CHLORPYRIFOS-METHYL (090)

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EXPLANATION

Chlorpyrifos-methyl is an organophosphorous insecticide effective against a wide range of insect pests in crops of commercial importance. The compound was evaluated by previous Joint Meetings many times since 1975, and was listed at the 40th session of the CCPR (2008) for periodic review by the 2009 JMPR for both residue and toxicological aspects. An ADI of 0–0.01 mg/kg bw and a ARfD of 0.1 mg/kg bw were established by the Meeting. The manufacturer submitted data on metabolism of chlorpyrifos-methyl in farm animals and plants, environmental fate, methods of analysis, GAP information, supervised residue trials on citrus, pome fruit, stone fruits, cherries, grapes, strawberries, kiwi fruit, onion, tomato, peppers, sugar beet, potato, carrot, artichoke, green beans, oilseed rape, cotton and cereals, and processing studies on various crops. Additionally, metabolism studies on chlorpyrifos in plants were submitted.

IDENTITY

ISO common name:	Chlorpyrifos-methyl
IUPAC name:	<i>O</i> , <i>O</i> -dimethyl <u>O</u> -3,5,6-trichloro-2-pyridyl phosphorothioate.
Chemical Abstract name:	O,O-dimethyl O-3,5,6-trichloro-2-pyridinyl phosphorothioate
CAS No.:	5598-13-0
CIPAC No.:	486
Molecular Formula:	C ₇ H ₇ Cl ₃ NO ₃ PS
Structural Formula:	$C I \qquad C I \qquad S \\ C I \qquad N \qquad O - P \qquad O - CH_3 \\ O - CH_3 $

Molecular Weight:

322.5 g/mol

Physical and chemical properties

Property	Result	Reference
Melting point:	46.0 °C	Boothroyd, 1993a
Relative density:	1.642 at 23 °C	Boothroyd, 1994a
Vapour pressure:	3×10^{-3} Pa at 25 °C, (2.0 × 10 ⁻³ Pa at 20 °C,	Boothroyd, 1993b
	by calculation)	
Henry's law constant:	0.235 Pa m ³ mol ⁻¹ , (by calculation at 20 $^{\circ}$ C)	Watson, 2002
Spectra for active substance		Boothroyd et al., 1994b

Property	Result	Reference
UV-VIS Molecular extinction	2.21×10^4 , 204.1 nm	
coefficients (ϵ , molL ⁻¹ cm ⁻¹):	1.17×10^4 , 229.1 nm	
	6.07×10^3 , 288.9 nm	
IR Bands and assignments:	3063 cm ⁻¹ C-H (Ar) stretching, consistent	
C C	with aromatic ring	
	3012 cm ⁻¹ C-H (Ar) stretching, consistent	
	with aromatic ring	
	2954 cm ⁻¹ C-H stretching, consistent with	
	RCH ₃	
	1548 cm ⁻ consistent with substituted pyridine	
	$1240 \text{ cm}^{-1} \text{ P.O. stratshing}$	
	1240 cm ⁻¹ P.O stretching consistent with	
	POAr	
	967 cm ⁻¹ P-O stretching, consistent with POAr	
NMR Proton and ¹³ C assignments:	1H: 7.88 (1H, s) aromatic	
	4.04 (6H, d) CH ₃	
	¹³ C: 150.7 (s) quaternary	
	144.1 (s) quaternary	
	141.3 (d) aromatic	
	127.0 (s) quaternary	
	120.5 (s) quaternary	
	55.9 (dq) CH ₃	
	$^{2}J_{CP} = 5.35 \text{ Hz}$	
MS m/z ions and assignments:	$m/z 327 (3 \times {}^{3}Cl)$	
	$m/z 325 ({}^{35}Cl, 2 \times {}^{37}Cl)$	
	$m/z 323 (2 \times {}^{35}Cl, {}^{37}Cl)$	
	$m/z \ 321 \ (3 \times {}^{35}Cl)$	
	m/z 288 (loss of one Cl from parent)	
	$m/z 199 (2 \times {}^{35}Cl, {}^{37}Cl)$	
	m/z 125; m/z 79	
Solubility		
	Water at 20 °C	Boothroyd, 1993b
	distilled water: 2.74 mg/L	
	pH 5 buffer: 2.36 mg/L	
	pH 7 buffer: 2.74 mg/L	
	pH 9 buffer: 2.22 mg/L	W 1 1002
Organic solvents	II. 12.0. /100. I	Knowles, 1993
	Hexane: 12.0 g/100 mL	
	Nathanali 18.0 a/100 mL	
	N estenol: 11.0 g/100 mL	
	N-octanol: 11.0 g/100 mL Dichloromethane > 400 g/100 mL	
	A cetone misciple: $> 400 \text{ g/100 mL}$	
	Ethyl acetate misciple: $> 400 \text{ g/100 mL}$	
	Acetonitrile: $> 400 \text{ g}/100 \text{ mL}$	
Partition coefficient:	L_{og} Kow = 4.0	Sydney, 1997
Hydrolysis rate constants 25 °C	pH 4: 26.6 days	Yon and Muller, 1994a
	pH 7: 20.9 days	
	pH 9: 13.1 days	
Direct photo-transformation	Observed at 290 nm with ca 50% degradation	Yon and Muller, 1994b:
r · · · · · · · · · · · · · · · · · · ·	after 8 hr irradiation in the preliminary test.	
	No significant quantities of degradation	
	products ($\geq 10\%$ active substance added)	
	were observed.	

Property	Result	Reference
Other properties		
Quantum yield:	2.6×10^{-3}	Yon and Muller, 1994b
Stability in air:	Half-life of 2.112 hours (reaction with hydroxyl radicals)	Day and Rudel, 1993
Flammability:	Non-flammable (melted but did not ignite)	Knowles, 1991a
Auto-flammability:	Auto-ignition temperature = 272 ± 5 °C	Richardson, 1995
Explosive properties:	Non-explosive	Knowles, 1991b
Surface tension:	70.5 mN/m (90% saturated solution)	Sydney, 1997
Oxidizing properties:	Non-oxidizing	Knowles, 1991c

METABOLISM AND ENVIRONMENTAL FATE

Abbreviation	Name	Structure
СРМ	Chlorpyrifos-methyl	
¹⁴ C-chlorpyrifos- methyl	¹⁴ C-labelled chlorpyrifos-methyl at 2- and 6-positions of the pyridinyl ring	$Cl \qquad Cl \qquad S \\ Cl' \qquad N \qquad N \qquad O-P \qquad O' \\ * - \text{ denotes } {}^{14}C \qquad O' \\ N \qquad N \qquad O' \qquad O' \\ N \qquad O' \\$
DEM	Des-methyl chlorpyrifos-methyl, (O-methyl-O-(3,5,6- trichloro-2-pyridinyl) phosphorothoic acid).	
S-methyl isomer	S-methyl chlorpyriphos-methyl, ,S-dimethyl-O-(3,5,6- trichloro-2-pyridinyl) phosphorothioate	
OXM	Chlorpyrifos-methyl oxon, (O,O-dimethyl-O-(3,5,6- trichloro-2-pyridinyl) phosphate).	
СНР	Chlorpyrifos	
¹⁴ C-chlorpyrifos	¹⁴ C-labelled chlorpyrifos at 2- and 6-positions of the pyridinyl ring	$CI \qquad CI \qquad S \\ CI \qquad * N \qquad * O - P - O \\ * - denotes ^{14}C \qquad O$
DES	Des-ethyl chlorpyrifos, (O-ethyl-O-(3,5,6-trichloro-2- pyridyl) phosphorothoic acid).	
OXON	Chlorpyrifos-oxon, (O,O-diethyl-O-(3,5,6-trichloro-2- pyridinyl) phosphate).	

Abbreviation	Name	Structure
ТСР	3,5,6-trichloro-2-pyridinol	
TMP	2-methoxy-3,5,6-trichloropyridine	

Metabolism in animals

Goat

 $[^{14}C]$ chlorpyrifos-methyl (unspecified label position, > 99% radiochemical purity) was fed to two lactating goats in a dosing rate *ca*. 32 mg/kg feed, administered in gelatin capsules twice a day for 7 days (McConnel *et al.*, 1982; Study 33688). Milk, blood, urine and faeces were collected throughout the dosing period. Tissues and gut contents were collected at sacrifice, 14 hours after the final dose.

Whole milk samples were radioassayed by liquid scintillation counting (LSC) prior to separation into milk fat and skim milk by centrifugation. Liquid samples were radioassayed by direct LSC and solids (faeces and milk fat) were combusted prior to determination of radioactivity. One goat was monitored for CO_2 and volatiles were collected using Chromosorb absorption tubes, which were extracted with methanol and radioassayed using LSC.

Liver, kidney, fat and milk fat were extracted with acetonitrile (ACN) and the extract partitioned three times with hexane. The acetonitrile layer was dried and the residue reconstituted in methanol prior to radio TLC and HPLC analysis. The non-extracted residue was subject to base hydrolysis (0.1 N NaOH in 80% methanol under reflux for 2 hours). The extract was evaporated to remove the methanol, and the resulting aqueous solution was adjusted to pH 1 with sulphuric acid. This solution was partitioned three times with diethyl ether, the ether extract dried, resuspended in methanol and analysed by radio TLC and HPLC. All extracts were analysed by LSC and the final remaining residue was combusted prior to LSC determination. Recovery was > 91% of administered dose and approximately 95% of recovered radioactivity was in the urine (approximately 22 mg/kg chlorpyrifos-methyl eq.). Total radioactive residues (TRR) in tissues never exceeded 0.62 mg/kg, level that was found in kidney; in milk, residues were concentrated in fat (Table 1). Most of the radioactivity was found in the ACN extract (Table 2).

Sample	Goat 1	Goat 2
Liver	0.32	0.40
Kidney	0.60	0.62
Fat (visceral and subcutaneous)	0.065	0.14
Heart	0.092	0.16
Skeletal muscle	0.029	0.047
Whole milk	0.021	0.027
Skin milk	0.016	0.015
Milk fat	0.061	0.115

Table 1 Total radioactive residues (TRR) in tissues (mg/kg parent equivalents) following feeding of $[^{14}C]$ chlorpyrifos-methyl to goats at ca. 32 mg/kg feed

Matrix	Acetonitrile extraction	Acetonitrile unextracted	Base extraction of acetonitrile unextracted	Base insoluble	Total ^a
Liver	ACN—73.6 hexane—2.8	18.6	aq—1.4 ether—10.0	6.4	95.0
Kidney	ACN—78.8 hexane—2.4	13.1	aq—0.6 ether—7.4	4.1	94.3
Fat	ACN—73.8 hexane—10.2	4.8	-	-	88.8
Milk fat	ACN—77.6 hexane—13.8	1.7	_	_	93.1

Table 2 Percentage TRR of residues following dosing with $[^{14}C]$ chlorpyrifos-methyl (mean of 2 goats)

^a ACN extraction + ACN unextracted

Table 3 shows the TLC metabolite profiles of tissue and milk ACN extracts. In liver and kidney, most of the residues were found as TCP, while in fat and milk fat, the parent compound was predominant. Similar results were found by HPLC analysis.

Table 3 TLC metabolite identification of residues in the acetonitrile extract fat following dosing of goats with $[^{14}C]$ chlorpyrifos-methyl at ca. 32 mg/kg feed %TRR and mg/kg

	Chlorpyrif	fos-methyl	S-methyl i	isomer	TCP		DEM		Total	
Matrix	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg
Liver	0.3	0.001	0.4	0.001	66.7	0.24	4.5	0.02	82.0	0.30
Kidney	0.4	0.002	0.5	0.003	74.2	0.45	7.0	0.04	88.9	0.54
Fat	55.3	0.06	0.7	0.001	16.5	0.02	2.6	0.003	75.1	0.08
Milk fat	61.8	0.06	0.0	0.0	12.8	0.01	1.9	0.002	82.5	0.07

Base extracts of liver and kidney showed no parent compound and only TCP as metabolite (10.5%TRR in liver and 6.8%TRR in kidney). Base extracts of tissue insolubles showed traces of chlorpyriphos-methyl (up to 0.2% TRR), TCP plus S-methyl isomer (up to 9%TRR) and up to 1%TRR of DEM in kidney.

Urine samples were analysed directly by LSC and also incubated with glusulase for 24 hours at 38 °C (contains beta-glucuronidase and sulfatase). Metabolites identified by TLC in urine before and after glusulase extraction are showing on Table 4, and agreed well with the HPLC results.

Compound	Goat 1		Goat 2		
	Before glusulase	After glusulase	Before glusulase	After glusulase	
Chlorpyrifos-methyl	0.1	0.5	0.1	0.0	
S-methyl isomer	0.2	0.1	0.4	0.0	
ТСР	54.4	70.7	73.0	77.6	
DEM	24.5	22.2	18.6	17.0	
Origin of TLC	19.1	5.6	6.0	4.2	
Total	96.3	99.1	98.1	98.8	

Table 4 TLC results of glusulase extraction in urine (mean % of total residue)

Poultry

Four laying hens (White Leghorn) received a daily dose of $[^{14}C]$ chlorpyrifos-methyl (specific activity 12.4 mCi/mmol, radiopurity > 99%) at a dietary intake of *ca* 25 mg/kg feed, for 10 days (Wilkes *et al.*, 1982; Study 33689). Eggs were collected from each hen, once daily prior to dosing, separated into yolk and white fractions and frozen for analysis. Excreta was also collected for each 24-hour period

from the floor and frozen for extraction with methanol. Tissue and fat (visceral and subcutaneous) samples were collected at sacrifice, approximately 16 hours after the tenth daily dose (apart from one bird that was terminated on Day 7 due to ill health) and frozen for analysis.

Radioactivity levels were determined by combustion analysis/LSC. Tissue and egg samples were extracted with ACN, the extracts partitioned with hexane and analysed by TLC and HPLC. The unextracted residues in egg yolk and kidney were subjected to base hydrolysis (0.1 N NaOH in 80% methanol) and the extracts analysed by LSC. Excreta methanol extract was evaporated, the pH of aqueous phase reduced to 1 with sulphuric acid, partitioned with diethyl ether, evaporated, resuspended into methanol and analysed by LSC.

The majority of the radioactivity (*ca* 70% applied radioactivity; 4.7–20 mg/kg) was present in the excreta. Radioactivity was low in tissues, exceeding 0.1 mg/kg only in fat, kidney and egg yolk (Table 5).

Table 5 Total radioactive residues (mg/kg) in tissues following dosing of hens with $[^{14}C]$ chlorpyrifosmethyl at 10N rate

Sample	TRR, mg/kg chlorpyrifos-methyl eq.
Liver	0.02–0.04
Kidney	0.09–0.15
Dark muscle	< 0.01-0.02
Light muscle	< 0.01
Fat	0.07–0.35
Heart	0.01–0.02
Skin	0.02–0.09
Egg white	< 0.01-0.03
Egg yolk	< 0.01-0.10

The radioactivity found in the kidney, fat and egg yolk solvent extract are given in Table 6. Over 75% TRR was found in the ACN fractions. Pooled tissue samples and eggs were characterized for metabolite composition by TLC/HPLC (Table 7). The majority of the residue present in kidney was the TCP and DEM metabolites. Fat contained mainly the parent and egg yolk contained roughly equal quantities of all three components. Excreta contained mainly TCP, which appeared to be more tightly bound with storage, and low levels of parent and DEM. The metabolite profiles were similar for HPLC and TLC.

Table 6 The characterization of residues in kidney, fat and egg yolk following dosing of hens with $[^{14}C]$ chlorpyrifos-methyl at 10N rate (%TRR)

Tissue	ACN extraction	ACN unextracted	Base extraction of ACN unextracted	Base insoluble	Total ^a
Kidney	ACN-78.7	17.0	aq—4.3	8.5	95
	hexane—0.0		ether—12.6		
Fat	ACN-82.0	0.2	-	-	96.4
	hexane—14.2				
Egg yolk	ACN-75.7	20.5	aq—2.0	3.6	103
	hexane—6.8		ether—18.2		

^a ACN extraction + ACN unextracted

Table 7 TLC metabolite identification of residues in kidney, fat and egg yolk following dosing of hens with [¹⁴C]chlorpyrifos-methyl at 10N rate, in %TRR

Matrix	Chlorpyrifos- methyl	S-methyl isomer	ТСР	DEM	Total
Kidney	0.0	0.0	ACN: 56.2 Base:10.9	ACN:22 Base: 0	89.7

Matrix	Chlorpyrifos- methyl	S-methyl isomer	ТСР	DEM	Total
Fat ^a	74.8	0.4	1.1	2.3	78.6
Egg yolk ^a	16.1	0.0	19.9	23.2	59.2

^a ACN extract

Plant Metabolism

Two studies were conducted in plants using chlorpyrifos methyl (tomato and cereal grains) and four with chlorpyrifos (citrus, cabbage, peas and radish).

Tomato

Tomato plants were grown in plastic pots (0.30 m diameter) containing a silt loam soil and kept in the greenhouse for germination and during early growth (Graper, 2002a; Study GH-C 5483). The plants were transferred outdoors and maintained for at least eight weeks prior to one spray application of $[^{14}C]$ chlorpyrifos methyl at a rate equivalent to 0.99 kg ai/ha, within the seasonal label rate range of 0.5 to 3.0 kg ai/ha. Fruit, leaf or vine samples were collected at 0, 5, 13, 26 and 42 days after application (DAT). Fruit and leaf samples were further processed by rinsing first with DCM and then with ACN, cut up, frozen, and milled with dry ice and/or liquid nitrogen until analysed.

Rinsed or unrinsed tomato fruit tissue was extracted three times with 80/20 ACN/water, filtered and partitioned three times with DCM. The organic phase was concentrated to low volume, partitioned with hexane, the hexane phase was partitioned twice with ACN and this phase concentrated for HPLC analysis. The extracted tissue and spent filter paper were allowed to air dry and assayed by combustion. TRR in all tissues were determined by oxidative combustion and LSC. TRR levels in all liquid samples were determined by direct LSC.

The stability of DEM during extraction was evaluated by adding [¹⁴C]DEM to a 5 DAT rinsed control tomato fruit sample. The synthesis of DEM was extremely difficult due to its instability and a purity of 76.0% was the best that could be achieved. The main contaminant appeared to be TCP, which comprised 18.1% of the radioactivity eluting from HPLC. Other minor contaminants did not exceed 6%. A concentrate of the 26-DAT fruit extracted aqueous phase was subjected to treatment using β -glucosidase, the sample partitioned with DCM, the extract concentrated and prepared for HPLC. In order to assess the stability of DEM to the enzyme procedure, an aliquot of a [¹⁴C]DEM solution was subjected to the same procedure. Elution of non-radiolabelled reference standards was monitored at 280 nm.

TRR values declined over the time for both fruit and leaves (Table 8). The TRR in fruit that had not been present when the ¹⁴C test substance was applied (42NP) was 0.211 mg/kg. In fruit at 0 and 5 DAT, the majority of the radioactivity was found in the DCM rinses, and increased in fruit tissue over time

	DCM Rinse	DCM Rinse		ACN Rinse		nsed Tissue	Total
DAT	%TRR	mg/kg ^a	%TRR	mg/kg ^a	%TRR	mg/kg ^a	mg/kg ^a
Fruit							
0	86.7	0.475	1.4	0.008	11.9	0.065	0.548
5	50.0	0.237	2.0	0.009	48.0	0.228	0.475
5U	NA	NA ^e	NA	NA	100.0	0.825	0.825
13	24.0	0.116	1.0	0.005	75.0	0.364	0.485
26	0.8	0.004	0.1	0.000	99.1	0.439	0.443
42U	NA	NA	NA	NA	100.0	0.309	0.309
42NP	NA	NA	NA	NA	100.0	0.211	0.211

Table 8 TRR in tomato fruit and leaves and distribution of radioactivity in rinses and rinsed tissue presented as mg chlorpyrifos-methyl equivalents per kg and as % of TRR

	DCM Rinse	DCM Rinse ACN		CN Rinse		Rinsed or Unrinsed Tissue		
DAT	%TRR	mg/kg ^a	%TRR	mg/kg ^a	%TRR	mg/kg ^a	mg/kg ^a	
Leaves								
5	6.2	0.771	7.6	0.947	86.2	10.727	12.45	
13	3.2	0.284	7.2	0.641	89.6	7.956	8.88	

^a Minimum detectable amount (MDA) and minimum quantifiable amount (MQA) were 0.002 and 0.007 mg/kg, respectively;

U = unrinsed tissue;

NP = fruit that was not present at ¹⁴C-test substance application. This fruit was not rinsed;

NA = not applicable.

By 13 DAT, half of the TRR was found in the ACN and aqueous extracts and about 15% remained in the tissues (Table 9). About 100% of the [¹⁴C]DEM radioactivity was recovered during the procedure.

	Hexane Pha	se	ACN Phase	ACN Phase		ueous	Tissue ^a	
DAT	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg
0	< 0.1	< 0.001	11.8%	0.065	0.2%	0.001	0.2%	0.001
5	< 0.1	< 0.001	33.2%	0.158	8.5%	0.040	3.9%	0.019
5U	0.3%	0.002	87.3%	0.720	4.8%	0.040	2.7%	0.022
13	0.1%	0.001	30.1%	0.146	20.0%	0.097	15.0%	0.073
26	1.0%	0.004	33.9%	0.150	40.9%	0.181	18.6%	0.082
42U	1.4%	0.004	32.1%	0.099	54.8%	0.169	16.1%	0.050
¹⁴ C-DEM	< 0.1	< 0.001	95.3%	0.036	5.2%	0.002	0.6%	< 0.001
stability								

Table 9 Distribution of radioactivity in extracts of rinsed and unrinsed tomato fruit presented

^a after combustion

The results of HPLC analysis of tomato fruit extracts are summarized in Table 10. Only a small % of TRR in the fruit surface rinses was found as residues other than chlorpyrifos-methyl. Chlorpyrifos-methyl was metabolized in fruit tissue rinses primarily to TCP and polar residues. For all fruit samples, no greater than 2.5% of TRR was found in the region where DEM was expected to elute; the region of TCP contained up to 23.8% of TRR. The MQL was not exceeded for TMP, S-methyl isomer, and OXN at any sample times.

When an extracted aqueous phase from 26-DAT fruit containing a relatively large amount of polar radioactivity (26, Enz) was subjected to treatment with β -glucosidase, 6.5%TRR that was liberated eluted in the TCP region; little or no radioactivity was released that chromatographed in the DEM region. When an aliquot of a [¹⁴C]DEM solution was subjected to the same procedure, 61.7 and 24.2% of the sample radioactivity eluted in the DEM and TCP regions, respectively. Knowing that the purity of the solution was 74.8%, about 17% of the radioactivity was lost during the procedure. The authors concluded that if DEM were formed in tomato samples, it would be only partially degraded by the methods used, and would be found in the ACN phases and extracted aqueous fractions.

Table 10 Distribution of radioactivity in regions of chromatograms from the HPLC analysis of fruit rinses and extracts presented as % of TRR and mg/kg chlorpyrifos methyl

	Polar residues							
	(6–7 min)		DEM		TCP		Chlorpyrifos-methyl	
DAT, Description	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg
0, DCM ^a Rinse	< MQL	< 0.007	< MQL	< 0.007	_	-	78.7	0.432
0, ACN ^a Phase	< MQL	< 0.007	< MQL	< 0.007	< MQL	< 0.007	11.6	0.063
Total	< MQL	< 0.007	< MQL	< 0.007	< MQL	< 0.007	90.3	0.495
5, DCM Rinse	< MQL	< 0.007	< MQL	< 0.007	< MQL	< 0.007	47.2	0.224

	Polar residues							
	(6–7 min)	-	DEM	-	ТСР		Chlorpyrife	os-methyl
DAT, Description	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg
5, ACN Phase	< MQL	< 0.007	1.3	0.006	7.2	0.034	23.2	0.110
5, Aqueous	7.9	0.038	< 0.007	< 0.007	< MQL	< 0.007	< MQL	< 0.007
Total	7.9	0.038	1.3	0.006	7.2	0.034	70.4	0.334
5U, ACN Phase	< MQL	< 0.007	< 0.007	< 0.007	4.8	0.039	82.2	0.678
5U, Aqueous	4.3	0.036	0.5	0.004	< MQL	< 0.007	< MQL	< 0.007
Total	4.3	0.036	0.5	0.004	4.8	0.039	82.2	0.678
13, DCM Rinse	< MQL	< 0.007	< MQL	< 0.007	< MQL	< 0.007	20.4	0.099
13, ACN Phase	< MQL	< 0.007	2.5	0.012	11.3	0.055	13.8	0.067
13, Aqueous	19.6	0.095	< MQL	< 0.007	< MQL	< 0.007	< MQL	< 0.007
Total	19.6	0.095	2.5	0.012	11.3	0.055	34.3	0.166
26, ACN Phase	1.5	0.007	< MQL	< 0.007	23.8	0.106	3.0	0.013
26, Aqueous	39.8	0.176	< MQL	< 0.007	< MQL	< 0.007	< MQL	< 0.007
Total	41.3	0.183	< MQL	< 0.007	23.8	0.106	3.0	0.013
26, Enz DCM	0.3	0.001	< MQL	< 0.007	6.5	0.029	< MQL	< 0.007
26, Enz AQ	23.2	0.103	< MQL	< 0.007	< 0.007	< 0.007	< MQL	< 0.007
Total	23.5	0.104	< MQL	< 0.007	6.5	0.029	< MQL	< 0.007
42U, ACN Phase	2.2	0.007	< MQL	< 0.007	21.2	0.065	1.7	0.005
42U, Aqueous	30.4	0.094	< MQL	< 0.007	< MQL	< 0.007	< MQL	< 0.007
Total	32.6	0.101	< MQL	< 0.007	21.2	0.065	1.7	0.005
¹⁴ C-DEM ^a ACN Phase	< MQL	< 0.007	40.3	0.015	33.1	0.012	< MQL	< 0.007
¹⁴ C-DEM ^a Aqueous	0.6		4.4	0.002	< MQL	< 0.007	< MQL	< 0.007
Total	0.6		44.7	0.017	33.1	0.012	< MQL	< 0.007
Enz ¹⁴ C-DEM ^b DCM	< MQL	< 0.007	< MQL	< 0.007	22.5		< MQL	
Enz ¹⁴ C-DEM ^b AQ	1.2		61.7		1.6		< MQL	
Total	1.2		61.7		24.2		< MQL	

MQL = less than 0.1% to 2.4% TRR

U = unrinsed tissue

^a76% purity

^b74.8 % purity

The results of HPLC analysis of tomato leaf extracts are summarized in Table 11. Like what was found for fruit extracts, chlorpyrifos-methyl was metabolized in leaf rinses primarily to TCP and to polar residues.

Table 11 Distribution of radioactivity in regions of chromatograms from the HPLC analysis of leaf rinses and extracts presented as % of TRR and mg/kg chlorpyrifos methyl

Sample Type -	Polar residues (6–7 min)		ТСР		Chlorpyrifos-methyl	
DAT, Description	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg
5, DCM Rinse	0.3	0.038	1.6	0.204	2.9	0.366
5, ACN Rinse	4.3	0.535	1.0	0.126	0.5	0.066
Total	4.6	0.572	2.6	0.329	3.5	0.432
13, DCM Rinse	0.1	0.013	1.2	0.105	1.1	0.095
13, ACN Rinse	2.8	0.250	0.3	0.024	< 0.1	0.004
Total	3.0	0.263	1.5	0.129	1.1	0.099

Stored Grain

The [¹⁴C]chlorpyrifos-methyl was formulated, together with unlabelled material, as an emulsifiable concentrate (McConnell *et al.*, 1982; Study GH-C 1578). The formulation was applied to samples of

wheat grain or maize grain at a rate equivalent to 32.4 mg ai/kg grain. Treated grain was stored in sealed glass bottles maintained at 25 ± 1 °C for up to 180 days. Samples were taken prior to storage, 30, 90 and 180 days, extracted and characterized by TLC and HPLC. Residues after 180 days of storage are shown in Table 12. Parent compound represent about 1/3 of the radioactivity in maize and 45% in wheat.

Table 12 Levels of parent and metabolite/degradation products arising after 180 days of storage (expressed as % AR)

	% of total ¹⁴ C residues	
Residue	Maize	Wheat
Chlorpyrifos-methyl	30	45
ТСР	39	19
DEM	24	19
Alkali-liberated pyridinol	6	15
Alkali insolubles	1	2

Metabolism of chlorpyrifos

Citrus fruits

The metabolism of [¹⁴C]chlorpyrifos (98.8% and specific activity of 1.4 mCi/mmol) was investigated in oranges (Magnussen, 2002; Study GH-C 5484). One Washington Navel orange tree received a single spray application at a rate of 3.97 kg ai/ha, and samples of whole fruit were collected at 0, 6 and 21 days after treatment (DAT). The oranges were subjected to one or two organic solvent rinses using DCM/ACN (2:1) followed by ACN (6 and 21 DAT samples only). Rinsed oranges were separated into the peel, pith and pulp fractions. The peel and pith fractions were frozen in liquid nitrogen and ground, while the pulp samples were blended unfrozen. Portions of each sample were assayed for total radioactivity by combustion.

Rinsed peel fractions were extracted with ACN and the 6 and 21 DAT samples further extracted in ACN/water and ACN/DCM (1:1). Stability of the DES metabolite to the procedure was determined using the [¹⁴C]DES standard. Due to the much lower TRR levels in the pith and pulp fractions (Table 13), no additional work was done with these samples.

Citrus leaves were initially analysed by rinsing with DCM/ACN (2:1) followed by ACN. The rinsed leaves were further extracted with ACN and/or ACN/water (70:30) following partitioning with DCM/ACN (1:1). To evaluate the nature of the polar residues in the aqueous fractions, the residues in the spent aqueous fractions from 21-DAT leaves were characterized following enzyme (β -glucosidase) and base hydrolysis (1.0 N in NaOH). Following acidification of the hydrolysate solutions, radioactive residues released were partitioned using ACN/DCM and analysed by HPLC. The stability of the DES metabolite to these hydrolysis procedures was determined using control samples spiked with [¹⁴C]DES.

To evaluate the nature of the unextracted residues (NER), extracted 21-DAT leaves were subjected to enzyme (cellulase or driselase), acid (50:50 1.0 N HCl: ACN) and base (1.0 N NaOH) hydrolysis. Any remaining spent tissue was assayed for total radioactivity by combustion. Aliquots of the hydrolysate solutions were assayed for total radioactivity by direct LSC. The base hydrolysate solution was subsequently acidified and partitioned using ACN/DCM and this extract analysed by HPLC. The stability of the DES metabolite to these hydrolysis procedures was determined using [¹⁴C]DES. The acid detergent fibre (ADF) fraction of the extracted 21-DAT leaf tissue was isolated to determine the radioactivity associated with the lignin and cellulose fractions.

TRR levels in both leaves and fruit declined by approximately 50% or more in the three-week interval between application and harvest (Table 13). Over 99% of the whole fruit TRR remained associated with the peel.

	Whole Fruit Residues	Percent Distribution of Residues (mg/kg chlorpyrifos eq.)				
	(mg/kg <u>)</u>	Peel	Pith	Pulp		
Oranges: 0 Time	3.44	99.5 (26.1)	0.3 (0.10)	0.2 (0.009)		
6 DAT	3.01	99.5 (27.9)	0.4 (0.10)	0.1 (0.002)		
21 DAT	1.5	99.3 (15.4)	0.6 (0.05)	0.1 (0.003)		
Leaves: 6 DAT	86.5					
21 DAT	44.4					

Table 13 Total radioactive residue levels in whole oranges and in orange leaves plus the percent distribution of whole orange residues among the peel, pith and pulp fractions

Table 14 shows the percent distribution of the whole fruit TRR among the solvent rinses and the fractions generated following the extraction of rinsed peel. At all sampling times, most of the radioactivity was removed with the solvent rinse. For the 0 Time sample, virtually all the radioactivity remaining in the rinsed peel was readily extractable using ACN. By 21 DAT, only about 40% of the non-rinsed residue (13% of the TRR) could be accounted for in the extract and reflux fractions. Less than 1.5% of the TRR was associated with the polar, aqueous soluble fraction that is usually assumed to represent conjugated residues. The remainder of the residue was associated with the spent peel.

Table 14 Distribution of residues in whole oranges treated with $[^{14}C]$ chlorpyrifos among fractions generated by the rinse and extraction of peels

	Percent of Whole Fruit I	Percent of Whole Fruit Residue (mg/kg chlorpyrifos eq.)							
	Solvent Rinses	ACN Ext	ACN/H2O Reflux	Spent Peel					
0 Time	94.5 (3.25)	4.4 (0.151)	_	0.6 (0.021)					
6 DAT	80.5 (2.42)	10.3 (0.310)	2.0 (0.060)	6.7 (0.202)					
21 DAT	69.0 (1.04)	9.1 (0.137)	3.9 (0.059)	17.3 (0.261)					

Table 15 summarizes the percent distribution and the mg/kg of parent equivalents of the whole fruit residues in the peel extracts and rinses determined by HPLC. At 0 Time, chlorpyrifos represented most of the residue. For the rinse, none of the metabolites investigated were observed at levels exceeding the MQL. For the peel extract, low levels of radioactivity were observed eluting in the region of the OXON (the identity of this material was not confirmed by LC/MS). For the 6-DAT fruit, both fractions also contained low levels of an unidentified component (Metabolite A) that was only slightly less polar than chlorpyrifos. The peel extract also contained low levels of radioactivity eluting in the region of the OXON. Analyses of the 21-DAT fractions showed a similar residue profile to that seen at 6 DAT.

Table 15 Percent distribution of the TRR in the rinses and extracts of treated orange peel among chlorpyrifos and its metabolites as determined by HPLC

	Percent of	Percent of Whole Fruit Residue ^a							
				OXON			Polar	Nonpolar	
	CHP	Met A	TMP		TCP	DES	Unkns ^b	Unkns ^c	NER ^d
0 Time:									
Solvent Rinse	93.0	< 0.007	-	-	-	-	-	0.8	-
Organic Ext	4.0	-	< 0.007	0.2	< 0.007		< 0.007	< 0.007	-
Total	97.0	< 0.007	< 0.007	0.2	< 0.007		< 0.007	0.8	0.6
(mg/kg)	(3.336)			(0.007)				(0.028)	(0.021)
6 DAT:									
Solvent Rinses	76.7	2.6	-	-	-	-	-	1.2	-
Organic Ext	8.6	0.4	-	0.3	< 0.007	-	0.6	< 0.007	_
Total	85.3	3.0		0.3	< 0.007		0.6	1.2	6.7
(mg/kg)	(2.566)	(0.090)		(0.009)			(0.018)	(0.036)	(0.202)

	Percent of	Percent of Whole Fruit Residue ^a									
				OXON			Polar	Nonpolar			
	CHP	Met A	TMP		TCP	DES	Unkns ^b	Unkns ^c	NER ^d		
21 DAT:											
Solvent Rinses	61.8	5.3	-	< 0.007	-	-	-	1.5	_		
Organic Exts	8.2	0.7	-	-	< 0.007	-	1.9	< 0.007	_		
Total	70.0	6.0		< 0.007	< 0.007		1.9	1.5	17.3		
(mg/kg)	(1.056)	(0.090)					(0.029)	(0.023)	(0.261)		

^a MQL were in the range of 0.1–0.3% TRR

^b unidentified, polar components that eluted before the DES reference standard. Depending on the sample, this group was comprised of 3–6 peaks of which no single fraction represented more than 1.3% of the TRR

 c unidentified components that eluted either just before or immediately after chlorpyrifos. Depending on the sample, this group was comprised of 3–5 components, all of which appeared to be contaminants that were present in the ¹⁴C-test material

^d Non-extractable Residues (NER)

As with fruit, a significant portion of the leaf TRR was accounted for as surface residues that could be readily removed by the solvent rinses. Most of the residues remaining in the rinsed leaves were extracted and found to contain higher levels of the polar, aqueous soluble residues than were seen in fruit. These residues were assumed to represent conjugates. HPLC analyses of the leaf rinses and extracts showed a similar residue profile to that seen in fruit (Table 16).

Table 16 Percent distribution of the TRR in the rinses and extracts of treated orange leaves as determined by HPLC

	Percent	of Total Lea	f Residue ^a						
			CHP-Me			Polar	Nonpolar	Aqueous	
	CHP	Met A	Oxon	TCP	DES	Unkns ^b	Unkns ^c	Soluble ^d	NER ^e
6 DAT:									
Solvent Rinse	72.3	0.8	< 0.007	< 0.007	_	_	3.7	_	-
Organic Ext	13.2	0.6	< 0.007	< 0.007	-	2.9	< 0.007	_	_
Total	85.4	1.4	< 0.007	< 0.007		2.9	3.7	4.3	5.7
(mg/kg)	(73.8)	(1.21)				(2.51)	(3.20)	(3.72)	(4.93)
21 DAT:									
Solvent Rinses	42.2	1.6	0.2	< 0.007	_	-	3.1	-	-
Organic Ext	16.4	0.9	0.3	0.3	0.3	7.9	0.8	-	-
Total	58.8	2.5	0.5	0.3	0.3	7.9	3.9	10.8	14.6
(mg/kg)	(26.1)	(1.11)	(0.222)	(0.133)	(0.13)	(3.50)	(1.73)	(4.79)	(6.48)

 $^{\rm a}\,MQL$ of 0.1–0.3%

^b unidentified, polar components that eluted before the DES reference standard. For both samples, this group was comprised of three peaks of which no single fraction represented more than 4.6% of the TRR

^c unidentified components that eluted either just before or immediately after chlorpyrifos. Depending on the sample, this group was comprised of 4–7 components, most of which appeared to be contaminants that were present in the ¹⁴C test material

^d This fraction represents those residues in the ACN/water refluxes that could not be partitioned into organic solvent

^e Non-extractable Residues (NER)

Following enzyme hydrolysis of an aliquot of 21 DAT leaf aqueous soluble fraction, approximately 60% of the sample radioactivity was extracted into organic solvent. HPLC analysis of these organosoluble residues showed 32.0% of the sample radioactivity to elute in the region of TCP, 2.3% in the region of DES and 49.7% to elute as an unknown fraction more polar than DES. When [¹⁴C]DES was subjected to these same hydrolysis conditions, approximately 40% was found to degrade to TCP. Correcting for any degradation that might have occurred the maximum level of DES in the aqueous soluble fraction was only 3.8% of the total sample residue (0.4% of the TRR). A

second aliquot of this same aqueous soluble fraction was subjected to base hydrolysis. Approximately 90% of the sample radioactivity was extracted, with nearly 80% of these residues eluting in the same region as TCP. Under these same conditions, over 90% of a [¹⁴C]DES sample was converted to TCP. Results of this work confirmed that most of the aqueous soluble residues still contained the intact TCP moiety.

About 90% of the leaf NER was solubilised by base hydrolysis and about 85% of the bound radioactivity remained associated with the ADF (Table 17). Subsequent partitioning of the aqueous phase from this step resulted in the extraction of 82.9% of the solubilised radioactivity into organic solvent. HPLC analysis of this residue showed the presence of seven or more components, with TCP representing 36.7% of the recovered radioactivity. Since chlorpyrifos and the DES metabolite both convert to TCP under the base hydrolysis conditions, the presence of peaks other than TCP in this chromatogram would seem to suggest the presence of metabolites in the NER fraction that have undergone changes to the central ring structure of the chlorpyrifos molecule. It was suggested that it may involve the loss or replacement of one or more of the chlorine atoms.

Table 17 Percent distribution of the non-extracted residues in 21-dat leaves following enzyme, acid or base hydrolysis or isolation of the acid detergent fibre fraction

Characterization	Percent of Non-extractable Residue ^a	
Procedure	Aqueous Phase	Spent Tissue
Enzyme Hydrolysis: Cellulase	4.2	95.8
Driselase	6.6	93.4
Acid Hydrolysis	16.3	83.7
ADF Isolation	15.4	84.6
Base Hydrolysis	89.4	10.6

^a The non-extractable residues in the extracted 21-DAT leaves represented 14.6% of the TRR.

Cabbage

Cabbage plants received one foliar spray application of [14 C]chlorpyrifos (radiopurity of 96.9% and specific activity of 13,062 dpm/µg) at a rate equivalent to 1.43 kg ai/ha (Graper, 2002b; GH-C 5482). Plants were collected at 0, 7, 14, 21 and 42 days after application (DAT), with the 21-DAT sample representing the label recommended pre-harvest interval (PHI). The plants were separated into head and wrapper and flat leaves. Some samples were rinsed with DCM and ACN; rinsed and unrinsed samples were cut up, frozen, and milled with dry ice and/or liquid nitrogen. Samples were extracted with 80/20 ACN/water: some samples were partitioned with DCM and further with hexane to provide further clean up. The extracted tissue and spent filter paper were allowed to air dry and assayed by combustion.

The stability of DES was evaluated by adding [¹⁴C]DES (64.8% purity) to a 7 DAT rinsed control cabbage head sample that was extracted by the method described previously. A concentrate of the 80/20 extract from the 21-DAT rinsed wrapper leaf tissue was subjected to treatment using ß-glucosidase. [¹⁴C]DES solution was subjected to the same enzyme procedure. Elution of radioactivity was monitored either by an in-line flow detector or by collection of one-minute fractions followed by LSC analysis. Elution of non-radiolabelled reference standards was monitored at 280 nm.

Table 18 shows the TRR values for cabbage heads and leaves. The majority of the radioactivity was found in the DCM and ACN rinses. TRR values declined over the 42 days in all cases, probably due to volatilization from the plant surfaces, since they were close to maturity when treated. The increase from 0 to 7 DAT in the tissue of rinsed heads and of rinsed wrappers indicated that the applied radioactivity was penetrating into plant tissue. The flat leaves did not show an increase from 0 to 7 DAT for mg/kg in rinsed tissue, but the percentage distribution at all sample times was comparable for the head, wrapper, and flat leaves.

	DCM Rinse		ACN Rinse		Rinsed or U	Jnrinsed Tissue ^a	Total
DAT	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	mg/kg
Heads							
0	74.5	1.430	11.1	0.214	14.4	0.276	1.920
7	17.8	0.305	4.4	0.075	77.8	1.334	1.713
14	3.0	0.021	2.7	0.019	94.3	0.650	0.690
21	1.8	0.013	2.7	0.020	95.5	0.705	0.738
21U ^b	NA	NA^d	NA	NA	100.0	0.654	0.654
42	0.8	0.005	2.2	0.015	97.0	0.677	0.698
Wrapper Leave	s						
0	79.4	69.04	1.9	1.673	18.7	16.294	87.006
7	26.0	17.04	2.4	1.589	71.6	47.011	65.637
14	8.1	2.484	2.5	0.751	89.4	27.282	30.517
21	4.2	1.111	1.9	0.515	93.8	24.776	26.401
21U ^c	NA	NA	NA	NA	100.0	19.437	19.437
42	1.7	0.317	1.9	0.349	96.4	17.876	18.542
Flat Leaves							
0	64.0	62.181	3.5	3.360	32.5	31.599	97.140
7	23.8	10.568	3.5	1.560	72.7	32.335	44.464
14	9.7	3.848	2.7	1.064	87.6	34.865	39.778
21	5.7	1.995	2.2	0.769	92.2	32.463	35.228
21U ^c	NA	NA	NA	NA	100.0	28.298	28.298
42	3.0	0.893	1.6	0.469	95.5	28.703	30.066
Secondary Hea	ds ^c						
42U ^c	NA	NA	NA	NA	100.0	4.191	4.191

Table 18 TRR in cabbage heads and leaves and distribution of radioactivity in rinses and rinsed tissue presented as mg chlorpyrifos equivalents per kg and as % of TRR

^a rinsed tissue with the exception of 21 DAT

^b sprouted between the existing wrapper leaves and flat leaves

^c U = unrinsed tissue

NA = not applicable.

Table 19 shows the distribution of radioactivity in the extracts and tissues. Up to 7 DAT, most of the radioactivity was found in the organic phase; at 21 DAT and after, 70% of the TRR or over in head samples was found in the extracted aqueous. By 42 DAT, 77.2% of TRR for wrapper leaves were accounted for in the extracted aqueous and extracted tissue. Over 93 % of the added [¹⁴C]DES was recovery during the procedure, mostly in the organic phase.

Table 19 Distribution of radioactivity in extracts and tissue presented as mg chlorpyrifos equivalents per kg and as % of TRR

	Organic Phase		Extracted Aque	ous	Tissue	
DAT	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg
Heads						
0	13.7	0.263	0.5	0.009	0.1	0.001
7	44.8	0.768	16.0	0.273	5.2	0.089
14	21.4	0.148	48.7	0.336	8.6	0.059
21	19.1 ^a	0.141 ^a	70.8	0.523	11.0	0.081
21U ^b	16.5	0.108	72.4	0.474	11.4	0.075
42	12.1	0.085	70.0	0.488	12.6	0.088
DES stability	77.5	0.047	15.8	0.010	0.2	0.000 ^c
Wrapper Tissue						
0	18.1 ^d	15.787 ^d	- ^d	- ^d	0.7	0.615
7	63.3 ^d	41.573 ^d	_ ^d	_ ^d	11.5	7.546
14	74.1 ^d	22.620 ^d	_ ^d	_ ^d	24.3	7.423

	Organic Phase		Extracted Aqueo	ous	Tissue		
DAT	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	
21	52.3 _d	13.808 ^d	_ ^d	- ^d	36.5	9.642	
21U ^b	18.9	3.680	39.7	7.717	45.5	8.845	
42	17.0	3.146	35.2	6.529	42.0	7.785	

^a ACN phase, the hexane phase comprised 0.2% TRR

 b U = unrinsed tissue; on the basis of the theoretical amount of 14 C-DES added

 $^{\rm c}$ Note that values of 0.000 or 0.0% indicate values less than 0.001 or 0.1%

^d for the 80/20 ACN/water extract.

The results of HPLC analysis of the samples are summarized in Table 20. In the rinses, the radioactivity was primarily chlorpyrifos. At 7 DAT, organic extracts contained 42% of TRR, most of it as chlorpyrifos. From 21 DAT on, most of the radioactivity was composed primarily of polar radioactivity (regions H and J). At 21 DAT, chlorpyrifos accounted for 5.2%, DES for 2.4% and TCP for 6.1% of TRR radioactivity. The percent distribution in the HPLC regions is similar for heads and wrappers (data not shown). About 78% of the ¹⁴C-DES (64.8% purity) that was added was recovered during the procedure.

Table 20 Distribution	of radioactivity fr	om the HPLC analy	ysis of head rinses	and extracts
	2			

Sample Type	J (6–8 min	.)	H (11–12	2 min.)	DES		ТСР		Chlorpyri	fos
DAT, Description	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg
0, DCM Rinse	< 0.1	_	< 0.1	_	< 0.1	_	< 0.1	_	73.0	1.402
0, ACN Rinse	< 0.1	_	< 0.1	_	< 0.1	_	< 0.1	_	10.4	0.200
0, 80/20	< 0.1	_	< 0.1	_	< 0.1	_	< 0.007	< 0.007	12.9	0.248
Extract										
Total	< 0.1	-	< 0.1	_	< 0.1	_	< 0.007	< 0.007	96.4	1.850
7, DCM Rinse	< 0.1	_	< 0.1	_	< 0.1	_	< 0.1	_	17.6	0.301
7, ACN Rinse	0.3	0.004	0.8	0.014	< 0.1	_	< 0.007	< 0.007	3.1	0.053
7, Organic	< 0.1	_	0.9	0.016	< 0.1	_	2.0	0.035	38.7	0.664
7, Aqueous	4.2	0.073	11.0	0.188	< 0.1	_	< 0.007	< 0.007	< 0.1	_
Total	4.5	0.077	12.8	0.219	< 0.1	_	2.0	0.035	59.4	1.018
14, DCM Rinse	< 0.1	_	< 0.1	_	< 0.1	_	< 0.007	< 0.007	2.8	0.019
14, ACN Rinse	0.5	0.004	1.0	0.007	< 0.1	_	< 0.007	< 0.007	0.6	0.004
14, Organic	1.5	0.010	3.5	0.024	< 0.1	-	4.5	0.031	9.2	0.064
14, Aqueous	15.6	0.108	21.2	0.146	5.3	0.037	< 0.1	-	-	-
Total	17.6	0.121	25.7	0.177	5.3	0.037	4.5	0.031	12.6	0.087
21, DCM Rinse	< 0.1	_	< 0.007	< 0.007	< 0.1	_	< 0.007	< 0.007	1.4	0.010
21, ACN Rinse	0.7	0.005	< 0.1	_	0.2	0.002	< 0.007	< 0.007	0.4	0.003
21, Organic	1.3	0.009	3.4	0.025	2.4	0.017	6.1	0.045	5.2	0.038
21, Aqueous.	38.7	0.285	27.1	0.200	< 0.1	_	< 0.1	_	_	_
Total	40.6	0.300	30.5	0.225	2.6	0.019	6.1	0.045	7.0	0.052
21U, Organic	2.6	0.017	< 0.1	_	3.4	0.022	3.9	0.026	6.0	0.039
21U, Aqueous	40.8	0.267	29.2	0.191	< 0.1	_	< 0.1	_	_	_
Total	43.4	0.284	29.2	0.191	3.4	0.022	3.9	0.026	6.0	0.039
42, DCM Rinse	< 0.007	< 0.007	< 0.1	-	< 0.1	-	< 0.1	-	0.5	0.004
42, ACN Rinse	0.9	0.006	1.0	0.007	< 0.1	-	0.1	-	0.1	0.001
42, Organic	2.2	0.015	5.5	0.038	< 0.1	_	3.5	0.024	2.6	0.018
42, Aqueous	47.0	0.328	21.2	0.148	< 0.1	_	< 0.1	_	_	_
Total	50.0	0.349	27.6	0.193	< 0.1	_	3.6	0.025	3.3	0.023
DES, Organic ^a	< 0.007	< 0.007	< 0.1	_	38.3	0.023	29.4	0.018	< 0.007	< 0.007
DES, Aqueous ^a	0.9	0.001	< 0.1		12.3	0.008	0.8	0.000		
Total	0.9	0.001	< 0.1	_	50.6	0.031	30.2	0.018	< 0.007	< 0.007

Sample Type	J (6–8 min.)		H (11–12 min.)		DES		ТСР		Chlorpyrifos	
—										
DAT,	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg
Description										
¹⁴ C-desethyl ^b	< 0.007	< 0.007	< 0.1	-	64.8	0.040	22.2	0.014	< 0.007	< 0.007

DCM = DCM; ACN = ACN; U = unrinsed tissue

^a from adding ¹⁴C-DES to a 7 DAT control rinsed head sample

^{b 14}C-DES solution used for addition to control tissue.

The distribution of radioactivity in 21-DAT wrapper leaf samples after enzyme treatment shows that radioactivity in the extract was divided almost equally between the organic and extracted aqueous phases (approximately 28%TRR). For the [14 C]DES, most of the radioactivity was present in the aqueous phases (62% TRR).

An additional portion of the 21 DAT rinsed wrapper leaf sample was extracted with ACN:water (80:20 v/v), the extract subjected to extensive purification and the highly purified isolates analysed by HPLC-MS to investigate the structures of the metabolites and a metabolic pathway (Balcer *et al.*, 2003; Study 020135). Chlorpyrifos appears to be metabolized to TCP, which is extensively conjugated with glucose and malonic acid. The locations and orientations of the linkages between TCP and glucose and malonic acid were not determined.

Peas

EC formulated [¹⁴C]chlorpyrifos was applied to fifteen pots of pea plants as a single foliar spray application at a rate equivalent to 1.9 kg ai/ha, 3.2 times greater than GAP rate for legumes (Magnussen and Balcer, 2006; Study 50021). Treated samples were collected at 0, 7, 14, 21and 28 days after application (DAT), with the 21 DAT sample representing the label recommended pre-harvest interval (PHI). Pods with peas were removed from the plants (pod samples) and the remainder of the plants were collected (whole plant samples). Samples were frozen, cryogenically milled and stored at -20 °C until analysed, within 18–20 days of collection.

Samples were extracted with ACN/water (80:20) and the extracts partitioned with 1:1 ACN/DCM (neutral). The aqueous phase was acidified and again partitioned with ACN/DCM. No additional work was done to characterize non-extracted residues. TRR in all tissue samples both before and after extraction were determined by oxidative combustion and entrapment of the evolved $^{14}CO_2$ in an alkaline scintillation cocktail. TRR levels in all liquid samples were determined by direct counting. Some HPLC column eluant that was collected in 96-well plates was analysed using a TopCount-NXT microplate scintillation and luminescence counter.

Radioactivity declined rapidly in the pod and whole plant during the first 7 days following application (Table 21). By 28 DAT, it was equally distributed between the acidic extracts and the spent aqueous fractions. For all samples, the accountability of radioactivity during the extraction and partitioning steps ranged of 89.7–116.4% of theory.

		% Distribution of TRR Following Extraction						
	(mg/kg)	Neutral Organic	Acidic Organic	Spent Aqueous	NER ^b			
Whole Plants:								
0 Time	18.043	99.5	-	0.2	0.3			
7 DAT	3.256	64.7	13.8	15.2	6.3			
14 DAT	2.419	38.0	16.6	35.1	10.2			
21 DAT	3.412	34.5	15.1	39.6	10.7			
28 DAT	2.796	27.0	16.2	41.8	15.0			

Table 21 TRR in the pods and whole plants of peas treated with [¹⁴C]chlorpyrifos

	TDD	% Distribution of TRR Following Extraction							
	(mg/kg)	Neutral Organic	Acidic Organic	Spent Aqueous	NER ^b				
Pea Pods:									
0 Time	1.327	98.1	_	0.3	1.6				
7 DAT	0.594	69.3	10.8	11.1	8.8				
14 DAT	0.332	44.3	15.9	28.0	11.8				
21 DAT	0.377	33.1	19.4	34.8	12.7				
28 DAT	0.247	26.7	17.0	42.8	13.5				

^aExpressed as mg/kg of chlorpyrifos equivalents;

^b Non-extracted Residues

The distribution of radioactivity in the organic extracts and the spent aqueous phase, as determined by HPLC, showed a steady decrease over time in the levels of chlorpyrifos and an increase in TCP conjugates (Table 22). TCP levels were below 10% TRR during the whole period. From the 5 conjugates observed, only 2 were at levels higher than 10% TRR. As much as 10–30% of the radioactivity in the 7–28 DAT corresponded to at least twenty components more polar than the conjugates. LC/MS analysis confirmed the identity of chlorpyrifos, TCP and sugar related conjugate of TCP. No conjugates of metabolites that still contained the intact phosphate ester were observed in any of the isolated fractions.

Table 22 Summary of the Distribution of the Residues in the Pods and Whole Plants of Peas among Chlorpyrifos and Its Metabolites

	0 Time		7 DAT		14 DAT	14 DAT			28 DAT	
	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg
Whole Plants										
Chlorpyrifos	95.3	17.195	33.0	1.074	11.7	0.283	6.9	0.235	3.9	0.109
TCP	0.8	0.144	7.3	0.238	7.9	0.191	5.1	0.174	3.3	0.092
TCP Conjs. ^a	NDR	-	23.6	0.768	42.4	1.026	53.2	1.815	46.9	1.311
Pods										
Chlorpyrifos	89.6	1.189	33.4	0.198	9.7	0.032	5.8	0.022	3.8	0.009
TCP	0.9	0.012	9.8	0.058	6.8	0.023	8.6	0.032	8.7	0.021
TCP Conjs. ^a	NDR	_	16.8	0.100	33.4	0.111	40.9	0.154	42.5	0.105

^a The TCP conjugates consisted of at least five different sugar or sugar plus malonic acid conjugates of TCP.

Radish

 $[^{14}C]$ chlorpyrifos was applied to the plants in one box as a single foliar spray application at a rate equivalent to 1.92 kg ai/ha, 3.3 times greater than the maximum label rate (GAP) for use on tuber crops (Graper *et al*, 2006; Study 50020). Treated samples were collected at 0, 7, 14, 21 and 35 days after application or treatment (DAT). The aerial portion of the plants (tops) was removed, a portion of each top sample rinsed with DCM followed by ACN and the rinsed and un-rinsed sample frozen for analysis. Aliquots of both rinses were assayed for total radioactivity by LSC and analysed by HPLC. Root samples were cut into smaller pieces and frozen for analysis. Frozen root and top samples were submitted to cryogenic milling and stored frozen at -20 °C pending analysis. All samples were analysed within 100 days of collection

Samples were extracted with ACN/water (80:20). The 0, 7 and 14 DAT top samples were analysed directly by LSC and HPLC; the other two samples were also partitioned using 1:1 ACN/DCM before analysis. Spent tissue was submitted to combustion analysis. Sample portions of the extracted top tissues were stirred overnight in 0.01 N HCl; the remaining tissue removed by centrifugation and the pellet further extracted by refluxing in 1 N HCl. The extracted tissue was again

removed by centrifugation and was subsequently submitted for combustion analysis. The twohydrolysate solutions were partitioned with 1:1 ACN/DCM.

