PARATHION-METHYL (059)

EXPLANATION

Parathion-methyl was first evaluated in 1965 and has been reviewed recently in 1991, 1992, 1994 and 1995. It was listed by the 1998 CCPR (30th Session, ALINORM 99/24, Appendix VII) for periodic re-evaluation by the 2000 JMPR. Comprehensive data were provided by the basic manufacturer. Information was also provided by the governments of Australia, Germany, The Netherlands, Poland and Thailand.

IDENTITY

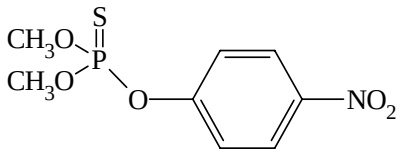
ISO common name: parathion-methyl

Chemical name

IUPAC: *O,O*-dimethyl *O*-4-nitrophenyl phosphorothioate
CA: *O,O*-dimethyl *O*-(4-nitrophenyl) phosphorothioate

CAS No.: 298-00-0

Structural formula:



Molecular formula: $C_8H_{10}NO_5PS$

Molecular weight: 263.2

Physical and chemical properties

Pure active ingredient

Appearance: colourless, crystalline solid, with garlic-like odour.

Vapour pressure: $1.72 (\pm 0.09) \times 10^{-5}$ mm Hg at 25°C

Melting point: 35-36°C

Octanol/water partition coefficient: $P_{ow} = 629$, $\log P_{ow} = 2.8$

Solubility:

in water: 70.3 ± 2.73 mg/l at 25°C.
in solvents: readily soluble in most aromatic solvents such as hydrocarbons, alcohols, esters and ketones. Slightly soluble in petroleum and some mineral oils.

Specific gravity: 1.358 (d^{20}_4)

Hydrolysis:

hydrolysis half-life at 25°C in the dark under sterile conditions at initial concentration of 4 mg/l
pH 5: 68 days
pH 7: 40 days
pH 9: 33 days.

The dominant product of acid hydrolysis is demethyl parathion-methyl and of alkaline hydrolysis 4-nitrophenol. In neutral conditions nearly equal amounts of both products are formed.

Photolysis

Parathion-methyl had a half-life of approximately 49 hours in water in a photodegradation study (FIFRA Guideline N161-2).

Thermal stability

Heating at 150°C for 6.5 hours resulted in 91% isomerization to *O,S*-dimethyl-parathion-methyl, followed by generation of dimethyl sulfide, sulfur dioxide and other substances. Parathion-methyl should not be heated above 55ºC.

Technical material

Purity: minimum 80% (technical concentrate, 80% parathion-methyl in xylene).

Melting point: 17ºC

Main impurity: 4-nitrophenol, less than 0.2%.

Stability: Samples of parathion-methyl technical concentrate were stored in sealed glass bottles in the dark at 20ºC, 40ºC and 55ºC. The initial parathion-methyl content was 77.7%, which decreased marginally to 76.6% and 75.0% after two years at 20ºC and 40ºC respectively. After storage at 55ºC for 20 weeks the parathion-methyl content was 73.2%, and after one year at this temperature the material had polymerized.

Formulations

Danatox 50 EC, Novafos M 20, Novafos M 40, Parathion-methyl 4 EC, Parashoot 450 CS, Danacap 450 CS.

METABOLISM AND ENVIRONMENTAL FATE

Animal metabolism

The Meeting received information on the metabolism of parathion-methyl in lactating goats and laying hens.

Goats. A lactating goat weighing 60 kg was dosed orally by intubation with 35 mg per day of [*phenyl*-^{14}C]parathion-methyl, equivalent to 6.25 ppm in the diet, for 3 days (Van Dijk, 1988a). The goat produced 1.15 kg milk on day 2, the only full day of the experiment. Milk and excreta were collected throughout, and the animal was slaughtered 1 hour after the final dose. Residues were determined in the milk, blood, excreta and round, loin and flank muscle, subcutaneous, omental and perirenal fat, liver and kidneys. The total recovery of ^{14}C was 35.5%. No residues of parathion-methyl or paraoxon-methyl were detected in tissues or milk. The results are shown in Tables 1 and 2.

Table 1. Residues in the tissues, milk, blood and excreta of a lactating goat (Van Dijk, 1988a).

Sample	Recovered ^{14}C	
	% of dose	mg/kg as parathion-methyl
Kidney	0.3	1.6
Liver	0.5	0.59
Muscle	1.3	0.055

Sample	Recovered ^{14}C	
	% of dose	mg/kg as parathion-methyl
Fat	0.1	0.014
Tissues + organs + blood	2.8	
Milk	<0.1	0.008-0.036
Urine + pan rinse	19.5	
Faeces	13.2	
Total	35.5	

Table 2. Identified metabolites in tissues and milk of a lactating goat (Van Dijk, 1988a).

Compound	Concentration, mg/kg, as parathion-methyl				
	milk, 8 hours after 2nd dose	kidney	liver	muscle	fat
O-demethyl-paraoxon-methyl	0.013	0.17	0.14	ndr	ndr
N-acetylaminophenol	ndr	ndr	0.14	ndr	ndr
N-acetylaminophenyl glucuronide	ndr	0.21	0.037	0.001	ndr
amino-paraoxon-methyl	0.012	0.15	ndr	0.032	0.004
O-demethyl-amino-parathion-methyl	ndr	0.29	ndr	ndr	ndr
O-demethyl-amino-paraoxon-methyl	ndr	0.24	0.13	0.014	ndr
p-aminophenyl glucuronide	0.004	ndr	ndr	0.002	ndr
amino-parathion-methyl	ndr	0.029	ndr	ndr	<0.001

ndr: no detected residue

Hens. Five white Leghorn-hybrid laying hens weighing 1.5-2.0 kg each were dosed 3 times at daily intervals by intubation with 0.5 mg/kg/bw of [*phenyl*-^{14}C]parathion-methyl equivalent to 6.25 ppm parathion-methyl in the feed (Van Dijk, 1988b). Eggs and excreta were collected throughout, and the birds killed 3 hours after the final dose.

The total recovery of ^{14}C was 54%, with 52% of the dose in the excreta and 2% in the edible tissues, organs, eggs and blood. ^{14}C in the digestive tract was not measured, but may have accounted for some of the missing ^{14}C.

^{14}C levels expressed as parathion-methyl in eggs were in the range 0.001-0.031 mg/kg, with the highest level in an egg laid 3 hours after the third dose. Nitrophenol and nitrophenyl sulfate were the only metabolites identified in eggs.

The total ^{14}C level was higher in kidneys than in the other tissues, but parathion-methyl was a minor component of the residue, the main compound being a glucuronide conjugate. Except for skin, fat was the tissue with the highest residue of parathion-methyl itself, suggesting a degree of fat solubility. Paraoxon-methyl was not detected in eggs or any of the tissues. The levels of identified compounds are shown in Table 3.

Table 3. Identified compounds in the tissues and eggs of laying hens dosed orally daily for 3 consecutive days with 0.5 mg/kg/bw [*phenyl*-^{14}C]parathion-methyl (Van Dijk, 1988b).

Compounds	^{14}C, mg/kg as parathion-methyl							
	eggs	liver	kidney	muscle	gizzard	heart	fat	skin
parathion-methyl	nd	nd	0.001	nd	0.004	0.001	0.008	0.011
O-demethyl-paraoxon-methyl	nd	nd	0.014	0.010	nd	nd	nd	nd
e-nitrophenyl phosphorothioate	nd	nd	0.008	nd	nd	nd	nd	0.002
p-nitrophenol	0.008	0.007	0.005	nd	0.011	0.005	0.008	0.064
p-nitrophenyl sulfate	0.021	nd	nd	nd	nd	nd	nd	0.003

Compounds	^{14}C, mg/kg as parathion-methyl							
	eggs	liver	kidney	muscle	gizzard	heart	fat	skin
N-acetylaminophenol	nd	0.048	nd	nd	0.002	0.012	nd	nd
N-acetylaminophenyl glucuronide	nd	0.017	0.11	nd	nd	0.013	nd	0.012
O-demethyl-amino-parathion-methyl	nd	nd	nd	nd	nd	0.003	nd	0.006
p-aminophenol	nd	nd	0.014	nd	nd	0.002	nd	nd
p-aminophenyl glucuronide	nd	nd	0.020	nd	nd	0.001	nd	nd
Total ^{14}C as parathion-methyl		0.076	0.24	0.017	0.029	0.051	0.021	0.11

nd: not detected

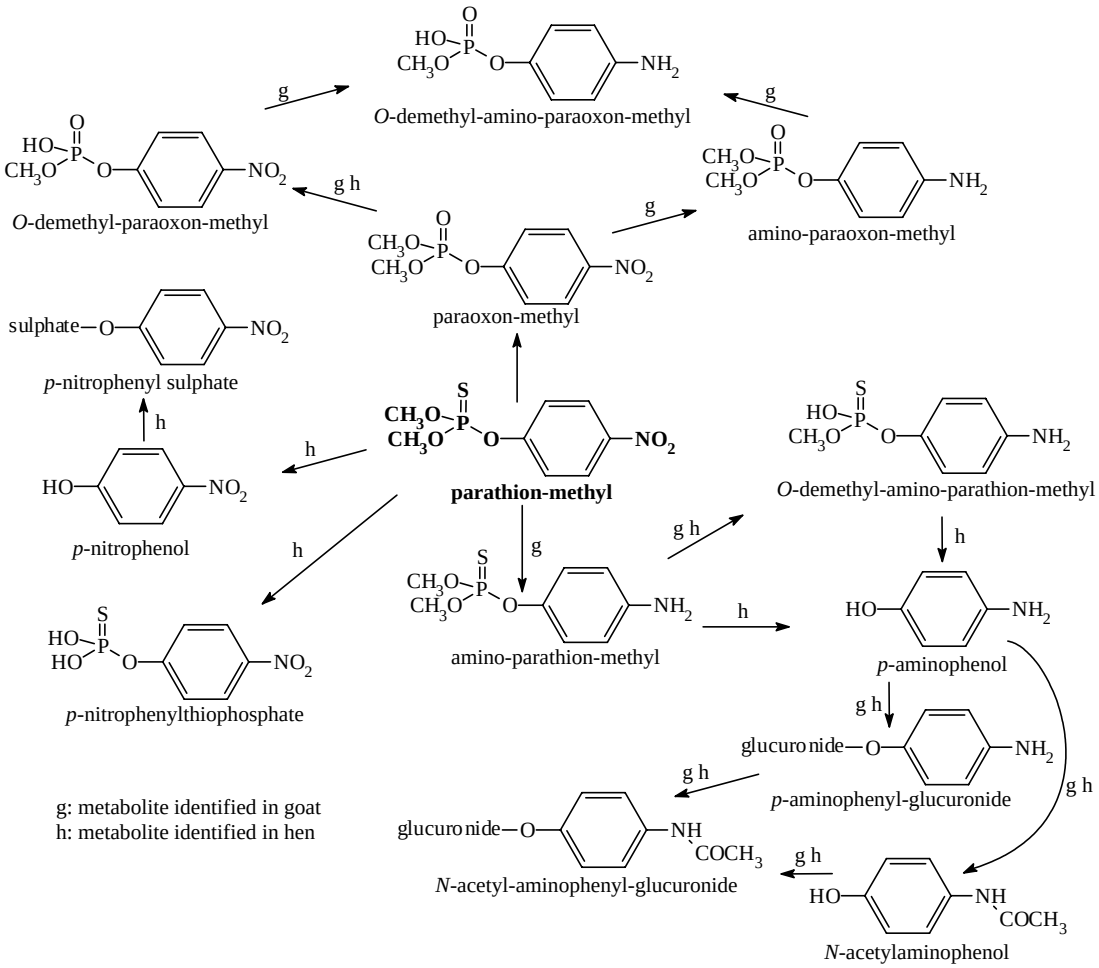


Figure 1. Animal metabolism of parathion-methyl.

Plant metabolism

The Meeting received information on the metabolism of parathion-methyl in potatoes, cotton and lettuce.

Potatoes. Linke and Brauner (1988) applied [*phenyl*-^{14}C]parathion-methyl once as a foliar spray to 3-month old plants at a rate equivalent to 4.7 kg ai/ha and harvested them 5 days and 21 days after treatment. In the plants harvested on day 5, the distribution of ^{14}C was 0.01-0.02% in tubers and 99.98-99.99% in foliage, and on day 21 0.13-0.14% and 99.86-99.87% respectively. The components

of the residue identified in the tubers are shown in Table 4. Paraoxon-methyl was a tentative identification.

Table 4. Compounds in tubers harvested 5 and 21 days after a single foliar treatment with [*phenyl*-^{14}C]parathion-methyl at a rate equivalent to 4.7 kg ai/ha.

Compound	^{14}C as parathion-methyl, mg/kg	
	Tubers harvested 5 days after crop treatment	Tubers harvested 21 days after crop treatment
parathion-methyl	0.001	<0.001
paraoxon-methyl		0.002
p-nitrophenyl conjugate	0.002	0.003
p-nitrophenyl glucoside		<0.001
demethyl-parathion-methyl	0.002	0.002
After hydrolysis		
parathion-methyl	<0.001	
p-nitrophenol	<0.001	0.011
Total ^{14}C	0.024	0.068

Cotton. A plant was foliar-sprayed with [*phenyl*-^{14}C]parathion-methyl at a rate equivalent to 0.376 kg ai/ha (Linke *et al.*, 1988). Ten days later the ^{14}C level in the seed was 0.08 mg/kg expressed as parathion-methyl. Parathion-methyl (0.008 mg/kg), *p*-nitrophenol (0.009 mg/kg), *p*-nitrophenyl glucopyranoside (0.007 mg/kg) and demethyl-parathion-methyl (0.004 mg/kg) were identified as components of the residue.

In a second experiment a solution of [*phenyl*-^{14}C]parathion-methyl was applied directly to cotton leaves with a syringe (Linke *et al.*, 1988). The leaves were analysed fifteen days later. The total ^{14}C expressed as parathion-methyl in the plants was 484 mg/kg; identified components of the residue were parathion-methyl (168 mg/kg), *p*-nitrophenol (48 mg/kg), *p*-nitrophenyl glucopyranoside (55 mg/kg), demethyl-parathion-methyl (55 mg/kg), and demethyl-paraoxon-methyl (15 mg/kg), all concentrations expressed as parathion-methyl. Paraoxon-methyl was not detected.

Lettuce. In a separate trial lettuces were sprayed with an emulsion of [*phenyl*-^{14}C]parathion-methyl at a rate equivalent to 1.23 kg ai/ha and sampled 14 and 21 days later (Ritter, 1988). Identified components of the residue are shown in Table 5. No P=O metabolites were detected. At least 7 other metabolites were observed, but none could be hydrolysed to *p*-nitrophenol, suggesting significant metabolism of the parent molecule.

Table 5. Identified components of the ^{14}C residue in lettuce treated with [*phenyl*-^{14}C]parathion-methyl (Ritter, 1988).

Compound	^{14}C, mg/kg as parathion-methyl	
	Day 14	Day 21
parathion-methyl	2.2	0.97
p-nitrophenol	2.5	2.07
p-nitrophenyl glucopyranoside	0.30	0.33
demethyl-parathion-methyl	0.25	0.41
Total ^{14}C	11.4	9.7

Linke (1988) further examined the unextractable ^{14}C in plants treated with [*phenyl*-^{14}C]parathion-methyl (Ritter, 1988), which accounted for 38% of the total ^{14}C on day 14 and 45% on day 21. Vigorous cid and alkaline hydrolysis released *p*-nitrophenol accounting for 12% of the ^{14}C in

the leaves. Attempts were made to determine whether part of the unextractable ^{14}C in the leaves resulted from incorporation of $^{14}CO_2$ produced by degradation of parathion-methyl in the soil. Very small amounts of ^{14}C-labelled glucose were identified, but a quantitative estimate was not possible.

Boner (1998) treated greenhouse plants at about 72 days with [*phenyl*-^{14}C]parathion-methyl at a rate equivalent to 1.1 kg ai/ha and harvested the lettuce 21 days later (Table 6). The major metabolite was 4-nitrophenyl 6-*O*-malonyl-ß-D-glucopyranoside. The remaining unidentified metabolites were very polar. Metabolism of parathion-methyl proceeds via cleavage to *p*-nitrophenol which is conjugated with glucose or further with a malonyl group.

Table 6. Identified components of the ^{14}C residue in lettuce treated with [*phenyl*-^{14}C]parathion-methyl (Boner, 1998).

Compound	% of total ^{14}C	mg/kg as parathion-methyl
parathion-methyl	36.2	2.1
p-nitrophenol	5.2	0.30
p-nitrophenyl glucoside	9.9	0.58
demethyl-parathion-methyl	3.7	0.22
4-nitrophenyl 6-*O*-malonyl-ß-D-glucopyranoside	25.5	1.49
Total ^{14}C	100	5.9

Proposed routes of metabolism are shown in Figure 2.

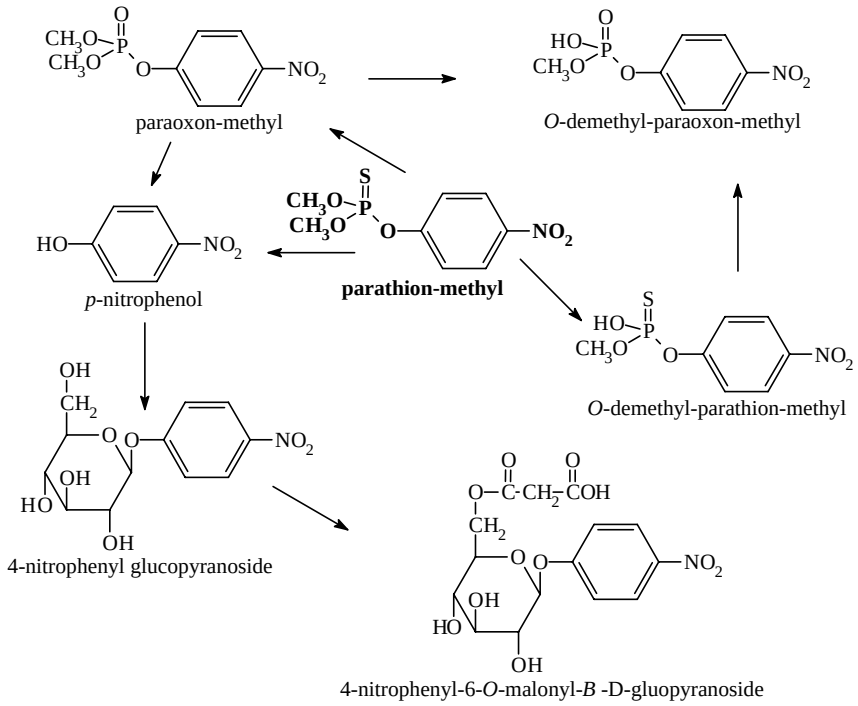


Figure 2. Proposed metabolic pathways of parathion-methyl in plants.

Environmental fate in soil

The Meeting received information on the adsorption, desorption, mobility, dissipation, aerobic and anaerobic degradation, and photolysis of parathion-methyl in soil.

Adsorption. Daly (1989) measured the adsorption-desorption of parathion-methyl in 4 soils equilibrated with 0.01M $CaCl_2$ solutions. One or 3 g samples of the soils were sterilized by autoclave and equilibrated with 10-ml aliquots of [*phenyl*-^{14}C]parathion-methyl at 2, 10, 15 and 20 µg/ml in aqueous 0.01M $CaCl_2$ by shaking at 25°C for 24 hours. The concentration of ^{14}C was measured in the decanted supernatant after centrifugation. The stability of the [^{14}C]parathion-methyl was examined by TLC, and desorption was determined by equilibrating the residual soil sediment with 0.01M $CaCl_2$ solution and measuring the ^{14}C released.

Table 7. K_d and K_{oc} values for parathion-methyl in 4 soils (Daly, 1989). (K_d is ratio of pesticide concentration in soil and K_{oc} that of pesticide concentration in soil organic matter, to that in the aqueous phase at equilibrium.)

Soil	pH	% organic carbon	Adsorption		Desorption		Mobility
			K_d	K_{oc}	K_d	K_{oc}	
Silt loam	7.8	1.2	7.09	591	11.1	923	Low
Clay loam	7.5	1.3	8.71	670	12.3	947	Low
Sandy loam	6.5	0.40	1.82	456	2.71	677	Medium-low
Sand	7.4	0.25	0.57	230	0.89	357	Medium

Degradation. Patterson and Bielefeld (1990) incubated [*phenyl*-^{14}C]parathion-methyl in a soil consisting of 56% sand, 26% silt, and 18% clay, with 1.6% organic matter (pH 6.8) at a nominal 10 mg/kg under aerobic conditions at 25°C in the dark for 6 months. Moisture levels were maintained at approximately 75% of field capacity. 92.5-101% of the applied ^{14}C, including volatiles, was accounted for.

Levels of parathion-methyl and degradation products are shown in Table 8. The estimated half-life of parathion-methyl in the first 14 days was 3.9 days, and the mineralization half-life 16 days. Once most of the parathion-methyl had disappeared, the mineralization half-life was approximately 400 days calculated for the 28-181 days period. The main component of the identified residue was parathion-methyl, and the identified products were *p*-nitrophenol and *O*,*O*-bis(4-nitrophenyl) *O*-methyl phosphorothioate. The unextractable residue reached a maximum after 1 month and then decreased at approximately the same rate as the long-term mineralization. The degradation is shown in Figure 3.

Table 8. Dissipation of parathion-methyl and generation of products during aerobic degradation of labelled parathion-methyl in a sandy loam soil (Patterson and Bielefeld, 1990).

Time	^{14}C, % of applied					
	Total	CO_2	unextractable	parathion-methyl	4-nitrophenol	$C_{13}H_{11}N_2O_7S^1$
day 0	101	0	0.34	98	0	2.3
day 1	97.4	0.22	2.5	79	7.7	1.8
day 3	94.1	10.8	15.1	54	5.6	1.7
day 7	91.3	30	27	27	0.13	1.38
day 14	93.5	43	37	7.9	0	1.06
1 month	95.9	51	39	1.6	0.27	0.37
2 months	92.9	58	31	0.69	0.06	0.28
3 months	96.9	60	33	0.32	0	0.27

Time	^{14}C, % of applied					
	Total	CO_2	unextractable	parathion-methyl	4-nitrophenol	$C_{13}H_{11}N_2O_7S$[1]
4 months	94.7	61	30	0.33	0	0.19
6 months	92.5	63	27	0.16	0	0.15

[1] *O,O*-bis(4-nitrophenyl) *O*-methyl phosphorothioate

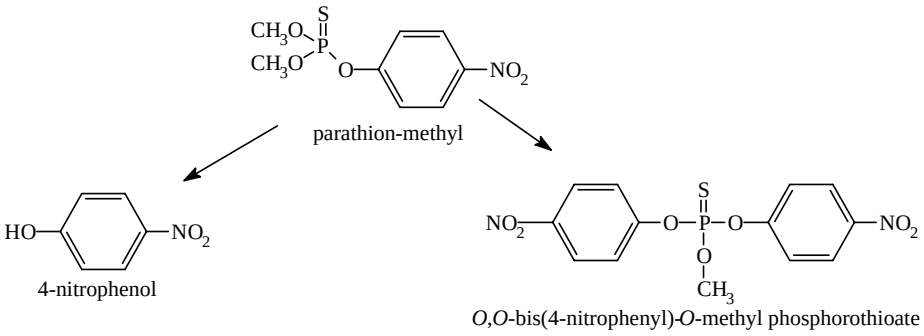


Figure 3. Aerobic degradation of parathion-methyl.

Patterson (1990) repeated the previous experiment, but under anaerobic conditions for 12 months. The soil was flooded with water. The recovery of ^{14}C, including volatiles, was in the range 90.8-110%. Parathion-methyl had an estimated half-life of 10.5 hours calculated for the first 24 hours (Figure 4). A number of products were identified, but mostly as minor components of the residue (Table 9). Nitrophenol was the main identified degradation product at most samplings. Very little mineralization had occurred after 1 year, and most of the ^{14}C had been incorporated into the unextractable fraction. The degradation pathways are shown in Figure 5.

Table 9. Disappearance of parathion-methyl and generation of products during anaerobic degradation of labelled parathion-methyl in a sandy loam soil (Patterson, 1990).

Time	^{14}C, % of applied									
	Total	CO_2	Unextractable	parathion-methyl	*O,O*-bis(4-nitrophenyl) *O*-methyl phosphorothioate	*S*-methyl-parathion-methyl	*S*-nitrophenyl-parathion-methyl	paraoxon-methyl	4-nitrophenol	amino-parathion-methyl
0 h	99.9	0	1.4	78	2.3	0	0	0	4.7	0
1 h	110	0	3.5	50	1.6	0	0	0	17	0
2 h	97.4	0	4.8	39	1.2	0	0	0	3.7	0
4 h	96.5	0	5.6	23	0	0.6	1.1	0.7	17	0
6 h	100	0	7.3	41	0	0	0	0	17	0
12 h	93.8	0	9.0	25	0	1.7	0.9	1.7	18	0
1 d	94.1	0	15	11	0	2.7	1.1	2.1	19	0
3 d	92.3	0	17	0.9	0	0.8	0	0	17	0
7 d	93.2	0	33	0.7	0	0.5	0	0	14	1.5
14 d	92.9	0.01	52	0	0	0.9	0	0.2	1.7	0.6
30 d	93.1	0.02	59	0.2	0	0.6	0	0	0.7	0.8
61 d	99.4	1.75	71	0.1	0	0	0	0	0	1.1
91 d	93.5	1.8	70	0	0	0.6	1.1	0	0.9	0.7
121 d	92.2	2.21	68	0.1	0	1.2	0	0	0.9	0.3
182 d	90.8	2.33	79	0	0	0.1	0.1	0.1	0.4	0.3
273 d	98.4	2.53	78	0	0	0.2	0.2	0.2	0.7	0.2
365 d	95.5	2.77	75	0	0	0.1	0	0.1	0.6	0.1

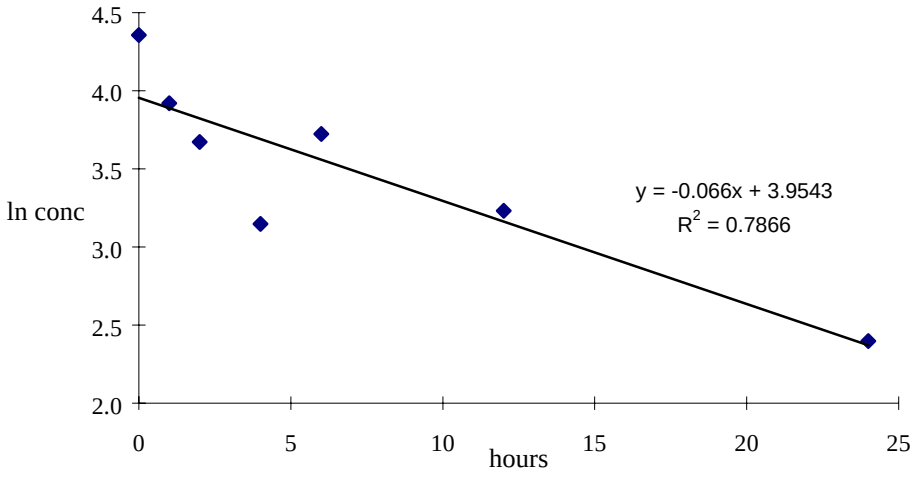


Figure 4. Degradation of parathion-methyl during anaerobic incubation of a sandy loam soil (Patterson, 1990).

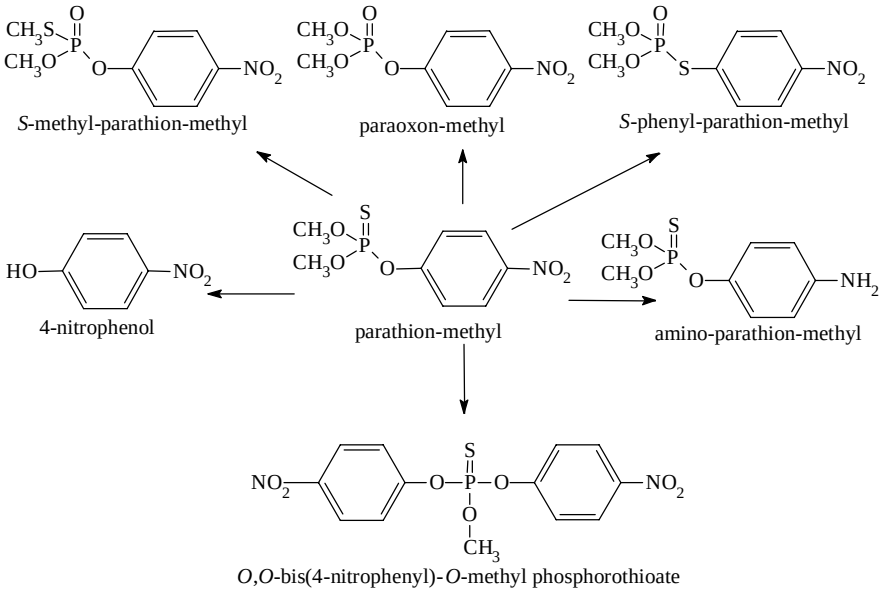


Figure 5. Anaerobic degradation of parathion-methyl.

Mobility. Pors (1995) compared the mobility of parathion-methyl in soil when formulated as an EC (emulsifiable concentrate) and as a CS (capsule suspension). The test soils were a sand (89.3% sand, 1.4% organic carbon) and a sandy loam (69.8% sand, 1.7% organic carbon). The formulations were applied at a rate equivalent to 200 µg ai for the EC and 55 µg for the CS to stainless steel columns of the soils (h 300 mm, diam 50 mm). Simulated rainwater was applied to the columns 18 times during 48 hours at volumes ranging from 18 to 25 ml. Parathion-methyl was not detected (<0.002 mg/l) in the percolates (volume 395 ml). There was no detectable mobility of parathion-methyl in soil from either formulation.

Photolysis. In two tests Wilmes (1987a) used a xenon lamp to simulate sunlight irradiating [*phenyl*-^{14}C]parathion-methyl (about 0.3 mg/cm^2) on a sandy loam soil at 27°C for 11 days. In one the soil was dampened but maintained below its maximum water capacity, and the initial half-life of parathion-methyl was 3.9 days with the longer-term half-life estimated as 8.6 days. In the other water was minimized and the initial and later half-lives were 4.5 and 24 days respectively. The moisture appeared to assist mobility, allowing more exposure to the irradiation.

The estimated half-lives in midsummer at 40° latitude were 17-19 days for a fresh residue and 37-104 days for longer-term residues.

Dissipation. In a trial in California, USA, an EC formulation was applied to a cotton crop 6 times at weekly intervals at 1.1 kg ai/ha (Rice *et al.*, 1990a). The soil was a sandy loam (surface soil 0.2% organic matter, pH 6.2, 77% sand, 17% silt, 6% clay). Soil cores to a depth of 1.2 m were taken before and after each application and then 1, 7, 14, 21 and 28 days after the final application. Cores were sectioned down the profile into 0-10 cm, 10-20 cm, 20-30 cm, 30-45 cm, 45-60 cm, 60-90 cm and 90-120 cm for analysis.

Residues of parathion-methyl were detected (LOQ 0.05 mg/kg) only in 0-10 cm samples taken immediately after spraying and 1 day after the final application, where the means of duplicate field samples were 0.37, 0.32, 0.25, 0.16, 0.16, 0.085 and 0.033 mg/kg. The identity of parathion-methyl in one duplicate of each of the first two samples was confirmed by GC-MS (Jacobsen and Fieser, 1990a). No residues of paraoxon-methyl were detected in any sample. The dissipation of parathion-methyl was too rapid to be measured accurately and no movement down the soil profile was detected. The study suggests that parathion-methyl disappears quickly by degradation and residues are unlikely to move down the soil.

Samples had been stored in a freezer for 40-289 days before analysis. A freezer storage study on the same soil showed that parathion-methyl residues would not have changed, but paraoxon-methyl residues would have decreased by approximately 30% at the longer intervals.

A second trial (Rice *et al.*, 1990b) was identical except that the EC formulation was applied to a cotton crop in Missouri and the soil was a loam (surface soil 0.7% organic matter, pH 5.4, 30% sand, 46% silt, 24% clay).

Again residues of parathion-methyl were only at 0-10 cm. Duplicate samples taken immediately after spraying and 1 day after the final application contained mean residues of 0.039, 0.030, 0.059, 0.087, 0.022 and 0.052 mg/kg. The identity of parathion-methyl in one duplicate of each of two of the samples (0.059 and 0.087 mg/kg) was confirmed by GC-MS (Jacobsen and Fieser, 1990b). No residues of paraoxon-methyl were detected in any sample, as in the California study. The samples were stored in a freezer for 19-182 days before analysis, which would not have affected parathion-methyl levels but would be likely to have reduced paraoxon-methyl residues at the longer intervals. However, 5 surface soil samples taken soon after spraying were analysed after 19-47 days of storage.

Environmental fate in water/sediment systems

The Meeting received information on parathion-methyl photolysis in aqueous solution and on field dissipation in rice paddies.

In a photolysis experiment Wilmes (1987b) used a xenon lamp to irradiate [*phenyl*-^{14}C]parathion-methyl dissolved in a sterile aqueous buffer (pH 5) at a concentration of 5 mg/l at 25°C. The half-life was 48 hours, equivalent to an environmental half-life of about 9 days for 40 degrees latitude with no cloud and in the water layer. The main photoproduct was *p*-nitrophenol. Paraoxon-methyl accounting for up to 2% of the applied ^{14}C was detected in the water. In a second experiment where volatiles were collected, the distribution of ^{14}C after 212 hours irradiation was 5.9%

parathion-methyl, 3.4% demethyl-parathion-methyl, 1.6% *p*-nitrophenol, 41.7% polar compounds and 24.7% CO_2. The demethyl-parathion-methyl was probably a product of hydrolysis rather than photolysis because it was also detected in the dark controls.

Hellpointer (1992), in a laboratory study, estimated the very low quantum yield of 0.0001 for the direct photodegradation of parathion-methyl dissolved in water and irradiated with polychromatic light. Modelling with this value suggests that direct photodegradation in water is a very minor contributor to the overall elimination of parathion-methyl in the environment.

Wilmes (1988) reported that the hydrolysis half-life of parathion-methyl in a sterile aqueous buffer solution at pH 5 and 25°C was 68 days.

In an aquatic field dissipation study an EC formulation was applied 6 times at weekly intervals at 0.84 kg ai/ha to rice paddy in California, USA (Rice *et al.*, 1990c). The soil was a sandy loam (surface soil 0.2% organic matter, pH 6.2, 77% sand, 17% silt, 6% clay). Soil cores to a depth of 0.6 m were taken after each application and then at 1, 7, 14, 21 and 28 days after the final application. Cores sectioned into 0-10 cm, 10-20 cm, 20-30 cm, 30-45 cm and 45-60 cm were analysed for parathion-methyl and paraoxon-methyl, but none was detected (<0.05 mg/kg) in any sample. The soil samples were stored in a freezer for 30-192 days before analysis, which would not have influenced the residue levels of either compound. The soil was the same as in the dissipation trial with a cotton crop (Rice *et al.*, 1990a).

Parathion-methyl was detected (LOQ 0.01 mg/l) in water samples, but only on the days of treatment at 0.21, 0.17, 0.30, 0.28, 0.30 and 0.13 mg/l and the day after the final treatment at 0.070 mg/l. The identity of parathion-methyl in one of each of two duplicate field samples (0.30 and 0.30 mg/kg) was confirmed by GC-MS (Jacobsen and Fieser, 1990c). Paraoxon-methyl was not detected (<0.01 mg/l) in any water sample. The water samples were stored frozen for 12-47 days before analysis.

The study suggests rapid degradation of parathion-methyl in an aquatic field environment with negligible movement down the soil profile.

In a second trial an EC formulation was applied at 6 weekly intervals at 0.84 kg ai/ha to rice paddy in Missouri, USA (Rice *et al.*, 1990d). The soil was the sandy loam (0.7% organic matter, pH 5.4, 30% sand, 46% silt, 24% clay) used previously by Rice *et al.* (1990b). The procedure was the same as in the California trial (Rice *et al.*, 1990c). Parathion-methyl was detected (LOQ 0.01 mg/l) in water samples on the days of and after treatment, and paraoxon-methyl was also detected twice (Table 10). Water samples were stored frozen for 22-53 days before analysis.

Soil cores were analysed for parathion-methyl and paraoxon-methyl, but neither was detected in any sample. Soil samples were stored in a freezer for 112-222 days before analysis, which would not have influenced the residue levels of parathion-methyl, but paraoxon-methyl residues, if present initially, would have been substantially degraded.

Table 10. Residues in the water from a rice plot treated at 6 weekly intervals with parathion-methyl at 0.84 kg ai/ha in Missouri, USA (Rice *et al.*, 1990d).

Days after initial treatment	Days after most recent treatment	parathion-methyl, mg/l	paraoxon-methyl, mg/l	Comments
-1		<0.01 (2)	<0.01 (2)	
0		<0.01 (2)	<0.01 (2)	
0 treatment 1	0	0.40 0.41 0.12	<0.01 (3)	Parathion-methyl confirmed by GC-MS in underlined samples (Jacobsen and Fieser, 1990d)
7	7	<0.01 (2)	<0.01 (2)	

Days after initial treatment	Days after most recent treatment	parathion-methyl, mg/l	paraoxon-methyl, mg/l	Comments
7 treatment 2	0	0.14 0.14 0.18	<0.01 (3)	
14	7	<0.01 (2)	<0.01 (2)	
14 treatment 3	0	0.27 0.067	<0.01 (2)	
21	7	<0.01 (2)	<0.01 (2)	
21 treatment 4	0	0.24 0.22	<0.01 0.011	
28	7	<0.01 (3)	<0.01 (3)	
28 treatment 5	0	0.13 <u>0.31</u>	<0.01 0.012	Parathion-methyl confirmed by GC-MS in underlined sample. Paraoxon-methyl was too low for GC-MS confirmation. Sample may have been stored for 15 months before analysis, which could have allowed some loss of paraoxon-methyl if present.
35	7	<0.01 (2)	<0.01 (2)	
35 treatment 6	0	<0.01 (2)	<0.01 (2)	
36	1	0.027 0.030	<0.01 (2)	
42	7	<0.01 (2)	<0.01 (2)	
49	14	<0.01 (2)	<0.01 (2)	
56	21	<0.01 (3)	<0.01 (3)	
63	28	<0.01 (3)	<0.01 (3)	

METHODS OF RESIDUE ANALYSIS

Analytical methods

The Meeting received information on analytical methods for residues of parathion-methyl and paraoxon-methyl in a variety of crops and processed commodities.

Gilbert (1996e) described a method for the determination of parathion-methyl and paraoxon-methyl in peaches and peach juice. A 20 g subsample is homogenised with 100 ml of acetone/water, the homogenate vacuum filtered, and the acetone removed by rotary film evaporation. The resulting aqueous solution is mixed with saturated sodium chloride and extracted with dichloromethane. The extract is dried with sodium sulfate and evaporated to dryness, and the residue taken up in methanol and cleaned up on a C-18 column. The eluate is evaporated and the residue taken up in ethyl acetate for GLC analysis with FP detection.

