range (%)	Recovery, mean (%)	RSD (%)	Analyte, reference
Strawberry	0.01	5	88-100	93	5	
	0.1	5	91-106	99	6	
Orange, skin	0.01	5	86-95	92	4	
	0.1	5	83-91	88	4	
Orange, flesh	0.01	5	72-92	85	9	
	0.1	5	92-98	94	3	
Olive	0.01	5	77-85	81	4	
	0.1	5	76-80	78	2	
Banana, skin	0.01	5	92-97	95	2	
	0.1	5	96-105	101	3	
Banana, flesh	0.01	5	99-103	101	1	
	0.1	5	99-110	105	4	
Potato, tuber	0.01	5	66-77	72	6	
	0.1	5	92-101	96	4	
Carrot	0.01	5	97-104	100	3	
	0.1	5	90-104	99	5	
Onion	0.01	5	94-100	96	3	
	0.1	5	84-105	96	8	
Cabbage	0.01	5	90-96	94	2	
	0.1	5	84-96	94	4	
Cauliflower	0.01	5	103-114	108	4	
	0.1	5	97-107	101	4	
Leek	0.01	5	79-99	89	9	
	0.1	5	88-97	93	4	
Pea, fresh seed	0.01	5	80-102	92	9	
	0.1	5	77-91	86	6	
Pea, dry seed	0.01	5	90-102	96	4	
	0.1	5	99-107	104	3	
French bean	0.01	5	69-87	79	11	
	0.1	5	77-87	82	4	
Tomato	0.01	5	77-82	79	3	
	0.1	5	84-86	85	1	
Melon, flesh	0.01	5	90-124	100	14	
	0.1	5	85-92	86	8	
Cereal, grain	0.01	5	79-94	86	8	
	0.1	4	102-109	106	2	
Cereal, straw	0.01	5	85-94	90	4	
	0.1	5	93-97	95	2	
Cereal, forage	0.01	5	95-104	101	4	
	0.1	5	93-103	98	4	
Potato, foliage	0.01	5	88-110	95	9	
	0.1	5	81-99	91	8	
Peanut, nutmeat	0.01	5	84-92	88	4	
	0.1	5	85-91	89	3	
Melon, flesh	0.01	5	91-113	100	9	
	0.1	5	87-100	92	6	
Wheat, grain	0.01	5	98-108	105	5	SDS-3701, Chaggar, 2006, CLTA10_269 & CLTA10_270, m/z: 245 → 182
	0.1	5	95-109	100	7	
Wheat, straw	0.01	5	84-96	87	10	
	0.1	5	87-102	95	7	
Leek	0.01	5	85-120	91	19	
	0.1	5	76-95	88	8	
Cabbage	0.01	5	101-114	108	5	
	0.1	5	97-109	104	5	
Olive	0.01	5	82-104	94	11	
	0.1	5	93-99	95	2	
Oranges	0.01	5	94-108	103	5	
	0.1	5	87-104	96	7	
Wheat, grain	0.01	5	94-115	105	8	SDS-3701, Chaggar, 2006, CLTA10_269 & CLTA10_270, m/z: 245 → 175
	0.1	5	94-112	101	6	
Wheat, straw	0.01	5	82-98	94	7	
	0.1	5	88-96	94	4	

Matrix	Fortification level (mg/kg)	n	Recovery range (%)	Recovery, mean (%)	RSD (%)	Analyte, reference
Leek	0.01	5	76-96	90	10	
	0.1	5	78-94	87	8	
Cabbage	0.01	5	96-119	106	10	
	0.1	5	103-111	98	3	
Olive	0.01	5	84-112	101	11	
	0.1	5	95-101	98	3	
Oranges	0.01	5	96-121	105	9	
	0.1	5	98-107	102	3	

Method "Cornell Laboratory" (Thompson, 2007, CLTA10_277 & CLTA10_278)
Crop samples are ground whilst frozen, then extracted with acidified acetone. Extracts are partitioned against petroleum ether, the organic phase containing chlorothalonil and the aqueous SDS-3701. The organic phase is evaporated and the residue cleaned up on a Florisil column, eluting with dichloromethane/hexane and dichloromethane/hexane/acetonitrile. The aqueous phase is adjusted to a pH below 2 and extracted with ether. The sample is then methylated with diazomethane and cleaned up on an alumina column, eluting with dichloromethane. The organic and aqueous extracts were analysed by GC/EC to determine residues of chlorothalonil and SDS-3701 respectively.

Table 2 Recovery data for method "Cornell Laboratory" in plant matrices by GC-ECD

Matrix	Fortification level (mg/kg)	n	Recovery range (%)	Recovery, mean (%)	RSD (%)	Analyte, reference
Bell pepper	0.03	7	83-133	117	19	Chlorothalonil
	0.5	16	80-124	92	15	
	1	10	84-94	91	3	
	2	13	80-115	98	13	
	3	1	87	-	-	
	4	1	80	-	-	
Non-bell pepper	0.03	3	80-93	87	7	
	0.5	5	84-92	89	4	
	2	7	85-100	91	5	
Horseradish	0.02	6	70-100	81	17	
	0.2	3	75-85	80	6	
	2	3	78-84	81	4	
Rhubarb	0.02	7	90-120	103	11	
	0.2	3	80-90	85	6	
	1	3	84-86	85	1	
	5	3	100	100	0	
Bell pepper	0.03	35	61-141	98	22	SDS-3701
	0.5	4	122-140	130	7	
	2	3	130-145	138	6	
Non-bell pepper	0.03	9	63-110	84	19	
	0.5	3	70-86	80	11	
Horseradish	0.02	6	85-105	95	8	
	0.2	3	80-95	88	9	
	2.0	3	99-100	100	1	
Rhubarb	0.02	6	90-110	100	9	
	0.2	3	95-100	98	3	
	1	3	92-100	95	5	

Stability of pesticides in stored analytical samples

Plant matrices

Two additional studies on the storage stability of chlorothalonil and SDS-3701 in stored plant commodities were submitted for incurred residues and fortified residues in cranberries.

Anderson (2007, CLTA10_271)

A study was conducted to investigate the storage stability of field-incurred residues of chlorothalonil and its metabolite SDS-3701 in a wide range of crops (tomato, cucumber, whole melon, whole orange, carrot leaves, carrots, barley straw, barley grain and soya bean) when prepared without acidification or the addition of dry ice and stored deep frozen for up to 24 months.

In this study, all field treated crops were prepared by chopping large quantities of semi-frozen crop without acidification or the addition of dry ice. Untreated samples of these matrices were acidified and chopped semi-frozen without the addition of dry ice and used as control samples and procedural recoveries. Field treated and untreated barley grain and soya bean samples were stored frozen and dispensed into sample pots with no preparation; frozen barley straw was chopped into small pieces and finally prepared in a knife mill. The 0 month samples were analysed immediately after preparation and samples for the 3, 6 12 and 24 month storage intervals were stored deep frozen for the appropriate period up to 24 months.

Samples were analysed by method GRM005.01A, using LC-MS/MS.

Table 3 Recovered chlorothalonil and SDS-3701 incurred residues in stored plant commodities after storage up to 24 months (Anderson, 2007, CLTA10_271)

Interval (days)	Chlorothalonil			SDS-3701		
	Recovered residue (mg/kg)	Percent remaining (%)	Procedural recovery (%)	Recovered residue (mg/kg)	Percent remaining (%)	Procedural recovery (%)
Tomato						
0	2.7, 2.8, 3.0 (2.8)	100	89	2×0.007, 3×0.008, 2×0.009, 0.010 (0.008)	100	92
98	2.7, 3.0, 3.1 (3.0)	106	102	0.008, 0.009 (0.008)	102	90
211	1.8, 1.9, 2.1 (1.9)	69	73	0.006, 0.007, 0.007 (0.007)	83	71
385	2.5, 2.6, 2.7 (2.6)	93	90	0.008, 0.01, 0.009 (0.009)	113	108
786	2.3, 2.5, 2.5 (2.5)	88	87	0.008, 0.009, 0.01 (0.009)	110	100
Cucumber						
7	1.5, 1.8, 2.3 (1.9)	100	106	2×0.002, 2×0.003, 3×0.004, 0.005 (0.004)	100	106
104	1.6, 1.6, 1.6 (1.6)	86	99	0.008, 0.010, 0.010 (0.009)	264	103
209	1.4, 1.5, 1.5 (1.5)	78	90	0.014, 0.017, 0.020 (0.017)	482	101
383	1.4, 1.4, 1.5 (1.4)	76	93	0.021, 0.016, 0.021 (0.019)	556	91
784	1.3, 1.3, 1.6 (1.4)	76	85	0.026, 0.024, 0.025 (0.025)	714	98
Melon						
0	0.57, 0.65, 0.65, 0.79, 0.62 (0.66)	100	95	2×0.003, 3×0.005 (0.004)	100	86
99	0.55, 0.52, 1.02 (0.7)	106	97	0.004, 0.003, 0.005 (0.004)	97	103
216	0.7, 0.66, 0.71 (0.69)	104	113	0.005, 0.005, 0.006 (0.006)	140	105
378	0.71, 0.41, 0.51 (0.54)	83	93	0.005, 0.003, 0.006 (0.004)	111	103
779	0.69, 0.53, 0.8 (0.68)	103	96	0.009, 0.008, 0.008 (0.009)	220	106
Orange						
0	11, 8.2, 8.9, 11, 11 (10)	100	87	0.024, 0.014, 0.015, 0.028, 0.029 (0.022)	100	92
102	8.0, 8.7, 8.6 (8.4)	84	100	0.022, 0.021, 0.028 (0.024)	109	94
223	7.6, 8.1, 8.3 (8.0)	80	95	0.020, 0.019, 0.019 (0.019)	86	108
404	8.5, 8.6, 8.2 (8.4)	84	97	0.016, 0.020, 0.018 (0.018)	82	100
788	8.0, 8.5, 7.8 (8.1)	81	97	0.016, 0.017, 0.018 (0.017)	77	94
Carrot roots						
0	0.73, 0.69, 0.70, 0.71, 0.64 (0.69)	100	97	3×0.030, 2×0.033 (0.031)	100	80
97	0.67, 0.62, 0.74 (0.68)	98	91	0.048, 0.042, 0.043 (0.044)	143	104
216	0.60, 0.62, 0.57 (0.6)	86	99	0.050, 0.047, 0.047 (0.048)	154	95
405	0.60, 0.61, 0.60	87	94	0.059, 0.063, 0.061 (0.061)	196	102