Additional portions of the tissues following extraction with ACN/water were also subjected to enzyme digestion using cellulose or driselase. The spent tissue was removed by centrifugation and the resulting supernatants partitioned with DCM after acidifying to pH 2–3. All fractions were analysed for total radioactivity, determined by oxidative combustion and entrapment of the evolved ¹⁴CO₂. TRR levels in all liquid samples were determined by direct counting (LSC). Some HPLC column eluant that was collected in 96-well plates was analysed using a TopCount-NXT microplate scintillation and luminescence counter.

Radioactive residues in the top samples decreased by 80–95% during the first 7 days following application (Table 23). The residue levels in roots were much smaller than in tops, with no pattern of decline over time. Based on the results from the 21 and 35 DAT top samples, there also appeared to be a decline over time in the portion of the residues that were organosoluble along with a corresponding increase in the level of aqueous soluble residues.

Residues in roots were readily extracted at 0 Time and remained so throughout the remainder of the study, as the NER levels never exceeded 10% TRR. Partitioning of the extracted residues at each time point showed virtually all the 0 Time residue to be organosoluble as only 0.6% TRR was accounted for in the spent aqueous phase. At 35 DAT, most of TRR was partitioned into organic solvent.

		% Distribution of TRR Following Extraction					
	TRR (mg/kg) ^a	Solvent Rinses	ACN/H2O or Organic extract	Spent Aqueous	NER ^b		
Rinsed Tops:							
0 Time	147.6	67.1	31.9	_	1.0		
7 DAT	14.2	21.2	65.5	_	13.3		
14 DAT	11.2	25.4	61.6	-	12.9		
21 DAT	6.8	13.9	43.3	22.9	19.8		
35 DAT	1.3	6.5	25.6	40.7	27.3		
Unrinsed Tops:							
0 Time	59.7	_	98.3	-	1.7		
7 DAT	12.7	_	88.5	_	11.5		
14 DAT	8.5	_	76.5	-	23.5		
21 DAT	4.7	_	42.9	36.0	21.1		
35 DAT	1.6	_	28.2	38.6	33.2		
Roots:							
0 Time	1.9	_	97.3	0.6	2.1		
7 DAT	1.0	_	84.8	10.4	4.8		
14 DAT	2.7	_	81.2	8.8	10.0		
21 DAT	1.1	_	72.1	20.2	7.7		
35 DAT	2.2	_	53.5	38.5	8.0		

Table 23 TRR in the roots and tops of radishes treated with [¹⁴C]chlorpyrifos and the percentage distribution of residues in the extraction

^a Expressed as mg/kg of chlorpyrifos equivalents

^b Non-extracted residues

Table 24 shows the distribution of the extracted radioactivity from both roots and tops as determined by HPLC. Since there were no differences in the nature of the residues between the rinsed and unrinsed tops, only results of the unrinsed tops are shown. By 7 DAT, the level of chlorpyrifos that remained had declined to 60.6% TRR and this level continued to decline over the remainder of the study while TCP conjugates increased (mainly glucose and malonic acid conjugates). Besides chlorpyrifos, the only other non-conjugated components that represented more than 2–3% of the TRR were TCP and an unknown compound that was less polar than the parent. LC/MS analysis confirmed

the identity of those residue components that co-chromatographed by HPLC with the reference standards for chlorpyrifos, TCP and glucose plus malonic acid TCP conjugates. Attempts to identify the unknown compound were not successful.

	0 Time		7 DAT		14 DAT		21 DAT		35 DAT	
	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg
	TRR		TRR		TRR		TRR		TRR	
Radish Tops										
Chlorpyrifos	93.7	55.98	60.6	7.7	38.3	3.3	22.3	1.0	14.8	0.236
TCP	<loq< td=""><td>-</td><td><loq< td=""><td>-</td><td>NDR</td><td>-</td><td>1.4</td><td>0.07</td><td>2.5</td><td>0.040</td></loq<></td></loq<>	-	<loq< td=""><td>-</td><td>NDR</td><td>-</td><td>1.4</td><td>0.07</td><td>2.5</td><td>0.040</td></loq<>	-	NDR	-	1.4	0.07	2.5	0.040
TCP Conjs.	0.9	0.52	23.4	2.61	33.9	2.887	36.6	1.7	43.0	0.686
Radish Roots										
Chlorpyrifos	93.8	1.77	80.1	0.824	76.3	2.046	61.4	0.690	41.5	0.906
TCP	1.3	0.025	2.3	0.023	3.1	0.084	1.5	0.017	1.2	0.026
TCP Conjs.	NDR	-	9.0	0.093	8.4	0.225	21.4	0.240	44.7	0.978

Table 24 Distribution of the residues in radish tops and roots among chlorpyrifos and its metabolites

Residues remaining in the extracted top samples were subjected to acid and enzyme hydrolysis procedures. Following the two sequential acid extraction steps, only an additional 3.4–5.8% TRR was found to have been released. Partitioning work with these hydrolysate samples showed 45–75% of the radioactivity to be aqueous soluble in nature. No additional characterization work was done with any of these fractions. For those samples that were subjected to an enzyme digestion step using cellulose, 43–88% of the bound residue (11.9–18.5% of the TRR) was solubilised. Partitioning work with these fractions showed 55–80% of the released residues to be aqueous soluble. For those samples that were subjected to enzyme digestion using driselase, 30.9–94.2% of the NER (8.4–19.8% of the TRR) was released, with most of these residues (70–85%) being aqueous soluble in nature. No additional characterization work was done with any of these fractions.

Based on the results from the metabolism studies conducted in orange, cabbage, peas and radish, a single primary metabolic pathway was observed to be responsible for the breakdown of chlorpyrifos in plants. This pathway involved hydrolysis of the phosphate ester in chlorpyrifos to give TCP, which in turn was then conjugated with glucose and malonic acid. A large number of additional polar components that were also thought to represent TCP conjugates were also observed in the studies. The proposed pathway is shown in Figure 1.

Environmental Fate in Soil

Aerobic degradation

[¹⁴C]Chlorpyrifos-methyl (radiochemical purity *ca* 98%; specific activity 1084 MBq/mmol) was incubated in Speyer 2.2 soil (loamy sand) and three UK agricultural soils (Marcham sandy loam, Marcham sandy clay loam and Derby silt loam) at a rate equivalent to 0.5 kg ai/ha at 40% MHC and 20 °C (Reeves, 1994; GHE-P-3638). Sodium hydroxide solution and PUF bungs were used to trap evolved ¹⁴CO₂ and organic volatiles, respectively. Samples were taken at regular intervals up to 100 days after treatment (DAT), extracted with solvent and the extracts analysed by LSC and HPLC. The data were subject to Timme-Frehse analysis to calculate the DT_{50} (half life) and DT_{90} using best-fit kinetics.

Table 25 illustrates the distribution of radioactivity (as % AR) in the Speyer 2:2 loamy sand, which was considered representative of the four soils tested. The initial degradation product in all soils was TCP, accounting for up to 65% of applied radioactivity (AR) within 7 days, which was subsequently mineralised to ¹⁴CO₂. In addition, up to nine minor metabolites were observed (generally $\leq 10\%$ AR each, but 15–16% AR on one occasion in two soils), one of which at ca 2% AR co-chromatographed with TMP. The other minor metabolites were unassigned. The majority of these

minor metabolites were transient. Non-extracted residues (NER) reached 17-26% AR at 100 days, and little or no organic volatiles were observed. Degradation was most rapid in the two soils with greatest microbial activity. Half life of all soils ranged from 0.63 to 3.6 days (Table 26).

Table 25 Distribution of radioactivity (as % AR) in Speyer 2:2 Loamy Sand

	Days After Treatment							
Component	0	1	3	7	14	30	59	100
Chlorpyrifos-methyl	92.9	55.3	31.7	5.7	5.6	1.9	3.0	2.6
TCP	4.1	28.3	43.2	26.9	3.8	3.5	1.7	1.0
TMP	1.9	ND	0.4	0.7	0.1	ND	ND	ND
$^{14}CO_2$	NS	2.5	10.9	34.8	55.5	57.5	64.3	67.6
Unidentified a	ND	9.6	5.1	10.1	11.0	9.0	6.0	4.7
NER	1.1	2.8	7.0	18.3	20.1	18.7	19.8	19.4
Total	100.0	98.5	98.2	96.6	96.0	90.7	94.7	95.3

ND-not detected,

NS—no sample.

Table 26 Half life	(DT_{50}) and DT_{90}	for chlorpyrifos	methyl in soils	under aerobic	conditions
	(2 1)0) 4114 2 19	J 101 01101 p J 11100			• • • • • • • • • • • • • • • • • • • •

Soil	DT ₅₀ , days	DT ₉₀ , days	Modified Likelihood	Order, function
Speyer 2.2	3.6	39.3	0.5633	Sqroot 1 st
Marcham sandy loam	1.4	38.0	0.9382	Sqroot 1.5st
Marcham sandy clay loam	0.63	17.3	0.9266	Sqroot 1.5st
Derby silt loam	1.7	46.8	0.6872	Sqroot 1.5st

The route of aerobic degradation of $[2,6^{-14}C]$ -TCP was investigated in four representative agricultural soils—Marcham sandy clay loam (UK), Charentilly silty clay loam (France), Cuckney sand (UK) and Thessaloniki loam (Greece)—under laboratory conditions (De Vette & Schoonmade, 2001; GH-C-5182). The soils were placed in conical flasks fitted with a glass column containing soda lime for trapping evolved CO₂, and quartz glass wool covered with paraffin oil for trapping organic volatiles. Soils were treated with $[2,6^{-14}C]$ -TCP at a rate equivalent to 250 g/ha in a soil depth of 5 cm and a soil bulk density of 1.5 g/cm³, adjusted to 40% WHC_{max} and incubated at 20 °C in the dark. Aerobic conditions were maintained by allowing passive entry of air. Further incubations were carried out using sterile Marcham soil at 40% WHC_{max} and 20 °C to elucidate the degradation route (biotic versus abiotic).

Samples were collected at regular intervals up to 120 days after treatment (152 days for sterile Marcham soil). The amount of ¹⁴CO₂ evolved from the soil was determined by LSC. The soil was extracted with acetone/0.1M HCl and taken for LSC analysis. The level of non-extracted radioactivity (NER) was determined by air drying the soil residue and combusting triplicate aliquots in oxygen using a sample oxidiser. The pooled soil extracts were evaporated, the remaining aqueous residue acidified, extracted with DCM, evaporated in a rotary evaporator at *ca* 40 °C and the radioactivity measured by LSC.

The amounts of TCP and its degradation products in the extracts were determined HPLC and confirmed by TLC. For the non-sterile soils, the overall recovery ranged between 83.1 and 103.7% of applied radioactivity. The levels of radioactivity in the soil extracts declined from 97.7 to 102.4% AR at 0 DAT to between 6.6 and 50.8% AR by 120 days. The level of NER and of evolved ¹⁴CO₂ increased throughout the incubation period (up to 58 % AR), whilst the levels of ¹⁴C organic volatiles were very low throughout (< 0.5% AR).

TCP was the major component present in all the soil extracts, dropping to about 32% AR after 120 days in Marchand sandy clay loam soil. At this time, TMP level reached 13%AR, while an unknown compound was observed at 5.5%AR In sterile Marcham soil, only TCP was detected.

Further work to characterise the nature of the unknown by HPLC and LC/MS was not successful, however, it was characterised as a neutral organic or weak base.

¹⁴C-ring-labeled TMP, label position not stated, was assayed in top soil taken from three USA sites at a TMP concentration of approximately 1.0 mg/kg soil at 100% or 35% 1/3 bar and 25 °C (Laskowski *et al.*, 1977; GH-C 964). The soils were fractionated and partitioned before extraction with solvent prior to combustion analysis and TLC chromatography. Extensive mineralisation to carbon dioxide (*ca* 70%AR) was observed in the two silty soils but not in the sandy soil, a known poor degrader, where TMP accounted for *ca* 70% AR after 300 days. Low levels of TCP (*ca* 10%AR) were observed in all three soils.

Using the information from the aerobic soil degradation studies described and metabolite in soils, the degradation route of chlorpyrifos-methyl in soils shown in Figure 2 is proposed.



Insoluble residues

Figure 1 Proposed metabolic pathway for chlorpyrifos in plants



Figure 2 Aerobic degradation route of chlorpyrifos-methyl in soil

Aerobic degradation in water and sediment

In a study conducted with sandy loam and clay loam sediments with their associated surface water were treated with [¹⁴C]Chlorpyrifos-methyl at a nominal rate equivalent to 0.5 kg ai/ha (Philips and Hall, 1994; GHE-P-3756). The samples were incubated under aerobic/anaerobic gradient in the dark at 17–20 °C and ¹⁴C volatiles collected in ethanolamine traps and polyurethane foam plugs. Samples were taken at interval up to 100 days.

The mean radiochemical balance was about 93–94% for both systems, with lower recoveries at 60–100 days. ¹⁴CO₂ and other volatile organic compounds accounted for up to 11% AR. The radioactivity associated with surface water declined from about 80% at time zero to 21–38% AR at the end of the experiment. HPLC analysis indicated that parent compound was the main component at 0 time, with low levels of TMP. Degradation of chlorpyrifos-methyl was rapid in both systems with less than 2% AR after 100 days. DT₅₀ values in the sandy loam and clay loam water/sediment systems were 2.6 and 25.4 days, respectively. In the water phase alone the dissipation was rapid, with DT₅₀ values of 2 and 4 days, respectively. The principal degradation product was TCP, which was detected at maximum levels of 83 and 62% AR in 30 day sandy loam and clay loam samples, respectively.

Photochemical degradation

The aqueous photolytic degradation rate and quantum yield of [¹⁴C]chlorpyrifos-methyl (specific activity 1084 MBq/mmol, radiochemical purity 99 + %) were determined by irradiation of chlorpyrifos-methyl solutions (8.8–13.7 mg/L) in water/ACN (9:1) at 20°C (Yon and Muller, 1994b; GHE-P-3981). The experiment was conducted under a 450 W Xenon high-pressure lamp at 290 nm for periods of up to eight hours. Chlorpyrifos-methyl degraded with a calculated quantum yield of 2.6 × 10⁻³. Degradation half-lives, based on this quantum yield were calculated using the ABIWAS model to be in the range 1.8–9.1 days (June) and 0.8–3.8 months (December).

METHODS OF RESIDUE ANALYSIS

Method ERC 93.1 (Khoshab and Laurie, 1993) is applicable to the quantitative determination of chlorpyrifos-methyl residues in citrus. The compound is extracted from the sample with an acetone/water solvent mixture, additional water is added, chlorpyrifos-methyl is partitioned into hexane and quantified by GC/FPD. The method was validated for residues of chlorpyrifos-methyl in lemons, mandarins and oranges (Table 27).

Matrix	Level (mg/kg)	Recovery (%)	RSD, %
Lemon peel	0.01	85.5, 75.5, 93.5	10.6
_	0.10	77	-
	1.0	83.5	-
	10	84.5	-
Lemon pulp	0.01	91.5, 84.5, 85.5	4
	0.1	84.5	-
	1	87	-
Mandarin Peel	0.01	90, 85, 86.5	2.9
	0.10	84.7	-
	5	87	-
Mandarin Pulp	0.01	84.5, 84.5, 87.5	2.0
	0.10	85	_
	1.0	80	-
Orange peel	0.01	84.5, 85, 97.5	8.2
	0.10	94, 85.5	6.6
	5	92.5	-
Orange pulp	0.01	73, 85, 82.5	7.9
	0.10	78, 81	2.6
	1.0	75	-

Table 27 Recovery rate of chlorpyrifos-methyl in citrus for method ERC 93.1

Method GRM 05.07 was validated in various crops by Pinheiro *et al.* (2006). In this method, residues of chlorpyrifos-methyl are extracted with an 80% acetone/20% water solution. An aliquot of 0.5 mL is added into a 96-well plate, isotope standard is added prior to purifying by on-line SPE using a C_{18} cartridge. Residues are analysed by HPLC/MS/MS. Quantitation is achieved using a stable

isotope internal standard, ${}^{13}C_2{}^{15}$ N-chlorpyrifos-methyl (t_R = 2.21) with specific MS/MS transitions m/z Q1/Q3 321.8/125.1. Limit of quantification (LOQ) was 0.01 mg/kg. Table 28 shows the validation data

Matrix	Level (mg/kg	Recovery (%)	Matrix	Level (mg/kg	Recovery (%)
Pear	0.01	88–90	Orange	0.01	88–91
	5	77–82		5	89–90
Tomato	0.01	90–92	Orange Peel	0.01	96–98
	5	81-84		5	95-102
Grape	0.01	81–90	Orange Pulp	0.01	76–107
	5	75–87		5	88–92
Peach	0.01	71-82	Whole Apple	0.01	91–106
	5	83-84		5	90–97
Apricot	0.01	90–96	Maize Plant	0.01	92-102
	5	80-87		5	94–98
Pepper	0.01	91–93		20	NA
	5	76-81	Maize Stover	0.01	86–92
Mandarin	0.01	85–89		5	105-108
	5	79–102		20	NA
Mandarin Peel	0.01	96	Maize Cobs	0.01	83–99
	5	91–96		5	109–110
Mandarin Pulp	0.01	80–96		20	NA
	5	89–95			

Table 28 Recovery rate of chlorpyrifos-methyl in various crops (n = 1 or 2) for method GRM 05.7

Method GRM 00.10 was applied for the determination of chlorpyrifos-methyl in crops with a high water content (Teasdale, 2000). The compound is extracted from the sample with acetone/water, additional water is added and chlorpyrifos-methyl partitioned into hexane. Quantification is done by GC/FPD. The method was validated for 25 matrixes, including tomato, apple, grapes, maize, onion, pepper, potato and sugar beet and processing products (Table 29). Method GRM 00.10 was independently validated, with recoveries averaging 97% at 0.01–0.2 mg/kg for whole grapes (n = 10) and 97% at 0.01–0.5 mg/kg for whole apples (n = 10). The corresponding relative standard deviations (RSD) were 3 and 7%, respectively (Maliani, 2002b; GH-C 5429).

Table 29 Recovery rate of chlorpyrifos-methyl in crops (n = 48 at each level) for method GRM 00.10

Level, mg/kg	Recovery range, %	Recovery mean, %	RSD, %
0.01	73–109	91	8.4
0.1	81–96	89	4.3
1	71–97	88	6.0
5	81–96	89	4.3

The method GRM 02.4 was validated for orange, barley, wheat and their processing products (Olberding *et al.*, 2002). Residues are extracted with acetone:water (80:20) or acetone (orange oil) and clean-up is performed with C_{18} SPE, eluting with ACN:0.1HCL (90:10). Residues are then partitioned into isooctane. Quantification is done by GC with negative ion chemical ionization (GC/NCI-MS), using ${}^{13}C_2$ ${}^{15}N$ -chlorpyrifos-methyl as internal standard. A summary of the validation data is shown in Table 30. Method GRM 02.04 has undergone an independent laboratory validation studies (Clark, 2002; GH-C 5430). Recoveries averaged $89 \pm 6\%$ in whole oranges and $99 \pm 8\%$ for in wheat grain over the concentration range of 0.01 mg/kg to 0.50 ug/g for whole oranges and 0.01 mg/kg to 6.0 mg/kg for wheat grain. The individual percent recoveries were within the range of 70–120%. RSD of replicate recovery measurements did not exceed the level of $\pm 20\%$.

Crop	Level, mg/kg	Recovery range, %	Recovery mean, %	Ν	RSD, %
Orange and processed	0.01	88–96	91	12	2.7
products (peel, pulp,	0.05	88–93	90	6	1.9
juice and oil)	0.25	86–97	91	6	3.9
	0.5	88–93	90	6	2.9
Barley grain, forage	0.01	91–102	94	12	3.4
and straw	0.05	91–97	92	3	3.4
	0.25	93–99	95	3	3.7
	0.5	98	_	_	_
	5.0	95–100	97	4	2.6
Wheat grain, forage	0.01	91–100	97	12	3.1
and straw	0.05	93–102	97	3	4.6
	0.25	97	97	3	0
	0.5	98	_	_	_
	1.0	99–102	100	2	_
	5.0	100–102	100	4	0.6

Table 30 Recovery rate of chlorpyrifos-methyl in various crops for method GRM 02.4

Maliani (2002b; GH-C 5437) validated the Method GRM 02.01 for the analysis of chlorpyrifos-methyl in kidney, liver, milk, muscle and egg. Samples are extracted with acetone and cleaned-up in a C_{18} SPE. Residues were eluted with ACN:0.1 HCL (90:10) and then extracted with isooctane containing ${}^{13}C_{2}$ 15 N-chlorpyrifos-methyl as internal standard. Fat samples did not undergo the SPE step. Quantification is done by GC/NCI-MS. A total of 80 samples underwent the validation procedure, with fortification levels at 0.01, 0.05, 0.25 and 0.50 mg/kg. Individual recoveries ranged from 88 to 103%.

Stability of Pesticide Residues in Stored Analytical Samples

Control samples of agricultural commodities were fortified at 0.10 mg/kg with chlorpyrifos-methyl and stored frozen at approximately -20 °C in high density polyethylene (HDPE) containers (Thomas *et al.*, 2002a; GH-C 5410). Samples that had been stored frozen for 99 days and 0 days were analysed on the same date. Unfortified agricultural commodities were placed in similar containers and stored frozen with the fortified samples. In each analytical set, samples were analysed in triplicate along with freshly-fortified controls per matrix. Analyses were conducted according to method GRM 02.4 (LOQ of 0.01 mg/kg). The percent of chlorpyrifos-methyl remaining per matrix are summarized in Table 31.

Days of	Chlorpyrifos-methyl (Average % Remaining ^a)					
Storage	Oranges	Grapes	Grape wine	Tomatoes	Tomato juice	Wheat grain
0	88	91	89	87	86	99
99	83	80	85	84	83	106

Table 31 Stability of chlorpyrifos-methyl residues in crops after 90 days of storage

^a Average of three replicate analyses

Control samples of animal tissues were fortified at 0.10 mg/kg with chlorpyrifos-methyl and stored frozen at approximately -20 °C in HDPE containers (Thomas *et al.*, 2000b; GH-C 5409). Samples that had been stored frozen for 90 days and 0 days were analysed on the same date. Unfortified animal tissues were placed in similar containers and stored frozen with the fortified samples. In each analytical set, samples were analysed in triplicate along with freshly-fortified controls per matrix. Analyses were conducted according method GRM 02.01 (LOQ of 0.01 mg/kg). Results are shown in Table 32.

Days of	Chlorpyrifos-met	Chlorpyrifos-methyl (Average % Remaining; n = 3)					
Storage	Beef muscle	Beef liver	Beef fat	Beef kidney	Dairy milk	Eggs	
0	84	91	95	90	95	88	
90	78	77	75	78	85	54	

Table 32 Stability of chlorpyrifos-methyl residue levels in animal products after frozen storage

A study on stability of chlorpyrifos-methyl on various crops under frozen conditions up to 18 months was submitted (Austin, 2009). Samples were fortified at a concentration of 0.1 mg/kg, stored at -18° C and analysed for chlorpyrifos-methyl. At each time point, the analysis include duplicate fortified samples and two procedural recoveries of chlorpyrifos-methyl fortified at 0.1 mg/kg immediately prior to extraction. Procedural recoveries ranged from 70–120 %. The results of the stability of chlorpyrifos-methyl are shown in Table 33.

Table 33 Stability of chlorpyrifos-methyl residues in crops after 18 months of storage

Matrix	Months	% remaining		Matrix	Months	% remaining	g
	0	87	88		0	79	91
	6	84	98		6	85	83
Annla	9	91	84	Oren ao maol	9	73	77
Apple	12	74	73	Orange peer	12	69	80
	15	113	99		15	82	100
	18	98	97		18	89	91
	0	85	89		0	87	86
	6	93	95		6	97	99
Daaah	9	76	81	Orange	9	81	79
Peach	12	72	74	pulp	12	77	66
	15	99	103		15	85	76
	18	94	92		18	% remaining 79 85 73 69 82 89 87 97 81 77 85 97 81 77 85 97 84 92 80 81 76 87 101 110 99 73 80 108 95 113 73 77 111 96	94
	0	90	85		0	85 % remaining 79 91 85 83 73 77 69 80 82 100 89 91 87 86 97 99 81 79 77 66 85 76 97 94 84 88 92 98 80 83 81 84 76 81 87 90 101 82 110 106 99 94 73 80 80 80 101 82 110 106 99 94 73 80 80 80 103 109 73 77 77 81 111 105 96 89	88
	6	94	94		6	92	98
	9	81	91	Potato	9	80	83
Cabbage	12	81	86		12	81	84
	15	105	106		15	76	81
	18	99	92		18	79 91 85 83 73 77 69 80 82 100 89 91 87 86 97 99 81 79 77 66 85 76 97 94 84 88 92 98 80 83 81 84 76 81 87 90 101 82 110 106 99 94 73 80 80 80 108 101 95 105 113 109 73 77 77 81 111 105 96 89	90
	0	82	83		0	101	82
	6	88	92		6	110	106
T (9	78	79	Wheat	9	99	94
Iomato	12	76	77	straw	12	73	80
	15	94	94		15	80	80
	18	93	85		18	108	101
	0	91	104		0	95	105
	6	97	100		6	113	109
C	9	-	82	Wheat	9	73	77
Grape	12	68	81	grain	12	77	81
	15	96	104		15	111	105
	18	78	88		18	96	89
	0	75	87				•
	6	93	96				
	9	79	75	1			
Oil seed rape	12	73	79	1			
	15	104	99	1			
	18	95	94	1			

USE PATTERN

Chlorpyrifos-methyl is formulated for use in agricultural crops as a range of different emulsifiable concentrates (EC), including mixtures with various pyrethroid insecticides. Table 34 and 35 list the Good Agricultural Practice (GAP) given on current registered labels that are relevant for this evaluation.

Table 34 Good Agricultural Practices for foliar application of chlorpyrifos-methyl using EC formulation

Crop Country kg ai/L No. kg ai/hL Water, L/ha kg ai/ha (days) Orange, lemon, elementine, mandarin Italy 0.225 - 0.056 15 Orange, lemon, mandarin Spain 0.225 - 0.068-0.09 15 Orange, lemon, mandarin Spain 0.225 - 0.045-0.088 15 Pome fruit Greece 0.225 1 0.056 2000-4000 21 Pome fruit Greece 0.225 1 0.056 2000-4000 21 Pome fruit Greece 0.225 1 0.056 2000-4000 21 Pome fruit Spain 0.225 0.068-0.09 0 15 Pome fruit Spain 0.225 1-2 0.068-0.09 0 15 Pome fruit Spain 0.400 1-2 0.049-0.05 1000-1500 4.48 Stone fruit Bulgaria 0.400 1 0.048-0.072 800-1000 0.60 30 <			Formulation	Applica	ation rate per treat	tment		PHI
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Crop	Country	kg ai /L	No.	kg ai/hL	Water, L/ha	kg ai/ha	(days)
	Orange, lemon	Italy	0.200 ^a	-	0.028-0.04			30
elementine, mandarin Spain 0.225 $ 0.068-0.09$ 15 Orange, lemon, mandarin Ialy 0.225 $ 0.045-0.088$ 15 Pear Italy 0.225 $ 0.045-0.088$ 15 Pome fruit Greece 0.225 1 0.056 $2000-4000$ 21 Pome fruit Poland 0.400 $ 500-750$ 0.6 21 Pome fruit Spain 0.225 $0.068-0.09$ 0.6 21 Pome fruit Switzerland 0.400 $1-2$ $0.04-0.05$ $1000-1500$ 0.48 14 Stone fruit Greece 0.225 $ 0.045-0.088$ 15 Peach Italy 0.220° $ 0.025-0.040$ 15 Peach Italy 0.225 $0.048-0.072$ $800-1000$ 0.60° 30° Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ 0.5° 0.30°	Orange, lemon,	Italy	0.225	-	0.056			15
	clementine,							
Orange, temon, mandarin Spain 0.225 $ 0.068-0.09$ [15] Apple, pear Italy 0.225 $ 0.045-0.088$ [15] Pear Italy 0.220° $1-2$ $0.028-0.06$ [21] Pome fruit Greece 0.225 1 0.056 $2000-4000$ 21 Pome fruit Hungary. 0.400 [20] $800-1000$ 0.76 14 Pome fruit Spain 0.225 $0.068-0.09$ 0.76 21 Pome fruit Switzerland 0.400 0.048 0.76 21 Stone fruit Bulgaria 0.400 0.048 0.76 21 Stone fruit Greece 0.225 $1-2$ $0.045-0.088$ 15 Peach Italy 0.225 $ 0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ 0.60 30 Grapes <td>mandarin</td> <td>G .</td> <td>0.005</td> <td></td> <td></td> <td></td> <td></td> <td>1.5</td>	mandarin	G .	0.005					1.5
Apple , pear Italy 0.225 $ 0.045-0.088$ 15 Pear One fruit Greece 0.225 1 0.056 $2000-4000$ 21 Pome fruit Hungary. 0.400 $ 800-1000$ 0.76 14 Pome fruit Spain 0.225 $0.068-0.09$ 0.76 14 Pome fruit Switzerland 0.400 0.048 0.76 21 Pome fruit Switzerland 0.400 0.048 0.76 21 Stone fruit Greece 0.225 -2 0.056 $1500-2500$ 21 Peaches, apricots Hungary. 0.400 $1-2$ $0.045-0.088$ 15 Peach Italy 0.225 $ 0.045-0.088$ 15 Peach Italy 0.225 $0.068-0.09$ 15 Chile 0.480 1 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 <td>Orange, lemon, mandarin</td> <td>Spain</td> <td>0.225</td> <td>-</td> <td>0.068-0.09</td> <td></td> <td></td> <td>15</td>	Orange, lemon, mandarin	Spain	0.225	-	0.068-0.09			15
Pear Italy 0.200^{+1} $1-2$ $0.028-0.06$ [15] Pome fruit Greece 0.225 1 0.056 $2000-4000$ 21 Pome fruit Poland 0.400 - $800-1000$ 0.76 14 Pome fruit Spain 0.225 $0.068-0.09$ 15 Pome fruit Switzerland 0.400 0.048 0.76 21 Stone fruit Bulgaria 0.400 $1-2$ $0.04-0.05$ $1000-1500$ 0.48 14 Stone fruit Greece 0.225 $1-2$ 0.056 $1500-2500$ Peach 21 Peaches, apricots Hungary. 0.400 $0.045-0.088$ 15 15 Peach, nectarine Spain 0.225 $0.068-0.09$ 15 15 Cherries Hungary 0.400 $0.048-0.072$ $800-100$ 0.60 30 Grapes France 0.225 $0.023-0.045$ 15 15 Grapes	Apple, pear	Italy	0.225	-	0.045-0.088			15
Pome fruit Greece 0.225 1 0.056 $2000-0000$ 0.76 14 Pome fruit Poland 0.400 - $800-1000$ 0.76 14 Pome fruit Spain 0.225 $0.068-0.09$ 0.6 21 Pome fruit Switzerland 0.400 0.048 0.76 21 Stone fruit Bulgaria 0.400 $0.04-0.05$ $1000-1500$ 0.48 14 Stone fruit Greece 0.225 $1-2$ $0.045-0.088$ 15 Peach Italy 0.225 $-0.045-0.088$ 15 15 Peach Italy 0.225 $-0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.400 $0.048-0.072$ $800-1000$ $0.52-0.60$ 30 Grapes France 0.225 2 0.338 21 Grapes France 0.225 $0.023-0.045$ $0.52-0.60$ 30 Graperootstock <td< td=""><td>Pear</td><td>Italy</td><td>0.200 ^a</td><td>1-2</td><td>0.028-0.06</td><td></td><td></td><td>15</td></td<>	Pear	Italy	0.200 ^a	1-2	0.028-0.06			15
Pome fruit Hungary. 0.400 - 800-1000 0.76 14 Pome fruit Spain 0.225 0.068-0.09 15 500-750 0.6 21 Pome fruit Spain 0.225 0.048.00 0.76 21 Stone fruit Bulgaria 0.400 0.048 0.76 21 Stone fruit Greece 0.225 1-2 0.056 1500-2500 21 Peachs, apricots Hungary. 0.400 800-1000 0.60 30 Peach Italy 0.225 - 0.045-0.088 15 Peach, nectarine Spain 0.225 0.068-0.09 15 Cherries Hungary 0.400 0.048-0.072 800-1000 0.60 30 Grapes Chile 0.480 1 0.048-0.078 Po ^b . Grapes Grapes Hungary 0.400 600-1000 0.52-0.60 30 Grapes Italy 0.225 0.023-0.045 15	Pome fruit	Greece	0.225	1	0.056	2000-4000		21
Pome fruit Poland 0.400 - 500-750 0.6 21 Pome fruit Spain 0.225 $0.068-0.09$ 15 Pome fruit Bulgaria 0.400 $1-2$ $0.04-0.05$ $1000-1500$ 0.48 14 Stone fruit Bulgaria 0.400 $1-2$ $0.04-0.05$ $1000-1500$ 0.48 14 Stone fruit Greece 0.225 $1-2$ 0.056 $1500-2500$ 21 Peache, apricots Hungary. 0.400 $0.025-0.040$ 15 $0.668-0.09$ 15 Cherries Hungary 0.400 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ 0.60 30 Grapes France 0.225 2 0.338 21 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grapes Italy 0.225 $0.023-0.045$	Pome fruit	Hungary.	0.400			800-1000	0.76	14
Pome fruit Spain 0.225 $0.088-0.09$ 15 Pome fruit Switzerland 0.400 0.048 0.76 21 Stone fruit Bulgaria 0.400 $1-2$ $0.04-0.55$ $1000-1500$ 0.48 14 Stone fruit Greece 0.225 $1-2$ $0.045-0.088$ 15 Peach Italy 0.225 $ 0.045-0.088$ 15 Peach Italy 0.225 $ 0.048-0.072$ $800-1000$ 0.60 30 Peach Italy 0.225 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Hungary 0.400 $0.048-0.072$ $800-1000$ 0.76 n/a Grapes Hungary 0.400 $0.048-0.058$ $0.00-1000$ 0.76 n/a Grapes Hungary 0.400 $0.022-0.045$ 0.176 <td>Pome fruit</td> <td>Poland</td> <td>0.400</td> <td>_</td> <td></td> <td>500-750</td> <td>0.6</td> <td>21</td>	Pome fruit	Poland	0.400	_		500-750	0.6	21
Pome fruit Switzerland 0.400 0.048 0.76 21 Stone fruit Bulgaria 0.400 $1-2$ $0.04-0.05$ $1000-1500$ 0.48 14 Stone fruit Greece 0.225 $1-2$ 0.056 $1500-2500$ 21 Peach Italy 0.225 $ 0.045-0.088$ 15 Peach Italy 0.225 $0.068-0.09$ 15 Peach, nectarine Spain 0.225 $0.068-0.09$ 0.60 30 Grapes Hungary 0.400 $0.048-0.072$ $800-1000$ 0.60 30 Grapes France 0.225 2 0.338 21 Grapes $1-20$ 0.336 $1000-1000$ 0.60 30 Grapes $11ay$ 0.225 $0.023-0.045$ 15 $0.76-0.96$ 15 Grapes Hungary 0.400 $0.026-0.030$ 15 $0.76-0.96$ 15 Grapes Spain 0.225	Pome fruit	Spain	0.225		0.068-0.09			15
Stone fruit Bulgaria 0.400 $1-2$ $0.04-0.05$ $1000-1500$ 0.48 14 Stone fruit Greece 0.225 $1-2$ 0.056 $1500-2500$ 21 Peaches, apricots Italy 0.225 $ 0.045-0.088$ 15 Peach Italy 0.225 $ 0.045-0.088$ 15 Peach, nectarine Spain 0.225 $0.025-0.040$ 15 Cherries Hungary 0.400 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ $0.52-0.60$ 30 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grape rootstock Hungary 0.400 $600-1000$ 0.76 n/a Grapes Italy 0.225 $0.023-0.045$ 15 15 Grapes Spain 0.225 $0.068-0.09$ 15 5 Potat	Pome fruit	Switzerland	0.400		0.048		0.76	21
Stone fruit Greece 0.225 $1-2$ 0.056 $150-2500$ 21 Peaches, apricots Hungary. 0.400 800-1000 0.60 30 Peach Italy 0.225 $ 0.045-0.088$ 15 Peach, nectarine Spain 0.225 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ 0.60 30 Grapes France 0.225 2 0.338 21 0.338 21 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grapes Italy 0.225 $0.023-0.045$ 15 5 Grapes Italy 0.200° $0.026-0.030$ 15 5 Grapes Spain 0.225 $0.068-0.09$ 15 5 Grapes	Stone fruit	Bulgaria	0.400	1-2	0.04-0.05	1000-1500	0.48	14
Peaches, apricots Hungary. 0.400 800-1000 0.60 30 Peach Italy 0.225 $ 0.045-0.088$ 15 Peach Italy 0.200^{a} $1-2$ $0.025-0.040$ 15 Peach, nectarine Spain 0.225 $0.068-0.09$ 15 Cherries Hungary 0.400 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.058$ Po ^b . Grapes France 0.225 2 0.338 21 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grapes Italy 0.225 $0.023-0.045$ 15 5 Grapes Italy 0.225 $0.068-0.09$ 15 5 Grapes Spain 0.225 $0.068-0.09$ 5 5 D	Stone fruit	Greece	0.225	1-2	0.056	1500-2500		21
Peach Italy 0.225 $ 0.045-0.088$ 15 Peach Italy 0.20^{a} $1-2$ $0.025-0.040$ 15 Peach, nectarine Spain 0.225 $0.068-0.09$ 15 Cherries Hungary 0.400 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ $0.52-0.60$ 30 Grapes Hungary 0.400 600-1000 $0.52-0.60$ 30 Grapes Hungary 0.400 600-1000 0.76 n/a Grapes Italy 0.225 $0.023-0.045$ 15 15 Grapes Spain 0.225 $0.026-0.30$ 15 5 Grapes Spain 0.225 $0.068-0.09$ 15 5 Strawberries Italy 0.225 0.34	Peaches, apricots	Hungary.	0.400			800-1000	0.60	30
Peach Italy 0.200^{a} $1-2$ $0.025-0.040$ 15 Peach, nectarine Spain 0.225 $0.068-0.09$ 0.60 30 Cherries Hungary 0.400 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.072$ $800-1000$ 0.60 30 Grapes France 0.225 2 0.338 21 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grape rootstock Hungary 0.400 $600-1000$ 0.76 n/a Grapes Italy 0.225 $0.023-0.045$ 15 5 Grapes Spain 0.225 $0.068-0.09$ 15 5 Grapes Svitzerland 0.400 $1-2$ $0.76-0.96$ $-$ Strawberries Italy 0.225 $0.068-0.09$ 5 5 Potatoes Italy 0.225 $0.068-0.$	Peach	Italy	0.225	-	0.045-0.088			15
Peach, nectarine Spain 0.225 $0.068-0.09$ 15 Cherries Hungary 0.400 $0.048-0.072$ $800-1000$ 0.60 30 Grapes Chile 0.480 1 $0.048-0.058$ Po ^b . Grapes France 0.225 2 0.338 21 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grape rootstock Hungary 0.400 $600-1000$ 0.76 n/a Grapes Italy 0.225 $0.023-0.045$ 15 Grapes Spain 0.225 $0.026-0.030$ 15 Grapes Spain 0.225 $0.068-0.09$ 15 Grapes Spain 0.225 $0.068-0.09$ 15 Grapes Switzerland 0.400 1-2 $0.76-0.96$ $-$ Strawberries Italy 0.225 $0.068-0.09$ 15 5 Potatoes Italy 0.225 $0.33-0.45$	Peach	Italy	0.200 ^a	1–2	0.025-0.040			15
CherriesHungary 0.400 $0.048-0.072$ $800-1000$ 0.60 30 GrapesChile 0.480 1 $0.048-0.058$ Po b.GrapesFrance 0.225 2 0.338 21GrapesHungary 0.400 $600-1000$ $0.52-0.60$ 30Grape rootstockHungary 0.400 $600-1000$ 0.76 n/a GrapesItaly 0.225 $0.023-0.045$ 15GrapesSpain 0.225 $0.023-0.045$ 15GrapesSpain 0.225 $0.068-0.09$ 15GrapesSpain 0.200^{a} $0.03-0.05$ 21GrapesSpain 0.225 $0.068-0.09$ 15GrapesSpain 0.225 $0.068-0.09$ 15GrapesSpain 0.225 $0.068-0.09$ 15StrawberriesItaly 0.225 $0.068-0.09$ 15StrawberriesItaly 0.225 $0.068-0.09$ 15PotatoesItaly 0.225 $0.068-0.09$ 15PotatoesItaly 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15OnionsHungary 0.400 $200-600$ 0.36 21PeppersGreece 0.225 $1-3$ $0.056-0$	Peach, nectarine	Spain	0.225		0.068-0.09			15
Grapes Chile 0.480 1 $0.048-0.058$ Po ^b . Grapes France 0.225 2 0.338 21 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grape rootstock Hungary 0.400 $600-1000$ 0.76 n/a Grapes Italy 0.225 $0.023-0.045$ 15 Grapes Spain 0.225 $0.026-0.030$ 15 Grapes Spain 0.200^a $0.026-0.09$ 15 Grapes Spain 0.200^a $0.03-0.05$ 21 Grapes Spain 0.225 $0.068-0.09$ 15 Strawberries Italy 0.225 $0.068-0.09$ 5 Potatoes Italy 0.225 $0.068-0.09$ 15 Strawberries Italy 0.225 $0.068-0.09$ 15 Potatoes Italy 0.225 $0.068-0.09$ 15 Potatoes Italy 0.200^a	Cherries	Hungary	0.400		0.048-0.072	800-1000	0.60	30
Grapes France 0.225 2 0.338 21 Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grape rootstock Hungary 0.400 $600-1000$ 0.76 n/a Grapes Italy 0.225 $0.023-0.045$ 15 Grapes Italy 0.200^a $0.026-0.030$ 15 Grapes Spain 0.225 $0.068-0.09$ 15 Grapes Spain 0.225 $0.068-0.09$ 21 Grapes Spain 0.225 $0.068-0.09$ 15 Grapes Spain 0.225 $0.068-0.09$ 15 Strawberries Italy 0.225 $0.068-0.09$ 15 Strawberries Spain 0.225 $0.068-0.09$ 15 Potatoes Italy 0.225 $0.33-0.45$ $0.34-0.45$ 15 Potatoes Italy 0.200^a $0.028-0.04$ $0.34-0.45$ 15 Pota	Grapes	Chile	0.480	1	0.048-0.058			Po ^b .
Grapes Hungary 0.400 $600-1000$ $0.52-0.60$ 30 Grape rootstock Hungary 0.400 $600-1000$ 0.76 n/a Grapes Italy 0.225 $0.023-0.045$ 15 Grapes Italy 0.200^a $0.026-0.030$ 15 Grapes Spain 0.225 $0.068-0.09$ 15 Grapes Spain 0.200^a $0.03-0.05$ 21 Grapes Spain 0.200^a $0.03-0.05$ 21 Grapes Switzerland 0.400 $1-2$ $0.76-0.96$ $-$ Strawberries Italy 0.225 $0.068-0.09$ 15 Strawberries Spain 0.225 $0.068-0.09$ 15 Potatoes Italy 0.225 $0.33-0.45$ 15 Potatoes Italy 0.225 $0.068-0.09$ 15 Potatoes Spain 0.225 $0.068-0.09$ 15 Potatoes Spain 0.225	Grapes	France	0.225	2			0.338	21
Grape rootstock Hungary 0.400 $600-1000$ 0.76 n/a Grapes Italy 0.225 $0.023-0.045$ 15 Grapes Italy 0.200^a $0.026-0.030$ 15 Grapes Spain 0.225 $0.068-0.09$ 15 Grapes Spain 0.200^a $0.03-0.05$ 21 Grapes Switzerland 0.400 $1-2$ $0.76-0.96$ $-$ Strawberries Italy 0.225 $0.068-0.09$ 15 5 Strawberries Spain 0.225 $0.068-0.09$ 5 5 Potatoes Italy 0.225 $0.33-0.45$ 15 5 Potatoes Italy 0.225 $0.068-0.09$ 15 5 Potatoes Italy 0.225 $0.33-0.45$ 15 5 Potatoes Italy 0.200^a $0.028-0.04$ 15 5 Potatoes Spain 0.225 $0.068-0.09$ 15 5 </td <td>Grapes</td> <td>Hungary</td> <td>0.400</td> <td></td> <td></td> <td>600-1000</td> <td>0.52-0.60</td> <td>30</td>	Grapes	Hungary	0.400			600-1000	0.52-0.60	30
GrapesItaly 0.225 $0.023-0.045$ 15GrapesItaly 0.200^{a} $0.026-0.030$ 15GrapesSpain 0.225 $0.068-0.09$ 15GrapesSpain 0.200^{a} $0.03-0.05$ 21GrapesSwitzerland 0.400 $1-2$ $0.76-0.96$ $-$ StrawberriesItaly 0.225 $0.068-0.09$ 15StrawberriesSpain 0.225 $0.068-0.09$ 5PotatoesItaly 0.225 $0.068-0.09$ 5PotatoesItaly 0.225 $0.03-0.45$ 15PotatoesItaly 0.225 $0.03-0.45$ 15PotatoesItaly 0.225 $0.03-0.04$ 15PotatoesItaly 0.200^{a} $0.028-0.04$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15OnionsHungary 0.400 $200-600$ 0.36 21PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5PeppersItaly 0.200^{a} $0.03-0.05$ 55PeppersSpain 0.225 $0.068-0.09$ 55PeppersSpain 0.225 $0.068-0.09$ 55PeppersSpain 0.225 $0.068-0.06$ $500-1000$ <td>Grape rootstock</td> <td>Hungary</td> <td>0.400</td> <td></td> <td></td> <td>600-1000</td> <td>0.76</td> <td>n/a</td>	Grape rootstock	Hungary	0.400			600-1000	0.76	n/a
GrapesItaly 0.200^{a} $0.026-0.030$ 15GrapesSpain 0.225 $0.068-0.09$ 15GrapesSpain 0.200^{a} $0.03-0.05$ 21GrapesSwitzerland 0.400 $1-2$ $0.76-0.96$ $-$ StrawberriesItaly 0.225 $0.068-0.09$ 15StrawberriesSpain 0.225 $0.068-0.09$ 5PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.225 $0.068-0.09$ 15PotatoesItaly 0.225 $0.068-0.09$ 15PotatoesItaly 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15OnionsHungary 0.400 $400-500$ 0.48 OnionsHungary 0.400 $200-600$ 0.36 OnionsPoland 0.400 $200-600$ 0.36 PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.056-0.06$ $500-1000$ 5PeppersSpain 0.225 $0.068-0.09$ 5 PeppersSpain	Grapes	Italy	0.225		0.023-0.045			15
GrapesSpain 0.225 $0.068-0.09$ 15GrapesSpain 0.200^{a} $0.03-0.05$ 21GrapesSwitzerland 0.400 $1-2$ $0.76-0.96$ $-$ StrawberriesItaly 0.225 $0.068-0.09$ 15StrawberriesSpain 0.225 $0.068-0.09$ 5PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.200^{a} $0.028-0.04$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15OnionsHungary 0.400 $200-600$ 0.36 21PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5PeppersItaly 0.200^{a} $0.032-0.04$ 1515PeppersItaly 0.225 $0.068-0.09$ 55PeppersSpain 0.225 <t< td=""><td>Grapes</td><td>Italy</td><td>0.200 ^a</td><td></td><td>0.026-0.030</td><td></td><td></td><td>15</td></t<>	Grapes	Italy	0.200 ^a		0.026-0.030			15
GrapesSpain 0.200^{a} $0.03-0.05$ 21 GrapesSwitzerland 0.400 $1-2$ $0.76-0.96$ $-$ StrawberriesItaly 0.225 $0.068-0.09$ 15 StrawberriesSpain 0.225 $0.068-0.09$ 5 PotatoesItaly 0.225 $0.33-0.45$ 15 PotatoesItaly 0.225 $0.33-0.45$ 15 PotatoesItaly 0.225 $0.068-0.09$ 15 PotatoesItaly 0.225 $0.068-0.09$ 15 PotatoesSpain 0.225 $0.068-0.09$ 15 PotatoesSpain 0.225 $0.068-0.09$ 15 PotatoesSpain 0.200^{a} $0.03-0.05$ 15 PotatoesSpain 0.200^{a} $0.03-0.05$ 15 OnionsHungary 0.400 $200-600$ 0.36 21 PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5 Peppers/Egg plantsItaly 0.200^{a} $0.032-0.04$ 15 PeppersSpain 0.225 $0.068-0.09$ 5 PeppersSpain 0.225 $0.068-0.09$ 5 PeppersItaly 0.200^{a} $0.032-0.04$ 5 PeppersSpain 0.225 $0.068-0.09$ 5 PeppersSpain 0.225 $0.068-0.09$ 5 PeppersSpain 0.225 $0.068-0.09$ 5 PeppersSpain 0.225 $0.068-0.09$ <td>Grapes</td> <td>Spain</td> <td>0.225</td> <td></td> <td>0.068-0.09</td> <td></td> <td></td> <td>15</td>	Grapes	Spain	0.225		0.068-0.09			15
GrapesSwitzerland 0.400 $1-2$ $0.76-0.96$ $-$ StrawberriesItaly 0.225 $0.068-0.09$ 15StrawberriesSpain 0.225 $0.068-0.09$ 5PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.225 $0.068-0.09$ 15PotatoesItaly 0.200^a $0.028-0.04$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.200^a $0.03-0.05$ 15PotatoesSpain 0.200^a $0.03-0.05$ 15OnionsHungary 0.400 $200-600$ 0.36 21PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5PeppersItaly 0.200^a $0.03-0.05$ 15PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.03-0.05$ 5PeppersSpain 0.200^a $0.03-0.05$ 5TomatoesGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5TomatoesItaly 0.200^a $0.03-0.05$ 55TomatoesItaly 0.200^a $0.028-0.04$ 15TomatoesItaly 0.200^a $0.028-0.04$ 15	Grapes	Spain	0.200 ^a		0.03-0.05			21
StrawberriesItaly 0.225 $0.068-0.09$ 15StrawberriesSpain 0.225 $0.068-0.09$ 5PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.200^{a} $0.028-0.04$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.200^{a} $0.028-0.04$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15OnionsHungary 0.400 $400-500$ 0.48 30OnionsPoland 0.400 $200-600$ 0.36 21PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5PeppersItaly 0.200^{a} $0.032-0.04$ 15PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5TomatoesGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ TomatoesItaly 0.200^{a} $0.03-0.05$ 5TomatoesItaly 0.200^{a} $0.028-0.04$ 15	Grapes	Switzerland	0.400	1–2			0.76-0.96	-
Strawberries Spain 0.225 0.068–0.09 5 Potatoes Italy 0.225 0.33–0.45 15 Potatoes Italy 0.225 0.33–0.45 15 Potatoes Italy 0.200 a 0.028–0.04 15 Potatoes Spain 0.225 0.068–0.09 15 Potatoes Spain 0.225 0.068–0.09 15 Potatoes Spain 0.225 0.068–0.09 15 Potatoes Spain 0.200 a 0.03–0.05 15 Onions Hungary 0.400 400–500 0.48 30 Onions Poland 0.400 200–600 0.36 21 Peppers Greece 0.225 1–3 0.056–0.06 500–1000 5 Peppers/Egg plants Italy 0.200 a 0.032–0.04 15 Peppers Spain 0.225 0.068–0.09 5 Peppers Spain 0.225 0.068–0.09 5	Strawberries	Italy	0.225		0.068-0.09			15
PotatoesItaly 0.225 $0.33-0.45$ 15PotatoesItaly 0.225 $0.03-0.45$ 15PotatoesItaly 0.200^{a} $0.028-0.04$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15OnionsHungary 0.400 $400-500$ 0.48 30OnionsPoland 0.400 $200-600$ 0.36 21PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5PeppersItaly 0.200^{a} $0.032-0.04$ 15PeppersItaly 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5TomatoesGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ TomatoesItaly 0.200^{a} $0.028-0.04$ 15TomatoesItaly 0.200^{a} $0.028-0.04$ 15	Strawberries	Spain	0.225		0.068-0.09			5
PotatoesItaly 0.225 $0.028-0.04$ $0.34-0.45$ 15PotatoesItaly 0.200^{a} $0.028-0.04$ 15 PotatoesSpain 0.225 $0.068-0.09$ 15 PotatoesSpain 0.200^{a} $0.03-0.05$ 15 PotatoesSpain 0.200^{a} $0.03-0.05$ 15 PotatoesSpain 0.200^{a} $0.03-0.05$ 15 OnionsHungary 0.400 $400-500$ 0.48 OnionsPoland 0.400 $200-600$ 0.36 21 PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5 PeppersItaly 0.200^{a} $0.032-0.04$ 15 15 PeppersSpain 0.225 $0.068-0.09$ 5 5 PeppersSpain 0.225 $0.068-0.09$ 5 5 PeppersSpain 0.225 $0.068-0.09$ 5 5 PeppersSpain 0.200^{a} $0.03-0.05$ 5 5 TomatoesGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5 TomatoesItaly 0.200^{a} $0.028-0.04$ 15	Potatoes	Italy	0.225		0.33-0.45			15
PotatoesItaly 0.200^{a} $0.028-0.04$ 15PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15OnionsHungary 0.400 $400-500$ 0.48 30OnionsPoland 0.400 $200-600$ 0.36 21PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5PeppersItaly 0.200^{a} $0.032-0.04$ 15PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.200^{a} $0.03-0.05$ 5PeppersSpain 0.200^{a} $0.03-0.05$ 5TomatoesGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ TomatoesItaly 0.200^{a} $0.028-0.04$ 15TomatoesItaly 0.200^{a} $0.028-0.04$ 15	Potatoes	Italy	0.225				0.34-0.45	15
PotatoesSpain 0.225 $0.068-0.09$ 15PotatoesSpain 0.200^{a} $0.03-0.05$ 15OnionsHungary 0.400 $400-500$ 0.48 30OnionsPoland 0.400 $200-600$ 0.36 21PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5PeppersItaly 0.200^{a} $0.032-0.04$ 15PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.225 $0.068-0.09$ 5PeppersSpain 0.200^{a} $0.03-0.05$ 5TomatoesGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5TomatoesItaly 0.200^{a} $0.03-0.05$ 55TomatoesItaly 0.200^{a} $0.028-0.04$ 15TomatoesItaly 0.200^{a} $0.028-0.04$ 15	Potatoes	Italy	0.200 ^a		0.028-0.04			15
Potatoes Spain 0.200 a 0.03-0.05 15 Onions Hungary 0.400 400-500 0.48 30 Onions Poland 0.400 200-600 0.36 21 Peppers Greece 0.225 1-3 0.056-0.06 500-1000 5 Peppers Italy 0.200 a 0.032-0.04 15 15 Peppers Italy 0.225 0.068-0.09 5 5 Peppers Spain 0.225 0.03-0.05 5 5 Peppers Spain 0.225 0.068-0.09 5 5 Peppers Spain 0.200 a 0.03-0.05 5 5 Tomatoes Greece 0.225 1-3 0.056-0.06 500-1000 5 Tomatoes Italy 0.200 a 0.028-0.04 15 15	Potatoes	Spain	0.225		0.068-0.09			15
OnionsHungary 0.400 $400-500$ 0.48 30 OnionsPoland 0.400 $200-600$ 0.36 21 PeppersGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ 5 PeppersItaly 0.200^{a} $0.032-0.04$ 15 Peppers/Egg plantsItaly 0.225 $0.068-0.09$ 5 PeppersSpain 0.225 $0.068-0.09$ 5 PeppersSpain 0.200^{a} $0.03-0.05$ 5 TomatoesGreece 0.225 $1-3$ $0.056-0.06$ $500-1000$ TomatoesItaly 0.200^{a} $0.028-0.04$ 15 TomatoesItaly 0.225 $0.028-0.04$ 15	Potatoes	Spain	0.200 ^a		0.03-0.05			15
Onions Poland 0.400 200-600 0.36 21 Peppers Greece 0.225 1-3 0.056-0.06 500-1000 5 Peppers Italy 0.200 a 0.032-0.04 15 15 Peppers/Egg plants Italy 0.225 0.068-0.09 55 Peppers Spain 0.225 0.068-0.09 55 Peppers Spain 0.200 a 0.03-0.05 55 Peppers Spain 0.200 a 0.03-0.05 55 Tomatoes Greece 0.225 1-3 0.056-0.06 500-1000 5 Tomatoes Italy 0.200 a 0.028-0.04 15 15 Tomatoes Italy 0.200 a 0.028-0.04 15	Onions	Hungary	0.400			400-500	0.48	30
Peppers Greece 0.225 1-3 0.056-0.06 500-1000 5 Peppers Italy 0.200 a 0.032-0.04 15 Peppers/Egg plants Italy 0.225 0.068-0.09 15 Peppers Spain 0.225 0.068-0.09 5 Peppers Spain 0.200 a 0.03-0.05 5 Peppers Spain 0.200 a 0.03-0.05 5 Tomatoes Greece 0.225 1-3 0.056-0.06 500-1000 5 Tomatoes Italy 0.200 a 0.028-0.04 15 15 Tomatoes Italy 0.200 a 0.028-0.04 15	Onions	Poland	0.400			200-600	0.36	21
Peppers Italy 0.200 a 0.032-0.04 15 Peppers/Egg plants Italy 0.225 0.068-0.09 5 Peppers Spain 0.225 0.068-0.09 5 Peppers Spain 0.200 a 0.03-0.05 5 Tomatoes Greece 0.225 1-3 0.056-0.06 500-1000 5 Tomatoes Italy 0.200 a 0.028-0.04 15 15	Peppers	Greece	0.225	1–3	0.056-0.06	500-1000		5
Peppers/Egg plants Italy 0.225 0.068-0.09 0.34-0.45 15 Peppers Spain 0.225 0.068-0.09 5 5 Peppers Spain 0.200 a 0.03-0.05 5 5 Tomatoes Greece 0.225 1-3 0.056-0.06 500-1000 5 Tomatoes Italy 0.200 a 0.028-0.04 15 Tomatoes Italy 0.225 1-3 0.028-0.04 15	Peppers	Italy	0.200 ^a		0.032-0.04			15
Peppers Spain 0.225 0.068-0.09 5 Peppers Spain 0.200 a 0.03-0.05 5 Tomatoes Greece 0.225 1-3 0.056-0.06 500-1000 5 Tomatoes Italy 0.200 a 0.028-0.04 15 Tomatoes Italy 0.225 1-3 0.028-0.04 15	Peppers/Egg plants	Italy	0.225				0.34-0.45	15
Peppers Spain 0.200 a 0.03-0.05 5 Tomatoes Greece 0.225 1-3 0.056-0.06 500-1000 5 Tomatoes Italy 0.200 a 0.028-0.04 15 Tomatoes Italy 0.225 1-3 0.028-0.04 15	Peppers	Spain	0.225		0.068-0.09			5
Tomatoes Greece 0.225 1–3 0.056–0.06 500–1000 5 Tomatoes Italy 0.200 a 0.028–0.04 15 Tomatoes Italy 0.225 0.34–0.45 15	Peppers	Spain	0.200 ^a		0.03-0.05			5
Tomatoes Italy 0.200 a 0.028-0.04 15 Tomatoes Italy 0.225 0.34-0.45 15	Tomatoes	Greece	0.225	1-3	0.056-0.06	500-1000		5
Tomatoes Italy 0.225 0.34_0.45 15	Tomatoes	Italy	0.200 ^a		0.028-0.04			15
	Tomatoes	Italy	0.225				0.34-0.45	15

		Formulation	Applicat	Application rate per treatment						
Crop	Country	kg ai /L	No.	kg ai/hL	Water, L/ha	kg ai/ha	(days)			
Tomatoes	Spain	0.225		0.068-0.09			5			
Tomatoes	Spain	0.200 ^a		0.03-0.05			5			
Cotton	Greece	0.225	1–2		500-800	0.45-0.67	21			
Cotton	Spain	0.225		0.068-0.09			15			
Cotton	Spain	0.200 ^a		0.03-0.05			21			
Maize	Italy	0.225		0.068			15			
Maize	Italy	0.200 ^a		0.028-0.04			15			
Maize	Spain	0.225		0.068-0.09			15			
Sugar beet	Spain	0.200 ^a		0.30-0.05			15			
Sugar beet	Poland	0.400			200-600	0.36	30			

^a mixed formulation

^b Post-harvest

Table 35 Good Agricultural Practices for post-harvest use of chlorpyrifos-methyl EC formulation

		Formulation	Application rate		
Crop	Country	kg ai L	g ai/tonne	kg ai/hL	PHI, days
Stored grain (except malting barley & rice)	Australia	0.500	5-10	500 (up to 3 months) 1000 (3–9 months)	_
Grains	Belgium	0.025	2.5	_	120
Cereals	Hungary	0.400	1.6-2.4	_	21
Wheat, barley and maize	Spain	0.224	2.24	224-300	_
Cereals	UK	0.225	4.5	600	90

RESIDUES RESULTING FROM SUPERVISED TRIALS

Four hundred and ninety-two supervised residue trials were conducted with chlorpyrifos-methyl in Europe and one in Chile using EC formulation of chlorpyrifos-methyl. Table 36 summarize the data submitted. Residues of chlorpyrifos-methyl were determined using different methods with LOQ of 0.01 mg/kg, including GRM 02.04 (LC/MS/MS), GRM 05.07 (GC/NCI-MS), GRM 00.10 (CG/FPD) and ERC 93.1 (GC/FPD). LOD were 0.002 or 0.003 mg/kg. Most of the studies were conducted according to GLP. In all trials, concurrent determinations of residues in untreated crops gave residues < LOQ.

