PARATHION (58)

EXPLANATION

Parathion was first evaluated in 1965 and has been reviewed several times since, most recently in 1995 and 1997. It was listed by the 1998 CCPR (30th Session, ALINORM 99/24, Appendix VII) under the Periodic Review programme for residues by the 2000 JMPR. A comprehensive data package was provided by the basic manufacturer. Information was also provided by Australia, Germany and The Netherlands.

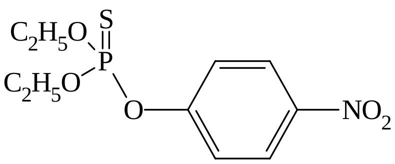
IDENTITY

ISO common name: parathion

Chemical name
IUPAC: *O*,*O*-diethyl *O*-4-nitrophenyl phosphorothioate
CA: *O*,*O*-diethyl *O*-(4-nitrophenyl) phosphorothioate

CAS No.: 56-38-2

Structural formula:



Molecular formula: $C_{10}H_{14}NO_5PS$

Molecular weight: 291.3

Physical and chemical properties

Pure active ingredient

Appearance: amber, with pungent garlic-like odour.

Vapour pressure: 0.965 (±0.055) × 10^{-5} mm Hg at 25°C
12.6 (±0.62) × 10^{-5} mm Hg at 45°C

Melting point: 0°C

Octanol/water partition coefficient: P_{ow} = 1598

Solubility:

water: 12.4±0.7 mg/l at 25°C.
solvents: freely soluble in alcohols, esters, ketones and aromatic hydrocarbons; practically insoluble in petroleum oils (petroleum ether, kerosene) and paraffin oil.

Specific gravity: 1.26 g/ml

Hydrolysis:

half-life at 25°C in the dark under sterile conditions at initial conc. of 10 mg/l
pH 5: 133 days
pH 7: 247 days
pH 9: 102 days.

Photolysis:

half-life 88 hours when exposed as a thin film to UV light with peak energy output at 300 nm.

Thermal stability: heating at 150°C for 24 hours resulted in 80-90% decomposition. Parathion should not be heated above 55°C.

Technical material

Purity: minimum 96%

Main impurity: 4-nitrophenol

Stability: A sample of parathion, in its commercial package, was stored at 20-23°C in an air-conditioned room at the production plant for one year. The initial parathion content was 98.6/97.9% (duplicate analyses) and the final values were 98.1/97.7%.

Formulations

Novafos E500 Insecticide. Nova Parathion 25 EC. Parathion EC 50. Novafos E 20. E 605 forte. Microcap E 560. Parathion 8E.

METABOLISM AND ENVIRONMENTAL FATE

Animal metabolism

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

Residues were measured in the tissues (muscle, omental and perirenal fat, liver, kidney), milk and excreta of lactating dairy goats (2 goats weighing 57 and 42 kg initially and 47 and 34 kg finally, control goat 48 kg decreasing to 42 kg) dosed orally by capsule with 188 mg [*phenyl*-^{14}C]parathion equivalent to 96.9 ppm parathion in the diet for 5 consecutive days (Cheng, 1987a). The feed intake was 1.7 and 2.2 kg/animal/day. The two goats produced averages of 2.97 and 2.17 kg milk per day and were slaughtered 6 hours after the last dose. The total recovery of ^{14}C was 42.4% and 36.65% for the two goats.

Table 1. Distribution of radioactivity in lactating goats dosed orally for 5 consecutive days by capsule with 188 mg [*phenyl*-^{14}C]parathion equivalent to 96.9 ppm parathion in the diet (Cheng, 1987a).

Sample	Recovered ^{14}C			
	Goat 092		Goat 088	
	% of dose	mg/kg as parathion	% of dose	mg/kg as parathion
Kidney	0.08	5.5	0.07	4.4
Liver	0.76	6.3	0.57	5.3
Muscle	0.08	0.75	0.03	0.32
Omental fat	0.03	0.86	0.03	0.34
Renal fat	<0.01	0.90	0.03	0.34
Bile	0.16	35	0.08	31
Milk	0.20	1.0	0.18	0.45
Urine + pan rinse	25.6		23.5	
Faeces	15.5		12.1	
Total	42.4		36.6	

83-97% of the radioactivity in the tissues and milk was extractable. The main component of the residue was *p*-acetamidoparaoxon and parathion itself was also present in all the samples (Cheng, 1988a).

Table 2. Compounds identified in tissues and milk from lactating goats dosed orally for 5 consecutive days by capsule with 188 mg [*phenyl*-^{14}C]parathion equivalent to 96.9 ppm parathion in the diet (Cheng, 1988a).