Interval (days)	Chlorothalonil			SDS-3701		
	Recovered residue (mg/kg)	Percent remaining (%)	Procedural recovery (%)	Recovered residue (mg/kg)	Percent remaining (%)	Procedural recovery (%)
	(0.6)					
781	0.50, 0.52, 0.53 (0.51)	74	92	0.084, 0.076, 0.081 (0.08)	259	99
Carrot tops						
0	101, 85, 94, 92, 87 (92)	100	93	0.28, 0.24, 0.25, 0.26, 0.26 (0.26)	100	101
92	92, 89, 87 (89)	97	101	0.45, 0.41, 0.42, 0.37, 0.42, 0.36 (0.4)	157	114
211	79, 80, 73 (77)	84	91	0.42, 0.38, 0.38 (0.39)	153	99
400	90, 101, 94 (95)	103	95	0.50, 0.49, 0.51 (0.5)	194	108
784	77, 77, 73 (75)	82	100	0.60, 0.70, 0.58 (0.62)	243	105
Barley straw						
0	25, 25, 28, 24, 26 (26)	100	101	1.1, 4×1.2 (1.2)	100	105
104	21, 21, 20 (20)	80	100	1.3, 1.4, 1.3 (1.3)	111	98
209	18, 18, 20 (18)	72	97	1.4, 1.5, 1.4 (1.4)	121	103
406	19, 18, 17 (18)	70	95	1.6, 1.6, 1.7 1.6)	138	104
790	15, 15, 16 (15)	59	95	1.9, 2.0, 2.0 (2.0)	166	102
840	13, 14, 15 (14)	53	89	1.3, 1.0, 2.0 (1.4)	119	117
Barley grain						
0	0.71, 0.80, 0.73, 0.74, 0.83 (0.76)	100	91	0.052, 0.053, 0.053, 0.056, 0.057 (0.054)	100	90
92	0.82, 0.82, 0.88 (0.84)	110	83	0.066, 0.075, 0.072 (0.071)	131	94
203	0.67, 0.80, 0.65 (0.71)	93	90	0.114, 0.124, 0.112 (0.117)	215	106
391	0.79, 0.76, 0.77 (0.77)	101	94	0.067, 0.069, 0.068 (0.068)	125	94
770	0.81, 0.58, 0.85 (0.74)	98	92	0.089, 0.093, 0.097 (0.093)	172	98
Soya beans						
0	1.4, 1.4, 1.3, 1.3, 1.4 (1.4)	100	84	0.024, 0.021, 0.022, 0.036, 0.032, 0.035, 0.031, 0.032 (0.026)	100	89
91	1.4, 1.3, 1.4 (1.4)	100	73	0.022, 0.020, 0.015 (0.019)	84	105
202	1.5, 1.6, 1.6 (1.6)	115	85	0.026, 0.029, 0.028 (0.027)	122	110
390	1.5, 1.4, 1.4 (1.5)	106	75	0.018, 0.024, 0.020 (0.021)	92	91
770	1.2, 0.69, 0.84 (0.91)	68	83	0.016, 0.014, 0.015 (0.015)	65	93
810	0.97, 1.2, 1.5 (1.2)	88	77	0.022, 0.022, 0.029 (0.024)	100	109

Mean values are expressed in parenthesis

Corley (2013, CLTA10_272)

Samples of cranberries were fortified with either chlorothalonil or the metabolite SDS-3701 at a concentration of 0.2 mg/kg and stored under the same conditions as those used for the residues trials samples, i.e. -20 °C in the dark. Samples were analysed after 295 days of storage. Analysis of the samples was performed according to the method GRM005.01A.

Table 4 Recovered residues in cranberries fortified with chlorothalonil or SDS-3701 at 0.2 mg/kg after storage for 295 days

Analyte	Storage Period (days)	Recovered residue (%)	Mean storage stability recovery (%)	Procedural Recoveries (%)
Chlorothalonil	295	55, 64, 70	63	58-64
SDS-3701		38, 38, 39	38	66-74

USE PATTERN

Chlorothalonil is a non-systemic protectant fungicide. The Meeting received numerous uses involving foliar spray applications mainly before harvest in 2010, amended by additional uses in 2015. The following table lists all additional GAPs only; however the labels provided cover a broader spectrum of uses.

Table 5 List of additional uses of chlorothalonil submitted in 2015

Crop	Country	Application detail					
		Indoor/ Outdoor	Type	kg ai/ha	Growth stage at last treatment	No	PHI
Pome fruit							
Pear	KR	Outdoor	Foliar	0.04 kg ai/hL	At infestation	4	14
Stone fruit							
Cherry	CA	Outdoor	Foliar	4.5	Shuck split (BBCH 71)	3	40
Peaches	CA	Outdoor	Foliar	4.5	Shuck period (BBCH 71)	3	60
Cherry	US	Outdoor	Foliar	3.5	Shuck split (BBCH 71)	4	0
Peaches	US	Outdoor	Foliar	3.5	Shuck split (BBCH 71)	4	0
Berries and other small fruit							
Cranberries	CA	Outdoor	Foliar	5.8	Late bloom	3	50
Cranberries	USA	Outdoor	Foliar	5.5	At infestation	3	50
Bulb vegetables							
Onions, dry	CA	Outdoor	Foliar	2.8	At infestation	3	7
Onions, green	CA	Outdoor	Foliar	2.8	At infestation	5	14
Onion, dry	PL	Outdoor	Foliar	1.0	At infestation	2	14
Leek	US	Outdoor	Foliar	2.5	At infestation	3	14
Onions, dry	US	Outdoor	Foliar	2.5	At infestation	7	7
Onions, green	US	Outdoor	Foliar	2.5	At infestation	3	14
Shallots	US	Outdoor	Foliar	2.5	At infestation	3	14
Fruiting vegetables, other than cucurbits							
Bell pepper	BR	Outdoor	Foliar	0.2 kg ai/hL (up to 1.8 kg ai/ha)	At infestation	2	7
Mushroom	US	Indoor	Soil drench	12.7 + 6.4	Not specified	2	7
Fruiting vegetables (except tomatoes)	US	Outdoor	Foliar	1.3	At infestation	8	3
Tomato	PL	Indoor	Foliar	0.1 kg ai/hL (up to 1 kg ai/ha and application)	At infestation	2	3
Root and tuber vegetables							
Ginseng	CA	Outdoor	Foliar	2.4	At infestation	6	14 (do not feed to livestock)
Ginseng	US	Outdoor	Foliar	1.7	At infestation	8	14
Horseradish	US	Outdoor	Foliar	2.5	At infestation	8	14
Stalk and stem vegetables							
Asparagus	CA	Outdoor	Foliar	1.7	After harvest, to the fern	3	190
Asparagus	US	Outdoor	Foliar	3.4	After harvest, to the fern	3	190
Rhubarb	US	Outdoor	Foliar	2.5	At infestation	6	30
Tree nuts							
Pistachios	US	Outdoor	Foliar	5.0	Full bloom (BBCH 65)	5	14

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

Residue levels were reported as measured. Application rates were always reported as chlorothalonil equivalents. When residues were not detected they are shown as below the LOQ, e.g., < 0.01 mg/kg. Application rates, spray concentrations and mean residue results have generally been rounded to two

significant figures. HR and STMR values from the trials conducted according to maximum GAP have been used for the estimation of maximum residue levels. These results are underlined.

Laboratory reports included method validation including batch recoveries with spiking at residue levels similar to those occurring in samples from the supervised trials. Dates of analyses or duration of residue sample storage were also provided. Field reports provided data on the sprayers used and their calibration, plot size, residue sample size and sampling date. Although trials included control plots, no control data are recorded in the tables except where residues in control samples exceeded the LOQ. Residue data are recorded unadjusted for % recovery.

Chlorothalonil - supervised residue trials

Commodity	Indoor/Outdoor	Treatment	Countries	Table
Pear	Outdoor	Foliar	Korea	Table 6
Cherries	Outdoor	Foliar	USA	Table 7
Peaches	Outdoor	Foliar	USA	Table 8
Cranberries	Outdoor	Foliar	USA	Table 9
Onions, bulb	Outdoor	Foliar	USA	Table 10
Onions, green	Outdoor	Foliar	USA	Table 11
Peppers	Outdoor	Foliar	Brazil, USA	Table 12
Tomatoes	Indoor	Foliar	France, Germany, Spain, United Kingdom	Tomatoes Table 13
Mushroom	Indoor	Drench	USA	Table 14
Ginseng	Outdoor	Foliar	USA	Table 15
Horseradish	Outdoor	Foliar	USA	Table 16
Asparagus	Outdoor	Foliar	USA	Table 17
Rhubarb	Outdoor	Foliar	USA	Table 18
Pistachio	Outdoor	Foliar	USA	Table 19

Pear

Table 6 Residues of chlorothalonil and SDS-3701 in pears (HPLC-UV (230nm), LOQ: 0.03 mg/kg (76–110% Recovery, n=5), storage interval: 4 months)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
South Korea, Sangju 2012 (Singo)	SC	4	1.8	0.04	85	Fruit, after removal of hilum and core parts	0 3 7 14 21 28 35	0.82 1.1 0.77 0.59 0.45 0.44 0.3	Not analysed	S-14-04-2-FOD-009-0-D, Trial 1, Park (2014, CLTA10_294)
South Korea, Gyeongju 2012 (Mansu)	SC	4	1.8	0.04	85	Fruit, after removal of hilum and core parts	0 3 7 14 21 28 35	0.9 0.8 0.48 0.45 0.38 0.36 0.25	Not analysed	S-14-04-2-FOD-009-0-D, Trial 2, Park (2014, CLTA10_294)
South Korea, Yesan 2013	SC	4	1.8	0.04	85	Fruit, after removal of hilum and core parts	0 3 7 14	1.0 0.85 0.86 0.68	Not analysed	S-14-04-2-FOD-009-0-D, Trial 3, Park (2014, CLTA10_294) months

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
(Singo)							21 28 35	0.39 0.34 0.17		
South Korea, Naju 2013 (Singo)	SC	4	1.8	0.04	85	Fruit, after removal of hilum and core parts	0 3 7 14 21	1.4 1.0 0.98 0.56 0.28	Not analysed	S-14-04-2-FOD-009-0-D, Trial 4, Park (2014, CLTA10_294)
South Korea, Anseong 2013 (Singo)	SC	4	1.8	0.04	85	Fruit, after removal of hilum and core parts Juice	0 3 7 14 21 28 35 14	1.6 1.2 0.87 0.62 0.41 0.34 0.1 0.15	Not analysed	S-14-04-2-FOD-009-0-D, Trial 5, Park (2014, CLTA10_294)
South Korea, Wonju 2013 (Singo)	SC	4	1.8	0.04	85	Fruit, after removal of hilum and core parts	0 3 7 14 21 28 35	2.3 1.6 1.2 0.85 0.49 0.35 0.22	Not analysed	S-14-04-2-FOD-009-0-D, Trial 6, Park (2014, CLTA10_294)

DAT: days after last treatment
BBCH 85: 50% of fruits show typical fully ripe colour

Cherries

Table 7 Residues of chlorothalonil and SDS-3701 in cherries (GRM005.01A, Storage interval: 13-16 months

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Alton (NY) 2013 (Montmorency)	SC	3	3.5	0.37	72	Whole fruit	39	0.038, 0.042 (0.04)	2× < 0.01 (< 0.01)	TK0119272-01 McDonald (2014, CLTA10_273)
USA, Conklin (MI) 2013 (Montmorency)	SC	3	3.5	0.37	74	Whole fruit	40	0.22, 0.33 (0.28)	2× < 0.01 (< 0.01)	TK0119272-02 McDonald (2014, CLTA10_273)
(Sams)	SC	3	3.5	0.4	74	Whole fruit	40	0.05, 0.053 (0.052)	2× < 0.01 (< 0.01)	TK0119272-06 McDonald (2014, CLTA10_273)
USA, Casnovia (MI) 2013 (Montmorency)	SC	3	3.5	0.37	74	Whole fruit	40	0.049, 0.097 (0.073)	2× < 0.01 (< 0.01)	TK0119272-03 McDonald (2014, CLTA10_273)
USA, Fremont (MI) 2013 (Montmorency)	SC	3	3.5	0.4	74	Whole fruit	39	1.1, 1.2 (1.2)	2× < 0.01 (< 0.01)	TK0119272-04 McDonald (2014, CLTA10_273)
USA, Hart (MI) 2013 (Montmorency)	SC	3	3.5	0.4	74	Whole fruit	39	0.86, 1.8 (1.3)	< 0.01, 0.012 (0.011)	TK0119272-05 McDonald (2014, CLTA10_273)
(Hudson)	SC	3	3.5	0.4	74	Whole fruit	39	0.24, 0.25 (0.24)	2× < 0.01 (< 0.01)	
USA, Perry (UT) 2013 (Montmorency)	SC	3	3.5	0.2	75	Whole fruit	37	0.11, 0.15 (0.13)	2× < 0.01 (< 0.01)	TK0119272-06 McDonald (2014, CLTA10_273)
USA, Tulare (CA) 2013 (Brooks)	SC	3	3.5	0.14	72	Whole fruit	40	0.11, 0.14 (0.12)	2× < 0.01 (< 0.01)	TK0119272-09 McDonald (2014, CLTA10_273)
USA, Plainview	SC	3	3.5	0.55	73	Whole	40	0.43, 0.57	2× < 0.01	TK0119272-10