Residues of chlorpyrifos-methyl within 25% GAP are underlined and were considered for estimation maximum residue level, HR and STMR. Residues on the crop edible portion (pulp or flesh) were doubled underlined and considered only for estimation of STMR. When residues in samples harvested at a latter stage were higher than what was found at the critical PHI, they will be selected for the estimations.

Table	Crop	Number of trials
37	Citrus (orange, mandarin, lemon)	51
38	Pome fruit (apple, pear)	72
39	Stone fruit (apricot, peach, nectarine)	34
40	Cherry	11
41	Grape	63

Table 36 Summary of supervised trials conducted with chlorpyrifos-methyl in Europe

Table	Crop	Number of trials
42	Strawberry	23
42	Kiwi fruit	4
44	Onion	6
45	Tomato	55
46	Pepper	24
47	Green beans	6
48	Carrot	4
49	Potato	21
50	Sugar beet	4
51	Artichoke	4
52	Barley	12
53	Corn/maize	8
54	Wheat	12
55	Cotton	12
56	Oil seed rape	16
57–60	Animal feed	51

Citrus

A total of 51 trials with lemon, mandarin, clementine and oranges conducted in Italy and Spain during 1991–2006 were submitted. The results of the supervised trials are shown in Table 37.

Table 37 Results of supervised trials conducted with chlorpyrifos-methyl in citru	s.
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Country,	Crop,	Applicatio	on			Portion	PHI	Residue	Report No.,
Region, year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/kg)	Trial No.,
Italy,	Mandarin,		2567	2.7	2	W. fruit	21	0.46	GHE-P-
Latina Lazio,	Clementine		2402						11004, CEMS 202E
2004	Colliulle								Rawle, 2005
Italy,	Mandarin,	(0.12)	2427	2.73	2	W. fruit	< 0	0.07	GHE-P-
Lazio,	Clementine		2362	2.77			0	2.4	11004,
2004	Comune						5	1.0	CEMS-
							11	0.40	2303A,
							15	0.47	Rawle, 2005
							21	0.38	
Italy,	Orange,	(0.12)	2463	2.8	2	W. fruit	< 0	0.05	GHE-P-
Lazio,	Tarocco		2351				0	1.8	11003,
2004							5	0.37	CEMS-
							11	0.48	2302A,
							15	0.31	Rawle, 2006
							21	0.20	
						Peel	21	0.67	
						Pulp	21	0.04	

Country,	Crop,	Applicatio	on			Portion	PHI	Residue	Report No.,
Region, year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/kg)	Trial No.,
Italy,	Orange,		2418	2.8	2	Peel	21	0.53	GHE-P-1003,
Lazio	Tarocco		2189	2.6		Pulp		< 0.01	CEMS-
2004						W. fruit		0.15	2302E,
						Individual		0.03	Rawle, 2006
						fruit		0.06	
								0.08	
								0.08	
								0.09	
								0.10	
								0.11	
								0.10	
								0.10	
								0.18	
								0.19	
Italy.	Orange.	(0.12)	2266	2.7	2	W. fruit	< 0	0.18	GHE-P-1003.
Lazio,	Valencia	(2384	2.8			0	2.1	CEMS-
2004							4	0.69	2302F,
							10	0.44	Rawle, 2006
							16	0.49	
							21	0.21	
						Peel	21	0.66	
						Pulp	21	$< 0.002^{a}$	
Italy,	Orange,		2672	2.7	2	Peel	22	0.45	GHE-P-1003,
Lazio,	Tarocco		2826	2.8		Pulp		< 0.01	CEMS-
2005						W. fruit		0.21	2302G,
						Individual		0.04	Rawle, 2006
						Iruit		0.06	
								0.11	
								0.12	
								0.15	
								0.19	
								0.21	
								0.25	
								0.27	
								0.31	
								0.47	
Italy,	Orange,	0.11	2617	2.8	2	W. fruit	< 0	0.14	GHE-P-
Sicily,	Navelina		2437	2.6			0	1.7	11219,
2005							5	0.78	686969D,
							9	0.40	Old, 2007
							15	0.32	
Te-1	Mandania	0.11	2420	26	2	D1	21	0.58	CHED
Sicily	Nova	0.11	3420	5.0	4	Pulp	21	~ 0.92	0ne-r- 11218
2005	11014		5450			W fruit		C 0.003	686953B.
2005						w. nun		0.17	Old, 2007
Italy	Clementine	0.11	2995	2.7	2	W. fruit	< 0	0.06	,
Sicily,	Monreal		2983				0	2.2	GHE-P-
2005							5	0.82	11218,
							9	0.58	686953D,
							15	0.52	Old, 2007
							21	0.31	
Italy	Orange,	0.071	2007	1.4	2	W. fruit	< 0	0.07	GHE-P-
Sicily,	Tarocco		2012				0	0.83	11544,
2006							5	0.43	690341B,
							11	0.27	Livingstone,

Region, year Variety kg ai/hL L/ha kg ai/ha No. Analysed (days) (mg/kg) T 15 0.15 15 0.15 15	Trial No.,
15 0.15	
21 0.16	
Italy Orange, 0.071 1972 1.4 2 W. fruit 0 0.75 C	GHE-P-
Sicily, Tarocco 1985 15 0.26 1	11544,
2006 21 0.21	690341D,
	Livingstone,
Italy Mandarin, 0.071 1981 1.4 2 W. fruit < 0 0.02 C	GHE-P-
Sicily, Monreal 2006 W. fruit 0 0.94 1	11545,
2006 W. fruit 5 0.70 6	690357B,
W. fruit 11 0.33 L	Livingstone,
W. fruit 15 0.23 2	2008
Peel 15 0.75	
Pulp 15 $< 0.003^{2}$	
W. fruit 21 0.21	
Peel 21 0.02	
Pulp 21 < 0.003 Italy Mandazin 0.071 2024 1.4 2 W fm/t 0 0.97 6	CHED
Italy Mandalli, $0.0/1$ 2034 1.4 2 w. hull 0 0.87 C Sicily Nova 2010 W fmit 14 0.18 1	ОПЕ-Р- 11545
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	690357D
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Livingstone
W fruit 20 0.11 2	2008
$\begin{array}{c c} \mathbf{P}_{\text{rel}} & 20 & 0.11 \\ \mathbf{P}_{\text{rel}} & 20 & 0.46 \end{array}$	
$\begin{array}{c c} Pulp \\ \hline \\ Pulp \\ \hline Pulp \\ \hline \\ Pulp \\ \hline Pulp \\ \hline Pulp \\ \hline Pulp \\ \hline Pulp \\ Pulp \\ \hline Pulp \\ Pulp \\ \hline Pulp \\ Pulp \\$	
Italy Orange 0.096 2490 2.4 2 W fruit < 0 0.10 C	GHF-P-
Sicily Tarocco 2539 $1000000000000000000000000000000000000$	11219.
2006 5 0.72 6	686969F,
	Old, 2007
15 0.89	
21 0.56	
Italy, Orange, 0.11 2893 3.3 2 Peel 21 0.95 C	GHE-P-
Sicily Tarocco 2996 Pulp < 0.003 ^a 1	11219,
2005 W. fruit 0.21 6	686969B,
	Old, 2007
Spain, Lemon, 0.090 2860 - 1 W. fruit 0 1.6 C	GHE-P-2905,
Cabezotorres Fino 7 0.35 P	R91-74A,
1991 21 0.06 K	Khoshab and
28 0.04 C	Chen, 1993
Peel 0 5.8	
Pulp = 0 < 0.01	
Spain Mandarin 0.000 3000 1 W fmit 60 0.20 6	CHE D 2004
$\begin{bmatrix} \text{Spann}, & \text{Manuallin}, & 0.050 & 5000 & - & 1 & W. \text{Hull} & 00 & 0.50 & C \\ \text{Canals} & \text{Clemenule} & & & & & & & \\ \end{bmatrix}$	R01_75A
1991 02 0.27 N	Khoshah and
Peel 60 12 C	Chen. 1993
	, -//0
Pulp $60 < 0.01$	
130 < 0.01	

Region, year Variety kg ai/hL L/ha kg ai/ha No. Analysed (days) (mg/kg) Trial No Trial No Carcaisent, 1991 Spain, 1991 Oranges, Navelina 0.090 3750 - 1 W fruit 60 0.07 GHE-P-207, R91-P-207, 00 Spain, Valencia Navelina - 1 W fruit 90 0.16 R91-76A, Noshab and 119 Spain, Valencia Oranges, Navelina 0.09 4800 - 1 W fruit 1 0.46 1992 Navelina 0.09 4800 - 1 W fruit 1 0.74 R91-76A, Noshab and 199 Spain, Spain	Country,	Crop,	Applicatio	on			Portion	PHI	Residue	Report No.,
Spain, 1991 Oranges, Navelina 0.090 3750 - 1 W. fruit Number (Marcaisent, 1991 60 0.07 CHE-P-2007 (HE-P-2007) Spain, Valencia Navelina 0.09 4800 - 1 W. fruit 10 0.046 Chen, 1993 Spain, Valencia Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.74 CHE-P-320, CHE-P-320, Seving Spain, Valencia Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.74 CHE-P-320, CHE-P-320, Seving Spain, Seving,	Region, year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/kg)	Trial No.,
Carcaixent, 1991 Navelina Image in a sector i	Spain,	Oranges,	0.090	3750	_	1	W. fruit	60	0.07	GHE-P-2907,
1991	Carcaixent,	Navelina						90	0.16	R91-76A,
spain, Spain, Spain, Spain, Spain, Spain, 1992 Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.740 GHE-P-3230, R92-21A, Solution Spain, Valencia Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.741 GHE-P-3230, R92-21A, Solution Spain, Spain, Spain, Spain, Spain, Spain, Alhama, 11992 Oranges, Navelino 0.09 3400 - 1 W. fruit 0 1.2 0.10 HE-P-3230, R92-21A, Solution GHE-P-3230, R92-21A, Solution GHE-P-320, R92-21B, Solution GHE-P-320, R92-21B, Solution GHE-P-320, R92-21B, Solution GHE-P-320, R92-21B, Solution GHE-P-320, R92-21B, Solution GHE-P-320, R92-21B, Solution GHE-P-320, R92-21B, Solution GHE-P-320, R92-21B, Solution GHE-P-320, R92-21C, Solution	1991							119	0.10	Khoshab and
Spain, Valencia Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.74 GHE-P-320, R92-21A, 5 1092 Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.74 GHE-P-320, R92-21A, 5 0.16 R92-21A, 5 0.16 R92-21A, 5 0.06 R92-21A, 12 0.11 2 0.11 1 0.01 1 0.01 1 0.01 1 0.01 1 0.01 1 0.01 1 0.01 1 0.01 1 1 1 0.01 1 0.01 1 0.01 1<							Peel	60	0.33	Chen, 1993
Spain, Valencia Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.74 GHE-P-3230, R92-21A, 50.00 5pain, Valencia Navelina 0.09 4800 - 1 W. fruit 1 0.74 GHE-P-3230, R92-21A, 50.06 1992 Navelina 0.09 4800 - 1 W. fruit 1 0.74 GHE-P-3230, R92-21A, 112 0.16 R92-21A, 120 0.16 R92-21A, 120 0.16 R92-21B, 120 0.01 12 12 12								90	0.46	
Spain, 1992 Oranges, Navelina 0.09 4800 - 1 W. fruit 1 1 0.01/4 GHE-P-3230, 872-21A, 56 1992 Navelina 0.09 4800 - 1 W. fruit 1 0.016 GHE-P-3230, 872-21A, 56 0.16 Khoshab and 85 0.06 Laurie, 1993 1992 0 -								119	0.42	
Spain, Valencia Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.74 GHE.P-3230, R02-21A, S0-06 1992 Navelina 0.09 4800 - 1 W. fruit 10 0.74 GHE.P-3230, R02-21A, S0-06 Spain, Spain, Sevilla Oranges, Navelino 0.09 3400 - 1 W. fruit 0 1.2 0.11 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.8 R92-21B, R02-21B, 30 0.14 Khoshab and Laurie, 1993 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.8 R92-21B, R02-21C, 1992 Navelino 0.09 3400 - 1 W. fruit 0 0.12 GHE-P-3230, R92-21C, 1992 Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21C, 1992 Salustian 0.09 3000 2.7 1 W. fruit <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Pulp</td> <td>60</td> <td>< 0.01</td> <td></td>							Pulp	60	< 0.01	
Spain, Valencia 1992 Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.74 GHE.P-3230, GHE.P-3230, Sevila 1992 Navelina 0.09 4800 - 1 W. fruit 1 5 0.16 GHE.P-3230, Sevila Spain, Sevilla Oranges, Navelino 0.09 3400 - 1 W. fruit 0 1.2 GHE.P-3230, GHE.P-3230, Sevilla, 1992 1992 Oranges, Sevilla, 1992 O.09 3400 - 1 W. fruit 0 1.2 GHE.P-3230, GO Spain, Sevilla, 1992 Oranges, Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE.P-3230, GO Spain, Sevilla, 1992 Camges, Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE.P-320, GO 1.2 1992 Salustian 0.09 3400 - 1 W. fruit 0 0.2 1.2 GHE.P-320, GO 1.2 GHE.P-320, GO 1.2 GHE.P-320, GO							_	90	< 0.01	
Spain, Valencia Oranges, Navelina 0.09 4800 - 1 W. fruit 1 0.74 CHER-P-3230, R92-21A, Sevila 1992 Navelina 0.09 4800 - 1 Knu 56 0.16 R92-21A, Sevilla 1992 Oranges, Sevilla Oranges, Sevilla 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-3230, R92-21B, Sevilla 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-3230, R92-21B, Sevilla 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-320, R92-21B, Sevilla 1992 Salustian 0.09 3400 - 1 W. fruit 0 0.26 R92-21C, R92-21C, 60 0.30 R92-21C, 60 0.30 R92-21C, 60 0.30 R40-4 R45-4								119	< 0.01	
Valencia 1992 Navelina H Image h	Spain,	Oranges,	0.09	4800	-	1	W. fruit	1	0.74	GHE-P-3230,
1992 Image: serie of the secience of the secince of the secience of the secience of the secience of th	Valencia	Navelina						25	0.16	R92-21A,
Spain, Sevilla, 1992 Oranges, Navelino 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-3230, R0.9 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-3230, R0.9 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-3230, R0.9 1992 Oranges, Sevilla, Sevilla, Sevilla, Sevilla, Sevilla, Sevilla, Salustian 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-3230, R0 Spain, Sevilla, 1992 Oranges, Salustian 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-3230, R0 R0-221C, R0 CHE-P-3230, R0 R0-221C, R0 CHE-P-3230, R0 R0-221C, R0 CHE-P-3230, R0 R0-221C, R0 R0 R0-221C, R0 R0 R0 <td>1992</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>56</td> <td>0.1</td> <td>Khoshab and</td>	1992							56	0.1	Khoshab and
Spain, Sevilla Oranges, Navelino 0.09 3400 - 1 W. fruit 0 1.2 0.40 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21B, 300 0.14 Khoshab and Laurie, 1993 1992 Oranges, Sevilla, 1992 Oranges, Sevilla, Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21B, 300 0.14 Khoshab and Laurie, 1993 Spain, Sevilla, 1992 Oranges, Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, Khoshab and Laurie, 1993 1992 Salustian 0.09 3400 - 1 W. fruit 0 0.26 R92-21C, R92-21C, R92-21C, R92-21C, 1992 Lemon, Fino 0.09 3000 2.7 1 W. Fruit 0 0.86 GHE-P-320, R92-19A, Spain, Pleasent, Pulp 0.04 Khoshab and Laurie, 1993 1992 Mandarin, Pleasent, Pleasent, Pleasent, Pleasent, Pleasent, Pleasent, Pleasent, Pleasent, Pleasent, Pleasent, Pleasent, Pleasent, Pleas								85	0.06	Laurie, 1993
Spain, Sevilla Oranges, Navelino 0.09 3400 - 1 W. fruit 0 1.2 CHE-P-3230, R92-21B, Substrain 1992 Navelino 0 1.2 0.14 Khoshab and Laurie, 1993 1992 - 1 W. fruit 0 0.13 Khoshab and Laurie, 1993 1992 - - 1 W. fruit 0 1.2 GHE-P-3230, Che Spain, Sevilla, 1992 Oranges, Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, Khoshab and Solutian 1992 Salustian 0.99 3400 - 1 W. fruit 0 1.2 GHE-P-3230, Khoshab and Solutian 1992 Salustian 0.99 3000 2.7 1 W. fruit 0 0.20 HE-P-3096, R92-1PA, Solutian 1992 Lemon, Fino 0.99 3000 2.7 1 W. Fruit 0 0.66 0.44 Khoshab and Khoshab and Laurie, 1993 1992 Mandarin, Fino 0.99								112	0.11	
Spain, Spain, Spain, Spain, Spain, 1992 Oranges, Navelino 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21B, 30 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21B, 30 1992 Navelino 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21C, 600 0.03 Spain, Sevilla, 1992 Oranges, Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21C, 600 22 1992 Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21C, 60 22 1992 Salustian 0.09 3000 2.7 1 W. fruit 0 0.86 GHE-P-3096, R92-120, R04 R92-19A, R92-19A, R92-19A, R92-19A, R92-19A, R92-19A, R92-19A, R92-19A, R92-19A, R92-19A, R92-19A, R92-19A, R92-20A, R92-100 0.00 2.7 1 W. fruit 1 1.2 GHE-P-3096, R120 100 0.04 Khoshab and Laurie,							Peel	112	0.40	
Spain, Sevilla Oranges, Navelino 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21B, 30 0.14 Khoshab and Laurie, 1993 1992 -							Pulp	112	< 0.01	
Sevilla 1992 Navelino Image: Sevilla 1992 Navelino Image: Sevilla 1992 Navelino Image: Sevilla 1992 Navelino Image: Sevilla 1993 Navelino Image: Sevilla 1992 Navelino Image: Sevilla 1992 Oranges, Sevilla 1992 Oranges, Sevilla 1992 Oranges, Sevilla 1992 Output to the seving sevilla 1992 Oranges, Sevilla 1992 Output to the seving sevilla 1992 Oranges, Sevilla 1992 Output to the seving se	Spain,	Oranges,	0.09	3400	-	1	W. fruit	0	1.2	GHE-P-3230,
1992 Image: Second	Sevilla	Navelino						15	0.18	R92-21B,
Spain, Sevilla, 1992 Oranges, Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R02-21C, 60 Spain, Sevilla, 1992 Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R02-21C, 60 0.30 R92-21C, 60 R92-21C, 60 R92-21C, 60 R90- R92-21C, 60 R90- R92-21C, 60 R90- R92-21C, 60 R90- R92-21C, 60 R92-21C, 77 R92-21C, 77 R92-21C, 77 R92-21A, 77 R92-21A, 77 R92-19A, 77 R92-19A, 77 R92-19A, 77 R92-19A, 77 R92-19A, 77 R92 R92-19A, 77 R92 R94 R94 Laurie, 1993 R92-20A, 77 R92 R94 Laurie, 1993 R92-20A, 76 R92-20A, 89 R92-20A, 89 R92-20A, 89 R92-20A, 89 R92-20A, 89 R92-20A, 89 R92-20A, 89 R92-20B, 89 R9	1992							30	0.14	Khoshab and
Spain, Sevilla, 1992 Oranges, Salustian 0.09 Substian 3400 								45	0.11	Laurie, 1993
Spain, 1992 Oranges, Salustian 0.09 3400 - 1 W. fruit 0 .12 GHE-P-3230, R92-21C, 60 0.03 Laurie, 1993 1992 Salustian 0.09 3400 - 1 W. fruit 0 0.26 R92-21C, 60 0.30 Laurie, 1993 1992 Salustian - - 1 W. fruit 0 0.20 R92-21C, 60 0.30 Laurie, 1993 1992 - - - - - 120 0.20 Laurie, 1993 Alhama, 1992 Lemon, 0.09 3000 2.7 1 W. Fruit 0 0.86 GHE-P-396, S33 0.04 R92-19A, 1992 Fino - - - - - 100 0.06 - 1992 Fino - - - - - - - - - - - - - - - - - - -								60	0.13	
Spain, Sevilla, 1992Oranges, Salustian 0.09 3400 $ 1$ $W.$ fruit 0 1.2 $CHE.P-3230,$ $800 -26R92-21C,R92-21C,R92-21C,R92-21C,R92-21C,R92-21C,3000.26R92-21C,R92-21C,R92-21C,1000.20R92-21C,R92-21C,R92-21C,1200.20R92-10,R92-10,1200.20R92-10,R92-10,1200.20R92-10,R92-10,1200.00R92-10,R92-20,R92-20$							Peel	60	0.35	
Spain, Sevila, 1992 Oranges, Salustian 0.09 3400 - 1 W. fruit 0 1.2 GHE-P-3230, R92-21C, R92-21C, R92-21C, 1992 Salustian - - 1 N. fruit 0 0.26 R92-21C, R92-21C, 1992 - - - - - 120 0.20 Peel 120 0.66 - - - - Spain, Alhama, 1992 Lemon, Fino 0.09 3000 2.7 1 W. Fruit 0 0.86 GHE-P-3096, R92-19A, 1992 Fino -							Pulp	60	< 0.01	
Sevilla, 1992 Salustian Image: solution of the soluti	Spain,	Oranges,	0.09	3400	-	1	W. fruit	0	1.2	GHE-P-3230,
1992 Image: second	Sevilla,	Salustian						30	0.26	R92-21C,
Spain, Alhama, 1992 Lemon, Fino 0.09 3000 2.7 1 W. Fruit New Fruit 0 0.04 GHE-P-3096, R92-19A, 53 1992 Fino 0.09 3000 2.7 1 W. Fruit 0 0.86 GHE-P-3096, R92-19A, 1992 Fino 0.09 3000 2.7 1 W. Fruit 0 0.86 GHE-P-3096, R92-19A, 1992 Fino 0.09 3000 2.7 1 W. Fruit 0 0.04 Khoshab and Laurie, 1993. 1992 Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 Mandarin, Picasent, 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 Mandarin, Picasent, 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, R92-20A, 1992 Mandarin, Picasent, 0.09 3000 - 1 W. fruit 1 1.4 <td>1992</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>60</td> <td>0.30</td> <td>Khoshab and</td>	1992							60	0.30	Khoshab and
Spain, 1992 Lemon, Fino 0.09 3000 2.7 1 W. Fruit N. Fruit 0 0.86 GHE-P-3096, R92-19A, 53 1992 Fino 0.09 3000 2.7 1 W. Fruit 0 0.86 GHE-P-3096, R92-19A, 1992 Fino 0.09 3000 2.7 1 W. Fruit 0 0.86 GHE-P-3096, R92-19A, 1992 Fino 0.09 3000 - 1 W. Fruit 100 0.02 Peel 100 0.06 Pulp 100 0.06 100 0.06 Plap Peel 100 0.06 100 0.06 100 25 0.34 Khoshab and 1992 Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, 1992 Clemenules 0.09 3000 - 117 0.48 12 12 12 12 12 12 12 12 12 12								90	0.22	Laurie, 1993
Spain, Alhama, 1992 Lemon, Fino 0.09 3000 2.7 1 W. Fruit Albama, Spain, Beel 0 0.86 BP2-19A, S3 GHE-P-3096, BP2-19A, S3 1992 Fino								120	0.20	
Image: second							Peel	120	0.66	
Spain, Alhama, 1992 Lemon, Fino 0.09 3000 2.7 1 W. Fruit 0 0.86 GHE-P-3096, R92-19A, 1992 Fino -							Pulp	120	< 0.01	
Alhama, 1992 Fino Fin	Spain,	Lemon,	0.09	3000	2.7	1	W. Fruit	0	0.86	GHE-P-3096,
1992 1992 53 0.04 Khoshab and Laurie, 1993. 1992 100 0.02 100 0.02 Spain, Picasent, 1992 Mandarin, Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, S66 1992 Clemenules - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, S66 1992 - - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, S66 1992 - - - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, S66 1992 - - - - 1 Peel 117 0.15 Picasent, Picasent, Picasent, 1993 Mandarin, Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, S66 0.38 Khoshab and Laurie, 1993 1992 - - 1 W. fruit 1 1.4 GHE-P-3229, S66 0.38 Khoshab and Laurie, 1993 1992 - - 1 W. fruit 1 1.4 GHE-P-3229, S	Alhama,	Fino						25	0.04	R92-19A,
Spain, Picasent, 1992 Mandarin, Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, GHE-P-3229, 27 0.58 R92-20A, 1992 Clemenules 1 1 1.2 GHE-P-3229, 27 0.58 R92-20A, 1992 Clemenules 1 1 1.2 GHE-P-3229, 27 0.58 R92-20A, 1992 Clemenules 1 1 1.2 GHE-P-3229, 27 0.58 R92-20A, 1992 Clemenules 1 1 1.4 Khoshab and 89 0.22 Laurie, 1993 1992 I 100 0.15 Intro 0.15 Intro Intro <td>1992</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>53</td> <td>0.04</td> <td>Khoshab and</td>	1992							53	0.04	Khoshab and
Spain, Picasent, 1992 Mandarin, Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 0.01 - 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, Spain, Picasent, 1992 Mandarin, Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Mandarin, Picasent, 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina I I I I I I I I								77	0.02	Laurie, 1993.
Spain, Picasent, 1992Mandarin, Clemenules 0.09 3000 $ 1$ $W.$ fruit 1 1.2 $GHE-P-3229,$ $2770.58R92-20A,R92-20A,1992Clemenules 1W. fruit11.2GHE-P-3229,R92-20A,1992Clemenules 1W. fruit11.2GHE-P-3229,R92-20A,1992 100 -$								100	0.02	
Spain, Picasent, 1992 Mandarin, Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 Clemenules - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 - - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 - - - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 -<							Peel	100	0.06	
Spain, Picasent, 1992 Mandarin, Clemenules 0.09 3000 - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 Clemenules - - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 - - - 1 W. fruit 1 1.2 GHE-P-3229, R92-20A, 1992 - - - - - - 56 0.34 Khoshab and Laurie, 1993 Spain, Mandarin, 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, Picasent, Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 192 - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 - - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 - - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 - - - -							Pulp	100	< 0.01	
Picasent, Clemenules Image: Clemenules Image: Clemenules Image: Clemenules Image: Clemenules R92-20A, 1992 Image: Clemenules Image: Clemenules Image: Clemenules Image: Clemenules Khoshab and 1992 Image: Clemenules Image: Clemenules Image: Clemenules Image: Clemenules Khoshab and 1992 Image: Clemenules Image: Clemenules Image: Clemenules Image: Clemenules Status 1992 Image: Clemenules Image: Clemenules Image: Clemenules Image: Clemenules Status	Spain,	Mandarin,	0.09	3000	-	1	W. fruit	1	1.2	GHE-P-3229,
1992 56 0.34 Khoshab and 89 1992 - - - - - 89 0.22 Laurie, 1993 117 0.15 - - - - - 117 0.48 Pulp 117 0.01 - - - 1 W. fruit 1 1.4 GHE-P-3229, Spain, Mandarin, 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 - <td>Picasent,</td> <td>Clemenules</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>27</td> <td>0.58</td> <td>R92-20A,</td>	Picasent,	Clemenules						27	0.58	R92-20A,
Spain, Mandarin, 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina 0.09 3000 - 1 Pulp 117 0.38 Khoshab and 1992 Hernandina Fulp Fulp 117 0.31 Laurie, 1993 1992 Fulp 117 0.01 Fulp 117 0.01 Spain, Mandarin, 0.09 3300 - 1 W. fruit 24 0.36 GHE-P-3630.	1992							56	0.34	Khoshab and
Spain, Mandarin, 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, Picasent, Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 - - - - - - 56 0.38 Khoshab and 1992 - - - - - 117 0.31 1992 - - - - - - 10 10 100 - - - - - 117 0.01 - Spain, Mandarin,								89	0.22	Laurie, 1993
Spain, Picasent, 1992 Mandarin, Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, R92-20B, 1992 Hernandina Image: Constraint of the structure of the							D 1	117	0.15	
Spain, Picasent, 1992 Mandarin, Hernandina 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, R92-20B, 1992 Hernandina Image: Constraint of the state of the st							Peel	117	0.48	
Spain, Mandarin, 0.09 3000 - 1 W. fruit 1 1.4 GHE-P-3229, Picasent, Hernandina - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina - - 1 W. fruit 1 1.4 GHE-P-3229, 1992 Hernandina - - - 1 27 0.78 R92-20B, 1992 - - - - - 56 0.38 Khoshab and 1992 - - - - - 117 0.31 Laurie, 1993 117 0.31 - - - Peel 117 1.0 Spain, Mandarin, 0.09 3300 - 1 W. fruit 24 0.36 GHE-P-3630.		N 1 .	0.00	2000		1	Pulp	11/	< 0.01	CHE D 2020
Preasent, Fremandina Fremandina <td>Spain,</td> <td>Mandarin,</td> <td>0.09</td> <td>3000</td> <td>-</td> <td>1</td> <td>W. fruit</td> <td>1</td> <td>1.4</td> <td>GHE-P-3229,</td>	Spain,	Mandarin,	0.09	3000	-	1	W. fruit	1	1.4	GHE-P-3229,
1992 56 0.38 Khosnab and 89 1992 89 0.37 Laurie, 1993 117 0.31 117 1.0 Peel 117 1.0 Pulp 117 <0.01	Picasent,	Hernanuma						21	0.78	K92-20B,
Spain, Mandarin, 0.09 3300 - 1 W. fruit 24 0.36 GHE-P-3630.	1992							20	0.38	Knosnad and Laurie 1003
Spain, Mandarin, 0.09 3300 - 1 W. fruit 24 0.31 0.03 GHE-P-3630.								09 117	0.37	Lauric, 1775
Spain, Mandarin, 0.09 3300 - 1 W. fruit 24 0.36 GHE-P-3630.							Peel	117	1.0	
Spain, Mandarin, 0.09 3300 – 1 W. fruit 24 0.36 GHE-P-3630.							Pulp	117	-1.0	
span, [Wandanii, [U.09] [3500] - [1] [W. Ifult [24] [U.30] [GHE-P-3630.	Spain	Mondoria	0.00	2200		1	ruip W fmit	24	< 0.01 0.24	СНЕ В 2620
Librilla Nova	Jibrillo	Nova	0.09	3300	-	1	w. Irult	24	0.50	UNE-P-303U, D03 12 A
Lioinia, Ky5-15A, 1003 Vesebele and	1003	11014								Kyoshah and
1775 Knosnab and Domrumon	1775									Rerryman
1994										1994

Country,	Crop,	Applicatio	on			Portion	PHI	Residue	Report No.,
Region, year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/kg)	Trial No.,
Spain,	Mandarin,	0.090	3000	-	1	W. fruit	22	0.39	GHE-P-3630,
Picana, 1993	Hernandina								R93-13B,
									Khoshab and
									Berryman,
Spain.	Lemons	0.090	2600	2.34	1	W. fruit	7	0.70	GHE-P-3631
Librilla,	Fino				-		-		R93-12A,
1993									Khoshab and
									Berryman,
. .	0	0.000	1207		1	W/ C ···	21	0.15	1994.
Spain,	Oranges, Navelina	0.090	1397	-	1	w. Iruit	21	0.15	GHE-P-3032, D03 14A
1993	ruvennu								K95-14A, Khoshab and
1775									Berryman,
									1994
Spain,	Oranges,	0.090	3000	-	1	W. fruit	21	0.12	GHE-P-3632,
Sevilla,	Navelina								R93-14B,
1993									Khoshab and
									1994
Spain,	Orange,	0.090	2449	_	1	W. fruit	21	0.06,	GHE-P-4497,
Sevilla,	Navelino							0.10,	R94-129A,
1994								0.12 (2)	Khoshab,
<u> </u>	0	0.000	02(1		1	W/C 1	21	0.00	1995.
Spain,	Orange, Navelino	0.090	2361	-	1	W. fruit	21	0.08	GHE-P-4497, P04 120P
Azilaicazai, 1994	Navenno								Khoshah
1771									1995
Spain,	Lemon,	0.090	3666	-	1	W. fruit	21	0.15	GHE-P-4495,
Librilla,	Eureka								R94-127A,
1994									Khoshab,
Spain.	Mandarin.	0.090	3580	_	1	W. fruit	21	0.04	GHE-P-4496
Silla, 1994	Satsuma	0.070	2200		-	, , , i i u i u		0.01	R94-128A,
,									Khoshab,
									1995
Spain,	Mandarin,	0.090	2667	-	1	W. fruit	21	0.07	GHE-P-4496,
Picasent, 1994	Satsuma								K94-128B, Khoshah
1771									1995
Spain,	Mandarin,	0.090	4722	-	1	W. fruit	21	0.17	GHE-P-4496,
Alfarp,	Clemenule								R94-128C,
1994									Khoshab,
Spain	Orange	(0.12)	2212	27	2	W fruit	< 0	0.02	1995 CHE P 1003
Sevilla.	Navelina	(0.12)	2283	2.7	2	w. nun	0	1.5	CEMS-
2004							5	0.57	2302B,
							11	0.36	Rawle, 2006
							15	0.26	
							21	0.18	
						Peel	21	0.67	
Spain	Orange		2220	26	2	Pulp W fmit	21	< 0.002"	CHE D
Almonte	Navelate		2320-	2.0-	$\frac{2}{2}$	W. fruit	42	0.08	11003.
2004	i uverate		2117	2.7	2	W. fruit	28	0.25	CEMS-
					2	W. fruit	70	0.18	2302C
									Rawle, 2006

Country,	Crop,	Applicatio	on			Portion	PHI	Residue	Report No.,
Region, year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/kg)	Trial No.,
Spain,	Orange,		2286	2.7	2	Peel	21	0.50	GHE-P-1003,
Sevilla,	Navelina		2227	2.6		Pulp		< 0.01	CEMS-302D,
2004						W. fruit		0.13	Rawle, 2006
Spain,	Mandarin,		2279	2.7	2	W. fruit	< 0	< 0.01	GHE-P-
Seville,	Clemenule						0	1.4	11004,
2004							5	0.93	CEMS-
							10	0.59	2303B,
							15	0.69	Rawle, 2005
							21	0.31	
Spain,	Mandarin,	-	2146-	2.6	2	W. fruit	70	0.40	GHE-P-
Almonte,	Clemenule		2283		2	W. fruit	56	0.44	11004, CEMS
2004					2	W. fruit	42	0.25	CEMS- 2303C
					2	w. fruit	28	0.26	2303C, Rawle 2005
Spain	Mandarin		2251	2.64	2	Peel	21	12	GHE-P-
Seville	Clementina		2319	2.72	2	Puln	21	< 0.01	11004.
2004	Clementing		2517	2.72		W fruit		0.32	CEMS-
2001						Individual		0.04	2303D,
						Fruit		0.05	Rawle, 2005
								0.09	
								0.16	
								0.23	
								0.27	
								0.30	
								0.34	
								0.44	
								0.52	
								0.59	
								0.85	
Spain,	Mandarin,	0.10	3008	3.1	2	W. fruit	21	0.17	GHE-P-
Andalucia,	Clemenule		2999						11218,
2005									686953A,
	36 1 1	0.10	2015			THE CONTRACTOR	0	0.01	Old, 2007
Spain,	Mandarin,	0.10	3015	3.1	2	W. fruit	< 0	< 0.01	GHE-P-
Andalucia,	Loretina		3007				0	1.5	11218, 686052C
2005							5	0.51	0.00933C,
							10	0.58	010, 2007
							15 21	0.20	
Spain	Mandarin	0.071	2010	1.4	2	W fruit	<0	0.01	CHE-P-
Andalucia.	Loretina	0.071	2010	1.4	2	W. fruit	0	1.6	11545.
2006	Doreening		2000			W fruit	5	0.28	690357A.
						W. fruit	10	0.36	Livingstone,
						W. fruit	15	0.09	2008
						Peel	15	0.44	
						Pulp	15	< 0.003 ^{<u>a</u>}	
						W. fruit	21	0.07	
						Peel	21	0.31	
						Pulp	21	< 0.01	
Spain	Mandarin,	0.071	1993	1.4	2	W. fruit	0	1.6	GHE-P-
Andalucia,	Clemenule		2008			W. fruit	15	0.21	11545,
2006						Peel	15	0.84	690357C,
						Pulp	15	0.01	Livingstone,
						W. fruit	21	0.20	2008
						Peel	21	0.79	
		0.000				Pulp	21	0.01	
Spain,	Orange,	0.094	2995	2.8	2	W. fruit	21	0.07	GHE-P-
Andalucia,	Navelina								11219,
2003									080969A,

Country,	Crop,	Application				Portion	PHI	Residue	Report No.,
Region, year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/kg)	Trial No.,
									Old, 2007
Spain,	Orange,	0.094	3042	3.0	2	W. fruit	< 0	0.01	GHE-P-
Sevilla,	Navelina		3006				0	0.65	11219,
2005							5	0.35	686969C,
							10	0.13	Old, 2007
							15	0.06	
							21	0.11	
Spain,	Orange,	0.094	3004	2.8	2	W. fruit	21	0.24	GHE-P-
Andalucia,	Lane Late		3009			Peel		0.94	11219,
2006						Pulp		< 0.01	686969E,
									Old, 2007
Spain	Orange,	0.071	1998	1.4	2	W. fruit	< 0	0.01	GHE-P-
Andalucia,	Navelina		1996				0	0.73	11544,
2006							5	0.31	690341A,
							10	0.13	Livingstone,
							15	0.11	2008
							21	0.06	
Spain	Orange,	0.071	1988	1.4	2	W. fruit	0	1.0	GHE-P-
Andalucia,	Navelina		2007				15	0.09	11544,
2006							21	0.02	690341C,
									Livingstone, 2008

^a limit of detection (LOD)

Pome Fruit

A total of 84 trials were conducted in Northern and Southern Europe during 2004–2007. The results of the supervised trials are shown in Table 38.

Table 38 Results of supervised trials conducted with chlorpyrifos methyl in apple and pears

Country		Application							Report No.
Region	Crop	kg ai/hL	L/ha	kg ai/ha	No.	Portion	PHI	Residues	Trial No.
Year	Variety					Analysed	(days)	(mg/Kg)	Reference
Austria	Apples	0.10	594	0.6	2	Fruit, whole	0	0.13	GHE-P-11526
Wien,	Early Smith		641				21	0.02	690142D
2006							28	0.01	Livingstone, 2008
Austria	Pears	0.10	605	0.6	2	Fruit, whole	< 0	0.01	GHE-P-11526
Kirchberg-	Williams		648				0	0.47	690142E
Thening,	Christ						7	0.18	Livingstone, 2008
2006							14	0.05	
							21	0.02	
							28	< 0.01	
Belgium	Pear		1002	0.6	2	Fruit, whole	28	0.04	GHE-P-10998
Nodebais	Conference		1015						CEMS-2297E
2004									Rawle, 2005
Belgium	Pear	0.12	521	0.6	2	Fruit, whole	28	0.02	GHE-P-11222
Molenbaix,	Doyenne du	0.21	303						687009B
Hainaut	Comice								Old, 2006
2005									
France-North	Apple	(0.09)	1406	1.0	2	Fruit, whole	< 0	< 0.01	GHE-P-8642
St.Mesmin	Golden		1111				0	0.36	Doran and Craig,
1999							3	0.21	2001
							7	0.1	
							14	0.08	
							21	0.07	
Country		Applicatio	n						Report No.
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Region	Crop	kg ai/hL	L/ha	kg ai/ha	No.	Portion	PHI	Residues	Trial No.
Year	Variety	-		-		Analysed	(days)	(mg/Kg)	Reference
France-North	Apple		609	1.0	2	Fruit, whole	21	0.04	GHE-P-8643
Maine et Loire	Golden		609						Doran and Craig,
1999									2001
France-South	Apple	(0.11)	984	1.0	2	Fruit, whole	< 0	< 0.01	GHE-P-8646
Meauzac	Fuji		905				0	0.19	Doran and Craig,
1999	-						3	0.18	2001
							7	0.13	
							14	0.04	
							21	0.04	
France-South	Apple		854	1.0	2	Fruit, whole	21	0.09	GHE-P-8647
Fregimont	Fuji		1139						Doran and Craig,
1999									2001
France-North	Apple		837	1.0	2	Fruit, whole	21	0.03, 0.03	GHE-P-9434
De Tourraine	Delbard		1141						000216A
2000									Doran and
		(0.00)	1001	1.0	-				Clements, 2002
France-South	Apple	(0.08)	1201	1.0	2	Fruit, whole	< 0	< 0.002	GHE-P-9551
Dieupentale	Granny		1364				0	0.10	000218A
2000	Smith						3	0.05	Doran and Clamanta 2002
							/	0.03	Ciements, 2002
							14	0.02	
Enonas South	Annla	(0,00)	071	1.0	2	Emuit whole	21	0.01	CHE D 0551
St Vicent de	Apple	(0.09)	971 1164	1.0	2	Fluit, whole	< 0	< 0.002	000218P
St. vicent de	Golden		1104				2	0.30	000218D
2000							3 7	0.27	Clements 2002
2000							14	0.55	Ciements, 2002
							21	0.12	
France-South	Apple	0.09	1034		2	Fruit whole	< 0	< 0.002	GHE-P-10005
Les Herbonnes	Gala	0.07	1142	_	-	i fuit, whole	0	0.20	CEMS-2294B
2004	Oulu						4	0.18	Rawle 2005
2001							10	0.16	10000
							14	0.10	
							21	0.10	
France-South	Apple	0.09	810-	_	2	Fruit, whole	70	< 0.002	GHE-P-10995
Finhan	Granny		833	_	2	Fruit, whole	56	< 0.002	CEMS-2294C
2004	Smith				2	Fruit, whole	42	< 0.01	Rawle, 2005
					2	Fruit, whole	28	< 0.01	
France-North	Apples		1182	0.6	2	Fruit, whole	< 0	< 0.002	GHE-P-10994
St Hillaire	Canada		1174				0	0.58	CEMS-2293B
2004							7	0.23	Rawle, 2005
							14	0.10	
							21	0.04	
							28	0.03	
France-North	Apples		1326	0.6	2	Fruit, whole	70	< 0.002	GHE-P-10994
Corze	Fuji No. 6		1265		2	Fruit, whole	55	< 0.002	CEMS-2293C
2004					2	Fruit, whole	42	< 0.01	Rawle, 2005
			440-	0.6	2	Fruit, whole	36	< 0.01	
France-North	Apples		1185	0.6	2	Fruit, whole	28	0.07	GHE-P-10994
Mezieres les	Golden		1167						CEMS-2293D
Clery, 2004			10/0	0.6			20	0.04	Kawle, 2005
France-North	Apples		1269	0.6	2	Fruit, whole	28	0.04	GHE-P-10994
Martin de la	Golden		1260			Fruit, whole,	28	0.02 (4)	CEMS-2293E
2004	Dencious					murvidual		0.03 (3)	kawie, 2005
2004								0.04	
								< 0.01 (4)	

Country		Applicatio	n						Report No.
Region	Crop	kg ai/hL	L/ha	kg ai/ha	No.	Portion	PHI	Residues	Trial No.
Year	Variety	-		-		Analysed	(days)	(mg/Kg)	Reference
France-South	Apple	0.09	821	_	2	Fruit, whole	21	0.02	GHE-P-10995
Castelsarrasin	Granny		868	_		,			CEMS-2294D
2007	Smith								Rawle, 2005
France-South	Pears	0.09	893	(0.72)	2	Fruit, whole	< 0	< 0.01	GHE-P-10997
Moissac	Guillot		883	Ì		,	0	1.2	CEMS-2296B
2004							5	0.16	Rawle, 2005
							10	0.06	,
							14	0.03	
							22	< 0.01	
France-South	Pears	0.09	951–	_	2	Fruit, whole	70	< 0.002	GHE-P-10997
Castelsarrasin	Williams		1049	_	2	Fruit, whole	56	< 0.002	CEMS-2296C
2004					2	Fruit, whole	42	< 0.002	Rawle, 2005
					2	Fruit, whole	28	< 0.002	
France-South	Pears	0.09	1079	_	2	Fruit, whole	21	0.03	GHE-P-10997
Meauzac	Cornice		790	_		Fruit, whole,	21	0.01	CEMS-2296D
2004						individual		0.02 (2)	Rawle, 2005
								< 0.01 (3)	
								0.03	
								0.08 (2)	
								0.09 (2)	
								0.06	
France-North	Pear		1162	0.6	2	Fruit, whole	< 0	< 0.002	GHE-P-10998
Mezieres lez	Passe		1229				0	0.35	CEMS-2297A
Clery	Crassane						7	0.11	Rawle, 2005
2004							14	0.04	
							21	0.02	
							28	0.01	
France-North	Pear		1139	0.6	2	Fruit, whole	< 0	< 0.002	GHE-P-10998
Varennes Le	Passe		1156				0	0.69	CEMS-2297B
Grand	Crassane						7	0.33	Rawle, 2005
2004							14	0.06	
							21	0.07	
							28	0.02	
France-North	Pear		1130-	0.6	2	Fruit, whole	70	< 0.002	GHE-P-10998
Montbellet	Conference		1293		2	Fruit, whole	56	< 0.002	CEMS-2297C
2004					2	Fruit, whole	35	< 0.01	Rawle, 2005
					2	Fruit, whole	42	< 0.01	
France-South	Apples	0.09	1000	-	2	Fruit, whole	21	0.15	GHE-P-11214
Rhone-Alpes	Golden			-					686911A
2005	Delicious								Old, 2005
France-South	Apples	0.09	987	(0.9)	2	Fruit, whole	< 0	< 0.003a	GHE-P-11214
Rhone-Alpes	Golden		997				0	0.93	686911D
2005							5	0.17	Old, 2006
							10	0.56	
							14	0.22	
							21	0.07	
France-North	Apple	0.12	509	0.6	2	Fruit, whole	28	< 0.01	GHE-P-11215
Pas De Calais,	Jona Gold		505						686927A
2005		0.12	500	0.6		.	20	0.04	Old, 2006
France-North	Apple	0.12	523	0.6	2	Fruit, whole	28	0.04	GHE-P-11215
Pas de Calais,	Elstar	0.21	310						686927B
2005		0.45	10.5			-		0.000	Old, 2006
France-North	Apple	0.12	486	0.6	2	Fruit, whole	< 0	< 0.003a	GHE-P-11215
Pas de Calais,	Boskoop	0.21	302				0	1.3	626927D
2005							8	0.10	Old, 2006
							14	0.02	
							21	0.05	

Country		Applicatio	on						Report No.
Region	Crop	kg ai/hL	L/ha	kg ai/ha	No.	Portion	PHI	Residues	Trial No.
Year	Variety			-		Analysed	(days)	(mg/Kg)	Reference
							28	0.08	
France-South	Pear	0.09	1027	0.9	2	Fruit, whole	21	< 0.003 ^a	GHE-P-11221
Rhone-Alpes	Williams		1038			,			686995A
2005									Old, 2006
France-South	Pear	0.09	991	0.9	2	Fruit, whole	< 0	< 0.01	GHE-P-11221
Rhone-Alpes	Louise		992				0	0.89	686995D
2005	Bonne						5	0.34	Old. 2006
							10	0.08	,
							14	0.16	
							21	0.01	
France-North	Pear	0.12	486	0.6	2	Fruit, whole	< 0	< 0.003a	GHE-P-11222
Pas de Calais.	Conference	0.21	310	0.0	-	11010, 011010	0	2.0	687009C
2005							8	0.23	Old. 2006
							14	0.26	,
							21	0.08	
							28	< 0.01	
France-North	Pear	0.12	469	0.6	2	Fruit, whole	< 0	< 0.003a	GHE-P-11222
Pas de Calais.	Dovenne du	0.21	303	0.0	-	11010, 011010	0	1.3	687009D
2005	Comice	0.21	000				8	0.36	Old 2006
2005							14	0.05	010, 2000
							21	0.05	
							28	0.02	
France-North	Apples	0.10	575	0.6	2	Fruit whole	< 0	< 0.01	GHE-P-11526
Pas de Calais.	Jona Gold	0110	601	0.0	-	11010, 011010	0	0.33	690142A
2006	vona cora		001				° 7	0.09	Livingstone, 2008
2000							13	0.07	2000 - 2000
							21	0.04	
							27	0.02	
France-South	Apples	0.07	1200	0.86	2	Fruit, whole	< 0	< 0.003a	GHE-P-11527
Rhone Alpes	Granny-		1226	0.88	_		0	0.16	690158A
2006	Smith						5	0.09	Livingstone, 2008
							10	0.04	,,,
							15	0.03	
							21	0.02	
France-South	Apples	0.07	1221	0.87	2	Fruit, whole	0	0.36	GHE-P-11527
Rhone-Alpes	Golden		1219			,	14	0.20	690158D
2006							21	0.06	Livingstone, 2008
France-South	Pears	(0.06)	1009	0.6	1	Fruit, whole	0	0.37	GHE-P-11796
Languedoc-	Williams	. ,				,	7	0.03	CEMS-3490H
Roussillon							14	< 0.003 ^a	Devine, 2008
2007							21	< 0.003 ^a	
France-South	Apples		1067	0.6	1	Fruit, whole	22	0.03	GHE-P-11796
Languedoc-	Fuji					,			CEMS-3490A
Roussillon	5								Devine, 2008
2007									
France-South	Apples	(0.06)	1010	0.6	1	Fruit, whole	0	0.3	GHE-P-11796
Languedoc-	Golden						7	0.12	CEMS-3490D
Roussillon							14	0.07	Devine, 2008
2007							21	0.05	
France	Pears		1063	0.6	1	Fruit, whole	21	< 0.01	GHE-P-11796
Rhone-Alpes	Conference								CEMS-3490E
2007									Devine, 2008
Germany	Apple	(0.1)	997	1.0	2	Fruit, whole	< 0	< 0.01	GHE-P-8644
Baden-	Idared		1025				0	0.38	Doran and Craig,
Wurttemberg							3	0.12	2001
1999							6	0.08	
							14	0.05	

Country		Applicatio	on						Report No.
Region	Crop	kg ai/hL	L/ha	kg ai/ha	No.	Portion	PHI	Residues	Trial No.
Year	Variety	0		0		Analysed	(days)	(mg/Kg)	Reference
				ĺ			21	0.03	
Germany	Apples		1017	1.0	2	Fruit, whole	20	0.03	GHE-P-8645
Rheinland-	Pinova		1089	110	-	i runt, whole		0102	Doran and Craig.
Pfalz	i movu		1007						2001
1999									2001
Germany	Apples	(0.07)	510	1.0	2	Fruit, whole	< 0	< 0.01	GHE-P-9552
Saxonia	Boskon	(0.07)	1546	110	_	11010, 111010	0	0.93	000217A
2000	Boshop		10 10				3	1.0	Doran and
2000							7	0.71	Clements.
							14	0.56	2002
							21	0.24	
Germany	Apples	(0.06)	997	0.6	2	Fruit whole	≤ 0	$< 0.002^{a}$	GHF-P-10994
Gotzdorf	Glostar	(0.00)	1012	0.0	2	i iuit, whole	0	0.12	CFMS-2293A
2004	Glostal		1012				7	0.12	Rawle 2005
2004							, 14	0.07	Rawie, 2005
							21	< 0.02	
							20	< 0.01	
Germany	Pear		976	0.6	2	Fruit whole	29	0.02	GHE_P_10008
Saxony	Condo		1000	0.0	2	Fruit whole	29	0.02	CEMS_2207D
2004	Condo		1008			individual	29	0.02	$\frac{CEWIS-2297D}{Powle, 2005}$
2004						marviauar		0.01(2)	Kawle, 2003
								0.03	
								0.07	
Germany	Apple	0.13	516	0.6	2	Eruit whole	< 0	< 0.07	CHE D 11215
Definally	Apple Iona Gold	0.15	1012	0.0	2	Fiult, whole		< 0.005	686027C
Dauell- Wurttemberg	Jolia Gold	0.00	1015				6	0.19	080927C
2005							12	0.07	010, 2000
2005							20	0.02	
							20	0.01	
Germany	Dear	0.22	300	0.6	2	Eruit whole	28	< 0.01	GHE_P_11222
Baden	Alexander	0.22	300	0.0	2	Fiult, whole	20	< 0.01	687000 A
Dauell- Wurttemberg	Lukas								007009A
2005	Eukus								010, 2000
Greece	Apple	0.09	1200	0.6	2	Fruit whole	< 0	$< 0.002^{a}$	GHE-P-10995
Korifi Imathia	Granny	0.05	1200	0.0	-	i runt, whole	0	0.64	CEMS-2294A
2004	Smith						5	0.01	Rawle 2005
2001							10	0.14	10010, 2000
							14	0.19	
							21	0.13	
Greece	Pears	0.09	1200	<u> </u>	2	Fruit, whole	< 0	< 0.01	GHE-P-10997
Imathia	Highland	0.07	1200	_	[⁻		0	1.0	CEMS-2296A
2004						1	5	0.69	Rawle, 2005
2001							10	0.02	Ruwie, 2005
							14	0.04	
							21	< 0.01	
Greece	Apples	0.09	1200	L	2	Fruit, whole	< 0	$< 0.003^{a}$	GHE-P-11214
Imathia	Mondial	0.05	1200	_	-	i runt, whole	0	0.53	686911C
2005	Gala						5	0.15	Old 2005
						1	10	0.09	
							14	0.15	
						1	21	0.10	
Greece	Pear	0.09	1200	0.9	2	Fruit, whole	< 0	< 0.003 ^a	GHE-P-11221
Imathia	Williams	0.07	1200	0.7	۱ [–]		0	0.79	686995C
2005	,, intants					1	5	0.16	Old 2006
-005						1	10	0.02	210, 2000
							14	0.02	
						1	21	< 0.01	
				1			<u>~ 1</u>	NO.01	

Country		Applicatio	n						Report No.
Region Year	Crop Variety	kg ai/hL	L/ha	kg ai/ha	No.	Portion Analysed	PHI (days)	Residues (mg/Kg)	Trial No. Reference
Italy Emilia- Romagna 1999	Apple Granny Smith	(0.09)	668 716	1.0	2	Fruit, whole	< 0 0 3 7 14 21	< 0.01 0.42 0.08 0.14 0.03 0.03	GHE-P-8648 R99-093 Doran and Craig, 2001
Italy Bologna, 2000	Apples Golden Mutsu		1025 1146	1.0	2	Fruit, whole	21	0.03, 0.04	GHE-P-9436 000051A Doran and Clements, 2001
Italy Verona. 2000	Apples Golden Delicious		780 1179	1.0	2	Fruit, whole	21	0.07, 0.09	GHE-P-9436 000051B Doran and Clements, 2002
Italy Piemonte 2006	Apples Golden	0.07	1168 1279	0.83 0.91	2	Fruit, whole	< 0 0 5 10 14 21	< 0.003 ^a 0.58 0.14 0.15 0.08 0.03	GHE-P-11527 690158B Livingstone, 2008
Italy Piemonte 2006	Pears Santa Maria	0.07	1193 1278	0.85 0.91	2	Fruit, whole	< 0 0 5 9 15 22	< 0.003 ^a 0.37 0.11 0.06 0.02 < 0.01	GHE-P-11527 690158E Livingstone, 2008
Italy Emilia Romagna 2007	Apples Imperatore	(0.06)	983	0.6	1	Fruit, whole	0 7 14 21	0.17 0.06 0.06 0.02	GHE-P-11796 CEMS-3490C Devine, 2008
Italy Emila Romagna 2007	Pears Abate Fetel	(0.06)	994	0.6	1	Fruit, whole	0 7 14 21	0.31 0.07 0.02 0.01	GHE-P-11796 CEMS-3490G Devine, 2008
Poland Central Poland 2006	Apples Golden Delicious	0.10	598 602	0.6	2	Fruit, whole	< 0 0 7 13 20 26	< 0.003 ^a 0.14 0.05 0.03 0.01 0.02	GHE-P-11526 690142B Livingstone, 2008
Poland Gora Kalwaria 2006	Apples Jersey Mac	0.10	597 656	0.6	2	Fruit, whole	0 22 29	0.06 < 0.003 ^a < 0.003 ^a	GHE-P-11526 690142C Livingstone, 2008
Poland Central Poland 2006	Pears Klaps	0.10	599 638	0.6	2	Fruit, whole	0 20 27	0.39 0.02 < 0.01	GHE-P-11526 690142F Livingstone, 2008
Spain San Pere Pescador 1999	Apples Golden		702 917	1.0	2	Fruit, whole	21	0.07	GHE-P-8649 R99-094A Doran and Craig, 2001
Spain Zaragoza 2004	Apple Reineta	0.09	1178 1190	_	2	Fruit, whole Fruit, whole, individual	21 21	0.08 0.04	GHE-P-10995 CEMS-2294E Rawle, 2005
Spain Zaragoza 2004	Pears Limonera	0.09	1215 1265	_	2	Fruit, whole	20	0.01	GHE-P-10997 CEMS-2296E Rawle, 2005

Country		Applicatio	n						Report No.
Region	Crop	kg ai/hL	L/ha	kg ai/ha	No.	Portion	PHI	Residues	Trial No.
Year	Variety	_		_		Analysed	(days)	(mg/Kg)	Reference
Spain	Apples	0.09	997	_	2	Fruit, whole	20	0.07	GHE-P-11214
Catalunya,	Mondial		1001	-					686911B
2005	Gala								Old, 2005
Spain	Pear	0.09	1003	0.9	2	Fruit, whole	21	< 0.01	GHE-P-11221
Catalunya	Conference		1005						686995B
2005									Old, 2006
Spain	Apples	0.07	1206	0.86	2	Fruit, whole	0	0.16	GHE-P-11527
Arbeca	Golden		1195	0.85			15	0.03	690158C
2006							21	0.03	Livingstone, 2008
Spain	Pears	0.07	1213	0.87	2	Fruit, whole	0	0.55	GHE-P-11527
Lleida	Conference		1195	0.85			15	0.08	690158F
2006							21	0.01	Livingstone, 2008
Spain	Apples		1033	0.6	1	Fruit, whole	21	0.06	GHE-P-11796
Valencia	Royal Gala								CEMS-3490B
2007									Devine, 2008
Spain	Pears		1045	0.6	1	Fruit, whole	21	< 0.003 ^a	GHE-P-11796
Valencia	Del Terreno								CEMS-3490F
2007									Devine, 2008
United	Apple		520	1.0	2	Fruit, whole	21	0.67, 1.1	GHE-P-9434
Kingdom	Golden		570						000216B
Oxon	Delicious								Doran and
2000									Clements, 2002
United	Apples		505	1.0	2	Fruit, whole	0	$< 0.002^{a}$	GHE-P-9552
Kingdom	Cox		699				3	0.57	000217B
Leckford,							7	0.48	Doran, A. and
Hampshire							14	0.35	Clements, 2002.
2000							21	0.18	

Apricot and peach

A total of 34 trials were conducted in apricots and peaches in Southern Europe during 1992–2007. The results of the supervised trials are shown in Table 39.