Recoveries of parathion-methyl were 83-95% and of paraoxon-methyl 84-99% at fortifications of 0.01, 0.2 and 2.0 mg/kg (n=18) for peaches and juice. The LOQ was 0.01 mg/kg.

Gilbert (1996f) used the same method on raisins, wine and grape juice. Recoveries were 77-96% for parathion-methyl and 84-108% for paraoxon-methyl at fortifications of 0.01, 0.2 and 2.0 mg/kg (n=27). The LOQ was 0.01 mg/kg.

Gilbert (1997a) used essentially the same method on apple juice and dry pomace. Juice samples did not require a C-18 column clean-up and were ready for GLC analysis after extraction with dichloromethane. Recoveries of parathion-methyl were 76-91% from pomace and 91-114% from juice and of paraoxon-methyl 65-89% from pomace and 92-116% from juice, at fortifications of 0.01, 0.2 and 2.0 mg/kg, n=9, for each commodity. The LOQ was 0.01 mg/kg.

Bower (1995) validated a GLC analytical method for apples and grapes. Samples were extracted with an acetone/water mixture (80:20) and the filtered extract treated with saturated sodium chloride and extracted with dichloromethane. The dichloromethane was evaporated and the residue dissolved in methanol and cleaned up on a small C-18 column. Analysis was by GLC with an FPD. Recoveries of parathion-methyl were 73-95% (mean 86%, n=18) and of paraoxon-methyl 84-112%

(mean 98%, n=18) from apples and grapes fortified at 0.01, 0.2 and 2.0 mg/kg. Recoveries of paraoxon-methyl tended to be higher at 0.01 mg/kg. The LOQ was 0.01 mg/kg.

Norby (1993) described a method for parathion-methyl and paraoxon-methyl (also parathion and paraoxon) in canola and its processed commodities. The extraction solution (100 ml of methanol + water + HCl) is blended with canola meal (25 g) and the whole mixture with washings and rinsings is refluxed gently for 30 minutes, cooled and filtered, and the methanol evaporated. The residual aqueous solution is treated with saturated sodium chloride and the residues are extracted into ethyl acetate, which is dried with sodium sulfate and evaporated to 5-10 ml for analysis by GLC with an FPD. For canola seed, oil and processing waste an additional clean-up with hexane-acetonitrile partition was introduced after the reflux step. Recoveries were more variable for paraoxon-methyl than for parathion-methyl (Table 11). Some values fell outside the acceptable 70-120% range with excessive variation at a fortification level of 0.02 mg/kg, so the LOQ was determined to be 0.05 mg/kg.

Table 11. Recoveries of parathion-methyl and paraoxon-methyl from canola and its processed commodities fortified at four levels (Norby, 1993).

Fortification, mg/kg	Recovery, %				Mean recovery	SD
	Seed	Meal	Crude oil	Refined oil		
parathion-methyl						
0.02	103 122	79.3 96.5	99.5 119	103 98.5	102.6	13.4
0.05	97.0 99.8	81.9 89.1	90.1 98.4	86.5 84.7	90.9	6.7
0.5	94.6 95.8	85.7 88.3	92.9 95.8	78.8 79.8	89.0	7.0
5	81.3 86.3 87.3	83.1 87.7 84.3	83.1 92.9	79.6 77.8 73.2	83.3	5.4
paraoxon-methyl						
0.02	126 126	94.5 115	116 128	117 64	110.8	21.7
0.05	119 102	93.8 91	114 96.2	72.8 113	100.2	15.1
0.5	108 105	97.4 89.2	104 99	72 76.4	93.9	13.5
5	109 117 114	92.4 102 97.4	95.4 106	82.2 79.2 81.6	97.8	13.1

Deyrup and Cassidy (1992) described a general GLC method for determining parathion-methyl and paraoxon-methyl in numerous substrates which requires reflux in acidic aqueous methanol for one hour, rotary evaporation of the methanol and partition clean-up with ethyl acetate followed by GLC analysis of the concentrated extract. Some changes to the method are required for certain substrates, e.g. a gel permeation chromatography clean-up step is necessary for oily samples. The method was applied to the analysis of numerous substrates in three laboratories. Recoveries were generally 70-120%, with typical LOQs of 0.05 mg/kg. The most difficult samples were soya bean soapstock, onions, clover and grass.

The method was tested on alfalfa seed, artichoke heads, bluegrass hay, broccoli, brown rice, bulb onion, cabbage heads, carrots, celery stalks, clover forage, cotton seed, cotton seed crude oil, cotton seed hulls, cotton seed meal, cotton seed refined oil, cotton seed soapstock, dry bean forage, dry bean hay, dry bean seeds, dry pea forage, dry pea seed, dry pea straw, fescue grass hay, field corn expeller oil, field corn flour, field corn fodder, field corn forage, field corn grain, field corn grits, field corn meal, field corn refined oil, field corn silage, field corn starch, green onion, head lettuce, leaf lettuce, lima bean pods, low grade flour, mustard greens, polished rice, potato chips, potato dried peel, potato granules, potato tubers, potato wet peel, rice bran, rice grain, rice hulls, rice straw, snap bean cannery waste, snapbean pods, sorghum fodder, sorghum forage, sorghum hay, sorghum grain, sorghum silage, soya bean crude oil, soya bean hulls, soya bean meal, soya bean refined oil, soya bean seed, soya bean soapstock, spinach greens, succulent pea forage, succulent pea vine, sugar beet dehydrated pulp, sugar beet fodder, sugar beet molasses, sugar beet refined sugar, sugar beet roots, sunflower seed, sweet corn ears, sweet corn fodder, sweet corn forage, turnip root, wheat bran, wheat

forage, wheat grain, wheat hay, wheat middlings, wheat patent flour, wheat red dog, wheat rough, wheat shorts and wheat straw.

Parathion-methyl is included in the multiresidue GLC analytical method for non-fatty and fatty foods published in the Official Methods of Analysis in The Netherlands (Netherlands, 1996). Parathion-methyl is detected with an ion-trap or nitrogen-phosphorus detector. The LOQ is 0.05 mg/kg.

Stability of pesticide residues in stored analytical samples

The Meeting received information on the freezer storage stability of parathion-methyl and paraoxon-methyl in a range of crops, processed commodities and soils.

Wassell and Gilles (1991) tested storage stability in a range of homogenized commodities which were weighed into individual glass jars, fortified and stored at -20°C for up to 2 years. At intervals samples were withdrawn for analysis and determination of procedural recoveries (Table 12).

Table 12. Stability at -20°C of parathion-methyl and paraoxon-methyl in samples fortified at 1 mg/kg (Wassell and Gilles, 1991).

Storage,	parathion-methyl		paraoxon-methyl		parathion-methyl		paraoxon-methyl		parathion-methyl		paraoxon-methyl	
months	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov
	snap bean seed and pod				dry bean seed				celery			
0	84 82	79 96	83 74	85 93	94 93	92 94	95 97	101 93	100 101	102 93	100 98	100 93
1	103 106	97 106	96 101	93 101	98 79	85 67	76 61	77 56	83 86	107	89 93	83
2	84 77	68 74	74 76	69 76	85 98	85 65	83 94	86 42	96 107	94 74	95 97	88 88
3	80 84	67 91	77 82	81 90					99 78	99 85	97 76	98 88
4	86 92	93 99	91 89	90 98	75 84	64 85	76 81	63 79	102 106	105 109	102 105	92 98
6	81 86	94 97	90 94	97 107	73 77	81 78	75 77	84 85	80 80	86 87	81 85	102 95
12	85 93	95 91	85 91	94 96	96 98	90 93	91 89	91 91	77 77	75 86	96 93	92 110
18	91 90	82 73	95 97	91 82	94 109	102 101	84 93	91 88	100 104	98 105	93 95	90 101
24	92 95	101 89	96 97	112 94	90 100	99 101	92 100	112 113	104 119	98 113	98 115	104 116
	maize forage				maize fodder				maize grain			
0	101 95	101 98	78 91	90 91	86 77	89 94	73 66	84 76	85 65	78 72	106 96	110 102
1	91 99	85 96	94 92	81 90	110 106	108 117	84 85	86 84	88 82	81 96	98 87	93 101
2	80 121	82 88	82 112	88 92	78 92	56 82	82 90	58 88	94 112	101 128	106 107	97 117
3					90 91	81 80	87 82	81 85	79 62	89 86	89 89	103 98
4	78 82	80 81	77 80	75 76	87 83	85 89	92 86	85 86				
6	82 80	97 95	91 93	101 99	78 68	82 96	80 71	84 102	72 74	69 83	100 96	91 104
12	98 88	103 86	101 94	104 85	82 85	81 100	75 80	85 82	64 62	62 71	90 91	86 100
18	101 103	97 83	90 98	91 81	91 95	94 96	91 99	90 92	69 83	94 89	87 103	97 100
24	91 81	91 91	86 75	89 97	93 93	93 80	91 89	91 81	122 104	116 107	128 115	130 130
	turnip root				turnip top							
0	85 90	92 91	84 88	91 90	82 87	88 87	88 91	95 95				
1	89 76	89 87	79 73	81 79	92 90	94 93	88 81	84 90				
2	96 93	87 89	95 80	84 78	91 94	86 74	88 77	79 71				
3	96 94	94 74	79 84	91 76	68 79	73 84	68 78	73 81				
4	96 93	94 92	71 80	91 90	115 87	81 86	119 96	89 98				
6	79 87	88 102	79 91	86 100	77 84	85 60	83 92	88 92				
12	84 84	82 93	79 79	84 97	83 84	89 87	92 89	97 99				
18	88 80	65 79	100 76	66 75	82 98	71 73	79 92	69 70				
24	92 102	109 109	83 91	114 114	95 99	114 102	90 94	123 110				

% rem: % remaining after storage% recov: % procedural recovery

Gillard (1992) tested stability in other commodities using similar methods (Table 13).

Table 13. Stability at -20°C of parathion-methyl and paraoxon-methyl in homogenized samples fortified at 1 mg/kg (Gillard, 1992).

Storage, months	parathion-methyl		paraoxon-methyl		parathion-methyl		paraoxon-methyl		parathion-methyl		paraoxon-methyl	
	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov
	lettuce				wheat straw				mustard			
0	98 97		118 123		112 107		132 121		110 106		131 125	
1	109 110	109 110	100 101	117 120	92 92	101 96	116 114	128 122	105 101	102 115	109 108	109 123
2	106 104	106 104	93 88	113 112	104 108	100 92	91 95	93 88	92 96	103 100	86 89	102 98
3	90 86	89 88	78 72	112 108	112 98	112 108	133 114	137 131	91 91	85 89	97 98	99 104
4	96 96	97 96	81 81	110 110	99 98	104 87	109 108	122 103	84 85	82 89	85 83	88 90
6	91 78	76 98	90 76	97 123	92 94	92 89	104 109	110 105	82 86	73 91	86 89	82 92
12	83 87	88 91	60 62	103 108	87 101	95 93	82 95	103 99	78 76	78 85	81 78	93 99
18	92 88	92 95	51 45	107 110	93 92	106 107	77 78	104 107	80 88	100 100	70 78	107 109
25	82 83	86 93	58 62	103 145	71 84	81 93	72 93	108 123	82 77	95 95	83 82	131 119
	wheat forage				wheat grain				sunflower seed			
0	108 107		127 127		96 91		97 97		100 91		117 108	
1	96 95	91 94	122 121	117 122	87 77	90 70	117 114	126 119	86 84	91 116	85 82	101 120
2	98 114	113 107	89 106	109 104	90 95	102 101	78 86	98 98	84 76	78 86	88 82	91 96
3	88 102	104 113	110 120	129 134	65 77	101 110	99 108	117 126	96 96	100 99	106 105	124 118
4	87 92	93 102	105 99	108 119	65 62	91 74	92 99	116 104	100 103	104 97	87 103	92 100
6	96	96 94	110	118 120	67 73	77 76	98 105	119 114	85 99	91 92	88 94	106 114
12	95 98	110 105	88 95	110 108	77 95	100 80	76 85	108 110	84 83	100 89	78 77	127 112
18	101 96	105 98	94 92	115 110	84 92	83 104	72 74	89 114	79 86	75 73	103 102	104 105
24	96 87	91 84	125 118	118 108	91 90	88 84	89 110	108 77	54 60	90 89	68 58	121 124
	onion											
0	117 117		122 122									
1	100 103	104 106	98 101	106 107								
2	93 81	83 67	102 99	104 88								
3	94 90	94 102	92 87	97 109								
4	86 87	88 93	74 78	84 88								
6	98 94	94 93	107 101	108 113								
12	84 82	86 90	86 83	95 99								
18	88 84	90 87	100 93	121 128								
24	74 70	83 81	61 57	84 83								

Owen (1995) tested the stability of parathion-methyl and paraoxon-methyl in canola seed, oil and meal (Table 14). 10 g subsamples were fortified with the compounds at 1 mg/kg in 250 ml bottles and stored in a freezer at a temperature below -5°C. Bottles were withdrawn periodically for analysis and procedural recoveries were determined. There was no evidence of the conversion of parathion-methyl to paraoxon-methyl during storage. Parathion-methyl was stable in the three substrates. Paraoxon-methyl was stable in the oil, but the estimated times for a 30% decrease were 5 months in the seed and 7 in the meal.

Table 14. Stability at -5°C of parathion-methyl and paraoxon-methyl in canola and its processed commodities fortified at 1 mg/kg (Owen, 1995).

Storage, months	parathion-methyl		paraoxon-methyl		parathion-methyl		paraoxon-methyl		parathion-methyl		paraoxon-methyl	
	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov
	seed				crude oil				meal			
0	80 89	86 93	74 79	78 83	97 98	96 98	101 103	99 101	81 84	73 87	83 84	75 86
1	105 99	99 103	81 74	102 102	97 96	100 98	101 100	103 99	100 86	96 94	99 89	104 102
3	99 101	108 101	63 75	109 104	82 88	94 92	67 85	91 77	79 80	89 83	62 63	80 73
5	91 95	91 99	53 58	83 87	100 99	100 110	87 82	88 97	100 97	95 93	85 81	97 96
6	88 87	89 91	49 47	76 79	85 84	90 5	67 65	72 74	71 82	85 86	54 61	79 77
14	69 69	78 71	28 34	80 71	82 99	94 81	48 96	65 64	67 64	87 87	43 41	78 80

Davis (1992) tested the stability of parathion-methyl and paraoxon-methyl in vegetables and forages (Table 15). 25 g subsamples were weighed into individual glass jars, fortified with the analytes at a nominal 1 mg/kg and stored in a freezer between -25°C and -20°C for up to 2 years. Jars were periodically removed for analysis and procedural recoveries checked. Parathion-methyl was stable in all samples for 2 years, and paraoxon-methyl also in all samples except succulent pea pods where stability was marginal: the results suggested a 30% decrease over about 20 months.

Table 15. Stability at -25°C to -20°C of parathion-methyl and paraoxon-methyl in homogenized samples fortified at 1 mg/kg (Davis, 1992).

Storage,	parathion-methyl		paraoxon-methyl		parathion-methyl		paraoxon-methyl		parathion-methyl		paraoxon-methyl	
months	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov	% rem	% recov
	head cabbage				bluegrass hay				dry pea seed			
0	87 87	88 89	90 90	91 92	97 87	83 100	97 87	83 102	92 90	89 91	82 79	78 78
1	77 92	75 92	77 88	75 93	72 70	71 76	69 67	70 73	89 90	94 80	79 80	95 80
2	98 94	119 116	95 93	122 119	81 79	94 90	77 75	96 91	78 74	94 94	80 73	101 100
3	65 68	88 87	66 68	91 92	93 91	75 82	91 91	77 85	71 75	77 82	68 70	79 81
4	87 87	88 88	85 82	89 88	95 98	90 89	108 108	102 102	71 80	82 77	70 75	81 80
6	92 81	95 91	94 87	103 101	88 86	93 93	88 87	99 96	72 75	92 95	70 73	92 96
12	94 86	89 93	98 90	110 107	100 96	87 85	98 101	97 97	81 75	78 79	76 70	88 84
18	108 83	87 93	105 84	102 98	92 96	91 90	103 103	95 99	84 88	84 90	77 86	93 102
24	89 88	88 92	87 77	88 97	85 95	73 71	78 86	82 76	80 86	95 90	77 83	98 101
	dry pea straw				succulent pea pod				succulent pea forage			
0	85 81	80 85	86 82	80 88	79 73	75 76	84 81	82 81	86 87	84 82	90 90	85 84
1	87 85	92 92	87 85	92 94	80 77	84 87	78 86	97 102	85 75	85 95	94 83	104 115
2	85 83	93 96	95 94	103 107								
3	75 79	81 80	73 77	80 79	80 80	80 87	69 72	94 94	79 81	86 89	81 83	89 95
4	67 67	80 86	71 71	81 87	76 73	86 85	66 66	82 83	81 81	90 88	80 78	88 87
6	81 79	102 115	85 84	106 119	77 76	81 80	64 62	84 84	85 89	84 85	80 85	91 96
12	86 81	92 92	83 77	92 89	75 75	80 81	60 56	84 83	84 82	73 83	72 75	75 88
18	88 77	93 102	84 75	98 102	83 82	90 89	70 68	104 102	85 89	93 94	84 85	104 102
24	87 94	98 97	76 87	95 97	68 76	87 84	47 44	87 78	88 89	93 87	76 80	105 99
	clover forage				soya bean seed							
0	91 91	92 89	95 95	97 94	63 69	64 78	89 86	89 87				
1	83 81	88 78	93 90	106 92	71 71	64 78	77 72	74 84				
2	86 87	96 99	81 81	96 101	71 67	70 71	61 57	67 66				
3	89 85	93 97	89 86	102 105	70 73	80 80	60 64	80 82				
4	85 87	103 99	80 82	107 102	59 69	79 75	49 54	76 73				
6	97 87	98 100	93 86	116 118	82 85	82 80	63 62	78 83				
12	83 91	82 89	70 74	87 91	72 63	64 67	53 52	69 73				
18	107 85	93 106	104 77	107 118	98 84	82 93	61 54	89 101				
24	100 117	115 115	68 85	117 116	98 100	96 108	56 61	93 96				

Rice *et al* (1990a) tested the stability of parathion-methyl and paraoxon-methyl in a fortified sandy loam soil (0.2% organic matter, pH 6.2, 77% sand, 17% silt, 6% clay). 20 g samples in polyethylene bottles were fortified with 0.20 mg/kg of either parathion-methyl or paraoxon-methyl and stored at -20°C for 12 months. Samples were withdrawn at intervals and analysed, and procedural recoveries were determined. The results are shown in Table 16. Parathion-methyl was stable under these conditions, and no paraoxon-methyl (LOQ 0.05 mg/kg) was detected in the parathion-methyl samples. Paraoxon-methyl showed a half-life of about 485 days, equivalent to a 30% decrease in 250 days.

Table 16. Stability of parathion-methyl and paraoxon-methyl in fortified sandy loam soil stored for 12 months at -20°C (Rice *et al*, 1990a).

Day	Parathion-methyl, mg/kg				Paraoxon-methyl, mg/kg			
	stored		procedural recoveries		stored		procedural recoveries	
0	0.200	0.210	0.223	0.216	0.200	0.181	0.213	0.208
7	0.199	0.208	0.194	0.203	0.214	0.203	0.196	0.212
14	0.210	0.204	0.212	0.209	0.204	0.207	0.212	0.214
30	0.234	0.202	0.234	0.202	0.180	0.179	0.194	0.159
61	0.203	0.164	0.203	0.18	0.191	0.199	0.209	0.185
91	0.171	0.155	0.164	0.165	0.156	0.151	0.153	0.168
182	0.189	0.193	0.224	0.205	0.151	0.167	0.215	0.205
273	0.182	0.195	0.194	0.185	0.144	0.146	0.185	0.182
365	0.180	0.181	0.186	0.165	0.116	0.109	0.186	0.178

Rice *et al* (1990b) also tested the freezer storage stability of parathion-methyl and paraoxon-methyl in a fortified loam soil (0.7% organic matter, pH 5.4, 30% sand, 46% silt, 24% clay) using the same procedures. Parathion-methyl was stable during the 12 months, but paraoxon-methyl disappeared with an estimated half-life of 42 days or a time of 22 days for a 30% decrease (Table 17).

Table 17. Stability of parathion-methyl and paraoxon-methyl in fortified loam soil stored for 12 months at -20°C (Rice *et al.*, 1990b).

Day	Parathion-methyl, mg/kg				Paraoxon-methyl, mg/kg			
	stored		procedural recoveries		stored		procedural recoveries	
0	0.238	0.235	0.236	0.239	0.225	0.224	0.229	0.239
7	0.169	0.185	0.189	0.187	0.142	0.118	0.187	0.188
14	0.206	0.207	0.227	0.218	0.166	0.142	0.221	0.214
30	0.183	0.177	0.216	0.192	0.101	0.086	0.214	0.189
61	0.150	0.175	0.171	0.152	0.059	0.048	0.174	0.159
91	0.179	0.175	0.173	0.167	0.049	0.045	0.172	0.171
182	0.183	0.166	0.158	0.195	<0.05	<0.05	0.167	0.209
273	0.182	0.161	0.183	0.195	<0.05	<0.05	0.181	0.197
365	0.160	0.159	0.15	0.169	<0.05	<0.05	0.159	0.185

Definition of the residue

Parathion-methyl and paraoxon-methyl are important components of the residue. In trials according to GAP to determine residues of parathion-methyl and paraoxon-methyl in food and feed commodities there were 54 and 155 cases respectively where the levels of both compounds exceeded the LOQ. The total residues were closely related to parathion-methyl levels in food and feed commodities, but with more spread in the relation at the lower concentrations.

The Meeting recommended that the definition of the residue for compliance with MRLs should continue to be parathion-methyl and for the estimation of dietary intake should be the sum of parathion-methyl and paraoxon-methyl expressed as parathion-methyl (parathion-methyl + 1.065 × paraoxon-methyl).

The log P_{ow} of 2.8 suggests that parathion-methyl should not be classified as fat-soluble. The animal metabolism studies provide limited information on the fat-solubility of parathion-methyl

because it is metabolized quickly. Parathion-methyl was not identified as a residue in tissues or milk in the goat metabolism study. In the laying-hen study parathion-methyl residues in fat were higher than in the other tissues, except skin, suggesting some fat-solubility. The Meeting decided that the evidence of fat-solubility was not sufficiently clear to describe parathion-methyl as fat-soluble.

USE PATTERN

Parathion-methyl is registered in many countries for the control of insects on fruit, vegetables, cereals, oilseeds and forage crops. The information available to the Meeting on registered uses is summarized in Table 18.

Table 18. Registered uses of parathion-methyl.

Crop	Country	Form	Application				PHI, days
			Method	Rate, kg ai/ha	Spray conc., kg ai/hl	No.	
Agric and horti crops	Netherlands	EC	soil treatment	2.6		1	
Alfalfa	Hungary	CS 450 g/l	foliar	0.45			14
Alfalfa	Hungary	EC 480 g/l	foliar	0.24-0.34			14
Alfalfa	USA	EC 480 g/l	foliar	0.28-1.1			15
Apple	Australia	ME 240	foliar	-	0.03	note [1]	14
Apple	Netherlands	EC	foliar	0.24-0.36			21
Apple	Poland	CS 450 g/l	foliar high volume	0.32-0.58	0.032-0.12	2	42
Banana	Spain	CS 450 g/l	foliar	0.68-1.76	0.045-0.059		21
Barley	Germany	WP 405 g/kg	bait	0.18		1	
Barley	USA	EC 480 g/l	foliar	0.28-0.84			15
Beans	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Beans	Italy	EC 150 g/l	foliar		0.023-0.030		20
Beans, dry	USA	EC 480 g/l	foliar	0.56-1.7			21[3]
Berries	Hungary	CS 450 g/l	foliar	0.45			14
Berries	Hungary	EC 480 g/l	foliar	0.48			14
Cabbage	France	EC 400 g/l	foliar	0.3			15
Cabbage	Italy	CS 170 g/l	foliar	0.32-0.41			20
Cabbage	Poland	CS 450 g/l	foliar high volume	0.45	0.075-0.23	2	35
Cabbage	USA	EC 480 g/l	foliar	0.56-1.7			21[4]
Capsicums (Sweet peppers)	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Carrots	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Cereals	Hungary	CS 450 g/l	foliar	0.45			14
Cereals	Hungary	EC 480 g/l	foliar	0.24-0.34			14
Cereals	Netherlands	EC	foliar	0.36			21
Citrus	Australia	ME 240	foliar	-	0.03	note [5]	14
Citrus fruits	Guatemala		foliar		0.09		14
Citrus fruits	Italy	CS 170 g/l	foliar		0.041-0.049		20
Citrus fruits	Italy	EC 150 g/l	foliar		0.023-0.038		20
Clover seed crops	Australia	EC 500 g/l	foliar	0.4			14
Cotton	Australia	EC 500 g/l	foliar	0.28-1.1			14
Cotton	Australia	ME 450	foliar	0.34-1.4	-		14
Cotton	Guatemala	CS 450 g/l	foliar	0.45			7

[1] Apples and pears - apply as determined by trap counts at minimum interval of 2 weeks.

[2] Apply as pest appears or at 10-14 days intervals.

[3] Dry beans, USA. PHI 15 days for rates up to 0.56 kg ai/ha, 21 days for higher rates.

[4] Cabbage USA. PHI 10 days for rates up to 0.56 kg ai/ha, 21 days for higher rates.

[5] Apply at minimum intervals of 3 weeks.

Crop	Country	Form	Application				PHI, days
			Method	Rate, kg ai/ha	Spray conc., kg ai/hl	No.	
Cotton	Pakistan	EC 500 g/l	foliar	0.43-1.2			14-21
Cotton	Spain	2% dust	foliar	0.40-0.60		2	21
Cotton	Spain	CS 450 g/l	foliar	0.13-0.29	0.045-0.059		21
Cotton	Spain	EC 200 g/l	foliar	0.048-0.18	0.016-0.036		21
Cotton	Thailand	EC 500 g/l	foliar high volume	0.13-0.25	0.025-0.05		14
Cotton	USA	EC 480 g/l	foliar	0.15-3.4			0 or 5[6]
Cruciferous crops	Guatemala	CS 450 g/l	foliar	0.34-0.45			21
Crucifers (Forage)	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Cucurbits	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Cucurbits	Guatemala	CS 450 g/l	foliar	0.45			
Egg plant	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Fibrous flax	Netherlands	EC	foliar	0.36			21
Field crops	Lebanon	CS 450 g/l	foliar		0.045-0.068		
Fodder beet	Netherlands	EC	foliar	0.15-0.48			21
Fruit trees	Lebanon	CS 450 g/l	foliar		0.045-0.068		
Fruiting vegetables	Guatemala	CS 450 g/l	foliar	0.45			15
Fruiting vegetables	Italy	CS 170 g/l	foliar	0.32-0.41			20
Grapefruit	Australia	EC 500	foliar	-	0.01-0.05		14
Grapefruit	Australia	ME 450	foliar	-	0.01-0.05	note [5]	14
Grapes	Australia	EC 500	foliar	-	0.03		14
Grapes	Australia	ME 240	foliar	-	0.03	note [5]	14
Grapes	Italy	CS 170 g/l	foliar		0.032-0.041		20
Grapes	Italy	EC 150 g/l	foliar		0.023-0.030		20
Grapes, wine and table	Spain	CS 450 g/l	foliar		0.045-0.059		21
Grass (forage)	USA	EC 480 g/l	foliar	0.56-0.84			15[7]
Horse radish	Poland	CS 450 g/l	foliar high volume	0.45	0.075-0.23	2	35
Leafy vegetables	Italy	CS 170 g/l	foliar	0.32-0.41			20
Leek	Poland	CS 450 g/l	foliar high volume	0.45	0.075-0.23	2	14
Legume vegetables	Guatemala	CS 450 g/l	foliar	0.45			15
Lemons	Australia	EC 500	foliar	-	0.01-0.05		14
Lemons	Australia	ME 450	foliar	-	0.01-0.05	note [5]	14
Lettuce	France	EC 400 g/l	foliar	0.3			15
Linseed	Netherlands	EC	foliar	0.36			21
Maize	Guatemala	CS 450 g/l	foliar	0.34			12
Maize	Hungary	CS 450 g/l	foliar	0.45-0.68			14
Maize	Hungary	EC 480 g/l	foliar	0.72			14
Maize	Netherlands	EC	foliar	0.48			21
Maize	Spain	CS 450 g/l	foliar	0.13-0.29	0.045-0.059		21
Maize	USA	EC 480 g/l	foliar	0.28-0.56			12
Mandarins	Australia	EC 500	foliar	-	0.01-0.05		14
Mandarins	Australia	ME 450	foliar	-	0.01-0.05	note [5]	14
Oats	Germany	WP 405 g/kg	bait	0.18		1	
Oats	Poland	CS 450 g/l	foliar high volume	0.45	0.11-0.30	2	21
Oats	USA	EC 480 g/l	foliar	0.28-0.84			15
Oilseed rape	France	EC 400 g/l	foliar	0.2-0.3			21
Oilseed rape	France	EC 400 g/l	foliar	0.2-0.3			15
Oilseed rape	Poland	CS 450 g/l	foliar high volume	0.22-0.45	0.055-0.45	2	42
Olives	Italy	CS 170 g/l	foliar		0.041-0.049		20
Onion	Hungary	CS 450 g/l	foliar	0.45			14

[6] Cotton, USA. PHI 5 days for hand picking, 0 days for mechanical picking.

[7] Grass, USA. PHI 15 days applies to cutting or grazing.

Crop	Country	Form	Application				PHI, days
			Method	Rate, kg ai/ha	Spray conc., kg ai/hl	No.	
Onion	Hungary	EC 480 g/l	foliar	0.72			14
Onion	Poland	CS 450 g/l	foliar high volume	0.45	0.075-0.23	2	14
Onion	USA	EC 480 g/l	foliar	0.56			15
Onions	Netherlands	EC	foliar	0.36			21
Oranges	Australia	EC 500	foliar	-	0.01-0.05		14
Oranges	Australia	ME 450	foliar	-	0.01-0.05	note [5]	14
Orchards	Pakistan	EC 500 g/l	foliar		0.05-0.075		14-21
Paprika	Hungary	CS 450 g/l	foliar	0.45			14
Paprika	Hungary	EC 480 g/l	foliar	0.72			14
Peach	France	EC 400 g/l	foliar		0.03		15
Peanut	Spain	CS 450 g/l	foliar	0.13-0.29	0.045-0.059		21
Peanut	Thailand	EC 500 g/l	foliar high volume	0.63-0.78	0.1-0.13		14
Pear	Netherlands	EC	foliar	0.24-0.36			21
Pear	Poland	CS 450 g/l	foliar high volume	0.32-0.58	0.032-0.12	2	42
Pears	Australia	ME 240	foliar	-	0.03	note [1]	14
Peas	France	EC 400 g/l	foliar	0.3			15
Peas	Hungary	CS 450 g/l	foliar	0.45			14
Peas	Hungary	EC 480 g/l	foliar	0.34			14
Peas	Netherlands	EC	foliar	0.24-0.36			21
Peas (Green/Garden)	Australia	EC 500	foliar	0.35-0.55	-		14
Peas, dry	USA	EC 480 g/l	foliar	0.56-1.1			15[8]
Pome fruits	Australia	EC 500 g/l	dormant spray		0.05		
Pome fruits	Australia	EC 500 g/l	foliar		0.02-0.033		14
Pome fruits	Australia	ME 450	foliar	-	0.02-0.05		14
Pome fruits	France	EC 400 g/l	foliar		0.03		15
Pome fruits	Germany	WP 405 g/kg	foliar	note[9]	0.02	1	28
Pome fruits	Hungary	CS 450 g/l	foliar	0.45			14
Pome fruits	Hungary	EC 480 g/l	foliar	0.48-0.86			14
Pome fruits	Italy	CS 170 g/l	foliar		0.032-0.041		20
Pome fruits	Italy	EC 150 g/l	foliar + mineral oil		0.023- 0.045		20
Pome fruits	Spain	CS 450 g/l	foliar		0.045-0.059		21
Pome fruits	Spain	EC 200 g/l	foliar	0.16-0.54	0.016-0.036		21
Pome fruits	Spain	3% EC + oil	foliar or dormant	0.48-1.35	0.060-0.090	1	21
Potato	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Potato	Lebanon	CS 450 g/l	foliar		0.045-0.068		
Potato	Poland	CS 450 g/l	foliar high volume	0.45-0.68	0.11-0.45	2	48
Potato	USA	EC 480 g/l	foliar	1.7			6
Rape seed	Netherlands	EC	foliar	0.48			21
Rape seed, canola	USA	EC 480 g/l	foliar	0.56		2	28
Rice	USA	EC 480 g/l	foliar	0.56-0.84			15
Rye	Germany	WP 405 g/kg	bait	0.18		1	
Rye	Poland	CS 450 g/l	foliar high volume	0.45	0.11-0.30	2	21
Rye	USA	EC 480 g/l	foliar	0.28-0.84			15
Soya bean	Thailand	EC 500 g/l	foliar high volume	0.63-0.78	0.1-0.13		14
Soya bean	USA	EC 480 g/l	foliar	0.43-1.1			20[10]
Spring barley	Poland	CS 450 g/l	foliar high volume	0.45	0.11-0.30	2	21
Spring triticale	Poland	CS 450 g/l	foliar high volume	0.45	0.11-0.30	2	21
Spring wheat	Poland	CS 450 g/l	foliar high volume	0.45	0.11-0.30	2	21
Stone fruits	Australia	EC 500 g/l	dormant spray		0.05		

[8] Dry peas, USA. PHI 10 days for rates up to 0.56 kg ai/ha, 15 days for higher rates.

[9] Pome fruit. Application 0.1 kg ai/ha per m height of tree crown, i.e. 0.3 kg ai/ha for standard tree of 3 m and 1500 l water/ha.

[10] Soya beans, USA. PHI 20 days also applies to grazing.

Crop	Country	Form	Application				PHI, days
			Method	Rate, kg ai/ha	Spray conc., kg ai/hl	No.	
Stone fruits	Australia	EC 500 g/l	foliar		0.02-0.033		14
Stone fruits	Australia	ME 450	foliar	-	0.02-0.05		14
Stone fruits	Hungary	CS 450 g/l	foliar	0.45			14
Stone fruits	Hungary	EC 480 g/l	foliar	0.48-0.86			14
Stone fruits	Italy	CS 170 g/l	foliar		0.032-0.041		20
Stone fruits	Italy	EC 150 g/l	foliar + mineral oil		0.023- 0.045		20
Stone fruits	Spain	CS 450 g/l	foliar		0.045-0.059		21
Stone fruits	Spain	EC 200 g/l	foliar	0.16-0.54	0.016-0.036		21
Stone fruits	Spain	3% EC + oil	foliar or dormant	0.48-1.35	0.060-0.090	1	21
Sugar beet	France	EC 400 g/l	foliar	0.15-0.3			21
Sugar beet	France	EC 400 g/l	foliar	0.2-0.3			15
Sugar beet	Hungary	CS 450 g/l	foliar	0.45-0.68			14
Sugar beet	Hungary	EC 480 g/l	foliar	0.34-0.67			14
Sugar beet	Italy	CS 170 g/l	foliar	0.32-0.41			20
Sugar beet	Netherlands	EC	foliar	0.15-0.48			21
Sugar beet	Spain	2% dust	foliar	0.40-0.60		2	21
Sugar beet	Spain	CS 450 g/l	foliar	0.13-0.59	0.045-0.059		21
Sugar beet	Spain	EC 200 g/l	foliar	0.048-0.36	0.016-0.036		21
Sugar beet	USA	EC 480 g/l	foliar	0.28-0.43			20[11]
Sugar cane	Pakistan	EC 500 g/l	foliar	0.43-0.62			14-21
Sunflowers	USA	EC 480 g/l	foliar	1.1			30
Tomatoes	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Triticale	Germany	WP 405 g/kg	bait	0.18		1	
Vegetables	Australia	EC 500	foliar	0.35	0.033	note [2]	14
Vegetables	Lebanon	CS 450 g/l	foliar		0.045-0.068		
Vines	France	EC 400 g/l	foliar	0.3			21
Vines	Spain	3% EC + oil	foliar or dormant	0.18-0.45	0.060-0.090	1	21
Watermelon	Spain	CS 450 g/l	foliar	0.13-0.59	0.045-0.059		21
Wheat	Germany	WP 405 g/kg	bait	0.18		1	
Wheat	USA	EC 480 g/l	foliar	0.28-0.84			15
Wine grapes	Germany	WP 405 g/kg	foliar	0.081-0.16	0.02	1	note[12]
Wine grapes	Germany	WP 405 g/kg	foliar	0.081-0.32	0.02	2 note[13]	35
Winter barley	Poland	CS 450 g/l	foliar high volume	0.45	0.11-0.30	2	21
Winter triticale	Poland	CS 450 g/l	foliar high volume	0.45	0.11-0.30	2	21
Winter wheat	Poland	CS 450 g/l	foliar high volume	0.45	0.11-0.30	2	21

RESIDUES RESULTING FROM SUPERVISED TRIALS

The Meeting received information on supervised field trials on

Fruits	Table 20.	Apple, pear
	Table 21.	Peach
	Table 22.	Grapes
Vegetables	Table 23.	Onions
	Table 24.	Broccoli
	Table 25.	Cabbage
	Table 26.	Sweet corn
	Table 27.	Mustard greens

[11] Sugar beet, USA. PHI of 60 days applies to tops used as animal fodder.

[12] Wine grapes. Use at beginning of infestation (vine leaf-roller, leaf gall miner), stage 12-57.

[13] Wine grapes. Not more than 1 application between flowering and harvest.

	Table 28.	Lettuce
	Table 29.	Spinach
	Table 30.	Lima beans, snap beans
	Table 31.	Soya beans
	Table 32.	Field peas
	Table 33.	Dried beans
	Table 34.	Carrots
	Table 35.	Potatoes
	Table 36.	Sugar beet
	Table 37.	Turnips
	Table 38.	Celery
	Table 39.	Artichokes
Cereals	Table 40.	Maize
	Table 41.	Rice
	Table 42.	Sorghum
	Table 43.	Wheat
Oilseeds	Table 44.	Cotton seed
	Table 45.	Canola, sunflower seed
Legume animal feeds	Table 46.	Alfalfa
	Table 47.	Clover
	Table 48.	Field pea forage, straw, vine
	Table 49.	Bean forage, hay
Cereal animal feeds	Table 50.	Sweet corn and maize fodder, forage, silage
	Table 51.	Sorghum fodder, forage, hay, silage
	Table 52.	Wheat forage, hay, straw
Grasses	Table 53.	Pasture grasses
Miscellaneous fodder	Table 54.	Sugar beet fodder, cotton gin trash
Dried hops	Table 55.	Hops

Trials were generally well documented with full laboratory and field reports. Laboratory reports included method validation including batch recoveries with spiking at residue levels similar to those occurring in samples from the supervised trials. Dates of analyses were also provided. Field reports provided data on the sprayers used and their calibration, plot size, residue sample size and sampling dates.

Where residues were not detected, data are recorded in the Tables as below the limit of quantification (LOQ), e.g. <0.01 mg/kg. Residue data, application rates and spray concentrations have generally been rounded to 2 significant figures or, for residues near the LOQ, to 1 significant figure. Although trials included control plots, no control data are recorded except where residues in control samples exceeded the LOQ. Residues are recorded unadjusted for procedural recoveries.