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
(CA) 2013 (Rainier)						fruit		(0.5)	(< 0.01)	McDonald (2014, CLTA10_273)
USA, Ephrata (WA) 2013 (Bing)	SC	3	3.5	0.37	81	Whole fruit	36	0.65, 0.95 (0.8)	2× < 0.01 (< 0.01)	TK0119272-11 McDonald (2014, CLTA10_273)
USA, Weiser (ID) 2013 (Benton)	SC	3	3.6	0.25	75	Whole fruit	40	0.59, 0.9 (0.74)	0.026, 0.035 (0.03)	TK0119272-12 McDonald (2014, CLTA10_273)
USA, Hotchkiss (CO) 2012 (Montmorency)	SC	5	3.5	0.4	Note a	Cherries w/o stem and stone	14	2.7, 5.1 (3.9)	2× < 0.02 (< 0.02)	12-CO01, Jolly (2014, CLTA10_274)
							20	23, 24 (24)	2× < 0.02 (< 0.02)	
						Washed cherries w/o stem and stone	14	2.3, 2.7 (2.5)	2× < 0.02 (< 0.02)	
							20	4.7, 6.5 (5.6)	2× < 0.02 (< 0.02)	
USA, Buhl (ID) 2012 (Montmorency)	SC	5	3.5	0.36	Note a	Cherries w/o stem and stone	7	9.3, 10 (9.7)	2× < 0.02 (< 0.02)	12-ID06, Jolly (2014, CLTA10_274)
							14	8.8, 9.3 (9.0)	2× < 0.02 (< 0.02)	
							22	9.0, 9.2 (9.1)	2× < 0.02 (< 0.02)	
							28	4.0, 6.4 (5.2)	2× < 0.02 (< 0.02)	
						Washed cherries w/o stem and stone	7	1.2, 1.6 (1.4)	2× < 0.02 (< 0.02)	
							14	0.96, 1.3 (1.1)	2× < 0.02 (< 0.02)	
							22	1.6, 1.7 (1.6)	2× < 0.02 (< 0.02)	
							28	1.3, 2.0 (1.8)	2× < 0.02 (< 0.02)	
USA, Fennville (MI) 2013 (Montmorency) Note B	SC	5	3.5	0.36	Note a	Cherries w/o stem and stone	7	2.6, 3.4 (3.0)	2× < 0.02 (< 0.02)	13-MI05, Jolly (2014, CLTA10_274)
							14	1.0, 1.4 (1.2)	2× < 0.02 (< 0.02)	
							21	0.81, 0.82 (0.82)	2× < 0.02 (< 0.02)	
							28	0.73, 0.76 (0.74)	2× < 0.02 (< 0.02)	
						Washed cherries w/o stem and stone	7	1.1, 1.2 (1.2)	2× < 0.02 (< 0.02)	
							14	0.48, 0.52 (0.5)	2× < 0.02 (< 0.02)	
							21	0.3, 0.37 (0.34)	2× < 0.02 (< 0.02)	
							28	0.25, 0.27 (0.26)	2× < 0.02 (< 0.02)	

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Fennville (MI) 2013 (Balaton) Note B	SC	5	3.4	1.2	Note a	Cherries w/o stem and stone	14	3.7, 4.1 (3.9)	2× < 0.02 (< 0.02)	13-MI36, Jolly (2014, CLTA10_274)
							21	1.4, 1.6 (1.5)	2× < 0.02 (< 0.02)	
						Washed cherries w/o stem and stone	14	1.5, 1.7 (1.6)	2× < 0.02 (< 0.02)	
							21	1.2, 1.4 (1.3)	2× < 0.02 (< 0.02)	
	SC	5	3.4	0.6	Note a	Cherries w/o stem and stone	14	2.9, 3.1 (3.0)	2× < 0.02 (< 0.02)	13-MI37, Jolly (2014, CLTA10_274)
							21	1.4, 1.6 (1.5)	2× < 0.02 (< 0.02)	
						Washed cherries w/o stem and stone	14	0.39, 0.5 (0.44)	2× < 0.02 (< 0.02)	
							21	0.37, 0.42 (0.4)	2× < 0.02 (< 0.02)	
USA, Fennville (MI) 2013 (Montmorency) Note B	SC	5	3.5	0.5	Note a	Cherries w/o stem and stone	13	4.2, 4.9 (4.5)	2× < 0.02 (< 0.02)	13-MI38, Jolly (2014, CLTA10_274)
							20	3.0, 3.0 (3.0)	2× < 0.02 (< 0.02)	
						Washed cherries (0.8 L/min) w/o stem and stone	13	2.5, 3.1 (2.8)	2× < 0.02 (< 0.02)	
							20	1.7, 1.7 (1.7)	2× < 0.02 (< 0.02)	
						Washed cherries (1.5 L/min) w/o stem and stone	13	2.4, 2.9 (2.6)	2× < 0.02 (< 0.02)	
							20	1.7, 1.8 (1.8)	2× < 0.02 (< 0.02)	
						Washed cherries (3.2 L/min) w/o stem and stone	13	1.8, 2.4 (2.1)	2× < 0.02 (< 0.02)	
							20	1.7, 1.8 (1.8)	2× < 0.02 (< 0.02)	
USA, Fennville (MI) 2013 (not reported) Note B	SC	5	3.5	0.27	Note a	Cherries w/o stem and stone	14	1.8, 2.1 (2.0)	2× < 0.02 (< 0.02)	13-MI39, Jolly (2014, CLTA10_274)
							21	2.8, 4.4 (3.6)	2× < 0.02 (< 0.02)	
						Washed cherries w/o stem and stone	14	0.68, 0.81 (0.74)	2× < 0.02 (< 0.02)	
							21	2.0, 2.2 (2.1)	2× < 0.02 (< 0.02)	
USA, Lansing (NY) 2013 (not reported)	SC	5	3.5	3.1	Note a	Cherries w/o stem and stone	14	0.41, 0.42 (0.42)	2× < 0.02 (< 0.02)	13-NY01, Jolly (2014, CLTA10_274) GRM005.01A, Storage interval: 16 months
							20	0.52, 0.61 (0.56)	2× < 0.02 (< 0.02)	
						Washed cherries w/o stem and stone	14	0.028, 0.03 (0.029)	2× < 0.02 (< 0.02)	
							20	0.029, 0.13 (0.08)	2× < 0.02 (< 0.02)	

DAT: days after last treatment
BBCH 72-74: 1st-4th fruit has reached typical size
A: BBCH not provided, plants were in "fruiting" growth stage at last application
B: Trials conducted at the same location were considered independent when the difference in treatment dates was at least one week

Peaches

Table 8 Residues of chlorothalonil and SDS-3701 following foliar application to peaches (GRM005.01A, Storage interval: 13 months)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Alton (NY) 2013 (Venture)	SC	3	3.5	0.37	77	Whole fruit	60	0.11, 0.14 (0.12)	2× < 0.01 (< 0.01)	TK0119271-01, McDonald (2014, CLTA10_275)
USA, Byron (GA) 2013 (Summer Lady)	SC	3	3.5	0.56	76	Whole fruit	62	0.13, 0.14 (0.13)	2× < 0.01 (< 0.01)	TK0119271-02, McDonald (2014, CLTA10_275)
USA, Athens (GA) 2014 (Contender)	SC	3	3.5	0.56	74	Whole fruit	57	0.086, 0.16 (0.12)	2× < 0.01 (< 0.01)	TK0119271-03, McDonald (2014, CLTA10_275)
USA, Plains (GA) 2013 (Red skin)	SC	3	3.5	0.37	77	Whole fruit	59	< 0.01, 0.018 (0.014)	2× < 0.01 (< 0.01)	TK0119271-04, McDonald (2014, CLTA10_275)
USA, Shorter (AL) 2013 (Flame Prince)	SC	3	3.5	0.56	77	Whole fruit	59	0.24, 0.25 (0.24)	2× < 0.01 (< 0.01)	TK0119271-05, McDonald (2014, CLTA10_275)
USA, Boyce (LA) 2013 (June Prince)	SC	3	3.5	0.19	78	Whole fruit	60	0.66, 1.1 (0.9)	< 0.01, 0.011 (0.01)	TK0119271-06, McDonald (2014, CLTA10_275)
USA, Hondo (TX) 2013 (Flamin' Fury)	SC	3	3.4	0.37	73	Whole fruit	60	< 0.01, < 0.01 (< 0.01),	2× < 0.01 (< 0.01)	TK0119271-08, McDonald (2014, CLTA10_275)
USA, Madera (CA) 2014 (Spring Crest)	SC	3	3.4	0.25	73	Whole fruit	58	< 0.01, 0.01 (0.01)	2× < 0.01 (< 0.01)	TK0119271-09, McDonald (2014, CLTA10_275)
USA, Los Molinos (CA) 2013 (Halford)	SC	3	3.5	0.37	72	Whole fruit	60	< 0.01, < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119271-10, McDonald (2014, CLTA10_275)
USA, Porterville (CA) 2013 (Fey Elberta)	SC	3	3.5	0.19	79	Whole fruit	60	0.18, 0.18 (0.18)	2× < 0.01 (< 0.01)	TK0119271-11, McDonald (2014, CLTA10_275)
USA, Kingsburg (CA) 2013 (Klamt Cling)	SC	3	3.5	0.37	79	Whole fruit	58	0.2, 0.4 (0.3)	2× < 0.01 (< 0.01)	TK0119271-12, McDonald (2014, CLTA10_275)
USA, Ringwood (OK) 2014 (Loring)	SC	3	3.5	0.19	76	Whole fruit	56	0.052, 0.074 (0.063)	2× < 0.01 (< 0.01)	TK0119271-13, McDonald (2014, CLTA10_275)

DAT: days after last treatment
BBCH 71-79: 1st-9th fruit has reached typical size

Cranberry

Table 9 Residues of chlorothalonil and SDS-3701 following foliar application to cranberries (GRM005.01A, Storage interval: 7 months)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Warehan (MA) 2012 (Howes)	SC	3	5.6	1	A	fruits	51	1.1, 1.7 (1.4)	2× < 0.02 (< 0.02)	MA01, Corley (2013, CLTA10_272)
USA, Creamridge (NJ) 2012 (Stevens)	SC	3	5.6	2.2	B	fruits	49	2.9, 3.4 (3.2)	2× < 0.02 (< 0.02)	NJ03, Corley (2013, CLTA10_272)
USA, Langlois (OR) 2012 (Stevens)	SC	3	5.6	1.5	C	fruits	52	5.4, 5.4 (5.4)	2× < 0.02 (< 0.02)	OR16, Corley (2013, CLTA10_272)
USA, Warrens (WI) 2012 (Stevens)	SC	3	5.6	1.5	A	fruits	50	2.5, 2.8 (2.6)	2× < 0.02 (< 0.02)	WI05, Corley (2013, CLTA10_272)
USA, Wisconsis Rapids (WI) 2012 (Norman LeMunyon)	SC	3	5.6	0.26	A	fruits	50	2.7, 3.7 (3.2)	2× < 0.02 (< 0.02)	WI06, Corley (2013, CLTA10_272)

DAT: days after last treatment
A: fruiting
B: green fruit
C: fruiting, white-pink

Bulb onions

Table 10 Residues of chlorothalonil and SDS-3701 after foliar application to bulb onions (GRM005.01A, Storage interval: 1-11 months