Table 39 Results of supervised trials conducted with chlorpyrifos methyl in stone fruit

Country		Application	1						Report No.
Region	Crop					Portion	PHI	Residues	Trial No.
Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Reference
France-South	Peaches	(0.058)	1472	0.82	2	Flesh	< 0	< 0.002 ^a	GHE-P-10992
Garonne,	Fidelia		1456				0	0.80	CEMS-2291B
2004							5	0.25	Rawle, 2005
							10	0.06	
							14	0.02	
							21	< 0.01	
						Fruit, whole	< 0	< 0.002 ^a	
							0	0.66	
							5	0.22	
							10	0.05	
							14	0.01	
							21	< 0.01	
France-South	Peaches		1481	0.83	2	Flesh	28	< 0.01	GHE-P-10992
Meauzac,	Fantasia		1607	0.90		Fruit, whole	28	< 0.01	CEMS-2291D
2004									Rawle, 2005

Country		Application	1						Report No.
Region	Crop					Portion	PHI	Residues	Trial No.
Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Reference
France, South	Apricot	0.06	1492	0.84	2	Flesh	< 0	< 0.002 ^a	GHE-P-10996
Moissac	Hargrand		1496				0	1.2	CEMS-2295B
2004							5	0.06	Rawle, 2005
							10	0.03	
							14	< 0.01	
							21	< 0.01	
						Fruit, whole	< 0	$< 0.002^{a}$	
							0	1.02	
							5	0.05	
							10	0.03	
							14	< 0.01	
							21	< 0.01	
France, South	Apricot	0.06	1499–	0.85	2	Flesh	70	< 0.002 ^a	GHE-P-10996
Montauban	Florilege		1597	0.84		Fruit, whole	70	< 0.002 ^a	CEMS-2295C
2004					2	Flesh	56	< 0.002ª	Rawle, 2005
					-	Fruit, whole	56	< 0.002ª	
					2	Flesh	41	< 0.002ª	
						Fruit, whole	41	< 0.002"	
					2	Flesh	28	< 0.01	
					-	Fruit, whole	28	< 0.01	
France-South	Apricot	0.07	1258	0.88	2	Flesh	< 0	< 0.01	GHE-P-11216
Rhone-Alpes	Bergeron /		1247				0	2.4	686932D
2005	гз 240						5	0.17	Old, 2006
							10	0.03	
							14	0.02	
						F '4 1 1	21	< 0.01	
						Fruit, whole	< 0	< 0.01	
							0	2.0	
							5	0.13	
							10	0.02	
							14	0.02	
Energy Carrela	Desshar	0.07	1250	0.00	2	Ell-	21	< 0.01	CHE D 11220
Prance-South	Peacnes Dich Lody	0.07	1239	0.88	Z	Flesh Emit whole	21	< 0.01	GHE-P-11220
2005	Kich Lauy		1232	0.80		Fiult, whole	21	< 0.01	080974A
Erance South	Desches	0.07	1263	0.88	2	Flesh	< 0	$< 0.003^{a}$	CHE P 11220
Phone Albes	Sanguine	0.07	1203	0.88	2	riesh	0	< 0.003 3 0	686074D
2005	Maguard		12.54				5	0.35	Old 2006
2005	magaara						10	0.14	010, 2000
							14	0.02	
							21	0.01	
						Fruit, whole	< 0	$< 0.003^{a}$	
							0	3.8	
							5	0.42	
							10	0.16	
							14	0.02	
							21	0.01	
France-South	Apricots	0.07	1510	1.1	2	Flesh	< 0	< 0.003 ^a	GHE-P-11528
Rhone Alpes,	Bergenow		1504				0	2.2	690163A
69700							5	0.09	Livingstone,
2006							10	0.02	2008
							15	< 0.01	
						Fruit, whole	20	< 0.003 ^a	
							< 0	< 0.003 ^a	
							0	1.8	
							5	0.08	
							10	0.02	

Region Crop Year Variety Kg ai/hL L/La Kg ai/hL No. Analysed (Mos) (Mo	Country		Applicatio	on						Report No.
Year Variety kg ai/hL L/ha kg ai/hL No. Analysed (days) (mg/K2) Reference	Region	Crop					Portion	PHI	Residues	Trial No.
France-South Rhone-Alpes Sanguine 2006 Peaches Magnard 0.07 1501 1516 1.1 2 Fielsh France-South France-South Rhone-Alpes 0.003 ⁺⁺ (0) 0042 ⁺⁺ (0) 0.02 (0.02) 12008 ⁺⁺ (0) France-South Rhone-Alpes Peaches Augnard 0.07 1501 1.1 2 Fielsh Frait, whole 0 0.003 ⁺⁺ (0) 0.24 13/mgstone, 12<	Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Reference
Prance-South Rhone-Alpes Sanguine 2006 Peaches Magnard 0.07 1516 1.1 2 Flesh 0 0.003 ⁺ GHIE-P-11528 GHIE-P-11528 2006 Magnard 0.07 1516 1.1 2 Flesh 0 0.003 ⁺ GHIE-P-11528 2006 Magnard 0.07 1501 1.1 2 Flesh 0 0 0.024 Livingstone, 10 0.02 2008 2006 0.07 1503 1.1 2 Flesh 0 0 0.75 6 0.001 22 2008 France-South Rhone-Alpes Peaches 0.07 1529 1.1 2 Flesh 0 0 0.20 2008 2008 Stolopoulos Red Gold 0.09 1500 1.35 1 Fruit, whole 0 2.0 GHE-P-11528 Mikolopoulos Red Gold 0.07 1250 0.84 2 Flesh 0 2.0 GHE-P-1029 1992 0.05 0.07 <								15	< 0.01	
France-South 2006 Sanguine Magnard 0.07 150 1.1 2 Flesh < 0 < 0.003 ⁺ GHE-P-11528 600.04 2006 Magnard 1516 1.516 1.516 1.516 0.07 100 0.02 2008 600163C 2006 15 < 0.01								20	< 0.003 ^a	
Rhone-Appes 2006 Sanguine Magnard I 516 I 516 II 516	France-South	Peaches	0.07	1501	1.1	2	Flesh	< 0	< 0.003 ^a	GHE-P-11528
Magnard Magnard <t< td=""><td>Rhone-Alpes</td><td>Sanguine</td><td></td><td>1516</td><td></td><td></td><td></td><td>0</td><td>0.96</td><td>690163C</td></t<>	Rhone-Alpes	Sanguine		1516				0	0.96	690163C
France-South Rhone-Alpes Peaches 0.07 1500 1.1 2 Flesh 0 0.01 60003 France-South Rhone-Alpes Peaches 0.07 1503 1.1 2 Flesh 0 1.1 6001 Greece Peach 0.09 1500 1.35 1 Fruit, whole 0 0 0.01 60003 ⁺ 1992 150 0.07 1503 1.1 2 Flesh 0 1.1 60163F Greece Peach 0.09 1500 1.35 1 Fruit, whole 0 0.1 GHE-P-1120 Greece Apricot 0.07 1250 0.84 2 Flesh 0 0.01 GHE-P-11216 192 0.07 1250 0.84 2 Flesh 0 0.02 GHE-P-11216 193 0.07 1250 0.84 2 Flesh 0 0.03 0 0.04 2006 0.01 21 0.01 2	2006	Magnard						6	0.24	Livingstone,
France-South Rhone-Alpes Peaches 0.07 1503 1.1 2 Flesh 0 0.07 France-South Rhone-Alpes Peaches 0.07 1503 1.1 2 Flesh 0 1.1 GPE2-P-11528 2006 1.0rrie 0.07 1503 1.1 2 Flesh 0 0.97 6 0.97 6 0.97 1.0 690163F 2006 Lorrie 0.09 1500 1.35 1 Fruit, whole 0 9.9 0.42 R92-24 1992 1992 0.07 1200 1.35 1 Fruit, whole 0 2.0 GHE-P-10828 1992 Red Gold 0.07 1200 1.35 1 Fruit, whole 0 2.0 0.02 Laurie 1993 Greece Apricot 0.07 1250 0.84 2 Flesh <0								10	0.02	2008
France-South Rhone-Alpes Peaches Lorrie 0.07 1503 1.1 2 Flesh 0 0.1 6003 ³⁴ 2006 Lorrie 0.07 1503 1.1 2 Flesh 0 1.1 60101 21 < 0.01								15	< 0.01	
France-South Rhome-Alpes Peaches Lorrice 0.07 1503 1.1 2 Flesh 0 1.1 GHE-P-11528 Stold of the second state Lorrice 0.07 1503 1.1 2 Flesh 0 1.1 GHE-P-11528 2006 Lorrice 0.07 1503 1.2 2 Flesh 0 1.1 GHE-P-10528 2006 Lorrice 0.09 1500 1.35 1 Fruit, whole 0 0.97 2008 Greece Peach Red Gold 0.09 1500 1.35 1 Fruit, whole 0 0.02 GHE-P-3089 1992 0.17 Khoshab and 29 0.02 Laurie 1993 2 0.01 Easter 1993 2 0.01 Easter 1993 2 0.01 Easter 1993 2 0.02 Easter 1993 2 0.01 Easter 1993 2 0.01 Easter 1993 2 0.01 2 2 4 689372 5 0.32 01d, 2006							Emit whole	21	< 0.01	
France-South Rhone-Alpes Peaches Lorrie 0.07 1503 1529 1.1 2 Flesh Fruit, whole 0 1.1 GHE-P-11528 (001) 2006 Lorrie 0.07 1503 1.1 2 Flesh 0 1.1 GHE-P-11528 (001) 2006 Lorrie 0.09 1500 1.35 1 Fruit, whole 0 0.07 2008 Greece Peach 0.09 1500 1.35 1 Fruit, whole 0 0.097 2008 1992 Occeance Apricot 0.07 1250 0.84 2 Flesh 0 0.42 R92-24 Halkidiki Bebeko 0.07 1250 0.84 2 Flesh 0 2.00 GHE-P-11216 Greece Apricot 0.07 1250 0.84 2 Flesh 0 2.00 6465932C 2005 0 0.06 14 0.01 21 <0.01							Fiult, whole		< 0.003	
France-South Rhone-Alpes Peaches Lorrie 0.07 1503 1529 1.1 2 Flesh Fruit, whole 0 1.1 Fruit, whole GHE-P-11528 (7) GHE-P-11993 (7) GHE-P-11993 (7) GHE-P-11993 (7) GHE-P-11993 (7) GHE-P-11916 (7) GHE-P-11916 (7) GHE-P-11916 (7) GHE-P-11916 (7) GHE-P-11916 (7) GHE-P-11916 (7) GHE-P-11916 (7) GHE-P-11916 (7) GHE-P-11916 (7) GHE-P-11216 (7)								6	0.75	
France-South Rhone-Alpes 2006 Peaches Lorrie 0.07 1503 1529 1.1 2 Flesh 0 1.1 690163F 22 6001 2006 Lorrie 0.09 1500 1.35 1 Flesh 0 0 11 690163F 22 0.01 Livingstone, 690163F 2006 Peaches 0.09 1500 1.35 1 Fruit, whole 0 0.07 2008 Greece Peach 0.09 1500 1.35 1 Fruit, whole 0 2.0 GHE-P-3089 1992 Peach 0.07 1250 0.84 2 Flesh 0 2.4 686932C 2005 Bebeko 0.07 1250 0.84 2 Flesh 0 2.003* GHE-P-11216 Halkidiki Bebeko 0.07 1250 0.84 2 Flesh 0 2.003* GHE-P-1096 0 2.003* GHE-P-1004 1 0.01 21 <0.01								10	0.20	
France-South France-South Rhome-Alpes Peaches Lorrie 0.07 1503 1529 1.1 2 1.1 Flesh Peaches Fruit, whole 0 1.1 GHE-P-11528 (0) OOI Poilos Pruit, whole 0 0.01 EME-P-11528 Pruit, whole 0.00 OOI Pruit, whole 0 22 <0.01 Livingstone, Pruit, whole Greece Peach Red Gold 0.09 1500 1.35 1 Fruit, whole 0 20 GHE-P-3089 1992 O Apricot 0.07 1250 0.84 2 Flesh 0 2.0 GHE-P-11216 Greece Apricot 0.07 1250 0.84 2 Flesh 0 0.002 Laurie 1993 2005 O Apricot 0.07 1250 0.84 2 Flesh 0 0.002 66932C 2005 O 2.0 5 0.32 OId, 2006 14 0.01 21 <0.01								15	< 0.01	
France-South Rhone-Alpes Peaches 0.07 1503 1.1 2 Flesh 0 1.1 GHE-P-11528 2006 Lorrie 1529 1.1 2 Flesh 17 0.01 690163F 2006 Peach 0.09 1500 1.35 1 Fruit, whole 0 2.0 GHE-P-3089 Nikolopoulos Red Gold 0.09 1500 1.35 1 Fruit, whole 0 2.0 GHE-P-3089 9 0.42 R92-24 R92-24 R92-24 R92-24 R92-24 R92-24 R92-24 R92-24 R92-24 R93 0.01 Laurie 1993 39 0.01 Laurie 1993 39 0.01 Laurie 1993 39 0.01 Laurie 1993 39 0.01 Laurie 1993 32 0.01 Laurie 1993								21	< 0.01	
Rhone-Alpes 2006 Lorrie Inverse Image: Section of the	France-South	Peaches	0.07	1503	1.1	2	Flesh	0	1.1	GHE-P-11528
2006 Intra Intra< Intra Intra< Intra Intra< Intra< Intra Intra< Intra Intra< Intra Intra Intra< Intra Intra <thintra< th=""> <thintra< th=""> <thintra<< td=""><td>Rhone-Alpes</td><td>Lorrie</td><td>0.07</td><td>1529</td><td></td><td>Ĩ.</td><td>1 10511</td><td>17</td><td>0.01</td><td>690163F</td></thintra<<></thintra<></thintra<>	Rhone-Alpes	Lorrie	0.07	1529		Ĩ.	1 10511	17	0.01	690163F
Greece Nikolopoulos Peach Red Gold 0.09 1500 1.35 1 Fruit, whole Pruit, whole 0 0.07 2008 Greece 1992 Peach Nikolopoulos 0.09 1500 1.35 1 Fruit, whole 0 2.0 GHE-P-3089 1992 0.02 Laurie 1993 9 0.42 R2-24 19 0.17 Khoshab and 29 0.02 Laurie 1993 39 <0.01	2006	201110		102)				22	< 0.01	Livingstone.
Greece Nikolopoulos Peach Red Gold 0.09 1500 1.35 1 Fruit, whole Point 0 2.0 GHE-P-3089 Point 1992 Red Gold 0.9 1500 1.35 1 Fruit, whole Point 0 0.42 R92-24 1992 0.07 1250 0.84 2 Flesh <0							Fruit, whole	0	0.97	2008
Greece 1992 Peach Red Gold 0.09 1500 1.35 1 Fruit, whole Nikolopoulos 0 2.0 GHE-P-3089 Pol-24 1992 0.01 Khoshab and 29 0.02 1.35 1 Fruit, whole Pol-24 0 0.42 R92-24 1992 0.02 0.01 Khoshab and 29 0.02 Laurie 1993 Greece Apricot Halkidiki 0.07 1250 0.84 2 Flesh <0							,	17	0.01	
Greece Nikolopoulos Peach Red Gold 0.09 1500 1.35 1 Fruit, whole Pruit, whole Pruit, whole 0 2.0 GHE-P-3089 R92-24 1992 0.17 Khoshab and 29 0.02 Laurie 1993 39 < 0.01								22	< 0.01	
Nikolopoulos Red Gold Red Gold Participant Paritipant Paritipant	Greece	Peach	0.09	1500	1.35	1	Fruit, whole	0	2.0	GHE-P-3089
1992 Apricot Halkidiki 0.07 1250 0.84 2 Flesh <0 <0.03 GHE-P-11216 Greece Halkidiki Bebeko 0.07 1250 0.84 2 Flesh <0	Nikolopoulos	Red Gold						9	0.42	R92-24
Greece Halkidiki 2005 Apricot Bebeko 0.07 1250 0.84 2 Flesh < 0 < 0.03 ^a GHE-P-11216 GME-P-11216 1alkidiki 2005 Bebeko 0.07 1250 0.84 2 Flesh < 0	1992							19	0.17	Khoshab and
Greece Halkidiki 2005 Apricot Bebeko 0.07 1250 0.84 2 Flesh <0 <0.003* GHE-P-11216 14lkidiki 2005 Bebeko 0.71 1250 0.84 2 Flesh <0								29	0.02	Laurie 1993
Greece Halkidiki 2005 Apricot Bebeko 0.07 1250 0.84 2 Flesh <0 <0.003* GHE-P-11216 2005 Bebeko 0.07 1250 0.84 2 Flesh <0								39	< 0.01	
Halkidiki 2005 Bebeko Image: solution of the solution	Greece	Apricot	0.07	1250	0.84	2	Flesh	< 0	< 0.003 ^a	GHE-P-11216
2005 5 0.32 Old, 2006 10 0.06 14 0.01 21 <0.01	Halkidiki	Bebeko						0	2.4	686932C
Greece Apricot (0.07) 1250 0.84 2 Flesh <0	2005							5	0.32	Old, 2006
Greece Peaches 0.068 1500 1.0 1 Fruit, whole 14 0.01 21 <0.01								10	0.06	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								14	0.01	
Apricot (0.07) 1250 0.84 2 Flesh <0								21	< 0.01	
Greece Apricot (0.07) 1250 0.84 2 Flesh <0							Fruit, whole	< 0	< 0.003 ^a	
Greece Portaria, Halkidiki Apricot Omega (0.07) 1250 1250 0.84 2 Flesh <0 3.6 0 CEMS-2295A 100 0.19 1250 0.84 2 Flesh <0								0	2.0	
Greece Apricot (0.07) 1250 0.84 2 Flesh <0 <0.01 21 < 0.01								5	0.28	
Greece Apricot (0.07) 1250 0.84 2 Flesh <0 <0.01 GHE-P-10996 GHE-P-10996 GHE-P-10996 CEMS-2295A Rawle, 2005 0 3.6 CEMS-2295A Rawle, 2005 10 0.19 14 0.04 21 <0.01 GHE-P-10996 CEMS-2295A Rawle, 2005 10 0.19 14 0.04 21 <0.01 CEMS-2295A Rawle, 2005 10 0.19 14 0.04 21 <0.01 CEMS-295A Rawle, 2005 10 0.19 14 0.04 21 <0.01 CEMS-295A Rawle, 2005 10 0.19 14 0.04 21 <0.01 11 14 0.04 21 <0.01 11 15 0.77 10 0.17 10 0.17 14 0.04 21 <0.01 CEMS-3491C 2007 2001 CEMS-3491C 2007 2003 GHE-P-11797 2008 2003 GHE-P-11797 2008 2003 2003 2003 2003 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>10</td><td>0.06</td><td></td></t<>								10	0.06	
Greece Apricot (0.07) 1250 0.84 2 Flesh < 0 < 0.01 GHE-P-10996 2004 Bebeko 1250 1250 0.84 2 Flesh < 0								14	0.01	
Greece Apricot (0.07) 1250 0.84 2 Flesh < 0 < 0.01 GHE-P-10996 CEMS-2295A Portaria, Halkidiki Bebeko 1250 1250 1250 1250 0.84 2 Flesh < 0	a		(0.07)	1250	0.04			21	< 0.01	GUE D 10006
Portaria, Halkidiki Bebeko 1250 1250 0 3.6 CEMS-2295A Halkidiki 2004 5 0.9 Rawle, 2005 2004 - - - - - - - Rawle, 2005 2004 -	Greece	Apricot	(0.07)	1250	0.84	2	Flesh	< 0	< 0.01	GHE-P-10996
Praikitiki Peaches 0.068 1500 1.0 1 Flesh 14 0.01 Greece Peaches 0.068 1500 1.0 1 Flesh 14 0.01 2007 Peaches 0.068 1500 1.0 1 Flesh 14 0.01 2007 Peaches 0.068 1500 1.0 1 Flesh 14 0.01 2007 Peaches 0.068 1500 1.0 1 Flesh 14 <0.01	Portaria,	Bebeko		1250				0	3.6	CEMS-2295A
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2004							5	0.9	Rawle, 2005
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2004							10	0.19	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $								14	0.04	
Greece Peaches 0.068 1500 1.0 1 Flesh 14 < 0.01 GHE-P-11797 10 0.17 14 0.04 21 < 0.01							Fruit whole	$\frac{21}{20}$	< 0.01	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							Fiult, whole	0	3 1	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								5	0.77	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								10	0.17	
Greece Peaches 0.068 1500 1.0 1 Flesh 14 < 0.01 GHE-P-11797 Imathia Red Gold 0.068 1500 1.0 1 Flesh 14 < 0.01						1		14	0.04	
Greece Imathia 2007Peaches Red Gold0.06815001.01Flesh Fruit, whole14< 0.01GHE-P-11797 CEMS-3491C Devine, 2008Greece Halkidiki 2007Apricots Bebeko0.06815001.01Flesh Fruit, whole15< 0.003^a								21	< 0.01	
Imathia 2007Red GoldImathia CEMS-3491C2007Apricots0.06815001.01Fruit, whole14<0.01	Greece	Peaches	0.068	1500	1.0	1	Flesh	14	< 0.01	GHE-P-11797
2007 Apricots 0.068 1500 1.0 1 Flesh 15 < 0.003 ^a GHE-P-11797 Halkidiki Bebeko Bebeko Image: State of the	Imathia	Red Gold	0.000	1000	1.0	ľ	Fruit. whole	14	< 0.01	CEMS-3491C
Greece Halkidiki 2007Apricots Bebeko 0.068 1500 1.0 1 Flesh Fruit, whole 15 $< 0.003^{a}$ GHE-P-11797 CEMS-3491A Devine, 2008	2007					1	.,			Devine, 2008
Halkidiki 2007BebekoFruit, whole15< 0.003aCEMS-3491A Devine, 2008	Greece	Apricots	0.068	1500	1.0	1	Flesh	15	< 0.003 ^a	GHE-P-11797
2007 Devine, 2008	Halkidiki	Bebeko				1	Fruit, whole	15	< 0.003 ^a	CEMS-3491A
	2007					1				Devine, 2008

Country		Application	1	-					Report No.
Region	Crop					Portion	PHI	Residues	Trial No.
Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Reference
Italy	Peaches	0.09	1500	1.35	1	Flesh	0	1.8	GHE-P-3120
Francolino	Flavor Crest						9	0.68	R92-23A
1992							20	0.18	Khoshab and
							30	0.01	Laurie, 1993
							40	< 0.01	
						Fruit, whole	0	1.39	
							9	0.52	
							20	0.15	
							30 40	< 0.01	
Italy	Peaches	0.09	1500	1 35	1	Flesh	0	20	GHF-P-3120
Buttanietra	Red Haven	0.07	1500	1.55	1	1 10311	10	0.55	R92-23B
1992							20	0.18	Khoshab and
							30	0.03	Laurie, 1993
							42	< 0.01	
						Fruit, whole	0	1.5	
							10	0.42	
							20	0.14	
							30	0.02	
							42	< 0.01	
Italy	Peaches	0.09	1500	1.35	1	Flesh	15	0.02	GHE-P-3722
Viterbo	Spring Rest					Fruit, whole	15	0.02	R93-15A
1993									Khoshab and
									Berryman,
T 1	D 1	0.00	1.467	1.00	1		1.7	0.04 (2)	1994
Italy	Peaches	0.09	1467	1.32	1	Flesh	15	0.04(2),	GHE-P-3722
Ferrara.	Flavor Crest					Emile substa	15	0.00, 0.09	K93-15B Khashah and
1995						Fruit, whole	15	0.04(2), 0.06(0.08)	Kilosilad allu Berryman
								0.000, 0.000	1994
Italy	Peaches	0.09	1458	1.31	1	Flesh	15	0.03, 0.05,	GHE-P-3722
Ferrara	M3							0.06, 0.07	R93-15C
1993						Fruit, whole	15	0.03, 0.05,	Khoshab and
								0.06, 0.07	Berryman,
									1994
Italy	Peaches	0.09	1532	1.38	1	Flesh	15	0.04 (2),	GHE-P-3722
Ferrara	Red Haven							0.05, 0.06,	R93-15D
1993						Fruit, whole	15	0.04(2),	Khoshab and
								0.03, 0.00,	Berryman,
Italy	Danchas	(0.06)	1457	0.82	2	Flech	< 0	$< 0.002^{a}$	CHE D 10002
Rologna	Flegant Lady	(0.00)	1402	0.02	2	1 10311	0	0.58	CFMS-2291A
2004	Elegant Eddy		1102	0.75			5	0.20	Rawle, 2005
							10	0.03	1
							14	0.01	
							21	< 0.01	
						Fruit, whole	< 0	< 0.002 ^a	
							0	0.49	
							5	0.17	
							10	0.03	
							14	0.01	
							21	< 0.01	
Italy	Peaches	0.07	1238	0.87	2	Flesh	< 0	< 0.003 ^a	GHE-P-11220
Emilia	Royal Glory		1301	0.91			0	1.2	686974C
Romagna							5	0.25	Old, 2006
2005							10	0.14	
							15	0.01	
							21	0.01	

Country		Applicatio	n						Report No.
Region	Crop					Portion	PHI	Residues	Trial No.
Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Reference
						Fruit, whole	< 0	< 0.003 ^a	
							0	1.0	
							5	0.23	
							10	0.13	
							15	0.01	
							21	0.01	
Italy	Apricots	0.07	1534	11	2	Flesh	0	0.89	GHE-P-11528
Piemonte	Bulida	0.07	1489		-	1 10011	15	< 0.01	690163B
2006	Dunua		1.05				22	$< 0.003^{a}$	Livingstone.
						Fruit, whole	0	0.79	2008
						,	15	< 0.01	
							22	< 0.003 ^a	
Italy	Peaches	0.07	1453	1.0	2	Flesh	0	0.96	GHE-P-11528
Piemonte	Duchessa	0.07	1478	1.0	Ĩ.	1 10511	16	0.02	690163D
2006	d'Este		11/0				22	< 0.01	Livingstone
2000						Fruit whole	0	0.81	2008
						11410, 111010	16	0.02	
							22	< 0.02	
Italy	Peaches	0.068	1468	0.99	1	Flesh	0	0.71	GHF-P-11797
Ferrara	Cresthaven	0.000	1400	0.77	1	1 10311	5	0.71	CFMS-3491D
2007	Crestilaven						9	0.22	Devine 2008
2007							15	0.07	Residues in
						Fruit whole	0	0.65	controls < 0.01
						Fruit, whole	5	0.05	to 0.2
							0	0.21	
							9	0.07	
Spain	Daaabaa	0.00	1500	1.25	1	Elash	0	0.02	CHE D 2000
Spain	Peaches	0.09	1500	1.55	1	Flesh	0	4.1	UHE-P-3088
Sevilla	Maycrest						/	0.89	K92-22
1992							14	0.26	Knosnad and
							20	0.04	Laurie, 1992
						Emile and also	20	0.01	
						Fruit, whole	0	3.8 0.72	
							/	0.73	
							14	0.23	
							20	0.04	
a :	D 1	(0.00)	1550	0.00	0	F 1 1	28	< 0.01	CHE D 10002
Spain	Peaches	(0.06)	1558	0.88	2	Fruit, whole	20	0.03	GHE-P-10992
Calatorao,	Catherine		1558			Fruit, whole,	20	< 0.002	CEMS-2291E
2004						individual		(2), < 0.01	Rawle, 2005
								(4), 0.01 (4), 0.02 0.04	
Sacia	Amricat	0.06	1.420	0.91	2	Elash	21	0.02, 0.04	CHE D 10006
Spann	Apricot	0.00	1458	0.81	Z	Flesii Emit whole	21	< 0.002	CEMS 2205E
	raviot		1400	0.04		Fiult, whole	21	< 0.002	CENIS-2293E
2004	A	0.06	1520	0.92	2	T211-	20	< 0.002 ^a	CHE D 10006
Spain	Apricot	0.06	1529	0.82	3	Flesh	20	$< 0.002^{\circ}$	GHE-P-10996
	Paviot		1405	0.84		Flesh,	20	< 0.002	CEM5-2295F
2004			1400	0.80		Fruit whole	20	(12)	Rawle, 2005
						Fruit, whole	20	< 0.002ª	
						individual	20	< 0.002	
				1		indi vidual		(11)	
								< 0.01	
Spain	Apricot	0.07	1251	0.88	2	Flesh	20	< 0.01	GHF_P_11216
Catalunya	Cow / FS	0.07	1231	0.00	2	Fruit whole	20	< 0.01	686937R
2005	240		1279	1			20	\$ 0.01	Old 2006
2005		1	1	1	1	1	1	1	510, 2000

Country		Application	1						Report No.
Region	Crop					Portion	PHI	Residues	Trial No.
Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Reference
Spain	Peaches	0.07	1253	0.87	2	Flesh	21	0.02	GHE-P-11220
Catalunya	Escola		1244			Fruit, whole	21	0.02	686974B
2005									Old, 2006
Spain	Peaches	0.07	1502	1.1	2	Flesh	< 0	< 0.01	GHE-P-11528
Andalucia,	Maycrest		1499				0	1.4	690163E
2006							5	0.56	Livingstone,
							10	0.12	2008
							15	0.02	
							20	< 0.01	
						Fruit, whole	15	0.02	
							20	< 0.01	
Spain	Apricots	0.068	1475	1.0	1	Flesh	0	0.23	GHE-P-11797
Valencia	Tadeo						5	0.06	CEMS-3491B
2007							11	< 0.01	Devine, 2008
							15	< 0.003 ^a	
						Fruit, whole	0	0.19	
							5	0.06	
							11	< 0.01	
							15	< 0.003 ^a	

Cherries

A total of 11 trials conducted in Northern and Central Europe during 2006–2007 were submitted. The results of the supervised trials are shown in Table 40.

Table 40 Results	of supervised	trials conducted	with chlorpyrifos	methyl in cherries
	1		1.2	-

Country	Variety	Applicat	ion			Portion	PHI	Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
Year									Author(s)
Austria	Sweet		642	0.64	1	Flesh	21	< 0.003 ^a	GHE-P-11798
Oberosterreich	Regina					Fruit, whole	21	< 0.003 ^a	CEMS-3492D
2007									Marshall, 2008
Austria	Sour		656	0.66	1	Flesh	21	< 0.003 ^a	GHE-P-11798
Oberosterreich	Gerema					Fruit, whole	21	< 0.003 ^a	CEMS-3492H
2007									Marshall, 2008
Germany	Sour		599	0.6	1	Flesh	21	< 0.003 ^a	GHE-P-11798
Brandenburg	Vowi					Fruit, whole	21	< 0.003 ^a	CEMS-3492E
2007									Marshall, 2008
Germany	Sweet Cherry		629	0.63	1	Flesh	21	< 0.003a	GHE-P-11798
Brandenburg	Kordia					Fruit, whole	21	< 0.003 ^a	CEMS-3492A
2007									Marshall, 2008
Hungary	Sweet	0.10	587	0.62	2	Flesh	< 0	< 0.01	GHE-P-11529
Szekesfehervar-	Katalin		572	0.61			0	1.0	690179A
Csala,							7	0.04	Livingstone,
2006							14	0.01	2008
							21	< 0.003 ^a	
							28	< 0.003 ^a	
						Fruit, whole	< 0	< 0.01	
							0	0.45	
							7	0.03	
							14	< 0.01	
							21	< 0.003 ^a	
							28	< 0.003 ^a	

Country	Variety	Applicati	ion			Portion	PHI	Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
Year		C		C					Author(s)
Hungary	Sour	0.10	617	0.65	2	Flesh	< 0	0.14	GHE-P-11529
Szekesfehervar-	Ciganymeggy		583	0.62			0	9.2	690179C
Csala,	ergan jineggj		000	0.02			7	0.08	Livingstone.
2006							14	0.02	2008
							21	< 0.01	
							28	< 0.01	
						Fruit whole	< 0	0.03	
						i fuit, whole	0	24	
							7	0.03	
							14	< 0.05	
							21	< 0.01	
							21	< 0.01	
Hungary	Sweet		576	0.58	1	Flech	20	3 00	CHE D 11708
Faiar	Valentine		570	0.58	1	110511	5	0.03	CFMS-3492C
2007	valentine						J 10	0.03	Marshall 2008
2007							10	< 0.01	101ar5flaff, 2000
							21	$< 0.003^{a}$	
						Emit whole	0	< 0.003	
						Fruit, whole	5	2.2	
							10	0.03	
							10	< 0.01	
							15	< 0.003	
D 1 1	0	0.10	(10	0.65	2		21	< 0.003	CHE D 11520
Poland	Sour	0.10	610	0.65	2	Flesh	0	0.74	GHE-P-11529
(Central Poland)	Lutowka		611				22	< 0.003	6901/9D
2006						F 1 1	29	< 0.003	Livingstone,
						Fruit, whole	0	0.31	2008
							22	< 0.003	
	a a1			0.40			29	< 0.003	
Poland	Sweet Cherry		302	0.18	1	Flesh	0	0.96	GHE-P-11798
Wielkopolska	Schneidera						5	0.09	CEMS-3492B
2007	Pozna						10	< 0.01	Marshall, 2008
							15	< 0.003"	
							21	< 0.003 ^a	
						Fruit, whole	0	0.8	
							5	0.08	
							10	< 0.01	
							15	< 0.003 ^a	
							21	< 0.003ª	
Poland	Sour		475	0.44	1	Flesh	0	1.0	GHE-P-11798
Wielkopolska	Lutowka						5	0.03	CEMS-3492F
2007							10	< 0.003 ^a	Marshall, 2008
							14	< 0.003 ^a	
							21	< 0.003ª	
						Fruit, whole	0	0.79	
							5	0.03	
							10	< 0.003ª	
							14	< 0.003 ^a	
							21	< 0.003 ^a	
						Juice	21	< 0.003 ^a	
						Fruit, canned	21	< 0.003 ^a	
Poland	Sour		425	0.29	1	Flesh	0	0.75	GHE-P-11798
Wielkopolska	Lutowka						5	0.03	CEMS-3492I
2007							10	< 0.003 ^a	Marshall, 2008
							14	< 0.003 ^a	
							21	< 0.01	
						Fruit, whole	0	0.57	
							5	0.02	

Country	Variety	Application			Portion	PHI	Residues	Report No.	
Region		kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
Year									Author(s)
							10	< 0.003 ^a	
							14	< 0.003 ^a	
							21	< 0.01	

Grapes

A total of 63 trials conducted in Northern and Southern Europe during 1998–2007 were submitted. The results of the supervised trials are shown in Table 41.

Table 41 Results of supervised trials conducted with chlorpyrifos methy	1 in gr	apes
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Country		Applic	ation					Report No.
Region,	Crop	kg				PHI	Residues	Trial No.
Year	Variety	ai/hL	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Reference
Austria	Red table	0.068	955	0.64	2	< 0	< 0.003a	GHE-P-11538
Gross	Nelly		1023	0.69		0	0.34	690273D
2006						5	0.04	Livingstone, 2008
						10	0.03	_
						14	0.03	
						21	0.03	
Austria	White wine	0.07	1034	0.7	2	< 0	< 0.003a	GHE-P-11538
Gemeinlebarn.	Gruner		933	0.63		0	0.89	690273A
2006	Veltliner					5	0.25	Livingstone, 2008
						10	0.06	8
						15	0.07	
						21	0.02	
Austria Oberosterreich	White wine Chardonnay		519 511	0.35	2	21	< 0.01	GHE-P-11803 CEMS- 3497C
2007								Devine, 2008
Chile	Red Table	0.065	2000	1.3	2	0	6.8	GHB-P-421
VI Region	Red Globe		2000			18	< 0.01	LARP G023
1998						38	< 0.001	Amaral et al, 1999
						58	< 0.001	
						86	< 0.001	
France-North	Wine, COT		190	0.45	1	0	0.90	GHE-P-4944
Amboise						7	0.25	R95-003A
1995						14	0.04	Teasdale, 1996
						22	0.04	
						28	0.04	
France, Southern	Wine, Negrete		182	0.45	1	0	0.22	GHE-P-4944
Fronton	_					7	0.07	R95-003B
1995						14	0.01	
						21	< 0.01	
						27	< 0.01	
France-North	White Wine		200	0.68	2	< 0	< 0.01	GHE-P-8650
Indre et Loire	Chenin/504					0	0.69	R99-095
1999	Clone 624					7	0.12	Doran and Craig, 2001
						14	0.06	
						21	0.05	
						28	0.02	
France-North	White Wine		216	0.68	2	28	0.02	GHE-P-8651
Indre et Loire, 1999	Riparia Gloire							R99-096A
	* ··· ·· · · ··· ·							Doran and Craig, 2001

Country		Applica	ation					Report No.
Region,	Crop	kg				PHI	Residues	Trial No.
Year	Variety	ai/hL	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Reference
France-South	White Table	0.075	956	0.72	2	< 0	< 0.002a	GHE-P-8654
Tarn-et-Garonne	Chasselas		880	0.66		0	4.6	R99-099
1999						7	0.20	Doran and Craig, 2001
						14	< 0.01	
						21	< 0.01	
						28	< 0.002a	
France-South	Red Wine		760	0.72	2	28	0.01	GHE-P-8655
Tarn-et-Garonne.	Grape		944	0.655				R99-100
1999	Syrah			-				Doran and Craig, 2001
France	White Wine		800	0.7	2	21	0.06, 0.08	GHE-P-9437
Loire	Chenin							000219A
2000								Doran and Clements,
Franco	Dad Wina		800	0.7	r	22	0.04.0.06	2002 CHE D 0427
France Beaumont En Veron	Cabernet Franc		800	0.7	2	22	0.04, 0.00	000210B
	Cabernet Franc							Doran and Clements
2000								2002
France-South	Red Wine		507-	0.7	2	21	< 0.01 (2)	GHE-P-9441
Vincent de Paul	Cabernet		530					000221A
2000	Sauvignon							Doran and Clements,
								2002
France	White table	0.068	828	(0.56)	2	21	< 0.01	GHE-P-10999
Moissac, 2004	Chasselas		811					CEMS-2298C
								Rawle, 2005
France-South		0.068	806	(0.54)	2	21	0.11	GHE-P-11000
Labastide du Temple	Muscat		833					CEMS-2299C
2004								Rawle, 2005
France-North	White Wine		880	0.66	2	< 0	< 0.002a	GHE-P-11001
Montgueret	Chenin		1074	0.69		0	0.50	CEMS-2300B
2004						3	0.12	Rawle, 2006
						7	0.02	
						14	0.01	
France North	White Wine	(0.81)	836	0.67	r	21	< 0.01	CHE D 11001
Mauze-Thouarsais	Chenin	(0.01)	830	0.07	2	21	0.01	CFMS-2300C
2004	Chenn		0.50					Rawle 2006
France	Red Wine		803	0.54	2	21	< 0.01	GHF-P-11002
Bouloc	Gamay		810	0.51	2	21	< 0.01	CEMS-2301C
2004	Guinay		010					Rawle, 2006
France-South	White Wine	0.07	503	0.36	2	21	< 0.01	GHE-P-11227
Champagne Ardenne	Meunier		510					687061 A
2005								Old, 2006
France-North	White Wine	0.07	498	0.35	2	< 0	< 0.003a	GHE-P-11227
Champagne-Ardenne	Chardonnay		515	0.37		0	0.21	687061 C
2005						4	0.02	Old, 2006
						7	0.01	
						14	< 0.01	
						21	< 0.003a	
France-South	Red Wine	0.07	1164	0.82	2	21	< 0.01	GHE-P-11228
Rhone Alpes	Gamay		1219	0.86				687077A
2005								Old, 2006
France-South	Red Table	0.07	1252	0.88	2	21	0.02	GHE-P-11224
Cote d'Azur	Alphonse		1246					687035A
2005	Lavailee	0.07	10.1-	0.07			0.02	Old, 2006
France-South	White table	0.07	1243	0.87	2	21	0.02	GHE-P-11224
Cote d'Azur	Italia		1231	0.86				08/035C
2005			1					UIA, 2006

Country		Applica	tion	1				Report No.
Region,	Crop	kg				PHI	Residues	Trial No.
Year	Variety	ai/hL	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Reference
France-South	White table	0.07	1002	0.7	2	< 0	< 0.003a	GHE-P-11539
Cote d'Azur	Danlas		979			0	1.3	690289A
2006						6	0.1	Livingstone, 2008
						10	0.08	
						14	0.07	
T.	XX71 · · ·		501	0.04	-	21	0.01	CHE D 11002 CEN/G
France	White wine		521	0.36	2	21	0.03	GHE-P-11803 CEMS-
Alsace	Pinot Auxerrois		487	0.55				5497E Devine 2008
2007 France North	Pad wina		522	0.26	2	< 0	< 0.01	CHE D 11802
Alsoce	Reu whie Dinot Noir		505	0.30	2		0.22	CEMS 3407G
2007	I mot Non		505	0.54		7	0.22	Devine 2008
2007						14	0.03	Devine, 2000
						21	0.01	
France	White wine		478	0.33	2	21	< 0.003a	GHE-P-11803
Languedoc-	Maccabau		500	0.34				CEMS-3497J
Rousillon								Devine, 2008
2007								
Germany	White Wine	(0.08)	623	0.68	2	< 0	< 0.002a	GHE-P-8652
Baden-Wurttemberg	Reisling		768	0.63		0	0.5	R99-097
1999						7	0.09	Doran and Craig, 2001
						15	0.02	
						21	< 0.01	
-					-	29	< 0.01	
Germany	White Wine		577	0.63	2	30	0.01	GHE-P-8653
Baden-Wurttemberg	Muller-Thurgau		808	0.67				R99-098
1999 Commonia	White Wine	(0,08)	601	0.68	2	< 0	< 0.002a	CUE D 0420
Germany Badan Wurttambarg	Righting	(0.08)	001 722	0.68	Z	< 0	< 0.002a	GHE-P-9430
2000	Klesning		155	0.02		3	0.41	Doran and Clements
2000						7	0.41	2000
						14	0.23	
						21	0.12	
Germany	White Wine	(0.08)	550	0.62	2	< 0	< 0.002a	GHE-P-9430
Baden-Wurttemberg	Riesling		869	0.73		0	1.7	000220B
2000	_					3	0.44	Doran and Clements,
						6	0.29	2000
						13	0.19	
						20	0.14	
Germany	White Wine	(0.056)	809	0.68	2	< 0	< 0.002a	GHE-P-11001
Baden Wurtenberg	Schwarz-		1192	0.67		0	1.2	CEMS-2300A
2004	Riesling					3	0.16	Rawle, 2006
						7	0.06	
						14	0.06	
Cormony	White Wine		Q / 1	0.71	2	21	0.03	CHE D 11001
Baden Wurttemberg	RIESI ING		041 1100	0.71	2	21	0.22	CFMS-2300D
2004	KILSEING		1170	0.7				Rawle 2006
Germany	White Wine	0.04	911	0.33	2	20	0.02	GHE-P-11227
Baden-Wurttemburg	Riesling	0.02	1625	0.36	_			687061B
2005	Ũ		-					Old, 2006
Germany	White Wine	0.04	796	0.35	2	< 0	< 0.003a	GHE-P-11227
Baden-Wuttemberg	Muller-Thurgau	0.02	1577			0	0.24	687061 D
2005						3	0.06	Old, 2006
						7	0.02	
						14	< 0.01	
						21	< 0.01	

Country		Applica	tion					Report No.
Region,	Crop	kg				PHI	Residues	Trial No.
Year	Variety	ai/hL	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Reference
Germany	Red wine		545	0.37	2	< 0	< 0.003a	GHE-P-11803 CEMS-
Brandenburg	Dornfelder		535	0.36		0	0.67	3497D
2007						7	0.05	Devine, 2008
						14	0.01	
						20	< 0.01	
Germany	Red wine		469	0.32	2	20	0.02	GHE-P-11803
Baden-Wurtemberg	Schwarzriesling		491	0.33				CEMS-3497F
2007	- C							Devine, 2008
Germany	White wine		516	0.35	2	< 0	< 0.01	GHE-P-11803
Baden-Wurttemberg	Muller-Thurgau		503	0.34		0	0.36	CEMS-3497H
2007	_					8	0.09	Devine, 2008
						14	0.03	
						20	0.02	
Greece	White Wine		1000	0.68	2	< 0	< 0.002a	GHE-P-9446
Nea Plagia,	Grape					0	0.82	000222A
Halkidiki	Roditis					3	0.14	Doran and Clements,
2000						7	0.09	2002.
						14	0.01	
						21	0.03	
Greece	Red Wine	(0.07)	1000	0.68	2	< 0	< 0.002a	GHE-P-9446
Thessaloniki.	Muscat de					0	1.7	000222B
2000	Hamburg					3	0.39	Doran and Clements,
						7	0.16	2002
						14	0.07	
						21	0.05	
Greece	Red Wine		1000	0.68	2	21	< 0.002a	GHE-P-11002
Thessaloniki	Cabernet							CEMS-2301D
2004	Sauvignon							Rawle, 2006
Greece	Red Wine	0.07	1000	0.68	2	22	< 0.003a	GHE-P-11228
Thessaloniki	Merlot							697077B
2005								Old, 2006
Greece	Red wine		500	0.34	2	21	< 0.003a	GHE-P-11803
Thessaloniki	Cabernet		500					CEMS-3497I
2007	Sauvignon							Devine, 2008
Hungary	White wine	0.07	930	0.66	2	< 0	< 0.003a	GHE-P-11538
Csiribpuszta,	Zoldveltelini		1028	0.73		0	0.73	690273B
2006						5	0.21	Livingstone, 2008
						10	0.07	
						14	0.11	
						21	0.09	
Hungary	Red wine grape	0.07	913	0.65	2	0	1.4	GHE-P-11538
Pazmand,	Zweigelt		960	0.68		14	0.08	690273C
2006								Livingstone, 2008
Hungary	White wine		473	0.32	2	< 0	0.02	GHE-P-11803 CEMS-
Fejer	Ezerfurtu		465			0	0.58	3497A
2007						7	0.06	Devine, 2008
						14	0.02	
						21	0.01	
Italy, North	Grape		885	0.67	2	28	0.03	GHE-P-8657
Emilia-Romagna	Trebbiano		1029	0.7				R99-102A
1999								Doran and Craig, 2001
Italy	White Wine	0.028	1000	0.28	2	21	< 0.01 (2)	GHE-P-10487
Emilia Romagna	Malvasia							682854A
2003					1	ļ		Wardman, 2004
Italy	Red Wine	(0.069)	770	0.52	2	< 0	< 0.002a	GHE-P-11002
Castel san Pietro	Barbera		816	0.55		0	0.1	CEMS-2301B
2004						3	0.06	Rawle, 2006