Residue	Milk		Liver		Kidney		Renal fat		Muscle	
	% of ^{14}C in sample	^{14}C as parathion mg/kg	% of ^{14}C in sample	^{14}C as parathion mg/kg	% of ^{14}C in sample	^{14}C as parathion mg/kg	% of ^{14}C in sample	^{14}C as parathion mg/kg	% of ^{14}C in sample	^{14}C as parathion mg/kg
Unidentified					8.3	0.45	3.3	0.030	1.7	0.013
p- acetamido-phenol			9.9	0.63	17	0.94	2.9	0.027	0.73	0.005
p-nitrophenol					1.7	0.094			9.2	0.066
p-acetamido-paraoxon	71	0.72	32	2.0	19	1.1	23	0.21	40	0.29
p-amino-parathion	2.5	0.026	3.8	0.24	3.5	0.19	2.2	0.020		
parathion	1.8	0.019	8.9	0.56	8.8	0.48	16	0.15	2.7	0.019

In a trial on 15 White Leghorn laying hens (each weighing 1.34-2.1 kg), the hens were dosed orally by capsule with 1.5 mg [*phenyl*-^{14}C]parathion, equivalent to 16.5 ppm parathion in the diet, for 6 days (Cheng, 1987b). The average feed intake was 91g/bird/day. Eggs and excreta were collected throughout, the hens were killed 6 hours after the last dose for analysis of the liver, kidney, abdominal fat tissue, thigh muscle, breast muscle, skin with fat, and gizzard. The mean total recovery of ^{14}C was 83%. The distribution of the ^{14}C is shown in Table 3. The residue in the eggs has apparently not reached a plateau by day 6.

Table 3. Distribution of radioactivity in laying hens dosed orally by capsule with 1.5 mg [*phenyl*-^{14}C]parathion equivalent to 16.5 ppm parathion in the diet for 6 days (Cheng, 1987b).

Sample	Mean recovered ^{14}C	
	% of dose	mg/kg as parathion
Kidney	0.04%	0.25
Liver	0.05%	0.093
Thigh muscle	<0.01%	0.008
Breast muscle	<0.01%	0.007
Abdominal fat	0.01%	0.028
Skin with fat	0.04%	0.081
Gizzard	0.03%	0.10
Eggs, total	0.02%	
eggs day 3		0.005
eggs day 4		0.009
eggs day 5		0.011
eggs day 6		0.014
GI tract	5.4%	
Excreta	77%	
Total	83%	

Cheng (1988b) identified the ^{14}C residues in the hen tissues and eggs. 53-86% of the radioactivity was extractable. The major components of the residue were *p*-nitrophenyl phosphate and *p*-acetamidophenol. Parathion itself was a minor component of the residue in all the samples.

Table 4. Compounds identified in tissues and eggs from laying hens dosed orally for 6 consecutive days by capsule with 1.5 mg [*phenyl*-^{14}C]parathion equivalent to 16.5 ppm parathion in the diet (Cheng, 1988b).

Compound	Eggs		Liver		Kidney		Skin + fat	
	% of ^{14}C in sample	^{14}C as parathion mg/kg	% of ^{14}C in sample	^{14}C as parathion mg/kg	% of ^{14}C in sample	^{14}C as parathion mg/kg	% of ^{14}C in sample	^{14}C as parathion mg/kg
p-nitrophenyl phosphate	19	0.003	8.1	0.009	35	0.087	7.5	0.013
p-aminophenol	3.5	0.001					4.7	0.008
p- acetamido-phenol	24	0.004	25	0.028	11	0.028	11	0.018
O-ethyl *p*-nitrophenyl phosphorothioate	7.1	0.001	13	0.014	3.5	0.009	8.6	0.014
p-nitrophenol	5.3	0.001	11	0.012	1.5	0.004	14	0.024
p-acetamido-paraoxon			4.1	0.004	0.98	0.002	5.3	0.009
paraoxon			0.96	0.001	0.60	0.001		
parathion	4.4	0.001	0.73	0.001	1.8	0.004	1.3	0.002

The proposed metabolic pathways are shown in Figure 1.