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Lyons (NY) 2013 (Bridger F1)	SC	3	2.5	0.89	48	Bulb, dry	7	0.19, 0.26 (0.22)	0.023, 0.028 (0.026)	TK0119273-01, McDonald (2014, CLTA10_276)
USA,Fresno (CA) 2013 (Stockton Yellow)	SC	3	2.5	1.1	49	Bulb, dry	7	0.37, 0.46 (0.4)	2× < 0.01 (< 0.01)	TK0119273-05, McDonald (2014, CLTA10_276)
USA, Portersville (CA) 2013 (Walla Walla)	SC	3	2.5	1.1	49	Bulb, dry	7	0.38, 0.42 (0.4)	2× < 0.01 (< 0.01)	TK0119273-06, McDonald (2014, CLTA10_276)
USA, Payette (ID) 2013 (Vaquero)	SC	3	2.5	1.1	49	Bulb, dry	7	0.34, 0.78 (0.56)	2× < 0.01 (< 0.01)	TK0119273-07, McDonald (2014, CLTA10_276)
USA, Hillsboro (OR) 2013 (Bridger)	SC	3	2.5	1.1	88	Bulb, dry	7	0.66, 0.69 (0.68)	2× < 0.01 (< 0.01)	TK0119273-08, McDonald (2014, CLTA10_276)
USA,Lenexa (KS) 2013 (Stuttgarter Yellow)	SC	3	2.5	1.1	48	Bulb, dry	7	0.054, 0.11 (0.083)	2× < 0.01 (< 0.01)	TK0119273-12, McDonald (2014, CLTA10_276)
USA, Uvalde (TX) 2013 (Obsession)	SC	3	2.5	1.3	49	Bulb, dry	6	0.34, 0.61 (0.48)	2× < 0.01 (< 0.01)	TK0119273-13, McDonald (2014, CLTA10_276)
USA, Larned (KS) 2013 (Candy Sweet Onion)	SC	3	2.5	1.2	48	Bulb, dry	6	0.061, 0.074 (0.068)	2× < 0.01 (< 0.01)	TK0119273-14, McDonald (2014, CLTA10_276)

DAT: days after last treatment
BBCH 48: Leaves bent over in 50% of plants
BBCH 49: Leaves dead, bulb top dry

Green Onions

Table 11 Residues of chlorothalonil and SDS-3701 after foliar application to green onions (GRM005.01A, Storage interval: 3-9 months

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Athens (GA) 2013 (Texas Sweet)	SC	5	1.5	0.65	17	Whole plant	14	0.37, 0.47 (0.42)	0.046, 0.069 (0.058)	TK0119273-09, McDonald (2014, CLTA10_276)
USA, Portersville (CA) 2013 (Texas Sweet)	SC	5	1.5	0.65	49	Whole plant	14	35, 44 (39)	0.052, 0.066 (0.059)	TK0119273-11, McDonald (2014, CLTA10_276)
USA, Richland (LA) 2013 (Texas Sweet)	SC	5	1.5	0.8	18	Whole plant	14	0.27, 0.31 (0.29)	< 0.01, 0.013 (0.012)	TK0119273-15, McDonald (2014, CLTA10_276)

DAT: days after last treatment
BBCH 18-19: 9 or more leaves clearly visible
BBCH 49: Growth complete; length and stem diameter typical for variety reached

Peppers

Table 12 Residues of chlorothalonil and SDS-3701 after foliar application to peppers

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
Bell peppers										
Brazil, Uberlandia 2005 (Natali)	SC	4		0.2	85	Fruit	0 3 5 7 14	6.6 7.5 5.4 2.7 <u>2.9</u>	NA	M03019-JJB, Baptista (2006, CLTA10_280)
	SC	4		0.4	85	Fruit	0 3 5 7 14	15.3 13.1 10.6 9.9 5.8	NA	POPIT MET.109 & 150, Recovery: Mean=103% RSD=6% Storage interval: 12 months
Brazil, Piepade 2005 (Natalie Rogers)	SC	4		0.2	82	Fruit	0 3 5 7 14	3.0 3.8 2.8 0.64 <u>0.74</u>	NA	M03019-LZF, Baptista (2006, CLTA10_280)
	SC	4		0.4	82	Fruit	0 3 5 7 14	12.9 15.6 14.3 11.5 1.5	NA	
Brazil, Sao José dos Pinhais 2005 (Magali)	SC	4		0.2	79	Fruit	0 3 5 7 14	1.6 0.17 0.12 0.12 <u>0.15</u>	NA	M03019-DMO, Baptista (2006, CLTA10_280)
	SC	4		0.4	79	Fruit	0 3 5 7 14	2.2 1.9 0.72 0.19 0.15	NA	
Brazil, Engenheiro Coehlo (SP) 2012 (Ikeda)	SC	3	1.8	0.2	78	Fruit	0 1 3 5 7	0.74 0.56 0.21 0.16 <u>0.16</u>	< 0.01 < 0.01 < 0.01 < 0.01 < 0.<u>01</u>	M13003-FSB1, Matarazzo (2014, CLTA10_281)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
Brazil, Ponta Grossa (PR) 2012 (Magali R)	SC	3	1.8	0.2	76	Fruit	0 1 3 5 7	0.83 0.47 0.41 0.49 <u>0.22</u>	< 0.01 < 0.01 < 0.01 < 0.01 < <u>0.01</u>	M13003-FSB2, Matarazzo (2014, CLTA10_281)
Brazil, Planaltina (DF) 2012 (Paloma)	SC	3	1.8	0.2	75	Fruit	0 1 3 5 7	3.2 2.6 2.8 2.1 <u>1.9</u>	< 0.01 < 0.01 < 0.01 < 0.01 < <u>0.01</u>	M13003-MFG, Matarazzo (2014, CLTA10_281)
Brazil, Palmeira (PR) 2012 (Magali R)	SC	3	1.8	0.2	76	Fruit	0 1 3 5 7	1.0 0.64 0.65 0.57 <u>0.28</u>	< 0.01 < 0.01 < 0.01 < 0.01 < <u>0.01</u>	M13003-RWC1, Matarazzo (2014, CLTA10_281)
Brazil, Lavras (MG) 2012 (Magali)	SC	3	1.8	0.2	85	Fruit	0 7	1.6 <u>0.44</u>	< 0.01 < <u>0.01</u>	M13003-RWC2, Matarazzo (2014, CLTA10_281) POPIT MET.109 & 150, Recovery: Mean=96-99% RSD=3-11% Storage interval: 12 months
USA, Bridgeton (NJ) 1997 (King Arthur Hybrid)	SC	8	1.3	0.21	89	Fruit	3 7 14 29	2.6, 3.1 (<u>2.8</u>) 2.1, 2.2 (2.2) 1.3, 1.4 (1.4) 0.56, 0.99 (0.78)	2× < 0.03 (< <u>0.03</u>) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03)	97-NJ15, Thompson (2007, CLTA10_277)
USA, Live Oka (FL) 1997 (Capistrano)	SC	8	1.3	0.46	85	Fruit	3	1.7, 1.7 (<u>1.7</u>)	2× < 0.03 (< <u>0.03</u>)	97-FL17, Thompson (2007, CLTA10_277)
USA, Weslaco (TX) 1998 (Capistrano)	SC	8	1.2	0.28	89	Fruit	3	2.3, 3.5 (<u>2.9</u>)	2× < 0.03 (< <u>0.03</u>)	97-TX15, Thompson (2007, CLTA10_277)
USA, Charleston (SC) 1997 (Camelot)	SC	8	1.3	0.25	37 leaf stage	Fruit	3	1.3, 1.6, (<u>1.4</u>)	2× < 0.03 (< <u>0.03</u>)	97-SC13, Thompson (2007, CLTA10_277)
USA, Freemont (OH) 1997 (King Arthur)	SC	8	1.3	0.19	89	Fruit	2	0.69, 0.82 (<u>0.76</u>)	2× < 0.03 (< <u>0.03</u>)	97-OH12, Thompson (2007, CLTA10_277)
USA, Salinas (CA) 1997 (Cal Wonder) Note A	SC	8	1.3	0.23	85	Fruit	2 6 13 27	0.33, 0.66 (<u>0.5</u>) 0.18, 0.2 (0.19) 0.2, 0.23 (0.22) 0.055, 0.06 (0.058)	2× < 0.03 (< <u>0.03</u>) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03)	97-CA45, Thompson (2007, CLTA10_277)
USA, Salinas (CA) 1997 (Gusto) Note A	SC	8	1.3	0.23	85	Fruit	2	0.45, 0.53 (0.49)	2× < 0.03 (< 0.03)	97-CA46, Thompson (2007, CLTA10_277)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Gainesville (FL) 1997 (Capristrano)	SC	8	1.2	0.23	85	Fruit	3 7 14 28	1.6, 1.6 (1.6) 1.0, 1.4 (1.2) 0.75, 0.9 (0.82) 0.2, 0.22 (0.21)	2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03)	97-FL41, Thompson (2007, CLTA10_277)
USA, Tifton (GA) 1997 (Camelot)	SC	7	1.3	0.28	89	Fruit	2 7 13	0.62, 0.94 (0.78) 0.96, 0.99, 1.2 (1.0) 0.4, 0.46 (0.43)	2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03)	98-GA17, Thompson (2007, CLTA10_277)
Non-bell peppers										
USA, Bridgeton (NJ) 1999 (Biscayne)	WG	8	1.2	0.21	89	Fruit	3 8 14	1.4, 1.8 (1.6) 0.8, 1.2 (1.0) 0.4, 0.6 (0.5)	2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03)	99-NJ21, Thompson (2007, CLTA10_278)
USA, Gainesville (FL) 1999 (Mesilla Cayenne)	WG	8	1.3	0.35	85	Fruit	3	0.42, 0.82 (0.62)	2× < 0.03 (< 0.03)	99-FL30, Thompson (2007, CLTA10_278)
USA, Weslaco (TX) 1999 (Sonora Anaheim)	WG	8	1.3	0.35	85	Fruit	2	1.5, 1.7 (1.6)	2× < 0.03 (< 0.03)	99-TX17, Thompson (2007, CLTA10_278)
USA, Fremont (OH) 1999 (Milta Jalapeno)	WG	8	1.3	5× 0.35 + 3× 0.25	85	Fruit	2	0.62, 0.78 (0.7)	2× < 0.03 (< 0.03)	99-OH12, Thompson (2007, CLTA10_278)
USA, El Centro (CA) 1999 (Fresno)	WG	6	1.3 1.3 3.8 1.3 1.3 1.3	0.3 0.3 1.0 0.3 0.3 0.3	85	Fruit	2 7 14	0.64, 1.1 (0.87) 2× < 0.03 (< 0.03) 0.93, 1.1 (1.0)	2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03)	99-CA51, Thompson (2007, CLTA10_278)
USA, Weslcao(TX) 1999 (Veracruz)	WG	8	1.3	0.28	89	Fruit	2 6 13	0.6, 0.64 (0.62) 0.24, 0.26 (0.25) 0.18, 0.24 (0.21)	2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03) 2× < 0.03 (< 0.03)	99-TX28, Thompson (2007, CLTA10_278)
USA, Las Cruces (NM) 2008 (Big Jim)	SC	8	1.3	0.45	85	Fruit	2	0.18, 0.32 (0.25)	0.028, 0.031 (0.03)	08-NM, Homa (2011, CLTA10_279)
	WG	8	1.3	0.45	85	Fruit	2	0.2, 0.31 (0.26)	0.028, 0.03 (0.029)	

Matarazzo (2014, CLTA10_281): POPIT MET.109 & 150, Recovery: Mean=96-99% RSD=3-11%, Storage interval: 12 months
Baptista (2006, CLTA10_280): POPIT MET.109 & 150, Recovery: Mean=103% RSD=6%, Storage interval: 12 months
Thompson (2007, CLTA10_277): "Cornell Method", Storage interval: 2-10 months
Thompson (2007, CLTA10_278): "Cornell Method", Storage interval: 24-25 months
A: Trials considered not independent, since same location and treatment date was used. Different variety was not considered sufficiently different to justify a independent trial result
B: Trials were conducted in the same area but at significantly different dates (two week difference). These trials are considered independent
DAT: days after last treatment
NA: not analysed
BBCH 71-79: 1st-9th fruit has reached typical size
BBCH 81-88: 10-80% of fruits show typical fully ripe colour
BBCH 89: Fully ripe: fruits have typical fully ripe colour