Conditions of the supervised trials are summarized in Table 19. Most trials were unreplicated or single replicate split plots. Where replicate residues are shown they represent samples from the split plots or replicate field samples from the same treated plot.

Periods of freezer storage between sampling and analysis were recorded for all trials and were within the acceptable determined stability period of 14 months or 2 years except in a few cases.

Table 19. Sprayers, plot sizes and field sample sizes in the supervised trials.

Crop	Country	Year	Sprayer	Plot size	Sample size
Apple, pear	Germany	1994	knapsack	6-10 trees	1.8-7 kg

Crop	Country	Year	Sprayer	Plot size	Sample size
Apple	France	1994-95	motorised knapsack	14 trees, 75-150 m^2	36 fruit, 1-4 kg
Peach	Italy	1994	knapsack or wheel barrow sprayer with boom	4-5 trees, 58-300 m^2	1-6.5 kg
Peach	Italy	1995	hand gun motor pump sprayer	136-224 m^2	2 kg
Grapes	France, Spain	1995	motorised knapsack	4-8 rows of 25-30 m	min 1 kg
Grapes	Germany	1994	knapsack	126-300 m^2	4-4.5 kg
Onion	USA	1988-89	backpack CO_2 sprayer, aerial fixed wing, helicopter	19 m^2-1.2 ha	12 bulbs, 1 kg
Broccoli	USA	1988-89	backpack CO_2 sprayer, aerial fixed wing, helicopter	60 m^2-0.11 ha	12 heads
Cabbage	USA	1988-89	backpack CO_2 sprayer, aerial fixed wing, helicopter	23 m^2-0.33 ha	12 heads or half-heads
Sweet corn	USA	1988-89	backpack CO_2 sprayer, aerial fixed wing, helicopter	37 m^2-0.33 ha	12 ears, 1 kg fodder, 2 kg forage
Mustard greens	USA	1988-89	backpack CO_2 sprayer, self-propelled research sprayer, aerial fixed wing	28 m^2-0.20 ha	1-3 kg
Lettuce	USA	1988-89	backpack CO_2 sprayer, aerial fixed wing, helicopter	23 m^2-0.20 ha	12 heads, 1-3 kg
Spinach	USA	1988-89	backpack CO_2 sprayer, aerial fixed wing, helicopter	28 m^2-0.11 ha	1-2 kg
Lima beans	USA	1989	backpack CO_2 sprayer, self-propelled research sprayer, aerial fixed wing, helicopter	98 m^2-0.16 ha	1 kg
Snap beans	USA	1988	backpack CO_2 sprayer, self-propelled research sprayer, aerial fixed wing	37 m^2c-0.16 ha	1 kg
Soya beans	USA	1988-90	backpack CO_2 sprayer, tractor mounted sprayer	56 m^2-465 m^2	1 kg
Peas, dried	USA	1989	backpack CO_2 sprayer, tractor mounted sprayer, helicopter, aerial fixed wing	31 m^2-0.26 ha	0.25-2 kg
Beans, dry	USA	1989	backpack CO_2 sprayer, tractor mounted sprayer, aerial fixed wing	88 m^2-0.16 ha	0.5-1 kg
Carrot	USA	1989	backpack CO_2 sprayer, self-propelled research sprayer, aerial fixed wing	29 m^2-1.2 ha	1-4 kg
Potatoes	USA	1988-89	backpack CO_2 sprayer, self-propelled research sprayer, aerial fixed wing	53 m^2 -0.14 ha	16 tubers
Sugar beet	USA	1988-89	backpack CO_2 sprayer, self-propelled research sprayer, aerial fixed wing	56 m^2-1.6 ha	2 kg
Turnip	USA	1988-89	backpack CO_2 sprayer, self-propelled research sprayer, aerial fixed wing	37 m^2-0.14 ha	1-4 kg
Celery	USA	1988-89	backpack CO_2 sprayer, aerial fixed wing, helicopter	29 m^2-0.33 ha	12 plants
Maize	USA	1988-90	backpack CO_2 sprayer, self-propelled research sprayer, tractor mounted sprayer, aerial fixed wing,	46 m^2-0.17 ha	1-2.5 kg
Rice	USA	1988	aerial fixed wing	0.04-0.84 ha	1-1.5 kg
Sorghum	USA	1988-89	tractor mounted sprayer, self-propelled research sprayer, aerial fixed wing	60 m^2-0.20 ha	0.5-1.5 kg
Wheat	USA	1989	backpack CO_2 sprayer, self-propelled research sprayer, tractor mounted sprayer, aerial fixed wing, helicopter	46 m^2-0.37 ha	0.5-1 kg

Crop	Country	Year	Sprayer	Plot size	Sample size
Cotton	USA	1988, 1998	backpack CO_2 sprayer, self-propelled research sprayer, tractor mounted sprayer, aerial fixed wing	56 m^2-0.84 ha	1-2 kg. 40 kg seed cotton to produce 1 kg seed
Canola	USA	1992	aerial fixed wing	0.4-1.8 ha	1-1.5 kg
Sunflower	USA	1988	tractor mounted sprayer, aerial fixed wing	170-900 m^2	1 kg
Alfalfa	USA	1989, 1998	backpack CO_2 sprayer, tractor mounted sprayer, hand held boom, aerial fixed wing	74 m^2-1.2 ha	0.5-4 kg
Clover	USA	1989	backpack CO_2 sprayer, self-propelled research sprayer, tractor mounted sprayer, aerial fixed wing, helicopter	74 m^2-0.14 ha	0.5-1 kg
Pasture grasses	USA	1988, 1998	backpack CO_2 sprayer, tractor mounted sprayer, self-propelled research sprayer, hand held boom, aerial fixed wing, helicopter	42 m^2-0.45 ha	0.5-3 kg
Hops	USA	1990	hand held sprayer, backpack mist blower	49-125 m^2	0.5-1 kg

Table 20. Residues in apples and pears from supervised trials in Germany and France. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
APPLE									
Germany, 1994 (James Grieve)	CS	1.0		1000	1	28	<0.01		407739
Germany, 1994 (James Grieve)	CS	0.45		1000	1	28	<0.01		407720
Germany, 1994 (James Grieve)	WP	0.50		1000	1	28	<0.01 (2)		407704
Germany, 1994 (James Grieve)	WP	0.50		1000	1	28	<0.01 (2)		407690
France, 1994 (Golden Delicious)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.24 0.05 0.03 <u>0.01</u> <0.01	<0.01 <0.01 <0.01 <<u>0.01</u> <0.01	Site I 51D/951553
France, 1994 (Red Chief)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.16 0.10 0.07 <u>0.04</u> 0.01	<0.01 <0.01 <0.01 <<u>0.01</u> <0.01	Site II 51D/951553
France, 1994 (Melrose)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.07 0.06 0.03 <u>0.02</u> <0.01	<0.01 <0.01 <0.01 <<u>0.01</u> <0.01	Olivet F1 51D/951553
France, 1994 (Golden Delicious)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.22 0.05 0.02 <<u>0.01</u> <0.01	<0.01 <0.01 <0.01 <<u>0.01</u> <0.01	Olivet F2 51D/951553
France, 1995 (Canada Gris)	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.40 0.51 0.26 <u>0.12</u> 0.09 0.04	<0.01 0.02 <0.01 <u>0.02</u> 0.01 <0.01	Cheille F3 961451

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
France, 1995 (Jonagold)	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.22 0.10 0.06 0.04 0.02 0.02	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Loiret F1 961451
France, 1995 (Golden Delicious	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.22 0.11 0.09 0.03 0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Loiret F2 961451
France, 1995 (Golden Delicious	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.29 0.16 0.08 0.07 0.05 0.02	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Maugio F4 961451
France, 1995 (Golden Delicious	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.32 0.28 0.17 0.08 0.15 0.12	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Meauzac F6 961451
France, 1995 (Golden Delicious	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.28 0.23 0.23 0.10 0.05 0.03	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Meauzac F7 961451
France, 1995 (Red Chief)	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.17 0.12 0.07 0.11 0.05 0.03	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Meauzac F8 961451
France, 1995 (Granny Smith)	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.20 0.16 0.07 0.05 0.03 0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Meauzac F9 961451
France, 1995 (Golden Delicious)	CS	0.36	0.036	1000	2	0 3 7 14 21 28	0.20 0.19 0.10 0.06 0.05 0.03	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Herault F5 961451
France, 1995 (Canada Gris)	EC	0.36	0.036	1000	1	0 3 7 14 21 28	0.42 0.25 0.11 0.04 0.04 0.03	<0.01 0.01 <0.01 <0.01 <0.01 <0.01	F3 961450
France, 1995 (Golden Delicious)	EC	0.36	0.036	1000	1	0 3 7 14 21 28	0.19 0.04 0.02 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Herault F4 961450

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
France, 1995 (Golden Delicious)	EC	0.36	0.036	1000	1	0 3 7 14 21 28	0.34 0.10 0.07 0.03 0.11 0.08	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Meauzac F6 961450
France, 1995 (Golden Delicious)	EC	0.36	0.036	1000	1	0 3 7 14 21 28	0.36 0.07 0.07 0.01 0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Meauzac F7 961450
France, 1995 (Red Chief)	EC	0.36	0.036	1000	1	0 3 7 14 21 28	0.2 0.04 0.03 0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Meauzac F8 961450
France, 1995 (Granny Smith)	EC	0.36	0.036	1000	1	0 3 7 14 21 28	0.27 0.05 0.02 0.02 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Meauzac F9 961450
France, 1995 (Jonagold)	EC	0.36	0.036	1000	1	0 3 7 14 21 28	0.19 0.05 0.02 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Loiret F1 961450
France, 1995 (Golden Delicious)	EC	0.36	0.036	1000	1	0 3 7 14 21	0.24 0.06 0.03 0.02 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Loiret F2 961450
France, 1995 (Golden Delicious)	EC	0.36	0.036	1000	1	0 3 7 14 21 28	0.18 0.08 0.04 0.02 0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Herault F5 961450
French Southern Territories, 1994 (Red Chief)	CS	0.36	0.036	1000	2	0 3 7 14 21	0.26 0.25 0.24 0.18 0.11	<0.01 <0.01 <0.01 <0.01 <0.01	Site II 91554
French Southern Territories, 1994 (Golden Delicious)	CS	0.36	0.036	1000	2	0 3 7 14 21 39	0.30 0.11 0.06 0.04 0.02 0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Site I 91554
France, 1994 (Golden Delicious)	CS	0.36	0.036	1000	2	0 3 7 14 21	0.28 0.20 0.01 0.04 0.02	<0.01 <0.01 <0.01 <0.01 <0.01	St Hilaire F2 91554

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
France, 1994 (Melrose)	CS	0.36	0.036	1000	2	0 3 7 14 21 39	0.09 0.10 0.06 <u>0.03</u> 0.02 <0.01	<0.01 <0.01 <0.01 <<u>0.01</u> <0.01 <0.01	St Hilaire F1 91554
PEAR									
Germany, 1994 (Alexander Lucas)	CS	0.45		1000	1	28	<0.01		407747
Germany, 1994 (Alexander Lucas)	WP	0.50		1000	1	28	<0.01 (2)		407712

Table 21. Residues in peaches from supervised trials in Italy. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
1994 (Maria Bianca)	EC	0.55	0.046	1200	2	0 7 14 21	<0.01 0.21 0.02 <0.01 <<u>0.01</u>		407267
1994 (Red Haven)	EC	0.55	0.046	1200	2	0 7 14 21	0.08 0.01 0.03 0.01 <<u>0.01</u>		407259
1994 (Maria Bianca)	CS	0.54	0.045	1200	2	0 7 14 21	0.05 0.11 0.11 0.08 <u>0.06</u>		407224
1994 (Red Haven)	CS	0.54	0.045	1200	2	0 7 14 21	0.22 0.27 0.21 0.15 <u>0.10</u>		407216
1994 (Maria Bianca)	EC	0.54	0.045	1200	2	0 7 14 21	<0.01 0.22 0.02 <0.01 <<u>0.01</u>		407208
1994 (Red Haven)	EC	0.54	0.045	1200	2	0 7 14 21	0.01 0.07 0.03 0.01 <u>0.01</u>		407194
1995 (K2)	CS	0.54	0.045	1200	1 2	14 0 3 7 14 21 28	0.85 1.6 1.7 0.84 0.46 <u>0.09</u> 0.10	<0.01 <0.01 0.01 <0.01 <0.01 <<u>0.01</u> <0.01	9551-1 CHV 57C/952700

Year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
1995 (Fayette)	CS	0.54	0.045	1200	1 2	14 0 3 7 14 21 28	0.30 0.81 0.37 0.29 0.14 0.13 0.02	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01	9551-2 CHV 57C/952700
1995 (Duchessa D'Este)	CS	0.54	0.045	1200	1 2	14 0 3 7 14 21 28	0.59 1.3 0.87 1.4 0.32 0.05 0.22	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01	9551-3 CHV 57C/952700
1995 (Autumn Glo)	CS	0.54	0.045	1200	1 2	14 0 3 7 14 21 28 28	0.32 0.62 0.18 0.32 0.05 0.06 0.02 juice 0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 juice <0.01	9551-4 CHV 57C/952700
1995 (Crest Haven)	CS	0.54	0.045	1200	1 2	14 0 3 7 14 21 28 28	0.03 0.65 0.39 0.27 0.08 0.08 0.03 juice <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 juice <0.01	9551-5 CHV 57C/952700
1995 (Hale)	CS	0.54	0.045	1200	1 2	14 0 3 7 14 21 28	0.50 1.6 0.74 0.49 0.26 0.16 0.08	<0.01 0.01 <0.01 <0.01 <0.01 <0.01 <0.01	9551-6 CHV 57C/952700
1995 (K2)	EC	0.54	0.045	1200	1 2	14 0 3 7 14 21 28	0.03 0.68 0.15 0.09 0.04 0.02 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01	9550-1 CHV 56C/952684
1995 (Fayette)	EC	0.54	0.045	1200	1 2	14 0 3 7 14 21 28	0.04 0.70 0.16 0.06 0.02 0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01	9550-2 CHV 56C/952684

Year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
1995 (Duchessa D'Este)	EC	0.54	0.045	1200	1 2	14 0 3 7 14 21 28	<0.01 c 0.01 0.58 0.24 0.18 c 0.01 0.05 <u>0.02</u> c 0.01 0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <<u>0.01</u> <0.01	9550-3 CHV 56C/952684
1995 (Autumn Glo)	EC	0.54	0.045	1200	1 2	14 0 3 7 14 21 28 28	0.03 0.42 0.38 0.05 0.03 <u>0.01</u> <0.01 juice <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <<u>0.01</u> <0.01 juice <0.01	9550-4 CHV 56C/952684
1995 (Crest Haven)	EC	0.54	0.045	1200	1 2	14 0 3 7 14 21 28 28	0.32 0.87 0.33 0.20 0.10 <u>0.04</u> 0.02 juice <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <<u>0.01</u> <0.01 juice <0.01	9550-5 CHV 56C/952684
1995 (Hale)	EC	0.54	0.045	1200	1 2	14 0 3 7 14 21 28	0.04 0.53 0.13 0.05 0.02 <u>0.01</u> <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <<u>0.01</u> <0.01	9550-6 CHV 56C/952684

c: sample from control plot

Table 22. Residues in wine grapes from supervised trials in Italy, France, Spain and Germany. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
France, 1994 (Chenin Blanc)	CS	0.29	0.15	200	2	0 3 7 14 21 35	0.09 0.05 0.11 0.06 <u>0.05</u> 0.07	<0.01 <0.01 <0.01 <0.01 <<u>0.01</u> <0.01	AP/2582/HR F1 951174

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
France, 1994 (Chenin Blanc)	EC	0.30	0.15	200	2	0 3 7 14 21	0.05 0.04 0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01	Tours F1 951175
France, 1994 (Grenache)	CS	0.32	0.16	200	2	0 3 7 14 21 31	0.28 0.16 0.28 0.11 0.13 0.07	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	AP/2582/HR Site II 951174
France, 1994 (Grenache)	CS	0.30	0.15	200	2	0 3 7 14 21	0.21 0.11 0.08 0.05 0.05	<0.01 <0.01 <0.01 <0.01 <0.01	AP/2582/HR Site I 951174
France, 1994 (Grenache)	EC	0.30	0.15	200	2	0 3 7 14 21	0.08 0.02 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01	Montpelier Site I 951175
France, 1994 (Grenache)	EC	0.30	0.15	200	2	0 3 7 14 21	0.16 0.03 0.02 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01	Nimes Site II 951175
France, 1995 (Cabernet)	CS	0.30	0.15	200	2	0 3 7 14 21 28	0.25 0.22 0.24 0.17 0.10 0.09	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Montreuil-Bellay F2 960539
France, 1995 (Cabernet)	EC	0.30	0.15	200	2	0 3 7 14 21 28	0.22 0.06 0.02 0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Montreuil-Bellay F2 961449
France, 1995 (Chenin)	CS	0.30	0.15	200	2	0 3 7 14 21 28	0.12 0.19 0.18 0.18 0.09 0.08	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Chancay F4 960539
France, 1995 (Chenin)	EC	0.30	0.15	200	2	0 3 7 14 21 28	0.09 0.06 0.02 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Chancay F4 961449

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
France, 1995 (Gris Meunier)	CS	0.30	0.15	200	2	0 3 7 14 21 28	1.2 1.1 0.78 0.57 0.02 [1] 0.41	0.01 0.01 0.01 <0.01 <0.01 [1] <0.01	Loiret F1 960539
France, 1995 (Gris Meunier)	EC	0.30	0.15	200	2	0 3 7 14 21 28	0.72 0.22 0.06 0.03 0.47 [2] 0.02	0.01 0.02 <0.01 <0.01 <0.01 [2] <0.01	Loiret F1 961449
France, 1995 (Groleau)	CS	0.30	0.15	200	2	0 3 7 14 21 28	0.23 0.16 0.17 0.11 0.09 0.10	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Chinon F3 960539
France, 1995 (Groleau)	EC	0.30	0.15	200	2	0 3 7 14 21 28	0.18 0.03 0.01 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Loiret F3 961449
France, 1995 (Syrah)	CS	0.30	0.15	200	2	0 3 7 14 21 28	0.36 0.41 0.27 0.16 0.09 0.09	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Tarn-et-Garonne F5 960539
France, 1995 (Syrah)	EC	0.30	0.15	200	2	0 3 7 14 21 28	0.23 0.13 0.05 0.01 <0.01 <0.01	<0.01 0.01 <0.01 <0.01 <0.01 <0.01	Tarn-et Garonne F5 961449
France, 1995 (Tannat)	CS	0.30	0.15	200	2	0 3 7 14 21 28	0.32 0.28 0.23 0.15 0.10 0.10	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Garonne F6 960539
France, 1995 (Tannat)	EC	0.30	0.15	200	2	0 3 7 14 21 28	0.20 0.07 0.03 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Montech F6 961449

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
Germany, 1994 (Kerner)	CS	0.12 +0.32	0.020	600 +1600	2	0 14 28 35 42 35 35	0.17 0.18 0.14 0.13 0.10 must <0.01 wine <0.01		407771
Germany, 1994 (Kerner)	WP	0.12 +0.32	0.020	600 +1600	2	0 14 28 35 42 35 35	0.20 0.02 <0.01 <0.01 <0.01 must <0.01 wine <0.01		407828
Germany, 1994 (Portugieser)	CS	0.12 +0.32	0.020	600 +1600	2	0 14 28 35 42 35 35	0.14 0.11 0.04 <0.01 <0.01 must <0.01 wine <0.01		407763
Germany, 1994 (Portugieser)	WP	0.12 +0.32	0.020	600 +1600	2	0 14 28 35 42 35 35	0.10 <0.01 <0.01 0.014 0.042 must <0.01 wine <0.01		407801
Germany, 1994 (Spätburgunder)	CS	0.12 +0.32	0.020	600 +1600	2	0 14 28 35 43 35 35	0.14 0.10 0.06 0.120 0.102 must <0.01 wine <0.01		407755
Germany, 1994 (Spätburgunder)	WP	0.12 +0.33	0.020	600 +1600	2	0 14 28 35 43 35 35	0.07 <0.01 <0.01 <0.01 <0.01 must <0.01 wine <0.01		407798
Italy, 1994 (Pampanuto)-white	EC	0.23	0.046	500	2	0 7 14 21	0.07 <0.01 <0.01 <0.01 <0.01		407275
Italy, 1994 (Pampanuto)-white	EC	0.25	0.050	500	2	0 7 14 21	0.15 <0.01 <0.01 <0.01 <0.01		407291

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
Italy, 1994 (Pampanuto)-white	CS	0.30	0.060	500	2	0 7 14 21	0.28 0.15 0.17 0.13 0.12		407305
Italy, 1994 (Pampanuto)-white	EC	0.34	0.068	500	2	0 7 14 21	0.10 <0.01 0.01 <0.01 <0.01 <0.01		407879
Italy, 1994 (Sangiovese)-red	CS	0.30	0.060	500	2	0 7 14 21	0.30 0.12 0.14 0.16 0.18		407240
Italy, 1994 (Sangiovese)-red	EC	0.23	0.046	500	2	0 7 14 21	0.03 <0.01 <0.01 <0.01 <0.01		407283
Italy, 1994 (Sangiovese)-red	EC	0.34	0.068	500	2	0 7 14 21	0.06 <0.01 0.01 <0.01 <0.01		407887
Italy, 1994 (Sangiovese)	EC	0.25	0.050	500	2	0 7 14 21	0.26 <0.01 0.01 0.01 0.01		407232
Spain, 1995 (Carignan)	CS	0.30	0.15	200	2	0 3 7 14 21 28	0.25 0.26 0.12 0.08 0.05 0.03	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Girona S8 960539
Spain, 1995 (Carignan)	EC	0.30	0.15	200	2	0 3 7 14 21 28	0.29 0.04 0.01 <0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Girona S8 961449
Spain, 1995 (Tempranillo)	CS	0.30	0.15	200	2	0 3 7 14 21 28	0.32 0.26 0.21 0.13 0.13 0.12	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Girona S7 960539
Spain, 1995 (Tempranillo)	EC	0.30	0.15	200	2	0 3 7 14 21 28	0.37 0.06 0.02 0.01 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Girona S7 961449

[1]21-day data not available because possible sample confusion with trial F1 961449
[2] suspected sample confusion with trial F1 960539

Table 23. Residues in onions from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels. All EC formulations.

Location, year (variety)	Application			PHI days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Southport Lake)	1.1	190	6	15	bulb	<0.05 (2) c <0.05	<0.05 (2) c 0.11	MP-ON-3107
CA, 1988 (Southport Lake)	1.1	190	(6	15	bulb	<0.05 (2)	<0.05 (2)	MP-ON-3108
WA, 1988 (Walla walla sweet)	1.1	190	5	15	bulb	<0.05 (2)	<0.05 (2)	MP-ON-3109
TX, 1989 (Ben Shamen)	1.0	75	6	15	bulb	0.11 0.13	[1]	MP-ON-3110
TX, 1989 (Ben Shamen)	1.1	51	(6	15	bulb	0.21 0.20 c 0.07	[1]	MP-ON-3111
MI, 1988 (Early Yellow Globe)	1.2	210	6	15	bulb	<0.05 c <0.05	0.08 c 0.08	MP-ON-7087
NY, 1988 (Early Yellow Globe)	1.1	235	6	15	bulb	0.40 0.58	<0.05 (2)	MP-ON-7088
CA, 1989	1.1	370	6	15	green	0.38 0.37 c <0.05	0.33 0.19 c 0.20	MP-ON-3112
AZ, 1989 (Sweet Spanish)	1.1	220	6	15	green	0.09 0.10 c 0.06	[1]	MP-ON-3114
CA, 1989 (K-99)	1.1	94	(6	15	green	<0.05 (2)	<0.05 (2)	MP-ON-3115
CA, 1989 (Evergreen)	0.56	190	(6	15	green	<u><0.05</u> (2) c <0.05	<u>0.24</u> 0.24 c 0.15	MP-ON-3113
ID, 1988 (Ebeneezer)	1.1	280	6	15	green	0.16 0.08	0.05 <0.05	MP-ON-7086

[1]measurement of paraoxon-methyl not possible because of co-eluting interference in GC
(aerial application. c: sample from control plot

Table 24. Residues in broccoli from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
TX, 1988 (Commander)	4×1.7 +2×0.56	200	6	7	<0.05 (2)	<0.05 (2)	MP-BR-3021
TX, 1988 (Commander)	1.7	200	6	21	<0.05 (2)	<0.05 (2)	MP-BR-3021
TX, 1988 (Commander)	1.7	49	(6	21	<0.05 (2)	<0.05 (2)	MP-BR-3023

Location, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
TX, 1988 (Commander)	4×1.7 +2×0.56	49	(6	7	<0.05 (2)	<0.05 (2)	MP-BR-3023
CA, 1989	4×1.7 +2×0.56	190	6	7	<0.05 (2)	<0.05 (2)	MP-BR-3024
CA, 1989	1.7	190	6	21	<0.05 (2)	<0.05 (2)	MP-BR-3024
CA, 1989 (501 Green Valiant)	1.7	370	6	21	0.05 <0.05	<0.05 (2)	MP-BR-3026
CA, 1989 (501 Green Valiant)	4×1.7 +2×0.56	370	6	7	0.06 0.10	0.12 0.14	MP-BR-3026
CA, 1989 (501 Green Valiant)	2×1.7 +2×0.84 +3×1.7	190	(7	21	<0.05 (2)	<0.05 (2)	MP-BR-3028
CA, 1989 (501 Green Valiant)	2×0.56 +2×1.7 +3×0.56	190	(7	7	<0.05 (2)	<0.05 (2)	MP-BR-3028
OR, 1988 (Gem)	1.7	190	6	21	<0.05 (2)	<0.05 (2)	MP-BR-3029
OR, 1988 (Gem)	4×1.7 +2×0.56	190	6	7	<0.05 (2)	<0.05 (2)	MP-BR-3029

(aerial application.

Table 25. Residues in cabbage from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels. EC formulations.

Location, year (variety)	Application			PHI days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Headstart)	6×1.7 +1×0.56	375	7	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-3031
CA, 1988 (Headstart)	6×1.7 +1×0.56	375	7	10	including wrapper leaves	<u><0.5</u> (2) [1]	<u>0.09</u> 0.08	MP-CB-3031
CA, 1988 (Headstart)	1.7	375	7	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-3031
CA, 1988 (Headstart)	1.7	375	7	21	including wrapper leaves	<u><0.5</u> (2) [1]	0.06 <u>0.12</u>	MP-CB-3031
CA, 1988 (Headstart)	6×1.7 +1×0.56	200	(7	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-3033

Location, year (variety)	Application			PHI days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Headstart)	6×1.7 +1×0.56	200	(7	10	including wrapper leaves	<0.5 (2) [1]	0.24 0.19	MP-CB-3033
CA, 1988 (Headstart)	1.7	200	(7	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-3033
CA, 1988 (Headstart)	1.7	200	(7	21	including wrapper leaves	<0.5 (2) [1]	0.08 0.08	MP-CB-3033
TX, 1988 (Bravo)	5×1.7 +1×0.56	98	6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-3034
TX, 1988 (Bravo)	5×1.7 +1×0.56	98	6	10	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-3034
TX, 1988 (Bravo)	1.7	98	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-3034
TX, 1988 (Bravo)	1.7	98	6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-3034
FL, 1989 (Bravo)	1×1.1 +4×1.7 +1×0.56	520	6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7018
FL, 1989 (Bravo)	1×1.1 +4×1.7 +1×0.56	520	6	10	including wrapper leaves	<0.05 (2)	0.21 0.22	MP-CB-7018
FL, 1989 (Bravo)	1×1.1 +5×1.7	520	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7018
FL, 1989 (Bravo)	1×1.1 +5×1.7	520	6	21	including wrapper leaves	<0.05 (2)	0.23 0.22	MP-CB-7018
NJ, 1988 (Danish)	5×1.7 +1×0.56	540	6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7020
NJ, 1988 (Danish)	5×1.7 +1×0.56	540	6	10	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7020
NJ, 1988 (Danish)	1.7	540	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7020
NJ, 1988 (Danish)	1.7	540	6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7020
NY, 1988 (King Cole)	5×1.7 +1×0.56	350	6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7022
NY, 1988 (King Cole)	5×1.7 +1×0.56	350	6	10	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7022

Location, year (variety)	Application			PHI days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
NY, 1988 (King Cole)	1.7	350	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7022
NY, 1988 (King Cole)	1.7	350	6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7022
NY, 1988 (King Cole)	5×1.7 +1×0.56	45	(6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7024
NY, 1988 (King Cole)	5×1.7 +1×0.56	45	(6	10	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7024
NY, 1988 (King Cole)	1.7	45	(6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7024
NY, 1988 (King Cole)	1.7	45	(6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7024
WI, 1988 (Gourmet)	5×1.7 +1×0.56	190	6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7025
WI, 1988 (Gourmet)	5×1.7 +1×0.56	190	6	10	including wrapper leaves	<0.05 (2)	0.07 0.06	MP-CB-7025
WI, 1988 (Gourmet)	1.7	190	6	22	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7025
WI, 1988 (Gourmet)	1.7	190	6	22	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-CB-7025

(aerial application
[1] Overspray with Meta-systox left residues that caused interference with the analytical method for parathion-methyl.

Table 26. Residues in sweet corn from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988	1.1	300	6	3	ears	<0.05 (2)	<0.05 (2)	MP-CN-3047
CA, 1988 (Jubilee)	1.1	84	(3	3	ears	<0.05 (2)	<0.05 (2)	MP-CN-3049
TX, 1988 (Funk's Sweet G-90)	1.1	9	(6	3	ears	<0.05 (2)	<0.05 (2)	MP-CN-3050
WA, 1988 (Jubilee)	1.1	94	(6	3	ears	<0.05 (2)	<0.05 (2)	MP-CN-3185
FL, 1988 (Merit)	1.1	300	6	3	ears	<0.05 (2)	<0.05 (2)	MP-CN-7056
NY, 1988 (Jubilee)	1.1	45	(6	3	ears	<0.05 0.09	<0.05 (2)	MP-CN-7057
WI, 1988 (Commander)	1.1	38	(6	3	ears	<0.05 (2)	<0.05 (2)	MP-CN-7058

(aerial application. c: sample from control plot

Table 27. Residues in mustard greens from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1989 (Florida Broadleaf)	5×1.7 +1×0.56	280	6	10	greens	<0.05 (2)	<0.05 (2)	MP-MG-3101
CA, 1989 (Florida Broadleaf)	1.7	280	6	21	greens	<0.05 (2)	<0.05 (2)	MP-MG-3101
CA, 1989 (Florida Broadleaf)	5×1.7 +1×0.56	190	(6	10	greens	<0.05 (2)	<0.05 (2)	MP-MG-3103
CA, 1989 (Florida Broadleaf)	1.7	190	(6	21	greens	<0.05 (2)	<0.05 (2)	MP-MG-3103
TX, 1988 (Florida Broadleaf)	5×1.7 +1×0.56	94	6	10	greens	<0.05 (2)	<0.05 (2)	MP-MG-3104
TX, 1988 (Florida Broadleaf)	1.7	94	6	21	greens	0.09 <0.05	<0.05 (2)	MP-MG-3104
TX, 1988 (Florida Broadleaf)	5×1.7 +1×0.56	47	(6	10	greens	0.10 0.05	<0.05 (2)	MP-MG-3106
TX, 1988 (Florida Broadleaf)	1.7	47	(6	21	greens	<0.05 (2)	<0.05 (2)	MP-MG-3106
FL, 1988 (Florida Broadleaf)	2×1.7 +1×0.56	300	3	10	greens	0.15 0.51	<0.05 0.09	MP-MG-7080
FL, 1988 (Florida Broadleaf)	1.7	300	3	21	greens	<0.05 0.06	<0.05 (2)	MP-MG-7080
LA, 1988 (Florida Broadleaf)	2×1.7 +1×0.56	230	3	10	greens	<0.05 (2)	<0.05 (2)	MP-MG-7082
LA, 1988 (Florida Broadleaf)	1.7	230	3	21	greens	<0.05 (2)	<0.05 (2)	MP-MG-7082
OH, 1988 (Green Wave)	2×1.7 +1×0.56	190	3	10	greens	<0.05 (2)	<0.05 (2)	MP-MG-7084
OH, 1988 (Green Wave)	1.7	190	3	21	greens	<0.05 (2)	<0.05 (2)	MP-MG-7084

(aerial application.

Table 28. Residues in lettuce from supervised trials in the USA. All EC formulations.

Lettuce, location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
Head , AZ, 1989 (Vanguard-75)	1.1	240	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-3089
Head , AZ, 1989 (Vanguard-75)	1.1	240	6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-3089

Lettuce, location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
Head , CA, 1988 (Empire)	1.1	190	6	21	excluding wrapper leaves	0.41 0.76	<0.05 (2)	MP-LE-3091
Head , CA, 1988 (Empire)	1.1	190	6	21	including wrapper leaves	1.2 0.97	<0.05 (2)	MP-LE-3091
Head , CA, 1989 (Empire)	1.1	190	(6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-3092
Head , CA, 1989 (Empire)	1.1	190	(6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-3092
Head , FL, 1988 (Mesa 659)	1.1	270	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-7068
Head , FL, 1988 (Mesa 659)	1.1	270	6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-7068
Head , MI, 1988 (Ithaca)	1.2	210	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-7072
Head , MI, 1988 (Ithaca)	1.2	210	6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-7072
Head , NJ, 1988 (Montello)	1.1	540	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-7070
Head , NJ, 1988 (Montello)	1.1	540	6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-7070
Head , TX, 1988 (Great Lakes 659)	1.1	47	(6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-3094
Head , TX, 1988 (Great Lakes 659)	1.1	47	(6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-3094
Head , TX, 1988 (Great Lakes 659)	1.1	150	6	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-3093
Head , TX, 1988 (Great Lakes 659)	1.1	150	6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	MP-LE-3093
Leaf , AZ, 1989 (Boston Dark Green)	1.1	240	6	21	leaves	<0.05 (2)	<0.05 (2)	MP-LE-3095
Leaf , CA, 1988 (Waldmann’s Green)	1.1	190	6	21	leaves	1.3 1.6	<0.05 (2)	MP-LE-3097
Leaf , CA, 1989 (Waldmann’s Green)	1.1	190	(6	21	leaves	<0.05 (2)	<0.05 (2)	MP-LE-3098
Leaf , FL, 1988 (Royal Red Leaf)	1.1	280	6	21	leaves	0.07 0.11	<0.05 (2)	MP-LE-7074
Leaf , MI, 1988 (Black Seeded Simpson)	1.1	210	6	21	leaves	<0.05 (2)	<0.05 (2)	MP-LE-7078

Lettuce, location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
Leaf , NJ, 1988 (Black Seeded Simpson)	1.1	540	6	21	leaves	0.23 0.17	<0.05 (2)	MP-LE-7076
Leaf , TX, 1989 (Cos, Romaine)	1.1	94	6	21	leaves	<0.05 (2)	<0.05 (2)	MP-LE-3099
Leaf , TX, 1989 (Black Seed Simpson)	1.1	47	(6	21	leaves	<0.05 (2)	<0.05 (2)	MP-LE-3192

(aerial application.

Table 29. Residues in spinach from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
CA, 1988 (Polka)	5×1.1 +1×0.56	380	6	15	0.06 <0.05	<0.05 (2)	MP-SP-3136
CA, 1988 (Polka)	1.1	380	6	21	<0.05 (2)	<0.05 (2)	MP-SP-3136
CA, 1988 (Walters)	2×1.1 +1×0.56	200	(3	15	<0.05 (2)	<0.05 (2)	MP-SP-3138
CA, 1988 (Walters)	1.1	200	(3	21	<0.05 (2)	<0.05 (2)	MP-SP-3138
CA, 1989 (St Helens)	3×1.1 +1×0.56	260	4	15	0.05 0.05	<0.05 (2)	MP-SP-3139
CA, 1989 (St Helens)	1.1	260	4	21	0.06 0.06	<0.05 (2)	MP-SP-3139
TX, 1989 (Coho)	5×1.1 +1×0.56	97	6	15	<0.05 (2)	<0.05 (2)	MP-SP-3141
TX, 1989 (Coho)	1.1	97	6	21	<0.05 (2)	<0.05 (2)	MP-SP-3141
TX, 1989 (Coho)	5×1.1 +1×0.56	51	(6	15	<0.05 (2)	<0.05 (2)	MP-SP-3143
TX, 1989 (Coho)	1.1	51	(6	21	<0.05 (2)	<0.05 (2)	MP-SP-3143
CO, 1988 (Melody)	4×1.1 +1×0.56	470	5	15	0.30 <0.05	0.10 <0.05	MP-SP-3187
CO, 1988 (Melody)	1.1	470	5	21	<0.05 (2)	<0.05 (2)	MP-SP-3187
NJ, 1988 (America)	5×1.1 +1×0.56	540	6	15	0.07 0.06	<0.05 (2)	MP-SP-7123
NJ, 1988 (America)	1.1	540	6	21	0.07 0.09	<0.05 (2)	MP-SP-7123

(aerial application.

Table 30. Residues in lima beans and snap beans from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
LIMA BEANS								
DE, 1988 (Fordhook 242)	1.7	290	6	21	pod	<0.05 (2)	<0.05 (2)	MP-LB-7008
DE, 1988 (Fordhook 242)	1.7	50	(6	21	pod	<0.05 (2)	<0.05 (2)	MP-LB-7010
CA, 1988 (Baby White)	1.7	94	(6	21	pod	<0.05 (2)	<0.05 (2)	MP-LB-3083
CA, 1988 (Baby White)	1.7	340	6	21	pod	<0.05 (2)	<0.05 (2)	MP-LB-3081
SNAP BEANS								
CA, 1988 (Blue Lake)	1.7	330	6	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-3084
OR, 1988 (O.S.U. 91G)	1.7	190	6	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-3087
CA, 1988 (Blue Lake)	1.7	330	6	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-3508
CA, 1988 (Blue Lake)	3.4	330	6	21	cut pod	<0.05	<0.05	MP-LB-3508
CA, 1988 (Blue Lake)	3.4	330	6	21	cannery waste	<0.05	<0.05	MP-LB-3508
OR, 1988 (O.S.U. 91G)	1.7	94	6	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-3509
OR, 1988 (O.S.U. 91G)	7.0	94	6	21	cut pod	<0.05	<0.05	MP-LB-3509
OR, 1988 (O.S.U. 91G)	7.0	94	6	21	cannery waste	0.06	<0.05	MP-LB-3509
FL, 1988 (Sprite)	1.7	300	6	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-7011
NY, 1988 (Improved Tendergreen)	1.7	280	6	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-7013
WI, 1988 (Venture VB 4004)	1.7	240	4	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-7016
CA, 1988 (Blue Lake 274)	1.7	94	(6	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-3086
NY, 1988 (Improved Tendergreen)	1.7	46	(6	21	whole pod	<0.05 (2)	<0.05 (2)	MP-LB-7015

(aerial application.