Region, YaarCrop wirkl yairh yairh yaarI. Ina ky airhu ky airhu ky airhuNo.elevity ky airhu ky airhu ky airhu ky airhuNo.elevity ky airhu ky airhu ky airhuResidues ky airhu ky airhuTrial No.ReferenceItaly LoubbardiaRed Wine Barbora0.71271 1980.892200.001 21667077D 0.602005Barbora Provinci Dodda0.071035 9710.74200.38 210.16 200016 200016 2003016 2006016 2003017 1990.6021 21 21 210.003a017 1990.60 21 21 21 210.003a017 1990.60 21 21 21 21 2003017 21 21 2003018 21 21 2003018 21 21 21 2003018 21 21 21 21 2003019 21 21 21 2003016 21 21 2003017 21 21 2003017 21 21 2003018 21 21 21 2003018 21 21 21 21 21 21 21 21 21 21 21 21 21 21 21 210101 21 21 21 21 21 21 21 21 21 21 210101 21 21 21 21 21 21 21 21 210102 21 21 21 21 21 210112 21 21 21 21 21 210112 21 21 21 21 210112 21 21 21 21 21012 21 21 21 21 210112 21 21 21 21012 21 21 210112 21 21 21 21 <t< th=""><th>Country</th><th></th><th>Applica</th><th>tion</th><th></th><th></th><th></th><th></th><th>Report No.</th></t<>	Country		Applica	tion					Report No.
Year Variety a/hL Una kg ai/ha No. (edys) (mg/Kg) Reference Indy Rel Wine 0.07 1 1 1 0.02 0.02 Indy Rel Wine 0.07 121 0.01 21 0.01 0.16 0.12.006 Dubbardia Barbora 0.07 1035 0.74 2 0 0.38 GHE-P-11539 Lunibardia Red table 0.07 1035 0.74 2 0 0.038 GHE-P-11803 Bologan Sangiovese 0.07 1035 0.74 2 0 0.01 GEMS-3497L Doff Sangiovese 0.07 1035 0.340 21 <	Region,	Crop	kg				PHI	Residues	Trial No.
Indy Lombandia Red Wine Barbora 0.07 0.07 121 198 0.84 0.84 2 <0.0 0.26 0.003u GHE-P-11228 00.26 2005 Barbora 0.07 171 198 0.84 2 <0.0	Year	Variety	ai/hL	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Reference
Indy Lombardia Dobs Red Wine Barbora 0.07 1198 121 0.99 0.0 0.99 121 0.99 0.0 0.05 101 0.99 0.99 0.05 0.0 0.05 0.16 0.16 0.16 0.12 0.16 0.16 0.16 0.12 0.16 0.12 0.16 0.12 0.16 0.12 0.16 0.12 0.16 0.12 0.16 0.02 0.16 0.02 0.16 0.02 0.16 0.02 0.16 0.02 0.16 0.02 0.16 0.02 0.16 0.02 0.16 0.02 0.16 0.00							7	0.02	
Indy Lombardin 2005 Red Wine Barbora 0.7 1271 0.89 2 < 0 < 0.00 Coll 68707D 2005 Barbora 0.7 1198 0.84 0 0.26 68707D 2005 Barbora 0.7 105 0.74 2 0 0.38 GHE-P-11228 1taly Red table 0.07 105 0.74 2 0 0.38 GHE-P-11539 2006 D'Addia 071 0.69 13 0.01 CEMS-3497L 2007 D'Addia 071 0.69 0.347 0 0.01 CEMS-3497L 2007 Seil Cascade 519 0.340 2 <0							15	< 0.01	
Italy Lombardia Red Wine Barbora 0.07 1121 0.89 2 <0 <0.003 GHE-P-11228 2005 0.01 CFM-S-11803 Creationa 0.05 0.05 0.01 CFM-S-34971 Devine, 2008 Spain Sci Cascade 513 0.35 2 21 0.01 CFM-S-34973 Devine, 2008 Spain Sci Cascade 515 0.05 0 0.06 0.01							21	< 0.01	
Lombardia 2005 Barbora II98 0.84 0 0 0.26 657077b 2005 0.16 00d, 2006 00d, 2006 00d, 2006 012	Italy	Red Wine	0.07	1271	0.89	2	< 0	< 0.003a	GHE-P-11228
2005 3 0.16 Oild, 2006 Italy, North Red table 0.07 1035 0.74 2 0.03 21 0.12 Italy, North Red table 0.07 1035 0.74 2 0 0.38 GHE-P-11539 Emitia Romagna, Moscato D'Addia 0.69 13 0.01 600280 Bologna Sangiovese 0.07 498 0.340 2 <0	Lombardia	Barbora		1198	0.84		0	0.26	687077D
Instrume Red value North Moscato Old Moscato Old Moscato Out Moscato Out Moscato <th< td=""><td>2005</td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>0.16</td><td>Old, 2006</td></th<>	2005						3	0.16	Old, 2006
Indy, North Red table 0.07 1035 0.74 2 0 0.38 6902890 Emilia Romagna, 2006 D'Adda 0.69 13 0.01 6902890 6902890 2006 D'Adda 0.107 498 0.340 2 <0							7	0.05	
Indy, North Red table 0.07 103 0.74 2 0 0.12 Emilia Romagna, 2006 D'Adda 0.71 0.55 0.74 2 0 0.03 GHE-P-11539 Emilia Romagna, 2007 Red wine 0.071 498 0.40 2 0 0.033 GHE-P-11803 Bologna Sangiovese 508 0.347 2 0 0.001 CEWins-4001 2007 Seil Cascade 519 0.35 2 1 0.04 GHE-P-11803 Spain Red wine 513 0.35 2 2 0.04 GHE-P-11803 Spain Red wine 519 0.68 2 <0							15	< 0.003a	
Italy, North Emilia Romagna, 2006 Red table D/Adda 0.07 1035 971 0.69 2 0 0.38 GHE-1-1159 2006 D/Adda 007 498 0.340 2 <							21	0.12	
Emilia Romagna, 2006 Moscato D'Add 971 0.69 13 0.01 690289D Italy Red wine (0.07) 498 0.340 2 < 0.0	Italy, North	Red table	0.07	1035	0.74	2	0	0.38	GHE-P-11539
2006 D'Adda - - 21 < 0.003a L'ingstone, 2008. Bologna Sangiovese 0.07 498 0.347 0 0 0.001 CEMS-3497L. 2007 Sangiovese 513 0.347 2 2 0 0.01 CEMS-3497L. 2007 Red wine 513 0.35 2 21 0.003a Perine, 2008 Weitkopolska Seil Cascade 513 0.35 2 21 0.04 GHE-P-11803 Spain Red wine 519 0.35 2 21 0.04 GHE-P-58656 Provincia de Gerona Carignan 0.068 830 0.68 2 0 0 0.02 GHE-P-545656 Spain White Wine 899 89 1.5 7 0.02 Daran and Craig, 2001 Spain White Wine 815 6.07 0.7 2 2 2 0 0 1.6 CEME-P-10400 0.02a GHE-P-1000	Emilia Romagna,	Moscato		971	0.69		13	0.01	690289D
Italy Bologna 2007 Red wine angiovese (0.07) 508 498 0.340 2 bologna angiovese < 0.07 508 0.347 2 bologna angiovese < 0.003 a CEMS-3497L 2007 CO03a Poland Red wine Wielkopolska 2007 Red wine angina 513 519 0.35 2 bologna 2 bologna 0.04 GHE-P-11803 CEMS-3497L Devine, 2008 Spain Red wine Provincia de Gerona 1999 Red wine angina 0.068 830 0.68 2 bologna 0 bologna 0.04 GHE-P-11803 CEMS-3497R Devine, 2008 Spain Red wine Provincia de Gerona 1999 Red wine angina 0.068 830 0.68 2 bologna 0 bologna 0.02 CHE-P-9401 Doran and Craig, 2001 Spain White Wine Spain Michael de Palieri 607 7 52 2 bologna 2 bologna 40 0.01 (2) bologna GHE-P-11000 Los Palacios y Villafranca Michael de Palieri 752 2 bologna 2 bologna 4 bologna 6 bologna 6 bologna 1 bologna 6 bologna 6 bologna 6 bologna 6 bologna 1 bologna 6 bologna	2006	D'Adda					21	< 0.003a	Livingstone, 2008.
Bologna 2007 Sangiovese 508 0.347 0 0.01 CEMS-3497L 4 CEMS-3497L 2003a Poland Red wine 513 0.35 2 21 0.04 GHE-P-11803 CEMS-3497B Devine, 2008 Spain Seil Cascade 519 0 0 0.04 GHE-P-5856 CEMS-3497B Devine, 2008 Spain Red wine (0.068) 830 0.68 2 <0	Italy	Red wine	(0.07)	498	0.340	2	< 0	< 0.003a	GHE-P-11803
2007 Red wine 513 0.35 2 21 0.04 CEMS-3497B 2007 Seil Cascade 519 0.05 2 21 0.04 CEMS-3497B 2007 Cransa 6003a CEMS-3497B Devine, 2008 CEMS-3497B 2007 Cransa 6007 0 0.36 R99-101A 1999 Carignan 989 0.68 2 <0	Bologna	Sangiovese		508	0.347		0	0.01	CEMS-3497L
Image: Poland Red wine S13 0.35 2 21 <0.003a Poland Seil Cascade 519 0.35 2 21 0.04 GHE-P-11803 Wielkopolska Seil Cascade 519 0 0 0.4 GHE-P-11803 Spain Red wine Carignan 0.68 30 0.68 2 <0	2007						7	< 0.01	Devine, 2008
Poland Wielkopolska Spain 1999 Red wine Spain Carignan S13 (0.08) (0.09) (0.01) (0.01) (0.01) (0.02) (0.01) (0.02) (0.01) (0.02) (0.01) (0.02) (0.02) (0.01) (0.02							14	< 0.003a	
Poland Wicikopolska 2007 Red wine 513 0.35 2 519 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2							21	< 0.003a	
Wielkopolska Spain Seil Cascade 519 Image: CEMS-3497B Devine, 2008 Spain Red wine (0.068) 830 0.68 2 <0	Poland	Red wine		513	0.35	2	21	0.04	GHE-P-11803
2007 Image: Constraint of the section of	Wielkopolska	Seil Cascade		519					CEMS-3497B
Spain Provincia de Gerona 1999 Red wine Carignan (0.068) (0.068) 830 989 0.68 2 / / / / / / / / / / / / / / / / / / 2 / / / / / / / / / / / / / / / / / / /	2007								Devine, 2008
Provincia de Gerona Carignan 989 989 0 0 0.64 R99-101A 1999 1999 14 <0.01	Spain	Red wine	(0.068)	830	0.68	2	< 0	< 0.002a	GHE-P-8656
1999 Image: Section of the sectin of the section of the section of the section o	Provincia de Gerona	Carignan		989			0	0.36	R99-101A
Spain White Wine 607- Palomino 607- 815 0.7 2 2 2 2 2 2 2 2 2 2 2 2 3 2 3 2<	1999						7	0.02	Doran and Craig, 2001
Image: Section of the sectio							14	< 0.01	
Spain Sanlucar de Barrameda 2000 White Wine Palomino No 607- 815 0.7 2 subscription 2 subscription Chicano Subscription Chicanoo Subscription Chicanoo Subscrina							21	< 0.01	
Spain Barrameda White Wine Sanlucar de Barrameda Palomino 607- 815 0.7 2 21 < 0.01 (2) (2002) GHE-P-3441 (2002) OO0221B Dora and Clements, 2002 Spain Los Palacios y Villafranca Michael de Palieri 0.068 761 2 < 0	~ .					-	28	< 0.01	
Santucar de Barrameda 2000 Palomino 815 Image: Santucar de Barrameda 2000 Palomino 815 Image: Santucar de Doran and Clements, 2002 Spain Los Palacios y Villafranca Michael de Palieri 0.068 761 752 2 <0	Spain	White Wine		607-	0.7	2	21	< 0.01 (2)	GHE-P-9441
Barraneda 2000 Barraneda 2002 Doran and Clements, 2002 Spain Los Palacios y Villafranca Michael de Palieri 752 2 < 0	Sanlucar de	Palomino		815					000221B
2000 1 2002 2002 Spain Des Palacios y Michael de 761 2 <0	Barrameda								Doran and Clements,
Spain Los Palacios y Villafranca Michael de Palieri Michael de Palieri Michael de Palieri Notos Palieri 752 Palieri 0.008 761 2 6 0 0.1 CEMS-2299A Rawle, 2005 2004 Palieri Palieri 752 10 < 0.002a	2000 Spain		0.069	761			< 0	< 0.002a	2002 CHE D 11000
Los Falacios y Michael de Palieri 1/2 1/2 0 0.1 CENR-3-2299A 2004 Palieri Palieri 1/2 10 < 0.002a	Spann Los Palacios v	Michael de	0.008	701		2	< 0	< 0.002a	CEMS 2200 A
2004 Fundamental <	Villafranca	Palieri		152			5	0.1	CENIS-2299A
Spain Autumn Black 0.068 778- 822 2 70 <0.002a	2004	i unen					10	-0.03	Kawie, 2005
Spain Los Palacios y Villafranca Autumn Black 0.068 778- 822 2 70 <0.002a GHE-P-11000 2004 2 56 <0.002a	2001						14	< 0.002a	
Spain Los Palacios y Villafranca Autumn Black Autumn Black 0.068 778- 822 2 70 <0.002a GHE-P-11000 2004 2 56 <0.002a							21	< 0.002a	
Just Palacios y Naturni Diack 0.000 770 2 50 < 0.002a	Spain	Autumn Black	0.068	778_		2	70	< 0.002a	GHF-P-11000
Dos Hancios y Particular (10, 2) 2 40 0.002 a Rawle, 2005 2004 2 28 <0.002 a	I os Palacios v	Autumn Diack	0.000	822		$\frac{2}{2}$	56	< 0.002a	CFMS-2299B
2004 Red Wine (0.07) 802 0.54 2 <0.002a GHE-P-11002 Calatorao Garnacha (0.07) 802 0.54 2 <0	Villafranca					2	42	< 0.002a	Rawle 2005
Spain Calatorao Red Wine Garnacha (0.07) 802 1230 0.54 2 <0 <0.002a GHE-P-11002 2004 Garnacha (0.07) 802 1230 0.83 2 <0	2004					2	28	< 0.002a	14010, 2005
Calatorao 2004GarnachaCost / 1230 0.83 1230 0.83 0.83 0 0 0.0011 0.0011 0.0011 2004Garnacha 1230 0.83 0 3.4 $CEMS-2301A$ 2004White table 0.07 774 2 <0 $<0.002a$ $GHE-P-10999$ Dos HermanasMatilde 0.07 774 2 <0 $<0.002a$ $GHE-P-10999$ 2004White table 0.07 $752 2$ <0 $<0.002a$ $GHE-P-10999$ SpainWhite table 0.07 $752 2$ 70 $<0.002a$ $GHE-P-10999$ Dos HermanasWhite table 0.07 $752 2$ 70 $<0.002a$ $GHE-P-10999$ Dos HermanasRegina 0.07 $752 2$ 70 $<0.002a$ $GHE-P-10999$ 2004 2 2 2 2 2 2 6 $0.002a$ $GHE-P-10999$	Spain	Red Wine	(0.07)	802	0.54	2	< 0	< 0.002a	GHE-P-11002
2004 3 2.2 Rawle, 2006 2004 3 2.2 Rawle, 2006 7 0.54 14 0.53 21 0.20 0 1.1 Spain Matilde 0.07 774 2 <0	Calatorao	Garnacha	(0.07)	1230	0.83	-	0	3.4	CEMS-2301A
Spain White table 0.07 774 2 <0	2004	Guinaena		1200	0.05		3	2.2	Rawle, 2006
Image: Second							7	0.54	14,10,2000
Image: Spain Dos Hermanas 2004 White table Matilde 0.07 774 824 2 <0 <0.002a GHE-P-10999 GHE-P-10999 CEMS-2298A Rawle, 2005 <0 1.1 CEMS-2298A S <0.01 14 <0.01 21 <0.002a GHE-P-10999 Cems-2298A S <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.02a GHE-P-10999							14	0.53	
Spain Dos Hermanas White table Matilde 0.07 774 824 2 < 0 < 0.002a 0 GHE-P-10999 (EMS-2298A) Rawle, 2005 2004 Matilde 824 824 0 1.1 CEMS-2298A Rawle, 2005 2004 9 0.01 1.4 < 0.01							21	0.20	
Dos Hermanas Matilde 824 0 1.1 CEMS-2298A 2004 0 1.1 CEMS-2298A 2004 5 < 0.01	Spain	White table	0.07	774		2	< 0	< 0.002a	GHE-P-10999
2004 Image: Spain Dos Hermanas 2004 White table Regina 0.07 752- 822 2 70 < 0.002a	Dos Hermanas	Matilde		824			0	1.1	CEMS-2298A
Image: Spain Dos Hermanas 2004 White table Regina 0.07 752- 822 2 70 < 0.002a GHE-P-10999 CEMS-2298B CEMS-2298B Rawle, 2005 Z 42 < 0.002a GHE-P-10999 CEMS-2298B Rawle, 2005 Z 42 < 0.002a GHE-P-10999 CEMS-2298B Rawle, 2005 Z 28 < 0.002a CEMS-2298B Rawle, 2005 CEMS-2005	2004						5	< 0.01	Rawle, 2005
Spain White table 0.07 752- 822 2 70 < 0.002a GHE-P-10999 2004 Regina 822 2 56 < 0.002a							10	< 0.01	
Image: Spain Dos Hermanas White table Regina 0.07 752- 822 2 70 < 0.002a GHE-P-10999 2004 Regina 822 2 56 < 0.002a							14	< 0.01	
Spain White table 0.07 752- 2 70 < 0.002a GHE-P-10999 Dos Hermanas 2004 2 56 < 0.002a							21	< 0.002a	
Dos Hermanas Regina 822 2 56 < 0.002a CEMS-2298B 2004 2 42 < 0.002a	Spain	White table	0.07	752-		2	70	< 0.002a	GHE-P-10999
2004 2 42 < 0.002a	Dos Hermanas	Regina		822		2	56	< 0.002a	CEMS-2298B
2 28 < 0.002a	2004	Ũ				2	42	< 0.002a	Rawle, 2005
						2	28	< 0.002a	

Country		Applica	ation					Report No.
Region,	Crop	kg				PHI	Residues	Trial No.
Year	Variety	ai/hL	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Reference
Spain	Red Table	0.07	1251	0.88	2	< 0	< 0.003a	GHE-P-11224
Andalucia	Shelva		1254			0	1.2	687035B
2005						5	0.01	Old, 2006
						9	< 0.01	
						14	< 0.003a	
						21	< 0.003a	
Spain	White table	0.07	1250	0.88	2	< 0	< 0.003a	GHE-P-11224
Andalucia	Airen		1241	0.87		0	0.29	687035D
2005						5	< 0.003a	Old, 2006
						10	< 0.003a	
						14	< 0.003a	
						21	< 0.003a	
Spain	White table	0.07	993	0.71	2	< 0	< 0.003a	GHE-P-11539
Andalucia	Matilde		996			0	0.71	690289B
2006						4	0.13	Livingstone, 2008
						10	0.04	
						14	< 0.003a	
						21	< 0.003a	
Spain	Red table	0.07	997	0.71	2	0	0.69	GHE-P-11539
Andalucia	Shelm		912	0.65		14	< 0.01	690289C
2006						20	0.05	Livingstone, 2008
Spain	White wine	(0.07)	496	0.34	2	< 0	< 0.003a	GHE-P-11803
Valencia	Macabeo		521	0.36		0	2.7	CEMS-3497K
2007						7	0.26	Devine, 2008
						15	0.03	
						22	0.04	

Strawberries

A total of 23 trials conducted in Northern and Southern Europe during 1999–2007 were submitted. The results are shown in Table 42.

Table 42 Results of supervised	l trials conducted	l with chlorpyrifos	s methyl in strawberries
1		1 2	

Country		Application						Report No.
Region						PHI		Trial No.
Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	(days)	Residues (mg/Kg)	Reference
Austria	Elsanta	(0.07)	803	0.54	1	5	0.03	GHE-P-11804
Oberosterreich								CEMS-3498M
2007								Devine, 2008
France south	Elsanta	(0.07)	752	0.54	2	< 0	< 0.01	GHE-P-11540
Rhone-Alpes,			834	0.6		0	0.5	690294A
2006						1	0.16	Livingstone, 2008
						3	0.01	
						5	0.02	
						7	< 0.003 ^a	
France north	Darselect	(0.07)	796	0.57	2	0	0.53	GHE-P-11541
Pas de Calais			845	0.6		5	0.02	690315B
2006						8	< 0.01	Livingstone, 2008
France south	Mara de Bori	(0.07)	807	0.54	1	5	0.02	GHE-P-11804
Montesquieu								CEMS-3498A
2007								Devine, 2008
France south	Mara de Bois	(0.07)	807	0.54	1	0	0.27	GHE-P-11804
Pyrenees						1	0.05	CEMS-3498E
2007						3	0.03	Devine, 2008
						5	< 0.01	

Country		Applicatio	on					Report No.
Region						PHI		Trial No.
Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	(days)	Residues (mg/Kg)	Reference
France north	Charlotte	(0.07)	733	0.50	1	5	0.05	N238
Bretagne								GHE-P-11804
2007								CEMS-3498I
								Devine, 2008
Germany	Elsanta	(0.07)	861	0.6	2	< 0	< 0.01	GHE-P-11541
Saxony			828			0	0.46	690315C
2006						1	0.17	Livingstone, 2008
						3	0.07	
						5	0.03	
						7	0.01	
Germany	Elsanta	(0.07)	831	0.56	1	0	0.07	GHE-P-11804
Baden-						1	0.08	CEMS-3498L
Wurttemberg						3	0.04	Devine, 2008
2007						5	0.02	
Germany	Madeleine	(0.07)	803	0.54	1	5	< 0.01	GHE-P-11804
Brandenburg								CEMS-3498N
2007								Devine, 2008
Hungary	Elsanta/fertodi	(0.07)	793	0.54	1	0	0.41	GHE-P-11804
Fejer	5					1	0.15	CEMS-3498O
2007						3	0.02	Devine, 2008.
						5	0.01	
Italy	Arosa	(0.07)	797	0.54	1	0	0.27	GHE-P-11804
Ferrara						1	0.05	CEMS-3498G
2007						3	0.03	Devine, 2008
						5	< 0.01	
Italy	Camarosa	(0.07)	830	0.52	1	0	0.42	GHE-P-11804
Matera						1	0.12	CEMS-3498F
2007						3	0.07	Devine, 2008
						5	0.02	
Italy	Marmolada	(0.07)	820	0.56	1	5	< 0.01	GHE-P-11804
Forli-Cesena								CEMS-3498B
2007								Devine, 2008
Italy	Onda	(0.07)	813	0.58	2	0	0.97	GHE-P-11540
Veneto			828	0.59		5	<u>0.04</u>	690294C
2006						7	0.03	Livingstone, 2008
Netherlands	Elsanta	(0.07)	863	0.584	1	5	0.05	GHE-P-11804
2007								CEMS-3498J
								Devine, 2008
Poland	Honey	(0.07)	814	0.58	2	0	0.71	GHE-P-11541
Zakroczym			779	0.56		5	0.02	690315D
2006						7	0.01	Livingstone, 2008
Poland	Elicat	(0.07)	848	0.57	1	0	0.21	GHE-P-11804
Wielkopolska						1	0.05	CEMS-3498P
2007						3	0.02	Devine, 2008
					ļ	5	< 0.003 ^a	
Spain		(0.07)	806	0.57	2	< 0	< 0.01	GHE-P-11540
Andalucia	Camarosa		800			0	0.83	690294B
2006						1	0.20	Livingstone, 2008
						3	0.03	
						5	<u>0.01</u>	
						7	< 0.01	
Spain	Pajaru	(0.07)	796	0.54	1	0	1.0	GHE-P-11804
Valencia						1	0.13	CEMS-3498H
2007						3	0.08	Devine, 2008
						5	0.02	
Spain	Camarosa	(0.07)	796	0.54	1	5	<u>< 0.003^a</u>	GHE-P-11804
Valencia								CEMS-3498C

Country		Application	on					Report No.
Region						PHI		Trial No.
Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	(days)	Residues (mg/Kg)	Reference
2007								Devine, 2008
Spain	Camarosa	(0.07)	828	0.56	1	5	0.01	GHE-P-11804
Valencia								CEMS-3498D
2007								Devine, 2008
United Kingdom	Elsanta	(0.07)	805	0.57	2	< 0	< 0.01	GHE-P-11541
Colchester			803			0	0.97	690315A
2006						1	0.67	Livingstone, 2008
						3	0.03	
						5	0.01	
						7	< 0.01	
United Kingdom	Elsanta	(0.07)	822	0.565	1	0	0.2	GHE-P-11804
2007						1	0.12	CEMS-3498K
						3	0.02	Devine, 2008
						5	0.02	

Kiwi Fruit

A total of four trials conducted in Italy during 2007 are included in this submission (Table 43).

Table 43 Results of supervised trials conducted with chlorpyrifos methyl in kiwi (var Hayward) in Italy in 2007 (Report No. 20075010/I1-FPKI; Miserocchi, 2007)

Region,	Application				PHI	Residue	Trial No.,
-	kg ai/hL	L/ha	kg ai/ha	No	(days)	(mg/kg)	
Emilia	0.049	997	0.48	2	0	0.51	I071032R
		1013	0.49		1	0.25	
					7	0.11	
					15	0.07	
					21	< 0.003 ^a	
Emilia	0.049	983	0.48	2	0	0.72	I071033R,
		995			1	0.50	
					7	0.22	
					15	0.13	
					21	< 0.003 ^a	
Bari	0.049	998	0.48	2	0	0.97	I071034R
		999	0.49		1	0.76	
					7	0.60	
					15	0.30	
					21	< 0.003 ^a	
Puglia	0.049	1002	0.49	2	0	0.81	I071035R
		992	0.48		1	0.81	
					7	0.23	
					15	0.25	
					21	< 0.003 ^a	

^a limit of detection (LOD)

Onions

A total of 6 trials conducted in Northern and Southern Europe during 1999–2000 were submitted. The results are shown in Table 44.

Table 44 Results of supervised trials conducted with chlorpyrifos methyl in onion

Country		Applicat	on			PHI	Residues	Report No.
Region, Year	Variety	kg ai/hl.	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Trial No., Author(s)
France	Dore de	_	840	0.52	2	< 0	< 0.002 ^a	GHE-P-10013
Lambesc	Parme	_	833			0	0.23	000200A
2000						2	0.02	Doran. and Clements, 2000
						3	0.03	
Greece	Aldobo	-	600	0.50	2	3	0.05 (2), 0.02,	GHE-P-9447
Thessaloniki		—					0.04, 0.06	000199A
2000								Doran and Clements, 2002
Greece	Sonic F1	_	610	0.50	2	3	0.02, 0.04	GHE-P-9447
Thessaloniki		—	597					000199B
2000								Doran and Clements, 2002
Hungary	Stuttgarti	_	490	0.49	2	< 0	$< 0.002^{a}$	GHE-P-8670
Szolnokmegye		-	477	0.48		0	0.12	R99-170A
1999						3	< 0.01	Doran and Craig, 2001
						7	< 0.01	
						14	$< 0.002^{a}$	
						22	< 0.002 ^a	
Hungary	Stuttgarti	_	508	0.50	2	22	$< 0.002^{a}$	GHE-P-8671
Szolnokmegye		—	503					R99-171A
1999								Doran and Craig, 2001
Spain	Tardia de	-	538	0.48	2	< 0	< 0.002 ^a	GHE-P-10013
Barriada El	Lerida	_	633			0	0.57	000200B
Gordillo						2	0.08	Doran. and Clements, 2000
2000						3	0.05	

Tomatoes

A total of 61 trials conducted in Northern and Southern Europe during 1999–2007 in tomatoes were submitted. The results are shown in Table 45.

Table 45 Results of supervised trials conducted with chlorpyrifos methyl in tomatoes

Country	Variety	Applicatio	n			Portion	PHI	Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
Year									Reference
Czech	Protected	0.07	810	0.55	2	Tomato	0	0.28	GHE-P-11543
Republic	Boreal		815				5	0.16	690336B
Tvrdonice							7	0.13	Livingstone, 2008
2006									
France, South		(0.15)	293	1.2	3	Tomato	< 0	$< 0.002^{a}$	GHE-P-9557
Noves	Stampa		584				0	0.18	000202A
2000			786				2	0.09	Doran and Craig, 2002
							3	0.09	
							5	0.02	
France, South		0.07	1202		2	Tomato	< 0	$< 0.002^{a}$	GHE-P-10988
Montauban	Brenda		1198				0	0.71	CEMS-2287B
2004							1	0.47	Rawle, 2005
							3	0.30	
							4	0.20	
							7	0.42	
France, South		0.07	1204-		2	Tomato	35	0.02	GHE-P-10988
Orgueil	Brenda		1272		2	Tomato	28	0.08	CEMS-2287C
2004					2	Tomato	21	0.08	Rawle, 2005
					2	Tomato	14	0.07	
France, South	Cherry	0.07	834				< 0	$< 0.002^{a}$	GHE-P-10989
Limas	Sweet		1211				0	0.82	CEMS-2288
2005	Million						1	0.82	Rawle, 2005

Country	Variety	Applicatio	on			Portion PHI	PHI	Residues	Report No.
Region Year		kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No. Reference
							3 5 7	0.28 0.20 0.14	
France, South Cote d'Azur 2005	Protected Roma	0.07	1031 1053	0.72–0.74	2	Tomato	< 0 0 1 3 5 8	0.03 0.30 0.39 0.18 0.20 0.12	GHE-P-11225 687040D Old, 2008
France, South Rhone Alps 2006	Protected Felicia	0.07	1046 1020	0.72–0.73	2	Tomato	< 0 0 1 3 5 8	< 0.003 ^a 0.48 0.23 0.39 0.13 0.11	GHE-P-11225 687040E Old, 2008
France, Nord Baisieux, 2006	Brentyla HFI	0.07	791 816	0.56–0.58	2	Tomato	0 5 7	0.16 0.09 0.10	GHE-P-11542 690320D Livingstone, 2008
France-South Languedoc- Roussillon 2007	Marbonne		983	0.670	1	Tomato	5	0.06	GHE-P-11805 CEMS-3499B Marshall, 2008
France Languedoc- Roussillon 2007	Protected Ondina		1005	0.68	1	Tomato	5	0.03	GHE-P-11805 CEMS-3499E Marshall, 2008
France, North Bretagne 2007	Protected Brazil		1014	0.7	1	Tomato	5	0.08	GHE-P-11805 CEMS-3499H Marshall, 2008
Netherlands Klazienaveen, 2007	Protected Claree		969	0.66	1	Tomato	0 1 3 5	0.25 0.08 0.11 0.09	GHE-P-11805 CEMS-3499K Marshall, 2008
Germany Saxony 2006	Protected Strya	0.07	800	0.57	2	Tomato	< 0 0 1 3 5 7	0.04 0.25 0.14 0.08 0.03 0.02	GHE-P-11543 690336A Livingstone, 2008
Germany Baden- Wurttemberg 2007	Protected Loretto		1017	0.7	1	Tomato	5	0.22	GHE-P-11805 CEMS-3499I Marshall, 2008
Germany Brandenburg 2007	Protected Vanessa		1090	0.7	1	Tomato	5	0.13	GHE-P-11805 CEMS-3499M Marshall, 2008
Greece Thessaloniki 1999	Cherry Supersweet		1250 1215 1245	1.2	3	Tomato	< 0 0 2 3 5	< 0.01 1.3 0.71 0.59 0.31	GHE-P-8660 R99-105A Doran and Craig, 2001
Greece Chalkidiki 2004	Galli F1	0.067	1000		2	Tomato	< 0 0 1 3 5 7	< 0.002 ^a 0.08 0.11 0.03 0.02 0.03	GHE-P-10993 CEMS-2292A Rawle, 2005

Country	Variety	Applicatio	n			Portion PHI		Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
Year									Reference
Greece		0.067	1000	0.68	2	Tomato	< 0	< 0.003 ^a	GHE-P-11226
Thessaloniki	Roma						0	0.13	687056C
2005							1	0.11	Old, 2006
							3	0.04	
							5	0.03	
							7	< 0.01	
Greece	Bobcat		1006	0.68	1	Tomato	5	0.06	GHE-P-11805
Thessaloniki							_		CEMS-3499A
2007									Marshall, 2008
Hungary	Protected		1360	1.2	1	Tomato	0	0.43	GHE-P-11805
Bacs-Kiskun	CarfuF1		1000		-	1011140	1	0.23	CEMS-3499N
2007	Currur I						3	0.23	Marshall 2008
2007							5	0.19	Warshan, 2000
Italy		(0.24)	502	1.2	2	Tomato	3	0.20	CHE D 8661
Italy Emilia	Padcatar	(0.24)	502	1.2	5	Tomato	5	0.24	DILL-1-8001
Romagna	Redecter		505						Teosdole 2000
1000			505						Teasuale, 2000
Italy		(0, 00)	1084	1.2	2	Tomato	< 0	< 0.01	CHE D 8664
Ragnarola di	Donador	(0.09)	1200	1.2	5	Tomato	0	0.54	DILL-1-8004
Budrio	Dolladol		1290				2	0.34	Doren and Croig 2001
Bologna			1272				2	0.20	Dorall and Craig, 2001
1999							5	0.12	
I + - 1		(0.049)	1090	1.0	2	T	2	0.07	CHE D 9665
Italy	F 1	(0.048)	1980	1.2	3	Tomato	3 5	0.34	GHE-P-8005
Bologna	Fedra		2000				5	0.10	K99-110A
1999		(0.17)	2578	1110	2		0	0.0003	Doran and Craig, 2001
Italy		(0.17)	685	1.1–1.2	3	Tomato	< 0	< 0.002ª	GHE-P-9557
S.Felice Circeo	Calida		647				0	0.26	000202B
2000			681				2	0.09	Doran and Craig, 2002
							3	0.05	
T . 1		0.04		0.42	-		3	0.08	CHE D 10402
Italy		0.04	-	0.42	2	Tomato	21	< 0.01	GHE-P-10492
Lombardia	Montego		-						682917A
2003					-				Wardman, 2004
Italy		0.04	—	0.42	2	Tomato	21	$< 0.002^{a}$	GHE-P-10492
Lombardia	Montego		—						682917A
2003									Wardman, 2004
Italy		0.067	753		2	Tomato	< 0	0.07	GHE-P-10988
Castenaso	Aden		757				0	0.24	CEMS-2287A
2004							1	0.13	Rawle, 2005
							3	0.07	
							6	0.05	
							7	0.04	
Italy		0.067	1107		2	Tomato	7	0.22	GHE-P-10988
Bologna	Arletta		1238						CEMS-2287E
2004									Rawle, 2005
Italy		0.067	833		2	Tomato	< 0	$< 0.002^{a}$	GHE-P-10993
Bologna	Podium		1010				0	1.6	CEMS-2292B
2004							1	1.0	Rawle, 2005
							3	1.1	
							4	0.92	
					L		8	0.77	
Italy		0.067	743-		2	Tomato	35	< 0.01	GHE-P-10993
Bologna	Perfect Peel		893		2	Tomato	28	0.04	CEMS-2292F
2004					2	Tomato	21	0.13	Rawle, 2005
					2	Tomato	14	0.10	
Italy, Emilia	Protected	0.07	1029	0.72	2	Tomato	7	0.05	GHE-P-11225
Romagna	Carson		1039						687040A
~		i				•			i

Region kg ai/hL Uha kg ai/hL No. Analysed (days) (m/R, R) Trial No. Reference 2005 - <th>Country</th> <th>Variety</th> <th>Applicatio</th> <th>n</th> <th></th> <th></th> <th>Portion</th> <th>PHI</th> <th>Residues</th> <th>Report No.</th>	Country	Variety	Applicatio	n			Portion	PHI	Residues	Report No.
Year Image Image Image Image Image Reference 12005 Image 0.07 1022 0.7 2 Tomato 0 0.03 GHE-P-11225 1mburding Nerina 0.07 1022 0.7 2 Tomato 0 0 0.03 GHE-P-11225 2005 0.00 0.07 983 0.70 0.68 2 Tomato 7 <0.01	Region		kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
2015 Image Protected 0.07 1022 0.7 2 Tomato 0 0.00 0.133 6/HE-P-11225 2005 Nerina 0.07 983 0.70-067 2 Tomato 0 0.03 0.01 1taly 0.07 998 0.70-067 2 Tomato 7 0.01 6070-066 0.02 0.01 67056.0 004 0.02 0.02 0.02 67056.0 004 0.02 0.02 0.01 67056.0 004 0.02 </td <td>Year</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Reference</td>	Year									Reference
Intaly Lombardia 2005 Protected Nerina 0.7 1022 983 0.7 2 983 Tomato Nerina 0.0 0.03 0.02 GRF-P-11225 0.02 1uly Lombardia 2005 0.07 998 0.70-07 92 Tomato 7 0.24 GRF-0-1225 687056A Lombardia 2005 13402 998 0.70-077 998 0.70-077 2 Tomato 7 0.24 GRF-0-11226 Emilia Romagna 2005 0.77 979 0.68 2 Tomato 0 0.13 GR70562 Romagna 2005 98.85 979 0.68 2 Tomato 0 0.12 GHE-P-11522 Romagna 2005 0.77 733 0.53-057 2 Tomato 0 0.12 GHE-P-11842 Lombardia 2006 100 100 0.8 CHE-P-11842 0.8 0.07 690208 Ritaly Lombardia 2007 Protected 925 0.63 1 Tomato 0 0.14 CHE-P-11805 CEMS-34900 0.07 1	2005									Old, 2008
Lombardia 2005 Nerina bell Second problem Second pro	Italy	Protected	0.07	1022	0.7	2	Tomato	< 0	< 0.003 ^a	GHE-P-11225
2005 Image: Second	Lombardia	Nerina		983				0	0.13	687040C
Indy 0.07 998 0.70 6.85 0.00 6HE-P-11226 Lombardia 0.07 998 0.70 0.8 2 Tomato 7 0.24 GHE-P-11226 Romagna 0.07 979 0.68 2 Tomato 7 0.24 GHE-P-11226 Romagna 0.07 974 0.68 2 Tomato 0 0.19 65705cb Romagna 0.07 75 0.53-0.57 2 Tomato 0 0.12 66903208 2006 743 0.53-0.57 2 Tomato 0 0.12 6903208 2006 743 0.53-0.57 1 Tomato 0 0.31 GHE-P-11805 Cambardia Protected 995 0.63 1 Tomato 0 0.14 Livingschez, 2008 Bari Protected 928 0.63 1 Tomato 0 0.14 CEMS-3499D 2007 1 Netected 928	2005							1	0.07	Old, 2008
Indy Indy Lombardia P 0.07 998 0.70–0.67 2 Tomato 7 <0.04 GHE-P-11226 1aly Dools 98-85 0.07 979 0.68 2 Tomato 7 <0.03'								3	0.02	
Italy Lombardia Bong South Service Spain 0.07 995 (959) 0.70-0.67 (959) 2 (7) Tomato (7) 7 (7) 0.24 (7) GHE-P-11226 (687056A (00) GHE-P-11226 (687056A (00) Italy Emilia (7) 0.8-85 (7) 0.07 979 0.68 2 (7) Tomato <0								5	< 0.01	
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Lombardia Italy Emilia Romagna 2005 H 3402 959 Solution (04, 2008 Italy Romagna 2005 98.85 0.07 974 0.68 2 Tomato <0	Italy	11.2.402	0.07	998	0.70-0.67	2	Tomato	7	0.24	GHE-P-11226
AMS Image I	Lombardia	H 3402		959						68/056A
Intry Romagna 2005 98-85 0.07 979 0.08 2 Iomado 0 0.003 687056D 1 0 0.003 687056D 1 0 0.13 0 0.009 587056D 0 0 0.12 687056D 0	2005		0.07	070	0.69	2	T	10	< 0.002 ^a	Old, 2008
Linina 98-33 974 1 0 0.19 0870500 2005 - 0.00 -<	Italy Emilia	00 05	0.07	979	0.68	2	Tomato	< 0	< 0.003	GHE-P-11220
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Internation	Italy	Asterix	0.07	795	0 53-0 57	2	Tomato	0	0.00	GHF-P-11542
2006 Interpret Terman Terman Terman Terman Terman Terman Terman Comparing the second	Lombardia	A ISICITX	0.07	743	0.55 0.57	Ĺ	Tomato	5	0.07	690320B
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	2006			1.0				7	0.04	Livingstone, 2008
Fortrara 2007 Stay Green Cas Interaction Interaction <thi< td=""><td>Italy</td><td></td><td></td><td>1020</td><td>0.7</td><td>1</td><td>Tomato</td><td>0</td><td>0.31</td><td>GHE-P-11805</td></thi<>	Italy			1020	0.7	1	Tomato	0	0.31	GHE-P-11805
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Italy Bari 2007 Protected Piccadilly 995 0.63 1 Tomato Cambo in the interval of th	2007							3	0.05	Marshall, 2008
Italy Bari 2007 Protected Piccadilly 995 0.63 1 Tomato 0 0.14 GHE-P-11805 CEMS-3499G 2007 Poland Protected 928 0.63 1 Tomato 5 0.12 GHE-P-11805 CEMS-3499L 2007 Stefani 928 0.63 1 Tomato 5 0.12 GHE-P-11805 CEMS-3499L 2007 Foland Protected 1054 0.7 1 Tomato 0 0.06 GHE-P-11805 CEMS-3499D 2007 Poland Protected 1054 0.7 1 Tomato 0 0.06 GHE-P-11805 Wielkopolska Malory 0.7 1 Tomato 0 0.04 Marshall, 2008 2007 Vicar (0.13) Chem 1.0–1.2 4 Tomato 4 0.04 GHE-P-8662 Murcia Bon 1223 1.2 4 Tomato 4 0.04 GHE-P-8663 R99-107 Spain Bond 1006– <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>5</td><td>0.07</td><td>,</td></t<>								5	0.07	,
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2007	Wielkopolska	Stefani								CEMS-3499L
Poland Wielkopolska 2007 Protected Malory Inota 0.7 1 Tomato 0 0.06 GHE-P-11805 2007 Malory Malory 1 0.04 CEMS-3499O 3 0.04 Marshall, 2008 2007 1 0.10 Marshall, 2008 0.10 Marshall, 2008 0.00 Barshall, 2008 Spain Vicar 480 1.0-1.2 4 Tomato < 0	2007									Marshall, 2008
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2000 Image: Constraint of the system Image: Consystem Image:	Sevilla.	Mina		1145				5	< 0.01,	000201A
Spain Sevilla. Sandy Lady (0.062) 1029- 1928 1.2 3 Tomato 3 0.02, 0.04 GHE-P-9558 000201B 2000 928 12 3 Tomato 5 0.03, 0.05 GHE-P-9558 000201B Spain Funes 0.067 1307 1252 2 Tomato 7 0.22 GHE-P-10988 CEMS-2287D 2004 0.04 (2), Rawle, 2005 Individual 0.04 (2), Rawle, 2005	2000								0.01	Doran and Craig, 2002
Sevilla. Sandy Lady 1928 5 0.03, 0.05 000201B Doran and Craig, 2002 Spain 0.067 1307 2 Tomato 7 0.22 GHE-P-10988 Funes Caramba 1252 2 Tomato, individual 7 0.02, 0.03, CEMS-2287D	Spain		(0.062)	1029-	1.2	3	Tomato	3	0.02, 0.04	GHE-P-9558
2000 Doran and Craig, 2002 Spain 0.067 1307 2 Tomato 7 0.22 GHE-P-10988 Funes Caramba 1252 7 Tomato, individual 7 0.02, 0.03, CEMS-2287D 2004 0.04 (2), Rawle, 2005 Rawle, 2005	Sevilla.	Sandy Lady		1928				5	0.03, 0.05	000201B
Spain 0.067 1307 2 Tomato 7 0.22 GHE-P-10988 Funes 2004 1252 2 Tomato, individual 7 0.02, 0.03, 0.02, 0.02, 0.03, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.02, 0.	2000									Doran and Craig, 2002
Funes Caramba 1252 Tomato, individual 7 0.02, 0.03, 0.04 (2), CEMS-2287D	Spain		0.067	1307		2	Tomato	7	0.22	GHE-P-10988
2004 individual 0.04 (2), Rawle, 2005	Funes	Caramba		1252			Tomato,	7	0.02, 0.03,	CEMS-2287D
	2004						individual		0.04 (2),	Rawle, 2005

Country	Variety	Application	on			Portion	PHI	Residues	Report No.
Region Year		kg ai/hL	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No. Reference
								0.14, 0.15, 0.24 (2), 0.18, 0.27, 0.29, 0.32,	
Spain Funes 2004	H-9036	0.067	1251 1242		2	Tomato Tomato, individual	7 7	0.15 0.02, 0.03, 0.04 (2), 0.05, 0.06, 0.07 (2), 0.11 (2), 0.12, 0.16	GHE-P-10993 CEMS-2292E Rawle, 2005
Spain Grisen, 2004	H9661	0.067	1256 1250		2	Tomato	7 9	0.11 0.17	GHE-P-10993 CEMS-2292G Rawle, 2005
Spain Andalucia 2005	Protected Bond	0.07	1005 1006	0.70	2	Tomato	7	0.02	GHE-P-11225 687040B Old, 2008
Spain Catalonia 2005	Tomate de rama	0.07	1005 1000	0.7	2	Tomato	7	0.12	GHE-P-11226 687056B Old, 2006
Spain Andalucia, 2006	Hector	0.07	798 801	0.57	2	Tomato	< 0 0 1 3 5 7	< 0.003 ^a 0.06 0.04 0.02 0.02 < 0.01	GHE-P-11542 690320A Livingstone, 2008
Spain Valencia 2007	Tomatoes Valenciana		1098	0.75	1	Tomato	0 1 3 5	0.33 0.17 0.10 0.06	GHE-P-11805 CEMS-3499C Marshall, 2008
Spain Alicante 2007	Protected Amadeo	(0.069)	989	0.68	1	Tomato	5	0.03	GHE-P-11805 CEMS-3499F Marshall, 2008
United Kingdom 2006	Moneymaker	0.07	803 801	0.57	2	Tomato	< 0 0 1 3 5 7	0.05 0.26 0.21 0.2 0.31 0.07	GHE-P-11542 690320C Livingstone, 2008
United Kingdom Leicestershire, 2007	Protected Ailsa Craig		1017	0.7	1	Tomato	0 1 3 5	0.26 0.21 0.17 0.19	GHE-P-11805 CEMS-3499J Marshall, 2008

Peppers

A total of 24 trials conducted in Southern Europe during 1999–2007 in peppers were submitted. The results are shown in Table 46.

Country Crop Variety		Applicatio	on			PHI	Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Trial No.
Year								Reference
France, south	Protected		959	0.65	1	5	0.14	GHE-P-11801
Languedoc-	Jordito							CEMS-3495B
Roussillon								Devine, 2008
2007								
France	Protected	0.067	1294		2	7	0.33	GHE-P-10990
Thezat	Cabeso		1297			7	0.16, 0.14,	CEMS-2289D
2004							0.18(2),	Rawle, 2005
							0.22, 0.28, 0.32, 0.34	
							0.40, 0.43,	
							0.48, 0.78,	
France	Protected	0.07	981	0.69-	2	7	0.17	GHE-P-11223
Rhone-Alpes	Hannibal		1027	0.72				687014A
2005								Old, 2006
Greece	Protected r	0.067	1000	0.67	2	< 0	< 0.003 ^a	GHE-P-11223
Thessaloniki	Lenor F1					0	0.65	687014C
2005	hybrid					1	0.12	Old, 2006
						3	0.21	
						5	0.16	
						7	0.13	
Greece	Florinis	(0.17)	700	0.6-1.2	3	< 0	< 0.01	GHE-P-9435
Epanomi						0	1.1	000204A
2000						2	0.33	Doran and Craig, 2002
						3	0.2	
~					-	5	0.14	
Greece	Protected	(0.17)	700-	1.2	3	< 0	< 0.01	GHE-P-9435
Ionia	Lenor		727			0	0.84	000204B
2000						2	0.26	Doran and Craig, 2002
						5	0.17	
C	Ducto et a d	0.067	1000		2	5	0.09	CHE D 10000
Theseoloniki	Iulia E1	0.007	1000		2	< 0	0.03	CEMS 2280A
2004	Julia 1 1					1	0.74	CENIS-2209A Dawle 2005
2004						1	0.34	Rawle, 2005
						5	0.16	
						7	0.12	
Greece	Protected		963	0.65	1	5	0.03	GHE-P-11801 V2
Thessaloniki	Astrion				-	-		CEMS-3495A
2007								Devine, 2008
Italy	Cesario		715-	1.2	3	3	0.56	GHE-P-8667
Bologna			846			5	0.28	R99-112A
1999								Doran and Craig, 2001
Italy	Protected	0.067	721		2	7	0.05	GHE-P-10990
Bagnarola di	Sienor		939					CEMS-2289E
Budrio								Rawle, 2005
2004								
Italy	Protected	0.07	1057	742	2	7	0.03	GHE-P-11223
Roncoferraro,	Navarro		1025	719				687014B
Lombardia								Old, 2006
2005								
Italy	Protected	0.07	819	0.58	2	0	0.12	GHE-P-11533
Piemonte	Cuneo		808			5	0.04	690226B
2006			10//	0.67		1	0.02	Livingstone, 2008
Italy	Protected		1066	0.67	1	0	0.14	GHE-P-11801 V2
Puglia	Senior						0.15	CEMS-3495D
2007					I	3	0.05	Devine, 2008

Table 46 Results of supervised trials conducted with chlorpyrifos methyl in peppers

Country	Crop Variety	Application				PHI	Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Trial No.
Year		0		0				Reference
						5	0.06	
Snain	Negrillo		1055	1 1-1 2	3	< 0	< 0.01	GHE-P-8666
Sevilla	rieginio		1883	1.1 1.2	5	0	0.27	R99-111A
1999			1000			2	0.13	Doran and Craig 2001
1777						3	0.09	Dorum und Orung, 2001
						5	0.04	
Snain	Protected		997_	10-12	4	< 0	< 0.01	GHF-P-8668
Villafrinca	Dulce Italico		1223	1.0 1.2	'	0	1 2	R99-1134
1000	Durce nameo		1225			2	0.81	Doran and Craig 2001
1777						2	0.01	Doran and Crarg, 2001
						5	0.52	
Spain	Vidi		Chamia	1012	4	2	0.32	CHE D 8660
Spaili Cordobo	viui		Chennig	1.0-1.2	4	5	0.15	DOD 114A
			900-			5	0.01	R99-114A
1999	NT 11		1544	1 1 1 0	2	2	0.11.0.17	Doran and Craig, 2002
Spain	Negrillo		/33-	1.1-1.2	3	3	0.11, 0.17	GHE-P-9442
Sevilla			1527			5	0.07, 0.09	000203A
2000			1000		-	-	0.00	Doran and Craig, 2002
Spain	Protected	0.12	1000	1.2	3	3	0.32	GHE-P-9442
Almeria	Lozano					5	0.31	000203B
2000								Doran and Craig, 2002
Spain	Protected	0.12	987–	1.2	3	3	0.2	GHE-P-9442
Almeria	Lozano		1025			5	0.19	000203B
2000								Doran and Craig, 2002
Spain	Protected	0.067	1233		2	< 0	< 0.003 ^a	GHE-P-10990
Dos Hermanas	Negrillo		1290			0	1.0	CEMS-2289B
2004						1	1.3	Rawle, 2005
						3	0.91	
						5	0.72	
						7	0.66	
Spain	Protected	0.067	920-1140		2	35	0.01	GHE-P-10990
Los Palacios	Palermo				2	28	0.02	CEMS-2289F
2004					2	21	0.09	Rawle, 2005
					2	14	0.12	
Spain	Protected	0.07	983	0.7	2	< 0	< 0.003 ^a	GHE-P-11223
Andalucia	Gallego		1000			0	0.55	687014D
2005	C					1	0.28	Old, 2006
						3	0.16	
						5	0.06	
						7	< 0.01	
Spain	Protected	0.07	799	0.57	2	< 0	< 0.003 ^a	GHE-P-11533
Andalucia	Palermo		792			0	0.31	690226A
2006						1	0.09	Livingstone, 2008
						3	0.04	<i>o</i> ,
						5	0.04	
						7	0.01	
Spain	Protected		1027	0.7	1	0	0.07	GHE-P-11801 V2
Valencia	Adiche		1027	0.7	1	1	0.07	CEMS_3495C
2007	Autone					3	0.05	$\frac{1}{2}$
2007						5	0.03	Devine, 2000
	1	1		1	1	5	0.05	

Green beans and peas

A total of six trials conducted in Southern Europe during 2000–2003 were submitted. The results are shown in Table 47.

Country	Variety	Applicatio	Application			PHI	Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No	(days)	(mg/Kg)	Trial No.
Year								Author(s)
France	Green beans	<u> </u>	486-518	0.49–	2	15	$< 0.002^{a}(5)$	GHE-P-9438
Montauban	Adana	_		0.52				000205A
2000								Doran and Clements, 2002
Italy	Green beans	_	500	0.51	2	15	$< 0.002^{a}(2)$	GHE-P-9438
Romagna	Tema	_						000205B
2000								Doran and Clements, 2002
Italy	Peas	<u> _</u>	500-530	0.21	2	10	< 0.01	GHE-P-10490
Lombardia	Gonal	_		0.20				682896
2003								Wardman, 2004.
Spain	Green beans	_	805	0.52	2	< 0	< 0.002 ^a	GHE-P-9432
Cordoba.	F-15	_	797	0.51		0	0.65	000206B
2000						3	0.05	Doran and Clements,
						7	< 0.01	2002
						10	< 0.01	
						15	< 0.002 ^a	
Spain	Green beans	<u> </u>	802	0.52	2	< 0	< 0.002 ^a	GHE-P-9432
Cadiz	Primel	_	800	0.51		0	0.96	000206C
2000						3	0.03	Doran and Clements,
						7	0.02	2002
						10	0.02	
						15	< 0.01	

Table 47 Results of supervised trials conducted with chlorpyrifos methyl in green bens and peas

Carrots

Four trials conducted in Southern Europe during 2000 were submitted. The results are shown in Table 48.

Table 48	Results of	f supervised	trials conducte	d with chlorpy	rifos methyl i	n carrots

Country		Application	l			J		Report No.
Region Year	Variety	kg ai/hL	L/ha	kg ai/ha	No.	PHI (days)	Residues (mg/Kg)	Trial No. Reference
France St Jory 2000	Maestro	_	601 602	0.48 0.49	2	< 0 0 2 3	< 0.01 0.04 0.06 0.01	GHE-P-9444 000196A Doran. and Clements, 2002
Italy Emilia Romagna. 2000	Napoli	-	589 591	0.50 0.52	2	< 0 0 2 3	< 0.01 0.01 0.02 < 0.01	GHE-P-9444 000196C Doran. and Clements, 2002
Spain Paterna del Campo 2000	Navarre F1	-	547– 614	0.47 0.53	2	3	0.03, 0.04 (2), 0.05, 0.07	GHE-P-9433 000195A Doran. and Clements, 2002
Spain Sanlucar de Barrameda 2000	Ando	_	581– 686	0.50- 0.52	2	3	0.04 (2)	GHE-P-9433 000195B Doran. and Clements, 2002

Potatoes

A total of 21 trials conducted in Northern and Southern Europe during 2000–2007 were submitted. The results are shown in Table 49.

. Country	Variety	Applicat	ion			PHI	Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No	(days)	(mg/Kg)	Trial No.
Year								Reference
France	Concurrent	(0.14)	508-	0.92	2	14	$< 0.002^{a}(2)$	GHE-P-9556
Gontaud de			693	0.99				000207A
Nogaret								Doran. and Clements, 2002
2000								
France	Berbere	(0.14)	575-	0.9	2	14	$< 0.002^{a}(2)$	GHE-P-9556
Velleron			633	1.0				000207B
2000								Doran. and Clements, 2002
France	Mona Lisa	0.07	795	0.57	2	< 0	< 0.003 ^a	GHE-P-11535
Rhone-Alpes			807	0.58		0	< 0.003 ^a	690247A
2006						8	< 0.003 ^a	Livingstone, 2008
						15	< 0.003 ^a	
						22	< 0.003 ^a	
						28	< 0.003 ^a	
France	Amila	0.07	814	0.58	2	0	< 0.003 ^a	GHE-P-11534
Allouagne			807			21	< 0.003 ^a	690231D
2006						29	< 0.003 ^a	Livingstone, 2008
France	Cicero	(0.067)	820	0.55	1	21	< 0.003 ^a	GHE-P-11802
Alsace								CEMS-3496C
2007								Devine, 2008
France	Mona Lisa	0.07	874	0.57	1	21	< 0.003 ^a	GHE-P-11802
Languedoc								CEMS-3496E
Roussillon								Devine, H.C.
2007								
France	Potatoes	0.07	822	0.56	1	0	< 0.003 ^a	GHE-P-11802
Languedoc	Bea					5	< 0.003 ^a	CEMS-3496H
Roussillon						11	< 0.003 ^a	Devine, 2008
2007						15	< 0.003 ^a	
						21	< 0.003 ^a	
Germany	Prinzess	0.07	740	0.53	2	< 0	< 0.003 ^a	GHE-P-11534
Motterwitz			776	0.55		0	< 0.003 ^a	690231A
2006						7	< 0.003 ^a	Livingstone, 2008
						14	< 0.003 ^a	
						21	< 0.003 ^a	
						28	< 0.003 ^a	
Hungary	Desiree	(0.067)	822	0.55	1	0	< 0.003 ^a	N232
Fejer		. ,				5	< 0.003 ^a	GHE-P-11802
2007						10	< 0.003 ^a	CEMS-3496B
						15	< 0.003 ^a	Devine, 2008
						21	< 0.003 ^a	
Italy	Agata	(0.16)	598	1.0	2	< 0	< 0.01	GHE-P-9445
Emilia	C	, í	598			0	< 0.01	000208B
Romagna						3	< 0.002 ^a	Doran. and Clements, 2002
2000						7	< 0.002 ^a	,
						10	< 0.002 ^a	
						14	< 0.002 ^a	
Italy	Primura	(0.067)	600	1.0	2	< 0	< 0.01	GHE-P-9445
Emilia		(583	0.99		0	< 0.01	000208A
Romagna						3	$< 0.002^{a}$	Doran, and Clements, 2002
2000						7	$< 0.002^{a}$	
						10	< 0.002 ^a	

Table 49 Results of supervised trials conducted with chlorpyrifos methyl in potatoes

. Country	Variety	Applicat	ion			PHI	Residues	Report No.
Region		kg ai/hL	L/ha	kg ai/ha	No	(days)	(mg/Kg)	Trial No.
Year				-				Reference
						14	< 0.002 ^a	
Italy	Hermes	0.04	628-	0.23-	2	15	$\leq 0.002^{a}$ (2)	GHE-P-10491
Lobardia			580	0.25				682901A
2003								Wardman, 2004
Italy	Potatoes	(0.067)	767	0.52	1	0	< 0.003 ^a	GHE-P-11802
Emilia	Primura					5	< 0.003 ^a	CEMS-3496J
Romagna						9	< 0.003 ^a	Devine, 2008
2007						14	< 0.003 ^a	
						21	< 0.003 ^a	
Italy	Potatoes	0.07	790	0.54	1	21	< 0.003 ^a	GHE-P-11802
Emilia	Agata							CEMS-3496G
Romagna								Devine, 2008
2007								
Poland	Irga	0.07	790	0.56	2	0	< 0.003 ^a	N224
Rozbity			823	0.59		21	< 0.003 ^a	GHE-P-11534
Kamien						28	< 0.003 ^a	690231B
2006								Livingstone, 2008
Poland	Pasat	0.07	807	0.54	1	20	< 0.003 ^a	GHE-P-11802
Wielkopolska								CEMS-3496A
2007								Devine, 2008
Spain	Fabula	0.07	788	0.56	2	0	< 0.003 ^a	GHE-P-11535
Andulucia			763	0.54		21	< 0.003 ^a	690247B
2006						28	< 0.003 ^a	Livingstone, 2008
Spain	Martina	0.07	819	0.56	1	21	< 0.003 ^a	GHE-P-11802
Valencia								CEMS-3496F
2007								Devine, 2008
Spain	Potatoes	0.07	795	0.54	1	0	< 0.003 ^a	GHE-P-11802
Albacete	Mona Lisa					5	< 0.003 ^a	CEMS-3496I
2007						10	< 0.003 ^a	Devine, 2008
						14	$\leq 0.003^{a}$	
						20	< 0.003 ^a	
United	Maris Piper	0.07	803	0.57	2	< 0	< 0.003 ^a	GHE-P-11534
Kingdom			804			0	< 0.003 ^a	690231C
Essex						7	< 0.003 ^a	Livingstone, 2008
2006						14	< 0.003 ^a	
						21	< 0.003 ^a	
						27	< 0.003 ^a	
United	Pentland Dell	0.07	807	0.54	1	0	< 0.003 ^a	GHE-P-11802
Kingdom						5	< 0.003 ^a	CEMS-3496D
Staffordshire						10	< 0.003 ^a	Devine, 2008
2007						15	< 0.003 ^a	
						21	< 0.003 ^a	

Sugar Beet

A total of four trials conducted in Southern Europe during 2000–2001 were submitted. The results are shown in Table 50.