Tomatoes

Table 13 Residues of chlorothalonil and SDS-3701 in protected cherry tomatoes following foliar spraying (GRM005.01A, Storage interval: 6 months)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No. Reference
cGAP: Poland, 2 × 0.1 kg ai/hL, PHI: 3 d										
France (North), Dampierre en burly 2011 (Lucinda, *Cherry tomato*)	SC	2	1.0	0.17	87	Fruit	0 1 3	1.6 1.8 1.6	0.01 0.02 0.01	S11-00518-REG-02, North (2012, CLTA10_283)
France (South), Elne 2011 (Swift, *Cherry tomato*)	SC	2	1.0	0.17	87	Fruit	0 1 3	2.8 4.0 3.1	0.02 0.04 0.04	S11-00519-REG-01, North (2012, CLTA10_284)
Germany, Unterriexingen 2012 (Favorita, *Cherry tomato*)	SC	2	1.5 1.6	0.2	87	Fruit	3	3.4	0.03	S12-01287-01, Schulz (2012, CLTA10_285)
Germany, Heidelberg 2012 (Amoah EZ, *Cherry tomato*)	SC	2	0.94 0.96	0.2	88	Fruit	3	0.99	0.01	S12-01287-02, Schulz (2012, CLTA10_285)
Spain, Conil de la frontera 2012 (Lupita, *Cherry tomato*)	SC	2	1.6	0.2	82	Fruit	3	2.2	0.03	S12-01288-01, Schulz (2013, CLTA10_286)
Spain, Puerto de Mazarrón 2012 (Katalina, *Cherry tomato*)	SC	2	1.3 1.2	0.2	82	Fruit	3	5.5	0.07	S12-01288-02, Schulz (2013, CLTA10_286)
Spain, Conil de la frontera 2011 (Lupita, *Cherry tomato*)	SC	2	1.0	0.13	85	Fruit	0 1 3	1.1 1.6 0.59	< 0.01 0.01 < 0.01	S11-00519-REG-02, North (2012, CLTA10_284)
United Kingdom, Suffolk 2011 (Conchita, *Cherry tomato*)	SC	2	1.0	0.17	74	Fruit	0 1 3	2.3 1.5 1.8	0.01 0.01 0.02	S11-00518-REG-01, North (2012, CLTA10_283)

DAT: days after last treatment
BBCH 71-79: 1st-9th fruit has reached typical size
BBCH 81-88: 10-80% of fruits show typical fully ripe colour
BBCH 89: Fully ripe: fruits have typical fully ripe colour

Mushrooms

Table 14 Residues of chlorothalonil and SDS-3701 in mushroom following soil drench application (Analytical method 3136-88-0138-MD-001 (see JMPR Report 2010), Storage interval: 1 month)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
cGAP: USA, 12.7 kg ai/ha + 6.4 kg ai/ha, PHI: 7 d										
USA, Fleetwood (PA) 1994 (Spawn: Lambert 900) Note D	SC	2	12 6.1	0.24 0.12	A	mushroom mushroom (washed)	5 7 5	0.33, 0.4 (0.36) 0.35, 0.51 (0.43) 0.024, 0.037 (0.03)	0.052, 0.086 (0.069) 0.15, 0.17 (0.16) 0.024, 0.046 (0.035)	PA03, Thompson (1995, CLTA10_287)
	SC	2	12 6.1	0.24 0.12	B	mushroom mushroom (washed)	5 5	0.092, 0.2 (0.14) 0.014, 0.022 (0.018)	0.031, 0.034 (0.032) 0.038, 0.027 (0.032)	PA04, Thompson (1995, CLTA10_287)
USA, Morgan Hill (CA) (Crop # 4143, Strain 2000)	SC	2	12 6.1	0.24 0.12	C	mushroom mushroom (washed)	5 7 13 5	0.031, 0.11 (0.070) 0.03, 0.15 (0.09) 0.033, 0.12 (0.076) 0.022 (0.012, 0.032)	2× < 0.01 (< 0.01) 2× < 0.01 (< 0.01) 2× < 0.01 (< 0.01) 2× < 0.01 (< 0.01)	CA98, Thompson (1995, CLTA10_287)

DAT: days after last treatment
A: "Pin to ¼ inch diameter buttons"
B: "Pin to ¾ inch diameter buttons"
C: "Pin"
D: These trials were conducted in the same room and at the same date. The use of a different mushroom bed is not considered sufficient to justify independent results

Ginseng

Table 15 Residues of chlorothalonil and SDS-3701 in ginseng following foliar application (Analytical method 3136-88-0138-MD-001 (see JMPR Report 2010), Storage interval: 19 month)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Marathon County (WI) 2004 (American Ginseng) Note D	SC	8	1.7	0.26	A	Root, washed and dried to 10-30% moisture content	6	0.33, 0.37 (0.35)	0.26, 0.33 (0.3)	WI20, Corley (2007, CLTA10_289)
USA, Marathon County (WI) 2004	SC	8	1.7	0.26	B	Root, washed and dried to 10-30%	7	0.55, 1.0 (0.78)	0.47, 0.75 (0.61)	WI21, Corley (2007, CLTA10_289)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
(American Ginseng) Note D						moisture content				
USA, Marathon County (WI) 2004 (American Ginseng) Note D	SC	8	1.7	0.26	C	Root, washed and dried to 10-30% moisture content	8	0.19, 0.19 (0.19)	0.17, 0.21 (0.19)	WI28, Corley (2007, CLTA10_289)

DAT: days after last treatment
A: "Mature berries"
B: "Most berries dropped"
C: "Berries dropping"
D: Trials were conducted at the same date but farm locations differed by at least 15 miles. The Meeting considered these trials as independent

Horseradish

Table 16 Residues of chlorothalonil and SDS-3701 in horseradish following foliar application ("Cornell Method", Storage interval: 3 months)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No., Reference
USA, Salisbury (MD) 2002 (no variety reported)	SC	8	2.5	1	A	Roots	13	< 0.02, 0.044 (0.031)	0.025, 0.029 (0.027)	MD02, Thompson (2007, CLTA10_290)
USA, Bridgeton (NJ) 2002 (no variety reported)	SC	8	2.5	1.3	B	Roots	12	0.24, 0.26 (0.25)	0.22, 0.28 (0.25)	NJ16, Thompson (2007, CLTA10_290)
USA, Arlington (WI) 2002 (Big Top Western)	SC	8	2.5	1.9	B	Roots	15	0.29, 0.48 (0.38)	0.13, 0.15 (0.14)	WI04, Thompson (2007, CLTA10_290)

DAT: days after last treatment
A: "Mature"
B: "Vegetative"

Asparagus

Table 17 Residues of chlorothalonil and SDS-3701 in asparagus following foliar application (GRM005.01A, Storage interval: 6 months)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	Stage	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No. Reference
USA, Comstock Park (MI) 2013 (Jersey Giant)	SC	3	3.4	4.4	fern	Spear	228	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119274-01, McDonald (2014, CLTA10_291)
USA, Verona (WI) 2013 (Jersey Supreme)	SC	3	3.4	3.4	fern	Spear	231	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119274-02, McDonald (2014, CLTA10_291)
Canada, Paris (Ontario) 2013 (Mellennium)	SC	3	3.4	4.2	fern	Spear	230	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119274-03, McDonald (2014, CLTA10_291)
USA, Stockton (CA) 2013 (Colossal)	SC	3	3.4	4.4	fern	Spear	120	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119274-04, McDonald (2014, CLTA10_291)
USA, Delta (CA) 2013 (Pacific Purple)	SC	3	3.4	4.4	fern	Spear	120	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119274-05, McDonald (2014,

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	Stage	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No. Reference
										CLTA10_291)
USA, Porterville (CA) 2013 (UC157)	SC	3	3.4	3.4	fern	Spear	121	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119274-06, McDonald (2014, CLTA10_291)
USA, King City (CA) 2013 (UC157)	SC	3	3.4	3.0	Fern	Spear	121	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119274-07, McDonald (2014, CLTA10_291)
USA, New Plymouth (ID) 2013 (Apollo)	SC	3	3.4	3.4	fern	Spear	195	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	TK0119274-08, McDonald (2014, CLTA10_291

DAT: days after last treatment

Rhubarb

Table 18 Residues of chlorothalonil and SDS-3701 in rhubarb following foliar treatment ("Cornell Method", Storage interval: 6 months)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No. Reference
USA, Clarksville (MI) 2002 (Reeds Early Superb)	SC	6	2.6	1.7	A	Petiole (stalk)	31	0.09, 1.0 (0.55)	2× < 0.02 (< 0.02)	MI13, Thompson (2007, CLTA10_292)
USA, Aurora (OR) 2002 (Crimson Red) Note C	SC	6	2.6	0.99	B	Petiole (stalk)	34	1.6, 3.9 (2.8)	2× < 0.02 (< 0.02)	OR14, Thompson (2007, CLTA10_292)
USA, Aurora (OR) 2002 (Crimson) Note C	SC	6	2.7	2.0	B	Petiole (stalk)	28	0.17, 0.58 (0.38)	2× < 0.02 (< 0.02)	OR15, Thompson (2007, CLTA10_292)
	SC	6	2.7	2.0	B	Petiole (stalk)	27	0.33, 0.45 (0.39)	2× < 0.02 (< 0.02)	OR13, Thompson (2007, CLTA10_292)

DAT: days after last treatment
A: "blooming"
B: "8-10 inch petioles"
C: Trial OR14 was conducted at sufficiently different treatment dates and location to justify independent results. Trials OR13 and OR15 were treated at the same location and same date.

Pistachio nuts

Table 19 Residues of chlorothalonil and SDS-3701 in pistachios following foliar application (Analytical method 3136-88-0138-MD-001 (see JMPR Report 2010), Storage interval: 17 month)

Location, Year (variety)	Application Form.	no	kg ai/ha	kg ai/hL	BBCH	Residues, mg/kg Sample	DAT	Chloro-thalonil	SDS-3701	Report/Trial No. Reference
USA, Chico (CA) 1992 (Kerman)	SC	5	5.0	1.3	NR	Nutmeat	14	0.08, 0.14 (0.11)	2× < 0.01 (< 0.01)	CA68, Thompson (1996, CLTA10_293)
USA, Madera (CA) 1992 (Peter, Kerman)	SC	5	5.0	-	A	Nutmeat	14	0.073, 0.091 (0.082)	2× < 0.01 (< 0.01)	CA69, Thompson (1996, CLTA10_293)
USA, Bowie (AZ) 2002 (Kerman)	SC	5	5.0	-	A	Nutmeat	14	2× < 0.01 (< 0.01)	2× < 0.01 (< 0.01)	AZ01, Thompson (1996, CLTA10_293)

DAT: days after last treatment
NS: not reported A: full size nuts

APPRAISAL

Chlorothalonil is a non-systemic fungicide first evaluated by JMPR in 1974 and a number of times subsequently. It was recently reviewed for toxicology by the 2009 and 2010 JMPR within the periodic review program of the CCPR. For the parent substance an ADI of 0–0.02 mg/kg bw and an ARfD of 0.6 mg/kg bw were established. In addition to the parent substance, an ADI of 0–0.008 mg/kg bw and an ARfD of 0.03 mg/kg bw were established for the metabolite SDS-3701.

The 2010 JMPR recommended the following residue definition for chlorothalonil:

Definition of the residue for compliance with MRL for plant commodities: *chlorothalonil*

Definition of the residue for estimation of dietary intake for plant commodities: *chlorothalonil*

SDS-3701 (2,5,6-trichloro-4-hydroxyisophthalonitrile), all considered separately.

Definition of the residue for compliance with MRL and for estimation of dietary intake for animal commodities: *SDS-3701 (2,5,6-trichloro-4-hydroxyisophthalonitrile).*

In 2012 the JMPR evaluated additional uses for chlorothalonil in banana, chard, chicory, endive, spring onion, spinach, and peas.

The current Meeting received new information on use patterns for chlorothalonil in multiple crops supported by additional analytical methods, storage stability data and supervised field trials.