Table 31. Residues in soya beans from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
IL, 1988 (BSR-201)	0.56	240	2	15	dry seed	<0.05 (2)	<0.05 (2)	MP-SY-7117
MN, 1988 (Agri-Pro 1776)	0.56	240	2	15	dry seed	<0.05 (2)	0.05 <0.05	MP-SY-7118

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
LA, 1988 (Forrest)	0.56	140	2	14	dry seed	<0.05 (2)	<0.05 (2)	MP-SY-7119
GA, 1988 (Coker 488)	0.56	58	2	15	dry seed	<0.05 (2)	<0.05 (2)	MP-SY-7120
IA, 1988 (Pioneer 9271)	0.56	200	2	15	dry seed	<0.05 (2)	<0.05 (2)	MP-SY-7121
NC, 1988 (Asgrow A5149)	0.56	220	2	15	dry seed	<0.05 (2)	<0.05 (2)	MP-SY-7122
IA, 1988 (Pioneer 9271)	0.56	200	2	15	dry seed	<0.05	<0.05	MP-SY-2101
MO, 1988 (Williams 82)	0.56	200	2	15	dry seed	<0.05	<0.05	MP-SY-2102
IA, 1990 (DK 265)	0.56	190	6	15	seed	<0.05 (2)	<0.05 (2)	MP-SY-3525-IA
MO, 1990 (Williams 82)	0.56	190	6	15	seed	<0.05 (2)	<0.05 (2)	MP-SY-3525-MO

Table 32. Residues in field peas from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
WA, 1989 (Dark Skin 49)	1.1	190	6	15	dry seed	0.12 <u>0.19</u>	<<u>0.05</u> (2)	MP-PE-3116
WA, 1989 (Dark Skin 49)	5×1.1 +1×0.56	190	6	10	dry seed	<u>0.24</u> 0.10	<<u>0.05</u> (2)	MP-PE-3116
WA, 1989 (Dark Skin 49)	1.1	94	(6	15	dry seed	<<u>0.05</u> (2)	<<u>0.05</u> (2)	MP-PE-3118
WA, 1989 (Dark Skin 49)	5×1.1 +1×0.56	94	(6	10	dry seed	<u>0.06</u> 0.05	<<u>0.05</u> (2)	MP-PE-3118
DE, 1988 (Alaska)	1.1	290	6	15	dry seed	<u>0.18</u> 0.15	<<u>0.05</u> (2)	MP-PE-7089
DE, 1988 (Alaska)	5×1.1 +1×0.56	290	6	10	dry seed	<u>0.07</u> 0.07	<<u>0.05</u> (2)	MP-PE-7089
MN, 1988 (Alaska 146)	1.1	190	4	15	dry seed	<<u>0.05</u> (2)	<<u>0.05</u> (2)	MP-PE-7091
MN, 1988 (Alaska 146)	3×1.1 +1×0.56	190	4	10	dry seed	<<u>0.05</u> (2)	<<u>0.05</u> (2)	MP-PE-7091
ND, 1988 (Trapper)	1.1	94	6	15	dry seed	<u>0.06</u> 0.06	<<u>0.05</u> (2)	MP-PE-7093
ND, 1988 (Trapper)	5×1.1 +1×0.56	94	6	10	dry seed	<0.05 <u>0.06</u>	<<u>0.05</u> (2)	MP-PE-7093
DE, 1988 (Alaska)	1.1	47	(6	10 15	dry seed	<0.05 (2) <<u>0.05</u> (2)	<0.05 (2) <<u>0.05</u> (2)	MP-PE-7095

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
DE, 1988 (Alaska)	5×1.1 +1×0.56	47	(6	10	dry seed	0.13 <u>0.16</u>	<<u>0.05</u> (2)	MP-PE-7095
WA, 1989 (Knight)	1.1	94	(4	15	pod	<0.05 (2)	<0.05 (2)	MP-PE-3188
WA, 1989 (Knight)	3×1.1 +1×0.56	94	(4	10	pod	<0.05 (2)	<0.05 (2)	MP-PE-3188
DE, 1988 (Wando)	1.1	290	6	15	pod	0.60 0.68	<0.05 (2)	MP-PE-7096
DE, 1988 (Wando)	5×1.1 +1×0.56	290	6	10	pod	0.21 0.19	<0.05 (2)	MP-PE-7096
MN, 1988 (Asgrow XPG 206)	1.1	190	4	10	pod	0.08 <0.05	<0.05 (2)	MP-PE-7098
MN, 1988 (Asgrow XPG 206)	3×1.1 +1×0.56	190	4	10	pod	<0.05 (2)	<0.05 (2)	MP-PE-7098
WI, 1988 (Ego)	1.1	240	5	14	pod	<0.05 (2)	<0.05 (2)	MP-PE-7100
WI, 1988 (Ego)	4×1.1 +1×0.56	240	5	9	pod	<0.05 (2)	<0.05 (2)	MP-PE-7100
WI, 1988 (9888F)	1.1	38	(5	15	pod	<0.05 (2)	<0.05 (2)	MP-PE-7102
WI, 1988 (9888F)	4×0.56 +1×1.1	38	(5	10	pod	<0.05 (2)	<0.05 (2)	MP-PE-7102
WA, 1989 (Knight)	3×1.1 +1×0.56	190	4	10	pods	<0.05 (2)	<0.05 (2)	MP-PE-3189

(aerial application.

Table 33. Residues in dried beans from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Baby White)	1.7	340	6	15	dry seed	<<u>0.05</u> (2)	<<u>0.05</u> (2)	MP-DB-3072
CA, 1988 (Red Kidney)	1.7	94	(6	15	dry seed	<<u>0.05</u> (2)	<<u>0.05</u> (2)	MP-DB-3074
MI, 1988 (Seafarer Navy Bean)	1.7	220	6	15	dry seed	<<u>0.05</u> (2)	<<u>0.05</u> (2)	MP-DB-7001
NE, 1988 (Pinto)	1.7	190	6	15	dry seed	<<u>0.05</u> (2)	<<u>0.05</u> (2)	MP-DB-7003
NE, 1988 (Pinto)	1.7	9	(6	15	dry seed	<<u>0.05</u> (2)	<<u>0.05</u> (2)	MP-DB-7005

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
ND, 1988 (Topaz, Pinto)	1.7	94	6	15	dry seed	<0.05 (2)	<0.05 (2)	MP-DB-7006

(aerial application.

Table 34. Residues in carrots from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
MI, 1988 (Scarlet Nantes)	1.2	210	6	15	0.38 0.35	<0.05 (2)	MP-CT-7027
CA, 1989 (Pacmor)	1.1	190	6	15	0.79 0.57	<0.05 (2)	MP-CT-3058
CA, 1989 (Pacmor)	1.1	190	(6	15	0.09 0.22	<0.05 (2)	MP-CT-3060
TX, 1988 (Danver)	1.1	150	6	15	0.47 0.49	<0.05 (2)	MP-CT-3061
TX, 1988 (Danver)	1.1	47	(6	15	0.07 0.26	<0.05 (2)	MP-CT-3063
WA, 1988 (Nantes Coreless)	1.1	280	6	15	0.65 <0.05	<0.05 (2)	MP-CT-3064

(aerial application.

Table 35. Parathion-methyl and paraoxon-methyl residues in potatoes and processed commodities from supervised trials in the USA (Cañez, 1990p) and Poland. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Location, year (variety)	Application					PHI, days	sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
ID, USA, 1988 (Russet Burbank)	EC	1.7		190	6	5	tuber	<0.05 (2)	<0.05 (2)	MP-PO-3122
CA, USA, 1989 (Red La Sota)	EC	1.7		230	6	5	tuber	<0.05 (2)	<0.05 (2)	MP-PO-3125
CA, USA, 1989 (Red La Sota)	EC	1.7		160	6	5	tuber	<0.05 (2)	<0.05 (2)	MP-PO-3501
CA, USA, 1989 (Red La Sota)	EC	3.4		160	6	5	tuber chips flakes granules wet peel dried peel	<0.05 <0.05 <0.05 <0.05 <0.05 <0.05	<0.05 <0.05 <0.05 <0.05 <0.05 <0.05	MP-PO-3501
ID, USA, 1988 (Russet Burbank)	EC	1.7		190	6	5	tuber	<0.05 (2)	<0.05 (2)	MP-PO-3502

Location, year (variety)	Application					PHI, days	sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
ID, USA, 1988 (Russet Burbank)	EC	1.7		94	(6	5	tuber	<0.05 (2)	<0.05 (2)	MP-PO-3124
ID, USA, 1988 (Russet Burbank)	EC	8.4		190	6	5	tuber chips flakes granules wet peel dried peel	<0.05 <0.05 <0.05 <0.05 <0.05 <0.05	<0.05 <0.05 <0.05 <0.05 <0.05 <0.05	MP-PO-3502
FL, USA, 1988 (Red Lasoda)	EC	1.7		350	6	5	tuber	<0.05 (2)	<0.05 (2)	MP-PO-7103
WI, USA, 1988 (Russet Burbank)	EC	1.7		190	6	5	tuber	<0.05 (2)	<0.05 (2)	MP-PO-7107
ME, USA, 1988 (Atlantic)	EC	1.8		430	6	5	tuber	<0.05 (2)	<0.05 (2)	MP-PO-7105
Poland, 1995 (Bzura and Ceza)	CS	0.27	0.09	300	4	33	tuber	<0.02		VR 589 [1]
Poland, 1995 (Aster)	CS	0.45	0.15	330	1	48	tuber	<0.02		VR 589 [1]
Poland, 1995 (Arkadia)	CS	0.45	0.15	330	2	49	tuber	<0.02		VR 589 [1]
Poland, 1992 (Sokól)	CS	0.30	0.10	300	1	62	tuber	<0.01		VR 589 [1]

[1]Only summary information available
(aerial application.

Table 36. Parathion-methyl and paraoxon-methyl residues in sugar beet and its processed commodities (Cañez, 1990q) from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels. All EC formulations.

Location, year (variety)	Application			PHI, days	Sample	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
ID, 1988 (WS 88)	0.42	190	6	20	root	<0.05 (2)	<0.05 (2)	MP-SB-3144
CA, 1988 (SS-NB2)	0.42	190	6	20	root	<0.05 (2)	<0.05 (2)	MP-SB-3146
CA, 1988 (SS-NB2)	0.42	190	(6	20	root	<0.05 (2)	<0.05 (2)	MP-SB-3148
ID, 1988 (WS 88)	0.42	94	(6	20	root	<0.05 (2)	<0.05 (2)	MP-SB-3186
CA, 1988 (SS-NB2)	0.42	190	6	20	root	<0.05 (2)	<0.05 (2)	MP-SB-3503
ID, 1988 (WS 88)	0.42	190	6	20	root	<0.05 (2)	<0.05 (2)	MP-SB-3504
MN, 1988 (Ultramono)	0.42	190	6	20	root	<0.05 (2)	<0.05 (2)	MP-SB-7124

Location, year (variety)	Application			PHI, days	Sample	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
ND, 1988 (ACS ACH 176)	0.42	94	6	20	root	<0.05 (2)	<0.05 (2)	MP-SB-7126
CA, 1988 (SS-NB2)	2.1	190	6	20	root pulp, dehydrated molasses refined sugar	<0.05 <0.05 <0.05 <0.05	<0.05 <0.05 <0.05 <0.05	MP-SB-3503
ID, 1988 (WS 88)	2.1	190	6	20	root pulp, dehydrated molasses refined sugar	<0.05 <0.05 <0.05 <0.05	<0.05 <0.05 <0.05 <0.05	MP-SB-3504

(aerial application.

Table 37. Residues in Chinese turnips from supervised trials in the USA.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Purple Top White Globe)	0.90	190	6	21	greens	1.8 1.3	0.06 0.05	MP-TU-3149
CA, 1988 (Purple Top White Globe)	4×0.90 +2×0.56	190	6	7	greens	3.8 2.6	0.13 0.09	MP-TU-3149
CA, 1988 (Purple Top White Globe)	0.90	190	6	15	root	<0.05 (2)	<0.05 (2)	MP-TU-3149
CA, 1988 (Purple Top White Globe)	4×0.90 +2×0.56	190	6	7	root	0.11 <0.05	<0.05 (2)	MP-TU-3149
CA, 1988 (Purple Top White Globe)	0.90	190	(6	21	greens	<0.05 (2)	<0.05 (2)	MP-TU-3151
CA, 1988 (Purple Top White Globe)	4×0.90 +2×0.56	190	(6	7	greens	0.22 <0.05	<0.05 (2)	MP-TU-3151
CA, 1988 (Purple Top White Globe)	0.90	190	(6	15	root	<0.05 (2)	<0.05 (2)	MP-TU-3151
CA, 1988 (Purple Top White Globe)	4×0.90 +2×0.56	190	(6	7	root	<0.05 (2)	<0.05 (2)	MP-TU-3151
TX, 1988 (Purple Top White Globe)	0.90	150	6	21	greens	<0.05 (2)	<0.05 (2)	MP-TU-3152
TX, 1988 (Purple Top White Globe)	4×0.90 +2×0.56	150	6	7	greens	0.16 0.20	<0.05 (2)	MP-TU-3152
TX, 1988 (Purple Top White Globe)	0.90	150	6	15	root	<0.05 (2)	<0.05 (2)	MP-TU-3152
TX, 1988 (Purple Top White Globe)	4×0.90 +2×0.56	150	6	7	root	<0.05 (2)	<0.05 (2)	MP-TU-3152
TX, 1988 (Purple Top White Globe)	0.90	47	(6	21	greens	0.07 0.08	<0.05 (2)	MP-TU-3154

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
TX, 1988 (Purple Top White Globe)	4×0.90 +2×0.56	47	(6	7	greens	0.91 0.94	0.14 0.13	MP-TU-3154
TX, 1988 (Purple Top White Globe)	0.90	47	(6	14	root	<0.05 (2)	<0.05 (2)	MP-TU-3154
TX, 1988 (Purple Top White Globe)	4×0.90 +2×0.56	47	(6	7	root	<0.05 (2)	<0.05 (2)	MP-TU-3154
WA, 1988 (Purple Top)	0.90	280	6	21	greens	<0.05 (2)	<0.05 (2)	MP-TU-3155
WA, 1988 (Purple Top)	4×0.90 +2×0.56	280	6	7	greens	0.07 <0.05	0.05 <0.05	MP-TU-3155
WA, 1988 (Purple Top)	0.90	280	6	15	root	<0.05 (2)	<0.05 (2)	MP-TU-3155
WA, 1988 (Purple Top)	4×0.90 +2×0.56	280	6	7	root	<0.05 (2)	<0.05 (2)	MP-TU-3155
GA, 1988 (Purple Globe)	0.90	290	6	21	greens	<0.05 (2)	<0.05 (2)	MP-TU-7130
GA, 1988 (Purple Globe)	4×0.90 +2×0.56	290	6	7	greens	<0.05 (2)	<0.05 (2)	MP-TU-7130
GA, 1988 (Purple Globe)	0.90	290	6	15	root	<0.05 (2)	<0.05 (2)	MP-TU-7130
GA, 1988 (Purple Globe)	4×0.90 +2×0.56	290	6	7	root	<0.05 (2)	<0.05 (2)	MP-TU-7130
NJ, 1988 (Purple Top White globe)	0.90	280	6	21	greens	<0.05 (2)	<0.05 (2)	MP-TU-7132
NJ, 1988 (Purple Top White globe)	4×0.90 +2×0.56	280	6	7	greens	<0.05 (2)	<0.05 (2)	MP-TU-7132
NJ, 1988 (Purple Top White globe)	0.90	280	6	15	root	<0.05 (2)	<0.05 (2)	MP-TU-7132
NJ, 1988 (Purple Top White globe)	4×0.90 +2×0.56	280	6	7	root	<0.05 (2)	0.07 <0.05	MP-TU-7132

(aerial application.

Table 38. Residues in celery from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Florida 683)	0.56	380	2	15 22	excluding foliage	0.34 0.40 0.17 0.29	<0.05 (2) <0.05 (2)	MP-CY-3066
CA, 1988 (Florida 683)	1.1	380	2	15 22	excluding foliage	1.3 1.2 0.28 0.65	<0.05 (2) <0.05 (2)	MP-CY-3066

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Florida 683)	0.56	380	2	15 22	including foliage	1.7 2.5 1.0 1.1	<0.05 (2) <0.05 (2)	MP-CY-3066
CA, 1988 (Florida 683)	1.1	380	2	15 22	including foliage	2.2 2.5 2.1 1.5	<0.05 (2) <0.05 (2)	MP-CY-3066
CA, 1988 (5270R)	0.56	190	(2	15 22	excluding foliage	0.06 0.06 0.20 0.05	<0.05 (2) <0.05 (2)	MP-CY-3067
CA, 1988 (5270R)	1.1	190	(2	15 22	excluding foliage	0.06 0.17 0.09 0.07	<0.05 (2) <0.05 (2)	MP-CY-3067
CA, 1988 (5270R)	0.56	190	(2	15 22	including foliage	1.2 1.3 0.09 0.29	<0.05 (2) <0.05 (2)	MP-CY-3067
CA, 1988 (5270R)	1.1	190	(2	15 22	including foliage	1.5 2.1 1.2 0.87	0.07 0.07 <0.05 (2)	MP-CY-3067
CA, 1988 (Florida 683)	0.56	380	2	15 22	excluding foliage	0.81 0.86 0.69 0.69	<0.05 (2) <0.05 (2)	MP-CY-3068
CA, 1988 (Florida 683)	1.1	380	2	15 22	excluding foliage	1.1 1.1 1.7 1.1	<0.05 (2) <0.05 (2)	MP-CY-3068
CA, 1988 (Florida 683)	0.56	380	2	15 22	including foliage	1.8 2.0 1.6 1.7	<0.05 (2) <0.05 (2)	MP-CY-3068
CA, 1988 (Florida 683)	1.1	380	2	15 22	including foliage	3.8 4.4 2.3 2.5	<0.05 (2) <0.05 (2)	MP-CY-3068
CA, 1989 (5275)	0.56	260	2	15 22	excluding foliage	0.28 0.54 0.10 0.12	<0.05 (2) <0.05 (2)	MP-CY-3070
CA, 1989 (5275)	1.1	260	2	15 22	excluding foliage	0.41 0.32 0.21 0.20	<0.05 (2) <0.05 (2)	MP-CY-3070
CA, 1989 (5275)	0.56	260	2	15 22	including foliage	1.6 1.3 0.98 0.77	<0.05 (2) <0.05 (2)	MP-CY-3070
CA, 1989 (5275)	1.1	260	2	15 22	including foliage	0.98 1.8 1.6 1.3	<0.05 (2) <0.05 (2)	MP-CY-3070
FL, 1989 (683)	1.1	280	2	15 22	including foliage	4.0 3.2 1.9 2.8	<0.05 (2) <0.05 (2)	MP-CY-7029
MI, 1988 (Utah Tall 52-70R1MP)	1.1	200	2	15 22	including foliage	3.4 4.7 2.4 4.3	<0.05 (2) <0.05 (2)	MP-CY-7031
NY, 1988 (Florida 683)	1.1	230	2	15 22	including foliage	3.2 3.9 3.6 4.4	<0.05 (2) <0.05 (2)	MP-CY-7033
NY, 1988 (Florida 683)	1.1	45	(2	15 22	including foliage	0.76 0.87 0.83 0.84	<0.05 (2) <0.05 (2)	MP-CY-7035

(aerial application.

Table 39. Residues in artichokes from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Green Globe)	1.1	1870	4	7	head	1.8 0.41	<0.05 (2)	MP-AR-3178
CA, 1988 (Green Globe)	1.1	470	4	7	head	1.3 0.98	<0.05 (2)	MP-AR-3178
CA, 1988 (Green Globe)	1.1	1870	4	7	head	1.2 1.1	<0.05 (2)	MP-AR-3176
CA, 1988 (Green Globe)	1.1	470	4	7	head	0.87 1.1	<0.05 (2)	MP-AR-3176

Table 40. Residues in maize grain from supervised trials in the USA. Double-underlined residues are from treatments at twice the label rate and are valid for estimating maximum residue levels. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
CA, 1989	1.1	300	6	12	<0.05 (2)	<0.05 (2)	MP-CN-3169
TX, 1988 (Dekalb 689)	1.1	47	(6	12	<0.05 (2)	<0.05 (2)	MP-CN-3170
TX, 1988 (Dekalb 689)	1.1	75	6	12	<0.05 (2)	<0.05 (2)	MP-CN-3171
TX, 1988 (Dekalb 689)	1.1	75	6	12	<0.05 (2)	<0.05 (2)	MP-CN-3512
MO, 1989 (Funks G-4500)	1.1	190	6	12	<0.05	<0.05	MP-CN-3524
GA, 1988 (Cargill Hybrid)	1.1	56	6	12	<0.05 (2)	<0.05 (2)	MP-CN-7042
IL, 1988 (F/S 2368A)	1.1	160	6	12	<0.05 (2)	<0.05 (2)	MP-CN-7043
MN, 1988 (Pioneer 3732)	1.1	230	6	12	0.06 0.09	<0.05 (2)	MP-CN-7044
VA, 1988 (SX383)	1.1	220	6	12	<0.05 (2)	<0.05 (2)	MP-CN-7045
NE, 1988 (Funks G-4440)	1.1	190	6	12	<0.05 (2)	<0.05 (2)	MP-CN-7046
OH, 1988 (Pioneer 3324)	1.1	100	6	12	<0.05 (2)	<0.05 (2)	MP-CN-7047
OH, 1988 (Pioneer 3324)	1.1	47	(6	12	<0.05 (2)	<0.05 (2)	MP-CN-7048

(aerial application.

Table 41. Residues in rice from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (L202)	0.89	75	(6	15 20	grain	2.2 2.3 c 0.34	0.16 0.17 c <0.05	MP-RI-3131
TX, 1988 (Lemont)	0.89	47	(6	15	grain	0.19 0.18	0.09 0.08	MP-RI-3132
CA, 1988 (M201)	0.88	190	6	16	grain	2.0 1.9	0.10 0.12	MP-RI-3514
TX, 1988 (Gulfmont)	0.88	170	6	15	grain	0.36 0.44	0.18 0.23	MP-RI-3515
AR, 1988 (V 7817)	0.89	47	(6	15	grain	0.27 0.25	0.17 0.15	MP-RI-7109
LA, 1988 (Lemont)	0.89	94	(6	15	grain	0.28 0.30	0.12 0.12	MP-RI-7110
CA, 1988 (L202)	0.89	75	(6	15	straw	7.3 7.5	0.11 0.15	MP-RI-3131
TX, 1988 (Lemont)	0.89	47	(6	15	straw	<0.05 (2)	<0.05 (2)	MP-RI-3132
AR, 1988 (V 7817)	0.89	47	(6	15	straw	<0.05 0.06	<0.05 (2)	MP-RI-7109
LA, 1988 (Lemont)	0.89	94	(6	15	straw	0.20 0.13	0.05 <0.05	MP-RI-7110

(aerial application. c: sample from control plot

Table 42. Residues in sorghum grain from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
TX, 1988 (TEY 75)	1.1	150	6	21	1.0 0.16	0.07 <0.05	MP-SG-3173
TX, 1988 (Asgrow Topaz)	1.1	47	6	21	0.36 0.20	<0.05 (2)	MP-SG-3174
TX, 1988 (Asgrow Topaz)	1.1	9	(6	21	0.09 0.08	<0.05 (2)	MP-SG-3175
MO, 1988 (Funk's G-623GBR)	1.1	200	6	21	0.27 0.22	<0.05 (2)	MP-SG-7111
MO, 1988 (Funk's G-623GBR)	1.1	22	(6	21	0.09 0.19	<0.05 (2)	MP-SG-7112
NE, 1988 (NC + 271)	1.1	190	6	21	0.40 0.36	<0.05 (2)	MP-SG-7113

(aerial application. c: sample from control plot

Table 43. Residues in wheat grain from supervised trials in the USA (LeRoy, 1990d). Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels. All EC formulations.

Location, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
MO, 1988 (Caldwell)	1.4	260	6	13	0.78	<0.05	MP-WH-2103
CA, 1989 (Anza, Hard red winter)	1.4	190	6	14	4.5 5.1	0.45 0.49	MP-WH-3157
CA, 1989 (Anza, Hard red winter)	2×1.4 +3×0.84 +1×0.28	190	6	0	4.4 3.5	0.17 0.17	MP-WH-3157
CA, 1989 (Anza, Hard red winter)	4×1.4 +2×0.84	190	6	14	3.2 3.7	0.36 0.39	MP-WH-3157
WA, 1989 (Rojo)	1.4	190	6	14	0.82 1.1	<0.05 (2)	MP-WH-3159
WA, 1989 (Rojo)	2×1.4 +3×0.84 +1×0.28	190	6	0	1.1 1.1	<0.05 (2)	MP-WH-3159
WA, 1989 (Rojo)	4×1.4 +2×0.84	190	6	14	1.1 1.0	0.09 0.08	MP-WH-3159
TX, 1989 (NK Pro 812)	1.4	47	6	14	0.15 0.13	<0.05 (2)	MP-WH-3161
TX, 1989 (NK Pro 812)	2×1.4 +3×0.84 +1×0.28	47	6	0	0.07 0.09	<0.05 (2)	MP-WH-3161
TX, 1989 (NK Pro 812)	4×1.4 +2×0.84	47	6	14	<0.05 0.05	<0.05 (2)	MP-WH-3161
WA, 1989 (Rojo)	1.4	94	(6	14	0.33 0.29	<0.05 (2)	MP-WH-3181
WA, 1989 (Rojo)	2×1.4 +3×0.84 +1×0.28	94	(6	0	0.28 0.24	<0.05 (2)	MP-WH-3181
WA, 1989 (Rojo)	4×1.4 +2×0.84	94	(6	14	0.27 0.48	<0.05 0.05	MP-WH-3181
WA, 1989 (Rojo)	1.4	190	6	14	0.88 0.74	0.05 0.05	MP-WH-3520
OH, 1988 (Becher)	1.4	190	6	14	0.35 0.32 c <0.05	<0.05 (2) c 0.06	MP-WH-7134
OH, 1988 (Becher)	2×1.4 +3×0.84 +1×0.28	190	6	0	0.65 0.51	0.08 0.06	MP-WH-7134
OH, 1988 (Becher)	4×1.4 +2×0.84	190	6	14	0.29 0.27	<0.05 (2)	MP-WH-7134

Location, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.		parathion-methyl	paraoxon-methyl	
VA, 1988 (Coker 797)	1.4	220	6	14	<0.05 (2)	<0.05 (2)	MP-WH-7136
VA, 1988 (Coker 797)	2×1.4 +3×0.84 +1×0.28	220	6	0	1.5 1.5	<0.05 (2)	MP-WH-7136
VA, 1988 (Coker 797)	4×1.4 +2×0.84	220	6	14	<0.05 (2)	<0.05 (2)	MP-WH-7136
ND, 1988 (Marshall)	1.4	94	6	14	<0.05 (2)	<0.05 (2)	MP-WH-7138
ND, 1988 (Marshall)	2×1.4 +3×0.84 +1×0.28	94	6	0	0.49 0.25	<0.05 (2)	MP-WH-7138
ND, 1988 (Marshall)	4×1.4 +2×0.84	94	6	14	<0.05 (2)	<0.05 (2)	MP-WH-7138
KS, 1989 (Arkan)	1.4	210	6	14	1.2 1.6	<0.05 (2)	MP-WH-7140
KS, 1989 (Arkan)	2×1.4 +3×0.84 +1×0.28	210	6	0	0.73 0.93	0.05 0.05	MP-WH-7140
KS, 1989 (Arkan)	4×1.4 +2×0.84	210	6	14	1.1 0.83	0.05 <0.05	MP-WH-7140
KS, 1989 (Caldwell)	1.4	47	(6	14	0.22 0.21	<0.05 (2)	MP-WH-7142
KS, 1989 (Caldwell)	2×1.4 +3×0.84 +1×0.28	47	(6	0	1.4 0.98	0.34 0.28	MP-WH-7142
KS, 1989 (Caldwell)	4×1.4 +2×0.84	47	(6	14	0.21 0.08	<0.05 (2)	MP-WH-7142

(aerial application. c: sample from control plot

Table 44. Residues in cotton seed from supervised trials in the USA. All EC formulations.

Location, year (variety)	Application			Growth stage	PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.			sample	parathion-methyl	paraoxon-methyl	
AR, 1998 (Paymaster 1220)	3.4	28	10	90% open	1	seed	1.5 1.5	0.02 0.02	9802.AR.CT.02(a)
AR, 1998 (Paymaster 1220)	3.4	9	(10	90% open	1	seed	2.0 1.8	0.02 0.01	9802.AR.CT.02(b)
CA, 1998 (Acula Maxxa)	3.4	9	(10	defoliated	1	seed	1.7 1.5	0.01 0.01	9802.CA.CT.10
CA, 1998 (Acula Maxxa)	3.4	280	10	defoliated	1	seed	4.4 4.6	0.03 0.04	9802.CA.CT.10

Location, year (variety)	Application			Growth stage	PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.			sample	parathion-methyl	paraoxon-methyl	
CA, 1998 (Maxxa)	3.4	280	10	70-80% open	1	seed	7.4 6.9	0.08 0.07	9802.CA.CT.11
CA, 1998 (Maxxa)	3.4	190	10	mature	1	seed	8.9 8.1 c 0.01	0.21 0.17 c <0.01	9802.CA.CT.12
GA, 1998 (Paymaster 1220)	3.4	190	10	open bolls	1	seed	3.2 2.0 c 0.02	0.03 0.02 c <0.01	9802.GA.CT.01
LA, 1998 (Stoneville 4740)	3.4	9	(10	90% open	1	seed	7.0 7.4	0.03 0.04	9802.LA.CT.03
LA, 1998 (Stoneville 4740)	3.4	93	10	90% open	1	seed	5.5 5.6	0.03 0.04	9802.LA.CT.03
LA, 1998 (Stoneville 4740)	3.4	94	10	90% open	1	seed	5.4 4.6	0.03 0.03	9802.LA.CT.04
TX, 1998 (Paymaster 1220)	3.4	94	10	harvestable	1	seed	1.5 0.87	0.03 0.02	9802.TX.CT.05
TX, 1998 (Paymaster 1220)	3.4	92	10	90% open	1	seed	2.1 2.5	0.02 0.02	9802.TX.CT.06(a)
TX, 1998 (Paymaster 1220)	3.4	8	(10	90% open	1	seed	3.6 3.9	0.03 0.04	9802.TX.CT.06(b)
TX, 1998 (PM 2200 RR)	3.4	94	10	90% open	1	seed	0.64 0.64	0.02 0.02	9802.TX.CT.07
TX, 1998 (Quikee)	3.4	120	10	85% open	1	seed	3.5 2.9 c 0.02	0.01 0.01 c <0.01	9802.TX.CT.08(a)
TX, 1998 (Quikee)	3.4	9	(10	85% open	1	seed	1.7 1.9	<0.01 (2)	9802.TX.CT.08(b)
TX, 1998 (Paymaster 2200	3.4	120	10	95% open	1	seed	5.4 6.8 c 0.01	0.02 0.02 c <0.01	9802.TX.CT.09(a)
TX, 1998 (Paymaster 2200	3.4	9	(10	95% open	1	seed	3.0 2.8	0.02 <0.01	9802.TX.CT.09(b)
CA, 1988 (GC 510)	3.4	190	10	harvestable	7	seed [1]	<0.05 (2)	<0.05 (2)	MP-CS-3052
CA, 1988 (GC 510)	3.4	94	(10	harvestable	7	seed [1]	<0.05 (2)	<0.05 (2)	MP-CS-3054
TX, 1988 (DPL41)	3.4	94	10	80% open bolls	7	seed [1]	0.91 1.4	<0.05 (2)	MP-CS-3055
TX, 1988 (DPL41)	3.4	9	(10	80% open bolls	7	seed [1]	0.9 1.2	<0.05 (2)	MP-CS-3057
CA, 1988 (GC 510)	8×3.4 +2×1.1	190	10	harvestable	0	seed [1]	<0.05 (2)	<0.05 (2)	MP-CS-3052
CA, 1988 (GC 510)	8×3.4 +2×1.1	94	(10	harvestable	0	seed [1]	<0.05 (2)	<0.05 (2)	MP-CS-3054
TX, 1988 (DPL41)	8×3.4 +2×1.1	94	10	80% open bolls	0	seed [1]	3.1 4.5	0.11 0.14	MP-CS-3055

Location, year (variety)	Application			Growth stage	PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.			sample	parathion-methyl	paraoxon-methyl	
TX, 1988 (DPL41)	8×3.4 +2×1.1	9	(10	80% open bolls	0 0	seed [1]	2.0 2.2 c 0.08	<0.05 (2) c <0.05	MP-CS-3057
CA, 1989 (GC 510)	3.4	99	6		7	seed	9.5 22	<0.05 0.07	MP-CS-3522
TX, 1988 (DPL 41)	3.4	94	10		7	seed	0.90 1.8 c 0.08 0.08	0.07 0.10 c <0.05 (2)	MP-CS-3523

[1] Sample described as 'seed cotton' in report, but is probably cotton seed.
(aerial application. c: sample from control plot

Table 45. Residues in oilseed from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels. All EC formulations.

Location, year (variety)	Application			growth stage	PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.			sample	parathion-methyl	paraoxon-methyl	
CANOLA									
ND, 1992 (Legend)	2×0.28 + 2×0.56	47	(4	110 cm tall	28	seed	<u>0.05</u> (2)	<u>0.05</u> (2)	92146a
ND, 1992 (Legend)	2×0.56 + 2×1.1	47	(4	110 cm tall	28	seed	<0.05 (2)	<0.05 (2)	92146a
MT, 1992 (Tobin)	0.56	51	(2	flowering	28	seed	<u>0.05</u> (2)	<u>0.05</u> (2)	92146b
MT, 1992 (Tobin)	1.1	51	(2	flowering	28	seed	0.063 0.056	<0.05 (2)	92146b
WA, 1992 (Series)	0.56	51	(2	post-bloom	28	seed	<u>0.05</u> (2)	<u>0.05</u> (2)	92146c
WA, 1992 (Series)	1.1	51	(2	post-bloom	28	seed	<0.05 (2)	<0.05 (2)	92146c
ID, 1992 (#104)	0.56	41	(2	5% bloom	28	seed	<u>0.05</u> (2)	<u>0.05</u> (2)	92146d
ID, 1992 (#104)	1.1	41	(2	post-bloom	28	seed	<0.05 (2)	<0.05 (2)	92146d
SUNFLOWER SEED									
ND, 1988 (Sigco Hybrid 465A)	1.1	190	3	post-flower	30	seed (with shell)	<0.05 (2)	<0.05 (2)	MP-SS-7128
	1.1	47	3		30		<0.05 (2)	<0.05 (2)	
ND, 1988 (Sigco Hybrid 465A)	1.1	38	(3	post-flower	30	seed (with shell)	<0.05 (2)	<0.05 (2)	MP-SS-7129

(aerial application.