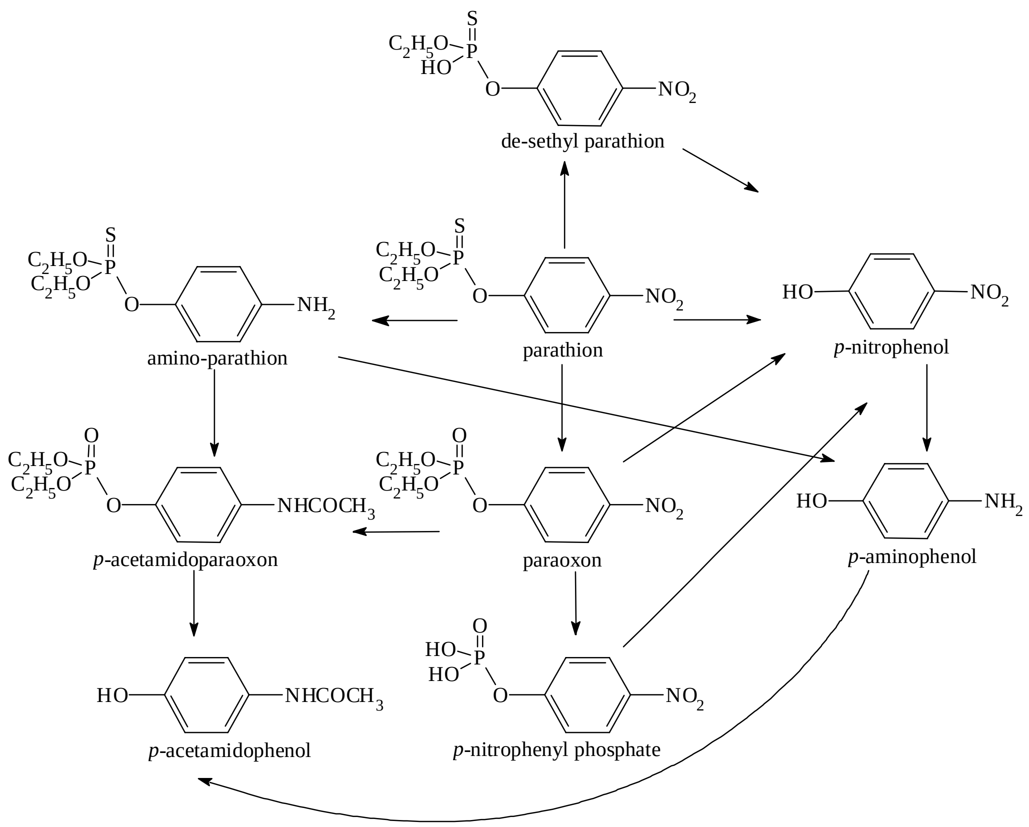


Figure 1. Proposed metabolic pathways of parathion in goats and hens.

Plant Metabolism

The Meeting received information on the metabolism of parathion in wheat, cotton and potatoes.

Wheat plants, Marshall variety, were sprayed twice with [*phenyl*-^{14}C]parathion at 1.3 kg ai/ha with a 7-day interval between treatments, beginning approximately 15 days before the expected harvest (Hubert, 1988a). Samples of chaff, foliage and grain were taken 1, 3 and 7 days after each treatment and examined for ^{14}C content (Table 5). Residues were present in the grain, but at much lower levels than in the chaff or foliage. The second spraying increased the residues from the first spraying.

Table 5. Levels of ^{14}C in chaff, grain and foliage from wheat plants treated twice with [*phenyl*-^{14}C]parathion at 1.3 kg ai/ha (Hubert, 1988a).

Day	^{14}C expressed as parathion, mg/kg					
	Chaff		Grain		Foliage	
-1	0.04	ndr	ndr	0.007	0.017	ndr
1st spraying						
1	66	169	1.4	5.2	20	47
3	86	107	1.6	3.7	24	36
7	62	75	3.4	5.1	21	22
2nd spraying						
8	164	178	3.3	6.0	70	79

Day	^{14}C expressed as parathion, mg/kg					
	Chaff		Grain		Foliage	
10	111	188	3.0	9.8	47	78
14	234	318	6.7	10	86	111

ndr: no detectable residue

Hubert (1989) identified the components of the ^{14}C residue in the treated wheat plants (day 14, Table 5). Methanol/water extracts of the plant tissues were subjected to mild acid hydrolysis. The total accountable ^{14}C in the straw (previously termed foliage) chaff and seed was in the range of 94-99.5%, but 5.5-17% was not extracted. The composition of the residue was determined by TLC and HPLC. The compounds identified by HPLC are shown in Table 6. TLC also identified small amounts of *p*-nitrophenyl phosphate. Parathion itself constituted the main part of the residue in all the samples.

Table 6. Composition of the residue in extracts of straw, chaff and seed from wheat plants treated twice with [*phenyl*-^{14}C]parathion at 1.3 kg ai/ha (Hubert, 1989).

Compound	straw		chaff		seed	
	% of ^{14}C	mg/kg as parathion	% of ^{14}C	mg/kg as parathion	% of ^{14}C	mg/kg as parathion
parathion	51	66	62	197	65	6.7
p-nitrophenol	5.4	6.9	3.9	12	6.1	0.63
paraoxon	3.3	4.2	3.7	12	1.2	0.13
S-phenyl parathion	2.5	3.2	2.6	8.2	0.7	0.073
S-ethyl parathion or *p*-amino-parathion	2.2	2.8	1.4	4.4	0.7	0.073
O-ethyl *p*-nitrophenyl phosphorothioate	3.7	4.7	4.0	13	4.1	0.43
p-nitrophenyl ß-D-glucopyranoside	1.1	1.4	3.2	10	4.6	0.48

Sanger (1993) further examined the residue, especially the unextractable fractions in straw and grain using more vigorous solubilizing techniques. ^{14}C was found in protein, pectin, lignin, hemicellulose and cellulose. Small amounts of parathion and paraoxon were released from the lignin fraction of the straw. Parathion was confirmed as the major part of the residue, but some of the compounds identified as metabolites in the earlier study were not found.

Table 7. Compounds identified in grain and straw from wheat plants treated twice with [*phenyl*-^{14}C]parathion at 1.3 kg ai/ha (Sanger, 1993).