Methods of analysis

The Meeting received two analytical methods for chlorothalonil not previously evaluated by the Meeting. Both methods were used in the supervised field trials newly submitted and are not intended for monitoring purposes.

Method GRM005.01A is applicable to plant matrices and used homogenisation with acetone and 5M sulphuric acid solution (95:5 v/v). Following solid phase extraction (SPE) clean-up, chlorothalonil was analysed by gas chromatography with mass selective detection (GC-MSD). The metabolite R182281 was quantified by high performance liquid chromatography with triple-quadrupole mass spectrometric detection. The method was successfully validated (70–110% recovery, RSD < 20%) for both analytes for matrices with high water, high acid, high oil and high starch content.

The second method (“Cornell-Method”) is an in-house method using acidified acetone and partitioning against petroleum ether. The organic phase contains chlorothalonil and the aqueous, its metabolite SDS-3701. The sample is then methylated with diazomethane and cleaned up on an alumina column, eluting with dichloromethane. The organic and aqueous extracts were analysed by GC/ECD to determine residues of chlorothalonil and SDS-3701 respectively. The method was successfully validated (70–110% recovery, RSD < 20%) for both analytes for matrices with high water and high acid content.

Stability of residues in stored analytical samples

The Meeting received two additional studies on the storage stability to support the newly submitted supervised field trials not previously evaluated.

In the first study chlorothalonil and its metabolite SDS-3701 were proven to be stable for at least 24 months in stored samples of tomato, cucumber, melon, oranges, carrots (roots and tops), barley (grain and straw) and soya bean seeds.

In a second study cranberries fortified with chlorothalonil and SDS-3701 were analysed after 10 months. The stored triplicate samples indicated a significant decline with average recoveries of 63% of chlorothalonil and 38% of SDS-3701 remaining. The Meeting concluded that both analytes may degrade in cranberries. Since no intermediate samples were analysed, no acceptable storage interval above one month could be identified by the Meeting.

Results of supervised residue trials on crops

The Meeting received supervised trial data for applications of chlorothalonil on various fruit and vegetable crops conducted in Brazil, Europe, Rep. of Korea and the USA.

Residues of SDS-3701 may potentially be taken up by succeeding crops after application of chlorothalonil in the previous year. For annual crops considered by this year, JMPR only estimated median and highest residue values following primary treatment, as these are intermediate values in the establishment of the final STMR and HR values which need to take into account the additional contribution by soil uptake; refer to the rotational crop section.

Pear

Chlorothalonil is registered in Rep. of Korea on pears at a rate of 4×0.04 kg ai/hL with a PHI of 14 days. Six supervised field trials from Rep. of Korea matching this GAP were submitted.

In the trials submitted samples were prepared for analysis by removal of the stem and the core, which were discarded before homogenisation. The Meeting concluded the sample preparation did not comply with the Codex Sampling Guideline, and would have had a significant influence on the residue concentration, making these trials unsuitable for the estimation of maximum residue levels or STMR and HR values.

Cherries

Chlorothalonil is registered in Canada on cherries with a rate of 3×4.5 kg ai/ha with a PHI of 40 days. Supervised field trials from the USA matching this GAP were submitted.

In cherries following treatment with chlorothalonil according to Canadian GAP, residues were (n=10): 0.04, 0.073, 0.12, 0.13, 0.28, 0.5, 0.74, 0.8, 1.2, 1.3 mg/kg.

The corresponding residues of SDS-3701 were (n=10): < 0.01(8), 0.011, 0.03 mg/kg

The Meeting estimated a maximum residue level, an STMR and an HR value of 3 mg/kg, 0.39 mg/kg and 1.8 mg/kg (based on a single highest field sample) for chlorothalonil in cherries, respectively.

For dietary intake purposes the Meeting also estimated an STMR of 0.01 mg/kg and an HR of 0.035 mg/kg (based on a single highest field sample) for SDS-3701 in cherries.

Peaches and nectarines (subgroup)

Chlorothalonil is registered in Canada on peaches and nectarins with a rate of 3×4.5 kg ai/ha with a PHI of 60 days. Supervised field trials from the USA matching the GAP were submitted.

In peaches following treatment with chlorothalonil according to Canadian GAP residues were (n=12): < 0.01, < 0.01, 0.01, 0.014, 0.063, 0.12, 0.12, 0.13, 0.18, 0.24, 0.3, 0.9 mg/kg.

The corresponding residues of SDS-3701 were (n=12): < 0.01(11), 0.01 mg/kg

The Meeting estimated a maximum residue level, an STMR and an HR value of 1.5 mg/kg, 0.12 mg/kg and 1.1 mg/kg (based on a single highest field sample) for chlorothalonil in peaches, respectively.

For dietary intake purposes the Meeting also estimated an STMR of 0.01 mg/kg and an HR of 0.011 mg/kg (based on a single highest field sample) for SDS-3701 in peaches (including nectarines and apricots).

Cranberry

Chlorothalonil is registered in Canada on cranberries with a rate of 3×5.5 kg ai/ha with a PHI of 50 days.

Supervised field trials from the USA matching the GAP were submitted; however supportive storage stability data indicated a substantial loss of residues after the seven month storage interval of the field samples. The Meeting concluded that the data could not be used for assessment.

Bulb onions

Chlorothalonil is registered in the USA on dry onions and shallots with a rate of 3×2.5 kg ai/ha with a PHI of 7 days. Supervised field trials from the USA matching this GAP were submitted.

In bulb onions following treatment with chlorothalonil according to USA GAP residues were (n=8): 0.068, 0.083, 0.22, 0.4, 0.4, 0.48, 0.56, 0.68 mg/kg.

The corresponding residues of SDS-3701 were (n=8): < 0.01(7), 0.026 mg/kg.

The Meeting estimated a maximum residue level, and STMR and an HR value of 1.5 mg/kg, 0.4 mg/kg and 0.69 mg/kg (based on a single highest field sample) for chlorothalonil in bulb onions, respectively.

For dietary intake purposes the Meeting also estimated a STMR of 0.01 mg/kg and an HR of 0.028 mg/kg (based on a single highest field sample) for SDS-3701 in bulb onions.

The Meeting agreed to extrapolate the results to shallots.

Green onions

Chlorothalonil is registered in the USA on green onions with a rate of 3×2.5 kg ai/ha with a PHI of 14 days.

Three supervised field trials from the USA matching the GAP application rate and PHI were submitted. However, one of these trials was conducted at a late growth stage of BBCH 49 which showed substantially higher residues (39 mg/kg) than the two other trials treated at BBCH 17–18 (0.29 mg/kg and 0.42 mg/kg).

The Meeting concluded that the total dataset available is inadequate and no recommendation on green onions can be made.

Peppers

Chlorothalonil is registered in Brazil on pepper with a rate of 2×0.2 kg ai/hL with a PHI of 7 days. Supervised field trials from Brazil matching this GAP were submitted to the 2010 Meeting and supported by additional trials this year.

Residues of chlorothalonil in peppers following treatment according to Brazilian GAP based on trials submitted to the 2010 JMPR were (n=4): 1.1, 1.5, 1.7 and 4.4 mg/kg.

Additional trials submitted this year on peppers gave chlorothalonil residues of (n=8): 0.15, 0.16, 0.22, 0.28, 0.44, 0.74, 1.9, 2.9 mg/kg

Total residues (2010+2015 data) in peppers following treatment according to Brazilian GAP were (n=12): 0.15, 0.16, 0.22, 0.28, 0.44, 0.74, 1.1, 1.5, 1.7, 1.9, 2.9 and 4.4 mg/kg.

The corresponding residues of SDS-3701 (when analysed) were (n=5): < 0.01(5) mg/kg.

In the USA chlorothalonil is registered on peppers with a rate of 8×1.3 kg ai/ha with a PHI of 3 days. Supervised field trials from the USA matching this GAP were submitted.

In bell peppers following treatment with chlorothalonil according to USA GAP residues were (n=8): 0.5, 0.76, 1.0, 1.4, 1.6, 1.7, 2.8, 2.9 mg/kg. The corresponding residues of SDS-3701 were (n=8): < 0.03(8) mg/kg.

In non-bell peppers following treatment with chlorothalonil according to USA GAP residues were (n=7): 0.26, 0.62, 0.62, 0.7, 1.0, 1.6, 1.6 mg/kg. The corresponding residues of SDS-3701 were (n=7): 0.029, < 0.03(6) mg/kg.

The Meeting recognized that chlorothalonil residues in peppers treated according to Brazilian GAP resulted in the highest residue and estimated a maximum residue level of 7 mg/kg based on this dataset for peppers.

For dietary intake purposes of chlorothalonil the Meeting concluded that the STMR value for bell peppers treated according to US GAP was higher than the STMR according to the Brazilian GAP. Since both GAPs were supported by a sufficient number of trial data, the higher STMR of 1.5 mg/kg was selected for dietary intake purposes. An HR of 4.4 mg/kg was estimated based on the Brazilian GAP.

Residues of SDS-3701 were generally below the LOQs of 0.01 mg/kg to 0.03 mg/kg except for one finite residue at 0.029 mg/kg. The Meeting estimated both an STMR and HR of 0.03 mg/kg for SDS-3701 in peppers based on the more critical US dataset.

For the extrapolation from sweet pepper to dried chili pepper a default processing factor of 10 was taken into account. The Meeting estimated a maximum residue level of 70 mg/kg for chlorothalonil in dried chili pepper as wells as a STMR of 15 mg/kg and a HR of 44 mg/kg. For SDS-3701 both a STMR and HR of 0.3 mg/kg were estimated.

Tomato

Chlorothalonil is registered in Poland on tomatoes under protected conditions with a rate of 2 × 0.1 kg ai/hL (up to 1 kg ai/ha per application) with a PHI of 3 days. Protected supervised field trials on cherry tomatoes from various European countries approximating the GAP but with higher spray concentrations of 0.13 kg ai/hL to 0.2 kg ai/hL were submitted.

Compared to the Polish GAP all supervised field trials involved treatment at exaggerated spray concentrations, however the rates applied approximate the GAP maximum of 1 kg ai/ha and application. Since in the field trials submitted tomatoes were cultivated as high crops, the Meeting concluded that the spray concentration is the most sensitive parameter in terms of residues and decided to use the proportionality approach based on the spray concentration.

In protected tomatoes following treatment with 0.13 kg ai/hL (scaling factor 0.77) chlorothalonil residues were 0.45 mg/kg (0.77×0.59 mg/kg) and SDS-3701 residues were < 0.01 mg/kg (unscaled).

In protected tomatoes following treatment with 0.17 kg ai/hL (scaling factor 0.59) chlorothalonil residues were 0.94, 1.1, 1.8 mg/kg (0.59×1.6, 1.8 and 3.1 mg/kg) and SDS-3701 residues were 0.006, 0.012, 0.024 mg/kg (0.59×0.01, 0.02 and 0.04 mg/kg).

In protected tomatoes following treatment with 0.2 kg ai/hL (scaling factor 0.5) chlorothalonil residues were 0.5, 1.1, 1.7, 2.8 mg/kg (0.5×0.99, 2.2, 3.4 and 5.5 mg/kg) and SDS-3701 residues were 0.005, 0.015, 0.015, 0.035 mg/kg (0.5×0.01, 0.03, 0.03 and 0.07 mg/kg).

Total scaled residues of chlorothalonil were (n=8): 0.45, 0.5, 0.94, 1.1, 1.1, 1.7, 1.8 and 2.8 mg/kg

Total scaled residues of SDS-3701 were (n=8): 0.005, 0.006, < 0.01, 0.012, 0.015, 0.015, 0.024 and 0.035 mg/kg

The Meeting estimated a maximum residue level, an STMR and an HR value of 5 mg/kg, 1.1 mg/kg and 2.8 mg/kg for chlorothalonil in tomatoes, respectively.

For dietary intake purposes the Meeting also estimated a STMR of 0.0135 mg/kg and an HR of 0.035 mg/kg for SDS-3701 in tomatoes.