Country		Applica	tion		PHI		Report No.
Region	Variety	L/ha	kg ai/ha	No.	(days)	Residues (mg/Kg)	Trial No.
Year							Author(s)
Italy	Rio	413	525	1	120	$< 0.002^{a}$	GHE-P-9428
Emilia-Romagna							000198A
2000							Doran. and Clements, 2002
Italy	Bushel	402	513	1	120	$< 0.002^{a}$	GHE-P-9428
Emilia-Romagna							000198B
2000							Doran. and Clements, 2002
Spain	Safrane	504-	460	1	118	$< 0.002^{a}(5)$	GHE-P-9429
Paterna del Campo		539					000197A
2000							Doran. and Clements, 2002
Spain	Khazar	409–	489	1	107	$< 0.002^{a}(2)$	GHE-P-9774
Sevilla		502					680773A
2001							Doran. and Clements, 2002

Table 50 Results of supervised trials conducted with chlorpyrifos methyl in sugar beet root

^a limit of detection (LOD)

Artichoke (Globe)

A total of four trials conducted in Southern Europe during 2000 were submitted. The results are shown in Table 51.

T-1.1. 51 D14-		1 4 1		:41.	-1-1		
Table 51 Results	s of supervised	i triais	conducted	with	chiorpyritos	s metnyi ir	articnoke

Country	Variety	Application	on	_	PHI	Residues	Report No.
Region		L/ha	kg ai/ha	No. of	(days)	(mg/Kg)	Trial No.
Year				Appl.			Author(s)
Greece	Argitiki	1000	1.0	1	5	0.83, 0.95,	GHE-P-9439
Nauplion	-					1.1, 1.2 (2)	000211A
2000							Doran and Clements 2002
Greece	Argitiki	1000	1.0	1	5	0.36, 0.40	GHE-P-9439
Nauplion	-						000211B
2000							Doran and Clements 2002
Spain	Blanca de	597	1.0	1	0	1.1	GHE-P-9559
Cantillana	Tudela				1	0.37	000002A
2000					3	0.18	Doran and Clements 2002
					5	0.10	
Spain	Teramo	576	0.98	1	0	1.6	GHE-P-9559
Toscana					1	0.56	000002B
2000					3	0.16	Doran and Clements 2002
					5	0.11	

Cereals—post-harvest use

Twenty four trials were conducted in Europe with a post-harvest use of chlorpyrifos-methyl in barley and wheat submitted. The results are shown in Table 52.

Table 52 Results	of post harv	est supervised	trials conducted	with chlorpyrife	os methyl in barley
	1	1		1,2	5 5 5

Country Region Year	Crop Variety	Application g ai/tonne seed	PHI (days)	Residues (mg/Kg)	Trial No. Author(s) Reference
France	Barley Winter	5	0	2.6	GHE-P-11536
Rhone-Alpes	Caravan		31	2.9	690252A
2006			62	2.6	Livingstone, 2008

Country	Crop	Application	PHI	Residues	Trial No.
Region	Variety	g ai/tonne seed	(days)	(mg/Kg)	Author(s)
Year					Reference
			98	3.3	
			181	3.2	
Poland	Barley Winter	5	0	6.2	GHE-P-11536
Siedlce	Prestige		29	5.3	690252D
2006			99	10	Livingstone, 2008
			121	8.5	
			182	6.7	
Spain	Barley Winter	5	0	2.9	GHE-P-11536
Lleida	Kulma		29	1.9	690252B
2006			59	1.1	Livingstone, 2008
			89	1.5	
			179	<u>1.6</u>	
United Kingdom	Barley Puffin	2.5	0	1.9	GHE-P-4372
King's Lynn			7	2.0	R94-079A
1994			28	1.7	Khoshab and Bolton 1995
			91	1.3	
			181	1.0	
United Kingdom	Barley Puffin	4.5	0	3.7	GHE-P-4372
King's Lynn			7	3.6	R94-079A
1994			28	2.6	Khoshab and Bolton 1995
			91	<u>1.9</u>	
			181	1.8	
United Kingdom	Barley Puffin	2.5	0	1.9	GHE-P-4372
King's Lynn			7	2.0	R94-079A
1994			28	1.4	Khoshab and Bolton 1995
			91	1.2	
			181	0.88	
United Kingdom	Barley Puffin	4.5	0	3.7	GHE-P-4372
King's Lynn			7	3.9	R94-079A
1994			28	3.2	Khoshab and Bolton 1995
			91	2.3	
			181	1.9	
United Kingdom	Barley Winter	5	< 0	< 0.01	GHE-P-11006
Derbyshire	Cellar		0	3.2	CEMS-2305A
2004			32	2.8	Rawle, 2006.
			60	3.3	
			95	<u>3.2</u>	
			182	2.8	
United Kingdom	Barley Winter	5	< 0	0.03	GHE-P-11006
Derbyshire	Adoms		0	3.6	CEMS-2305B
2004			31	3.1	Rawle, 2006
			59	3.0	
			94	<u>3.0</u>	
			181	2.4	
United Kingdom	Barley Winter	5	< 0	< 0.01	GHE-P-11006
Derbyshire	Chalice		0	3.9	CEMS-2305C
2004			31	2.8	Rawle, 2006
			59	3.2	
			94	2.8	
			181	<u>2.9</u>	
United Kingdom	Barley Winter	5	0	3.2	GHE-P-11006
Derbyshire	Optic		31	3.2	CEMS-2305D
2004			59	2.8	Rawle, 2006
			94	<u>2.6</u>	
			186	2.4	

Region YarVariety vargainone seed (days)(days) (days)(mg/kg) Reference ReferenceUnited Kingdom Essex 2006Barley Winter Pearl503.6GHE.P-11536 (GHE.P-11537 (HE.P.11537)France Rhone-AlpesWheat Winter Del Horn503.0GHE.P-11537 (HE.P.11537)France Rhone-AlpesWheat Winter Del Horn503.0GHE.P-11537 (HE.P.11537)Poland Contal Poland 2006Wheat Winter Nor504.0GHE.P-11537 (HE.P.11537)Poland Contal Poland 2006Wheat Winter Nor504.0GHE.P-11537 (HE.P.11537)Poland Contal Poland 2006Wheat Winter Nor504.0Livingstone, 20082006Sarina292.4600268D (Livingstone, 2008)1213.42006Sarina1824.24.24.22006Sarina1824.24.24.22006Sarina2.502.2GHE.P-4372 (HE.P-4372)2007Sarina71.9Ryd-079B2008Sarina73.0Ryd-079B2009Lyingstone, 20081311.32006Sarina71.9Ryd-079B2007Sarina71.9Ryd-079B2008Sarina73.0Ryd-079B2009Sarina73.0Ryd-079B2009Sarina73.0Ryd-	Country	Crop	Application	PHI	Residues	Trial No.
Year Image of the set of t	Region	Variety	g ai/tonne seed	(days)	(mg/Kg)	Author(s)
United Kingdom Sear. Beley Winer Pearl 5 0 3.0 GHE-P-11536 600252C 2006 1 2.7 600252C 12 2006 181 2.7 600252C 181 2.7 690252C 690268A 2006 Cap Horn 31 5.2 690268A 2006 Cap Horn 31 5.2 690268A 2006 Kris 29 4.9 690268D 2006 Kris 29 4.9 690268D 2006 121 3.4 1.2 2006 121 3.4 4.2 2006 2.1 1.3 1.1 2006 2.2 GHE-P-11537 600268B 2006 2.9 2.4 600268B 2006 121 3.4 600268B 2006 129 1.6 Khoshab and Boton 1995 121 3.4 1.5 1.5 1.5 121 3.4 1.5 1.5	Year	-	-		-	Reference
Essex 2006 Pearl 30 2.7 600252C 2006 62 2.6 Livingstone, 2008. Prance Wheat Winter 5 0 3.0 GHE-P-11537 Rhome-Alpes Cap Horn 31 3.2 690268A 2006 98 3.0	United Kingdom	Barley Winter	5	0	3.6	GHE-P-11536
2006 91 2.6 Livingstone, 2008. 91 2.7 181 3.1 France Wheat Winter 5 0 3.0 GHE.P.11537 Rhome-Alpes Cap Horn 5 0 3.0 GHE.P.11537 Rhome-Alpes Cap Horn 5 0 4.9 G00268A 2006 Kris 5 0 4.9 G00248D 2006 Kris 29 4.9 G00248D 208 2006 Sarina 5 0 1.1 Livingstone, 2008 201 A.1 4.2 - - - Spain Wheat Winter 5 0 3.0 GHE-P-11537 Catalunya Sarina Sarina 29 2.4 G00268B 2006 Sarina 2.5 0 2.2 GHE-P-1372 King's Lynn Pi 1.5 - 1.5 - 1994 2.5 0 3.7 GHE-P-4372	Essex	Pearl		30	2.7	690252C
91 2.7 181 3.0 GHE-P-11537 Rhone-Alpes Cap Horn 31 3.2 690268A 2006 98 3.0 GHE-P-11537 Ceap Horn 5 0 4.9 GHE-P-11537 Cond Doland Wheat Winter 5 0 4.9 GHE-P-11537 Contal Poland Kris 29 4.0 Livingstone, 2008 121 2006 Sarina Sarina 29 2.4 690268B 690268B 2006 Sarina Sarina 29 2.4 690268B 690268B 2006 131 3.4 121 3.4 690268B 690268B 2006 179 1.9 Livingstone, 2008 16 181 1.3 United Kingdom Wheat Riband 2.5 0 2.2 GHE-P-4372 King's Lynn Wheat Riband 4.5 0 3.7 GHE-P-4372 King's Lynn Wheat Riband 4.5 0 3.	2006			62	2.6	Livingstone, 2008.
Image France Rhone-Alpes 2006Weat Winter Cap HornImage SImage SImage SImage SImage SImage SImage SImage SImage 				91	2.7	
France (abc) Wheat Winter (abc) S 0 3.0 CHE-P-11537 Rhome-Alpes Cap Hom S 62 2.9 Livingstone. 2008 98 3.0 181 2.7 C Poland Wheat Winter S 0 4.9 CHE-P-11537 Contal Poland Kris 29 4.0 Livingstone. 2008 2006 121 3.4 121 3.4 Spain Wheat Winter S 0 3.0 CHE-P-11537 Calulanya Sarina 29 2.4 690268B 690268B 2006 Sarina 29 2.1 Livingstone. 2008 181 United Kingdom Wheat Riband 2.5 0 2.2 CHE-P-4372 King's Lym Pi1 1.5 11 1.5 11 1.5 1994 .5 0 3.7 CHE-P-4372 181 1.2 United Kingdom Wheat Riband 4.5 0 3.7 CHE-P-437				181	<u>3.1</u>	
Rhone-Alpes 2006 Cap Horn 31 3.2 60268A 2006 181 2.7 Livingstone, 2008 7 181 2.7 60268D 2006 4.9 60268A 600268D 2006 4.9 60268D 600268D 2006 181 2.7 600268D 2006 121 3.4 121 2006 121 3.4 121 3.4 2006 22 2.4 600268B 600268B 2006 129 1.4 Livingstone, 2008 2010 1.9 1.4 1.4 1.4 2020 2.4 690268B 600268B 1.5 2010 1.9 1.6 1.5 1.6 United Kingdom Wheat Riband 2.5 0 2.2 GHE-P-4372 193 1.5 1.5 1.5 1.5 1.5 United Kingdom Wheat Riband 4.5 0 2.2 GHE-P-4372	France	Wheat Winter	5	0	3.0	GHE-P-11537
2006 9 6.2 2.9 Livingstone, 2008 96 and Cental Poland 2006 Wheat Winter Kris 5 0 4.9 GHE-P-11537 2014 5 0 4.9 602068D 2006 12 3.4 12 12 2006 2007 2008 2008 12 12 Spain Catalunya Sarina 5 0 3.0 GHE-P-11537 2006 20 2.4 602068B 12 12 2006 29 2.4 602068B 12 12 2006 20 2.4 602068B 12 12 100100 Wheat Riband 2.5 0 2.2 GHE-P-4372 1994 19 2.5 0 3.7 GHE-P-4372 1994 19 2.5 0 2.2 R04-079B 1994 2.5 0 2.2 GHE-P-4372 1994 2.5 0 2.2 R04-079B <	Rhone-Alpes	Cap Horn		31	3.2	690268A
98 3.0 181 2.7 Poland Cental Poland 2006 Wheat Winter Kris 5 0 4.9 GHE-P-11537 29 4.9 690268D 121 3.4 2006 121 3.4 122 3.4 Spain Catalunya 2006 Wheat Winter Sarina 5 0 3.0 GHE-P-11537 Spain Catalunya 2006 Sarina 5 0 3.0 GHE-P-11537 Catalunya 2006 Wheat Riband King's Lynn 1994 2.5 0 2.4 690268B 199 1.6 179 1.9 R94-079B 1994 2.5 0 2.2 GHE-P-4372 1994 1.5 1.1 1.3 1.3 1994 2.4 0 3.7 GHE-P-4372 1994 2.5 0 2.2 GHE-P-4372 1994 2.4 1.3 2.4 1.3 1994 2.4 1.3 2.2 GHE-P-4372 191 2.4 1.1 2.	2006			62	2.9	Livingstone, 2008
Deland Cental Poland Cental Poland KrisVeat Winter Kris504.9GHE-P-11537 GHE.P-115372006Kris503.0GHE-P-11537 GHE.P-11537Spain Catalunya SarinaWheat Winter Sarina503.0GHE-P-11537 GHE.P-11537Spain Catalunya SarinaSarina503.0GHE-P-11537 GHE.P-11537Zob6Sarina502.2GHE-P-11537 GHE.P-4372United Kingdom HynnWheat Riband2.502.2GHE-P-4372 RP4-079B1994Veat Riband2.503.7GHE-P-4372 RP4-079B1994Wheat Riband4.503.7GHE-P-4372 RP4-079B1994Wheat Riband4.503.7GHE-P-4372 RP4-079B1994Wheat Riband4.503.7GHE-P-4372 RP4-079B1994Wheat Riband2.502.2R94-079B R94-079B1994Wheat Riband4.503.7GHE-P-4372 R94-079B1994Wheat Riband4.503.7GHE-P-4372 R94-079B1994Sarina121212United Kingdom Wheat Riband4.503.7GHE-P-4372 R94-079B1994Sarina121212United Kingdom Winer4.503.7GHE-P-4372 R94-079B1994Sarina121212United Kingdom Winer Winer50 <td></td> <td></td> <td></td> <td>98</td> <td><u>3.0</u></td> <td></td>				98	<u>3.0</u>	
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2006 99 4.0 Livingstone, 2008 3pain Wheat Winter 5 0 3.4 Spain Sarina 5 0 3.0 GHE-P-11537 Catalunya Sarina 5 0 2.2 CHE-P-11537 2006 179 1.9 Livingstone, 2008 10 2006 179 1.9 CHE-P-11537 10 1994 199 1.5 10 2.2 CHE-P-4372 King's Lynn 2.5 0 2.2 CHE-P-4372 194 1.5 1.5 Khoshab and Bolton 1995 191 1.5 1.6 Khoshab and Bolton 1995 191 1.5 7 3.0 R94-079B 1994 1.5 0 2.2 CHE-P-4372 191 2.4 1.3 1.3 1.3 192 2.4 1.1 1.3 1.3 1934 2.5 0 2.2 CHE-P-4372 191 1.	Cental Poland	Kris		29	4.9	690268D
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united Kingdom King's Lynn Wheat Riband 2.5 0 2.2 2.8 GHE-P-4372 1994 2.5 0 2.2 7 1.9 R94-079B 1994 2.8 1.6 Khoshab and Bolton 1995 191 1.5 1.5 181 1.3 1.5 United Kingdom King's Lynn Wheat Riband 4.5 0 3.7 GHE-P-4372 1994 7 3.0 R94-079B R94-079B 1994 2.8 3.1 Khoshab and Bolton 1995. 191 2.4 181 2.2 United Kingdom Wheat Riband 2.5 0 2.2 R94-079B 1994 2.8 1.7 Khoshab and Bolton 1995 11.3 1994 1.3 12 11.3 12 United Kingdom Wheat Riband 4.5 0 3.7 GHE-P-4372 King's Lynn 194 1.2 11.3 12 11.3 United Kingdom Wheat Winter 5 0	2006			59	2.1	Livingstone, 2008
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	King's Lynn			7	1.9	R94-079B
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	King's Lynn			7	2.2	R94-079B
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				181	1.2	
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$ \begin{array}{c} \text{Derbyshire} \\ 2004 \\$	United Kingdom	Wheat Winter	5	0	3.0	GHE-P-11005
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$ \begin{array}{c} \mbox{United Kingdom} \\ \mbox{Wilson, Derbyshire} \\ 2004 \\ \mbox{United Kingdom} \\ \mbox{United Kingdom} \\ \mbox{United Kingdom} \\ \mbox{Derbyshire} \\ 2004 \\ \mbox{United Kingdom} \\ \mbox{United Kingdom} \\ \mbox{Derbyshire} \\ 2004 \\ \mbox{United Kingdom} \\ \mbox{United Kingdom} \\ \mbox{Derbyshire} \\ \mbox{2004} \\ \mbox{United Kingdom} \\ United Kingdo$				181	2.5	
Wilson, Derbyshire Claire 41 3.2 CEMS-2304B 2004 69 3.5 Rawle, 2005 104 2.9 104 2.9 101 2.1 69 3.6 69 United Kingdom Wheat Winter 5 0 3.6 69 Derbyshire Biensur 33 3.3 $CEMS-2304C$ 2004 61 3.3 $Rawle, 2005$ 96 3.1 183 3.1	United Kingdom	Wheat Winter	5	8	3.9	GHE-P-11005
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Image: Mark Mark Mark Mark Mark Mark Mark Mark				104	2.9	
United Kingdom Wheat Winter 5 0 3.6 GHE-P-11005 Derbyshire Biensur 33 3.3 CEMS-2304C 2004 61 3.3 Rawle, 2005 96 3.1 3.1				191	2.1	
Derbyshire Biensur 33 3.3 CEMS-2304C 2004 61 3.3 Rawle, 2005 96 <u>3.1</u> 183 3.1	United Kingdom	Wheat Winter	5	0	3.6	GHE-P-11005
2004 61 3.3 Rawle, 2005 96 3.1 183 3.1	Derbyshire	Biensur		33	3.3	CEMS-2304C
$ \begin{array}{ccc} 96 & \underline{3.1} \\ 183 & 3.1 \end{array} $	2004			61	3.3	Rawle, 2005
183 3.1				96	3.1	
				183	3.1	

Country	Crop	Application	PHI	Residues	Trial No.
Region	Variety	g ai/tonne seed	(days)	(mg/Kg)	Author(s)
Year					Reference
United Kingdom	Wheat Winter	5	0	3.4	GHE-P-11005
Derbyshire	Hereward		32	3.4	CEMS-2304D
2004			60	2.6	Rawle, 2005
			95	2.7	
			182	3.2	
United Kingdom	Wheat Winter	5	0	3.8	GHE-P-11537
Essex	X119		30	3.0	690268C
2006			62	3.1	Livingstone, 2008
			91	3.2	
			181	3.0	

Corn/Maize

A total of eight trials conducted in Southern Europe during 2000–2007 were submitted. The results are shown in Table 53.

Table 53 Results of supervised trials conducted with chlorpyrifos methyl in maize grain (Report No. GHE-P-11806; Marshall, 2008)

Country		Applicatio	on		PHI	Residues	
Region, year	Variety	L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Trial No.
France, Midi-Pyrenees	Galactic	403	0.91	1	93	< 0.003 ^a	CEMS-3500A
France, Languedoc-Roussillon	PR 35465	417	0.94	1	85	< 0.003 ^a	CEMS-3500D
France Languedoc-Roussillon	Anvil ST	417	0.94	1	56	< 0.003 ^a	CEMS-3500E
Italy, Piemont	KVS Kandal	410	0.92	1	101	< 0.003 ^a	CEMS-3500C
Italy, Piemonte	DKC 5783	395	0.84	1	93	< 0.003 ^a	CEMS-3500H
Spain, Albacete	Factor	426	0.96	1	22	< 0.003 ^a	CEMS-3500B
Spain, Albacete	N-K Factor	400	0.91	1	22	< 0.003 ^a	CEMS-3500F
Spain, Albacete	Milty	391	0.89	1	23	< 0.003 ^a	CEMS-3500G

^a limit of detection (LOD)

Cotton seed

A total of 12 trials conducted in Southern Europe during 2006–2007 were submitted. The results are shown in Table 55.

Table 55 Results of supervised trials conducted with chlorpyrifos methyl in cotton seed

Country	Variety	Applicati	plication		PHI	Residues	Report No., Trial No.
Region, Year		L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Author(s)
Greece	Kampo	604	0.68	2	29	< 0.003 ^a	GHE-P-11530, 690184A
Epanomi, 2006		595	0.67		42	< 0.003 ^a	Livingstone, 2008
Greece	Kampo	600	0.68	2	29	< 0.003 ^a	GHE-P-11530, 690184C
Epanomia, 2006		605			42	< 0.003 ^a	Livingstone, 2008
Greece	Celia	522	0.71	1	0	0.37	GHE-P-11799
Thessaloniki					5	0.01	CEMS-3493E
2007					9	0.02	Devine, 2008
					14	< 0.01	
Greece	Celice	498	0.68	1	0	0.53	GHE-P-11799
Pella					5	0.02	CEMS-3493F
2007					10	< 0.01	Devine, 2008

Country	Variety	Application		PHI	Residues	Report No., Trial No.	
Region, Year		L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Author(s)
					14	0.02	
Greece	Celia	506	0.69	1	14	< 0.003 ^a	GHE-P-11799, CEMS-3493A
Thessaloniki, 2007							Devine, 2008
Greece	Volcano	507	0.69	1	14	< 0.01	GHE-P-11799, CEMS-3493B
Pella, 2007							Devine, 2008
Spain	Hermes	602	0.72	2	28	< 0.003 ^a	GHE-P-11530, 690184B
Andalucia, 2006		605			54	< 0.01	Livingstone, 2008
Spain	Celia	597	0.71-	2	8	< 0.003 ^a	GHE-P-11530, 690184D
Andalucia, 2006		603	0.72		56	< 0.01	Livingstone, 2008
Spain	Lider	503	0.69	1	14	< 0.01	GHE-P-11799, CEMS-3493C
Andalucia, 2007							Devine, 2008
Spain	Julia	503	0.69	1	14	< 0.003 ^a	GHE-P-11799, CEMS-3493D
Andalucia, 2007							Devine, 2008
Spain	Celia	506	0.69	1	0	< 0.01	GHE-P-11799
Andalucia					5	0.02	CEMS-3493G
2007					9	0.03	Devine, 2008
					14	0.02	
Spain	Bravo	502	682	1	0	0.01	GHE-P-11799
Andalucia					5	0.01	CEMS-3493H
2007					11	< 0.01	Devine, 2008
					14	< 0.01	

Oilseed Rape

A total of 16 trials conducted in Central, Northern and Southern Europe during 2006–2007 were submitted. The results are shown in Table 56.

Table 56 Results of supervi	ed trials conducted	l with chlorpyrifos	methyl in oil s	eed rape
1		12	~	1

Country	Variety	Application		PHI	Residues	Report No., Trial No.	
Region, Year		L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Author(s)
France-North	Winter	623	0.49	1	89	< 0.01	GHE-P-11531, 690205A
Pas de Calais, 2006	Pollen						Livingstone, 2007
France-South	Winter	620	0.49	1	94	< 0.002 ^a	GHE-P-11532, 690210B
Rhone-Alpes, 2006	oilseed						Livingstone, 2007
	Exocet						
France-North	Winter	577	0.43	1	75	< 0.003 ^a	GHE-P-11800, CEMS-3494A
Alsace, 2007	Grizzly						Devine, H.C.
France-South	Winter	611	0.46	1	82	< 0.003 ^a	GHE-P-11800, CEMS-3494E
Languedoc Roussillon, 2007	Corail						Devine, 2007
France-South	Winter	601	0.45	1	82	< 0.003 ^a	GHE-P-11800, CEMS-3494H
Roussillon, 2007	Stardart						Devine, 2007
Germany	Winter	560	0.44	1	105	< 0.003 ^a	GHE-P-11531, 690205D
Brandenburg, 2006	NK Fair						Livingstone, 2007
Germany	Winter	598	0.45	1	93	< 0.003 ^a	GHE-P-11800, CEMS-3494D
Brandenburg, 2007	Titan						Devine, 2007
Greece	Winter	595	0.45	1	51	< 0.003 ^a	GHE-P-11800, CEMS-3494G
Thessaloniki, 2007	Lycodor						Devine, 2007
Greece	Spring	599	0.45	1	50	< 0.003 ^a	GHE-P-11800, CEMS-3494J
Kilkis, 2007	Lycodor						Devine, 2007
Poland	Spring	603	0.48	1	99	< 0.003 ^a	GHE-P-11531, 690205C
2006	Heros						Livingstone, 2007
Poland	Winter	637	0.48	1	91	0.02	GHE-P-11800, CEMS-3494C
Wielkopolska, 2007	Californium						Devine, 2007

Country	Variety	Application			PHI	Residues	Report No., Trial No.
Region, Year		L/ha	kg ai/ha	No.	(days)	(mg/Kg)	Author(s)
Spain Lleida, 2006	Spring Oban	602	0.48	1	120	< 0.002 ^a	GHE-P-11532, 690210A Livingstone, 2007
Spain Valencia, 2007	Spring Tracia	654	0.49	1	54	< 0.003 ^a	GHE-P-11800, CEMS-3494F Devine, 2007
Spain Cuenca, 2007	Spring Tracia	603	0.45	1	31	< 0.01	GHE-P-11800, CEMS-3494I Devine, 2007
United Kingdom, Essex, 2006	Winter Winner	570	0.45	1	90	< 0.003 ^a	GHE-P-11531, 690205B Livingstone, 2007
United Kingdom Derbyshire, 2007	Spring Apex	601	0.45	1	85	< 0.01	GHE-P-11800, CEMS-3494B Devine, 2007

Animal feed

In a total of 51 trials conducted in corn/maize, cotton, rape seed and sugar beet, samples destined as feed for animal consumption were collected and analysed. The results are shown in Tables 57 to 60.

Country	Variety	Application			Portion	PHI	Residues	Report No.
Region		L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
Year			C		-			Reference
France	Quartal	222	1.0	1	Cob	90	$< 0.002^{a}(2)$	GHE-P-9443
Larra	-				Stover	90	$< 0.002^{a}(2)$	000212A
2000					Whole plant	56	$< 0.002^{a}(2)$	Doran &Clements, 2002
France	Cecilia	250	1.0	1	Cob	88	$< 0.002^{a}(2)$	GHE-P-9443
Savenes					Stover	88	$< 0.002^{a}(2)$	000212B
2000					Whole plant	52	$< 0.002^{a}(2)$	Doran &Clements, 2002
France	604	301	0.56	2	Cob	< 0	< 0.002 ^a	GHE-P-10991
Meauzac		301				0	0.02	CEMS-2290B
2004						7	< 0.01	Rawle, 2005
						14	< 0.01	
						21	< 0.01	
						28	< 0.01	
					Stover	< 0	$< 0.002^{a}$	
						0	11	
						7	0.8	
						14	0.41	
						21	0.12	
						28	0.07	
France	Maize604	301	0.56	1	Whole plant	< 0	$< 0.002^{a}$	GHE-P-10991
Meauzac						0	15	CEMS-2290B
2004						7	0.09	Rawle, 2005
						14	0.01	
						21	< 0.01	
						28	< 0.002 ^a	
France	Merci	303	0.56	2	Cob	28	$< 0.002^{a}$	GHE-P-10991
Lizac		298			Stover	28	0.04	CEMS-2290C
2004								Rawle, 2005
France	Merci	303	0.57	1	Whole plant	28	< 0.002 ^a	GHE-P-10991
Lizac								CEMS-2290C
2004								Rawle, 2005
France	DK315	742	0.54-	2	Cob	29	< 0.003 ^a	N205
Rhone-Alpes		810	0.59		Stover	29	0.13	GHE-P-11217
2005								686948A
								Livingstone, 2006

Table 57 Results of supervised trials conducted with chlorpyrifos methyl in corn/maize
Country	Variety	Applicati	on		Portion	PHI	Residues	Report No.
Region Year		L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No. Reference
France Rhone-Alpes 2005	DK315	742	0.54	1	Whole plant	28	0.01	GHE-P-11217 686948A Livingstone, 2006
France Rhone-Alpes 2005	DK5050	823 880	0.60– 0.64	2	Cob Stover Whole plant	29 29 < 0 0 7 14 21	< 0.003 ^a 1.5 0.10 6.7 0.22 1.4 0.76	GHE-P-11217 686948D Livingstone, 2006
France Rhone-Alpes 2005	DK5050	823	0.60	1	Whole plant	0 7 14 21 28	1.7 1.04 0.16 0.30 0.05	GHE-P-11217 686948D Livingstone, 2006
France Midi-Pyrenees 2007	Galactic	403	0.91	1	Rest of plant	93	0.01	GHE-P-11806 CEMS- 3500A Marshall, 2008
France Languedoc- Roussillon 2007	PR 35465	417	0.94	1	Rest of plant	85	< 0.01	GHE-P-11806 CEMS- 3500D Marshall, 2008
France Languedoc- Roussillon 2007	Anvil ST	417	0.94	1	Rest of plant Silage Whole plant	56 29 0 5 11 14	0.02 0.03 29 0.39 0.04 0.03	GHE-P-11806 CEMS- 3500E Marshall, 2008
Italy Emilia- Romagna 2000	Belgrano	613	1.0	1	Cob Stover Whole plant	113 113 0 31 84	< 0.002 ^a < 0.002 ^a 31 < 0.002 ^a 0.04	GHE-P-9440 000213A Doran &Clements, 2002
Italy Lombardia 2000	Aliseo	611	1.0	1	Cob Stover Whole plant	113 113 0 31 79	< 0.002 ^a < 0.01 18 < 0.01 < 0.002 ^a	GHE-P-9440 000213B Doran &Clements, 2002
Italy Bologna 2004	PR 34 FO2	309 305	0.57– 0.58	2	Cob Stover	28 28	< 0.002 ^a 0.04	GHE-P-10991 CEMS-2290D Rawle, 2005
Italy Bologna 2004	PR 34 FO2	309	0.58	1	Whole plant	28	< 0.002 ^a	GHE-P-10991 CEMS-2290D Rawle, 2005
Italy Lombardia 2005	DKC6530	837 759	0.55– 0.61	2	Cob Stover	28 28	< 0.003 ^a < 0.003 ^a	GHE-P-11217 686948B Livingstone, 2006
Italy Lombardia 2005	DKC6530	837	0.61	1	Whole plant	28	< 0.003 ^a	GHE-P-11217 686948B Livingstone, 2006
Italy Piemonte 2007	KVS Kandal	410	0.92	1	Rest of plant	101	< 0.003 ^a	GHE-P-11806 CEMS- 3500C Marshall, 2008
Italy Piemonte, 2007	DKC 5783	395	0.84	1	Rest of plant Silage Whole plant	93 61 0 5	< 0.003 ^a < 0.003 ^a 8.6 0.13	GHE-P-118061 CEMS-3500H Marshall, 2008

Country	Variety	Applicat	ion		Portion	PHI	Residues	Report No.
Region		L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
Year			C					Reference
						10	0.04	
						15	0.01	
Spain	Dekalb	299	0.56	2	Cob	< 0	$< 0.002^{a}$	GHE-P-10991
Calatorao	DKC 6575	301				0	< 0.01	CEMS-2290A
2004						7	$< 0.002^{a}$	Rawle, 2005
						14	$< 0.002^{a}$	
						21	$< 0.002^{a}$	
						28	$< 0.002^{a}$	
					Stover	< 0	< 0.002 ^a	
						0	2.6	
						7	0.15	
						14	0.07	
						21	0.03	
						28	0.02	
Spain	Dekalh	200	0.56	1	Whole plant	< 0	$< 0.02^{a}$	GHF_P_10991
Calatorao	DKC 6575	277	0.50	1	whole plane	0	15	CFMS-2290A
2004						7	0.02	Rawle 2005
2001						14	< 0.02	Kuwie, 2005.
						21	< 0.01	
						21	$< 0.01^{a}$	
Spain	Oboe	813	0.59	2	Cob	28	< 0.002	GHE_P_11217
Spain Catalunya	Obbe	8/3	0.39 - 0.62	2	Stover	28	< 0.003	686048C
2005		045	0.02		Whole plant	20	$\sim 0.02^{a}$	Livingstone 2006
2005					whole plant		0.52	Livingstone, 2000
						7	0.33	
						14	0.24	
						21	< 0.04	
Spain	Ohoa	Q13	0.50	1	Whole plant	0	12	СНЕ Р 11217
Catalunya	0000	015	0.59	1	whole plant	7	0.02	6860480
2005						14	0.02	Livingstone 2006
2005						21	< 0.01	Livingstone, 2000
						21	0.02	
Spain	Factor	126	0.06	1	Post of plant	27	0.52	CHE D 11806 CEMS
Albacete	Pactor	420	0.90	1	Rest of plain	22	0.55	3500B
2007								Marshall 2008
2007 Spain	N K Easter	400	0.01	1	Post of plant	22	1.0	CHE D 11806 CEMS
Albaaata	IN-K Factor	400	0.91	1	Silago	0	1.0	3500F
Albacele					Whole plant	0	17	Marshall 2008
2007					whole plant	5	11	Warshan, 2000
						J 11	2.5	
						11	5.9 0.45	
Spain	Milta	201	0.80	1	Doct of plant	1.5	0.45	CUE D 11904
	winty	391	0.89	1	Rest of plant	23	0.15	CEMS 2500C
Albacete					Silage	0	0.8	CEMIS-3500G
2007					whole plant	0	ð.1 0.26	warshall, 2008
						5	0.50	
						9	0.35	
						15	0.31	

Country		Applic	Application		Portion	PHI	Residues	Report No.
Region	Variety	L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No.
Year								Author(s)
Greece	Kampo	604	0.68	2	Whole plant	< 0	0.43	GHE-P-11530
Epanomi,		595	0.67			0	34	690184A
2006						7	1.5	Livingstone, 2008
						14	1.6	
Spain	Hermes	602	0.72	2	Whole plant	< 0	0.44	GHE-P-11530
Andalucia,		605				0	12	690184B
2006						7	1.5	Livingstone, 2008
						14	0.86	

Table 58 Results of supervised trials conducted with chlorpyrifos methyl in cotton animal feed

Table 59 Results of supervised trials conducted with chlorpyrifos methyl in rape animal feed

Country	Variety	Applic	ation		Portion	PHI	Residues	Report No.
Region Year		L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No. Author(s)
France-North Pas de Calais 2006	Winter Pollen	623	0.49	1	Straw Whole plant	89 0 26 53 80	< 0.003 ^a 10 0.03 < 0.003 ^a < 0.003 ^a	GHE-P-11531 690205A Livingstone, 2007
France-South Rhone-Alpes, 2006	Winter oilseed Exocet	620	0.49	1	Straw	94	< 0.002 ^a	GHE-P-11532 690210B Livingstone, 2007
France-North Alsace 2007	Winter Grizzly	577	0.43	1	Rest of plant	75	< 0.003 ^a	GHE-P-11800 CEMS-3494A Devine, H.C.
France-South Roussillon 2007	Winter Corail	611	0.46	1	Rest of plant	82	0.04	GHE-P-11800 CEMS-3494E Devine, 2007
France-South Roussillon 2007	Winter Stardart	601	0.45	1	Rest of plant Whole plant	82 0 3 7 14 20 27	< 0.003 ^a 3.4 0.58 0.10 0.02 0.03 < 0.01	GHE-P-11800 CEMS-3494H Devine, 2007
Germany Brandenburg 2006	Winter NK Fair	560	0.44	1	Straw	105	< 0.01	GHE-P-11531 690205D Livingstone, 2007
Germany Brandenburg 2007	Winter Titan	598	0.45	1	Rest of plant Whole plant	93 0 3 7 13 20 27	< 0.003 ^a 5.2 1.6 0.31 0.14 0.05 0.08	GHE-P-11800 CEMS-3494D Devine, 2007
Greece Thessaloniki 2007	Winter Lycodor	595	0.45	1	Rest of plant	51	< 0.003 ^a	GHE-P-11800 CEMS-3494G Devine, 2007
Greece Kilkis 2007	Spring Oilseed Rape Lycodor	599	0.45	1	Rest of plant Whole plant	50 0 3 7 14 21	< 0.003 ^a 3.6 0.43 0.12 < 0.003 ^a < 0.003 ^a	GHE-P-11800 CEMS-3494J Devine, 2007

Country	Variety	Applica	ation		Portion	PHI	Residues	Report No.
Region Year		L/ha	kg ai/ha	No.	Analysed	(days)	(mg/Kg)	Trial No. Author(s)
		T		Τ		28	< 0.003 ^a	
Poland 2006	Spring Heros	603	0.48	1	Straw Whole plant	99 0 25 47 71	<0.003 ^a 9.6 <0.003 ^a <0.003 ^a 0.08	GHE-P-11531 690205C Livingstone, 2007
Poland Wielkopolska 2007	Winter Californium	637	0.48	1	Rest of plant	91	< 0.003 ^a	GHE-P-11800 CEMS-3494C Devine, 2007
Spain Lleida 2006	Spring Oban	602	0.48	1	Straw Whole plant	120 0 22 46 68	$< 0.002^{a}$ 16 $< 0.002^{a}$ $< 0.002^{a}$ $< 0.002^{a}$	GHE-P-11532 690210A Livingstone, 2007
Spain Valencia 2007	Spring Tracia	654	0.49	1	Rest of plant	54	0.02	GHE-P-11800 CEMS-3494F Devine, 2007
Spain Cuenca 2007	Spring Oilseed Rape Tracia	603	0.45	1	Rest of plant Whole plant	31 0 3 7 14 21 28	0.02 3.5 0.29 0.04 0.02 0.01 0.03	GHE-P-11800 CEMS-3494I Devine, 2007
United Kingdom, Essex 2006	Winter Winner	570	0.45	1	Straw	90	< 0.003 ^a	GHE-P-11531 690205B Livingstone, 2007
United Kingdom Derbyshire, 2007	Spring Apex	601	0.45	1	Rest of plant Whole plant	85 0 3 7 14 21 28	0.02 6.9 2.3 0.54 0.09 0.01 < 0.01	GHE-P-11800 CEMS-3494B Devine, 2007

Country		Applica	tion		Portion	PHI		Report No.
Region	Variety	L/ha	kg ai/ha	No.	Analysed	(days)	Residues	Trial No.
Year			-			-	(mg/Kg)	Author(s)
Italy	Rio	413	525	1	Тор	120	< 0.002 ^a	GHE-P-9428
Emilia-					Whole plant	0	0.51	000198A
Romagna						30	$< 0.002^{a}$	Doran. and Clements, 2002
2000						60	< 0.002 ^a	
						90	< 0.002 ^a	
Italy	Bushel	402	513	1	Тор	120	< 0.002 ^a	GHE-P-9428
Emilia-					Whole plant	0	1.4	000198B
Romagna						30	< 0.002 ^a	Doran. and Clements, 2002
2000						60	< 0.002 ^a	
						90	$< 0.002^{a}$	
Spain	Safrane	504-	460	1	Leaves	118	$< 0.002^{a}(5)$	GHE-P-9429
Paterna del		539						000197A
Campo,2000								Doran and Clements, 2002

Table 60 Results of supervised trials conducted with chlorpyrifos methyl in sugar beet

Country		Application		Portion	PHI		Report No.	
Region	Variety	L/ha	kg ai/ha	No.	Analysed	(days)	Residues	Trial No.
Year							(mg/Kg)	Author(s)
Spain	Khazar	409–	489	1	Leaves	107	$< 0.002^{a}(2)$	GHE-P-9774
Sevilla		502						680773A
2001								Doran. and Clements, 2002

FATE OF RESIDUES IN PROCESSING

The effect of processing on chlorpyrifos-methyl residues was investigated in oranges, apples, peach, grape, tomato, barley, wheat, maize, cotton and rape seed. When residues in the processed commodity were < LOQ, the LOQ was used to determine the processing factor (PF), and was expressed as below the calculated value. When the residues in the raw commodity was < LOQ and they concentrated in the processed commodity, PF was expressed as higher than the calculated. No PF was calculated when the residues in both the raw and processed commodities were < LOQ.

Residues of total TCP (mg/kg) were reported as TCP. The TCP method involves an alkaline hydrolysis step that would convert any conjugates and parent chlorpyrifos-methyl to TCP.

Oranges

Two processing studies (Reports GHE-P-11003 and GHE-P-11219) on oranges were conducted in Spain during 2004–2005 to determine the residue of chlorpyrifos-methyl and total TCP in whole orange, peel, pulp, juice and essential oil. Two applications of chlorpyrifos-methyl were made to orange trees at a nominal rate of 2.7 kg ai/ha and fruits harvested 21 days after the last application. Orange fruits were washed and juice extracted using an industrial processing machine. The water/oil emulsion with rests of pulp was centrifuged to obtain the essential oil fraction. The raw juice was pasteurised at 85-100 °C for 1–2 min. and immediately cooled down. Residues in the samples are summarized in Table 61.

	GHE-P-110	03, D, 2004		GHE-P-11219			
	Rawle, 2002	2		Old, 2007	Mean		
	СРМ	PF	ТСР	СРМ	PF	ТСР	CPM PF
Whole fruit	0.13	-	0.15	0.24	_	0.23	
Juice	0.01	0.08	0.01	< 0.003 ^a	< 0.012	< 0.003 ^a	0.046
Essential oil	5.2	40	7.6	9.7	40.4	8.3	40.2

Table 61 Processing studies on oranges

^a limit of detection (LOD)

Apples

Three processing studies on apple were conducted in France to determine the residue of chlorpyrifosmethyl and total TCP in whole apple, juice, puree and dry pomace. Two applications of chlorpyrifosmethyl were made to apple trees at a nominal application rate of 0.6 or 0.78 kg ai/ha and processed according to Figure 3. Residues in the samples are summarized on Table 62.



Figure 3 Scheme of the processing of apples to apple juice and puree (GHE-P 10994)

	GHE-P-8643	P-8643 GHE-P-1099		94, D		GHE-P-10995, D			
	Doran and C	craig, 2001	Rawle, 2005			Rawle, 2005			Mean
	СРМ	PF	СРМ	PF	ТСР	СРМ	PF	ТСР	CPM PF
Fruit	0.04	_	0.07	-	0.06	0.02	1	0.02	_
Juice	< 0.002 ^A	< 0.05	< 0.003 ^a	< 0.04	< 0.01	< 0.003 ^a	< 0.15	< 0.01	< 0.08
Pomace wet	0.26	6.5	_	1	-	_	1	-	6.5
Pomace, dried	-	-	0.16	2.29	0.45	0.08	4.0	0.23	3.1
pure	< 0.01	< 0.25	< 0.003 ^a	< 0.04	0.01	< 0.003 ^a	< 0.15	0.01	< 0.15

Table 62 Processing studies on apples

Peaches

One processing trial (Report GHE-P-10992, Rawle, 2005) on peaches was conducted in France during 2004 to determine the residue of chlorpyrifos-methyl and total TCP in whole fruit, juice and dry pomace. Two applications of chlorpyrifos-methyl were made to peach trees at a nominal application rate of 0.833 and 0.904 kg ai/ha. The last application was made 28 days before harvest. The peaches were stoned, crushed and put into an automatic sieve to obtain the juice. Sugar was added to the purée, the purée heated until brix reaches 24%. The pH of the puree was corrected, if necessary, to approximately 3.5 with citric acid and the puree samples put into glass containers and sterilized at 115 to 120 °C for 10 minutes. Residues in the samples are summarised on Table 63.

Table 63	Processing	study on	peaches
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Substrate	Chlorpyrifos methyl (mg/kg)	PF	TCP (mg/kg)
Whole fruit	< 0.01	_	0.02
Juice	< 0.003 ^a	_	0.01
Dried pomace	0.01	< 1	0.23
Puree	< 0.003 ^a	_	0.01

^a limit of detection (LOD)

Grapes

Seven studies on grapes were conducted in France during 2004 to determine the residue of chlorpyrifos-methyl and total TCP in grapes and processing fractions. The field conditions of the trials are shown in Table 41 and the description of the processing procedure on Figure 4. Residues found in the samples are summarised in Table 64a and b.



Figure 4 Scheme of the processing of grapes

Table 64a Processing	studies on grapes
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	GHE-P-8 Doran and Craig, 20	651 1 01	GHE-P-8655 Doran and Craig, 2001		GHE-P-11001, C Rawle, 2006		GHE-P-11 Rawle, 20	002, C 06	GHE-P-11228, A Old, 2006		Mean or median
	СРМ	PF	СРМ	PF	СРМ	PF	CPM	PF	CPM	PF	PF
Grapes	0.02	_	0.01	_	0.01	_	< 0.01	_	< 0.01	_	_
Must	< 0.002 ^a	< 0.1	< 0.002 ^a	< 0.2	< 0.002 ^a	< 0.2	< 0.01, < 0.003 ^A	-	< 0.003 ^A	-	< 0.15
Pomace, wet	0.05	2.5	0.06	6	1	_	_	-	_		4.2
Pomace, dried	_		-		0.03	3	0.08, 0.07	> 8, > 7	0.22	> 22	> 7.5
Wine at bottling	< 0.002 ^a	< 0.1	< 0.002 ^a	< 0.2	< 0.002 ^a	< 0.2	< 0.002 ^a , < 0.003 ^a		< 0.003 ^A		< 0.15
Wine after 4 months	< 0.002 ^a	< 0.1	< 0.002 ^a	< 0.2	< 0.002 ^a	< 0.2	< 0.002 ^a , < 0.003 ^a	_	< 0.003 ^A	_	< 0.15

^a limit of detection (LOD)

	GHE-P-10999, C Rawle, 2005			GHE-P-11000, C Rawle, 2005			Mean CPM	GHE-P- 11001, C, 2004	GHE-P- 11002, C, 2004	GHE-P- 11228, A, 2005
	СРМ	PF	TCP	CPM	PF	TCP	PF	TCP	TCP	TCP
Grapes	< 0.01		0.08	0.11		0.17		0.06	0.04	0.06
Raisins	< 0.002 ^b	-	0.29	< 0.01	< 0.09	0.05	< 0.09	_	_	_
Must	-	-	_	-	_	_	_	< 0.01	$0.06, 0.04^{a}$	0.02
Pomace, dried	_	_	_	-	_	-	_	0.20	0.34, 0.33	0.64
Wine at bottling	_	_	_	_	_	_	_	< 0.01	0.04, 0.03 ^b	0.03
Wine after 4 months	_	_	_	_	_	_	_	< 0.01	0.03, 0.03 ^b	0.04

Table 64b Processing studies on grapes

^a Produced by heating. All other process fractions produced by maceration;

^b limit of detection (LOD)

Tomatoes

Three studies were conducted to determine residues of chlorpyrifos-methyl and TCP in tomatoes and process fractions. The field conditions of the trials are shown in Table 45. The tomatoes were weighed and blanched (plunged into boiling water for one minute maximum then immediately plunged into cool water) and peeled. The proportions of canned tomatoes were two thirds of peeled tomatoes and one third of juice. The peeled tomatoes and juice were filled into glass jars and sterilized at 115 to 120 °C for 10 minutes. Table 65 shows the residues found in the samples analysed

	GHE-P-80 Teasdale,	561, Italy 2000	GHE-P-10988, E, Italy, Rawle, 2005			GHE-P-109 Rawle, 2005	Mean		
	СРМ	PF	CPM	PF	ТСР	СРМ	PF	ТСР	CPM PF
Tomato	0.24	_	0.22	_	0.03	0.17	-	0.15	_
Washed	0.18	0.75	_	_	_	-	-	_	0.75
Canned	< 0.01	< 0.04	_	_	_	< 0.003 ^a	< 0.01	0.03	< 0.025
Juice	< 0.01	< 0.04	< 0.01	< 0.05	0.10	< 0.003 ^a	< 0.01	0.03	< 0.033
Puree	0.11	0.46	-	-	-	0.02	0.09	0.08	0.27

Table 65 Processing studies on tomatoes

^a limit of detection (LOD)

Barley

Two trials (Reports GHE-P-11006 and GHE-P-11536) were conducted during 2004–2006 to determine residues of chlorpyrifos-methyl, TCP and des-methyl chlorpyrifos-methyl in stored malting barley grain and process fractions (malt sprouts, brewing malt, spent grains, brewer's yeast and beer) stored under conditions and practice typical of Northern and Southern European Zones. Chlorpyrifos-methyl was applied to the post-harvest grain, prior to storage in a rotary mixer using hand held trigger application equipment or Hege 14 seed dresser equipment at a nominal rate of 5 g ai/tonne grain. Samples were taken after 0 or 6 months of storage and processed according to Figure 5. Residues of chlorpyrifos-methyl and metabolites found in barley and processing products are shown in Table 66.



Figure 5 Scheme for processing barley

Table 66 Processing studies in barley

	GHE-P-1	1006, Trial	D,	GHE-P-1	1536 Franc	e,		GHE-P-1	1536 Franc	æ,		Mean
	UK 2004,	6 months		0 day stor	age			6 months storage				
	storage											
	CPM	PF	TCP	CPM	PF	TCP	Des-	CPM	PF	TCP	Des-	CPM
							Me				Me	PF
Grain	2.1	-	1.6	2.6	-	1.5	0.03	3.2		2.6	0.52	-
Beer	< 0.002	< 0.001	0.08	< 0.003 ^c	< 0.001	0.10	0.02	< 0.003 ^c	< 0.001	0.10	0.03	< 0.001
	а											
Malt	0.19	0.09	0.89	0.18 ^c	0.07	0.80	0.18	0.28 ^c	0.09	0.96	0.22	0.08
sprouts												
Derooted	0.32	0.16	1.2									
malt												
Spent	0.16	0.08	0.24	0.12 ^b	0.05	0.22	0.03	0.30 ^b	0.09	0.39	0.07	0.06
grains												
Flocs	< 0.002 ^a	< 0.001	0.15									
Yeast	< 0.002	< 0.001	0.68	< 0.003 ^c	< 0.001	0.17	0.04	< 0.003 ^c	< 0.001	0.15	0.04	< 0.001
	а											

^a brewing malt and malt sprouts

^b spent grain including flocs

^c limit of detection (LOD)

Maize

In one processing study conducted in France, the grain treated twice at 0.56 kg ai/ha was processed according to commercial practices to flour and oil (Rawle, 2005; GHE-10991). No residues of chlorpyrifos-methyl (< LOD of 0.002 mg/kg) was detected in maize flour and oil. Residues in grain were not reported.

Wheat

Two trials were conducted during 2004–2006 to determine residues of chlorpyrifos-methyl, TCP and des-methyl chlorpyrifos-methyl in stored wheat grain and process fractions (flour, bran, wholemeal flour, bread and wholemeal bread). The trials took place in UK and Southern France in typical European wheat grain storage areas. Chlorpyrifos methyl was applied to the post-harvest grain, prior to storage in a rotary mixer using hand held trigger application equipment or Hege 14 seed dresser equipment at a nominal rate of 5 g ai/tonne grain (Figure 6). Process fractions were generated immediately after application and after 6 months of storage. Residues found in the samples are shown in Table 67.

	GHE-F 2004, 6	2-11005 5 month	, Trial D s of stor	, UK, age	GHE-P-11537, France, 2006 0 day of storage				GHE-P-11537, France, 2006 6 months storage				
	СРМ	PF	ТСР	Des- Me	СРМ	PF	ТСР	Des- Me	СРМ	PF	ТСР	Des- Me	Mean CPM PF
Grain	3.2	_	2.4	_	3.0	_	2.3	0.03	2.7	_	2.4	0.33	_
White flour	0.70	0.22	0.43	-	0.72	0.24	0.47	0.02	0.59	0.22	0.43	0.08	0.23
White bread	0.27	0.08	0.23	I	0.27	0.09	0.28	0.17	0.21	0.08	0.22	0.21	0.08
Wholemeal flour	2.6	0.8	2.0	_	3.2	1.0	2.2	0.05	3.2	1.2	2.2	0.34	1
Wholemeal bread	1.0	0.33	1.0		2.0	0.65	1.3	0.44	1.2	0.47	1.3	0.42	0.48
Wheat germ	9.6	3.0	9.1	-	2.5	0.83	3.4	1.7	5.0	1.9	4.8	2.5	1.9
Bran	9.3	2.9	9.2	-	9.4	3.1	6.2	0.19	7.8	2.9	6.6	0.95	3

Table 67 Processing studies on wheat treated post harvested with chlorpyrifos-methyl

In one study conducted by Morel (1975; GHE-P 326), wheat grains were treated post harvested at 1.25 to 3.75 g/tonne and samples collected 7 days after treatment were processed. Residues found in the raw and processed commodities are shown in Table 68.

Table 68 Processing studies on wheat treated post harvested with chlorpyrifos-methyl

Rate	Wheat	Flour	PF	Middlings	PF	Bran	PF	Bread	PF
1.25	0.52	0.16	0.31	1.4	2.69	0.96	1.85	0.01	0.02
2.5	0.92	0.22	0.24	2.2	2.39	1.6	1.74	0.01	0.01
3.75	1.0	0.30	0.30	3.3	3.30	2.2	2.20	0.02	0.02
		Mean PF	0.28	Mean PF	2.8	Mean PF	1.9	Mean PF	0.02



Figure 6 Scheme for processing wheat

Cotton

One trial was conducted to determine residues of chlorpyrifos-methyl and TCP in seed and process fractions (pressed cake, raw oil and refined oil) following two applications of chlorpyrifos-methyl at 0.675 kg ai/ha. Seed samples were collected 56 days after the last application and processed according to commercial practices. Residues in samples are summarised on Table 69.

Table 69 Processing studies on cotton treated with	chlorpyrifos-methyl
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Study	Substrate	Chlorpyrifos-methyl (mg/kg)	TCP (mg/kg)
GHE-P-11530, D	Seed	< 0.01	0.025
Spain	Pressed Cake	< 0.003 ^a	0.020
Livingstone, 2008	Raw Oil	< 0.01	0.030
	Refined Oil	< 0.003 ^a	0.025

^a limit of detection (LOD)

Oil Seed Rape

Two studies were conducted to determine residues of chlorpyrifos-methyl and TCP in seed, and process fractions following a single application of chlorpyrifos-methyl at 0.45 kg ai/ha. Seed samples were collected 105 days after the last application and processed according to commercial practices. Residues in seed and processing fractions samples are summarised in Table 70.