Compound	^{14}C expressed as parathion, mg/kg	
	grain	straw
parathion	6.6	46
p-nitrophenol	0.79	13
paraoxon	none	1.2
4-acetylaminophenyl diethyl phosphate	none	1.0
O-ethyl p-nitrophenyl phosphorothioate	0.027	none
p-aminophenol	0.086	none
sugar conjugate of *p*-nitrophenol	0.041	0.73
complex polar metabolites (5+ TLC origin)	0.47	14
Total ^{14}C (measured)	9.7	115

Hubert (1988b) sprayed cotton plants twice at a 7-day interval with [*phenyl*-^{14}C]parathion at 1.7 kg ai/ha and sampled the plants 0, 7, 14, 28 and 56 days after the first application for measurement of ^{14}C. Residues in the seed were very low compared with levels on the leaves (Table 8).

Table 8. Levels of ^{14}C in cotton calyx, seed and leaves of plants sprayed twice at a 7-day interval with [*phenyl*-^{14}C]parathion at 1.7 kg ai/ha (Hubert, 1988b).

Day	^{14}C expressed as parathion, mg/kg		
	calyx	seed	leaves
1st spraying			
0	0.84	ndr	24
7	0.59	0.005	13
2nd spraying			
7	0.74	ndr	27
14	0.98	0.019	23
28	0.70	0.019	52
56	1.96	0.039	52

ndr: no detectable residue

Hubert (1990) extracted the cotton calyx, seed and leaves (day 14 samples, Table 8) with methanol + water and treated the remaining material with ethanolic hydrochloric acid. Compounds in the leaf and calyx extracts were identified by TLC and HPLC. Residues in the seed were too low for identification. The ^{14}C was accounted for by 62% extracted and 35% unextractable in the leaves, 59% extracted and 37% unextractable in the calyx and 46% extracted and 60% unextractable in the seed. Parathion was the main residue (Table 9).

Table 9. Compounds identified in the calyx and leaves of cotton plants treated twice with [*phenyl*-^{14}C]parathion at 1.7 kg ai/ha (Hubert, 1990). .

Compound	^{14}C expressed as parathion, mg/kg	
	calyx	leaves
parathion	0.55	14
p-nitrophenol	0.16	1.4
paraoxon	0.080	1.2
S-phenyl parathion	0.077	1.1
S-ethyl parathion or *p*-amino-parathion	0.13	0.76
O-ethyl *p*-nitrophenyl phosphorothioate	0.094	2.5
p-nitrophenyl ß-D-glucopyranoside	0.043	0.71

Potato plants were sprayed twice with [*phenyl*-^{14}C]parathion at 3.0 kg ai/ha 15 and 30 days before harvest (Larson, 1990). At harvest most of the ^{14}C remained in the stems and foliage (20-31 mg/kg, n=12) with small amounts in the tubers (0.093-0.14 mg/kg, n=12).

Approximately 50% of the ^{14}C in the tubers was extracted with methanol + water and another 28% was released by hydrochloric acid hydrolysis. About 1% was identified by TLC as parathion and 10% as *p*-nitrophenol. Attempts at further identification were unsuccessful; the ^{14}C was generally in polar material and at a low level and the extracts contained substantial concentrations of endogenous compounds. Major components of the ^{14}C residue in the foliage and stems were parathion (8 mg/kg, 27% of the ^{14}C), *O*-ethyl *p*-nitrophenyl phosphorothioate (5.3 mg/kg), *p*-nitrophenol (3.2 mg/kg) and *p*-aminoparathion (2.9 mg/kg). Metabolic pathways are shown in Figure 2.