Table 46. Residues in alfalfa from supervised trials in the USA. In the 1998 trials, two applications per cutting were made at 4 ± 1 day intervals. Forage and hay samples were collected 15 days after the second application per cutting, and from 3 cuttings except in a Montana trial (2 cuttings) and a

California trial (4 cuttings). Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Location, year (variety)	Application				PHI, days	Sample[1]	% moisture[2]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water l/ha	no. per cut				parathion-methyl	paraoxon-methyl	
CA, 1988 (Cuff-101)	EC	1.4	370	2	83	seed		<0.05 (2)	<0.05 (2)	MP-AF-3001
CA, 1988 (Cuff-101)	EC	1.4	190	(1	85	seed		<0.05 (2)	<0.05 (2)	MP-AF-3003
WA, 1988 (La Rocca)	EC	1.4	240	2	92	seed		<0.05 (2)	<0.05 (2)	MP-AF-3004
WA, 1988 (La Rocca)	EC	1.4	140	(2	92	seed		<0.05 (2)	<0.05 (2)	MP-AF-3006
MT, 1998 (Cenex 741)	EC	1.1	28	2 2	15 15	forage 1 forage 2	74.2 69.7	2.1 2.0 1.6 1.2	0.03 0.03 0.04 0.03	9801.MT.AF.10-a
MT, 1998 (Cenex 741)	EC	1.1	9	(2 (2	15 15	forage 1 forage 2	74.2 69.7	1.7 1.8 0.82 0.39	0.03 0.04 0.01 <0.01	9801.MT.AF.10-b
MT, 1998 (NK 919)	EC	1.1	28	2 2	15 15	forage 1 forage 2	72.7 53.2	0.97 1.1 0.46 0.36	0.02 0.02 <0.01 (2)	9801.MT.AF.09-a
MT, 1998 (NK 919)	EC	1.1	9	(2 (2	15 15	forage 1 forage 2	72.7 53.2	1.0 1.4 0.22 0.24	0.02 0.03 <0.01 (2)	9801.MT.AF.09-b
IA, 1998 (Winnbrand)	EC	1.1	110	2 2 2	15 15 15	forage 1 forage 2 forage 3	81.0 77.2 81.7	0.96 1.1 0.82 0.84 5.9 3.6	0.01 0.01 <0.01 (2) 0.06 0.05	9801.IA.AF.08
MN, 1998 (Pioneer 5347LH)	EC	1.1	110	2 2 2	15 15 15	forage 1 forage 2 forage 3	85.2 77.9 81.7	0.76 0.66 0.97 1.0 2.4 11	<0.01 (2) 0.01 0.01 0.03 0.08	9801.MN.AF.07
MN, 1998 (Pioneer)	EC	1.1	46	2 2 2	15 15 15	forage 1 forage 2 forage 3	73.9 74.5 75.6	0.66 0.61 0.31 0.22 0.92 0.67	0.02 0.01 <0.01 (2) 0.02 0.01	9801.MN.AF.06-a
MN, 1998 (Pioneer)	EC	1.1	9	(2 (2 (2	15 15 15	forage 1 forage 2 forage 3	73.9 74.5 75.6	8.6 6.0 2.7 0.42 2.3 1.3	0.11 0.08 0.02 <0.01 0.03 0.01	9801.MN.AF.06-b
OH, 1998	EC	1.1	82	2 2 2	14 14 14	forage 1 forage 2 forage 3	75.4 76.5 78.6	0.61 0.70 0.74 0.65 1.3 1.5	<0.01 0.01 0.01 <0.01 0.02 0.02	9801.OH.AF.04
OH, 1998 (Mustang)	EC	1.1	80	2 2 2	14 15 16	forage 1 forage 2 forage 3	73.0 74.8 68.1	0.27 0.25 0.87 0.66 2.0 1.8	<0.01 (2) 0.01 <0.01 0.02 0.02	9801.OH.AF.03-a
OH, 1998 (Mustang)	EC	1.1	9	(2 (2 (2	14 15 16	forage 1 forage 2 forage 3	73.0 74.8 68.1	0.09 0.13 0.21 0.17 0.73 0.72	<0.01 (2) <0.01 (2) 0.01 0.01	9801.OH.AF.03-b
PA, 1998	EC	1.1	270	2 2 2	15 15 15	forage 1 forage 2 forage 3	68.6 77.2 72.5	1.2 1.2 0.30 0.32 0.91 0.78	0.02 0.02 <0.01 (2) 0.01 0.01	9801.PA.AF.01

Location, year (variety)	Application				PHI, days	Sample[1]	% moisture[2]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water l/ha	no. per cut				parathion-methyl	paraoxon-methyl	
VA, 1998	EC	1.1	250	2 2 2	15 15 15	forage 1 forage 2 forage 3	72.1 78.7 81.5	0.26 0.24 0.35 0.29 0.54 0.24	<0.01 (2) <0.01 (2) <0.01 (2)	9801.VA.AF.02
WA, 1998 (Pioneer 5364)	EC	1.1	28	2 2 2	15 15 15	forage 1 forage 2 forage 3	82.7 78.1 83.6	2.6 1.9 0.38 0.35 0.03 0.03	0.04 0.03 <0.01 (2) <0.01 (2)	9801.WA.AF.11
WA, 1998 (Pioneer 5364)	EC	1.1	9	(2 (2 (2	15 15 15	forage 1 forage 2 forage 3	82.7 78.1 83.6	1.6 1.7 0.39 0.21 0.09 0.08	0.02 0.03 <0.01 (2) <0.01 (2)	9801.WA.AF.11
WI, 1998 (Wrangler)	EC	1.1	47	2 2 2	15 15 15	forage 1 forage 2 forage 3	79.7 77.5 76.5	1.1 0.67 0.49 0.57 11 5.9	0.02 0.02 0.01 0.02 0.13 0.09	9801.WI.AF.05-a
WI, 1998 (Wrangler)	EC	1.1	9	(2 (2 (2	15 15 15	forage 1 forage 2 forage 3	79.7 77.5 76.5	2.2 1.8 0.34 0.55 8.5 6.9	0.03 0.03 <0.01 0.01 0.11 0.10	9801.WI.AF.05-b
CA, 1998 (GT13R)	EC	1.1	92	2 2 2 2	15 15 15 15	forage 1 forage 2 forage 3 forage 4	78.2 70.9 64.6 83.6 64.6	0.57 0.91 0.23 0.32 0.89 1.3 6.8 6.0 c 0.02	0.01 0.03 <0.01 (2) <0.01 0.01 0.11 0.10 c <0.01	9801.CA.AF.12
MT, 1998 (Cenex 741)	EC	1.1	28	2 4	15 15	hay 1 hay 2	25.9 45.5	1.4 1.7 0.64 0.53	0.03 0.03 0.01 0.01	9801.MT.AF.10-a
MT, 1998 (Cenex 741)	EC	1.1	9	(2 (2	15 15	hay 1 hay 2	25.9 45.5	1.6 1.7 0.79 0.63	0.04 0.03 0.01 0.01	9801.MT.AF.10-b
MT, 1998 (NK 919)	EC	1.1	28	2 2	15 15	hay 1 hay 2	34.0 28.6	3.4 2.6 0.26 0.28	0.04 0.03 <0.01 (2)	9801.MT.AF.09-a
MT, 1998 (NK 919)	EC	1.1	9	(2 (2	15 15	hay 1 hay 2	34.0 28.6	2.1 2.3 0.38 0.39	0.03 0.03 <0.01 (2)	9801.MT.AF.09-b
IA, 1998 (Winnbrand)	EC	1.1	110	2 2 2	15 15 15	hay 1 hay 2 hay 3	44.2 30.7 59.9	2.1 2.1 1.9 1.6 5.6 6.4	0.01 0.02 0.01 0.01 0.06 0.07	9801.IA.AF.08
MN, 1998 (Pioneer 5347LH)	EC	1.1	110	2 2 2	15 15 15	hay 1 hay 2 hay 3	66.3 38.5 59.3 59.3	1.3 1.3 1.3 1.3 4.4 23 c 0.02	0.01 0.01 0.01 <0.01 0.04 0.13 c <0.01	9801.MN.AF.07
MN, 1998 (Pioneer)	EC	1.1	46	2 2 2	15 15 15	hay 1 hay 2 hay 3	36.8 42.7 21.2	2.2 2.0 0.67 0.36 4.5 3.6	0.06 0.05 <0.01 (2) 0.08 0.07	9801.MN.AF.06-a
MN, 1998 (Pioneer)	EC	1.1	9	(2 (2 (2	15 15 15	hay 1 hay 2 hay 3	36.8 42.7 21.2	17 16 1.4 1.1 8.4 8.8	0.17 0.18 <0.01 (2) 0.07 0.08	9801.MN.AF.06-b

Location, year (variety)	Application				PHI, days	Sample[1]	% moisture[2]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water l/ha	no. per cut				parathion-methyl	paraoxon-methyl	
OH, 1998	EC	1.1	82	2 2 2	14 14 14	hay 1 hay 2 hay 3	24.9 6.9 24.3	1.1 1.3 1.4 1.5 3.5 3.0	0.01 0.01 0.01 0.01 0.04 0.03	9801.OH.AF.04
OH, 1998 (Mustang)	EC	1.1	80	2 2 2	15 15 15	hay 1 hay 2 hay 3	33.1 9.9 10.8	0.64 0.49 2.2 2.7 4.1 3.7	<0.01 (2) 0.02 0.02 0.02 0.02	9801.OH.AF.03-a
OH, 1998 (Mustang)	EC	1.1	9	(2 (2 (2	15 15 15	hay 1 hay 2 hay 3	33.1 9.9 10.8	0.33 0.31 0.63 0.28 1.8 1.9	<0.01 (2) <0.01 (2) 0.02 0.02	9801.OH.AF.03-b
PA, 1998	EC	1.1	270	2 2 2	15 15 15	hay 1 hay 2 hay 3	19.3 26.8 20.2	2.2 2.0 0.64 0.87 1.2 1.4	0.04 0.04 0.01 0.02 0.02 0.02	9801.PA.AF.01
VA, 1998	EC	1.1	250	2 2 2	15 15 15	hay 1 hay 2 hay 3	11.9 29.0 22.2	0.36 0.35 0.64 0.48 0.55 1.0	<0.01 (2) <0.01 (2) <0.01 (2)	9801.VA.AF.02
WA, 1998 (Pioneer 5364)	EC	1.1	28	2 2 2	15 15 15	hay 1 hay 2 hay 3	50.1 8.7 16.9	3.6 4.2 0.28 0.38 0.08 0.37	0.06 0.06 <0.01 (2) <0.01 (2)	9801.WA.AF.11
WA, 1998 (Pioneer 5364)	EC	1.1	9	(2 (2 (2	15 15 15	hay 1 hay 2 hay 3	50.1 8.7 16.9	5.7 3.0 0.38 0.19 0.46 0.36	0.08 0.05 <0.01 (2) <0.01 (2)	9801.WA.AF.11
WI, 1998 (Wrangler)	EC	1.1	47	2 2 2	15 15 15	hay 1 hay 2 hay 3	43.3 43.6 18.9	3.0 1.3 0.81 0.57 11 13	0.04 0.03 0.01 0.01 0.11 0.12	9801.WI.AF.05-a
WI, 1998 (Wrangler)	EC	1.1	9	(2 (2 (2	15 15 15	hay 1 hay 2 hay 3	43.3 43.6 18.9	1.7 1.8 0.74 1.2 17 17	0.02 0.03 0.01 0.02 0.18 0.21	9801.WI.AF.05-b
CA, 1998 (GT13R)	EC	1.1	92	2 2 2 2	15 15 15 15	hay 1 hay 2 hay 3 hay 4	18.1 8.0 16.7 56.1 16.7 56.1	1.9 1.4 0.64 0.60 1.4 1.7 8.0 7.8 c 0.02 c 0.04	0.03 0.03 0.01 0.01 0.01 0.02 0.11 0.12 c <0.01 c <0.01	9801.CA.AF.12

[1] Forage 1, forage 2, hay 1, etc refer to the 1st, 2nd and later cuttings.
[2] Moisture levels were measured on the accompanying control sample.
(aerial application. c: sample from control plot

Table 47. Residues in clover from supervised trials in the USA.

Location, year (variety)	Application				PHI, days	Sample[1]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
CA, 1989	EC	1.1	190	2	0 7 15 20 25	forage 2	30 19 0.19 0.38 <0.05 (2) <0.05 (2) <0.05 (2)	0.12 0.08 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-3036
CA, 1989	EC	1.4	190	2	0 7 15 20 25	forage 2	45 39 0.49 0.58 0.06 0.06 <0.05 (2) <0.05 (2)	0.23 0.24 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-3036
CA, 1989	EC	1.1	190	(2	0 7 15 20 25	forage 2	42 46 3.4 2.5 0.11 0.19 <0.05 (2) <0.05 (2)	0.31 0.33 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-3038
CA, 1989	EC	1.4	190	(2	0 7 15 20 25	forage 2	71 67 4.8 5.1 0.26 0.30 0.07 <0.05 <0.05 (2)	0.56 0.49 0.06 0.06 <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-3038
ID, 1988 (Arlington Red)	EC	1.1	94	2	0 7 15 21 25	forage 2	28 60 0.55 0.94 0.13 0.07 <0.05 (2) <0.05 (2)	0.18 0.42 0.06 0.08 <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-3041
ID, 1988 (Arlington Red)	EC	1.4	94	2	0 7 15 21 25	forage 2	35 44 0.51 0.61 0.16 0.09 0.07 <0.05 <0.05 (2)	0.17 0.18 0.09 0.09 <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-3041
ID, 1988 (Arlington Red)	EC	1.1	94	(2	0 7 15 21 25	forage 2	18 4.1 0.05 0.07 <0.05 (2) <0.05 (2) <0.05 (2)	0.12 <0.05 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-3180
ID, 1988 (Arlington Red)	EC	1.4	94	(2	0 7	forage 2	14 15 0.45 0.08	0.12 0.12 <0.05 (2)	MP-CL-3180
MN, 1988 (Mammonth)	EC	1.1	190	2	0 7 15 20 25	forage 2	54 49 9.9 9.6 6.1 6.5 2.4 3.0 0.86 1.4	0.36 0.34 0.09 0.07 <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-7036
MN, 1988 (Mammonth)	EC	1.4	190	2	0 7 15 20 25	forage 2	51 46 13 15 8.1 8.2 3.7 3.6 1.3 1.8	0.30 0.25 0.09 0.10 0.05 0.06 <0.05 (2) <0.05 (2)	MP-CL-7036

Location, year (variety)	Application				PHI, days	Sample[1]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
NY, 1988	EC	1.1	260	2	0 7 15 20 26	forage 2	3.6 3.5 0.62 0.53 0.23 0.18 0.08 0.12 0.14 0.13	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-7038
NY, 1988	EC	1.4	260	2	0 7 15 20 26	forage 2	7.8 6.6 0.61 0.63 0.31 0.24 0.24 0.20 0.13 0.11	0.05 0.05 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-7038
WI, 1988 (Medium Red)	EC	1.1	190	2	0 7 15 20 25	forage 2	47 53 7.2 6.2 2.5 2.8 1.4 1.4 0.74 0.51	0.21 0.19 0.09 0.06 <0.05 (2) <0.05 (2) <0.05 (2)	MP-CL-7040
WI, 1988 (Medium Red)	EC	1.4	190	2	0 7 15 20 25	forage 2	60 69 9.1 8.9 2.5 2.2 1.6 1.3 0.32 0.33	0.26 0.33 0.11 0.11 0.05 <0.05 <0.05 (2) <0.05 (2)	MP-CL-7040

[1] Forage 2 refers to 2nd cutting.
(aerial application.

Table 48. Residues in field pea forage, straw and vines from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
WA, 1989 (Dark Skin 49)	EC	1.1	190	6	0 5 10 15	forage, dried	2.7 2.3 5.0 1.5 1.8 1.7 2.9 <u>3.6</u>	0.11 0.08 0.25 0.11 0.19 0.20 0.23 <u>0.41</u>	MP-PE-3116
WA, 1989 (Dark Skin 49)	EC	5×1.1 +1×0.56	190	6	0 5 10 15	forage, dried	0.29 0.13 1.3 1.7 <u>3.4</u> 1.8 1.6 1.3	<0.05 (2) 0.11 0.15 <u>0.28</u> 0.14 0.14 0.10	MP-PE-3116
WA, 1989 (Dark Skin 49)	EC	1.1	94	(6	0 5 10 15 20 25 10 15	forage, dried	16 4.2 0.56 0.73 0.49 0.22 <u>0.66</u> 0.44 0.31 0.24 0.29 0.12 c<0.05 c <0.05	0.55 0.16 0.10 0.09 0.10 0.05 <u>0.08</u> 0.06 0.07 0.06 0.06 <0.05 c 0.05 c 0.06	MP-PE-3118

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
WA, 1989 (Dark Skin 49)	EC	5×1.1 +1×0.56	94	(6	0 5 10 15 20 25	forage, dried	1.5 2.8 0.18 0.23 0.30 0.55 0.15 0.08 0.10 0.08 0.26 0.21	0.10 0.12 0.05 <0.05 0.08 0.14 <0.05 (2) 0.09 0.06 0.07 0.05	MP-PE-3118
DE, 1988 (Alaska)	EC	1.1	290	6	0 5 10 15 20 25	forage, dried	46 41 11 15 4.8 4.8 6.6 7.6 6.3 6.0 5.5 7.6	0.22 0.17 0.09 0.13 <0.05 (2) 0.10 0.09 0.11 0.10 0.09 0.11	MP-PE-7089
DE, 1988 (Alaska)	EC	5×1.1 +1×0.56	290	6	0 5 10 15 20 25	forage, dried	19 24 7.1 6.6 2.2 2.0 3.6 4.2 4.2 2.1 3.2 3.9	0.06 0.07 0.07 0.07 <0.05 (2) 0.06 0.05 0.06 <0.05 0.05 0.07	MP-PE-7089
MN, 1988 (Alaska 146)	EC	1.1	190	4	0 5 10 15 20 25	forage, dried	18 17 1.0 1.0 0.42 0.35 0.27 0.26 0.34 0.12 0.35 0.26	0.15 0.12 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7091
MN, 1988 (Alaska 146)	EC	3×1.1 +1×0.56	190	4	0 5 10 15 20 25	forage, dried	11 14 0.69 0.59 0.35 0.30 0.18 0.37 0.17 0.16 0.17 0.33	0.12 0.09 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7091
ND, 1988 (Trapper)	EC	1.1	94	6	0 5 10 15 20 26 20	forage, dried	23 22 14 8.1 10 8.5 9.5 7.7 5.5 4.6 0.53 0.82 c 0.05	0.39 0.33 0.30 0.24 0.29 0.15 0.21 0.16 0.10 0.11 <0.05 (2) c <0.05	MP-PE-7093
ND, 1988 (Trapper)	EC	5×1.1 +1×0.56	94	6	0 5 10 15 20 25 20	forage, dried	12 8.8 5.8 5.7 4.3 4.7 3.2 5.2 2.6 3.2 0.47 0.30 c 0.05	0.24 0.21 0.14 0.17 0.10 0.11 0.09 0.09 0.06 0.06 <0.05 (2) c <0.05	MP-PE-7093

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
DE, 1988 (Alaska)	EC	1.1	47	(6	0 5 10 15 20 25 0 10 15 20 25	forage, dried	5.4 <0.05 <0.05 0.23 0.58 0.41 0.25 0.26 0.20 0.43 1.0 0.25 c 3.1 0.37 c 0.48 c 0.20 <0.05 c 0.20 <0.05 c 0.19 <0.05	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) c <0.05 (2) c <0.05 c <0.05 (2) c <0.05 (2) c <0.05 (2)	MP-PE-7095
DE, 1988 (Alaska)	EC	5×1.1 +1×0.56	47	(6	0 5 10 15 20 24 0 10 15 20 25	forage, dried	53 46 52 58 15 18 36 58 13 14 6.8 6.2 c 3.1 0.37 c 0.48 c 0.20 <0.05 c 0.20 <0.05 c 0.19 <0.05	0.17 0.18 0.30 0.35 0.18 0.18 0.43 0.52 0.08 0.12 <0.05 (2) c <0.05 (2) c <0.05 c <0.05 (2) c <0.05 (2) c <0.05 (2)	MP-PE-7095
WA, 1989 (Knight)	EC	1.1	94	(4	0 5 10 15 20 25	forage, succu-lent	0.35 0.78 <0.05 0.08 <0.05 (2) <0.05 (2) <0.05 0.10 <0.05 0.06	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 0.06 <0.05 (2)	MP-PE-3188
WA, 1989 (Knight)	EC	3×1.1 +1×0.56	94	(4	0 5 10 15 20 25	forage, succu-lent	<0.05 0.53 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-3188
WA, 1989 (Knight)	EC	1.1	190	4	0 5 10 15	forage, succu-lent	5.0 7.8 0.23 0.26 0.12 <0.05 0.17 <0.05	0.11 0.15 <0.05 (2) 0.07 <0.05 0.09 <0.05	MP-PE-3189
WA, 1989 (Knight)	EC	3×1.1 +1×0.56	190	4	0 5 10 15	forage, succu-lent	1.5 2.1 0.11 <0.05 0.06 0.07 0.07 <0.05	0.05 <0.05 <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-3189
DE, 1988 (Wando)	EC	1.1	290	6	0 5 10 15 20 25	forage, succu-lent	26 25 12 7.9 3.3 3.1 4.4 2.5 4.0 4.2 7.3 8.2	0.08 0.12 0.07 0.06 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7096

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
DE, 1988 (Wando)	EC	5×1.1 +1×0.56	290	6	0 5 10 15 20 25	forage, succu-lent	10 13 5.4 3.8 1.4 1.5 2.9 2.4 4.4 3.4 3.0 4.9	<0.05 0.05 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05	MP-PE-7096
MN, 1988 (Asgrow XPG 206)	EC	1.1	190	4	0 5 10 15 20 25	forage, succu-lent	4.6 4.2 0.07 0.11 0.05 0.06 <0.05 (2) 0.08 0.06 <0.05 0.05	0.09 0.11 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7098
MN, 1988 (Asgrow XPG 206)	EC	3×1.1 +1×0.56	190	4	0 5 10 15 20 25	forage, succu-lent	2.4 2.1 0.07 0.20 <0.05 0.06 0.10 0.15 0.08 0.11 0.07 0.08	0.08 0.05 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7098
WI, 1988 (Ego)	EC	1.1	240	5	0 5 9 14 19 24	forage, succu-lent	21 20 0.14 0.24 0.12 0.08 0.13 0.13 0.06 0.08 0.09 0.07	0.02 0.18 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7100
WI, 1988 (Ego)	EC	4×1.1 +1×0.56	240	5	0 5 9 14 19 24	forage, succu-lent	5.0 6.0 <0.05 0.06 0.06 <0.05 0.08 0.05 <0.05 (2) <0.05 (2)	0.07 0.08 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7100
WI, 1988 (9888F)	EC	4×0.56 +1×1.1	38	(5	0 6 10 15 20 25	forage, succu-lent	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7102
WI, 1988 (9888F)	EC	1.1	38	(5	0 6 10 15 20 25	forage, succu-lent	0.13 <0.05 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 0.05 <0.05 (2)	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-PE-7102
WA, 1989 (Dark Skin 49)	EC	1.1	190	6	15	straw	5.0 3.6	0.42 0.46	MP-PE-3116
WA, 1989 (Dark Skin 49)	EC	5×1.1 +1×0.56	190	6	10 10	straw	2.1 4.9 c <0.05	0.34 0.54 c 0.10	MP-PE-3116
WA, 1989 (Dark Skin 49)	EC	1.1	94	(6	15	straw	0.70 0.82	0.07 0.09	MP-PE-3118

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
WA, 1989 (Dark Skin 49)	EC	5×1.1 +1×0.56	94	(6	10	straw	0.72 0.24	0.17 0.13	MP-PE-3118
DE, 1988 (Alaska)	EC	1.1	290	6	15	straw	13 11	0.12 0.07	MP-PE-7089
DE, 1988 (Alaska)	EC	5×1.1 +1×0.56	290	6	10	straw	2.1 2.6	<0.05 (2)	MP-PE-7089
MN, 1988 (Alaska 146)	EC	1.1	190	4	15	straw	0.71 0.67	<0.05 (2)	MP-PE-7091
MN, 1988 (Alaska 146)	EC	3×1.1 +1×0.56	190	4	10	straw	1.1 1.1	<0.05 (2)	MP-PE-7091
ND, 1988 (Trapper)	EC	1.1	94	6	15 15	straw	3.1 3.5 c 0.25	0.46 0.42 c <0.05	MP-PE-7093
ND, 1988 (Trapper)	EC	5×1.1 +1×0.56	94	6	10	straw	3.1 2.7	0.08 0.07	MP-PE-7093
DE, 1988 (Alaska)	EC	1.1	47	(6	10 15 10 15	straw [1]	1.7 0.80 0.43 0.48 c 0.90 0.38 c 0.33	<0.05 (2) <0.05 (2) c <0.05 (2) c <0.05	MP-PE-7095
DE, 1988 (Alaska)	EC	5×1.1 +1×0.56	47	(6	10 10 15	straw	19 27 c 0.90 0.38 c 0.33	0.17 0.19 c <0.05 (2) c <0.05	MP-PE-7095
WA, 1989 (Knight)	EC	1.1	94	(4	15	vine	<0.05 (2)	<0.05 (2)	MP-PE-3188
WA, 1989 (Knight)	EC	3×1.1 +1×0.56	94	(4	10	vine	<0.05 (2)	<0.05 (2)	MP-PE-3188
WA, 1989 (Knight)	EC	3×1.1 +1×0.56	190	4	10	vine	0.21 0.15	0.07 0.05	MP-PE-3189
DE, 1988 (Wando)	EC	1.1	290	6	15	vine	6.8 7.3	<0.05 (2)	MP-PE-7096
DE, 1988 (Wando)	EC	5×1.1 +1×0.56	290	6	10	vine	1.1 1.6	<0.05 (2)	MP-PE-7096
MN, 1988 (Asgrow XPG 206)	EC	1.1	190	4	10	vine	0.20 0.15	<0.05 (2)	MP-PE-7098
MN, 1988 (Asgrow XPG 206)	EC	3×1.1 +1×0.56	190	4	10	vine	0.13 0.23	<0.05 (2)	MP-PE-7098
WI, 1988 (Ego)	EC	1.1	240	5	14	vine	0.15 0.17	<0.05 (2)	MP-PE-7100
WI, 1988 (Ego)	EC	4×1.1 +1×0.56	240	5	9	vine	0.08 <0.05	<0.05 (2)	MP-PE-7100
WI, 1988 (9888F)	EC	1.1	38	(5	15	vine	<0.05 (2)	<0.05 (2)	MP-PE-7102

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
WI, 1988 (9888F)	EC	4×0.56 +1×1.1	38	(5	10	vine	<0.05 (2)	<0.05 (2)	MP-PE-7102

[1] Contamination of control at levels comparable to those in the treated plot invalidates results
(aerial application. c: sample from control plot

Table 49. Residues in bean forage and fodder from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
CA, 1988 (Baby White)	EC	1.7	340	6	0 7 15 21 28 21	forage	48 50 2.2 2.7 0.88 0.82 0.66 0.62 0.38 0.47 c 0.10	0.59 0.73 0.16 0.08 0.07 <0.05 <0.05 (2) <0.05 (2) c <0.05	MP-DB-3072
CA, 1988 (Red Kidney)	EC	1.7	94	(6	0 7 15 21 28	forage	9.3 14 0.46 0.55 0.14 0.18 0.11 0.06 0.09 0.07	0.37 0.41 0.08 0.12 <0.05 (2) <0.05 (2) <0.05 (2)	MP-DB-3074
MI, 1988 (Seafarer Navy Bean)	EC	1.7	220	6	0 7 15 21 28	forage	15 11 0.33 0.20 0.14 <0.05 0.07 0.10 0.08 0.07	0.34 0.27 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-DB-7001
NE, 1988 (Pinto)	EC	1.7	190	6	0 7 15 21 28	forage	50 47 0.12 0.69 <0.05 (2) <0.05 (2) <0.05 (2)	0.27 0.23 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-DB-7003
NE, 1988 (Pinto)	EC	1.7	9	(6	0 7 15 21 28	forage	25 18 0.61 0.49 0.06 0.08 <0.05 (2) <0.05 (2)	0.13 0.16 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-DB-7005
ND, 1988 (Topaz, Pinto)	EC	1.7	94	6	0 7 15 21 28	forage	19 32 1.0 3.0 1.1 0.75 0.17 0.31 0.21 0.13	0.48 1.7 0.06 0.17 0.06 <0.05 <0.05 (2) <0.05 (2)	MP-DB-7006
CA, 1988 (Baby White)	EC	1.7	340	6	15	hay	0.94 0.93	0.13 0.06	MP-DB-3072
CA, 1988 (Red Kidney)	EC	1.7	94	(6	15	hay	3.5 3.0 c 0.07	0.35 0.30 c <0.05	MP-DB-3074

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
MI, 1988 (Seafarer Navy Bean)	EC	1.7	220	6	15	hay	0.22 0.25	<0.05 (2)	MP-DB-7001
NE, 1988 (Pinto)	EC	1.7	190	6	15	hay	<0.05 (2)	0.07 <0.05	MP-DB-7003
NE, 1988 (Pinto)	EC	1.7	9	(6	15	hay	<0.05 0.06	<0.05 (2)	MP-DB-7005
ND, 1988 (Topaz, Pinto)	EC	1.7	94	6	15	hay	1.2 1.4	0.05 0.12	MP-DB-7006

(aerial application. c: sample from control plot

Table 50. Residues in maize and sweet corn forage and fodder from supervised trials in the USA.

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		Sample	parathion-methyl	paraoxon-methyl	
MAIZE									
CA, 1989	EC	1.1	300	6	12	fodder	<0.05 (2)	<0.05 (2)	MP-CN-3169
TX, 1988 (Dekalb 689)	EC	1.1	47	(6	12	fodder	0.96 0.79	<0.05 (2)	MP-CN-3170
TX, 1988 (Dekalb 689)	EC	1.1	75	6	12	fodder	0.28 0.23	<0.05 (2)	MP-CN-3171
GA, 1988 (Cargill Hybrid)	EC	1.1	56	6	12	fodder	1.2 1.1	<0.05 (2)	MP-CN-7042
IL, 1988 (F/S 2368A)	EC	1.1	160	6	12	fodder	0.10 0.07	<0.05 (2)	MP-CN-7043
MN, 1988 (Pioneer 3732)	EC	1.1	230	6	12 12	fodder	7.9 2.4 c 0.22	0.28 0.12 c <0.05	MP-CN-7044
VA, 1988 (SX383)	EC	1.1	220	6	12	fodder	<0.05 (2)	<0.05 (2)	MP-CN-7045
NE, 1988 (Funks G-4440)	EC	1.1	190	6	12	fodder	2.6 4.5	0.49 0.42	MP-CN-7046
OH, 1988 (Pioneer 3324)	EC	1.1	100	6	12	fodder	2.3 17	0.08 0.47	MP-CN-7047
OH, 1988 (Pioneer 3324)	EC	1.1	47	(6	12	fodder	3.3 5.9	<0.05 0.21	MP-CN-7048
CA, 1989 (Pioneer 3780)	EC	1.1	300	6	0 6 12 18 24	forage	0.06 0.07 <0.05 (2) <0.05 (2) 0.10 0.55 <0.05 (2)	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-3043
TX, 1988 (Douglas King DK4161)	EC	1.1	47	6	0 6 12 18 24	forage	25 13 0.14 0.46 0.58 0.68 0.08 0.12 <0.05 (2)	0.43 0.22 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-3045

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		Sample	parathion-methyl	paraoxon-methyl	
TX, 1988 (Douglas King DK4161)	EC	1.1	9	(6	0 6 12 18 24	forage	5.1 5.2 0.75 0.32 <0.05 0.13 0.13 0.09 0.17 0.14	0.10 0.09 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-3183
GA, 1988 (Cargill Hybrid)	EC	1.1	56	6	0 6 12 18 24	forage	94 91 2.5 0.16 <0.05 0.05 <0.05 0.65 <0.05 (2)	0.57 0.44 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-7049
IL, 1988 (F/S 2368A)	EC	1.1	160	6	0 6 12 18 24	forage	21 19 0.27 0.22 <0.05 (2) <0.05 (2) <0.05 (2)	0.49 0.37 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-7050
MN, 1988 (Pioneer 3732)	EC	1.1	230	6	0 6 12 18 24 24	forage	8.8 9.7 1.1 0.84 0.40 0.24 0.28 0.40 0.34 <0.05 c 0.21	2.6 3.5 0.07 <0.05 <0.05 (2) <0.05 (2) <0.05 (2) c <0.05	MP-CN-7051
VA, 1988 (SX383)	EC	1.1	220	6	0 6 12 18 31	forage	0.62 0.54 0.12 0.11 <0.05 (2) <0.05 0.07 <0.05 (2)	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-7052
NE, 1988 (Funks G-444D)	EC	1.1	190	6	0 6 12 18 24 18	forage	9.9 15 1.4 0.98 55 37 0.65 0.19 0.22 0.43 c 0.07	0.09 0.06 <0.05 (2) 0.32 0.11 <0.05 (2) <0.05 (2) c <0.05	MP-CN-7053
OH, 1988 (Pioneer 3324)	EC	1.1	100	6	0 6 12 18 24	forage	8.9 9.2 0.25 0.27 0.16 0.18 0.17 0.18 0.20 0.18	0.17 0.22 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-7054
OH, 1988 (Pioneer 3324)	EC	1.1	47	(6	0 6 12 18 24	forage	3.3 2.0 0.46 0.37 0.06 <0.05 0.14 0.11 0.12 0.12	0.08 0.06 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-7055
CA, 1989 (Pioneer 3780)	EC	1.1	300	6	12	silage	0.07 <0.05	<0.05 (2)	MP-CN-3043
TX, 1988 (Douglas King DK4161)	EC	1.1	47	6	12	silage	0.13 0.54	<0.05 (2)	MP-CN-3045
TX, 1988 (Douglas King DK4161)	EC	1.1	9	(6	12	silage	0.14 <0.05	<0.05 (2)	MP-CN-3183

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		Sample	parathion-methyl	paraoxon-methyl	
SWEET CORN									
CA, 1988	EC	1.1	300	6	3	fodder	0.15 0.11	<0.05 (2)	MP-CN-3047
CA, 1988 (Jubilee)	EC	1.1	84	(3	3	fodder	1.2 0.38	0.06 <0.05	MP-CN-3049
TX, 1988 (Funk's Sweet G-90)	EC	1.1	9	(6	3	fodder	1.2 0.84	0.11 0.06	MP-CN-3050
WA, 1988 (Jubilee)	EC	1.1	94	(6	3	fodder	0.11 <0.05	<0.05 (2)	MP-CN-3185
FL, 1988 (Merit)	EC	1.1	300	6	3	fodder	2.1 1.2	0.08 0.07	MP-CN-7056
NY, 1988 (Jubilee)	EC	1.1	45	(6	3	fodder	0.44 0.55	<0.05 (2)	MP-CN-7057
WI, 1988 (Commander)	EC	1.1	38	(6	3	fodder	1.1 2.0	0.10 0.13	MP-CN-7058
CA, 1988	EC	1.1	300	6	0 6 12 18 24	forage	0.13 0.22 0.11 0.10 0.06 <0.05 <0.05 0.09 0.09 0.10	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 0.07 <0.05 (2)	MP-CN-3047
CA, 1988 (Jubilee)	EC	1.1	84	(3	0 6 12 18 24	forage	0.25 0.21 1.1 0.66 0.55 0.58 0.18 0.21 0.10 0.11	<0.05 (2) 0.19 0.36 0.18 <0.05 <0.05 0.09 <0.05 (2)	MP-CN-3049
TX, 1988 (Funk's Sweet G-90)	EC	1.1	9	(6	0 6 12 18 24	forage	9.4 3.2 1.4 1.1 0.32 0.19 <0.05 (2) 0.08 0.12	0.25 0.06 0.09 0.08 <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-3050
WA, 1988 (Jubilee)	EC	1.1	94	(6	0 6 12 18 24	forage	<0.05 (2) <0.05 0.13 <0.05 (2) <0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-3185
FL, 1988 (Merit)	EC	1.1	300	6	0 6 12 18 24 6	forage	18 17 1.0 0.96 0.26 0.39 0.32 0.25 0.08 0.10 c 0.05	0.20 0.27 0.13 0.18 <0.05 (2) <0.05 (2) <0.05 (2) c <0.05	MP-CN-7056
NY, 1988 (Jubilee)	EC	1.1	45	(6	0 6 12 18 24	forage	3.6 2.3 0.05 0.16 <0.05 (2) <0.05 (2) <0.05 (2)	0.09 0.07 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-7057

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		Sample	parathion-methyl	paraoxon-methyl	
WI, 1988 (Commander)	EC	1.1	38	(6	0 6 12 18 24	forage	18 18 0.56 0.56 0.23 0.29 <0.05 (2) <0.05 (2)	0.42 0.39 0.17 0.13 <0.05 (2) <0.05 (2) <0.05 (2)	MP-CN-7058

(aerial application. c: sample from control plot

Table 51. Residues in sorghum fodder and forage from supervised trials in the USA.

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
TX, 1988 (TEY 75)	EC	1.1	150	6	21	fodder	0.83 0.61	0.05 <0.05	MP-SG-3173
TX, 1988 (Asgrow Topaz)	EC	1.1	47	6	21	fodder	1.2 0.84	0.05 0.06	MP-SG-3174
TX, 1988 (Asgrow Topaz)	EC	1.1	9	(6	21	fodder	0.08 <0.05	<0.05 (2)	MP-SG-3175
MO, 1988 (Funk's G-623GBR)	EC	1.1	200	6	21	fodder	0.16 0.33	<0.05 (2)	MP-SG-7111
MO, 1988 (Funk's G-623GBR)	EC	1.1	22	(6	22	fodder	0.25 0.21	<0.05 (2)	MP-SG-7112
NE, 1988 (NC + 271)	EC	1.1	190	6	21	fodder	1.7 2.3	0.14 0.15	MP-SG-7113
TX, 1988 (TEY 75)	EC	1.1	150	6	0 7 14 21 28 35	forage	10 7.2 1.3 0.56 0.29 0.58 0.62 1.3 0.15 0.12 0.16 0.10	0.31 0.21 0.06 <0.05 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-SG-3133
MO, 1988 (Funk's G-623GBR)	EC	1.1	270	6	0 7 14 21 28 35 7	forage	10 10 0.66 0.38 0.09 0.07 0.13 0.11 <0.05 (2) 0.07 0.11 c 0.09	0.25 0.28 0.05 <0.05 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) c <0.05	MP-SG-7114
MO, 1988 (Funk's G-623GBR)	EC	1.1	22	(6	0 7 14 21 28 35 0	forage	9.3 6.5 0.29 0.27 0.17 0.14 0.26 0.24 0.09 0.23 0.09 0.23 c 0.13	0.22 0.15 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) c <0.05	MP-SG-7115
NE, 1988 (NC + 271)	EC	1.1	190	6	0 7 14 21 28 35	forage	20 14 1.0 1.8 0.48 0.69 0.32 0.35 0.35 0.33 0.18 0.17	0.16 0.12 <0.05 0.05 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	MP-SG-7116

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		sample	parathion-methyl	paraoxon-methyl	
TX, 1988 (TEY 75)	EC	1.1	150	6	21	hay	0.29 0.53	<0.05 (2)	MP-SG-3133
MO, 1988 (Funk's G-623GBR)	EC	1.1	270	6	21	hay	0.09 0.07	<0.05 (2)	MP-SG-7114
MO, 1988 (Funk's G-623GBR)	EC	1.1	22	(6	21	hay	0.30 0.10	<0.05 (2)	MP-SG-7115
NE, 1988 (NC + 271)	EC	1.1	190	6	21	hay	0.64 0.64	<0.05 (2)	MP-SG-7116
TX, 1988 (TEY 75)	EC	1.1	150	6	21	silage	0.13 0.10	<0.05 (2)	MP-SG-3133
MO, 1988 (Funk's G-623GBR)	EC	1.1	270	6	21	silage	0.13 0.17	<0.05 (2)	MP-SG-7114
MO, 1988 (Funk's G-623GBR)	EC	1.1	22	(6	21	silage	0.27 0.11	<0.05 (2)	MP-SG-7115
NE, 1988 (NC + 271)	EC	1.1	190	6	21	silage	0.26 0.24	<0.05 (2)	MP-SG-7116

(aerial application. c: sample from control plot

Table 52. Residues in wheat forage and fodder from supervised trials in the USA (LeRoy, 1990d). Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Location, year (variety)	Application				PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
WA, 1989 (Rojo)	EC	2×1.4 +3×0.84 +1×0.28	190	6	0	forage	1.5 2.5	0.30 0.36	MP-WH-3165
WA, 1989 (Rojo)	EC	4×1.4 +2×0.84	190	6	0 7 14 21 28	forage	10 12 1.4 0.83 <u>0.46</u> 0.34 0.13 0.12 0.13 0.07	0.64 0.77 0.39 0.30 <u>0.21</u> 0.22 0.09 0.10 0.10 0.05	MP-WH-3165
WA, 1989 (Rojo)	EC	2×1.4 +3×0.84 +1×0.28	94	(6	0	forage	3.5 4.8	0.76 0.70	MP-WH-3182
WA, 1989 (Rojo)	EC	4×1.4 +2×0.84	94	(6	0 7 14 21 28	forage	1.1 9.4 1.1 1.0 0.24 0.19 0.09 <u>0.28</u> 0.19 0.14	0.33 0.69 0.33 0.30 0.12 0.14 0.10 <u>0.18</u> 0.12 0.10	MP-WH-3182
OH, 1988 (Becker)	EC	2×1.4 +3×0.84 +1×0.28	190	6	0	forage	3.8 4.0	0.31 0.33	MP-WH-7143

Location, year (variety)	Application				PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
OH, 1988 (Becker)	EC	4×1.4 +2×0.84	190	6	0 7 14 21 28 7 14	forage	10 8.3 0.51 0.57 0.68 0.97 0.26 0.25 0.25 0.28 c 0.13 c 0.09	0.60 0.50 0.17 0.19 0.15 0.17 0.10 0.09 0.05 0.06 c <0.05 c <0.05	MP-WH-7143
ND, 1988 (Marshall)	EC	2×1.4 +3×0.84 +1×0.28	94	6	0	forage	3.4 3.2	0.33 0.22	MP-WH-7145
ND, 1988 (Marshall)	EC	4×1.4 +2×0.84	94	6	0 7 14 21 28 0	forage	13 13 0.68 0.35 0.19 0.17 0.11 0.13 0.06 0.06 c 0.13	0.50 0.58 0.10 0.08 0.06 0.05 <0.05 (2) <0.05 (2) c <0.05	MP-WH-7145
KS, 1989 (Arkan)	EC	2×1.4 +3×0.84 +1×0.28	210	6	0	forage	2.3 6.0	0.18 0.30	MP-WH-7147
KS, 1989 (Arkan)	EC	4×1.4 +2×0.84	210	6	0 7 14 21 28	forage	13 7.5 2.4 3.5 1.2 1.5 0.40 0.21 0.23 0.29	0.63 0.34 0.28 0.27 0.17 0.19 <0.05 (2) <0.05 (2)	MP-WH-7147
KS, 1989 (Caldwell)	EC	2×1.4 +3×0.84 +1×0.28	47	(6	0	forage	7.5 7.1	0.32 0.31	MP-WH-7149
KS, 1989 (Caldwell)	EC	4×1.4 +2×0.84	47	(6	0 7 14 21 28	forage	5.4 6.5 0.35 0.23 0.12 0.07 <0.05 0.07 0.07 0.05	0.27 0.29 0.07 0.06 <0.05 (2) <0.05 (2) <0.05 (2)	MP-WH-7149
WA, 1989 (Rojo)	EC	2×1.4 +3×0.84 +1×0.28	190	6	0	hay	3.4 3.8	3.4 2.4	MP-WH-3165
WA, 1989 (Rojo)	EC	4×1.4 +2×0.84	190	6	14	hay	0.36 1.2	0.18 1.1	MP-WH-3165
WA, 1989 (Rojo)	EC	2×1.4 +3×0.84 +1×0.28	94	(6	0	hay	3.1 2.3	0.35 0.24	MP-WH-3182
WA, 1989 (Rojo)	EC	4×1.4 +2×0.84	94	(6	14	hay	0.33 0.29	0.15 0.11	MP-WH-3182
OH, 1988 (Becker)	EC	2×1.4 +3×0.84 +1×0.28	190	6	0	hay	3.8 3.7	0.54 0.58	MP-WH-7143