Mushroom

Chlorothalonil is registered in the USA on mushrooms for soil drench application with a rate of 12.7 kg ai/ha as a first treatment followed by 6.4 kg ai/ha as second treatment with a PHI of 7 days. Supervised field trials from the USA matching the GAP were submitted.

In mushrooms following treatment with chlorothalonil according to USA GAP residues were (n=2): 0.09, 0.43 mg/kg.

The corresponding residues of SDS-3701 were (n=2): < 0.01, 0.16 mg/kg.

The Meeting concluded that the data submitted for mushroom was insufficient upon which to make recommendations.

Ginseng

Chlorothalonil is registered in the USA on ginseng with a rate of 8×1.7 kg ai/ha with a PHI of 14 days. Supervised field trials from the USA matching the GAP were submitted.

In ginseng roots (washed and dried) following treatment with chlorothalonil according to USA GAP residues were (n=3): 0.19, 0.35, 0.78 mg/kg.

The corresponding residues of SDS-3701 were (n=3): 0.19, 0.3, 0.61 mg/kg.

The Meeting estimated a maximum residue level, and STMR and an HR value of 2 mg/kg, 0.35 mg/kg and 1.0 mg/kg (based on a single highest field sample) for chlorothalonil in dried ginseng (including red ginseng), respectively.

For dietary intake purposes the Meeting also estimated an STMR of 0.3 mg/kg and an HR of 0.61 mg/kg (based on a single highest field sample) for SDS-3701 in dried ginseng (including red ginseng).

Horseradish

Chlorothalonil is registered in the USA on horseradish with a rate of 8×2.5 kg ai/ha with a PHI of 14 days. Supervised field trials from the USA matching this GAP were submitted.

In horseradish roots following treatment with chlorothalonil according to USA GAP residues were (n=3): 0.031, 0.25, 0.38 mg/kg.

The corresponding residues of SDS-3701 were (n=3): 0.027, 0.14, 0.25 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR value of 1 mg/kg, 0.25 mg/kg and 0.48 mg/kg (based on a single highest field sample) for chlorothalonil in horseradish, respectively.

For dietary intake purposes the Meeting also estimated an STMR of 0.14 mg/kg and an HR of 0.28 mg/kg (based on a single highest field sample) for SDS-3701 in horseradish.

Root and tuber vegetables, except horseradish

In 2010 the Meeting recommended a maximum residue level for root and tuber vegetables of 0.3 mg/kg. Due to the higher maximum residue level of 1 mg/kg for chlorothalonil in horseradish, the Meeting decided to exclude horseradish from the group maximum residue level.

The Meeting estimated a maximum residue level of 0.3 mg/kg for root and tuber vegetables, except horseradish. In 2010 the Meeting decided to accommodate for the uncertainty involved with the residue data by basing the dietary risk assessment (chronic and acute) on the maximum residue level also.

The Meeting withdraws its previous recommendation of 0.3 mg/kg for chlorothalonil in root and tuber vegetables.

Asparagus

Chlorothalonil is registered in the USA on asparagus with a rate of 3×3.4 kg ai/ha applied after harvest to the fern with a PHI of 190 days. Supervised field trials from the USA matching the GAP were submitted.

In asparagus spears following treatment with chlorothalonil according to USA GAP residues were (n=8): < 0.01(8) mg/kg.

The corresponding residues of SDS-3701 were (n=8): < 0.01(8) mg/kg.

The Meeting estimated a maximum residue level of 0.01* mg/kg for chlorothalonil in asparagus.

For dietary intake purposes the Meeting concluded that the application of chlorothalonil after harvest to the fern does not lead to significant residues in asparagus spears in the next growing season. Therefore the STMR and HR for both chlorothalonil and SDS-3701 were estimated at 0 mg/kg, although no trials conducted at exaggerated rates were submitted.

Rhubarb

Chlorothalonil is registered in the USA on rhubarb with a rate of 6×2.5 kg ai/ha with a PHI of 30 days. Supervised field trials from the USA matching this GAP were submitted.

In rhubarb stalks following treatment with chlorothalonil according to USA GAP residues were (n=3): 0.39, 0.55, 2.8 mg/kg.

The corresponding residues of SDS-3701 were (n=3): < 0.02(3) mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR value of 7 mg/kg, 0.55 mg/kg and 3.9 mg/kg (based on a single highest field sample) for chlorothalonil in rhubarb, respectively.

For dietary intake purposes the Meeting also estimated an STMR and an HR of 0.02 mg/kg for SDS-3701 in rhubarb.

Pistachio nut

Chlorothalonil is registered in the USA on pistachio nuts with a rate of 5×5.0 kg ai/ha and a PHI of 14 days. Supervised field trials from the USA matching the GAP were submitted.

In pistachio nutmeat following treatment with chlorothalonil according to USA GAP residues were (n=3): < 0.01, 0.082, 0.11 mg/kg.

The corresponding residues of SDS-3701 were (n=3): < 0.01(3) mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR value of 0.3 mg/kg, 0.082 mg/kg and 0.14 mg/kg (based on a single highest field sample) for chlorothalonil in pistachios, respectively.

For dietary intake purposes the Meeting also estimated an STMR and an HR of 0.01 mg/kg for SDS-3701 in pistachios.

Residues in rotational crops

Following application of chlorothalonil the major metabolite SDS-3701 has a potential to be taken up by succeeding crops. However, the additional uses evaluated by this JMPR either involve treatment of permanent crops not being subject to crop rotation or their total seasonal rate is lower than the maximum seasonal rate of 20 kg ai/ha used in 2010 to estimate residues in rotational crops. The

Meeting concluded that the assessment of SDS-3701 residues in rotational crops, as evaluated in 2010, also covers uses evaluated this year.

For primary uses evaluated this year on crops being subject to crop rotation, the Meeting decided to take into account the soil uptake of SDS-370 on crop residues. STMR and HR values following direct treatment were added to the corresponding values estimated for rotational crops to address the potential use of chlorothalonil in previous years.

For bulb onions and shallots STMR and HR values of 0.01 mg/kg and 0.028 mg/kg were identified after treatment according to current GAP. In 2010 STMR and HR values of 0.01 mg/kg and 0.04 mg/kg were estimated for SDS-3701 in rotated bulb vegetables. For the dietary intake assessment the Meeting estimated overall STMR and HR values of 0.02 mg/kg and 0.068 mg/kg, respectively.

In peppers grown as rotational crop (see fruiting vegetables) the 2010 Meeting estimated an STMR and an HR value of 0.015 mg/kg and 0.06 mg/kg for SDS-3701, respectively. The current Meeting evaluated uses on peppers (STMR and HR: 0.03 mg/kg each) and estimated overall STMR and HR-values of 0.045 mg/kg and 0.09 mg/kg. For dried chili pepper a default processing factor of 10 was applied, resulting in STMR and HR values of 0.45 mg/kg and 0.9 mg/kg for SDS-3701.

Uses on tomatoes evaluated by the current Meeting are only related to protected conditions and therefore not subject to crop rotation.

In horseradish grown as rotational crop (see root and tuber vegetables) the 2010 Meeting estimated an STMR and an HR value of 0.02 mg/kg and 0.03 mg/kg for SDS-3701, respectively. The current Meeting evaluated uses on horseradish (STMR: 0.14 mg/kg and HR: 0.28 mg/kg) and estimated overall STMR and HR-values of 0.16 mg/kg and 0.31 mg/kg for SDS-3701.

Asparagus, cherries, ginseng, peaches, pistachio nuts and protected tomatoes were not considered relevant in terms of residues derived from crop rotation.

Fate of residues during processing

In 2010 the JMPR Meeting concluded that under simulated processing conditions in sterile buffer solutions at pH 4 chlorothalonil residues were relatively stable with > 90% remaining at 90 °C and 73% remaining at 120 °C. At pH 5 and 100 °C a moderate degradation was observed in all samples, leaving approx. 80% of the initial chlorothalonil. The major degradation product was identified as SDS-3701 at 19% of the initial residue. For pH6 at 120 °C chlorothalonil is quickly degraded. Under addition of a sodium acetate buffer, less than 4% of the chlorothalonil remained. Main degradation products were SDS-3701 (48%) and an artefact (28%, identified as 4-amino-2,5,6-trichloroisophthalonitrile). In sterile water without buffer approx. 26% of the chlorothalonil remained. SDS-3701 constituted 59% of the residue while there was no formation of the artefact.

In contrast to the results obtained from sterile buffer solutions processing studies involving background matrices gave much lower levels of SDS-3701 after processing. The 2010 Meeting decided that besides the normal processing factors for chlorothalonil, yield factors for the conversion of parent substance into SDS-3701 should be taken into account for the estimation of the dietary intake. Depending on the outcome, the higher processing factor of SDS-3701 → SDS-3701 or chlorothalonil → SDS-3701 is used for the overall estimation of STMR-P and HR-P for SDS-3701 in the processed product.

Raw commodity (chlorothalonil)	Processed commodity	Chlorothalonil → Chlorothalonil (see 2010 JMPR Evaluation)		
		Individual processing factors	Mean or best estimate processing factor	STMR-P in mg/kg
Tomato (STMR: 1.1 mg/kg)	Juice, raw	0.3	See juice, bottled	See juice, bottled
	Juice, bottled	0.09, 0.1, 0.11, 0.13	0.1	0.11
	Puree	< 0.01(4)	0.01	0.011
	Canned/preserve	< 0.01(4)	0.01	0.011

	pomace, wet	0.01, 0.32	See pomace, dry	See pomace, dry
	pomace, dry	1.0, 1.3, 1.3, 1.4	1.3	1.4

Raw commodity (SDS-3701)	Processed commodity	SDS-3701 → SDS-3701 (see 2010 JMPR Evaluation)		
		Individual processing factors	Mean or best estimate processing factor	STMR-P in mg/kg
Tomato (STMR: 0.0135 mg/kg)	Juice, raw	0.5	See juice, bottled	See juice, bottled
	Juice, bottled	1.0, 1.0, 1.0, 1.5	1.0	0.0135
	Puree	5.5, 6, 6.5, 7.5	6.3	0.085
	Canned/preserve	1.0, 2.0, 2.0, 2.5	2.0	0.027
	pomace, wet	1.5, 19	See pomace, dry	See pomace, dry
	pomace, dry	13, 14, 16, 18	15	0.2

Raw commodity (chlorothalonil)	Processed commodity	Chlorothalonil → SDS-3701 (see 2010 JMPR Evaluation)		
		Individual processing factors	Mean or best estimate processing factor	STMR-P in mg/kg
Tomato (STMR: 1.1 mg/kg)	Juice, raw	0.001	See juice, bottled	See juice, bottled
	Juice, bottled	0.002(4)	0.002	0.0022
	Puree	0.01(3), 0.02	0.01	0.011
	Canned/preserve	0.002, 0.004, 0.004, 0.005	0.004	0.0044
	pomace, wet	0.003, 0.04	See pomace, dry	See pomace, dry
	pomace, dry	0.03(3), 0.04	0.03	0.033

For chlorothalonil in processed tomato products, based on an STMR value of 1.1 mg/kg, the Meeting estimated STMR-P values of 0.11 mg/kg for tomato juice, 0.011 mg/kg for tomato puree and canned tomatoes and 1.4 mg/kg for tomato dry pomace.

For SDS-3701, based on processing factor from SDS-3701 → SDS-3701 and an STMR value of 0.0135 mg/kg, the Meeting estimated STMR-P values of 0.0135 mg/kg for tomato juice, 0.085 mg/kg for tomato puree, 0.027 mg/kg for canned tomatoes and 0.2 mg/kg for tomato dry pomace.

Residues in animal commodities

For all uses under evaluation in this JMPR for chlorothalonil only tomato pomace was identified as a relevant feed item to livestock animals. Since residues in tomato pomace in the dietary feed burden are superseded by residues of grape pomace being in the same Codex feed item group, no increase in the dietary burden for SDS-3701 by the uses evaluated this year compared to 2010 can be expected.

RECOMMENDATIONS

The Meeting estimated the STMR, HR and MRL values shown in Annex 1.