Study Report (GHE-P-), Trial, Year	Substrate	Chlorpyrifos-methyl (mg/kg)	Total TCP Residue (mg/kg)
11521 D 2007	Seed	< 0.003 ^a	0.021
11531, D, 2006 Germany	Pressed cake	< 0.01	0.018
Livingstone 2007	Raw oil	< 0.01	< 0.003 ^a
Livingstone, 2007	Refined oil	< 0.003 ^a	0.013
11522 D 2006	Seed	< 0.002 ^a	< 0.01
11552, B, 2000	Pressed cake	< 0.002 ^a	0.025
S France Livingstone 2007	Raw oil	< 0.002 ^a	< 0.003 ^a
Livingstone, 2007	Refined oil	< 0.002 ^a	< 0.003 ^a

Table 70 Processing studies on wheat treated post harvested with chlorpyrifos-methyl

RESIDUES IN ANIMAL COMMODITIES

Farm animal feeding studies

Cattle

In a feeding study conducted by Kuper (1978; GH-C-1161), <u>cows</u> were fed 0, 1, 3, 10, 30, and 100 ppm chlorpyrifos-methyl in the diet starting at the lowest level and increasing the dosage every two weeks. The highest feeding level was followed by a two week period where no chlorpyrifos-methyl was added to the feed. Milk samples from each cow were obtained by combining equal amounts of milk from two successive milkings starting with the evening milking. Samples were taken twice during the first week of feeding at each level and three times the second week. Cream samples were obtained by combining 1.5 gal of milk from each of the three cows at one milking. The composite milk was sampled and then put in a separator. The resulting cream was also sampled. Milk samples were analysed for residues of chlorpyrifos-methyl and TCP using methodology validated for concentrations as low as 0.01 ppm. The results are shown in Table 72.

Table 72 Residues (mean) of chlorpyrifos-methyl and TCP found in composite milk and cream samples

Feeding level		Chlorpyrifos-methy	d	TCP	
ppm	days	milk	cream	milk	cream
3	13	< 0.01	_	< 0.01	_
10	11	-	-	< 0.01	-
	13	< 0.01	-	< 0.01	-
30	9	0.01	0.08	0.01	0.02
	11	0.01	0.09	0.01	0.02
	13	< 0.01	0.06	0.01	0.02
100	9	0.03	0.40	0.04	0.05
	11	0.02	0.26	0.04	0.06
	13	0.02	0.42	0.04	0.05

In another study conducted by Kuper (1978; GH-C 1118), calves were fed rations containing 1, 3, 10, 30 and 100 ppm chlorpyrifos-methyl for 28 days. Tissue samples were analysed for chlorpyrifos-methyl and TCP using GC/FPD (LOQ of 0.01 and 0.05 ppm, respectively). The results are shown in Table 73.

Feed	Chlorpyrifos	-methyl			TCP °			
level, ppm	muscle	liver	kidney	fat	muscle	liver	kidney	fat
1	_	_	_	< 0.01(3)	_	0.07	< 0.05	-
3	_	_	_	0.01, < 0.01 (2)	_	0.15	0.07	_
10	-	-	-	0.02 (2), 0.03	< 0.05	0.44	0.21	< 0.05
30	< 0.01 (3)	< 0.01(3)	< 0.01 (2), 0.01	0.03, 0.05, 0.12	< 0.05	1.2	0.63	0.06
100	< 0.01(3)	< 0.01(3)	0.02, 0.03, 0.05	0.52, 0.59, 0.73	0.08	2.2	1.2	0.08
100 ^a	< 0.01(3)	< 0.01(3)	< 0.01(3)	< 0.01(3)	< 0.05	< 0.05	< 0.05	< 0.05
100 ^b	_	-	_	< 0.01(3)	_	< 0.05	< 0.05	_

Table 73 Average residues of chlorpyrifos-methyl and TCP found in tissues of calves fed chlorpyrifos-methyl for 28 days

^a after seven-day withdrawal from treated feed

^b after 14 days withdrawal from treated feed

^c only the mean values are reported

Swine

Swine were fed rations containing 1, 3, 10, 30 or 100 ppm of chlorpyrifos-methy for 28 days (Kuper and Kutschinski, 1979; GH-C-1233). Tissue samples were analysed for chlorpyrifos-rnethyl and TCP using GC/FPD, validated at 0.01 and 0.05 mg/kg, respectively. The results are shown in Table 74.

Table 74 Average residues of chlorpyrifos-methyl and TCP found in tissues of swine fed chlorpyrifosmethyl for 28 days

Feed	Chlorpyrifos	-methyl			TCP ^a			
level, ppm	muscle	liver	kidney	fat	muscle	liver	kidney	fat
1	< 0.01 (3)	-	_	< 0.01(3)	< 0.05	< 0.05	< 0.05	< 0.05
3	< 0.01(3)	-	_	0.02 (3)	< 0.05	0.05	0.05	< 0.05
10	< 0.01(3)	< 0.01(3)	< 0.01(3)	0.05, 0.06,	< 0.05	0.17	0.14	< 0.05
				0.11				
30	0.03(3)	< 0.01(3)	< 0.01(3)	0.19, 0.22, 0.17	0.08	0.40	0.38	0.06
100	0.14	< 0.01(3)	< 0.01(3)	0.70, 0.62, 0.91	0.23	1.2	1.4	0.22
100 ^a	< 0.01	< 0.01(3)	< 0.01(3)	< 0.01(3)	< 0.05	< 0.05	< 0.05	< 0.05

^a only mean values are reported

Poultry

Chickens were fed rations containing 1, 3, 10, 30 and 100 ppm chlorpyrifos-methyl for 28 days (Kupper, 1978; GH-C-1155). Eggs were collected on alternate days throughout the test and muscle, fat and liver samples were taken at 0, 7 and 14 days after withdrawal from treated feeds and analysed for chlorpyrifos-methyl and TCP using GC/FPD (LOQ of 0.01 and 0.05 mg/kg, respectively). Residue in tissues and eggs are shown in Table 74.

Feed	Chlorpyrifos-methyl				TCP ^f			
level, ppm	muscle	fat	liver	eggs	muscle	fat	liver	eggs
10	< 0.01 (6)	< 0.01(6)	_	< 0.01(6)	< 0.05	_	< 0.05	< 0.05
30	< 0.01(6)	0.01 (5), 0.02	< 0.01(6)	< 0.01(6)	< 0.05	< 0.05	0.05	< 0.05
100	0.01	0.06 (2), 0.07 (2), 0.08, 0.04	< 0.01(6)	0.02	< 0.05	< 0.05	0.05	0.06
100	$< 0.01(6)^{a}$	< 0.01 ^a (6)	< 0.01 ^a (6)	0.01 ^b	< 0.05 ^a	< 0.05 ^a	< 0.05 ^a	< 0.05 ^b
100				< 0.01 ^c			< 0.05 ^e	< 0.05 ^c
100				< 0.01 ^d				< 0.05 ^d

Table 74 Average residues of chlorpyrifos-methyl and TCP found in tissues of chickens fed chlorpyrifos-methyl for 28 days

^a after seven-day withdrawal from treated feed

^b after two-day withdrawal from treated feed

^c after four-day withdrawal from treated feed

^d after six-day withdrawal from treated feed

^e after fourteen-day withdrawal from treated feed

f only mean levels are reported

RESIDUES IN FOOD IN COMMERCE AND CONSUMPTION

Monitoring data of chlorpyrifos-methyl in various crops is available from Working Party on Pesticide Residues (WPPR) annual reports over years 1995 to 2007 (http://www.pesticides.gov.uk), the report of the U.S. Food and Drug Administration's (FDA) on pesticide residue monitoring program over 2004 to 2006 (http://www.cfsan.fda.gov) and the European Commission Staff Working Document on Monitoring of Pesticide Residues over 1996 to 2006 (www.europa.eu.int/comm/food/fvo/specialreports/pesticides_index_en.htm).

APPRAISAL

Chlorpyrifos-methyl, an organophosphate insecticide has been evaluated by the JMPR several times since 1975. The compound was listed at the Thirty-ninth Session of the CCPR for periodic review by the 2009 JMPR for both toxicology and residues. An ADI of 0–0.01 mg/kg bw and a ARfD of 0.1 mg/kg bw was established by the Meeting. The manufacturer submitted data on metabolism of chlorpyrifos-methyl in farm animals and plants, environmental fate, methods of analysis, GAP information, supervised residue trials on citrus, pome fruit, stone fruits, cherries, grapes, strawberries, kiwi fruit, onion, tomato, peppers, sugar beet, potato, carrot, artichoke, green beans, oilseed rape, cotton and cereals, and processing studies on various crops. Additionally, metabolism studies on chlorpyrifos in plants and of TCP and TMP in soils were submitted. The structure of the parent compounds and main metabolites are shown below.

¹⁴ C-labelled	Cl	OXM -	
chlorpyrifos-methyl		Chlorpyrifos- methyl oxon	
(O,O-dimethyl O-	* denotes 14C O	metnyi oxon	ا م
pyridinyl			
phosphorothioate)			

DEM	CI CI	ТСР	
Des-methyl chlorpyrifos-methyl		3,5,6-trichloro- 2-pyridinol	CI N O H
S-methyl isomer		ТМР	CI
chlorpyrifos-methyl		2-methoxy- 3,5,6- trichloropyridin	CI NO
		e	

Animal metabolism

The metabolism of chlorpyrifos-methyl in <u>rats</u> was evaluated by the WHO panel at the present Meeting. The compound was found to be rapidly and extensively absorbed in the rat following a single oral dose (16 or 30 mg/kg bw). Excretion was rapid (largely within 24 hours) and primarily in the urine. Urinary metabolites were identified as the glucuronide conjugate of TCP (68.6%), free TCP (13.8%) and DEM (17.8%). The fate of the phosphorothioate moiety was not investigated.

Two lactating goats were fed [¹⁴C]chlorpyrifos-methyl at 32 mg/kg feed, administered in gelatin capsules, twice a day for 7 days then sacrificed 14 h after the final dose and samples taken. Liver, kidney, fat and milk fat were extracted with acetonitrile (ACN), the extract partitioned with hexane and the ACN layer analysed by radio TLC and HPLC. The non-extracted residue (NER) was subject to base hydrolysis. Recovery was > 91% of administered dose and approximately 95% of recovered radioactivity was in the urine (~22 mg/kg chlorpyrifos-methyl eq.). Highest total radioactive residues (TRR) were found in kidney and liver (0.62 and 0.40 mg/kg chlorpyrifos-methyl eq., respectively). Residues in fat and skeletal muscle were 0.14 and 0.047 mg/kg, respectively. In milk, residues concentrated in milk fat (0.115 mg/kg), with levels over 4 times that found in whole milk. The majority of the residues found in liver and kidney were TCP, 66.7% TRR (0.24 mg/kg) and 74.2% TRR (0.45 mg/kg) respectively. In fat and milk fat, the parent compound was predominant (55.3 and 61.8% TRR, respectively), at levels of 0.06 mg/kg. The S-methyl isomer and DEM were also detected in all matrices, at levels < 10% TRR each. Base extracts of liver and kidney showed no parent compound and only TCP as metabolite (10.56% TRR in liver and 6.8% TRR in kidney). Base extracts of insoluble tissue showed traces of chlorpyrifos-methyl (up to 0.2% TRR), TCP plus Smethyl isomer (up to 9% TRR) and up to 1% TRR of DEM in kidney.

Four <u>laying hens</u> received a daily dose of labelled [¹⁴C]chlorpyrifos-methyl at a dietary intake level equivalent to 25 mg/kg feed for 10 days. The birds were sacrificed approximately 16 h after the tenth dose for tissue collection. Tissue and egg samples were extracted using ACN, the extracts partitioned with hexane and analysed by TLC and HPLC. The unextracted residues in egg yolk and kidney were subjected to base hydrolysis and the extracts analysed by LSC. The majority of the radioactivity (approximately 70% applied radioactivity) was present in the excreta. Radioactivity was low in tissues, exceeding 0.1 mg/kg only in fat (0.07–0.35 mg/kg chlorpyrifos-methyl eq.), kidney (0.09–0.15 mg/kg) and egg yolk (< 0.01–0.10 mg/kg). The highest level in muscle was 0.02 mg/kg. The majority of the residues present in kidney were the TCP (approximately 77% TRR) and DEM metabolites (22% TRR). Fat contained mainly the parent (approximately 75% TRR) and egg yolk contained roughly equal quantities of all three components (16 to 23% TRR).

In summary, chlorpyrifos-methyl is metabolized in goats and hens primarily to TCP (over 60% TRR). Residues concentrated in fat tissue and milk fat. This metabolic pathway was also found in rats.

Plant metabolism

The Meeting received plant metabolism studies with chlorpyrifos-methyl on tomato and cereal grains, and chlorpyrifos on citrus, cabbage, peas and radish.

Structurally, chlorpyrifos (O,O-diethyl O-3,5,6-trichloro-2-pyridinyl phosphorothioate) differs from chlorpyrifos-methyl (O,O-dimethyl O-3,5,6-trichloro-2-pyridinyl phosphorothioate) only in the phosphorothioester moiety, as the first is a diethyl and the second a dimethyl ester. Consequently, knowledge of chlorpyrifos metabolism in plants is useful in determining the relevant residues of chlorpyrifos-methyl, for enforcement purposes.

Chlorpyrifos-methyl

In a tomato study $[{}^{14}C]$ chlorpyrifos-methyl was applied to plants at a rate equivalent to 0.99 kg ai/ha, within the seasonal label rate range of 0.5 to 3.0 kg ai/ha. Fruit and leaf samples were collected at 0, 5, 13, 26 and 42 days after application (DAT), rinsed first with dichloromethane (DCM) and then with ACN. A concentrate of the 26 DAT fruit extracted aqueous phase was subjected to treatment using ßglucosidase. The stability of DEM during extraction was evaluated by adding [¹⁴C]-DEM (76% purity) to a 5 DAT rinsed control tomato fruit sample. An aliquot of a [¹⁴C]-DEM solution (74.8% purity) was also subjected to the enzyme procedure. In rinsed fruit, the radioactivity decreased from 86.7% TRR at 0 DAT to 0.8% TRR at 26 DAT. TRR values also declined over the time in leaves. By 13 DAT, 15% remained in the tissues. About 100% of the [¹⁴C]-DEM radioactivity was recovered during the procedure. Up to 5 DAT, most of the residues were identified as chlorpyrifos-methyl, which was metabolized primarily to TCP (11.3% TRR at 13 DAT) and polar residues (19.6% TRR at 13 DAT). For all fruit samples, no more than 2.5% of TRR was found in the region where DEM was expected to elute. TMP, the S-methyl isomer, and OXN were not detected in any sample. The βglucosidase treatment liberated 6.5% TRR, eluting in the TCP region. About 62 and 24% TRR of ¹⁴C]-DEM solution submitted to the enzyme procedure eluted in the DEM and TCP regions, respectively; about 17% of the radioactivity was lost during the procedure. As was found for fruit extracts, chlorpyrifos-methyl was metabolized in leaf rinses primarily to TCP and to polar residues.

An EC formulation of [¹⁴C]chlorpyrifos-methyl was applied to <u>wheat</u> and <u>maize</u> grain at a rate equivalent to 32.4 mg ai/kg grain with samples of the treated grain stored at 25 ± 1 °C for 180 days. At the end of the experiment, the parent compound represented about ¹/₃ of the applied radioactivity (AR) in maize and 45% in wheat. TCP and DEM represented 39 and 24% AR in maize, respectively, and 19% AR each in wheat.

Chlorpyrifos

A single <u>orange</u> tree (Washington navel) was sprayed with [14 C]chlorpyrifos at a rate equivalent to 3.97 kg ai/ha. TRR levels in both leaves and fruit declined by 50% or more after 21 days after treatment. Over 99% of the whole fruit TRR remained associated with the peel, mostly as chlorpyrifos. OXON, TCP and DES were found at low levels (up to 0.5% TRR; 0.22 mg/kg chlorpyrifos eq.). Enzyme hydrolysis of the leaf aqueous soluble fraction, approximately 60% of the sample radioactivity was extracted into organic solvent, being 32.0% TCP. A base hydrolysis of this same fraction showed 80% of the residues as TCP. About 5% of NER was solubilised by enzyme digestion, 15% by acid hydrolysis; approximately 85% of the bound radioactivity remained associated with the acid detergent fibre. About 90% of the leaf NER was solubilised by base hydrolysis. Subsequent partitioning of the aqueous phase from this step resulted in the extraction of 82.9% of the solubilised radioactivity into organic solvent, composed of at least seven components, with TCP representing 36.7% TRR.

<u>Cabbage</u> plants received one foliar spray application of $[^{14}C]$ chlorpyrifos at a rate equivalent to 1.43 kg ai/ha. Plants were sampled at 0, 7, 14, 21 and 42 days after application (DAT) with TRR values declining over the 42 days. At 7 DAT, organic extracts contained 42% of TRR, mostly as chlorpyrifos. TCP levels increased from 2% TRR at 7 DAT to 6.1% TRR at 21 DAT. The maximum

level of DES was found at 14 DAT (5.3% TRR). Chlorpyrifos appears to be metabolized to TCP, which is extensively conjugated with glucose and malonic acid.

<u>Potted pea</u> plants were treated with one application of $[^{14}C]$ chlorpyrifos, applied at a rate equivalent to 1.9 kg ai/ha, with samples collected weekly up to 28 DAT. Radioactivity declined rapidly during the first 7 days; in pods, the levels had reached 0.25% of TRR at the end of the study. There was a steady decrease of chlorpyrifos over time (from 89.6% of TRR at 0 DAT to 3.8% of TRR by day 28 in pea pods), while TCP and TCP conjugates increased during this period (8.7 and 42.5% of TRR, respectively). Conjugates consisted of at least five different sugar or sugar plus malonic acid conjugates of TCP.

A single foliar spray of [14 C]chlorpyrifos was applied to <u>radish</u> plants at rate equivalent to 1.92 kg ai/ha then sampled weekly up to 35 days DAT. TRR in the rinsed tops decreased from 58.7 mg/kg chlorpyrifos eq. on Day 0 to 1.6 ma/kg at 35 DAT. Whereas the levels in roots remained relatively unchanged during the course of the study at about 2 mg/kg. Residues in the aqueous phase increased during the course of the experiment (from 0.06 to 38.5% of TRR in roots), representing mostly TCP conjugates. Chlorpyrifos residues decreased to 14.8% TRR in tops and 41.5% of TRR in roots at 35 DAT, while TCP reached 2.5% of TRR in tops at the end of the experiment. Enzyme digestion was more effective at releasing NER residues (up to 20% of TRR), with over 80% of this radioactivity being aqueous soluble.

In summary, metabolism studies conducted with chlorpyrifos-methyl and chlorpyrifos in plants indicates a single primary metabolic pathway that involves hydrolysis of the phosphate ester to give primarily TCP and polar residues, mainly TCP conjugates of glucose and malonic acid.

Environmental fate

The Meeting received information on soil aerobic metabolism and soil photolysis.

In four agricultural soils [¹⁴C]Chlorpyrifos-methyl, at a rate equivalent to 0.5 kg ai/ha, was incubated under <u>aerobic</u> conditions at 40% moisture-holding capacity (MHC) and 20 °C. Samples were taken at regular intervals up to 100 DAT, extracted with solvent and analysed by LSC and HPLC. The initial degradation product in all soils was TCP, accounting for up to 65% of applied radioactivity (AR) within 7 days, which was subsequently mineralised to ¹⁴CO₂ (23–69% of AR at 100 days, depending upon soil type). Nine minor degradation products were also observed (up to 16% of AR), one of which at approximately 2% of AR co-chromatographed with TMP. Levels of NER reached 17–26% of AR at 100 days, and little or no organic volatiles were observed. Soil half-lives, estimated by best-fit kinetics, ranged from 0.63 days (sandy clay loam) to 3.6 days (loamy sand).

The route of aerobic degradation of [¹⁴C]TCP was investigated in the laboratory in four European soils treated at 250 g/ha in a soil depth of 5 cm and a soil bulk density of 1.5 g/cm³, adjusted to 40% maximum water holding capacity (WHC_{max}) and incubated at 20 °C in the dark. The amounts of TCP and its degradation products in the extracts were determined by HPLC and confirmed by TLC. For the non-sterile soils, the overall recovery ranged between 83.1 and 103.7% of AR. The level of radioactivity in the soil extracts declined to between 6.6 and 50.8% of AR after 120 days. The level of NER and of evolved ¹⁴CO₂ increased throughout the incubation period (up to 58% of AR), whilst the levels of ¹⁴C organic volatiles were very low throughout (< 0.5% of AR). TCP was the major component present in all soil extracts, dropping to about 32% of AR after 120 days in the Marcham sandy clay loam soil. At this time, TMP level reached 13% of AR.

In top soil taken from three USA sites [14 C]TMP was assayed at a concentration of approximately 1.0 mg/kg of soil at 100% or 35% moisture content, $\frac{1}{3}$ bar soil moisture tension and 25 °C. Extensive mineralization to CO₂ (in the order of 70% of AR) was observed in the two silty soils but not in the sandy soil, a known poor degrader, where TMP accounted for about 70% of AR after 300 days. Low levels of TCP (about 10% of AR) were observed in all three soils.

The aerobic degradation of $[{}^{14}C]$ Chlorpyrifos-methyl_was investigated in sandy loam and clay loam <u>water/sediments</u> treated at 0.5 kg ai/ha. The samples were incubated under an aerobic/anaerobic

gradient in the dark at 17–20 °C. ¹⁴CO₂ and other volatile organic compounds accounted for up to 11% of AR. The radioactivity associated with surface water declined from about 80% at time zero to 21–38% at the end of the experiment. Degradation of chlorpyrifos-methyl was rapid in both systems with less than 2% of AR remaining after 100 days. DT_{50} values in the sandy loam and clay loam systems were 2.6 and 25.4 days, respectively. The principal degradation product was TCP, which was detected at maximum levels of 83 and 62% in 30 day sandy loam and clay loam samples, respectively.

The aqueous photolytic degradation rate and quantum yield of [¹⁴C]chlorpyrifos-methyl solutions (8.8–13.7 mg/L) in water/ACN (9:1) were determined at 20 °C irradiated under a 450 W Xenon high-pressure lamp at 290 nm for periods of up to eight hours. Chlorpyrifos-methyl degraded with a calculated quantum yield of 2.6×10^{-3} and DT₅₀ varying according to season and weather conditions, from 1.8 days to 3.8 months.

In summary, chlorpyrifos-methyl is degraded in soils and sediments to TCP, which is either directly mineralized to CO_2 , or via TMP.

Methods of residue analysis

The Meeting received data on analytical methods for chlorpyrifos-methyl in various plant and animal commodities. In general, for plant commodities the methods involved extraction with acetone/water. The extract was partitioned into hexane and quantified by GC/FPD or cleaned-up with C_{18} SPE and quantified by HPLC/MS/MS or GC/NCI-MS. The methods were satisfactorily validated at a LOQ of 0.01 mg/kg, with a LOD of 0.002 or 0.003 mg/kg.

In kidney, liver, milk, muscle and egg the compound was extracted with acetone, the extract cleaned-up in a C_{18} SPE and chlorpyrifos-methyl quantified by GC/NCI-MS. LOQ for chlorpyrifos-methyl was 0.01 mg/kg.

Although a multiresidue method to analyse chlorpyrifos-methyl was not provided, the Meeting is aware of the availability of multiresidue methods that include the compound.

Stability of pesticide residues in stored analytical samples

The Meeting received data on the stability of residues in various plant and animal commodities.

In one study conducted with oranges, grapes, wine, tomato, tomato juice and wheat fortified at 0.10 mg/kg chlorpyrifos-methyl, from 80 to 106% of the compound remained after 90 days of storage at -20 °C. Another study on various plant commodities, fortified at 0.10 mg/kg, chlorpyrifos-methyl was shown to be stable for up to 18 months when stored at -18 °C, with over 70% of the compound remaining on completion of the study.

In a study conducted with cattle tissues and milk, chlorpyrifos-methyl remained stable (75–85% remained) in samples fortified at 0.10 mg/kg after 90 days under frozen conditions (-20 °C). Almost half of chlorpyrifos-methyl present in fortified egg samples was lost during storage, suggesting instability of the compound in this matrix.

Definition of the residue

Chlorpyrifos-methyl was shown to metabolize in animals and plants primarily to TCP. This metabolite is the major residue in goat liver and kidney and hen kidney; it represented over 20% TRR in tomato 26 days after the last treatment and 39% TRR in maize after 180 days of storage. TCP is also the main metabolite in plants treated with chlorpyrifos.

Residues of chlorpyrifos-methyl were found to concentrate in fat tissue and milk fat. The compound has a log K_{ow} of 4.

Even though TCP can be a significant part of the residues in plant and animals treated with chlorpyrifos-methyl, it is also a major metabolite formed following the application of chlorpyrifos. As a consequence, TCP is not considered as a specific residue marker of the use of chlorpyrifos-methyl.

TCP lacks the phosphate ester moiety, responsible for the cholinesterase inhibiting capacity of chlorpyrifos-methyl. Data from repeated dose studies show that TCP is about 10 times less toxic than the parent compound. Also, TCP levels in crops and animal products are generally not higher than those of the parent compound. As a consequence the Meeting agreed that dietary human exposure to this metabolite is not considered of toxicological concern.

The current residue definition for chlorpyrifos-methyl in plant and animal commodities, for both enforcement and dietary risk assessment purposes is: *Chlorpyrifos-methyl (fat-soluble)*.

The Meeting agreed to confirm this residue definition of chlorpyrifos-methyl: *Chlorpyrifos-methyl*.

The residue is fat soluble.

Results of supervised trials on crops

The NAFTA calculator was used as a tool in the estimation of the maximum residue level from the selected residue data set obtained from trials conducted according to GAP. As a first step, the Meeting reviewed all relevant factors related to each data set in arriving at a best estimate of the maximum residue level using expert judgment. The NAFTA calculator was then employed. If use of the statistical calculation spreadsheet resulted in the derivation of a different value from that recommended by the JMPR, a brief explanation of the deviation is provided.

As no chlorpyrifos-methyl residue trial data was submitted for the following crops; cabbage head, Chinese cabbage, common beans, date, lettuce head, mushrooms, radish, rice and tea green black, the Meeting withdrew its previous maximum residue level recommendations.

Citrus fruits

Chlorpyrifos-methyl is registered in oranges, mandarins, clementines and lemons in Italy at a GAP rate of 0.055 kg ai/hL. In Spain, the approved rate is 0.068–0.09 kg ai/hL. In both countries the PHI is 15 days. Residue data from 51 trials conducted on various citrus fruits conducted from 1991 to 2006 were submitted.

Fifteen trials were conducted in Italy in oranges, mandarins and clementines. In seven trials conducted according to maximum Spanish GAP rate, residues (whole fruit) at 15 days PHI in <u>mandarins</u> and <u>clementines</u> were 0.18, 0.23 and 0.52 mg/kg and in <u>oranges</u> 0.16, 0.26, 0.58 and 0.89 mg/kg. Residues in mandarin pulp were < 0.01 (< LOD of 0.003 mg/kg) and 0.01 mg/kg. Eight trials did not match GAP.

Thirty six trials were conducted in Spain in lemons, oranges, mandarins and clementines. In eight trials conducted according to the maximum Spanish GAP rate, residues at 15 days PHI (whole fruit) were 0.09, 0.21, 0.33 and 0.69 mg/kg in <u>mandarins</u> and 0.09, 0.11, 0.11 and 0.18 mg/kg in <u>oranges</u>. Residues were < 0.01 (< LOD of 0.003 mg/kg) and 0.01 mg/kg in mandarin pulp. Twenty eight trials did not mach GAP.

The Meeting noted that the residue populations of chlorpyrifos-methyl in mandarins, clementine and oranges from 15 trials conducted according to Spanish GAP are within the same range and agreed to use a combined data set of: 0.09, 0.09, 0.11, 0.11, 0.16, 0.18, 0.18, 0.21, 0.23, 0.26, 0.33, 0.52, 0.58, 0.69 and 0.89 mg/kg. Residues in pulp from four trials were < 0.01 (2) (< LOD of 0.003 mg/kg) and 0.01 (2) mg/kg.

There is no current GAP for chlorpyrifos-methyl covering the citrus crop group; however the GAPs for the individual crops within the group are comparable. The Meeting agreed that as the registered uses cover the main crops within the group an estimate could be done for citrus crop group.

The Meeting estimated a maximum residue level of 2 mg/kg for chlorpyrifos-methyl in citrus fruit. The Meeting also estimated a HR of 0.01 mg/kg and a STMR of 0.01 mg/kg based on the residue data in citrus pulp.

A maximum residue level estimate of 1.4 mg/kg was derived from the use of the NAFTA calculator. The Meeting applied the JMPR procedure of using one significant figure for residues below 10 mg/kg.

The Meeting withdraws its previous recommendation of 0.5 mg/k for chlorpyrifos-methyl in oranges.

Pome fruits

Chlorpyrifos-methyl is registered in apples and pears in Italy (maximum rate of 0.077 kg ai/hL), in pome fruit in Spain (maximum rate of 0.09 kg ai/hL) and in Hungary (maximum rate of 0.76 kg ai/ha; 800–1000 L/ha), with a 15 day PHI. It is also approved for use in pome fruit in Switzerland, (maximum rate of 0.76 kg ai/ha), Poland (maximum rate of 0.6 kg ai/ha; 500–750 L/ha) and Greece (maximum rate of 0.056 kg ai/hL), with a PHI of 21 days. A total of 72 trials conducted in Europe from 1999 to 2007 in apple and pears were submitted. Decline studies showed that residues were still decreasing between 15 and 21 days after application

In two trials conducted in Austria, residues were 0.02 mg/kg in <u>apple</u> at 21 days PHI, matching GAP in Poland, and 0.05 mg/kg in <u>pear</u> at 14 days PHI, matching GAP in Hungary.

Two trials conducted in Belgium did not match GAP.

Thirty six trials were conducted in France (north and south). In 14 trials conducted in the south matching Spanish GAP, residues at 15 days PHI were: < 0.01 (< LOD of 0.003 mg/kg), 0.03 and 0.16 mg/kg in <u>pears</u> and 0.02, 0.03, 0.04, 0.07 (2), 0.08, 0.10 (2), 0.19, 0.20, 0.22 mg/kg in <u>apples</u>. In 13 trials matching Swiss or Polish GAP, residues at 21 days PHI were: < 0.01 (< LOD of 0.003 mg/kg), < 0.01, 0.02, 0.03, 0.05, 0.07 and 0.08 mg/kg in pears and 0.02, 0.03, 0.04, 0.08 mg/kg in pears and 0.02, 0.03, 0.05, 0.07 and 0.08 mg/kg in pears and 0.02, 0.03, 0.04, 0.09 and 0.15 mg/kg in apples. Eighteen trials did not match any GAP.

Seven trials were conducted in Germany in <u>apples</u>. In four trials matching Hungarian GAP, residues within 15 days PHI were 0.02 (2), 0.05 and 0.56 mg/kg. One trial matched Swiss GAP with residues at 21 days PHI of 0.03 mg/kg. Two trials did not match GAP.

Four trials were conducted in Greece matched Spanish GAP. Residues at 15 days PHI were 0.02 and 0.04 mg/kg in pear and 0.15 and 0.19 mg/kg in apple.

Seven trials were conducted in Italy. In five trials matching Spanish GAP, residues at 15 days PHI were 0.02 (2) mg/kg in <u>pears</u> and 0.03, 0.06 and 0.08 mg/kg in <u>apple</u>. Two trials did not match GAP.

In three trials conducted in Poland according to GAP, residues at 21 days PHI were < 0.01 (< LOD of 0.003 mg/kg) and 0.01 mg/kg in <u>apple</u> and 0.02 mg/kg in <u>pears</u>.

Nine trials were conducted in Spain. In two trials conducted according to GAP, residues at 15 days PHI were 0.03 mg/kg in <u>apple</u> and 0.08 mg/kg in pears. Seven trials did not match GAP.

Two trials conducted in the United Kingdom did not match GAP.

Residues in <u>pears</u> from nine trials with a PHI of 15 days were: < 0.01 (< LOD of 0.003 mg/kg), 0.02 (3), 0.03, 0.04, 0.05, 0.08 and 0.16 mg/kg.

Residues in <u>apples</u> from 21 trials conducted at a 15 day PHI were: 0.02 (2), 0.03 (3), 0.04, 0.05, 0.06, <u>0.07</u> (3), 0.08 (2), 0.10 (2), 0.15, 0.19 (2), 0.20, 0.22 and 0.56 mg/kg

Residues in <u>pears</u> from nine trials conducted at a 21 day PHI were: < 0.01 (< LOD of 0.003 mg/kg), < 0.01, 0.02 (3), 0.03, 0.05, 0.07 and 0.08 mg/kg

Residues in <u>apples</u> from nine trials conducted at a 21 day PHI were: < 0.01 (< LOD of 0.003 mg/kg), 0.01, 0.02, 0.03 (2), 0.04, 0.08, 0.09 and 0.15 mg/kg.

The Meeting decided that data from trials in apples and pears, done according to GAP, were from different populations (Mann-Whitney U test) and could not be combined. The Meeting agreed

that the residue data from apples at a PHI of 15 days, which had the highest residues and reflected the critical GAP in Europe, could be used for the estimation for pome fruits.

The Meeting estimated a maximum residue level of 1 mg/kg, a HR of 0.56 mg/kg and a STMR of 0.07 mg/kg for chlorpyrifos-methyl in pome fruits.

The maximum residue level estimate derived from use of the NAFTA calculator was 0.6 mg/kg. The Meeting noted that the majority of trials were conducted at the lower 25% range of the GAP rate, including the trial that gave rise to the highest residue (0.56 mg/kg). As a consequence the Meeting considered that the estimate derived from the calculation using the NAFTA spreadsheet may not accommodate all uses of chlorpyrifos-methyl in pome fruit that followed GAP.

The Meeting agreed to withdraw its previous recommendations of 0.5 mg/kg for chlorpyrifosmethyl in apple

Stone fruits

Chlorpyrifos-methyl is registered in Italy peaches and in Spain in peaches and nectarines at a maximum rate of 0.09 kg ai/h, with a PHI of 15 days. In Bulgaria, the rate is up to 0.055 kg ai/hL for stone fruits with a PHI of 14 days. In Greece, the PHI for stone fruit is 21 days (0.056 kg ai/hL) and 30 days (0.6 kg ai/ha) in Hungary for peaches and apricots. A total of 34 European trials were submitted for peaches and apricots completed between 1992 and 2007. Decline studies showed that residues were still decreasing between 15 and 21 days after application

Ten trials were conducted in southern France. In five trials matching Spanish GAP, residues in whole fruit at 14–15 days PHI were < 0.01 and 0.02 mg/kg in <u>apricots</u> and < 0.01, 0.01 and 0.02 mg/kg in <u>peaches</u>; residues in pulp (pitted fruit) were < 0.01 (2), 0.01 and 0.02 (2) mg/kg. Three trials matched GAP in Greece, with residues in whole fruit and pulp of apricots (1 trial) and peaches at 21 days PHI of < 0.01 (3) mg/kg. Two trials did not match GAP

From five trials conducted in Greece, according to Italian GAP, residues in whole fruit at a PHI of 15 days were: < 0.01 (< LOD of 0.003 mg/kg), 0.01 and 0.04 mg/kg in <u>apricots</u> and < 0.01 and 0.17 mg/kg in <u>peaches</u>. Residues in pulp were < 0.01 (< LOD of 0.003 mg/kg), 0.01 and 0.04 mg/kg in apricot and < 0.01 mg/kg in peaches.

Eleven trials were conducted in Italy. In eight trials conducted according to GAP, residues at a PHI of 15 days were: < 0.01 mg/kg in <u>apricots</u> and 0.01, 0.02 (3), 0.06, 0.07 and 0.08 mg/kg in <u>peaches</u>; residues in pulp were < 0.01 mg/kg in apricot and 0.01, 0.02 (3), 0.06, 0.07 and 0.09 mg/kg in peaches. One trial matching Greek GAP, residues at a PHI of 21 days was < 0.01 mg/kg in peach whole fruit and pulp.

Eight trials were conducted in Spain. In three trial matching GAP, residues in whole fruit at a PHI of 15 days were: < 0.01 mg/kg (< LOD of 0.003 mg/kg) in apricots and 0.02 and 0.23 mg/kg in peaches; in pulp, residues were < 0.01 mg/kg (< LOD of 0.003 mg/kg) in apricots and 0.02 and 0.02 and 0.26 mg/kg in peaches. Five trials matched Greek GAP with residues at a PHI of 21 days of < 0.01 (2) (< LOD of 0.002 mg/kg) and < 0.01 in apricots and 0.02 and 0.03 mg/kg in peaches; in pulp, residues were < 0.01 (2) (< LOD of 0.002 mg/kg), < 0.01 and 0.02 mg/kg.

Residues in whole fruit and pulp of apricots from seven trials matching GAP with a PHI of 15 days were: < 0.01 (2) (< LOD of 0.003 mg/kg), < 0.01 (2), 0.01, 0.02 and 0.04 mg/kg.

Residues in whole fruit of peaches from 14 trials matching GAP with a PHI of 15 days were: < 0.01 (2), 0.01 (2), 0.02 (5), 0.06, 0.07, 0.08, 0.17 and 0.23 mg/kg. In pulp (pitted fruit), residues were: < 0.01 (3), 0.01 (2), 0.02 (5), 0.06, 0.07, 0.09 and 0.26 mg/kg.

Residues in whole fruit and pulp of <u>apricots</u> from four trials according to GAP at 21 days PHI were: < 0.01 (2) (< LOD of 0.002 mg/kg) and < 0.01 (2) mg/kg,

Residues in <u>peaches</u> from five trials matching GAP at a PHI of 21 days were: < 0.01 (3), 0.02 and 0.03 mg/kg. In pulp, residues were < 0.01 (2) (< LOD of 0.002 mg/kg), < 0.01 (2) and 0.02 mg/kg.

Chlorpyrifos-methyl

Chlorpyrifos-methyl is registered for use in <u>cherries</u> in Hungary at 0.6 kg ai/ha and 800–1000 L/ha (0.048–0.072 kg ai/hL) with a 30 day PHI. Eleven trials were conducted in Austria, Germany, Hungary and Poland in 2006/2007. Decline studies showed that residues declined rapidly during the first 5 days following application then relatively slowly thereafter. Consequently, data from samples collected 21 days after application (30% shorter PHI than GAP of 30 days) were accepted as being comparable to GAP. Residues from the 11 trials were < 0.01 (9) (< LOD of 0.003 mg/kg) and < 0.01 (2) mg/kg in whole fruit and pulp.

The Meeting agreed that the residue population from trials conducted at a PHI of 15 days in peaches had the highest residues and could be used for the estimation of a maximum residue level for stone fruit.

The Meeting estimated a maximum residue level of 0.5 mg/kg for chlorpyrifos-methyl in stone fruits. Based on the residue data in peach pulp (pitted fruit), the Meeting also estimated a HR of 0.26 mg/kg and a STMR of 0.02 mg/kg.

The maximum residue level estimate derived from use of the NAFTA calculator was 0.15 mg/kg. However, the Meeting noted that most of the trials were conducted at the lower 25% range of the GAP rate, including the trial that gave rise to the highest residue (0.23 mg/kg). The Meeting considered that the estimate derived from the NAFTA spreadsheet calculation may not accommodate all uses of chlorpyrifos-methyl in stone fruit that followed maximum GAP.

The Meeting withdraws its previous recommendations of 0.5 mg/kg for chlorpyrifos-methyl in peaches.

Grapes

Chlorpyrifos-methyl is registered in grapes in Italy at a rate up to 0.045 kg ai/hL and in Spain at up to 0.09 kg ai/hL, both with a PHI of 15 days. In France, the PHI is 21 days (0.338 kg ai/ha) and in Hungary 30 days (0.52–0.60 kg ai/ha; 800–1000L/ha). In Chile, the compound is recommended as a post-harvest treatment. Data was submitted from 63 trials conducted in red and white grapes (table and wine) from 1998 to 2007.

Three trials were conducted in Austria, from which one matched French GAP, with residues at a PHI of 21 days of < 0.01 mg/kg.

One trial conducted in Chile using foliar application did not matched GAP.

Twenty three trials were conducted in France. In two trials conducted in the south according to Spanish GAP, residues at a 15 day PHI were: < 0.01 and 0.07 mg/kg. Nine trials matched the French or Hungarian GAP, and residues were: < 0.01 (2) (< LOD of 0.003 mg/kg), < 0.01 (2), 0.01 (2), 0.03, and 0.04 mg/kg at a 21 day PHI and < 0.01 mg/kg at a 30 day PHI. The remaining trials did not match GAP.

Eleven trials were conducted in Germany, from which seven matched the French or Hungarian GAP, where residues found were: < 0.01 (2), 0.01 and 0.02 (3) mg/kg at a 21 day PHI and < 0.01 mg/kg at a 30 day PHI. The remaining trials did not match GAP.

Five trials were conducted in Greece, two matched the Italian GAP with residues at a 15 day PHI of 0.03 and 0.07 mg/kg. One trial matching French GAP gave residues at a 21 day PHI of < 0.01 mg/kg (< LOD of 0.003 mg/kg). Two trials did not match southern European GAP.

Two trials were conducted in Hungary, one matching French GAP, with residues at a PHI of 21 days of 0.01 mg/kg. One trial did not match any GAP from northern Europe.

Six trials were conducted in Italy, of which four matched GAP, where residues found at a PHI of 15 days were: < 0.01 (< LOD of 0.003 mg/kg), < 0.01, 0.01 and 0.12 mg/kg. One trial conducted in the north matched French GAP with residues at a 21 day PHI of < 0.01 mg/kg. One trial did not match GAP.

One trial was conducted in Poland according to French GAP with residues at a 21 day PHI of 0.04 mg/kg.

Twelve trials were conducted in Spain. In nine trials conducted according to GAP, residues at a 15 day PHI were: < 0.01 (< LOD of 0.003 mg/kg) (3), < 0.01 (< LOD of 0.003 mg/kg), < 0.01 (2), 0.04, 0.05 and 0.53 mg/kg. The remaining three trials did not match GAP.

Residues in grapes from 17 combined trials matching GAP at a 15 day PHI were: < 0.01 (4) (< LOD of 0.003 mg/kg), < 0.01 (< LOD of 0.002 mg/kg), < 0.01 (4), 0.01, 0.03, 0.04, 005, 0.07 (2), 0.12 and 0.53 mg/kg

Residues in grapes from 20 trials according to GAP at PHIs of 21 and 30 days could be also combined resulting in residues of: < 0.01 (3) (< LOD of 0.003 mg/kg), < 0.01 (8), 0.01 (4), 0.02 (3), 0.03 and 0.04 mg/kg

The residue populations from trials conducted according to 15 days PHI gave the highest levels and were used as the basis for the maximum residue level estimation for grapes.

The Meeting estimates a maximum residue level of 1 mg/kg, a HR of 0.53 mg/kg and a STMR of 0.01 mg/kg for chlorpyrifos-methyl in grapes.

The maximum residue level estimate derived from use of the NAFTA calculator was 0.70 mg/kg. The Meeting noted that most of the trials were conducted at the lower 25% range of the GAP rate, including the trial that gave rise to the highest residue (0.53 mg/kg). The Meeting considered that the estimate derived from the NAFTA spreadsheet calculation may not accommodate all uses of chlorpyrifos-methyl in grapes following the critical GAP.

Strawberries

Chlorpyrifos-methyl is registered for use in strawberries at a rate of 0.068–0.09 kg ai/hL in Italy and Spain, with PHIs of 15 and 5 days, respectively. No GAP information for northern Europe was provided. Data from 23 European trials were submitted.

Of five trials conducted in France, three were conducted in the south and matched Spanish GAP, residues found were: < 0.01 and 0.02 (2) mg/kg at 5 days PHI. Two trials conducted in northern France gave residues in the same range. Eight trials conducted in Italy and Spain at GAP rate, resulted in residues at 5 days PHI of: < 0.01 (< LOD of 0.003 mg/kg), < 0.01 (2), 0.02 (2), 0.01 (2), and 0.04 mg/kg. Ten trials were conducted in northern Europe (Austria, Germany, Hungary, Poland and the UK) matching southern Europe GAP, giving residues in the same range.

From 11 trials conducted in southern Europe matching Spanish GAP residues found were: < 0.01 (< LOD of 0.003 mg/kg), < 0.01 (3), 0.01 (2), 0.02 (4) and 0.04 mg/kg.

The Meeting estimated a maximum residue level of 0.1 mg/kg, a HR of 0.04 mg/kg and a STMR of 0.01 mg/kg for chlorpyrifos-methyl in strawberries.

The maximum residue level estimate derived from use of the NAFTA calculator (> 10% of non-detects; maximum likelihood estimation (MLE) approach) was 0.08 mg/kg. The Meeting noted that all the trials were conducted at the lower 25% range of the GAP rate, including the one that gave rise to the highest residue (0.04 mg/kg). The Meeting considered that the estimate derived using the NAFTA spreadsheet calculator may not accommodate all uses of chlorpyrifos-methyl in strawberries following critical GAP.

Kiwifruit

Four European trials were submitted where 2 applications of chlorpyrifos-methyl were made at a rate of 0.049 kg ai/hL. Residues after 15 days ranged from 0.07 to 0.30 mg/kg and dropped to < 0.01 mg/kg (< LOD of 0.003 mg/kg) after 21 days. However, chlorpyrifos-methyl is currently not approved for use on kiwifruit in Europe.

As there was no GAP provided to support the trials, the Meeting could not estimate a maximum residue level for chlorpyrifos-methyl in kiwifruit.

Onions

Chlorpyrifos-methyl is registered for use in onions at a rate of 0.48 kg ai/ha in Hungary (PHI of 30 days) and at 0.36 kg ai/ha in Poland (PHI of 21 days). Six trials in onions were submitted however none were according to GAP.

As there was no GAP information provided to support the trials, the Meeting could not estimate a maximum residue level for chlorpyrifos-methyl in onions.

Tomatoes

Chlorpyrifos-methyl is registered in Italy, at a rate of 0.028–0.04 kg ai/hL (PHI of 15 days) and in Spain at up to 0.068–0.09 kg ai/hL (PHI of 5 days). Fifty five field and protected trials were conducted in Europe from 1999 to 2007. Ten trials were conducted in France. In seven trials conducted in southern France matching the Spanish GAP rate, residues at a PHI of 5 days were: 0.06, 0.20 and 0.42 mg/kg in field trials and 0.03, 0.08, 0.13 and 0.20 mg/kg in protected cropping trials. Three trials did not match GAP.

In four field trials conducted in Greece matching Spanish GAP, residues at a PHI of 5 days were: 0.03 (2), 0.06 and 0.31 mg/kg.

Seventeen trials were conducted in Italy. In nine trials conducted matching Spanish GAP, residues at 5 days PHI were: 0.05 (2), 0.07 (3), 0.08 and 0.92 mg/kg in field trials and < 0.01 and 0.05 mg/kg in protected cropping trials. Six trials did not match any GAP.

Fourteen trials were conducted in Spain. In six trials matching GAP, residues at 5 days PHI were: 0.01, 0.02, 0.04, 0.05 and 0.06 mg/kg in field trials and 0.03 mg/kg in protected cropping trials. Eight trials did not match GAP.

Ten trials conducted in northern Europe (the Czech Republic, Hungary, Germany, Poland and the UK) could not be evaluated due to the lack of an approved GAP for the region.

Residues on tomato from 19 trials conducted according to GAP in the field at 5 days PHI were: 0.01, 0.02, 0.03 (2), 0.04, 0.05 (3), 0.06 (3), 0.07 (3), 0.08, 0.20, 0.31, 0.42 and 0.92 mg/kg.

Residues on tomato from eight trials conducted matching GAP in the protected cropping at 5 days PHI were: < 0.01 (2), 0.03 (2) and 0.05 (2), 0.13 and 0.20 mg/kg.

Trials conducted matching Spanish GAP in field and protected cropping situations were not similar (Mann-Whitney U test) and could not be combined. The Meeting agreed that the residues coming from the field trials, having the highest residue population, could be used for the maximum residue level estimation.

The Meeting estimates a maximum residue level of 1 mg/kg, a HR of 0.92 mg/kg and a STMR of 0.06 mg/kg for chlorpyrifos-methyl in tomato.

The maximum residue level estimate derived from use of the NAFTA calculator was 0.90 mg/kg. The Meeting noted that most of the trials were conducted at the lower 25% range of the most critical GAP rate and that the NAFTA calculator value was lower than the highest residue found in the trials (0.92 mg/kg). The Meeting agreed that the value derived from the use of the NAFTA calculator spreadsheet may not accommodate all uses of chlorpyrifos-methyl in tomatoes where chlorpyrifos-methyl is applied according to critical GAP.

Peppers

Chlorpyrifos-methyl is registered to be used in peppers and egg plant in Italy at a rate of 0.34–0.45 kg ai/ha (PHI of 15 days) and 0.068–0.09 kg ai/hL in Spain for peppers (PHI of 5 days). Twenty four trials were conducted in Europe from 1999 to 2007 in the field and protected cropping.

Three trials were conducted in southern France, with one in protected cropping matching Spanish GAP, with residues of 0.14 mg/kg at a 5 day PHI.

Five trials were conducted in Greece. In three protected cropping trials matching Spanish GAP, residues at 5 days PHI were 0.03 and 0.16 (2) mg/kg. Three trials conducted at double rate gave residues in the same range.

Five trials were conducted in Italy. In two protected cropping trials matching Spanish GAP, residues at 5 days PHI were 0.04 and 0.06 mg/kg.

Fourteen trials were conducted in Spain. Five protected trials matching GAP gave residues at a PHI of 5 days were: 0.03, 0.04, 0.06, 0.52 and 0.72 mg/kg and three field trials conducted at GAP gave residues of 0.01, 0.04 and 0.09 mg/kg. Six trials conducted at double rate or higher PHI gave residues in the same range.

Residues from protected cropping trials, conducted according to Spanish GAP were: 0.03 (2), 0.04 (2), 0.06 (2), 0.14, 0.16 (2), 0.52 and 0.72 mg/kg.

Residues found from field trials, conducted according to Spanish GAP, were: 0.01, 0.04 and 0.09 mg/kg.

Trials conducted according to Spanish GAP in the field and protected cropping were not similar (Mann-Whitney U test) and could not be combined. The Meeting agreed that as the residues coming from the protected cropping had the highest residue population, they be used for the maximum residue level estimation.

The Meeting estimated a maximum residues level of 1 mg/kg, a HR of 0.72 mg/kg and a STMR of 0.06 mg/kg for chlorpyrifos-methyl in peppers.

The maximum residue level estimate derived from use of the NAFTA calculator was 0.5 mg/kg. The Meeting noted that most of the trials were conducted at the lower 25% range of the most critical GAP rate and that NAFTA calculator value was lower than the highest residue found in the trials (0.72 mg/kg). The Meeting agreed that value derived from the use of the NAFTA calculator might not accommodate all uses in peppers where chlorpyrifos-methyl is applied according to critical GAP.

Using the default dehydration factor of 10 to extrapolate from peppers to dried chilli peppers, the Meeting estimated a maximum residue level of 10 mg/kg (based on a highest residue of 7.2 mg/kg) and a STMR of 0.6 mg/kg for chlorpyrifos-methyl in Peppers, chilli dried.

In Italy, the approved GAP is for both peppers and egg plant. The Meeting agreed to use the residue data in peppers and estimates a maximum residues level of 1 mg/kg, a HR of 0.72 mg/kg and a STMR of 0.06 mg/kg for chlorpyrifos-methyl in egg plants.

The Meeting withdraws its previous chlorpyrifos-methyl recommendations of 5 mg/kg in peppers, chilli dry and of 0.1 mg/kg in egg plant

Green beans and peas

The Meeting received data from six residue trials in green beans and peas conducted in Europe at a rate of 2×0.20 to 0.52 kg ai/ha. Residues at 10 or 15 days after the last application ranged from < 0.01 (< LOD of 0.002 mg/kg) to 0.02 mg/kg.

However, as there was no GAP information provided to support the trials, the Meeting could not estimate a maximum residue level for chlorpyrifos-methyl in green beans or peas.

Carrot

The Meeting received data from four trials conducted in carrots in France, Italy and Spain, at a rate of 2×0.48 to 0.52 kg ai/ha. Residues after 3 days of the last application ranged from < 0.01 to 0.07 mg/kg.

However, as there was no GAP information provided to support the trials, the Meeting could not estimate a maximum residue level for chlorpyrifos-methyl in carrots.

Potatoes

Chlorpyrifos-methyl is approved for use in potatoes in Italy at a rate up 0.045 kg ai/hL or 0.45 kg ai/ha and in Spain up to 0.09 kg ai/hL. In both countries the PHI is 15 days. Data from 21 trials conducted in Europe from 2000 to 2007 were provided to the Meeting.

Seven trials were conducted in South of France. In two trials matching Spanish GAP, residues at a PHI of 15 days were: < 0.01 mg/kg (2) (< LOD of 0.003 mg/kg). No residues were detected in trials conducted at double rate (two trials), lower (one trial) or higher PHI (two **tr**ials).

Five trials were conducted in Italy. In three trials matching either the Italian or Spanish GAP rate, residues at a PHI of 15 days were: < 0.01 (2) (< LOD of 0.002 mg/kg) and < 0.01 mg/kg (< LOD of 0.003 mg/kg). No residues were detected in two trials conducted at doubled rate or one at a lower PHI.

Three trials were conducted in Spain. One trial matching GAP, resulted in residues at the 15 day PHI of < 0.01 mg/kg (< LOD of 0.003 mg/kg). No residues were detected in two trials conducted at lower or higher PHIs.

Six trials were conducted at 0.07 kg ai/hL in northern Europe (Germany, Poland, Hungary and the UK), for which no GAP information was provided. No residues were detected at any sampling point (0 to 21 days).

In six trials conducted in southern Europe according to GAP residues found were: < 0.01 (< LOD of 0.002 mg/kg) and < 0.01 (4) mg/kg (< LOD of 0.003 mg/kg). In all trials submitted, no residues were detected at the day of the last application, indicating that it is unlikely the use of chlorpyrifos-methyl, at the GAP rate, will leave detectable residues in potato tubers.

The Meeting estimated a maximum residue for chlorpyrifos-methyl of 0.01(*) mg/kg and a HR and STMR of 0 for chlorpyrifos-methyl in potato.

The NAFTA calculator was not used to derive an estimate as all residue values considered by the Meeting were below the LOQ, making its application unsuitable.

Sugar beet

Chlorpyrifos-methyl is registered for use on sugar beet in Poland at a rate of 0.36 kg ai/ha (PHI of 30 days) and up to 0.05 kg ai/hL in Spain (PHI of 15 days). Data from four trials conducted in Italy and Spain in 2000/2001 were submitted where sampling occurred at more than harvest interval of greater than 100 days.

As no trials were conducted that matched GAP, the Meeting could not estimate a maximum residue level for chlorpyrifos-methyl in sugar beet.

Artichoke (globe)

No GAP information on the use of chlorpyrifos-methyl in artichokes was provided to the Meeting. Four trials were conducted in Greece and Spain, at a 1 kg ai/ha. Residues at a PHI of 5 days ranged from 0.11 to 1.2 mg/kg.

As there is no GAP to support the trials, the Meeting could not estimate a maximum residue level for chlorpyrifos-methyl in artichoke.

The Meeting withdraws its previous recommendations of 0.1 mg/kg for chlorpyrifos-methyl in artichoke, globe

Cereal grains – post-harvest use

Chlorpyrifos-methyl is registered for use as a grain storage treatment in a number of countries. The application rate for cereal grains ranges from 2.5 g ai/tonne seed (storage interval of 21 days in Hungary to 120 days in Belgium) to 4.5 g ai/tonne seed (storage interval of 90 days) in the UK. In Spain, the GAP for wheat, barley and maize is 2.2 g ai/tonne seed with no storage interval specified.

Twelve trials were conducted in <u>barley</u> in Europe from 1994 to 1995. The formulation was applied to the grain in a rotary mixer using hand-held trigger application equipment at the GAP use rates and timings. Nine trials conducted at 4.5–5 g ai/tonne seed, gave residues within 90 days storage interval of 1.6, 1.9, 2.3, 2.6, 2.9, 3.0, 31, 3.2 and 3.3 mg/kg. One trial conducted at the GAP rate gave a large variation of residues during the period of storage, starting with 6.2 mg/kg at the day of treatment, reaching a highest residue of 10 mg/kg at 99 days of storage and dropping to 6.7 mg/kg after 182 days. The highest value from this trial is twice the application rate (5g ai/tonne), an unexpected in large scale post-harvest application in cereals. The Meeting agreed that this variation indicates a lack of homogeneity in mixing during treatment and the trial should not be considered in the estimation.

In two trials conducted at 2.5 g ai/tonne seed matching Spanish GAP, samples were collected from 0 to 181 days after the treatment; the highest residues were found after 7 days at 2.0 (2) mg/kg.

Twelve trials were conducted in <u>wheat</u> in Europe. Ten trials conducted at 4.5–5 g ai/tonne seed, gave residues within 90 days storage interval of 1.9, 2.2, 2.4, 2.9, 3.0, 3.1, 3.2 (2), 3.5 and 4.7 mg/kg.