Location, year (variety)	Application				PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
OH, 1988 (Becker)	EC	4×1.4 +2×0.84	190	6	14	hay	0.32 1.0	0.13 0.23	MP-WH-7143
ND, 1988 (Marshall)	EC	2×1.4 +3×0.84 +1×0.28	94	6	0	hay	4.7 3.9	0.19 0.21	MP-WH-7145
ND, 1988 (Marshall)	EC	4×1.4 +2×0.84	94	6	14	hay	0.17 0.15	0.06 0.06	MP-WH-7145
KS, 1989 (Arkan)	EC	2×1.4 +3×0.84 +1×0.28	210	6	0	hay	3.1 2.9	0.29 0.28	MP-WH-7147
KS, 1989 (Arkan)	EC	4×1.4 +2×0.84	210	6	14	hay	0.98 0.83	0.12 0.09	MP-WH-7147
KS, 1989 (Caldwell)	EC	2×1.4 +3×0.84 +1×0.28	47	(6	0	hay	4.5 3.8	0.50 0.38	MP-WH-7149
KS, 1989 (Caldwell)	EC	4×1.4 +2×0.84	47	(6	14	hay	0.10 0.07	<0.05 (2)	MP-WH-7149
CA, 1989 (Anza, Hard red winter)	EC	1.4	190	6	14	straw	4.5 3.4	0.59 0.28	MP-WH-3157
CA, 1989 (Anza, Hard red winter)	EC	2×1.4 +3×0.84 +1×0.28	190	6	0	straw	5.0 4.0	0.22 0.16	MP-WH-3157
CA, 1989 (Anza, Hard red winter)	EC	4×1.4 +2×0.84	190	6	14	straw	3.1 3.7	0.31 0.37	MP-WH-3157
WA, 1989 (Rojo)	EC	1.4	190	6	14	straw	3.5 2.8	0.18 0.13	MP-WH-3159
WA, 1989 (Rojo)	EC	2×1.4 +3×0.84 +1×0.28	190	6	0	straw	9.7 7.4	0.16 0.15	MP-WH-3159
WA, 1989 (Rojo)	EC	4×1.4 +2×0.84	190	6	14	straw	2.6 2.2	0.16 0.12	MP-WH-3159
TX, 1989 (NK Pro 812)	EC	1.4	47	6	14	straw	1.2 0.95	0.06 <0.05	MP-WH-3161
TX, 1989 (NK Pro 812)	EC	2×1.4 +3×0.84 +1×0.28	47	6	0	straw	3.8 2.8	0.08 0.05	MP-WH-3161
TX, 1989 (NK Pro 812)	EC	4×1.4 +2×0.84	47	6	14	straw	0.27 0.34	<0.05 (2)	MP-WH-3161
WA, 1989 (Rojo)	EC	1.4	94	(6	14	straw	1.8 1.2	0.15 0.18	MP-WH-3181

Location, year (variety)	Application				PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
WA, 1989 (Rojo)	EC	2×1.4 +3×0.84 +1×0.28	94	(6	0	straw	1.9 2.5	0.15 0.17	MP-WH-3181
WA, 1989 (Rojo)	EC	4×1.4 +2×0.84	94	(6	14	straw	0.30 0.55	0.06 0.11	MP-WH-3181
OH, 1988 (Becher)	EC	1.4	190	6	14	straw	1.0 0.88	0.11 0.09	MP-WH-7134
OH, 1988 (Becher)	EC	2×1.4 +3×0.84 +1×0.28	190	6	0	straw	1.2 1.8	<0.05 (2)	MP-WH-7134
OH, 1988 (Becher)	EC	4×1.4 +2×0.84	190	6	14	straw	0.74 0.79	0.09 0.11	MP-WH-7134
VA, 1988 (Coker 797)	EC	1.4	220	6	14	straw	<0.05 (2)	<0.05 (2)	MP-WH-7136
VA, 1988 (Coker 797)	EC	2×1.4 +3×0.84 +1×0.28	220	6	0	straw	12 21	0.14 0.24	MP-WH-7136
VA, 1988 (Coker 797)	EC	4×1.4 +2×0.84	220	6	14	straw	0.13 <0.05	<0.05 (2)	MP-WH-7136
ND, 1988 (Marshall)	EC	1.4	94	6	14	straw	0.16 0.10	<0.05 (2)	MP-WH-7138
ND, 1988 (Marshall)	EC	2×1.4 +3×0.84 +1×0.28	94	6	0	straw	3.5 2.7	0.26 0.17	MP-WH-7138
ND, 1988 (Marshall)	EC	4×1.4 +2×0.84	94	6	14	straw	0.28 0.09	<0.05 (2)	MP-WH-7138
KS, 1989 (Arkan)	EC	1.4	210	6	14	straw	11 10	0.26 0.23	MP-WH-7140
KS, 1989 (Arkan)	EC	2×1.4 +3×0.84 +1×0.28	210	6	0	straw	13 14	0.24 0.32	MP-WH-7140
KS, 1989 (Arkan)	EC	4×1.4 +2×0.84	210	6	14	straw	4.0 5.7	0.11 0.17	MP-WH-7140
KS, 1989 (Caldwell)	EC	1.4	47	(6	14	straw	0.77 1.6	<0.05 0.10	MP-WH-7142
KS, 1989 (Caldwell)	EC	2×1.4 +3×0.84 +1×0.28	47	(6	0	straw	0.49 0.74	<0.05 0.05	MP-WH-7142
KS, 1989 (Caldwell)	EC	4×1.4 +2×0.84	47	(6	14	straw	0.65 0.85	0.05 0.08	MP-WH-7142

(aerial application. c: sample from control plot

Table 53. Residues in pasture grasses from supervised trials in the USA. In the 1998 trials two applications per cutting were made at 7 ± 1 day intervals. Forage and hay samples were collected on the day of the second application at each cutting, and the hay placed in drying racks for 3-5 days. In the 1988 trials the hay was left in the field to dry for 2-5 days.

Location, year (variety)	Application				PHI, days	Sample[1]	% moisture[2]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water l/ha	no./ cut				parathion-methyl	paraoxon-methyl	
CA, 1998 (Bermuda Grass)	EC	0.84	29	2 2	0 0	hay 1 hay 2	13.3 7.6	35 34 27 31	1.2 1.1 1.3 1.6	9803.CA.GR.12
FL, 1998 (Coastal Bermuda Grass)	EC	0.84	140	2 2	0 0	hay 1 hay 2	24.8 34.0	6.7 6.1 34 25	0.07 0.07 0.57 0.44	9803.FL.GR.04
GA, 1998 (Coastal Bermuda Grass)	EC	0.84	160	2 2	0 0	hay 1 hay 2	13.5 16.3 13.5 16.3	51 59 17 17 c 1.0 c 0.02	0.72 0.74 0.31 0.33 c 0.02 c <0.01	9803.GA.GR.03
GA, 1998 (Coastal Bermuda Grass)	EC	0.84	10	(2 (2	0 0	hay 1 hay 2	13.5 16.3 13.5 16.3	53 62 6.2 7.8 c 1.0 c 0.02	1.3 1.5 0.20 0.25 c 0.02 c <0.01	9803.GA.GR.03
IA, 1998 (Brome Grass)	EC	0.84	120	2 2	0 0	hay 1 hay 2	48.1 26.4	12 13 80 82	0.52 0.61 1.6 1.5	9803.IA.GR.07
MT, 1998 (Brome Grass, Meadow)	EC	0.84	31	2 2	0 0	hay 1 hay 2	31.4 16.2 31.4 16.2	45 46 72 73 c 0.02 c 0.09	1.9 1.5 1.4 1.4 c 0.02 c <0.01	9803.MT.GR.10
MT, 1998 (Brome Grass, Meadow)	EC	0.84	9	(2 (2	0 0	hay 1 hay 2	31.4 16.2 31.4 16.2	10 14 78 140 c 0.02 c 0.09	0.64 0.81 1.5 2.4 c 0.02 c <0.01	9803.MT.GR.10
PA, 1998 (Fescue, Festorina)	EC	0.84	300	2 2	0 0	hay 1 hay 2	29.0 30.6 29.0 30.6	62 61 195 187 c 0.02 c 0.01	3.5 3.3 4.4 4.4 c <0.01 c <0.01	9803.PA.GR.01
TX, 1998 (Brome grass, MATUA)	EC	0.84	130	2 2	0 0	hay 1 hay 2	46.5 31.2 31.2	4.2 3.8 74 63 c 0.01	0.03 0.03 0.94 0.86 c <0.01	9803.TX.GR.08
WA, 1998 (Orchard grass)	EC	0.84	28	2 2	0 0	hay 1 hay 2	21.0 9.9	19 18 30 29	0.86 0.76 0.33 0.36	9803.WA.GR.11
WA, 1998 (Orchard grass)	EC	0.84	9	(2 (2	0 0	hay 1 hay 2	21.0 9.9	23 23 31 24	0.72 0.64 0.29 0.22	9803.WA.GR.11
WI, 1998 (Brome grass)	EC	0.84	47	2 2	0 0	hay 1 hay 2	27.0 38.2	21 19 54 54	0.84 0.67 0.75 0.77	9803.WI.GR.06
WI, 1998 (Brome grass)	EC	0.84	9	(2 (2	0 0	hay 1 hay 2	27.0 38.2	50 54 62 52	1.7 1.6 1.5 1.6	9803.WI.GR.06

Location, year (variety)	Application				PHI, days	Sample[1]	% moisture[2]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water l/ha	no./ cut				parathion-methyl	paraoxon-methyl	
NJ, 1998 (Fescue, Kentucky 31)	EC	0.84	300	2 2	0 0	hay 1 hay 2	27.9 19.9	28 24 110 108	1.1 1.0 5.4 4.8	9803.NJ.GR.02
OH, 1998 (Fescue, Kentucky 31)	EC	0.84	79	2 2	0 0	hay 1 hay 2	16.2 17.4 17.4	17 17 63 58 c 0.02	0.67 0.71 3.2 3.3 c <0.01	9803.OH.GR.05
OH, 1998 (Fescue, Kentucky 31)	EC	0.84	9	(2 (2	0 0	hay 1 hay 2	16.2 17.4 17.4	11 11 44 46 c 0.02	0.54 0.62 1.3 1.3 c <0.01	9803.OH.GR.05
MT, 1998 (Brome Grass, Meadow)	EC	0.84	29	2	0	hay 1	50.2	35	2.6	9803.MT.GR.09
MT, 1998 (Brome Grass, Meadow)	EC	0.84	10	(2	0	hay 1	50.2	7.3 5.4	1.1 0.75	9803.MT.GR.09
CA, 1988 (Bermuda grass)	EC	0.89	190	3	15	hay		0.63 1.4	<0.05 0.06	MP-BE-3009
CA, 1988 (Bermuda grass)	EC	0.89	190	(3	15	hay		0.49 0.54	<0.05 (2)	MP-BE-3012
GA, 1988 (Bermuda grass, coastal)	EC	0.86	62	6	15	hay		1.6 1.4	<0.05 (2)	MP-BE-7059
GA, 1988 (Bermuda grass, coastal)	EC	0.87	96	(6	15	hay		0.96 0.49	<0.05 (2)	MP-BE-7060
SC, 1988 (Bermuda grass, coastal)	EC	0.89	37	6	15	hay		0.66 0.63	<0.05 (2)	MP-BE-7061
CA, 1988 (Bluegrass)	EC	0.89	190	3	15	hay		0.22 0.31	0.19 0.13	MP-BL-3013
CA, 1988 (Bluegrass)	EC	0.89	190	(3	15	hay		0.58 0.64	0.09 0.06	MP-BL-3016
MO, 1988 (Bluegrass)	EC	0.87	190	6	15	hay		0.17 0.21	0.11 0.10	MP-BL-7062
MO, 1988 (Bluegrass)	EC	0.89	33	(6	15	hay		0.12 0.09	0.10 0.09	MP-BL-7063
PA, 1988 (Bluegrass, Merit/Nassau/Baron)	EC	0.89	250	6	15	hay		1.0 0.97	0.11 0.12	MP-BL-7064
CA, 1988 (Fescue)	EC	0.89	190	3	15	hay		0.50 0.34	0.09 0.06	MP-BO-3017
CA, 1988 (Fescue)	EC	0.89	190	(3	15	hay		0.25 0.23	<0.05 (2)	MP-BO-3020
MO, 1988 (Fescue, Jaguar)	EC	0.87	190	6	15	hay		0.19 0.11 c 0.07	0.07 0.05 c <0.05	MP-BO-7065
MO, 1988 (Fescue, Jaguar)	EC	0.89	33	(6	15	hay		<0.05 0.05 c 0.10	<0.05 0.08 c <0.05	MP-BO-7066
PA, 1988 (Fescue, Tall and fine)	EC	0.89	260	6	15	hay		2.5 2.5	0.35 0.32	MP-BO-7067

Location, year (variety)	Application				PHI, days	Sample[1]	% moisture[2]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water l/ha	no./ cut				parathion-methyl	paraoxon-methyl	
CA, 1998 (Bermuda Grass)	EC	0.84	29	2 2	0 0	forage 1 forage 2	68.8 57.9	74 68 31 32	1.8 1.9 0.91 1.1	9803.CA.GR.12
FL, 1998 (Coastal Bermuda Grass)	EC	0.84	140	2 2	0 0	forage 1 forage 2	67.2 76.3	9.1 7.2 32 26	0.16 0.15 0.50 0.52	9803.FL.GR.04
GA, 1998 (Coastal Bermuda Grass)	EC	0.84	160	2 2	0 0	forage 1 forage 2	64.0 56.5 64.0 56.5	35 40 31 34 c 0.51 c 0.02	0.29 0.37 0.45 0.51 c <0.01 c <0.01	9803.GA.GR.03
GA, 1998 (Coastal Bermuda Grass)	EC	0.84	10	(2 (2	0 0	forage 1 forage 2	64.0 56.5 64.0 56.5	12 14 13 13 c 0.51 c 0.02	0.28 0.36 0.36 0.37 c <0.01 c <0.01	9803.GA.GR.03
IA, 1998 (Brome Grass)	EC	0.84	120	2 2	0 0	forage 1 forage 2	66.7 60.5	24 23 69 98	0.37 0.49 1.1 1.7	9803.IA.GR.07
MT, 1998 (Brome Grass, Meadow)	EC	0.84	31	2 2	0 0	forage 1 forage 2	70.8 57.0 57.0	74 74 75 90 c 0.02	0.87 0.78 0.77 0.89 c <0.01	9803.MT.GR.10
MT, 1998 (Brome Grass, Meadow)	EC	0.84	9	(2 (2	0 0	forage 1 forage 2	70.8 57.0 57.0	18 32 42 19 c 0.02	0.43 0.55 0.61 0.39 c <0.01	9803.MT.GR.10
PA, 1998 (Fescue, Festorina)	EC	0.84	300	2 2	0 0	forage 1 forage 2	74.2 68.0	56 53 125 123	0.82 1.0 0.63 0.63	9803.PA.GR.01
TX, 1998 (Brome grass, MATUA)	EC	0.84	130	2 2	0 0	forage 1 forage 2	58.3 69.8	46 54 95 107	0.42 0.44 0.57 0.55	9803.TX.GR.08
WA, 1998 (Orchard grass)	EC	0.84	28	2 2	0 0	forage 1 forage 2	72.0 76.8 76.8	28 19 38 32 c 0.01	0.87 0.63 0.12 0.08 c <0.01	9803.WA.GR.11
WA, 1998 (Orchard grass)	EC	0.84	9	(2 (2	0 0	forage 1 forage 2	72.0 76.8 76.8	23 30 18 39 c 0.01	0.31 0.35 0.07 0.17 c <0.01	9803.WA.GR.11
WI, 1998 (Brome grass)	EC	0.84	9	(2 (2	0 0	forage 1 forage 2	70.2 74.9	34 30 83 46	0.83 0.75 1.0 0.62	9803.WI.GR.06
WI, 1998 (Brome grass)	EC	0.84	47	2 2	0 0	forage 1 forage 2	70.2 74.9	17 14 44 36	0.61 0.46 0.55 0.37	9803.WI.GR.06
NJ, 1998 (Fescue, Kentucky 31)	EC	0.84	300	2 2	0 0	forage 1 forage 2	73.0 66.3	37 29 70 71	0.95 0.93 1.1 1.2	9803.NJ.GR.02
OH, 1998 (Fescue, Kentucky 31)	EC	0.84	9	(2 (2	0 0	forage 1 forage 2	58.5 71.2	17 16 42 46	0.95 0.81 0.81 0.85	9803.OH.GR.05
OH, 1998 (Fescue, Kentucky 31)	EC	0.84	79	2 2	0 0	forage 1 forage 2	58.5 71.2	24 29 75 62	0.66 0.83 2.1 2.3	9803.OH.GR.05

Location, year (variety)	Application				PHI, days	Sample[1]	% moisture[2]	Residues, mg/kg		Ref.
	Form	kg ai/ha	water l/ha	no./ cut				parathion-methyl	paraoxon-methyl	
MT, 1998 (Brome Grass, Meadow)	EC	0.84	29	2	0	forage 1	58.2	66 56	0.29 0.25	9803.MT.GR.09
MT, 1998 (Brome Grass, Meadow)	EC	0.84	10	(2	0	forage 1	58.2	20 21	0.34 0.37	9803.MT.GR.09

[1] Forage 1, forage 2, hay 1, hay 2 refer to the 1st and 2nd cuttings.
[2] Moisture levels were measured on the accompanying control sample.
(aerial application. c: sample from control plot

Table 54. Parathion-methyl and paraoxon-methyl residues in beet fodder (Cañez, 1990q) and cotton gin trash from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Crop, Location, year (variety)	Application				Growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
BEET FODDER									
ID, 1988 (WS 88)	EC	0.42	190	6		60	<0.05 (2)	<0.05 (2)	MP-SB-3144
CA, 1988 (SS-NB2)	EC	0.42	190	6		60	<0.05 (2)	<0.05 (2)	MP-SB-3146
CA, 1988 (SS-NB2)	EC	0.42	190	(6		60	<0.05 (2)	<0.05 (2)	MP-SB-3148
ID, 1988 (WS 88)	EC	0.42	94	(6		60	<0.05 (2)	<0.05 (2)	MP-SB-3186
MN, 1988 (Ultramono)	EC	0.42	190	6		60	<0.05 (2)	<0.05 (2)	MP-SB-7124
ND, 1988 (ACS ACH 176)	EC	0.42	94	6		60	<0.05 (2)	<0.05 (2)	MP-SB-7126
COTTON GIN TRASH									
AR, 1998 (Paymaster 1220)	EC	3.4	28	10	90% open	1	32 43 c 0.08	0.46 0.66 c <0.01	9802.AR.CT.02(a)
AR, 1998 (Paymaster 1220)	EC	3.4	9	(10	90% open	1	41 67	0.71 0.60	9802.AR.CT.02(b)
CA, 1998 (Maxxa)	EC	3.4	280	10	70-80% open	1	309 325 c 0.46	3.8 3.7 c 0.04	9802.CA.CT.11
TX, 1998 (Paymaster 1220)	EC	3.4	92	10	90% open	1	200 131 c 0.21	2.0 1.6 c <0.01	9802.TX.CT.06(a)
TX, 1998 (Paymaster 1220)	EC	3.4	8	(10	90% open	1	440 280 c 0.21	3.1 2.3 c <0.01	9802.TX.CT.06(b)
TX, 1998 (PM 2200 RR)	EC	3.4	94	10	90% open	1	27 33 c 0.07	0.93 1.1 c <0.01	9802.TX.CT.07
TX, 1998 (Quikee)	EC	3.4	9	(10	85% open	1	43 39 c 1.3	0.27 0.16 c <0.01	9802.TX.CT.08

Crop, Location, year (variety)	Application				Growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
TX, 1998 (Quikee)	EC	3.4	120	10	85% open	1	65 85 c 1.3	0.30 0.37 c <0.01	9802.TX.CT.08(a)
TX, 1998 (Paymaster 2200	EC	3.4	120	10	95% open	1	114 136	0.63 0.60	9802.TX.CT.09(a)
TX, 1998 (Paymaster 2200	EC	3.4	9	(10	95% open	1	82 75	0.42 0.41	9802.TX.CT.09(b)

(aerial application. c: sample from control plot

Table 55. Residues in hops from supervised trials in the USA.

Location, year (variety)	Application				PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	water, l/ha	no.		Sample	parathion-methyl	paraoxon-methyl	
OR, 1990 (Nugget)	EC	1.1 2.1 1.1 2.1	1400 1400 470 470	3 3 3 3	15 15 15 15	fresh	0.12 0.28 0.096 0.39	0.036 0.12 <0.04 0.11	90:OR.017
OR, 1990 (Nugget)	EC	1.1 2.1 1.1 2.1	1400 1400 470 470	3 3 3 3	15 15 15 15	dry	0.43 0.78 0.40 0.87	0.16 0.29 0.17 0.32	90:OR.017
ID, 1990 (Galena)	EC	1.1 2.1 1.1 2.1	1400 1400 470 470	3 3 3 3	15 15 15 15	fresh	0.18 0.17 0.18 0.25	0.10 0.058 0.15 0.09	90:ID:005
ID, 1990 (Galena)	EC	1.1 2.1 1.1 2.1	1400 1400 470 470	3 3 3 3	15 15 15 15	dry	0.23 0.27 0.41 0.37	0.18 0.23 0.19 0.25	90:ID:005
WA, 1990 (L1)	EC	1.0 2.0 1.0 2.0	2100 2100 700 700	4 4 4 4	14 14 14 14	fresh	0.15 0.35 0.46 0.96	0.042 0.11 0.067 0.21	90:WA:015
WA, 1990 (L1)	EC	1.0 2.0 1.0 2.0	2100 2100 700 700	4 4 4 4	14 14 14 14	dry	0.36 1.2 0.99 2.7	0.13 0.41 0.35 0.90	90:WA:015

FATE OF RESIDUES IN STORAGE AND PROCESSING

In processing

The Meeting received information on the fate of incurred residues of parathion-methyl and paraoxon-methyl during the processing of apples, peaches, grapes, olives, snap beans, soya beans, potatoes, sugar beet, wheat, maize, rice, cotton seed, sunflower seed and canola. Information on the fate during drying of hops is included in the supervised residue trials.

Apples. Apples from supervised trials in France (Table 20) were processed by Gilbert (1996h). 26-30 kg of apples were crushed and pressed (Figure 6). Residues were below the LOQ (0.01 mg/kg) in the juice, and about 4 times those in the apples in the dry pomace (Table 56).

Table 56. Residues in apples from supervised trials in France and their processed commodities (Gilbert, 1996h).

Year (variety)	Application					PHI,	sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.	days		parathion-methyl	paraoxon-methyl	
1995 (Jonagold)	CS	0.36	0.036	1000	2	14	apples	0.04	<0.01	Loiret F1
							dry pomace	0.17	<0.01	961451
							juice	<0.01	<0.01	
						21	apples	0.02	<0.01	962321
							dry pomace	0.09	<0.01	
							juice	<0.01	<0.01	
1995 (Golden Delicious)	CS	0.36	0.036	1000	2	14	apples	0.03	<0.01	Loiret F2
							dry pomace	0.12	<0.01	961451
							juice	<0.01	<0.01	
						21	apples	0.01	<0.01	962321
							dry pomace	0.08	<0.01	
							juice	<0.01	<0.01	

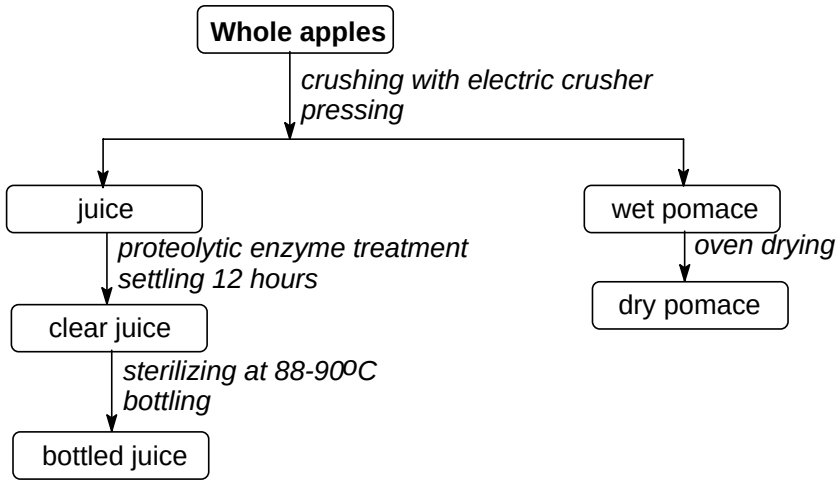


Figure 6. Apple processing (Gilbert, 1996h).

Peaches. Gilbert (1996g) described the processing of peaches to juice. A sample of 20 mature peaches, bruised fruit having been discarded, were cut with a knife and the stones removed. The peach pieces were crushed and juice separated from skin with an automatic sieve. The same procedure was followed by Gilbert and Roberts (1996). The residues in the juice are included in Table 21 (Trials 9551-4, 9551-5, 9550-4, 9550-5).

Grapes. In processing trials in Germany (407755, 407763, 407771, 407798, 407801 and 407828, Table 22) field samples of 41-52 kg were harvested 35 days after the final treatment.

Approximately 46 kg from trials 407771 and 407828 were processed to white wine. Grapes, complete with stems, were crushed, pressed and the sugar adjusted to a standard level. A volume of about 23 l of the must was transferred to a demijohn and yeast added. Fermentation proceeded for 34 days, and the young wine was treated with SO_2 and filtered after clarification for 10 days. Approximately 40 kg of grapes from trials 407755, 407763, 407798 and 407801 were processed to red wine. Grapes were destemmed and mashed, before heating to 83°C for about 3 minutes and then cooling to 25°C. The mash was pressed, the sugar level adjusted to a standard value, and processing completed as described above for white wine. The residues in the must and wine are shown in Table 22 with the supervised trials. In all cases parathion-methyl residues in the must and wine were below the LOQ (0.01 mg/kg), but residues in the grapes were also below LOQ in three of the trials. In two of the trials the parathion-methyl residues in grapes were 0.12 and 0.13 mg/kg, suggesting that parathion-methyl levels decrease by a factor of at least 12-13 in vinification (Blass and Waltz-Tylla, 1996).

Gilbert (1997b) described the processes (Figure 7) for wine, juice and raisin production from grapes treated with CS formulations of parathion-methyl in supervised trials (Table 57). Parathion-methyl levels in wine and juice were much lower than in the grapes while levels in raisins were 30-50% higher. After drying and destemming 1 kg of raisins was produced from 8 kg grapes.

Table 57. Parathion-methyl and paraoxon-methyl residues in grapes and their processed commodities in France (Gilbert, 1997b). The supervised trials are listed in Table 22.

Year (variety)	Application				PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
1995 (Tannat)	CS	0.30	200	2	14	grapes	0.15	<0.01	Garonne F6 960539
					14	raisins	0.22	<0.01	
					14	wine	0.02	<0.01	
					14	juice	<0.01	<0.01	
					21	grapes	0.10	<0.01	
					21	raisins	0.13	<0.01	
					21	wine	0.02	<0.01	
					21	juice	<0.01	<0.01	
					21	raisins	c 0.01		
1995 (Syrah)	CS	0.30	200	2	14	grapes	0.16	<0.01	Tarn-et-Garonne F5 960539
					14	raisins	0.21	<0.01	
					14	wine	0.03	<0.01	
					14	juice	0.01	<0.01	
					21	grapes	0.09	<0.01	
					21	raisins	0.14	<0.01	
					21	wine	0.02	<0.01	
					21	juice	<0.01	<0.01	
					21	raisins	c 0.01		

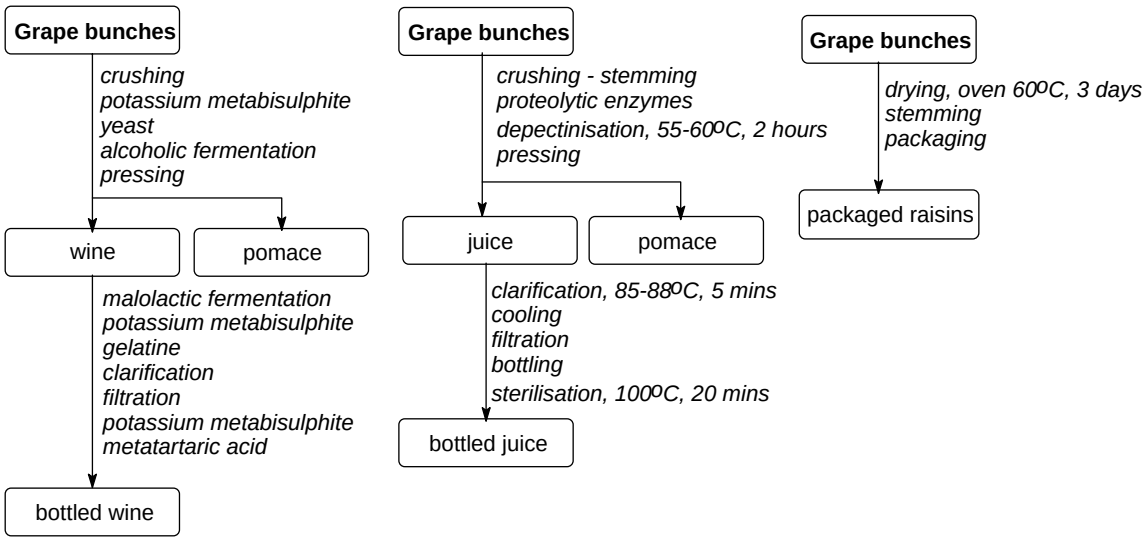


Figure 7. Processing of grapes to wine, juice and raisins (Gilbert, 1997b).

Olives. In a trial in Spain in 1994, olive trees were treated once with either a CS or EC parathion-methyl formulation (Fitexp, 1995). Olives were harvested at intervals after treatment and processed to oil. Details of the process and the analytical method were not available. Parathion-methyl residues in the oil were about 5-8 times those in the olives.

Table 58. Residues in olives and olive oil from trials in Spain in 1994 (Fitexp, 1995).

Year (variety)	Application			PHI, days	parathion-methyl residues, mg/kg		Ref.
	Form	kg ai/ha	no.		olives	olive oil	
1994 (Lechín)	CS	0.495	1	0	4.7	30	Fitexp, 1995
				7	0.55	2.6	
				14	0.44	1.1	
				21	0.24	1.6	
				28	0.19	0.35	
1994 (Lechín)	EC	0.49	1	0	6.2	59	Fitexp, 1995
				7	3.4	18	
				14	1.5	13	
				21	1.2	5.4	
				28	0.98	11	

Snap beans. LeRoy (1990c) described the processing of snap beans in trials MP-LB-3508 and MP-LB-3509 (Figure 8). Residues of parathion-methyl and paraoxon-methyl were below the LOQ of 0.05 mg/kg in the raw agricultural commodity and the cut pods even at exaggerated application rates. Residues and supervised trial conditions are shown in Table 30.

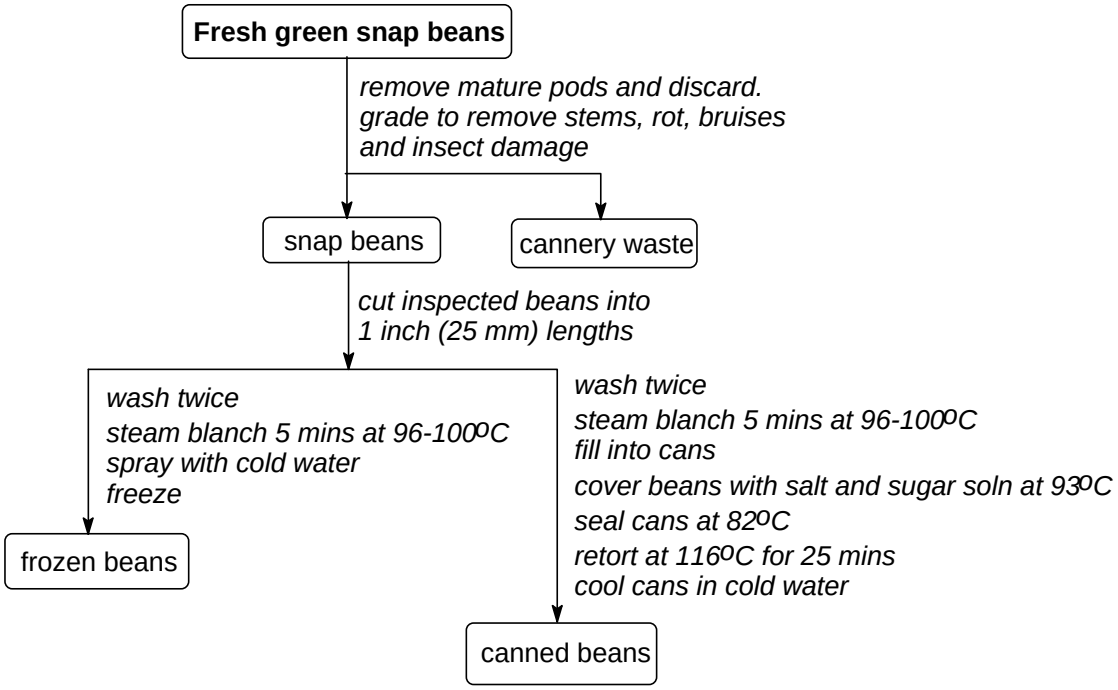


Figure 8. Processing of snap beans (LeRoy, 1990c).

Soya beans. Parathion-methyl was applied twice at 2.8 kg ai/ha (5 times the label rate) in two trials in the USA in 1988 and the beans harvested 15 days after the final treatment for processing (Figure 9). In one trial (MP-SY-2102) the residues were below the LOQ in all commodities. In trial MP-SY-2101 parathion-methyl levels were lower in the meal and higher in the oils (Table 59).

In similar trials in 1990 (LeRoy, 1992), parathion-methyl residues were below the LOQ in the seed in trial MP-SY-3525-IA but measurable in the oils. In trial MP-SY-3525-MO parathion-methyl residues were decreased in the meal and increased about 3-fold in the oils (Table 59). Processing of 28 and 32 kg soya bean seed followed the procedure in Figure 9.

Table 59. Parathion-methyl and paraoxon-methyl residues in soya beans and their processed commodities in the USA (Cañez, 1990o, LeRoy, 1992).

Location, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha		water, l/ha	no.			parathion-methyl	paraoxon-methyl	
IA, 1988 (Pioneer 9271)	EC	2.8		200	2	15	dry seed meal hulls crude oil refined oil	0.15 <0.05 0.12 0.71 0.57	<0.05 <0.05 <0.05 <0.1 <0.1	MP-SY-2101
MO, 1988 (Williams 82)	EC	2.8		200	2	15	dry seed meal hulls crude oil refined oil	<0.05 <0.05 <0.05 <0.1 <0.1	<0.05 <0.05 <0.05 <0.1 <0.1	MP-SY-2102

Location, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha		water, l/ha	no.			parathion-methyl	paraoxon-methyl	
IA, 1990 (DK 265)	EC	2.8		190	6	15	seed	<0.05	<0.05	MP-SY-3525-IA
							meal	<0.1	<0.1	
							hulls	<0.05	<0.05	
							crude oil	0.06	<0.05	
							refined oil	0.07	<0.05	
							soapstock	<0.05	note [1]	
MO, 1990 (Williams 82)	EC	2.8		190	6	15	seed	0.17	<0.05	MP-SY-3525-MO
							meal	<0.1	<0.1	
							hulls	0.19	<0.05	
							crude oil	0.51	<0.05	
							refined oil	0.49	<0.05	
							soapstock	0.06	note [1]	

[1]paraoxon-methyl recoveries too low for quantification

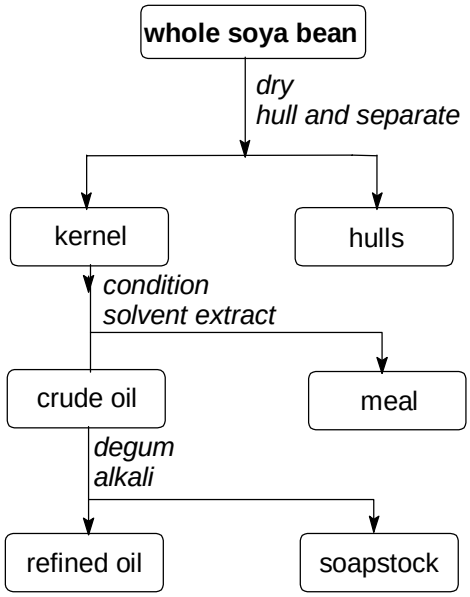


Figure 9. Soya bean processing (Cañez, 1990o).

Potatoes. Parathion-methyl was applied six times to potatoes at 3.4 and 8.4 kg ai/ha (2 and 5 times the label rate) in two trials in the USA in 1988 and 1989 and 68 kg tubers were harvested 5 days after the final treatment for processing (Cañez, 1990p). In both trials (MP-PO-3501 and MP-PO-3502) neither parathion-methyl nor paraoxon-methyl exceeded the LOQ (0.05 mg/kg) in the tubers or the processed commodities. The data are recorded in Table 35. In trial MP-PO-3502 the dry and wet peel samples originated from the flake process because they are normally fed to livestock. The dry and wet peel samples from the chip process were discarded because this is normal commercial practice.

Sugar beet. Parathion-methyl was applied six times to sugar beet at 2.1 kg ai/ha (5 times the label rate) in two trials in the USA in 1988 and the crops were harvested (140 kg roots) 20 days after the final treatment for processing (Cañez, 1990q). In both trials (MP-SB-3503 and MP-SB-3504) neither

parathion-methyl nor paraoxon-methyl exceeded the LOQ (0.05 mg/kg) in the sugar beet roots, molasses or refined sugar. The data are recorded in Table 37.

Wheat. Parathion-methyl was applied six times to wheat at 7.0 kg ai/ha (exaggerated rate) in two trials in the USA in 1988 and 1989 and the crops were harvested (18 and 27 kg grain) 13-14 days after the final treatment for milling (LeRoy, 1990d). Figure 10 is a schematic diagram of the milling process; Table 60 summarizes the results. Residues were concentrated in the bran, shorts and germ and decreased in the flour.

Table 60. Residues in wheat and its processed commodities from supervised trials in the USA (LeRoy, 1990d). EC formulations.