Definition of the residue for compliance with MRL for plant commodities: *chlorothalonil*

Definition of the residue for estimation of dietary intake for plant commodities: chlorothalonil SDS-3701 (2,5,6-trichloro-4-hydroxyisophthalonitrile), all considered separately.

Definition of the residue for compliance with MRL and for estimation of dietary intake for animal commodities: *SDS-3701 (2,5,6-trichloro-4-hydroxyisophthalonitrile).*

The residue is considered not fat-soluble.

CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
		New	Previous		
VS 0621	Asparagus	0.01*	-	Chlorothalonil: 0 SDS-3701: 0	Chlorothalonil: 0 SDS-3701: 0
FS 0013	Cherries	3	-	Chlorothalonil: 0.39 SDS-3701: 0.01	Chlorothalonil: 1.8 SDS-3701: 0.035
DV 0604	Dried ginseng (including red ginseng)	2	-	Chlorothalonil: 0.35 SDS-3701: 0.3 [a]	Chlorothalonil: 1.0 SDS-3701: 0.61[a]
VR 0583	Horseradish	1	-	Chlorothalonil: 0.25 SDS-3701: 0.16 [b]	Chlorothalonil: 0.48 SDS-3701: 0.31 [b]
VA 0385	Onion, bulb	1.5	-	Chlorothalonil: 0.4 SDS-3701: 0.02 [b]	Chlorothalonil: 0.69 SDS-3701: 0.068 [b]
FS 0247	Peaches (including nectarines and apricots)	1.5	-	Chlorothalonil: 0.12 SDS-3701: 0.01	Chlorothalonil: 1.1 SDS-3701: 0.011
VO 0051	Peppers	7	-	Chlorothalonil: 1.5 SDS-3701: 0.045 [b]	Chlorothalonil: 4.4 SDS-3701: 0.09[b]
VO 0440	Peppers, Chili (dry)	70	-	Chlorothalonil: 15 SDS-3701: 0.45 [b]	Chlorothalonil: 44 SDS-3701: 0.9[b]
TN 0675	Pistachio nut	0.3	-	Chlorothalonil: 0.082 SDS-3701: 0.01	Chlorothalonil: 0.14 SDS-3701: 0.01
VS 0627	Rhubarb	7	-	Chlorothalonil: 0.55 SDS-3701: 0.02	Chlorothalonil: 3.9 SDS-3701: 0.02
VR 0075	Root and tuber vegetables	W	0.3	-	-
VR 0075	Root and tuber vegetables, except horseradish	0.3	-	Chlorothalonil: 0.3 SDS-3701: 0.02 [c]	Chlorothalonil: 0.3 SDS-3701: 0.03 [c]
VA 0388	Shallot	1.5	-	Chlorothalonil: 0.4 SDS-3701: 0.02 [b]	Chlorothalonil: 0.69 SDS-3701: 0.068 [b]
VO 0448	Tomato	5	-	Chlorothalonil: 1.1 SDS-3701: 0.0135	Chlorothalonil: 2.8 SDS-3701: 0.035
JF 0048	Tomato juice			Chlorothalonil: 1.1 SDS-3701: 0.0135	
MW 0448	Tomato purée			Chlorothalonil: 1.1 SDS-3701: 0.0185	
	Tomato canned			Chlorothalonil: 1.1 SDS-3701: 0.027	
	Tomato dry pomace			Chlorothalonil: 1.4 SDS-3701: 0.2	

[a] The contribution of SDS-3701 by uptake from soil cannot be estimated for dried ginseng.

[b] STMR and HR values represent the sum of SDS-3701 found after direct application and in crops grown as rotational crop (see Residues in rotational crops

[c] Based on 2010 Evaluation

DIETARY RISK ASSESSMENT

Long-term intake

The evaluation of chlorothalonil has resulted in recommendations for MRLs and STMRs for raw and processed commodities. The International Estimated Daily Intakes for the 17 GEMS/Food cluster diets, based on this years estimated STMRs and previous STMRs from 2010 and 2012 were in the range 10–50% of the maximum ADI of 0.02 mg/kg bw.

The evaluation of SDS-3701 has resulted in recommendations for STMRs for raw and processed commodities following primary treatment and after uptake from soil as rotational crop.

The International Estimated Daily Intakes for the 17 GEMS/Food cluster diets, based on this years estimated STMRs and previous STMRs from 2010 and 2012 were in the range 4–10% of the maximum ADI of 0.008 mg/kg bw.

The results are shown in Annex 3 to the 2015 Report.

The Meeting concluded that the long-term intake of residues of chlorothalonil and its metabolite SDS-3701, from uses that have been considered by the JMPR, is unlikely to present a public health concern.

Short-term intake

The International Estimated Short Term Intake (IESTI) for chlorothalonil and its metabolite SDS-3701 were separately calculated for the plant and livestock commodities (and their processing fractions) for which new STMRs and HRs were estimated and for which consumption data were available. The results are shown in Annex 4 to the 2015 Report.

The IESTI for chlorothalonil varied from 0–30% of the ARfD (0.6 mg/kg bw) and the IESTI for its metabolite SDS-3701 from 0–10% of the ARfD (0.03 mg/kg bw). The Meeting concluded that the short-term intake of residues of chlorothalonil and SDS-3701, from uses that have been considered by the JMPR, is unlikely to present a public health concern.

REFERENCES

Code	Author	Year	Title, Institute, Report reference
CLTA10_269	Chaggar S.	2006	Chlorothalonil (R44686) - Analytical Method For The Determination Of Residues Of Chlorothalonil And R182281 In Crops, Syngenta Crop Protection AG, Basel, CH,, GRM 005.01A, GLP, not published, Syngenta File No R44686/4047
CLTA10_270	Chaggar S.	2006a	Chlorothalonil (R44686) - Validation of Residue Analytical Method GRM005.01A for the Determination of Residues of R182281 in Crops. Final Determination by LC-MS/MS, Syngenta Crop Protection AG, Basel, CH,, T013840-05-REG, GLP, not published, Syngenta File No R44686/4046
CLTA10_271	Anderson L., Chaggar S.	2007	Chlorothalonil (R44686) and R182281 (SDS-3701) - Storage Stability of Field-Incurred Residues in Homogenised Crops stored Deep Frozen for up to Two Years, Syngenta Crop Protection AG, Basel, CH,, T000559-06-REG 04-S606, GLP, not published, Syngenta File No R182281/0023
CLTA10_272	Corley J.	2013	Chlorothalonil: Magnitude of the Residue on Cranberry, Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA,, IR-4 No.10801, GLP, not published, Syngenta File No R044686_11073
CLTA10_273	McDonald T.	2014	Chlorothalonil SC(A12531B) ? Magnitude of the Residues in or on Cherry to Support Codex, USA 2013, Syngenta Crop Protection AG, Basel, CH,, Golden Pacific Laboratories, LLC (GPL), USA, TK0119272, GLP, not published, Syngenta File No A12531B_10118
CLTA10_274	Jolly C.	2014	Chlorothalonil: Magnitude of the Residue on Cherry, Sour, IR-4-10859, Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA, , IR-4 PR No. 10859, GLP, not published, Syngenta File No R044686_11084
CLTA10_275	McDonald T., Salzman F.	2014	Chlorothalonil SC (A12531B) - Magnitude of the Residues in or on Peaches to Support Codex USA 2013, Syngenta Crop Protection AG, Basel, CH,, Golden Pacific Laboratories, LLC (GPL), USA, TK0119271, 130517, GLP, not published, Syngenta File No A12531B_50047
CLTA10_276	McDonald T., , Smith N.	2014	Chlorothalonil SC (A12531B) - Magnitude of the Residues in or on Bulb and Green Onion to Support Codex USA 2013, Syngenta Crop Protection AG, Basel, CH,, Golden Pacific Laboratories, LLC (GPL), USA, TK0119273, 130519, GLP, not published, Syngenta File No A12531B_50053
CLTA10_277	Thompson D.	2007	Chlorothalonil - Magnitude of the Residue on Pepper (Bell), Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA, , A0032, GLP, not published, Syngenta File No R44686/4221
CLTA10_278	Thompson D.	2007	Chlorothalonil - Magnitude of the Residue on Pepper (Non-Bell), Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA, 00571, GLP, not published, Syngenta File No R44686/4220
CLTA10_279	Homa Kathryn	2011	Chlorothalonil - Magnitude of the Residue on Pepper (Non-Bell), Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA, A0571, GLP, not published, Syngenta File No R044686_51575

CLTA10_280	Baptista G., Bahia Filho O.	2006	Bravonil 500 - Residues of chlorothalonil in sweet pepper - Brazil, 2004-05
CLTA10_281	Matarazzo V.	2014	Bravonil 500 - Magnitude of Residues of Chlorothalonil and R182281 in Sweet Pepper Brazil, 2012-13
CLTA10_282	Lopez N.	2009	Bravonil 500 - Residues of Chlorothalonil in sweet pepper - Brazil, 2007-08
CLTA10_283	North L.	2012	Chlorothalonil and Azoxystrobin - Residue Study on Protected Cherry Tomato in the United Kingdom and Northern France in 2011, Syngenta Crop Protection AG, Basel, CH,, Eurofins Agroscience Services Ltd, Wilson, UK, S11-00518-REG, GLP, not published, Syngenta File No A14111B_10061
CLTA10_284	North L.	2012	Chlorothalonil and Azoxystrobin - Residue Study on Protected Cherry Tomato in Spain and Southern France in 2011, Syngenta Crop Protection AG, Basel, CH,, Eurofins Agroscience Services Ltd, Wilson, UK, S11-00519-REG, GLP, not published, Syngenta File No A14111B_10062
CLTA10_285	Schulz D., Breyer N.	2013	Chlorothalonil - Residue study on Protected Cherry Tomatoes in Germany in 2012, Syngenta Crop Protection AG, Basel, CH,, Eurofins Agroscience Services Chem, DE, S12-01287, GLP, not published, Syngenta File No A14111B_10822
CLTA10_286	Schulz D., Breyer N.	2013	Chlorothalonil - Residue study on Protected Cherry Tomatoes in Spain in 2012, Syngenta Crop Protection AG, Basel, CH,, Eurofins Agroscience Services Chem, DE, S12-01288, GLP, not published, Syngenta File No A14111B_10821
CLTA10_287	Thompson David C.	1995	Chlorothalonil - Magnitude of Residue on Mushrooms, Syngenta Crop Protection AG, Basel, CH,, ISK Biotech Corporation, Houston, USA,, 06204, GLP, not published, Syngenta File No R044686_10809
CLTA10_289	Corley J.	2007	Chlorothalonil - Magnitude of the Residue on Ginseng, Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA, , A0988, GLP, not published, Syngenta File No R44686/4224
CLTA10_290	Thompson D.	2007	Chlorothalonil - Magnitude of the Residue on Horseradish, Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA, , A2392, GLP, not published, Syngenta File No R44686/4223
CLTA10_291	McDonald T., Oakes T.	2014	Chlorothalonil SC (A12531B) - Magnitude of the Residues in or on Asparagus to Support Codex USA 2013, Syngenta Crop Protection AG, Basel, CH,, Golden Pacific Laboratories, LLC (GPL), USA TK0119274, 130520, GLP, not published, Syngenta File No A12531B_50056
CLTA10_292	Thompson D.	2007	Chlorothalonil - Magnitude of the Residue on Rhubarb, Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA,, 05410, GLP, not published, Syngenta File No R44686/4222
CLTA10_293	Thompson D.	1996	Chlorothalonil - Magnitude of Residue on Pistachio, Syngenta Crop Protection AG, Basel, CH,, IR-4 Project, North Brunswick, USA, , 05196, GLP, not published, Syngenta File No 454103
CLTA10_294	Park, J. W.	2014	FINAL REPORT, on, Magnitude of Chlorothalonil Residues in or on Pears in Korea, Ministry of Food and Drug Safety (MFDS), S-14-04-2-FOD-009-0-D, No-GLP, not published