In two trials conducted at 2.5 g ai/tonne seed matching Spanish GAP, samples were collected from 0 to 181 days after the treatment; the highest residues were found at 0 days were 2.2 (2) mg/kg.

Residue data from 19 trials conducted at the highest application rate in barley and wheat can be combines as follow: 1.6, 1.9 (2), 2.2, 2.3, 2.4, 2.6, 2.9 (2), $\underline{3.0}$ (2), 3.1 (2), 3.2 (3), 3.3, 3.5 and 4.7 mg/kg.

Residues from trials conducted in wheat and barley at 2.5 g ai/tonne seed are 2.0 (2) and 2.2 (2) mg/kg

Based on the residue data from the highest application rate, the Meeting estimated a maximum residue level of 5 mg/kg, a HR of 4.7 mg/kg and a STMR of 3.0 mg/kg for chlorpyrifosmethyl in cereal grain group, post-harvest.

Long-term dietary risk assessment indicates an exceedance of the ADI for 10 of the 13 GEMS/Food Consumption Cluster Diets (up to 260% ADI).

Taking the alternative GAP approach, the Meeting considered the residue data set coming from trials conducted according to Spanish GAP in wheat and barley for maximum residue level estimation. The Meeting estimated a maximum residue level of 3 mg/kg, a HR of 2.2 mg/kg and a STMR of 2.1 mg/kg for chlorpyrifos-methyl in wheat, barley and maize, post-harvest.

The maximum residue level estimate derived from use of the NAFTA calculator was 2.5 mg/kg. The normal JMPR procedure is to use one significant figure for maximum residue levels below 10 mg/kg. Rounding up the value obtained from the calculator results in 3 mg/kg which corresponds to the recommendation of the current Meeting.

The Meeting withdraws its previous recommendations of 10 mg/kg for chlorpyrifos-methyl in wheat and sorghum, post-harvest

Maize

Chlorpyrifos-methyl is registered to be used in maize in Italy (0.06 kg ai/hL) and Spain (0.068-0.09 kg ai/hL), with a 15 days PHI.

Eight trials were conducted with maize in France, Italy and Spain in 2007 at a rate of 0.84-0.94 kg ai/ha (0.225 kg ai/hL). Samples collected from 22 to 93 days after the application gave residues < 0.01 mg/kg (< LOD of 0.003 mg/kg).

As no trial was conducted according to GAP, the Meeting could not estimate a maximum residue level for chlorpyrifos-methyl in maize.

Cotton

Chlorpyrifos-methyl is registered to be used in cotton in Spain (up to 0.09 kg ai/hL, 15 days PHI) and in Greece (up to 0.67 kg/ha; 500–800 L/ha with a 21 day PHI). Twelve trials were conducted in Greece and Spain in 2006/2007 at the Greek GAP rate, with residues in cotton seed ranging from < 0.003 to 0.02 mg/kg 15 days after the last application (eight trials) and < 0.01 mg/kg (< LOD of 0.003 mg/kg) 28 days after the last application.

As no trial was conducted according to GAP, the Meeting could not estimate a maximum residue level for chlorpyrifos-methyl in cotton seed.

Rape seed

The Meeting received no information on registered GAP for chlorpyrifos-methyl in rape seed. Data was submitted from 16 trials conducted in 2006/2007 where chlorpyrifos was applied at a rate of 0.45 to 0.49 kg ai/ha, which resulted in no detectable residues in samples collected at harvest intervals of 31 to 120 days.

As there was no GAP provided to support the trials, the Meeting could not recommend a maximum residue level for chlorpyrifos-methyl in rape seed.

Animal feed

Chlorpyrifos-methyl is registered for pre-harvest use in <u>maize</u> in Italy (0.06 kg ai/hL) and Spain (0.068–0.09 kg ai/hL), with a PHI of 15 days. In 28 trials conducted in Europe, samples of cobs, whole plant and stover (rest of the plant) were analysed. In four trials conducted in southern France and Spain, matching Spanish GAP, residues in <u>maize</u> whole plant, at a PHI of 15 days were: < 0.01, 0.04, 0.16 and 1.4 mg/kg. Twenty four trials were conducted at double rate and or samples were collected 28 days after the last application, i.e., did not match GAP

The trials matching GAP with chlorpyrifos-methyl in maize were considered insufficient for making estimations for chlorpyrifos-methyl in animal feed.

In two trials conducted in <u>cotton</u> in Spain, matching Greek GAP, residues in cotton, whole plant, at a 15 day PHI were: 0.86 and 1.6 mg/kg.

The trials conducted with chlorpyrifos-methyl in cotton were considered insufficient to make estimations for chlorpyrifos-methyl in animal feed.

In 16 trials conducted with rape seed, samples of animal feed were analysed. As no registered GAP information for use in rape seed was provided, the trials could not be evaluated. Four trials were conducted in sugar beet and samples of animal feed were analysed (tops/leaves and whole plant).

As no registered GAP information was provided to support the trials, the Meeting could not make estimations for chlorpyrifos-methyl in animal feed from sugar beet.

Fate of residues during processing

Two processing studies on <u>oranges</u> were conducted in Spain in 2004–2005. Orange trees received 2 applications of chlorpyrifos-methyl at 2.7 kg ai/ha. The fruit was harvested 21 days after the second application and underwent processing that simulated standard industrial procedures. Residues of chlorpyrifos-methyl in whole fruit were 0.13 and 0.24 mg/kg. Mean (n = 2) processing factors (PF) for chlorpyrifos-methyl were calculated as 0.046 for orange juice and 40.2 for essential oil.

In three French studies, two applications were made to <u>apple</u> trees at 0.6 or 0.78 kg ai/ha with harvested fruit processed following standard commercial practices. Residues of chlorpyrifos-methyl in the fruit ranged from 0.02 to 0.07 mg/kg. No residues were detected in apple juice, PF estimated as < 0.05, < 0.04 and < 0.15 (mean of < 0.08). No residues of chlorpyrifos-methyl were detected in apple purée, with a mean PF of < 0.15.

In a study conducted in 2004 on <u>peaches</u> in France, trees received two applications of chlorpyrifos-methyl at 0.833 and 0.904 kg ai/ha. Treated fruit was sampled 28 days after the last application and processed to juice and purée according to commercial practices. Chlorpyrifos-methyl residues in whole fruit were < 0.01 mg/kg. No residues were found in juice and purée, but were detected in dry pomace at the LOQ level. No PF for chlorpyrifos-methyl could be estimated as no residues were detected in the raw commodity.

In seven studies conducted on <u>grapes</u>, chlorpyrifos-methyl was applied twice at 0.07 kg ai/hL. Samples were taken 21 or 28 days after the last application and were processed to raisins and wine according to commercial practices. Residues of chlorpyrifos-methyl in grapes ranged from < 0.01 to 0.11 mg/kg but were not detected in wine (PF < 0.15), raisins (PF < 0.09) and must (PF < 0.15). Residues concentrated in grape wet pomace (mean PF of 4.2, n = 2) and in dry pomace (median of > 7.5, n = 4).

Three processing studies were conducted in <u>tomatoes</u> in Italy and Spain. Tomatoes were treated with chlorpyrifos-methyl at 0.24 or 0.07 kg ai/hL with samples processed according do commercial practice. Residues in tomatoes ranged from 0.17 to 0.22 mg/kg but were not detected in the juice (mean PF < 0.033) or the canned tomato (mean PF < 0.025). Residues were reduced in purée, with a mean PF of 0.27 and in washed tomato (PF of 0.75).

Two processing studies were conducted during 2004–2006 on <u>barley</u> grain stored for 6 months after receiving chlorpyrifos-methyl at 5 g ai/tonne grain. Residues of chlorpyrifos-methyl in grain at 0 or 180 days after treatment ranged from 2.1 to 3.2 mg/kg and were not detected in beer (mean PF < 0.001).

In one processing study conducted in France, <u>maize</u> treated twice at 0.56 kg ai/ha was processed according to commercial practices to flour and oil. Residues in grain were not reported and no residues of chlorpyrifos-methyl (<LOD of 0.002 mg/kg) were detected in the processed commodities.

Four processing studies were conducted on <u>wheat</u> grain stored for up to 6 months after being treated with chlorpyrifos-methyl at 1.25 to 5 g ai/tonne grain. Residues of chlorpyrifos-methyl in grain after treatment ranged from 0.52 to 3.2 mg/kg. Residues were reduced in white flour (mean PF of 0.25; n = 6), white bread (mean PF of 0.05; n = 6) and wholemeal bread (mean PF of 0.48, n = 3). Residues remained unchanged in wholemeal flour (n = 3) and concentrated in wheat germ (mean PF=1.9; n = 3) and in bran (mean PF=2.45 n = 6).

One processing study was conducted <u>cotton</u> after the plant was treated twice with chlorpyrifos-methyl at 0.675 kg ai/ha. Seed samples were collected 56 days after the last application and processed according to commercial practices. No residues were detected in cotton seed, pressed cake, raw oil or refined oil.

Two processing studies were conducted in rape seed treated with chlorpyrifos-methyl at a rate of 0.45 kg ai/ha. Seed samples were collected 105 days after treatment and processed according to commercial practices. No residues were detected in seed, pressed cake, raw or refined oil.

Processed commodity	rocessed commodity Processing Resid factor commo		STMR- P, mg/kg	HR- P, mg/kg	Maximum residue level, mg/kg
Orange juice	0.046	0.21 (median, citrus)	0.01		-
Apple juice	< 0.08	0.07 (STMR, pome)	0.0056		-
Apple wet pomace	6.5	0.07 (STMR, pome)	0.455		-
Apple dried pomace	3.1	0.56 (HR, pome)	-		2
Grape pomace, wet	4.2	0.01 (STMR)	0.042		-
Grape pomace, dry	>7.5	0.53 (HR)	-		5
Grape Wine	< 0.15	0.01 (STMR)	0.002		-
Raisins	< 0.09	0.01 (STMR)	0.001		-
Tomato juice	< 0.033	0.06 (STMR)	0.002		-
Beer	< 0.001	2.1 (STMR, barley)	0.002		-
Wheat bran	2.45	2.1 (STMR, wheat)	5.14	5.39	6
		2.2 (IIK, wheat)			
Wheat white flour	0.25	2.2 (HR, wheat)	0.525	0.55	-
Wheat germ	1.9	2.1 (STMR, wheat) 2.2 (HR, wheat)	3.99	4.18	5
Wheat wholemeal	1	2.1 (STMR, wheat) 2.2 (HR, wheat)	2.1	2.2	-
Wheat white bread	0.05	2.1 (STMR, wheat) 2.2 (HR, wheat)	0.105	0.11	-
Wheat wholemeal bread	0.48	2.1 (STMR, wheat) 2.2 (HR, wheat)	1.01	1.06	-

Summary of processing factors from the processing of Raw Agricultural Commodities (RACs)

Residues in animal commodities

Farm animal dietary burden

The Meeting estimated the dietary burden of chlorpyrifos-methyl in farm animals on the basis of the diets listed in Annex 6 of the 2006 JMPR Report (OECD Feedstuffs Derived from Field Crops), the STMR or highest residue levels estimated at the present Meeting. Dietary burden calculations are provided in Annex 6. Only residue values for grain and fruit pomace, wet were available for use in the calculation of the dietary burden

		Animal dietary burden for chlorpyrife	os-methyl, ppm of dry	matter diet
		US-Canada	EU	Australia
Beef cattle	max	3.95	3.59	4.2 ^a
	mean	3.77	3.42	3.77 ^b
Dairy cattle	max	3.69 °	2.95	3.56
	mean	3.52 ^d	2.85	3.4
Swine breed	max	5.04 ^a	4.31 ^a	3.95
	mean	4.8	4.11 ^b	3.77
Swine finish	max	4.31	4.31	3.95
	mean	4.11	4.11	3.77
Poultry broiler	max	4.31 ^e	2.98	1.6
	mean	4.11 ^f	2.84	1.53
Poultry layer	max	3.68 ^g	1.97	2.96
	mean	3.52 ^h	1.88	2.84

^{a.} Highest maximum cattle or swine dietary burden suitable for maximum residue level estimates for mammalian meat

^b. Highest mean cattle or swine dietary burden suitable for STMR estimates for mammalian meat.

- ^c. Highest maximum dairy cattle dietary burden suitable for MRL estimates for mammalian milk
- ^d. Highest mean dairy cattle dietary burden suitable for STMR estimates for milk.
- ^e. Highest maximum poultry dietary burden suitable for MRL estimates for poultry meat and eggs.
- ^{f.} Highest mean poultry dietary burden suitable for STMR estimates for poultry meat and eggs.
- ^g. Highest maximum poultry dietary burden suitable for MRL estimates for eggs.
- ^h. Highest mean poultry dietary burden suitable for STMR estimates for eggs.

The chlorpyrifos-methyl dietary burdens for animal commodity MRL estimation (residue levels in animal feeds expressed on dry weight) reached a maximum of 5 ppm for swine and of 3.68 ppm for poultry. The chlorpyrifos-methyl dietary burdens for animal commodity STMR estimation (residue levels in animal feeds expressed on a dry weight basis) reached a maximum of 4.11 ppm for swine and of 3.52 ppm for poultry.

Animal feeding studies

In one feeding study conducted in <u>dairy cows</u>, the animals were fed 0, 1, 3, 10, 30, and 100 ppm chlorpyrifos-methyl in the diet starting at the lowest level and increasing the dosage every two weeks. The highest feeding level was followed by a two week period where no chlorpyrifos-methyl was added to the feed. In milk, chlorpyrifos-methyl was not detected 13 days after 3 and 10 ppm dosing but was detected at the LOQ level 9–11 days after dosing at 30 ppm. In milk cream, the levels detected at 30 ppm were 0.08–0.09 mg/kg. Cream samples from the 3 or 10 ppm dose levels were not analysed.

In another study, <u>calves</u> were fed rations containing 1, 3, 10, 30 and 100 ppm chlorpyrifosmethyl for 28 days. Residues of chlorpyrifos-methyl in fat samples were 0.01 mg/kg at 3 ppm, 0.03 mg/kg at 10 ppm and 0.09 mg/kg at 30 ppm. Muscle, liver and kidney samples were only analysed from the 30 or 100 ppm feeding level, and were not detected (< 0.01 mg/kg).

In a study on swine, animals were fed rations containing 1 to 100 ppm of chlorpyrifos-methyl for 28 days. In muscle, residues were only found above the LOQ (0.01 mg/kg) at the 30 ppm level or 100 ppm (0.03 and 0.14 mg/kg). No residues were found at any feeding level in liver or kidney. In fat, residues increased proportionally with the feeding level (mean/high levels at 3 ppm: 0.02/0.02 mg/kg; 10 mg/kg: 0.07/011 mg/kg).

In one study conducted with <u>laying poultry</u>, the birds were fed rations containing 1, 3, 10, 30 and 100 ppm chlorpyrifos-methyl for 28 days. No residues of chlorpyrifos-methyl were detected (< 0.01) in muscle, fat and eggs at or below the feeding level of 10 mg/kg. At 30 ppm, residues were detected only in fat at the LOQ and at 100 ppm in fat (0.15 mg/kg) and eggs (0.02 mg/kg).

Dietary burden (mg/kg)		Chlorpyrifos-methyl residues, mg/kg						
Feeding level [ppm]]	Milk	Milk cream	Muscle	Liver	Kidney	Fat	
mrl cattle beef, highest residue	(4.2) [1; 3; 10; 30]			(< 0.01) [-; -; -; < 0.01]	(< 0.01) [-; -; -; < 0.011	(< 0.01) [-; -; -; < 0.01]	(0.013) [< 0.01;0.01; 0.02; 0.12]	
STMR cattle beef, mean residue	(3.8) [1; 3; 10; 30]			(0) [-; -; -; < 0.01]	(0) [-; -; -; < 0.01]	(0) [-; -; -; < 0.01]	(0.013) [< 0.01; 0.01; 0.03 0.09]	
mrl milk, mean residue	(3.7) [3; 10; 30]	(< 0.01) [-; < 0.01; < 0.01]	(0.009) [-; -; 0.07]					
STMR milk, mean residue	(3.5) [3; 10; 30]	(0) [-; < 0.01; < 0.01]	(0.008) [-; -; 0.07]					

Animal commodity maximum residue levels

Dietary burden (mg/kg)		Chlorpyrifos-methyl residues, mg/kg				
Feeding level [ppm]		Muscle	Liver	Kidney	Fat	
mrl swine	(5.0)	(< 0.01)	(< 0.01)	(< 0.01)	(0.055)	
highest residue	[3; 10]	[< 0.01; < 0.01]	[< 0.01; < 0.01]	[< 0.01; < 0.01]	[0.02; 0.11]	
STMR swine	(4.1)	(0)	(0)	(0)	(0.03)	
mean residue	[3; 10]	[< 0.01; < 0.01]	[< 0.01; < 0.01]	[< 0.01; < 0.01]	[0.02; 0.07]	

Dietary burden (mg/kg)		Chlorpyrifos-methyl residues, mg/kg				
Feeding level [ppm]		Eggs	Muscle	Liver	Fat	
mrl poultry meat highest residue (4.3)			(< 0.01)	(< 0.01)	(0.004)	
	[10; 30]		[< 0.01; < 0.01]	[-; < 0.01]	[0.01; < 0.01]	
STMR poultry meat, mean	(4.1)		(0)	(0)	(0.004)	
residue	[3; 10]		[< 0.01; < 0.01]	[-; < 0.01]	[0.01; < 0.01]	
mrl eggs highest residue	(3.7)	(< 0.01)				
	[10; 30]	[< 0.01; < 0.01]				
STMR eggs, mean residue	(3.5)	(0)				
	[3; 10]	[< 0.01; < 0.01]				

Feeding study and the dietary burden calculations for cattle were the basis for the estimations in milk. Based on the residues on milk cream (0.009 and 0.008 mg/kg) and the default assumption that milk cream is 50% fat, the Meeting recommends a maximum residue level of 0.02 mg/kg and a STMR of 0.016 mg/kg for chlorpyrifos-methyl in milk fats. The Meeting estimated a maximum residue level of 0.01(*) mg/kg in milks; assuming milk to contain 4% fat, the Meeting estimated a STMR of 0.0006 mg/kg for chlorpyrifos-methyl in milks (4% of milk fat STMR of 0.016 mg/kg).

Based on the feeding studies and the dietary burden calculations for swine, the Meeting recommends a maximum residue level of 0.01(*) mg/kg, a STMR and a HR of 0 mg/kg for chlorpyrifos-methyl in edible offal (mammalian); a maximum residue level of 0.1 mg/kg (fat) for meat (from mammalian other than marine mammals); a STMR of 0.03 mg/kg and HR of 0.055 mg/kg in the fat portion of the meat and a STMR and HR of 0 in the muscle portion of the meat.

Based on the feeding study and the dietary burden calculation for chickens, the Meeting estimates a maximum residue level of 0.01(*) mg/kg and a STMR and HR of 0 mg/kg for chlorpyrifos-methyl in eggs and poultry edible offal; a maximum residue level of 0.01 mg/kg in poultry meat (fat), a STMR and HR of 0.004 mg/kg in the fat portion of the poultry meat and a STMR and HR of 0 in the muscle portion of the poultry meat.

The Meeting withdraws its previous recommendations for chlorpyrifos-methyl in cattle fat, cattle meat, cattle edible offal, chicken fat, chicken meat, chicken edible offal, milks and eggs.

RECOMMENDATIONS

The Meeting estimated the maximum residue levels and STMR values shown below. The maximum residue levels are recommended for use as maximum residue limits.

<u>For plants and animals</u>, definition of the residue for compliance with maximum residue level and estimation of dietary intake: *chlorpyrifos-methyl*.

The residue is fat soluble.

	Recommended MRL (mg/kg)		RL (mg/kg)	STMR (P)	HR
CCN	Commodity name	New	Previous	mg/kg	mg/kg
FP 0226	Apple	W ^a	0.5		
	Apple juice			0.005	
AB 0226	Apple pomace, dry	2		0.22	
	Apple pomace, wet			0.455	
VS 0620	Artichoke, Globe	W	0.1		
GC 0640	Barley	3		2.1	2.2
	Beer			0.002	
VB 0041	Cabbages, Head	W	0.1		
MF 0812	Cattle fat	W ^a	0.05		
MM 0812	Cattle meat	W ^a	0.05		
MO 0812	Cattle, Edible offal of	W ^a	0.05		
PF 0840	Chicken fat	W ^a	0.05		
PM 0840	Chicken meat	W ^a	0.05		
PO 0840	Chicken, Edible offal of	W ^a	0.05		
VL 0467	Chinese cabbage (type pe-tsai)	W	0.1		
FC 0001	Citrus	2		0.01	0.01
VP 0526	Common bean (pods and/or				
	immature seeds)	W	0.1		
FT 0295	Date	W	0.05		
MO 0108	Edible offal (mammalian)	0.01*		0	0
VO 0440	Egg plant	1	0.1	0.06	0.72
PE 0112	Eggs	0.01*	0.05	0	0
FB 0269	Grapes	1	0.2	0.02	0.53
	Raisins			0.001	0.001
	Wine			0.002	
AB 0226	Grape pomace, dry	5		0.075	
	Grape pomace, wet			0.042	
VL 0482	Lettuce, Head	W	0.1		
GC 0645	Maize	3		2.1	2.2
MM 0005	Meat (from mammals other than	0.1 (fat)		0.03 (fat)	0.055 (fat)
101101 0095	marine mammals)	0.1 (lat)		0 (muscle)	0 (muscle)
ML 0106	Milks	0.01*	0.01	0.0006	
FM 0183	Milk fats	0.02		0.01	
VO 0450	Mushrooms	W	0.01		
FC 0004	Oranges, Sweet, Sour	W ^a	0.5		
	Orange juice			0	
FS 0247	Peach	W ^a	0.5		
VO 0051	Peppers	1	0.5	0.06	0.72
VO 0444	Peppers, Chili (dry)	10	5	0.6	
FP 0009	Pome fruits	1		0.06	0.56
VR 0589	Potato	0.01*		0	0
PO 0111	Poultry edible offal	0.01*		0	0
PO 0110	Poultry meat	0.01 (fat)		0.004 (fat)	0.004 (fat)
				0 (muscle)	0 (muscle)
VR 0494	Radish	W	0.1		
GC 0649	Rice	W	0.1		
GC 0651	Sorghum	W	10 Po		
FS012	Stone fruit	0.5		0.02	0.26
FB 0275	Strawberry	0.06		0.01	0.04
DT 1114	Tea, Green, Black	W	0.1		
VO 0448	Tomato	1	0.5	0.06	0.92
	Tomato juice			0.002	
	Tomato pure			0.016	
GC 0654	Wheat	3	10 Po	2.1	2.2
CM 0654	Wheat bran, Unprocessed	6 PoP	20 PoP	5.14	5.39
CF 1211	Wheat flour	W	2 PoP	0.525	0.55

		Recommended MRL (mg/kg)		STMR (P)	HR
CCN	Commodity name	New	Previous	mg/kg	mg/kg
CF 1210	Wheat germ	5 PoP		3.99	4.18
CF 1212	Wheat wholemeal			2.1	2.2
CP 1211	White bread	W	0.5 PoP	0.105	0.11
CP 1212	Wholemeal bread	W	2 PoP	1.01	1.06

^a replaced by an estimation for the group

DIETARY RISK ASSESSMENT

Long-term intake

The ADI for chlorpyrifos-methyl is 0–0.01 mg/kg bw. The International Estimated Daily Intakes (IEDI) for chlorpyrifos-methyl was estimated for the 13 GEMS/Food Consumption Cluster Diets using the STMR or STMR-P values estimated by the current Meeting. The results are shown in Annex 3 of the 2009 JMPR Report. The IEDI ranged from 20 to 140% of the ADI. The information provided to the JMPR precludes an estimate that the long-term intake of residues of chlorpyrifos-methyl would be below the ADI.

The IEDI exceeded the maximum ADI for the Cluster diets C (110% ADI) and H (140% ADI), with 42.7 and 72.8% of the total intake, respectively, coming from the consumption of maize. The estimation of a STMR made by the Meeting considered the alternative GAP approach. However, in the absence of suitable information this could not be done. To refine the long-term intake estimates information on expected residues in maize processed commodities, such as maize flour and cooked maize would need to be assessed. The ADI for chlorpyrifos-methyl was established by the present Meeting on the basis of a NOAEL of 1 mg/kg bw/d from a 2-year study in rats and a safety factor of 100. However, two other studies had LOAELs of 3 mg/kg bw/d, suggesting it is unlikely that the ADI itself could be refined.

Short-term intake

The ARfD for chlorpyrifos-methyl is 0.1 mg/kg bw. The International Estimated Short Term Intake (IESTI) for chlorpyrifos-methyl was calculated for the plant and animal commodities for which STMR(P)s and HR(P)s were estimated and for which consumption data were available. The results are shown in Annex 4 of the 2009 JMPR Report. The IESTI ranged from 0 to 30% of the ARfD for the general population and from 0 to 40% for children. The Meeting concluded that the short-term intake of residues from the uses of chlorpyrifos-methyl considered by the Meeting is unlikely to present a public health concern.

Code	Author	Year	Report
GHB-P-421	Amaral, LC, Merino, CM and Rampazzo, PE	1999	Residues of chlorpyrifos-methyl in grapes treatment with Reldan Insecticide—Chile 1998–99. Dow AgroSciences. Non-GLP. Unpublished.
GHE-P- 12124	Austin R	2009	Chlorpyrifos, Chlorpyrifos-methyl and TCP: Residue Stability Study in Crops under Freezer Storage Conditions. Dow AgroSciences.GLP. Unpublished.
020135	Balcer JL, Smith KP, Hilla S and Graper LK	2003	A Nature of the Residue Study with ¹⁴ C-Labelled Chlorpyrifos Applied to Cabbage-Additional Characterization of Radioactive Residues. Dow AgroSciences, Non-GLP. Unpublished.

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GHE-P-3809	Boothroyd, S Cowlyn, TC and Gosh, D	1994	Chlorpyrifos-methyl (pure): Generation of spectral data (UV-VIS, IR. NMR, MS). Dow AgroSciences. GLP. Unpublished.
GH-C 5430	Clark, S	2002	Independent laboratory validation of Dow AgroSciences LLC Method GRM 02.04—Determination of residues of chlorpyrifos-methyl in
			agricultural commodities by gas chromatography with negative-ion chemical ionisation mass spectrometry (OR18A). Dow AgroSciences. GLP. Unpublished.
GHE-P-3313	Boothroyd, S	1993a	Chlorpyrifos-methyl (pure): Determination of Melting Point (A22). Dow AgroSciences. GLP. Unpublished.
GHE-P-3352	Boothroyd, S	1993b	Chlorpyrifos-methyl: Determination of Physico-chemical Properties (A23). Dow AgroSciences. GLP. Unpublished.
GHE-P-3314	Day, SR and Rudel, H	1993	The evaporation of Chlorpyrifos-methyl from soil and leaf surfaces and its persistence in air following application of Reldan 22 RO (EF-1066). (K11). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11796 ver. 2	Devine, HC	2008	Residues of chlorpyrifos-methyl and TCP in apples and pears at intervals and at harvest following a single application of GF-1684—Southern Europe 2007 (N230). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11797 ver. 2.	Devine, HC	2008	Residues of chlorpyrifos-methyl and TCP in apricots and peaches at intervals and at harvest following a single application of GF-1684— Southern Europe 2007 (N229). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11799	Devine, HC	2008	Residues of chlorpyrifos-methyl and TCP in cotton seeds at intervals and at harvest following a single application of GF-1684—Southern Europe 2007 (N236). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11801 ver. 2	Devine, HC	2008	Residues of chlorpyrifos-methyl and TCP in indoor peppers at intervals and at harvest following a single application of GF-1684—Southern Europe 2007 (N231). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11800	Devine, HC	2008	Residues of chlorpyrifos-methyl and TCP in oilseed rape at intervals and at harvest following a single application of GF-1684—Northern, Central and Southern Europe 2007 (N237). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11802 ver. 2	Devine, HC	2008	Residues of chlorpyrifos-methyl and TCP in potatoes at intervals and at harvest following a single application of GF-1684—Northern, Central and Southern Europe 2007 (N232). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11804	Devine, HC	2008	Residues of chlorpyrifos-methyl and TCP in strawberries at intervals and at harvest following a single application of GF-1684—Northern, Central and Southern Europe 2007 (N238). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11803 ver. 2	Devine, HC	2008	Residues of chlorpyrifos-methyl and TCP in wine grapes at intervals and at harvest following two applications of GF-1684—Northern, Central and Southern Europe 2007 (N228) Dow AgroSciences. GLP. Unpublished.
GHE-P-9436	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in apples at harvest following two applications of EF-1066 (RELDAN 22) or GF-71, Southern Europe—2000 (N156) Dow AgroSciences. GLP. Unpublished.
GHE-P-9552	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in apples at intervals following two applications of EF-1066 (RELDAN 22) Northern Europe—2000 (N165) Dow AgroSciences. GLP. Unpublished.
GHE-P-9551	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in apples at intervals following two applications of EF-1066 (RELDAN 22) Southern Europe—2000 (N164) Dow AgroSciences. GLP. Unpublished.
GHE-P-9433	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in carrots at harvest following two applications of EF-1066 (RELDAN 22) or GF-71, Southern Europe—2000 (N154) Dow AgroSciences. GLP. Unpublished.
GHE-P-9444	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in carrots at intervals following two applications of EF-1066 (RELDAN 22) Southern Europe—2000 (N161) Dow AgroSciences. GLP. Unpublished.
GHE-P-9439	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in globe artichokes at harvest under open field conditions following a single application of EF-1066 (RELDAN 22) or GF-71, Southern Europe—2000 (N130). Dow AgroSciences. GLP. Unpublished.
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Code	Author	Year	Report
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GHE-P-9437	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in grapes at harvest following two applications of EF-1066 (RELDAN 22) or GF-71, Northern France—2000 (N134) Dow AgroSciences. GLP. Unpublished.
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GHE-P-9432	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in green beans at intervals following two applications of RELDAN 22 (EF-1066), Southern Europe—2000 (N131) Dow AgroSciences. GLP. Unpublished.
GHE-P-9443	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in maize at harvest following a single application of EF-1066 (RELDAN 22) or GF-71, Southern Europe—2000 (N160) Dow AgroSciences. GLP. Unpublished.
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GHE-P- 10013	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in onions at intervals following two applications of RELDAN 22 (EF-1066), Southern Europe—2001 (N169) Dow AgroSciences. GLP. Unpublished.
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GHE-P-9445	Doran, A and Clements, B	2002	Residues of chlorpyrifos-methyl in potatoes at intervals following two applications of EF-1066 (RELDAN 22) Southern Europe—2000 (N162). Dow AgroSciences. GLP. Unpublished.
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Code	Author	Year	Report
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GHE-P-8644	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in apples at intervals following two applications of RELDAN 22 (EF-1066), Germany—1999 (N122). Dow AgroSciences. GLP. Unpublished.
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GHE-P-8655	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in grapes at harvest and processed fractions (wet pomace, must and wine) following applications of RELDAN 22 (EF-1066), Southern France—1999 (N103). Dow AgroSciences. GLP. Unpublished.
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GHE-P-8652	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in grapes at intervals following applications of RELDAN 22 (EF-1066), Germany—1999 (N107). Dow AgroSciences. GLP. Unpublished.
GHE-P-8650	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in grapes at intervals following applications of RELDAN 22 (EF-1066), Northern France—1999 (N106). Dow AgroSciences. GLP. Unpublished
GHE-P-8657	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in grapes at intervals following applications of RELDAN 22 (EF-1066), Spain—1999 (N105). Dow AgroSciences. GLP. Unpublished.
GHE-P-8671	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in onions at harvest following multiple applications of RELDAN 400 (EF-1256), Hungary—1999 (N129). Dow AgroSciences. GLP. Unpublished.
GHE-P-8670	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in onions at intervals following multiple applications of RELDAN 400 (EF-1256), Hungary—1999 (N128). Dow AgroSciences. GLP. Unpublished.
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GHE-P-8668	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in sweet peppers at intervals grown under cover following multiple applications of RELDAN 22 (EF-1066), Spain— 1999 (N118). Dow AgroSciences. GLP. Unpublished. May 2001.

Code	Author	Year	Report
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GHE-P-8654	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in table grapes at intervals following applications of RELDAN 22 (EF-1066), Southern France—1999 (N108). Dow AgroSciences. GLP. Unpublished.
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GHE-P-8658	Doran, A. and Craig, A.	2001	Residues of chlorpyrifos-methyl in tomatoes at intervals following multiple applications of RELDAN 22 (EF-1066), Spain—1999 (N110). Dow AgroSciences. GLP. Unpublished.
GHE-P-8664	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in tomatoes at intervals grown under cover following multiple applications of RELDAN 22 (EF-1066), Italy—1999 (N114). Dow AgroSciences. GLP. Unpublished.
GHE-P-8653	Doran, A and Craig, A	2001	Residues of chlorpyrifos-methyl in wine grapes at harvest following applications of RELDAN 22 (EF-1066), Germany—1999 (N109). Dow AgroSciences. GLP. Unpublished.
GH-C 5482	Graper, LK	2002	Nature of the Residue Study with ¹⁴ C-Labeled Chlorpyrifos Applied to Cabbage (Dursban L017). Dow AgroSciences. GLP. Unpublished.
GH-C 5483	Graper, LK	2002	Nature of the Residue Study with ¹⁴ C-Labeled Chlorpyrifos-Methyl Applied to Tomatoes (L07). Dow AgroSciences. GLP. Unpublished.
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GHE-P-9032	Jackson, R	2000	The generation and identification of water and soil degradation products of chlorpyrifos-methyl. Dow AgroSciences. GLP. Unpublished.
GHE-P-4495	Khoshab, A	1995	Residues of chlorpyrifos-methyl and its pyridinol metabolite in whole Lemon at harvest following a single application of Reldan 22E (EF-1066), Spain—1994 (N088). Dow AgroSciences. GLP. Unpublished.
GHE-P-4496	Khoshab, A	1995	Residues of chlorpyrifos-methyl and its pyridinol metabolite in whole Mandarin at harvest following a single application of Reldan 22E (EF- 1066), Spain—1994 (N089). Dow AgroSciences. GLP. Unpublished.
GHE-P-4497	Khoshab, A	1995	Residues of chlorpyrifos-methyl and its pyridinol metabolite in whole Orange at harvest following a single application of Reldan 22E (EF-1066), Spain—1994 (N090). Dow AgroSciences. GLP. Unpublished.
GHE-P-3722	Khoshab, A and Berryman, T	1994	Residues of chlorpyrifos-methyl in peaches at harvest following a single application of Reldan 22E (EF 1066)—Italy 1993 (N085). Dow AgroSciences. GLP. Unpublished.
GHE-P-3631	Khoshab, A and Berryman, T	1994	Residues of chlorpyrifos-methyl in whole lemon at harvest following a single application of Reldan 22E (EF 1066)—Spain 1993 (N086). Dow AgroSciences. GLP. Unpublished.
GHE-P-3630	Khoshab, A and Berryman, T	1994	Residues of chlorpyrifos-methyl in whole Mandarins at harvest following a single application of Reldan 22E (EF 1066 or EF 815)—Spain 1993 (N087). Dow AgroSciences GLP. Unpublished.
GHE-P-3632	Khoshab, A and Berryman, T	1994	Residues of chlorpyrifos-methyl in whole orange at harvest following a single application of Reldan 22E (EF 1066)—Spain 1993 (N084). Dow AgroSciences. GLP. Unpublished.
GHE-P-4372	Khoshab, A and Bolton, A	1995	Residues of chlorpyrifos-methyl in post-harvest stored Wheat and Barley grain following treatment with RELDAN 22 (EF-1066) or RELDAN 50 (EF-917) at two different rates of application (N091). Dow AgroSciences. GLP. Unpublished.
GHE-P-2905	Khoshab, A and Chen, S	1993	Residues of chlorpyrifos-methyl in lemon peel and pulp at intervals following a single application of Reldan 22E (EF 815)—Spain 1991 (N080). Dow AgroSciences. GLP. Unpublished.
GHE-P-2906	Khoshab, A and Chen, S	1993	Residues of chlorpyrifos-methyl in mandarin peel and pulp at intervals following a single application of Reldan 22E (EF 815)—Spain 1991 (N076). Dow AgroSciences. GLP. Unpublished.
GHE-P-2907	Khoshab, A and	1993	Residues of chlorpyrifos-methyl in orange peel and pulp at intervals

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GHE-P-3089	Khoshab, A and Laurie, D	1993	Residues of chlorpyrifos-methyl in peaches at intervals following a single application of Reldan 22E (EF 815)—Greece 1992 (N079). Dow AgroSciences Ref. No. GLP. Unpublished.
GHE-P-3120	Khoshab, A and Laurie, D	1993	Residues of chlorpyrifos-methyl in peaches at intervals following a single application of Reldan 22E (EF 815)—Italy 1992 (N077). Dow AgroSciences. GLP. Unpublished.
GHE-P-3088	Khoshab, A and Laurie, D	1993	Residues of chlorpyrifos-methyl in peaches at intervals following a single application of Reldan 22E (EF 815)—Spain 1992 (N078). Dow AgroSciences. GLP. Unpublished.
GHE-P-3096	Khoshab, A and Laurie, D	1993	Residues of chlorpyrifos-methyl in whole lemon at intervals and in peel and pulp at harvest following a single application of Reldan 22E (EF 815)—Spain 1992 (N083). Dow AgroSciences GLP. Unpublished.
GHE-P-3229	Khoshab, A and Laurie, D	1993	Residues of chlorpyrifos-methyl in whole mandarins at intervals and in peel and pulp at harvest following a single application of Reldan 22E (EF 815)—Spain 1992 (N082). Dow AgroSciences. GLP. Unpublished.
GHE-P-3230	Khoshab, A and Laurie, D	1993	Residues of chlorpyrifos-methyl in whole orange fruit at intervals and in peel and pulp at harvest following a single application of Reldan 22E (EF 815)—Spain 1992 (N081) Dow AgroSciences GLP. Unpublished.
ERC93.1	Khoshab, Aand Laurie, D	1993	Analytical Method. Determination of Chlorpyrifos-methyl in Lemons, Mandarins and Oranges. (OR09). Dow AgroSciences. Ref. No. Non-GLP. Unpublished.
ERC 92.27	Khoshab, A and Laurie, D	1993	Analytical Method. Determination of Chlorpyrifos-methyl in Peaches (OR10). Dow AgroSciences. Non-GLP. Unpublished. 22 July 1993.
GHE-P-2500	Knowles, SJ	1991a	Determination of flammability of chlorpyrifos-methyl technical. Dowelanco Europe. GLP. Unpublished.
GHE-P-2500	Knowles, SJ	1991b	Determination of explosive properties of chlorpyrifos-methyl technical. Dowelanco Europe. GLP. Unpublished.
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GHE-P-3085	Knowles, SJ	1993	Determination of Solvent Solubility of Chlorpyrifos-Methyl (Pure) Dowelanco. GLP. Unpublished.
GH-C-1155	Kuper, AW	1978	Residues of chlorpyrifos-methyl and 3,5,6,-trichloro-2-pyridinol in tissues and eggs of chickens fed chlorpyrifos-methyl (N144). Dow AgroSciences. Non-GLP. Unpublished.
GH-C 1118	Kuper, AW	1978	Residues of chlorpyrifos-methyl and 3,5,6,-trichloro-2-pyridinol in tissues from calves fed chlorpyrifos-methyl (N143). Dow AgroSciences. Non-GLP. Unpublished.
GH-C-1233	Kuper, AW and Kutschinski, AH	1979	Residues of chlorpyrifos-methyl and 3,5,6,-trichloro-2-pyridinol in tissues of swine fed chlorpyrifos-methyl (N146). Dow AgroSciences. Non-GLP. Unpublished.
GH-C-1161	Kuper, AW	1978	Residues of chlorpyrifos-methyl and 3,5,6,-trichloro-2-pyridinol in milk and cream from cows fed chlorpyrifos-methyl (N145). Dow AgroSciences. Non-GLP. Unpublished
GH-C 964	Laskowski, DA, Comeaux, LB and Bidlack, HD	1977	Aerobic soil decomposition of ¹⁴ C-labeled 3,5,6-trichloro-2- methoxypiridine. Dow AgroSciences. GLP. Unpublished.
GHE-P- 11217	Livingstone, K.	2006	Residues of chlorpyrifos-methyl in maize at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N205). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11531	Livingstone, K.	2007	Residues of chlorpyrifos-methyl in spring or winter oilseed rape at intervals, at harvest and in process fractions following a single applications of GF-1684—Northern and Central Europe—2006 (N209). Dow AgroSciences. GLP. Unpublished. November 2007.
GHE-P- 11529	Livingstone, K	2008	Residues of chlorpyrifos-methyl in cherries at intervals and at harvest following multiple applications of GF-1684—Central Europe—2006 (N226). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11530	Livingstone, K	2008	Residues of chlorpyrifos-methyl in cotton at intervals, at harvest following multiple applications of GF-1684—Southern Europe—2006 (N223). Dow AgroSciences. GLP. Unpublished.

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GHE-P- 11545	Livingstone, K	2008	Residues of chlorpyrifos-methyl in mandarins at intervals, at harvest following multiple applications of GF-1684—Southern Europe—2006 (N212). Dow AgroSciences. GLP. Unpublished. January 2008.
GHE-P- 11544	Livingstone, K	2008	Residues of chlorpyrifos-methyl in oranges at intervals, at harvest following multiple applications of GF-1684—Southern Europe—2006 (N213). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11533	Livingstone, K	2008)	Residues of chlorpyrifos-methyl in peppers (protected) at intervals, at harvest following multiple applications of GF-1684—Southern Europe—2006 (N222). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11527	Livingstone, K	2008	Residues of chlorpyrifos-methyl in pome fruit at intervals and at harvest following multiple applications of GF-1684—Southern Europe—2006 (N241). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11526	Livingstone, K	2008	Residues of chlorpyrifos-methyl in pome fruit at intervals, at harvest following multiple applications of GF-1684—Northern and Central Europe—2006 (N214). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11534	Livingstone, K	2008	Residues of chlorpyrifos-methyl in potatoes at intervals, at harvest following multiple applications of GF-1684—Northern and Central Europe—2006 (N224). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11535	Livingstone, K	2008)	Residues of chlorpyrifos-methyl in potatoes at intervals, at harvest following multiple applications of GF-1684—Southern Europe—2006 (N225). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11528	Livingstone, K	2008	Residues of chlorpyrifos-methyl in stone fruit at intervals, at harvest following multiple applications of GF-1684—Southern Europe—2006 (N215). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11536	Livingstone, K	2008	Residues of chlorpyrifos-methyl in stored barley grain at intervals and harvest following application of GF-1684—Northern, Southern and Central Europe—2006 (N234). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11537	Livingstone, K	2008	Residues of chlorpyrifos-methyl in stored wheat grain at intervals and harvest following application of GF-1684—Northern, Southern and Central Europe—2006 (N233). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11541	Livingstone, K	2008	Residues of chlorpyrifos-methyl in strawberries at intervals, at harvest following multiple applications of GF-1684—Northern and Central Europe—2006 (N218). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11540	Livingstone, K	2008	Residues of chlorpyrifos-methyl in strawberries at intervals, at harvest following multiple applications of GF-1684—Southern Europe—2006 (N219). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11542	Livingstone, K	2008	Residues of chlorpyrifos-methyl in tomatoes (field and protected) at intervals, at harvest following multiple applications of GF-1684—Northern and Southern Europe—2006 (N220). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11543	Livingstone, K	2008	Residues of chlorpyrifos-methyl in tomatoes (protected) at intervals, at harvest following multiple applications of GF-1684—Central Europe—2006 (N221). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11539	Livingstone, K	2008	Residues of chlorpyrifos-methyl in white and red table grapes at intervals, at harvest following multiple applications of GF-1684—Southern Europe—2006 (N217). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11538	Livingstone, K	2008	Residues of chlorpyrifos-methyl in white and red wine grapes and red table grapes at intervals, at harvest following multiple applications of GF-1684—Central Europe—2006 (N216). Dow AgroSciences. GLP. Unpublished.
GH-C 5484	Magnussen, JD	2002	¹⁴ C Chlorpyrifos Citrus Nature of Residue Study (Dursban L018). Dow AgroSciences. GLP. Unpublished.
50021	Magnussen, JD and Balcer, JL	2006	Nature of the Residue Study with ¹⁴ C-Chlorpyrifos Applied to Peas (L020). Dow AgroSciences. GLP. Unpublished.
GH-C 5429	Maliani, N	2002a	Independent laboratory validation of Dow AgroSciences LLC Method GRM 00.10—Determination of residues of chlorpyrifos-methyl residues in crops and process fractions with a high water content (OR17A). Dow AgroSciences. GLP. Unpublished.
GH-C 5437	Maliani, N	2002b	Independent laboratory validation of Dow AgroSciences LLC Method GRM 02.01—Determination of residues of chlorpyrifos-methyl and chlorpyrifos in animal tissues by gas chromatography with negative-ion chemical ionisation mass spectrometry (O34A). Dow AgroSciences. GLP.

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GHE-P- 11798	Marshall, L	2008	Residues of chlorpyrifos-methyl and TCP in cherries at intervals and at harvest following a single application of GF-1684—Central Europe—2007 (N235). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11806	Marshall, L	2008	Residues of chlorpyrifos-methyl and TCP in maize at intervals and at harvest following a single application of GF-1684—Southern Europe—2007 and 2008 (N240). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11805	Marshall, L	2008	Residues of chlorpyrifos-methyl and TCP in outdoor and indoor tomatoes at intervals and at harvest following a single application of GF-1684— Northern, Central and Southern Europe—2007 and 2008 (N239). Dow AgroSciences. Version 3. GLP. Unpublished.
33688	McConnell, AB, Servatius, LJ, Herrer, RE, Bache, B and Wilkes, LC	1982	Determination of the metabolic fate of ¹⁴ C chlorpyrifos-methyl in lactating goats (H18). Dow AgroSciences. Ref. No. GH-C 1578. Non-GLP. Unpublished.
GH-C 1578	McConnell, AB, Servatius, LJ, Herrera, RE, Bache, B and Wilkes, LC	1982	Fate of ¹⁴ C-chlorpyrifos-methyl applied as a protectant to stored grain (L03). Dow AgroSciences. Non-GLP. Unpublished.
20075010/11- FPKI	Miserocchi, G	2008	Residues decay of chlorpyrifos-methyl in Kiwi following applications of GF-1684 Italy, 2007 (N227). Dow AgroSciences. GLP. Unpublished.
GHE-P-326	Morel, JL	1975	Determination of residues of chlorpyrifos-methyl in bread following treatment of grain in a silo with Reldan insecticide (N013). Dow AgroSciences, Non-GLP. Unpublished.
GRM 02.04	Olberding, EL, Arnold, BH and Lindsey, AE	2002	Determination of residues of chlorpyrifos-methyl in agricultural commodities by gas chromatography with negative-ion chemical ionisation mass spectrometry (OR18). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11215	Old, J	2006	Residues of chlorpyrifos-methyl in apples at intervals and harvest following multiple applications of GF-1325—Northern Europe—2005 (N198). Dow AgroSciences. GLP. Unpublished. November 2006.
GHE-P- 11214	Old, J	2006	Residues of chlorpyrifos-methyl in apples at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N195). Dow AgroSciences GLP. Unpublished.
GHE-P- 11216	Old, J	2006	Residues of chlorpyrifos-methyl in apricots at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N199). Dow AgroSciences GLP. Unpublished.
GHE-P- 11220	Old, J	2006	Residues of chlorpyrifos-methyl in peaches at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N200). Dow AgroSciences GLP. Unpublished.
GHE-P- 11222	Old, J	2006	Residues of chlorpyrifos-methyl in pears at intervals and harvest following multiple applications of GF-1325—Northern Europe—2005 (N202). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11221	Old, J	2006	Residues of chlorpyrifos-methyl in pears at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N201). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11223	Old, J	2006	Residues of chlorpyrifos-methyl in protected peppers at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N203). Dow AgroSciences Ref. No. GLP. Unpublished.
GHE-P- 11224	Old, J	2006	Residues of chlorpyrifos-methyl in red and white table grapes at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N196). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11228	Old, J	2006)	.Residues of chlorpyrifos-methyl in red wine grapes at intervals and harvest and in process fractions following multiple applications of GF-1325— Southern Europe—2005 (N206). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11226	Old, J	2006	Residues of chlorpyrifos-methyl in tomatoes at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N204). Dow AgroSciences Ref. No. GLP. Unpublished.
GHE-P- 11227	Old, J	2006	Residues of chlorpyrifos-methyl in white wine grapes at intervals and harvest following multiple applications of GF-1325—Northern Europe—2005 (N197). Dow AgroSciences. GLP. Unpublished.

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GHE-P- 11218	Old, J	2007	Residues of chlorpyrifos-methyl in mandarins at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N207). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11219	Old, J	2007	Residues of chlorpyrifos-methyl in oranges at intervals and harvest following multiple applications of GF-1325—Southern Europe—2005 (N208). Dow AgroSciences Ref. No. GLP. Unpublished.
GHE-P- 11225	Old, J	2008	Residues of chlorpyrifos-methyl in protected tomatoes at intervals, at harvest and in process fractions following multiple applications of GF-1325—Southern Europe—2005 (N211). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11532	Livingstone K	2007	Residues Of Chlorpyrifos-Methyl In Spring or Winter Oil Seed Rape at and In Process Fractions Following of Application of Gf-1684—Southern Europe—2006 (N210). Dow AgroSciences. GLP. Unpublished.
GHE-P-3756	Phillips, M and Hall, BE	1994	Aerobic Degradation of Chlorpyrifos-methyl in Natural Waters and Associated Sediments (K12). Dow AgroSciences. GLP. Unpublished.
GRM 05.07	Pinheiro, AC, Matos, NC, Faira, FP, Nobre, SL and De Vito, R	2006	Determination of residues of chlorpyrifos-methyl in Agricultural commodities by on-line solid phase extraction and liquid chromatography with tandem mass spectrometry (OR21). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10994	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in apples and process fractions at intervals and at harvest following multiple applications of GF-1325, Germany and Northern France—2004 (N183). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10995	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in apples and process fractions at intervals and at harvest following multiple applications of GF-1325, Greece, Southern France and Spain (N186). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10996	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in apricots at intervals and at harvest following multiple applications of GF-1325, Greece, Southern France and Spain (N187). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10989	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in cherry tomatoes grown under cover at intervals following multiple applications of GF-1325, Southern France—2004 (N189). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10991	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in maize and process fractions at intervals and at harvest following multiple applications of GF-1325, Spain, Southern France and Italy—2004 (N181). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11004	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in mandarins at intervals and at harvest following multiple applications of GF-1325, Italy and Spain—2004 (N179). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10992	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in peaches and process fractions at intervals and at harvest following multiple applications of GF-1325, Italy, Southern France and Spain (N185). Dow AgroSciences. GLP. Unpublished
GHE-P- 10997	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in pears at intervals and at harvest following multiple applications of GF-1325, Greece, Southern France and Spain—2004 (N177). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10998	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in pears at intervals and at harvest following multiple applications of GF-1325, Northern France, Germany and Belgium - 2004 (N184). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11000	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in red table grapes and process fractions at intervals and at harvest following multiple applications of GF-1325, Spain and Southern France—2004 (N178). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10990	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in sweet peppers grown under cover at intervals and at harvest following multiple applications of GF- 1325, Greece, Spain, Southern France and Italy—2004 (N180). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10993	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in tomatoes and process fractions at intervals and at harvest following multiple applications of GF-1325, Greece, Italy and Spain—2004 (N182). Dow AgroSciences. GLP. Unpublished.

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GHE-P- 10988	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in tomatoes and tomato juice grown under cover at intervals and at harvest following multiple applications of GF-1325, Italy, Southern France and Spain—2004 (N176). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10999	Rawle, N	2005	Residues of chlorpyrifos-methyl and TCP in white table grapes and process fractions at intervals and at harvest following multiple applications of GF-1325, Spain and Southern France (N188). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11003	Rawle, N	2006	Residues of chlorpyrifos-methyl and TCP in oranges and process fractions at intervals and at harvest following multiple application of GF-1325, Italy and Spain—2004 and 2005 (N194). Dow AgroSciences. GLP. Unpublished. 2006.
GHE-P- 11002	Rawle, N	2006	Residues of chlorpyrifos-methyl and TCP in red wine grapes and process fractions at intervals and at harvest following multiple applications of GF-1325, Spain, Italy, Southern France and Greece (N191). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11006	Rawle, N	2006	Residues of chlorpyrifos-methyl and TCP in stored malting barley grain and process fractions at intervals following a single application of GF- 1325, UK—2004 (N193). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11005	Rawle, N	2006	Residues of chlorpyrifos-methyl and TCP in stored wheat grain and process fractions at intervals following a single application of GF-1325, UK—2004 (N190). Dow AgroSciences. GLP. Unpublished.
GHE-P- 11001	Rawle, N	2006	Residues of chlorpyrifos-methyl and TCP in white wine grapes and process fractions at intervals and at harvest following multiple applications of GF-1325, Germany and Northern France (N192). Dow AgroSciences. GLP. Unpublished.
GHE-P-3638	Reeves, GL	1994	Aerobic soil degradation of ¹⁴ C-chlorpyrifos-methyl (K13). Dow AgroSciences. GLP. Unpublished.
GHE-P-4045	Richardson, N	1995	Chlorpyrifos-Methyl (Technical) Determination Of Auto-Ignition Temperature. Dow AgroSciences. GLP. Unpublished.
GHE-P-6453	Sydney, P	1997	Determination of physical-chemical properties (surface tension and partition coefficient) (A45). Dow AgroSciences. GLP. Unpublished.
GHE-P-4944	Teasdale, R	1996	Residues of chlorpyrifos-methyl in wine grapes at intervals following a single application of RELDAN 22 (EF-1066), Northern and Southern France—1995 (N092). Dow AgroSciences. GLP. Unpublished.
GRM 00.10	Teasdale, R	2000	Determination of residues of chlorpyrifos-methyl residues in crops and process fractions with high water content (OR17). Dow AgroSciences. GLP. Unpublished.
GHE-P-8661	Teasdale, R	2000	Residues of chlorpyrifos-methyl in tomatoes at harvest and processed fractions (canned tomatoes, juice and puree) following multiple applications of RELDAN 22 (EF-1066), Italy—1999 (N100). Dow AgroSciences. GLP. Unpublished.
GHE-P-8662	Teasdale, R	2000	Residues of chlorpyrifos-methyl in tomatoes at intervals grown under cover following multiple applications of RELDAN 22 (EF-1066), Spain—1999 (N101). Dow AgroSciences. GLP. Unpublished.
GH-C 5410	Thomas AD, Lindsay, DA, Miller, AM and Rutherford, LA	2002a	Frozen storage stability of chlorpyrifos-methyl in whole oranges, grapes, grape wine, tomatoes, tomato juice, and wheat grain (S01). Dow AgroSciences. GLP. Unpublished. 26 March 2002.
GH-C 5409	Thomas AD, Lindsay, DA, Miller, AM and Rutherford, LA	2002b	Frozen storage stability of chlorpyrifos-methyl in beef muscle, beef liver, beef kidney, beef fat, dairy milk, and eggs (S02). Dow AgroSciences. GLP. Unpublished.
GH-C-5182	Vette, HQM and Shoonmade, JA	2001	A study on the route and rate of aerobic degradation of [14C]-TCP (3,5,6-trichloropyridinol) in four European soils. Dow AgroSciences GLP. Unpublished.
GHE-P-9749	Watson, P	2002	Chlorpyrifos-Methyl Calculation of Henry's Law Constant (H) Dow AgroSciences. GLP. Unpublished.
GHE-P- 10490	Wardman, JP	2004	Residues of cypermethrin, alpha-cypermethrin and chlorpyrifos in peas at harvest following multiple applications of GF-875 or EF-1153, Southern Europe—2003 (N173). Dow AgroSciences GLP. Unpublished.
GHE-P- 10492	Wardman, JP	2004	Residues of cypermethrin, alpha-cypermethrin and chlorpyrifos in tomatoes at harvest following multiple applications of GF-875 or EF-1153,

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GHE-P- 10487	Wardman, JP	2004	Residues of Cypermethrin, Alpha-Cypermethrin and Chlorpyrifos in Grapevines at Harvest Following Multiple Applications of GF-875 or EF- 1153, Southern Europe—2003 (N170). Dow AgroSciences. GLP. Unpublished.
GHE-P- 10491	Wardman, JP	2004	Residues of cypermethrin, alpha-cypermethrin and chlorpyrifos in potatoes at harvest following multiple applications of GF-875 or EF-1153, Southern Europe—2003 (N174). Dow AgroSciences. GLP. Unpublished.
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