Location, year (variety)	Application			PHI, days	Sample	Residues, mg/kg		Ref.
	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
MO, 1988 (Caldwell)	7.0	260	6	13	grain	6.2	0.13	MP-WH-2103
					rough	11	0.28	
					bran	15	0.19	
					flour	2.6	0.05	
					flour, low grade	1.5	0.09	
					middlings	4.4	0.08	
					red dog	5.5	0.10	
					shorts and germ	20	0.29	
WA, 1989 (Rojo)	7.0	190	6	14	grain	9.8	0.15	MP-WH-3520
					bran	19	0.26	
					flour, patent	2.8	0.09	
					middlings	4.9	0.12	
					red dog	4.2	0.14	
					shorts and germ	9.0	0.24	

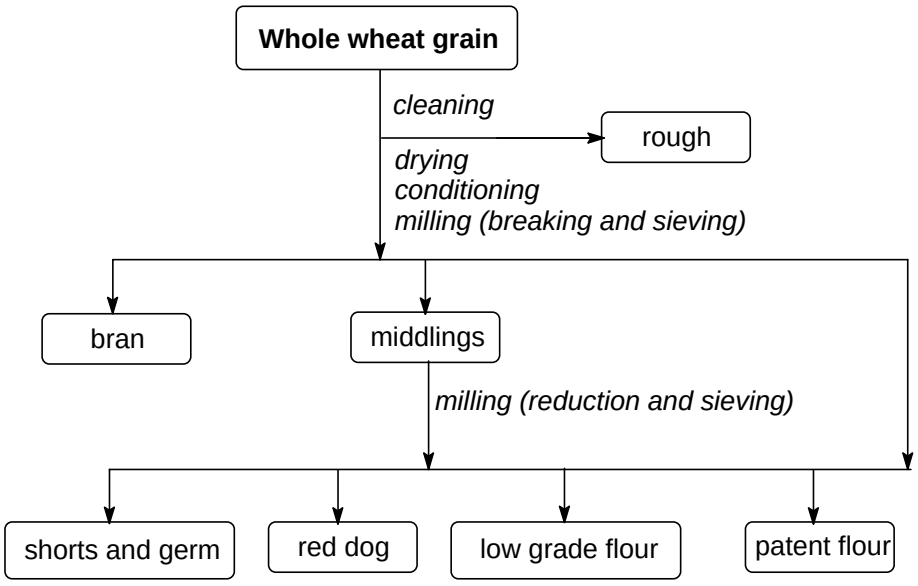


Figure 10. Wheat milling (LeRoy, 1990d).

Williams and Rice (1999b) measured the residues in aspirated grain fractions (AGF or grain dust) of field-treated wheat in Georgia, USA, in 1998. The crop was sprayed 6 times with parathion-methyl at 1.4 kg ai/ha using a tractor-mounted boom sprayer at about 7-day intervals and harvested 15 days after the final treatment. The harvested grain was put on a simulated commercial grain bucket elevator and drag conveyor system while an aspiration system collected and filtered the air from various points. The AGF were collected from the air on sieves. 139 kg of grain produced 212 g of AGF. Residue levels in the grain were 0.39 mg/kg parathion-methyl and 0.01 mg/kg paraoxon-methyl, which produced residues in the AGF of 0.33 mg/kg parathion-methyl and <0.01 mg/kg paraoxon-methyl.

Maize. Parathion-methyl was applied six times to maize at 5.6 kg ai/ha (5 times the label rate) in two trials in the USA in 1988 and 1989 and the crops harvested (about 160 kg grain) 12 days after the final treatment for wet and dry milling (LeRoy, 1990e). The milling process is shown in Figure 11 and the residues in Table 61. In the 1989 trial parathion-methyl appeared in all the dry milling fractions, but at higher levels in the starting grain. In wet milling, residues decreased in the flour and appeared in the oils at much the same level as in the grain.

Table 61. Residues in maize and its processed commodities from supervised trials and wet and dry milling in the USA (LeRoy, 1990e).

Location, year (variety)	Application				PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
TX, 1988 (Dekalb 689)	EC	5.6	75	6	12	whole grain	<0.05 (2)	<0.05 (2)	MP-CN-3512
						large grits	<0.05	<0.05	
						medium grits	<0.05	<0.05	dry milling
						small grits	<0.05	<0.05	
						coarse meal	<0.05	<0.05	
						meal	<0.05	<0.05	
						flour	<0.05	<0.05	
						crude oil	<0.05	<0.05	
						refined oil	<0.05	<0.05	
TX, 1988 (Dekalb 689)	EC	5.6	75	6	12	whole grain	<0.05 (2)	<0.05 (2)	MP-CN-3512
						starch	<0.05	<0.05	
						crude oil	<0.05	<0.05	wet milling
						refined oil	<0.05	<0.05	
MO, 1989 (Funks G-4500)	EC	5.6	190	6	12	whole grain	0.58	<0.05	MP-CN-3524
						large grits	0.12	<0.05	
						medium grits	0.11	<0.05	dry milling
						small grits	0.43	<0.05	
						coarse meal	0.27	<0.05	
						meal	0.26	<0.05	
						flour	0.24	<0.05	
						crude oil	0.18	<0.05	
						refined oil	0.15	<0.05	
MO, 1989 (Funks G-4500)	EC	5.6	190	6	12	whole grain	0.58	<0.05	MP-CN-3524
						starch	<0.05	<0.05	
						crude oil	0.77	<0.05	wet milling
						refined oil	0.60	<0.05	

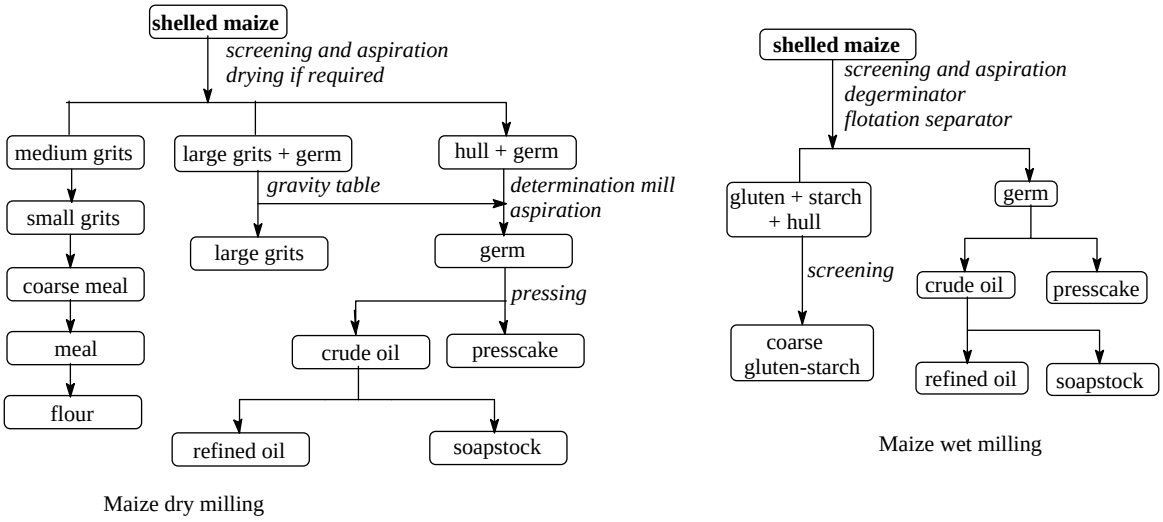


Figure 11. Dry and wet milling of maize (LeRoy, 1990e).

Rice. Parathion-methyl was applied six times to rice at 4.4 kg ai/ha (5 times the label rate) in two trials in the USA in 1988 and the crops harvested (about 9 and 45 kg grain) 15 and 16 days after the final treatment for milling (LeRoy, 1990f). Figure 12 shows the milling process and Table 62 summarizes the results. Residues at each stage of the process were higher in the outer layers of the hulls and bran, and decreased in the brown and still more in the polished rice.

Table 62. Residues in rice and its processed commodities from supervised trials and milling in the USA (LeRoy, 1990f).

Location, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
CA, 1988 (M201)	EC	4.4		190	6	16	grain brown rice hulls bran polished rice	14 2.7 72 11 0.52	0.63 <0.05 3.5 0.13 <0.05	MP-RI-3514
TX, 1988 (Gulfmont)	EC	4.4		170	6	15	grain brown rice hulls bran polished rice	1.9 0.45 9.3 2.0 0.13	0.67 <0.05 3.6 0.11 <0.05	MP-RI-3515

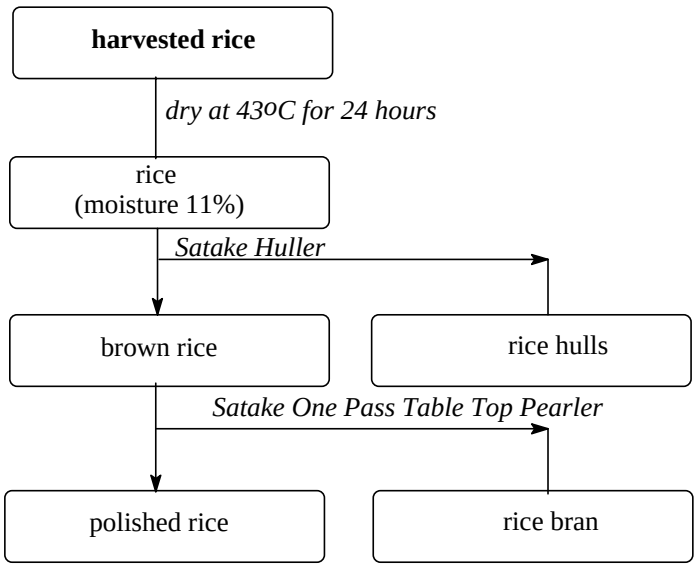


Figure 12. Processing of rice (LeRoy, 1990f).

Cotton seed. Parathion-methyl was applied six or 10 times to cotton at 6.7 and 17 kg ai/ha (exaggerated rates) in two trials in the USA in 1988 and 1989 and the crops harvested (about 11 and 7 kg grain) 7 days after the final treatment (LeRoy, 1990g). Figure 13 shows the milling process and Table 63 summarizes the results. Residues decreased in the meal in both trials, but were inconsistent in the oils.

Table 63. Residues in cotton seed and its processed commodities from supervised trials in the USA (LeRoy, 1990g).

Location, year (variety)	Application				PHI,	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.	days		parathion-methyl	paraoxon-methyl	
CA, 1989 (GC 510)	EC	6.7	99	6	7	cotton seed meal hulls crude oil refined oil soapstock	14 0.53 5.7 11 8.2 0.19	0.12 <0.05 <0.05 <0.05 0.05 0.14	MP-CS-3522
TX, 1988 (DPL 41)	EC	17	94	10	7	cotton seed meal hulls crude oil refined oil soapstock cotton seed hulls	4.1 0.51 2.0 0.30 0.28 0.08 c 0.08 0.08 c0.07	0.21 <0.05 <0.05 <0.05 <0.05 <0.05 c <0.05 (2) c <0.05	MP-CS-3523

c: sample from control plot

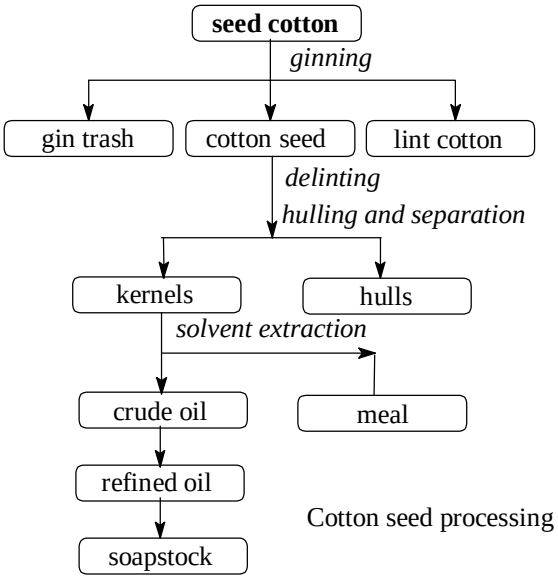


Figure 13. Processing of seed cotton (LeRoy, 1990g).

Sunflower seed. Parathion-methyl was applied three times by tractor mounted boom spray at about 6-day intervals to sunflowers at 5.6 kg ai/ha (5 times the label rate) in a trial in the USA in 1998 and the crop harvested (about 23 kg grain) 30 days after the final treatment (Williams and Rice 1999c). Figure 14 shows the process. Residues in the meal and refined oil were lower than in the seed (Table 64).

Table 64. Residues in sunflower seed and its processed commodities from a supervised trial in the USA (Williams and Rice, 1999c).

Location, year (variety)	Application				PHI, days	Sample	Residues, mg/kg (duplicate analyses)		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
TX, 1998 (NK-547)	EC	5.6	120	3	30	seed meal refined oil	0.52 0.52 0.03 0.05 0.13 0.12	<0.01 (2) <0.01 (2) <0.01 (2)	PM9805

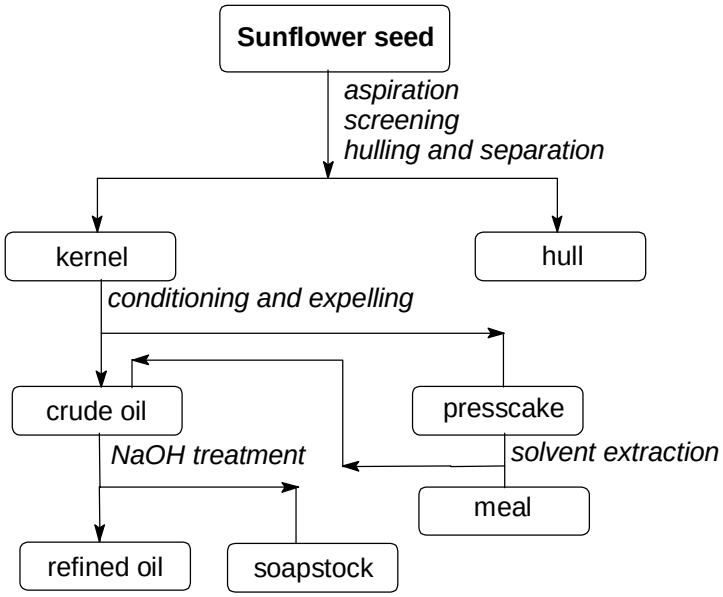


Figure 14. Sunflower seed processing (Williams and Rice, 1999c).

Oilseed rape (canola). Parathion-methyl was applied twice by tractor mounted boom spray to canola at the post-bloom stage at 5.6 kg ai/ha (5 times the label rate) in a trial in the USA in 1992 and the crop harvested (about 90 kg seed) 28 days after the final treatment (Belcher, 1993). The process was the same as for sunflower seed (Figure 14). Residues were higher in the oils and lower in the meal than in the seed (Table 65).

Table 65. Residues in canola seed and its processed fractions from a supervised trial in the USA (Belcher, 1993).

Location, year (variety)	Application				PHI, days	Sample	Residues, mg/kg (duplicate analyses)		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion-methyl	paraoxon-methyl	
WA, 1992 (Series)	EC	5.6	200	2	28	seed meal crude oil refined oil processing waste	0.39 0.41 0.085 0.095 0.95 1.0 0.79 0.81 0.39 0.42	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	92147

Residues in the edible portion of food commodities

Processing factors were calculated for all the processed commodities, both for parathion-methyl only and for combined parathion-methyl and paraoxon-methyl residues expressed as parathion-methyl. The calculated factors are shown in Table 66.

In the parathion-methyl-only calculation where the residue in the processed commodity was below the LOQ, the processing factor is reported as <(LOQ ÷ (residue in RAC)). In the total-residue calculation where the residue of paraoxon-methyl was below the LOQ it was assumed to be zero except when both parathion-methyl and paraoxon-methyl residues were below the LOQ, in which case the processing factor is reported as in the parathion-methyl-only calculation. For example:

parathion-methyl	paraoxon-methyl	total residue	Processing factor
4.91	0.12	5.04	5.04 ÷ R
0.26	<0.05	0.26	0.26 ÷ R
<0.05	<0.05	<0.05	<(0.05 ÷ R)

where R is the total residue in the RAC

Because parathion-methyl is usually the major component of the residue the processing factors for parathion-methyl only and for the total residue are usually much the same.

Table 66. Processing factors from the reported processing trials calculated for parathion-methyl residues and for combined residues of parathion-methyl and paraoxon-methyl expressed as parathion-methyl. Processing factors were calculated directly from unrounded results.

COMMODITY	Residues, mg/kg				Processing factors					
	parathion-methyl		paraoxon-methyl		parathion-methyl			parathion-methyl + 1.065 × paraoxon-methyl		
	Trial A	Trial B	Trial A	Trial B	A	B	mean	A	B	mean
APPLES, fruit	0.04	0.02	<0.01	<0.01						
dry pomace	0.17	0.09	<0.01	<0.01	4.3	4.5	4.4			
juice	<0.01	<0.01	<0.01	<0.01	<0.25	<0.5				
APPLES, fruit	0.03	0.01	<0.01	<0.01						
dry pomace	0.12	0.08	<0.01	<0.01	4.0	8.0	6.0			
juice	<0.01	<0.01	<0.01	<0.01	<0.3	<1				
PEACHES, fruit	0.03	0.02								
juice	<0.01	<0.01			<0.33	<0.5				
GRAPES, fruit	0.12	0.13								
must	<0.01	<0.01			<0.083	<0.077				
wine	<0.01	<0.01			<0.083	<0.077				
GRAPES, day 14	0.16	0.15								
raisins, day 14	0.21	0.22			1.3	1.5	1.4			
wine, day 14	0.03	0.02			0.19	0.13	0.16			
juice, day 14	0.01	<0.01			0.06	<0.07	0.06			
GRAPES, day 21	0.09	0.10								
raisins, day 21	0.14	0.13			1.6	1.3	1.4			
wine, day 21	0.02	0.02			0.22	0.20	0.21			
juice, day 21	<0.01	<0.01			<0.11	<0.10				
OLIVES, day 0	4.7	6.2								
olive oil, day 0	30	59			6.4	9.5	7.9			
OLIVES, day 7	0.55	3.4								
olive oil, day 7	2.6	18			4.7	5.3	5.0			
OLIVES, day 14	0.44	1.5								
olive oil, day 14	1.1	13			2.4	8.6	5.5			
OLIVES, day 21	0.24	1.2								
olive oil, day 21	1.6	5.4			6.7	4.7	5.7			
OLIVES, day 28	0.19	1.0								
olive oil, day 28	0.35	11.1			1.8	11.3	6.6			
SOYA BEAN, dry seed	0.15									
meal	<0.05				<0.33					
hulls	0.12				0.80		0.80			
crude oil	0.71				4.73		4.7			
refined oil	0.57				3.80		3.8			
SOYA BEAN, seed	0.17									
meal	<0.1				<0.6					
hulls	0.19				1.1		1.1			
crude oil	0.51				3.0		3.0			
refined oil	0.49				2.9		2.9			
soapstock	0.06				0.35		0.35			

COMMODITY	Residues, mg/kg				Processing factors					
	parathion-methyl		paraoxon-methyl		parathion-methyl			parathion-methyl + 1.065 × paraoxon-methyl		
	Trial A	Trial B	Trial A	Trial B	A	B	mean	A	B	mean
WHEAT, grain	9.8	6.2	0.15	0.13						
bran	19	15	0.26	0.19	2.0	2.4	2.2	1.9	2.4	2.2
flour, patent	2.8		0.09		0.28		0.28	0.29		0.29
middlings	4.9	4.4	0.12	0.08	0.50	0.71	0.61	0.51	0.70	0.61
red dog	4.2	5.5	0.14	0.10	0.43	0.87	0.65	0.44	0.87	0.65
shorts and germ	9.0	20	0.24	0.29	0.92	3.2	2.1	0.93	3.2	2.1
rough		11		0.28		1.8	1.8		1.8	1.8
flour		2.6		0.05		0.42	0.42		0.42	0.42
flour, low grade		1.5		0.09		0.24	0.24		0.25	0.25
WHEAT, grain	0.39		0.01							
aspirated grain fractions	0.34		<0.01		0.87		0.87	0.85		0.85
MAIZE, whole grain	0.58		<0.05							
large grits	0.12		<0.05		0.21		0.21			
medium grits	0.11		<0.05		0.19		0.19			
small grits	0.43		<0.05		0.74		0.74			
coarse meal	0.27		<0.05		0.47		0.47			
meal	0.26		<0.05		0.45		0.45			
flour	0.24		<0.05		0.41		0.41			
crude oil	0.18		<0.05		0.31		0.31			
refined oil	0.15		<0.05		0.26		0.26			
MAIZE, whole grain	0.58		<0.05							
starch	<0.05		<0.05		<0.09					
crude oil	0.77		<0.05		1.33		1.33			
refined oil	0.6		<0.05		1.03		1.03			
RICE, grain	14	1.9	0.63	0.67						
brown rice	2.7	0.45	<0.05	<0.05	0.19	0.24	0.21	0.18	0.17	0.18
hulls	72	9.3	3.5	3.6	5.1	5.0	5.0	5.1	5.1	5.1
bran	11	2.0	0.13	0.11	0.75	1.1	0.91	0.73	0.82	0.77
polished rice	0.52	0.13	<0.05	<0.05	0.037	0.070	0.053	0.035	0.051	0.043
COTTON, seed	14	4.1	0.12	0.21						
meal	0.53	0.51	<0.05	<0.05	0.038	0.124	0.08	0.04	0.12	0.08
hulls	5.7	2.04	<0.05	<0.05	0.41	0.50	0.46	0.41	0.47	0.44
crude oil	11	0.3	<0.05	<0.05	0.81	0.073	0.44	0.81	0.07	0.44
refined oil	8.2	0.28	0.05	<0.05	0.59	0.068	0.33	0.59	0.06	0.33
soapstock	0.19	0.08	0.14	<0.05	0.014	0.020	0.017	0.02	0.02	0.021
SUNFLOWER, seed	0.52		<0.01							
meal	0.04		<0.01		0.08		0.08			
refined oil	0.13		<0.01		0.24		0.24			
CANOLA, seed	0.40		<0.05							
meal	0.09		<0.05		0.22		0.22			
crude oil	0.98		<0.05		2.4		2.4			
refined oil	0.80		<0.05		2.0		2.0			
processing waste	0.40		<0.05		1.00		1.00			
HOPS, fresh	0.46	0.15	0.067	0.042						
hops, dried	0.99	0.36	0.35	0.13	2.2	2.4		2.6	2.6	
HOPS, fresh	0.96	0.35	0.21	0.11						
hops, dried	2.7	1.19	0.90	0.41	2.8	3.4		3.1	3.5	
HOPS, fresh	0.096	0.12	<0.04	0.036						
hops, dried	0.40	0.43	0.17	0.16	4.2	3.6		6.1	3.8	
HOPS, fresh	0.39	0.28	0.11	0.12						
hops, dried	0.87	0.78	0.32	0.29	2.2	2.8		2.4	2.7	
HOPS, fresh	0.18	0.18	0.15	0.1						
hops, dried	0.41	0.23	0.19	0.18	2.3	1.3		1.8	1.5	
HOPS, fresh	0.25	0.17	0.09	0.058						
hops, dried	0.37	0.27	0.25	0.23	1.5	1.6		1.8	2.2	

COMMODITY	Residues, mg/kg				Processing factors					
	parathion-methyl		paraoxon-methyl		parathion-methyl			parathion-methyl + 1.065 × paraoxon-methyl		
	Trial A	Trial B	Trial A	Trial B	A	B	mean	A	B	mean
					hops mean		2.5			2.8

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

Information was provided by the governments of Australia and The Netherlands.

Monitoring data from The Netherlands are shown in Table 67. Only 2 samples of lemons, 3 of oranges, 1 of tangerines, 4 of grapes, 1 of blue bilberries and 1 of broccoli contained residues above the MRLs.

Table 67. Residues found in monitoring in The Netherlands, 1994-1998. The LOQ was 0.02 mg/kg.

Commodity	No. of samples		Commodity	No. of samples	
	analysed	residues detected		analysed	residues detected
apples	1986	6	lemon	267	8
apricots	80	0	lettuce	4134	4
bananas	57	2	mangoes	191	1
beans with pods	617	2	melons	390	4
blue bilberries	104	2	nectarines	221	3
broccoli	154	0	onion	97	1
celery	233	2	oranges	1361	46
Chinese cabbage	297	2	parsley	368	3
currants	55	1	peaches	277	11
endive	1503	3	peppers	2132	2
globe artichokes	24	1	radishes	1010	1
grapefruit	388	15	raspberries	68	1
grapes	863	40	strawberries	3595	8
iceberg lettuce	471	3	tangerines	742	25
kiwifruit	223	3			

Parathion-methyl was monitored in the 1994 Australian Market Basket Survey in which 77 foods were analysed for pesticide residues (Marro, 1996). The estimated daily dietary intakes (expressed as µg/kg bw) for mean energy diets of parathion-methyl residues in food were adult males 0.0114, adult females 0.0169, boys aged 12 0.0123, girls aged 12 0.0105, toddlers 0.0279 and infants 0.0373.

Parathion-methyl was included in the targeted enforcement monitoring programmes in Australian States for 1992-1999. In Queensland no parathion-methyl residues (LOQ 0.02-0.1 mg/kg) were detected in 342 samples of fruits, vegetables and cereals in 1996-99. In Victoria parathion-methyl was detected (LOQ 0.01 mg/kg) in apples (6 of 23 samples) and pears (11 of 35 samples) in 1995-97, with the highest residue at 0.23 mg/kg. In New South Wales parathion-methyl was detected (LOQ 0.05 mg/kg) in 14 of 2621 samples of fruits and vegetables analysed from 1992 to 1997. No residue exceeded an MRL.

NATIONAL MAXIMUM RESIDUE LIMITS

The Meeting was aware that the following national MRLs had been established.

Country	MRL, mg/kg	Commodity
Australia	1	cotton seed, fruits, vegetables
	0.05	cotton seed oil crude
	0.05*	edible offal mammalian, meat mammalian, milks
Netherlands	0.2	fruit, vegetables, tea
	0.05	other vegetable products
	0.02*	other food commodities
Poland	0.1	cereal grains, fruits, vegetables
USA	5	alfalfa hay, birdsfoot trefoil hay
	3	almond hulls, sorghum fodder, sorghum forage
	1.25	alfalfa (fresh), birdsfoot trefoil forage
	1	apples. apricots, artichokes, avocados, barley, beans, beet greens, beets, blackberries, blueberries, boysenberries, Brassica vegetables, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, celery, cherries, clover, collards, corn, corn forage, cranberries, cucumbers, currants, dates, dewberries, eggplants, endive, figs, garlic, gooseberries, grapes, grass forage, guavas, hops, kale, kohlrabi, leafy vegetables, lentils, lettuce, loganberries, mangoes, melons, mustard greens, nectarines, oats, okra, olives, onions, parsley, parsnips, parsnip greens, peaches, peanuts, pears, peas, pea forage, peppers, pineapples, plums, pumpkins, quinces, radishes, radish tops, raspberries, rice, rutabagas, rutabaga tops, soya bean hay, spinach, squash, strawberries, summer squash, Swiss chard, tomatoes, turnips, turnip greens, vetch, wheat, youngberries
	0.75	cottonseed
	0.2	mustard seed, rape seed, sunflower seed, guar beans
	0.1	almonds, sugar beets, sugar beet tops, filberts, pecans, potatoes, safflower seed, sorghum, soya beans, sweet potatoes, walnuts

* indicates lower limit of determination (LOD) or MRL set at or about LOD.
[1] Australia residue definition: parathion-methyl.
[2] Netherlands residue definition: parent compound, expressed as parathion-methyl.

APPRAISAL

Parathion-methyl was first evaluated by the Joint Meeting in 1965 and has been reviewed several times since. At its thirtieth session in 1998, the CCPR (ALINORM 99/24, Appendix VII) listed parathion-methyl for periodic review for residues by the 2000 JMPR. The Meeting received information on physical and chemical properties, metabolism and environmental fate, analytical methods, stability in frozen storage, registered uses, the results of supervised trials on fruits, vegetables, and field crops, and studies on processing.

Metabolism

Animals and birds

When a lactating goat weighing 60 kg was given [*phenyl*-^{14}C]parathion-methyl orally at a dose of 35 mg per day (equivalent to 6.25 ppm in the diet) daily for 3 days, no residues of parathion-methyl or paraoxon-methyl were detected in tissues or milk. However, as only 35.5% of the administered radiolabel was recovered, a large proportion was unaccounted for.

When laying hens were given [*phenyl*-^{14}C]parathion-methyl orally three times at daily intervals at a dose of 0.5 mg/kg bw (equivalent to 6.25 ppm in the diet), the compound was detected in tissues but not in eggs, while paraoxon-methyl was detected in neither tissues nor eggs. The highest concentrations of parathion-methyl were found in skin and fat, suggesting a certain degree of solubility in fat. Only 54% of the radiolabel was accounted for.

The metabolites identified indicate that parathion-methyl is degraded by demethylation, oxidation, hydrolysis of the phosphate ester, reduction of the nitro group to an amine, and conjugation.

Plants

The Meeting received information on the fate of parathion-methyl in potatoes, cotton, and lettuce. Only 0.01-0.02% of the radiolabel in *potato* plants was found in the tubers 5 days after application of [*phenyl*-^{14}C]parathion-methyl as a foliar spray to the plants at a rate equivalent to 4.7 kg ai/ha. Parathion-methyl was identified in the tubers at a concentration of 0.001 mg/kg. In plants harvested 21 days after treatment, the tubers contained 0.13-0.14% of the radiolabel, and paraoxon-methyl was tentatively identified at a concentration of 0.002 mg/kg. Very low concentrations of nitrophenyl conjugates were also identified.

Parathion-methyl was found at a concentration of 0.008 mg/kg in *cotton seed* 10 days after foliar application of [*phenyl*-^{14}C]parathion-methyl to cotton plants at the equivalent of 0.38 kg ai/ha. Nitrophenol, *para*-nitrophenyl glucopyranoside, and *O*-demethyl-parathion-methyl were also components of the residue.

Lettuce plants harvested 14 and 21 days after foliar treatment with [*phenyl*-^{14}C]parathion-methyl at a rate equivalent to 1.23 kg ai/ha contained parathion-methyl residues at a concentration of 2.2 and 0.097 mg/kg, respectively. Neither paraoxon-methyl nor any other metabolite containing P=O was detected. The metabolites *para*-nitrophenol, *para*-nitrophenyl glucopyranoside, and *O*-demethyl-parathion-methyl were identified. In a further experiment on lettuce, the major metabolite was 4-nitrophenyl 6-*O*-malonyl-β-D-glucopyranoside.

The plant metabolites identified indicate that hydrolysis of parathion-methyl to nitrophenol is the major metabolic pathway, but *O*-demethylation and oxidation to paraoxon-methyl may also occur to a limited extent. *para*-Nitrophenol is readily conjugated.

The Meeting noted that no information was available on the fate of parathion-methyl in fruit crops but was informed that studies were planned to support the re-registration programme in the European Union.

Environmental fate

Parathion-methyl residues disappeared quickly (initial half-life, 3.9 days) during incubation in aerobic soil. The metabolites identified were *para*-nitrophenol and *O,O*-bis(4-nitrophenyl) *O*-methyl phosphorothioate. Under anaerobic conditions, parathion-methyl disappeared rapidly, with an initial half-life of 10.5 h. Nitrophenol was a major component of the residue during the first week, but the concentration declined rapidly thereafter. Parathion-methyl had medium to low mobility on four soils in a laboratory study and did not appear below the top 10 cm in two field studies of soil dissipation. No residues of paraoxon-methyl were detected in any sample in the field studies.

Direct photodegradation of parathion-methyl residues in water is likely to make a minor contribution to its overall disappearance from the environment. In aquatic field studies (rice paddies), parathion-methyl disappeared quickly, and was detectable in the water only on the day of application or the next day.

Methods of analysis

The analytical methods for parathion-methyl and paraoxon-methyl are based on gas-liquid chromatography with flame photometry after solvent extraction and simple clean-up by solvent

partition and reversed-phase column chromatography. Some variations are required for different substrates, particularly in the extraction step. A LOQ of 0.01 mg/kg is achieved for many substrates, but the validated LOQ for difficult substrates is 0.05 mg/kg.

The method used in many of the supervised trials in the USA included an initial 1-h reflux of the sample in acidic aqueous methanol before clean-up. The typical LOQ in trials conducted in the 1980s and early 1990s was 0.05 mg/kg, but 0.01 mg/kg was achieved in later trials.

Stability of residues in stored analytical samples

Residues of parathion-methyl in bluegrass hay, rape seed, celery, clover forage, dry bean seeds, dry pea seeds, dry pea straw, head cabbages, lettuce, maize fodder, maize forage, maize grain, mustard, onions, snap bean seeds and pods, soya bean seeds, succulent pea forage, succulent pea pods, sunflower seeds, turnip roots, turnip tops, wheat forage, wheat grain, and wheat straw, in processed crude rape seed oil and rape seed meal, and in soils were stable during frozen storage for the durations tested (mostly 2 years). Residues of paraoxon-methyl were also stable in frozen storage, with a few exceptions. The calculated times for a 30% decrease in the concentration of paraoxon-methyl residues were 5 months in rape seed, 12 months in crude rape seed oil, 7 months in rape seed meal, and 13 months in lettuce.

No information was available on the stability of parathion-methyl or paraoxon-methyl residues in frozen storage of fruits. Because parathion-methyl has been tested in many commodities with consistent results, it is probably stable in fruit matrices; however, the stability of paraoxon-methyl residues in fruits is not established. The Meeting was informed that studies of the stability in fruits in frozen storage are being planned to support the re-registration programme of the European Union. The concentrations of paraoxon-methyl decreased by 30% within about 250 days in a frozen sample of sandy loam and 22 days in one of loam soil.

Definition of the residue

Parathion-methyl and paraoxon-methyl are the most important components for the residue definition. The contributions of residues of the two components to the total residue in food and feed commodities in GAP trials at the recommended PHIs were examined. In 54 trials of food commodities and 155 of feed commodities, the concentrations of both components exceeded the LOQ. The total concentration of residues was closely related to that of parathion-methyl in both food and feed commodities, but the relationship was less close at lower concentrations.

The Meeting recommended that the residue definition for compliance with MRLs continue to be parathion-methyl and that for estimation of dietary intake should be the sum of parathion-methyl and paraoxon-methyl expressed as parathion-methyl (parathion-methyl + 1.065 ∞ paraoxon-methyl). The residue definition applies to plant commodities and it should be reconsidered when MRLs for animal commodities are recommended.

Results of supervised trials

Extensive data were provided from supervised trials on many crops: apple, pear, peach, grape, onion, broccoli, cabbage, sweet corn, mustard green, lettuce, spinach, lima bean, snap bean, soya bean, field pea, dried bean, carrot, potato, sugar beet, turnip, celery, artichoke, maize, rice, sorghum, wheat, cotton seed, rape seed, sunflower seed, alfalfa, clover, pasture grass, and hops. No relevant GAP was available to evaluate the data for pear, onion, broccoli, sweet corn, mustard green, lettuce, spinach, lima bean, snap bean, soya bean, carrot, turnip, celery, artichoke, sorghum, sunflower seed, clover, or hops.

The Meeting agreed to withdraw the recommended MRLs for globe artichoke (2 mg/kg), broccoli (0.2 mg/kg), carrot (1 mg/kg), celery (5 mg/kg), cherry (0.01* mg/kg), clover (10 mg/kg), common bean (0.05* mg/kg), garden pea (1 mg/kg) gooseberry (0.01* mg/kg), dry hops (1 mg/kg), lettuce head (0.05* mg/kg), lettuce leaf (0.5 mg/kg), lima bean (0.05* mg/kg), mustard greens (0.5 mg/kg), plums including prunes (0.01* mg/kg), red and black raspberries (0.01* mg/kg), spinach (0.5 mg/kg), turnip greens (2 mg/kg), and garden turnip (0.05* mg/kg). These MRLs were not supported by current GAP or by the results of supervised trials that matched current GAP.

The residue definition for dietary intake requires the addition of parathion-methyl and paraoxon-methyl residues expressed as parathion-methyl. In this calculation, concentrations of residues of paraoxon-methyl that were <LOQ were assumed to be 0, except when the concentrations of both parathion-methyl and paraoxon-methyl residues were <LOQ. For example:

Parathion-methyl	Paraoxon-methyl	Total residue (parathion-methyl + 1.058 x paraoxon- methyl)
3.20	0.34	3.56
0.42	<0.05	0.42
<0.05	<0.05	<0.05

The results of supervised trials on *apple* in Germany were not evaluated because there was no matching GAP. In France, parathion-methyl is registered for use on pome fruits at a spray concentration of 0.03 kg ai/hl with a PHI of 15 days. In 26 trials conducted in France in 1994 and 1995 at 0.036 kg ai/hl and a 14-day PHI, the concentrations of parathion-methyl residues, in rank order, were <0.01 (3 trials), 0.01 (3 trials), 0.02 (4 trials), 0.04 (2 trials), and 0.11 mg/kg after use of emulsifiable concentrate formulations, and 0.03 (2 trials), 0.04 (3 trials), 0.05, 0.06, 0.07, 0.10, 0.11, 0.12, 0.15, and 0.18 mg/kg after use of capsule suspension formulations. The residues of the two formulations appeared to be from different populations, higher concentrations generally arising from the capsule suspension formulation, and the Meeting agreed to use the data for the latter formulations for estimating the STMR value and MRL. The concentrations of the combined residues of parathion-methyl and paraoxon-methyl, in rank order (median in italics), in the 13 trials with capsule suspension formulations were 0.03 (2 trials), 0.04 (3 trials), 0.05, ***0.06***, 0.07, 0.10, 0.11, 0.14, 0.15, and 0.18 mg/kg.

The Meeting estimated a maximum residue level of 0.2 mg/kg, an STMR value of 0.06 mg/kg, and a HR value of 0.18 mg/kg for parathion-methyl in apples.

Parathion-methyl is registered in Italy for use on stone fruit at a spray concentration of 0.023-0.045 kg ai/hl and a PHI of 20 days. The concentrations of residues in *peach* in 18 trials in Italy in 1994 and 1995 that matched GAP were <0.01 (3 trials), 0.01 (4 trials), 0.02 (2 trials), and 0.04 mg/kg after use of emulsifiable concentrate formulations and 0.06 (2 trials), 0.08, ***0.09***, ***0.10***, 0.13, 0.16, and 0.22 mg/kg after use of capsule suspension formulations. The concentration of paraoxon-methyl residues did not exceed the LOQ (0.01 mg/kg). The residues of the two formulations appeared to be from different populations, higher concentrations generally arising from the capsule suspension formulation, and the Meeting agreed to use the data for the latter formulations for estimating the STMR value and MRL.

The Meeting estimated a maximum residue level of 0.3 mg/kg, an STMR value of 0.095 mg/kg, and a HR value of 0.22 mg/kg for parathion-methyl in peaches expressed for the whole fruit.

Parathion-methyl is registered in France for use on *grape* at an application rate of 0.3 kg ai/ha and a PHI of 21 days. In 18 trials conducted in France in accordance with the GAP, the concentrations of residues were <0.01 (8 trials) and 0.02 mg/kg from the use of emulsifiable concentrate formulations and 0.05 (2 trials), 0.09 (2 trials), ***0.10*** (3 trials), 0.13, and 0.41 mg/kg after use of capsule suspension formulations. In one trial, the concentration found at day 28 was used because it was higher than that

at day 21. In two further trials, the concentrations at day 21 were not available because of a sample mix-up, and the residues for day 28 (0.41 and 0.02 mg/kg) were used.