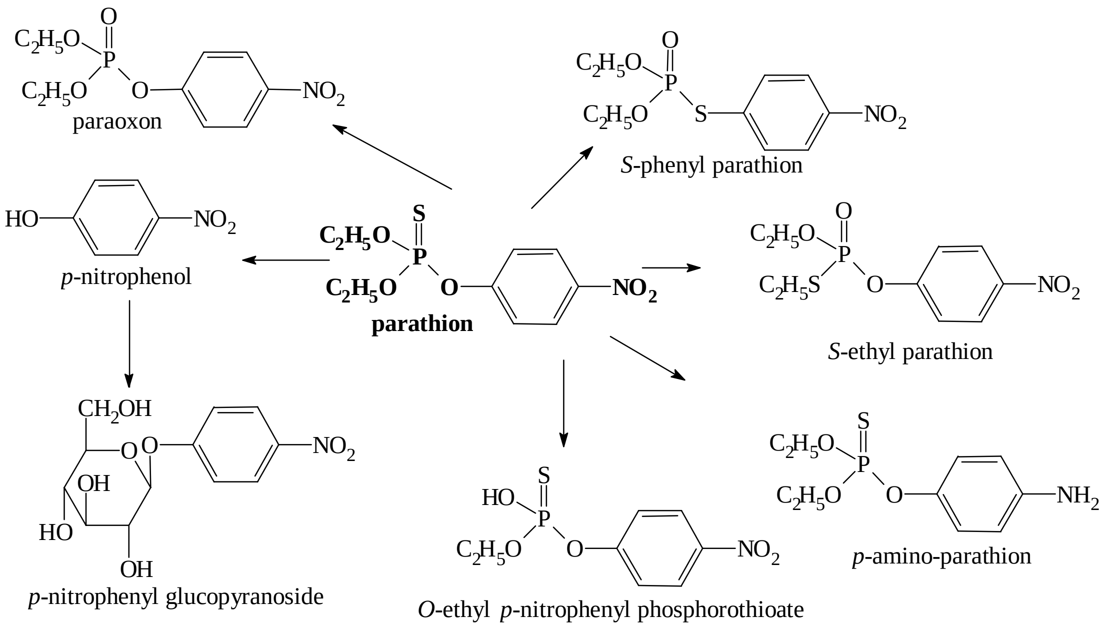


Figure 2. Metabolism of parathion by plants.

Environmental fate in soil

The Meeting received information on the aerobic and anaerobic degradation of parathion in soil.

Cranor (1989a) incubated [*phenyl*-^{14}C]parathion in the dark at 25°C in a sandy loam soil at a dose of 10 mg/kg for 12 months under aerobic conditions. The moisture in the soil was maintained at 70% field capacity. Volatiles were collected and soil samples were taken periodically for analysis. The sandy loam soil was microbiologically active with the following characteristics: 1.6% organic matter, 64% sand, 20% silt, 16% clay and pH 6.2. The total ^{14}C recovered was in the range 97-105% in the first 6 months, decreasing to 88% at 12 months.

The half-life for the disappearance of parent parathion was 58 days. Levels of the primary metabolites paraoxon and nitrophenol always remained much less than the level of parent parathion, suggesting that parathion would normally be the main residue. After 1 month and 1 year 9.8% and 44% respectively of the residue had been mineralized. After 12 months 37% of the dose remained in the soil as unextractable material.

Table 10. Residues from aerobic incubation of [*phenyl*-^{14}C]parathion in the dark at 25°C in a sandy loam soil at a dose of 10 mg/kg for 12 months (Cranor, 1989a).

Day	^{14}C, mg/kg expressed as parathion				CO_2, cumulative % of dose
	parathion	*p*-nitrophenol	paraoxon	bis(4-nitrophenyl) ethyl phosphate	
0	9.4	0.058	0.097	0	0.2
7	8.8	0.073	0.073	0	2.2
14	7.1	0.28	0.14	0	5.0
31					9.8
61	3.0	0.050	0.15	0.10	20
92					28
122	1.5	0.021	0.080	0.20	32
183	0.87	0	0.097	0.20	37
275					41
366	0.15				44

Cranor (1990) further investigated the unextractable residues from the previous study. Soil samples were subjected to more vigorous treatments and extractions. Extracts from refluxing the bound residues with acidified aqueous acetonitrile produced traces of parent parathion. The day-10 soil sample released 0.82 mg/kg ^{14}C (expressed as parathion) of which 64% was parathion, while the day-275 soil released 1.1 mg/kg ^{14}C of which 17% was parathion. Incorporation of ^{14}C into humic acid (0.30 mg/kg), fulvic acid (1.8 mg/kg) and humin (0.64 mg/kg) was also demonstrated for the day 275 soil.

Cranor (1989b) incubated [*phenyl*-^{14}C]parathion in the dark at 25°C in the same sandy loam soil at a dose of 10 mg/kg for 12 months under anaerobic conditions. The soil had been flooded with well water and aged anaerobically for more than 30 days in preparation before dosing. Soil samples were taken periodically during the study for analysis. ^{14}C volatiles evolved during the incubation were negligible. The total recovered ^{14}C was in the range 92-110% of the dose.

The half-life for the loss of parathion calculated for the first 0.5-6 hours was 13 hours (Table 11), but became much longer after 24 hours, suggesting that part of the parathion became bound or less available for microbial attack. A small part of the dose was converted to *p*-nitrophenol and a trace of paraoxon, but a large part was converted to unextractable residues (Table 12). Bis(4-nitrophenyl) ethyl phosphate was also detected as a minor product. The ^{14}C in the aqueous phase was consistently less than in the soil.

Table 11. Disappearance of parathion during anaerobic incubation at 25°C in the dark of soil with an initial dose of 10 mg/kg [*phenyl*-^{14}C]parathion (Cranor 1989b).

Hours after dosing	Parathion as % of dose		
	soil extract	aqueous phase	Total
0.5	51	28	79
1.0	49	26	75
2.0	49	22	71
3.0	30	35	64
4.0	52	22	74
6.0	27	28	55
24.	21	12	33
72	20	8.4	28

Table 12. Formation of degradation products and bound residues during anaerobic incubation at 25°C in the dark of soil with an initial dose of 10 mg/kg [*phenyl*-^{14}C]parathion (Cranor 1989b).