In Spain, parathion-methyl is registered for use on grapes at a spray concentration of 0.045-0.059 kg ai/hl and a PHI of 21 days. Four trials in Spain conducted in accordance with the French GAP resulted in a concentration of <0.01 mg/kg in the two trials of use of emulsifiable concentrate formulations and 0.05 and 0.13 mg/kg after use of capsule suspension formulations. Eight valid trials in Italy at the Spanish GAP (spray concentrations of 0.046-0.068 kg ai/hl; PHI, 21 days) resulted in concentrations of parathion-methyl residues of <0.01 (5 trials) and 0.01 mg/kg after use of emulsifiable concentrate formulations and 0.12 and 0.18 mg/kg after use of capsule suspension formulations. Paraoxon-methyl was not measured in the Italian trials and was not detected at the GAP PHI in the other trials. The residues of the two formulations appeared to be from different populations, higher concentrations generally arising from the capsule suspension formulation, and the Meeting agreed to use the data for the latter formulations for estimating the STMR value and MRL. The concentrations of parathion-methyl residues in grapes, in rank order, in the 13 trials with capsule suspension formulations were 0.05 (3 trials), 0.09 (2 trials), ***0.10*** (3 trials), 0.12, 0.13 (2 trials), 0.18, and 0.41 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg, an STMR value of 0.10 mg/kg, and a HR value of 0.41 mg/kg for parathion-methyl in grapes.

Parathion-methyl is registered in the USA for use on *cabbage* at 0.56-1.7 kg ai/ha, with a PHI of 10 days for 0.56 kg ai/ha and 21 days for higher rates. A series of trials conducted in 1988 and 1989 with either six or seven applications at 1.7 kg ai/ha and a 21-day PHI or with a final application at the lower rate and a PHI of 10 days resulted in the concentrations of parathion-methyl residues in cabbages, including wrapper leaves, of <0.05 (12 trials) and <0.5 (4 trials) mg/kg.

In four trials in California with high LOQs, there was analytical interference due to overspray with another pesticide, demeton-*S*-methyl. However, the results of these trials cannot be ignored because paraoxon-methyl residues of 0.08-0.24 mg/kg were recorded. Concentrations of paraoxon-methyl of 0.22 and 0.23 mg/kg were found in cabbages in trials in Florida, where those of parathion-methyl residues were <0.05 mg/kg. This finding differs from those in other crops where parathion-methyl almost invariably constitutes most of the residue. The concentrations of paraoxon-methyl residues in the 16 trials, in rank order, were ***0.05*** (9 trials), 0.07, 0.09, 0.10, 0.13, 0.23, 0.24, and 0.26 mg/kg.

The Meeting estimated a maximum residue level of 0.05 mg/kg, an STMR value of 0.05 mg/kg, and a HR value of 0.26 mg/kg for parathion-methyl in cabbages. The estimated maximum residue level replaces the current recommendation (0.2 mg/kg) for head cabbages.

Parathion-methyl is registered in the USA for use on *pea* for production of dried peas at 0.56-1.1 kg ai/ha, with a PHI of 10 days for 0.56 kg ai/ha and 15 days for higher rates. A series of 12 trials conducted in 1988 and 1989 with either four or six applications at 1.1 kg ai/ha and 15-day PHI or with a final application at the lower rate and a PHI of 10 days resulted in the following concentrations of parathion-methyl residues in dried peas: <0.05 (4 trials), ***0.06*** (3 trials), 0.07, 0.16, 0.18, 0.19, and 0.24 mg/kg. The concentration of paraoxon-methyl residues did not exceed the LOQ (0.05 mg/kg) in any of the trials.

The Meeting estimated a maximum residue level of 0.3 mg/kg, an STMR value of 0.06 mg/kg, and a HR value of 0.24 mg/kg for parathion-methyl in dried peas. The estimated maximum residue level replaces the current recommendation (0.2 mg/kg) for dried peas.

Parathion-methyl is registered in the USA for use on *bean* for production of dried bean at 0.56-1.7 kg ai/ha with a PHI of 15 days for 0.56 kg ai/ha and 21 days for higher rates. In six trials in

four states in 1988, with six applications at 1.7 kg ai/ha and harvesting at 15 days, no parathion-methyl or paraoxon-methyl (<0.05 mg/kg) was detected. The number of trials was limited, but in view of the absence of detectable residues and use of a shorter PHI in the trials than required by GAP, the Meeting agreed to recommend an MRL. Although no residues were detected, there was no evidence that residues were not present, and the STMR value should be equivalent to the LOQ.

The Meeting estimated a maximum residue level of 0.05* mg/kg, an STMR value of 0.05 mg/kg, and a HR value of 0.05 mg/kg for parathion-methyl in dried beans. The estimated maximum residue level confirms the current recommendation for dried beans.

Parathion-methyl is registered in the USA for use on *potato* at 1.7 kg ai/ha with a PHI of 6 days. In eight trials in five states in 1988 and 1989, with six applications at 1.7 or 1.8 kg ai/ha and harvesting after 5 days, no parathion-methyl or paraoxon-methyl (<0.05 mg/kg) was detected in the tubers. Two processing trials with exaggerated application rates (3.4 and 8.4 kg ai/ha) also showed no residues. In the study of metabolism in potatoes, with an application rate equivalent to 4.7 kg ai/ha, residues of parathion-methyl (0.001 mg/kg) were found in tubers 5 days after treatment and of paraoxon-methyl (0.002 mg/kg) 21 days after treatment. The Meeting agreed that the finding of very low concentrations of residues (50 times less than the LOQ) even after an exaggerated application rate would allow establishment of STMR and HR values as ‘essentially zero’.

The Meeting estimated a maximum residue level of 0.05* mg/kg, an STMR value of 0, and a HR value of 0 mg/kg for parathion-methyl in potatoes. The estimated maximum residue level confirms the current recommendation for potatoes.

Parathion-methyl is registered in the USA for use on *sugar beet* at 0.28-0.43 kg ai/ha with a PHI of 20 days. In eight trials in four states in 1988, with six applications at 0.42 kg ai/ha and harvesting at 20 days, no parathion-methyl or paraoxon-methyl was detected (<0.05 mg/kg) in the roots. Two processing trials with an exaggerated application rate (2.1 kg ai/ha) also showed no residues.

The Meeting estimated a maximum residue level of 0.05* mg/kg, an STMR value of 0, and a HR value of 0 mg/kg for parathion-methyl in sugar beet. The estimated maximum residue level confirms the current recommendation for sugar beets.

Parathion-methyl is registered in the USA for use on *maize* at 0.28-0.56 kg ai/ha with a PHI of 12 days. In 12 trials in nine states in 1988 and 1989, with six applications at 1.1 kg ai/ha and harvesting at 12 days, no paraoxon-methyl was detected (<0.05 mg/kg) in the grain in any of the 12 trials; no parathion-methyl was detected in 11 trials, but a concentration of 0.09 mg/kg was found in one trial. The Meeting agreed to use the data, even though the application rate was exaggerated (twice the labelled amount) since concentrations <LOQ were found in all but one.

The Meeting estimated a maximum residue level of 0.1 mg/kg, an STMR value of 0.05 mg/kg, and a HR value of 0.09 mg/kg for parathion-methyl in maize.

Parathion-methyl is registered in the USA for use on *rice* at 0.56-0.84 kg ai/ha with a PHI of 15 days. In six trials in four states in 1988, with six applications at 0.89 kg ai/ha and harvesting at 15 or 16 days, the concentrations of residues of parathion-methyl in rice grain were 0.19, 0.27, 0.30, 0.44, 2.0, and 2.3 mg/kg, and those of combined parathion-methyl and paraoxon-methyl residues were 0.29, 0.43, ***0.45***, ***0.68***, 2.1, and 2.5 mg/kg.

The Meeting considered that six trials were too few to allow estimation of an MRL for rice, a major commodity, and withdrew the current recommendations of 3 mg/kg for rice, 1 mg/kg for husked rice, and 10 mg/kg for rice straw and fodder.

Parathion-methyl is registered in the USA for use on *wheat* at 0.28-0.84 kg ai/ha with a PHI of 15 days. In nine trials in seven states in 1988 and 1989, with four applications at 1.4 kg ai/ha followed by two applications at 0.84 kg ai/ha and harvesting at 14 days, the concentrations of residues of parathion-methyl in wheat grain were <0.05 (2 trials), 0.05, 0.21, 0.29, 0.48, 1.1 (2 trials), and 3.7 mg/kg, and those of combined parathion-methyl and paraoxon-methyl residues were <0.05 (2 trials), 0.05, 0.21, ***0.29***, 0.53, 1.2 (2 trials), and 4.1 mg/kg. As the residue is derived mainly from the final application, the first four of the six applications at an exaggerated rate would not have affected the concentration of residue.

The Meeting estimated a maximum residue level of 5 mg/kg, an STMR value of 0.29 mg/kg, and a HR value of 4.1 mg/kg for parathion-methyl in wheat.

Parathion-methyl is registered in the USA for use on *cotton* at 0.15-3.4 kg ai/ha, with a PHI of 5 days for hand-picking and 0 days for mechanical picking. In a trial in 1989, the concentrations of parathion-methyl residues were 9.5 and 22 mg/kg 7 days after application of 3.4 kg ai/ha in a processing trial. In 18 trials in four states in 1998 with 10 applications at 3.4 kg ai/ha and harvesting 1 day after the final application, the concentrations of parathion-methyl in cotton seed were 0.64, 1.5 (2 trials), 1.7, 1.9, 2.0, 2.5, 3.0, 3.2, 3.5, 3.9, 4.6, 5.4, 5.6, 6.8, 7.4 (2 trials), and 8.9 mg/kg, and those of the combined parathion-methyl and paraoxon-methyl residues were 0.66, 1.5 (2 trials), 1.7, 1.9, 2.0, 2.5, 3.0, ***3.2***, ***3.5***, 3.9, 4.6, 5.4, 5.6, 6.8, 7.4, 7.5, and 9.1 mg/kg. The concentrations found in the 19 trials were 0.66, 1.5 (2 trials), 1.7, 1.9, 2.0, 2.5, 3.0, 3.2, *3.5*, 3.9, 4.6, 5.4, 5.6, 6.8, 7.4, 7.5, 9.1, and 22 mg/kg

The Meeting estimated a maximum residue level of 25 mg/kg, an STMR value of 3.5 mg/kg, and a HR value of 22 mg/kg for parathion-methyl in cotton seed.

Parathion-methyl is registered in the USA for use on *rape seed* at 0.56 kg ai/ha with a PHI of 28 days. In four trials on rape seed in four states in 1992 with two applications at 0.56 kg ai/ha or two applications at 0.28 kg ai/ha followed by two at 0.56 kg ai/ha and harvesting 28 days after the final application, no parathion-methyl or paraoxon-methyl was detected (<0.05 mg/kg) in rape seed. In a further four trials at twice the label rate and harvesting at the 28-day PHI, no paraoxon-methyl residues were detected in any trial; parathion-methyl was not detected in three trials, and a concentration of 0.06 mg/kg was found in the fourth. Although the four trials were conducted at twice the GAP rate, the Meeting considered that the data provided valid support as all the concentrations but one were <LOQ. The estimates of the MRL and the STMR and HR values were based on the results of the GAP trials with support from the trials at twice the label rate.

The Meeting estimated a maximum residue level of 0.05 mg/kg, an STMR value of 0.05 mg/kg, and a HR value of 0.05 mg/kg for parathion-methyl in rape seed.

Parathion-methyl is registered in the USA for use on *alfalfa* at 0.28-1.1 kg ai/ha with a PHI of 15 days. In 18 trials in nine states in 1998 with two applications of 1.1 kg ai/ha per cutting (two to four cuttings in each trial, each cutting being regarded as a separate trial) and cutting 14 or 15 days after the second application, the concentrations of parathion-methyl residues in *alfalfa forage* were 0.03, 0.09, 0.13, 0.21, 0.24, 0.26, 0.27, 0.31, 0.32 (2 trials), 0.35, 0.38, 0.39, 0.46, 0.54, 0.55, 0.57, 0.66, 0.70, 0.73, 0.74, 0.76, 0.82, 0.84, 0.87, 0.91 (2 trials), 0.92, 1.0, 1.1 (3 trials), 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 2.0, 2.1, 2.2, 2.3, 2.6, 2.7, 5.9, 6.8, 8.5, 8.6, and 11 (2 trials) mg/kg of fresh weight or 0.18, 0.48, 0.51, 0.55, 0.83, 0.93, 1.0 (2 trials), 1.1, 1.2, 1.4, 1.6, 1.7, 1.8, 2.3, 2.4, 2.5 (2 trials), 2.7, 2.8, 2.9, 3.1, 3.3, 3.5, 3.7 (2 trials), 3.8 (2 trials), 4.0, 4.2, 4.5, 5.1 (2 trials), 5.3, 5.4, 5.8, 6.3, 7.0 (2 trials), 8.1, 9.4, 9.8, 11 (2 trials), 15, 32, 33, 36, 41, 47, and 60 mg/kg of dry weight. As moisture was measured in each accompanying control sample, the concentration of residues in each sample could be calculated on a dry weight basis.

The concentrations of combined parathion-methyl and paraoxon-methyl residues in alfalfa forage were 0.03, 0.09, 0.13, 0.21, 0.24, 0.26, 0.27, 0.31, 0.32 (2 trials), 0.35, 0.38, 0.39, 0.46, 0.54, 0.56, 0.59, 0.68, 0.71, 0.74, 0.75, 0.76, 0.83, 0.84, 0.88, 0.92, 0.94 (2 trials), 1.0, 1.1 (3 trials), 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 2.0, 2.1, 2.2, 2.3, 2.6, 2.7, 6.0, 6.9, 8.6, 8.7, and 11 (2 trials) mg/kg of fresh weight or 0.18, 0.48, 0.51, 0.55, 0.83, 0.93, 1.0 (2 trials), 1.1, 1.2, 1.4, 1.6, 1.7, 1.8, 2.3, 2.5, 2.6 (2 trials), 2.7, 2.9 (2 trials), 3.2, 3.3, 3.5, ***3.7*** (2 trials), 3.9 (2 trials), 4.1, 4.3, 4.6, 5.1, 5.2, 5.4, 5.5, 5.8, 6.3, 7.1 (2 trials), 8.3, 9.6, 10, 11 (2 trials), 15, 33 (2 trials), 37, 42, 47, and 61 mg/kg of dry weight.

The Meeting estimated a maximum residue level of 70 mg/kg and an STMR value for parathion-methyl in alfalfa forage of 3.7 mg/kg (dry weight).

The concentrations of parathion-methyl residues in *alfalfa hay* were 0.28, 0.33, 0.36, 0.37, 0.38 (2 trials), 0.39, 0.46, 0.63, 0.64 (4 trials), 0.67, 0.79, 0.81, 0.87, 1.0, 1.2, 1.3 (3 trials), 1.4 (2 trials), 1.5, 1.7 (3 trials), 1.8, 1.9 (3 trials), 2.1, 2.2 (2 trials), 2.3, 2.7, 3.0, 3.4, 3.5, 4.1, 4.2, 4.5, 5.7, 6.4, 8.0, 8.8, 13, 17 (2 trials), and 23 mg/kg of fresh weight or 0.39, 0.41, 0.42 (2 trials), 0.45, 0.49, 0.55 (2 trials), 0.70 (2 trials), 0.90, 1.0, 1.2 (3 trials), 1.3, 1.4 (2 trials), 1.6, 1.7, 1.8, 2.0, 2.1 (3 trials), 2.3 (3 trials), 2.4, 2.7 (2 trials), 3.0, 3.2, 3.5 (2 trials), 3.8, 3.9, 4.6 (2 trials), 5.2, 5.3, 5.7, 8.4, 11 (2 trials), 16 (2 trials), 18, 21, 27, and 57 mg/kg of dry weight.

The concentrations of combined parathion-methyl and paraoxon-methyl residues in alfalfa hay were 0.28, 0.33, 0.36, 0.37, 0.38 (2 trials), 0.39, 0.46, 0.63, 0.64 (2 trials), 0.65 (2 trials), 0.67, 0.80, 0.82, 0.89, 1.0, 1.2, 1.3 (3 trials), 1.4 (2 trials), 1.5, 1.7 (3 trials), 1.8, 1.9 (3 trials), 2.1, 2.2, 2.3 (2 trials), 2.7, 3.0, 3.4, 3.5, 4.1, 4.3, 4.6, 5.8, 6.5, 8.1, 8.9, 13, 17 (2 trials), and 23 mg/kg of fresh weight or 0.39, 0.41, 0.42 (2 trials), 0.45, 0.49, 0.55 (2 trials), 0.70, 0.71, 0.90, 1.0, 1.2 (3 trials), 1.3, 1.5 (2 trials), 1.6, 1.7, 1.8, 2.1 (2 trials), 2.2 (2 trials), ***2.3*** (2 trials), 2.4 (2 trials), 2.8 (2 trials), 3.0, 3.2, 3.5, 3.6, 3.8, 3.9, 4.6, 4.7, 5.2, 5.4, 5.8, 8.5, 11, 12, 16 (2 trials), 18, 21, 27, and 57 mg/kg of dry weight.

The Meeting estimated a maximum residue level of 70 mg/kg and an STMR value of 2.3 mg/kg for parathion-methyl in alfalfa fodder (dry weight).

The concentrations of residues in pea hay or *pea fodder* (described in the trials as dried forage) and of *pea straw* were measured in the trials on field peas (see above) carried out according to GAP. The concentrations of parathion-methyl residues in pea hay or pea fodder (12 trials) were 0.35, 0.37, 0.55, 0.66, 1.0, 3.4, 3.6, 4.2, 5.2, 7.6, 9.5, and 58 mg/kg. The concentrations of parathion-methyl residues in pea straw (11 trials) were 0.71, 0.72, 0.82, 1.1, 2.6, 3.1, 3.5, 4.9, 5.0, 13, and 27 mg/kg. One of these trials was invalid because of an excessively contaminated control plot. Because dried forage and pea straw are included in the commodity pea hay or pea fodder (dry), the data on dried forage and pea straw were combined, and the higher residue in each trial was used to estimate the MRL and STMR value. The concentrations of parathion-methyl were then: 0.71, 0.72, 0.82, 1.0, 1.1, 4.2, 4.9, 5.0, 5.2, 9.5, 13, and 58 mg/kg, and those of the combined parathion-methyl and paraoxon-methyl residues become: 0.71, 0.90, 0.92, 1.0, 1.1, ***4.3***, ***5.3***, 5.4, 5.5, 9.7, 13, and 59 mg/kg.

Allowing for the standard 88% of dry matter in pea hay (FAO, 1997, p. 125), the Meeting estimated a maximum residue level of 70 mg/kg and an STMR value of 5.5 mg/kg (4.8/0.88) for parathion-methyl in pea hay or pea fodder (dry weight).

As noted above, parathion-methyl is registered in the USA for use on peas for production of dried peas. In 11 trials conducted in 1988 and 1989 with four or six applications at 1.1 kg ai/ha and a 15-day PHI or with a final application at 0.56 kg ai/ha and a PHI of 10 days, the concentrations of parathion-methyl residues in *pea vine* were <0.05 (4 trials), 0.08, 0.17, 0.20, 0.21, 0.23, 1.6, and 7.3 mg/kg of fresh weight. In the same trials, the concentrations of parathion-methyl residues on *succulent forage* were <0.05 (4 trials), 0.07, 0.08 (2 trials), 0.13, 0.15, 0.17, 4.9, and 8.2 mg/kg. As succulent forage is included in the commodity pea vines, the data for pea vines and succulent forage

were combined, and the higher residue value in each trial was used to estimate the MRL and STMR value. The concentrations of parathion-methyl data are then: <0.05 (4 trials), 0.08, 0.17 (2 trials), 0.20, 0.21, 0.23, 4.9, and 8.2 mg/kg, and those of the combined parathion-methyl and paraoxon-methyl residues become: <0.05 (4 trials), 0.08, ***0.17***, ***0.20***, 0.23, 0.27, 0.28, 4.9, and 8.2 mg/kg.

Allowing for the standard 25% of dry matter in pea vines (FAO, 1997, p. 125), the Meeting estimated a maximum residue level of 40 mg/kg and an STMR value of 0.74 mg/kg (0.185/0.25) for parathion-methyl in green pea vines (dry weight).

As noted above, parathion-methyl is registered in the USA for use on beans for production of dried beans. In six trials in four states in 1988 with six applications at 1.7 kg ai/ha and sampling of *bean forage* at a 21-day PHI, the concentrations of parathion-methyl residues were <0.05 (2 trials), 0.10, ***0.11***, 0.31, and 0.66 mg/kg. The residues are expressed on a fresh weight basis because the percent dry matter for bean forage is not provided in the *FAO Manual* (FAO, 1997).

The Meeting estimated a maximum residue level of 1 mg/kg and an STMR value of 0.11 mg/kg for parathion-methyl in green bean forage. The estimated maximum residue level confirms the current MRL recommendation for bean forage of 1 mg/kg.

As noted above, parathion-methyl is registered in the USA for use on wheat. In six trials in four states, *wheat hay* was cut 14 days after a final treatment with parathion-methyl at four applications of 1.4 kg ai/ha followed by two applications of 0.84 kg ai/ha, which was considered to represent GAP for the purposes of measuring residues. The resulting concentrations of residues in wheat hay were 0.10, 0.17, 0.33, 0.98, 1.0, and 1.2 mg/kg (fresh weight).

In nine trials on wheat in seven states in 1988 and 1999, parathion-methyl was applied four times at 1.4 kg ai/ha and then twice at 0.84 kg ai/ha, and *wheat straw* was harvested 14 days after the final treatment. The concentrations of parathion-methyl residues in wheat straw were 0.13, 0.28, 0.34, 0.55, 0.79, 0.85, 2.6, 3.7, and 5.7 mg/kg (fresh weight)

The data on wheat hay and straw were combined to support an MRL for wheat straw and fodder. The concentrations of the combined parathion-methyl and paraoxon-methyl residues in wheat straw and fodder become: 0.10, 0.13, 0.23, 0.28, 0.34, 0.49, 0.67, ***0.91***, 0.94, 1.1, 1.2, 2.4, 2.8, 4.1, and 5.9 mg/kg.

Allowing for the standard 88% of dry matter in wheat hay and straw (FAO, 1997, p. 127), the Meeting estimated a maximum residue level of 10 mg/kg and an STMR value of 10 and 1.03 mg/kg (0.91/0.88) for parathion-methyl in wheat straw and fodder (dry weight). The estimated maximum residue level confirms the current recommendation for wheat straw and fodder of 10 mg/kg.

Parathion-methyl is registered in the USA for use on forage grasses at 0.56-0.84 kg ai/ha with a PHI of 15 days for cutting or grazing. In 15 trials in six states in 1988 with six applications at 0.86-0.89 kg ai/ha and sampling of *pasture grass hay* after 15 days, the concentrations of parathion-methyl residues were 0.05, 0.12, 0.19, 0.21, 0.25, 0.31, 0.50, ***0.54***, 0.64, 0.66, 0.96, 1.0, 1.4, 1.6, and 2.5 mg/kg (fresh weight), and those of the combined parathion-methyl and paraoxon-methyl residues in pasture grass hay were 0.14, 0.23, 0.25, 0.26, 0.32, 0.45, 0.54, ***0.60***, 0.66, 0.70, 0.96, 1.1, 1.5, 1.6, and 2.9 mg/kg of fresh weight.

Allowing for the standard 88% of dry matter in hay of pasture grasses (FAO, 1997, p. 124), the Meeting estimated a maximum residue level of 5 mg/kg and an STMR value of 0.68 mg/kg (0.60/0.88) for parathion-methyl in grass hay or fodder (dry weight). The estimated maximum residue level confirms the current recommendation for hay or fodder of grasses of 5 mg/kg.

As noted above, parathion-methyl is registered in the USA for use on sugar beets at 0.28-0.43 kg ai/ha with a PHI of 60 days for *sugar beet tops* used as animal fodder. Neither parathion-methyl residues nor paraoxon-methyl residues were detected in beet fodder in six trials in four states in 1988, with six applications at 0.42 kg ai/ha and fodder harvesting at 60 days. Residues of parathion-methyl are unlikely to occur after such an interval, but there was no evidence that residues were not present.

The Meeting estimated a maximum residue level of 0.05* mg/kg and an STMR value of 0.05 mg/kg for parathion-methyl in beet tops and fodder (fresh weight). The estimated maximum residue level confirms the current recommendation for sugar beet leaves or tops of 0.05* mg/kg.

Fate of residues during processing

The Meeting received information on the fate of incurred residues of parathion-methyl and paraoxon-methyl during the processing of apple, peach, grapes, olive, soya bean, wheat, maize, rice, cotton seed, sunflower seed, rape seed, and hops, and processing factors were calculated for processed commodities derived from these raw agricultural commodities. The studies on apple, peach, grape, wheat, maize, cotton seed, and rape seed are summarized below because maximum residue levels are estimated for these raw agricultural commodities.

Processing factors were calculated for parathion-methyl residues only and for combined parathion-methyl and paraoxon-methyl residues. As parathion-methyl is the dominant component of the residue, the processing factor is similar with the two calculations. Nevertheless, since these factors are used in calculating the concentrations of residues in processed foods for the purpose of estimating dietary intake, that for the combined residue was used when available. When the concentration of residues in the processed commodity did not exceed the LOQ, the processing factor was calculated from the LOQ and was prefixed with a ‘less than’ symbol (<).

The factors for parathion-methyl in *apple* processed to dry pomace were 4.0, 4.3, 4.5, and 8.0 (mean, 5.2) and those for juice were <0.25, <0.5, <0.33, and <1. As no residues were detected in juice, the value <0.25 is the best estimate of the juice processing factor. Application of these factors to the STMR value and MRL for apples provides an STMR-P value of 0.31 mg/kg and a HR-P value of 1.04 mg/kg for dry apple pomace and an STMR-P value for juice of 0.015 mg/kg.

Parathion-methyl residues were not detected in *peach* juice in two trials in which the calculated processing factors were <0.33 and <0.5; the best estimate is <0.33. Application of the factor to the STMR value for peaches provides an STMR-P value for peach juice of 0.031 mg/kg.

The factors for the processing of *grape* to raisins were 1.3 (2 trials), 1.5, and 1.6 (mean, 1.4). Application of the factor to the STMR value and MRL for grapes provides an STMR-P value of 0.014 mg/kg and a HR-P value of 0.70 mg/kg for raisins. The Meeting estimated a maximum residue level for parathion-methyl in dried grapes of 1 mg/kg. The factors for processing of grapes to juice were 0.06, <0.07, <0.10, and <0.11, and the best estimate is 0.06. Application of the factor to the STMR value for grapes provides an STMR-P value for grape juice of 0.0006 mg/kg. The factors for processing of grapes to wine were <0.077, <0.083, 0.13, 0.19, 0.20, and 0.22 (mean, 0.15). Application of the factor to the STMR value for grapes provides an STMR-P value for wine of 0.0015 mg/kg.

The factors for processing of *wheat* to bran were 2.0 and 2.4 (mean, 2.2). Application of the factor to the STMR value for wheat provides an STMR-P value for wheat bran of 0.64 mg/kg. Application of the factor to the MRL for wheat gives a highest residue of parathion-methyl in wheat bran of 11.0 mg/kg. The Meeting estimated a maximum residue level for parathion-methyl in wheat bran of 10 mg/kg, which confirms the current recommendation for unprocessed wheat bran.

The factors for processing of wheat to flour were 0.29, 0.42, and 0.45 (mean, 0.39). Application of the factor to the STMR value for wheat provides an STMR-P value for flour of 0.11 mg/kg. Application of the factor to the MRL for wheat gives a highest residue of parathion-methyl in flour of 1.95 mg/kg. The Meeting estimated a maximum residue level for parathion-methyl in wheat flour of 2 mg/kg.

The processing factors for dry milling of *maize* were 0.21, 0.19, and 0.74 (mean, 0.38) for grits, 0.47 and 0.45 (mean, 0.46) for meal, 0.41 for flour, 0.31 for crude oil, and 0.26 for refined oil. The processing factors for wet milling of maize were <0.09 for starch, 1.33 for crude oil, and 1.03 for refined oil. Application of the factors to the STMR value and MRL for maize provides an STMR-P value of 0.023 mg/kg and a highest residue of 0.046 mg/kg in meal and STMR-P values of 0.021 mg/kg for maize flour, 0.019 mg/kg for grits, and 0.0045 mg/kg for starch. Application of the factor for flour (0.41) to the MRL for maize gives a highest residue of parathion-methyl in maize flour of 0.041 mg/kg. The Meeting estimated a maximum residue level for parathion-methyl in maize flour of 0.05 mg/kg.

The two processes resulted in different concentrations of residues in maize oil. The processing factors for oils were 0.31 and 0.26 with the dry process and 1.33 and 1.03 with the wet process. The Meeting agreed to use the values for the wet process, which, when applied to the STMR value for maize, provide STMR-P values of 0.067 mg/kg for crude oil and 0.051 mg/kg for refined oil. Application of the factors to the MRL for maize provides highest residues of 0.13 mg/kg in crude maize oil and 0.10 mg/kg in refined maize oil. The Meeting estimated maximum residue levels for parathion-methyl in crude maize oil and edible maize oil of 0.2 and 0.1 mg/kg, respectively.

The processing factors for *cotton seed* milling were 0.04 and 0.12 (mean, 0.08) for meal, 0.41 and 0.47 (mean, 0.44) for hulls, 0.81 and 0.07 (mean, 0.44) for crude oil, and 0.59 and 0.06 (mean, 0.33) for refined oil. Application of the factors to the STMR value and MRL for cotton seed provides an STMR-P value of 0.28 mg/kg and a HR-P value of 2.0 mg/kg in meal, an STMR-P value of 1.5 mg/kg and a HR-P value of 9.7 mg/kg in hulls, and STMR-P values of 1.54 mg/kg for crude oil and 1.16 mg/kg for refined oil. Application of the factors to the MRL for cotton seed provides highest residues of parathion-methyl of 11 mg/kg in crude cotton seed oil and 8.25 mg/kg in refined cotton seed oil. The Meeting estimated a maximum residue level of 10 mg/kg for parathion-methyl in both crude and edible cotton seed oil.

The processing factors for *rape seed* were 0.22 for meal, 2.4 for crude oil, and 2.0 for refined oil. Application of the factors to the STMR value and MRL for rape seed provides an STMR-P and a highest residue in rape seed meal of 0.011 mg/kg and an STMR-P value of 0.12 mg/kg for crude oil and 0.10 mg/kg for refined oil. Application of the factors for oil to the MRL for rape seed provides highest residues of parathion-methyl of 0.12 mg/kg in crude rape seed oil and 0.10 mg/kg in refined rape seed oil. The Meeting estimated a maximum residue level for parathion-methyl in crude and edible rape seed oil of 0.2 mg/kg.

Residues in animal and poultry commodities

The Meeting estimated the dietary burden of parathion-methyl residues in farm animals on the basis of the diets listed in Appendix IX of the *FAO Manual* (FAO, 1997). Calculation from MRLs (or HR values) provides concentrations in feed suitable for estimating MRLs for animal commodities, while calculation from STMR values for feed is suitable for estimating STMR values for animal commodities. The percent dry matter is considered to be 100% for MRLs and STMR values expressed in dry weight.

Commodity	MRL or HR	Group	% dry matter	MRL/ dry matter	% of diet			Concentration of residue, mg/kg		
					Beef cattle	Dairy cows	Poultry	Beef cattle	Dairy cows	Poultry

Commodity	MRL or HR	Group	% dry matter	MRL/ dry matter	% of diet			Concentration of residue, mg/kg		
					Beef cattle	Dairy cows	Poultry	Beef cattle	Dairy cows	Poultry
Alfalfa fodder	70	AL	100	70	70	60		49.0	42.0	
Alfalfa forage (green)	70	AL	100	70						
Bean forage (green)	1	AL	25	4.0						
Pea hay or pea fodder (dry)	70	AL	100	70						
Pea vines (green)	40	AL	100	40						
Hay or fodder (dry) of grasses	5	AS	100	5.0						
Wheat straw and fodder, dry	10	AS	100	10	10	10		1.00	1.00	
Sugar beet leaves or tops	0.05	AV	23	0.22						
Maize meal	0.046	CF	85	0.054						
Maize	0.1	GC	88	0.11						
Wheat	5	GC	89	5.62		10	80		0.56	4.49
Apple pomace (dry)	1.04	AB	100	1.04						
Cotton seed hulls	9.7		90	10.8	20	20		2.16	2.16	
Cotton seed meal	2.00		88	2.27			20			0.45
Rape seed meal	0.011		88	0.025						
Total								52.2	45.7	4.95

Commodity	STMR	Group	% dry matter	STMR/ dry matter	% of diet			Concentration of residue, mg/kg		
					Beef cattle	Dairy cows	Poultry	Beef cattle	Dairy cows	Poultry
Alfalfa fodder	2.3	AL	100	2.3						
Alfalfa forage (green)	3.7	AL	100	3.7	45	10		1.67	0.37	
Bean forage (green)	0.11	AL	25	0.44						
Pea hay or pea fodder (dry)	5.5	AL	100	5.5	25	50		1.38	2.75	
Pea vines (green)	0.74	AL	100	0.74						
Hay or fodder (dry) of grasses	0.68	AS	100	0.68		10			0.07	
Wheat straw and fodder, dry	1.03	AS	100	1.03	10	10		0.10	0.10	
Sugar beet leaves or tops	0.05	AV	23	0.22						
Maize meal	0.023	CF	85	0.027						
Maize	0.05	GC	88	0.06						
Wheat	0.29	GC	89	0.33			80			0.26
Apple pomace (dry)	0.31	AB	100	0.31						
Cotton seed hulls	1.54		90	1.71	20	20		0.34	0.34	
Cotton seed meal	0.28		88	0.32			20			0.06
Rape seed meal	0.011		88	0.01						
Total								3.5	3.6	0.32

The dietary burdens of parathion-methyl in animal commodities (expressed as dry weight) used to estimate the MRL and STMR value are: 52 and 3.5 ppm for beef cattle, 46 and 3.6 ppm for dairy cows, and 4.95 and 0.32 ppm for poultry.

No suitable studies of farm animal feeding were available to allow conversion of the dietary burden of residues to MRLs and STMR values for animal and poultry commodities. The Meeting was informed that such studies will be initiated shortly.

RECOMMENDATIONS

The Meeting estimated the maximum residue levels and STMRs shown below. The maximum residue levels are recommended for use as MRLs.

Definition of the residue for compliance with MRLs: parathion-methyl. For estimation of dietary intake: sum of parathion-methyl and paraoxon-methyl expressed as parathion-methyl.

Commodity		MRL, mg/kg		STMR, mg/kg	HR, mg/kg
CCN	Name	New	Previous		
AL 1020	Alfalfa fodder	70	-	2.3	

Commodity		MRL, mg/kg		STMR, mg/kg	HR, mg/kg
CCN	Name	New	Previous		
AL 1021	Alfalfa forage (green)	70	-	3.7	
FP 0226	Apple	0.2	-	0.06	0.18
JF 0226	Apple juice			0.015	
AB 0226	Apple pomace, dry			0.31	1.04
VS 0620	Artichoke, Globe	W	2		
AL 1030	Bean forage (green)	1 (fresh weight)	1	0.11	
VD 0071	Beans (dry)	0.05*	0.05*	0.05	0.05
VB 0400	Broccoli	W	0.2		
VB 0041	Cabbages, Head	0.05	0.2	0.05	0.26
VR 0577	Carrot	W	1		
VS 0624	Celery	W	5		
FS 0013	Cherries	W	0.01*		
AL 1023	Clover	W	10		
VP 0526	Common bean (pods and/or immature seeds)	W	0.05*		
SO 0691	Cotton seed	25	-	3.5	22
	Cotton seed hulls			1.54	9.7
	Cotton seed meal			0.28	2.0
OC 0691	Cotton seed oil, crude	10	-	1.54	
OR 0691	Cotton seed oil, edible	10	-	1.16	
DF 0269	Dried grapes (= Currants, Raisins and Sultanas)	1		0.14	0.70
VP 0528	Garden pea (young pods)	W	1		
FB 0268	Gooseberry	W	0.01*		
JF 0269	Grape juice			0.0006	
FB 0269	Grapes	0.5	-	0.10	0.41
AS 0162	Hay or fodder (dry) of grasses	5	5	0.68	
DH 1100	Hops, dry	W	1		
VL 0482	Lettuce, Head	W	0.05*		
VL 0483	Lettuce, Leaf	W	0.5		
VP 0534	Lima bean (young pods and/or immature beans)	W	0.05*		
GC 0645	Maize	0.1	-	0.05	0.09
CF 1255	Maize flour	0.05	-	0.021	
	Maize grits			0.019	
	Maize meal			0.023	0.046
OC 0645	Maize oil, crude	0.2	-	0.067	
OR 0645	Maize oil, edible	0.1	-	0.051	
	Maize starch			0.0045	
VL 0485	Mustard greens	W	0.5		
AL 0072	Pea hay or Pea fodder (dry)	70	-	5.5	
AL 0528	Pea vines (green)	40	-	0.74	
FS 0247	Peach	0.3	-	0.095	0.22
	Peach juice			0.031	
VD 0072	Peas (dry)	0.3	0.2	0.06	0.24
FS 0014	Plums (including Prunes)	W	0.01*		
VR 0589	Potato	0.05*	0.05*	0	0
SO 0495	Rape seed	0.05	-	0.05	0.05
	Rape seed meal			0.011	0.011
OC 0495	Rape seed oil, crude	0.2	-	0.12	
OR 0495	Rape seed oil, edible	0.2	-	0.10	
FB 0272	Raspberries, Red, Black	W	0.01*		
GC 0649	Rice	W	3		
AS 0649	Rice straw and fodder, dry	W	10		
CM 0649	Rice, husked	W	1		
VL 0502	Spinach	W	0.5		
VR 0596	Sugar beet	0.05*	0.05*	0	0
AV 0596	Sugar beet leaves or tops	0.05* (fresh weight)	0.05*	0.05	
VL 0506	Turnip greens	W	2		

Commodity		MRL, mg/kg		STMR, mg/kg	HR, mg/kg
CCN	Name	New	Previous		
VR 0506	Turnip, Garden	W	0.05*		
GC 0654	Wheat	5	5	0.29	4.1
CM 0654	Wheat bran, unprocessed	10	10	0.64	
CF 1211	Wheat flour	2		0.11	
AS 0654	Wheat straw and fodder, dry	10	10	1.03	
	Wine			0.0015	

Further work or information

Desirable

1. Feeding studies in farm animals to permit estimation of maximum residue levels and STMR values for animal and poultry commodities.

2. Information on the stability of paraoxon-methyl in fruits in frozen storage.

3. Information on the metabolism of parathion-methyl in fruits.

Dietary risk assessment

Chronic intake

The periodic review of parathion-methyl resulted in recommendations for new and revised MRLs and new STMR values for raw and processed commodities. Data on consumption were available for 17 food commodities and were used in calculating the dietary intake. The results are shown in Annex 3.

The international estimated daily intakes from the five GEMS/Food regional diets, based on estimated STMR values, represented 3-30% of the ADI. The Meeting concluded that the long-term intake of residues of parathion-methyl from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The IESTI for parathion-methyl was calculated for the food commodities (and their processing fractions) for which maximum residue levels and STMR values were estimated and for which consumption data were available. The results are shown in Annex 4. The IESTI represented 0-30% of the acute RfD for the general population and 0-80% of the acute RfD for children.

The Meeting concluded that the acute intake of residues of parathion-methyl from uses that have been considered by the JMPR is unlikely to present a public health concern.

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