Day	Concentration expressed as % of dose		
	p-nitrophenol	paraoxon	bound residues
0	2.4	0	1.3
1	9.2	0	16
3	8.6	0	36
5	6.4	0	42
7	5.4	0	49
10	7.2	0	52
14	7.8	0	53
31	6.2	0	62
61	3.8	0	77
92	2.1	1.7	89
123	0.7	0.9	86
183			84
274			82

Day	Concentration expressed as % of dose		
	p-nitrophenol	paraoxon	bound residues
366			76

Cranor (1992a) further investigated the nature of the unextractable residues from the previous study. Soil fractions were extracted under more vigorous conditions, including refluxing with acidified aqueous acetonitrile, following which the remaining soil containing the unextracted ^{14}C was separated into humic acid, fulvic acid and humin fractions. Small amounts of parathion were released by the vigorous extraction, but most of the released ^{14}C was in polar material. The ^{14}C in the humic acid + fulvic acid + humin fractions amounted to 28% of the dose in both day 7 and day 31 samples. The results show that ^{14}C was rapidly incorporated into the biomass of the soil by day 7.

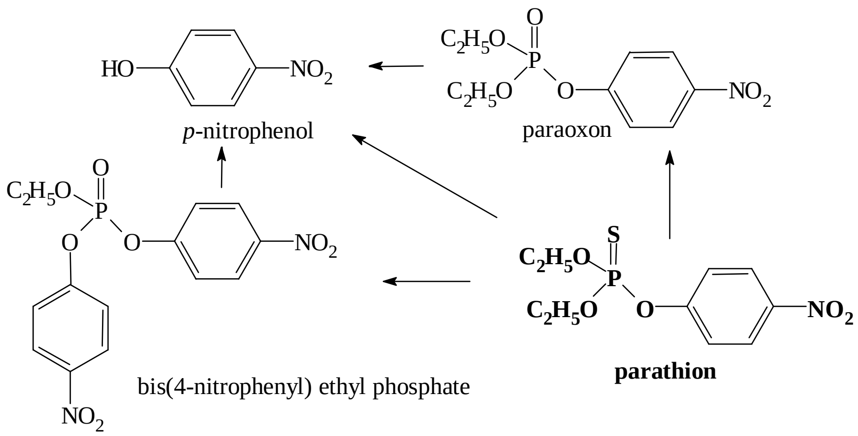


Figure 3. Degradation of parathion in soil.

Environmental fate in water/sediment systems

The Meeting received information on the aerobic degradation of parathion in a flooded soil.

Cranor (1989c) incubated [*phenyl*-^{14}C]parathion at a nominal dose of 10 mg/kg soil on a microbiologically active sandy loam soil flooded with well water under aerobic conditions in the dark at 25°C for 1 month. After 31 days parathion accounted for 2.5% of the dose, and evolved CO_2 for 3.0%. The sandy loam soil was characterized, as before, as 1.6% organic matter, 64% sand, 20% silt, 16% clay and pH 6.2. Total ^{14}C recovery was in the range 94-102%. The disposition of the residue with time is shown in Table 13.

Parathion disappeared quickly, with an initial half-life of 2.4 days (calculated on 0-14 days data). Half of the initial dose had become unextractable within 14 days. Analyses by TLC and by HPLC for *p*-nitrophenol and paraoxon differed substantially and identifications were therefore labelled as tentative.

When Cranor (1992b) re-examined the samples, HPLC analysis of samples at day 10 confirmed the identifications of parathion and *p*-nitrophenol by matching retention times with standards. A large HPLC peak in day 10 samples corresponding to 24% of the administered dose had been previously tentatively identified as paraoxon, but was shown not to be so. Identification by GC-MS was not possible, but the mass spectrum suggested a *p*-nitrophenol component. More vigorous extraction of day 10 and day 31 samples released more ^{14}C compounds from the unextractable residues including traces of parathion. ^{14}C was shown to be incorporated into fulvic acid and humic acid.

Table 13. Parathion and degradation products from incubation of [*phenyl*-^{14}C]parathion at a nominal dose of 10 mg/kg of soil flooded with well water under aerobic conditions in the dark at 25°C (Cranor, 1989c).

Day	Residue expressed as % of dose									
	extractable + aqueous residues	unextractable residues	cumulative volatiles	parathion		*p*-nitrophenol		paraoxon		*O,O*-bis(4-nitrophenyl) ethyl phosphate
				HPLC	TLC	HPLC	TLC	HPLC	TLC	HPLC
0	94	0.15	0	89	87	0	0	-[3]	0	0
5	77	20	0.95	39 [1]	37	3.2 [1]	19		0	0
7	70	27	1.4	2.6 [2]	16	5.6 [2]	27		0	
14	50	50	2.3	0 [2]	1.6	0 [2]	23		0.41	
21	43	54	2.6	0 [1]	3.2	0 [1]	15		0	1.4
31	39	60	3.0	0.8	2.5	0.6	12		0	1.6

[1] soil extract only
[2] water phase only
[3] original tentative HPLC identification of paraoxon could not be substantiated on re-examination

METHODS OF RESIDUE ANALYSIS

Analytical methods

The Meeting received information on analytical methods for determining residues of parathion, paraoxon and *p*-nitrophenol in supervised trials and suitable for enforcement.

Cassidy (1991) described such a method for a wide variety of raw agricultural and processed commodities. A solution of 100 ml of methanol + water + HCl is added to a finely divided sample of 25 g and thoroughly blended, then transferred with washings and rinsings to a round-bottom flask, refluxed gently for 30 minutes, cooled and filtered. The filtrate is transferred to a rotary evaporator and the methanol evaporated. The residual aqueous solution is treated with saturated sodium chloride and the residues extracted into ethyl acetate, which is dried with sodium sulfate and evaporated to 5-20 ml. This solution is analysed by GLC with an FPD in the P mode for parathion and paraoxon. An additional Florisil and C-18 Sep-Pak clean-up is required for *p*-nitrophenol residues before determination by HPLC with UV detection.

The LOQ was generally 0.05 mg/kg. Analytical recoveries were generally in the 80-90% range from numerous samples, many fortified at or about 0.05 mg/kg, in 3 laboratories on a wide range of substrates.

The method has been used on 39 different substrates including vegetables, nuts, forage, hay, olives, processed commodities and wheat, and tested for interferences from 230 pesticides. Eight compounds showed possible interference: dioxathion, phosphamidon, malathion and chlorpyrifos methyl had retention times close to paraoxon, and fenthion, chlorpyrifos and fensulfothion to parathion. The interference study was reported in detail by Szorik (1991).

The acid reflux extraction was introduced because the metabolism studies on wheat straw and grain demonstrated that acid released an additional 10-25% of parathion and paraoxon. Comparison of the reflux extraction with and aqueous methanol extraction of sweet peppers and celery at room temperature did not result in significant differences, suggesting that cold neutral extraction is also generally suitable.

Sub-samples from the metabolism studies were analysed for parathion, paraoxon and *p*-nitrophenol and the results compared with levels derived from the HPLC measurements of ^{14}C (Table 14). The analysed sub-samples were not identical to those in the metabolism studies although from the same sampling period. The agreement for parathion is good in wheat commodities, but not in cotton leaves. The agreement for paraoxon in wheat grain is poor, but this was likely to be the result of oxidation of a small amount of parathion during storage (the wheat samples had been stored after blending) (Szorik, 1989).

Table 14. Comparison of residues found in plant metabolism studies determined by HPLC measurement of ^{14}C and by the analytical method of Cassidy, 1991 (Szorik, 1989).

Sample	Residues, mg/kg					
	parathion		paraoxon		*p*-nitrophenol	
	^{14}C HPLC	Cassidy method	^{14}C HPLC	Cassidy method	^{14}C HPLC	Cassidy method
wheat straw (forage)	41.0	30.3	2.51	2.51	2.07	1.20
wheat chaff	147	102	8.25	16.8	4.39	2.65
wheat grain	3.97	4.30	0.07	0.35	0.18	0.23
cotton leaves	19.1	5.70	1.57		0.92	
cotton calyx	0.27	0.18	0.031	<0.05	0.032	<0.05

Validation data were reported for wheat straw, grain and flour and sunflower seed oil (Sparacino, 1992). Recoveries were generally satisfactory at the levels tested: 0.05-2 mg/kg for parathion and 0.05-0.5 mg/kg for paraoxon. A confirmatory method using capillary GC-MS was also tested on wheat grain and proved satisfactory for parathion over the range tested (0.05-2 mg/kg). For paraoxon there was too much interference at 0.05 mg/kg and recoveries were 150-170% at 0.2-0.5 mg/kg.

Norby (1993a) provided validation data for a modification of the Cassidy method with an LOQ of 0.02 mg/kg for parathion and paraoxon in wheat grain, straw, forage, bran, flour, and milled samples. Lower sample weights were used for processed commodities and a capillary GC column for improved chromatography. Recoveries were generally 80-110%, with those of paraoxon at 0.02 mg/kg towards the higher end of the range.

Norby (1993b) validated the method for sorghum forage, fodder, grain, stover and flour. The LOQ for parathion and paraoxon was 0.05 mg/kg in sorghum forage and fodder and 0.02 mg/kg in the other commodities. Recoveries at spiking levels from the LOQs to 5 mg/kg were generally 80-110%.

Norby (1993c) tested the same method on canola seed, crude oil, refined oil, processing waste and meal. Recoveries at 0.02 mg/kg were often unacceptably high, so the LOQ for the 5 substrates was 0.05 mg/kg. Recoveries at spiking concentrations of 0.05-5 mg/kg were satisfactory at 74-110% for parathion and 81-116% for paraoxon.

Bower and Gillis (1996) validated a method with an LOQ of 0.01 mg/kg for residues of parathion and paraoxon in apples and grapes. Samples were extracted with acetone + water and the mixture filtered, evaporated to leave an aqueous solution, then treated with saturated sodium chloride and extracted with dichloromethane. The dichloromethane was evaporated and the residue taken up in methanol for clean-up on a C-18 column, then transferred to ethyl acetate for analysis by GLC with an FPD in the P-mode. Recoveries of parathion and paraoxon were generally 80-110% at levels of 0.01-2.0 mg/kg.

Nishioka (1996) described the Leoni method for determining residues of parathion, paraoxon and 4-acetylaminophenyl diethyl phosphate in animals and animal products. Goat liver is extracted with acetone and the filtered extract diluted, cleaned up by dichloromethane/water partition, and further purified on carbon/Celite and C-18 columns. The residues are determined by capillary GLC with an FPD in the P mode. The procedure is modified slightly for milk and fat. The LOQ for parathion and paraoxon in liver and fat was 0.05 mg/kg, and for 4-acetylaminophenyl diethyl phosphate 0.1 mg/kg. Residues in the tissues and milk from the goat and hen metabolism studies determined by ^{14}C measurement and the Leoni analytical method were in good agreement (Table 15).

Table 15. Residues from metabolism studies on goats and hens determined by radiotracer and Leoni methods (Nishioka, 1996).

Compound	Residue, mg/kg					
	goat liver		goat milk		hen fat	
	^{14}C HPLC	Leoni	^{14}C HPLC	Leoni	^{14}C HPLC	Leoni
parathion	<0.05	<0.05	<0.05	<0.05	0.138	0.122
paraoxon	<0.05	<0.05				
4-acetylaminophenyl diethyl phosphate	0.848	0.730	0.360	0.390		

Williams (1998) used a similar method for determining residues in milk and kidneys. The LOQs for parathion and paraoxon were 0.001 mg/kg in milk, and recoveries from milk spiked at 0.001 and 0.002 mg/kg were 83-96% (n=12) for parathion, 80-102% (n=12) for paraoxon and 17-90% (n=12) for 4-acetylaminophenyl diethyl phosphate. Two milk samples contained small amounts of 4-acetylaminophenyl diethyl phosphate, which affected the recoveries at 0.001 mg/kg (subtraction of control values from measured recoveries) and an LOQ of 0.001 or 0.002 was not demonstrated. The LOQ was 0.01 mg/kg for kidney, with recoveries from samples spiked at 0.01 and 0.02 mg/kg of 87-117% for parathion (n=4), 73-98% (n=4) for paraoxon and 71-91% (n=4) for 4-acetylaminophenyl diethyl phosphate.

Parathion 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). Detection is 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 data on the stability of residues in snap beans, kidney beans, cotton seed, strawberries, plums, apples, sunflower seed, almond kernels, spinach, green peppers, oranges, clover, canola seed, crude canola oil, canola meal, canola processing waste, sorghum flour, maize and processed maize commodities stored frozen.

Keller (1992) stored ground 25 g samples of snap beans, kidney beans and cotton seed, fortified at 1 mg/kg with parathion, paraoxon and *p*-nitrophenol, at approximately -20°C for up to 2 years. (The *p*-nitrophenol stability was tested but is not reported). Procedural recoveries validated the analytical results at each sampling interval. The results are shown in Table 16. The residues were stable except those of paraoxon in snap beans which had decreased substantially in samples stored for 12 months.

Table 16. Stability of parathion and paraoxon in snap beans, kidney beans and cotton seed fortified at 1 mg/kg and stored at approximately -20°C (Keller, 1992). The % remaining is not adjusted for procedural recoveries.

Months storage	Snap beans				Kidney beans				Cotton seed			
	parathion		paraoxon		parathion		paraoxon		parathion		paraoxon	
	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov
0	80	75	74	74	89	70	89	82	80	80	92	97
1	90	100	97	113	88	89	95	93	86	84	92	91
2	80	90	84	94	80	76	87	87	84	87	98	98
3	102	100	109	112	77	75	80	79	85	90	104	109
4	90	102	74	106	82	77	88	88	78	80	93	98
6	89	91	121	115	80	95	83	112	98	91	67	97
12	96	93	31	98	96	96	95	103	96	95	102	105
18	87	94	26	102	96	96	99	106	74	80	104	104
24	84	92	29	99	79	84	78	94	73	72	88	90

Price (1991) tested the stability of parathion, paraoxon and *p*-nitrophenol added together at 1 mg/kg to ground samples of a number of commodities in 50 g lots and stored at approximately -20°C for up to 24 months. A decrease of less than 30% would not be distinguished from the variability of the analytical method. Parathion in almond kernels and oranges and paraoxon in spinach decreased to slightly below 70% of the initial level. Decreases of parathion may obscure losses of paraoxon if parathion has been converted to paraoxon. The results of the analyses for parathion and paraoxon are shown in Table 17.

Table 17. Stability of parathion and paraoxon in strawberry, plum, apple, sunflower seeds, almond kernels, spinach, green peppers, orange and clover fortified at 1 mg/kg and stored at approximately –20°C (Price, 1991). The % remaining is not adjusted for procedural recoveries.

Months	parathion		paraoxon		parathion		paraoxon		parathion		paraoxon	
	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov
	Strawberry				Plum				Apple			
0	110	96	101	90	104	98	94	87	105	103	80	79
1	104	106	93	95	105	108	93	95	102	104	83	84
2	103	110	96	106	108	111	107	105	98	103	84	92
3	100	104	100	103	101	104	98	100	91	95	83	89
4	98	97	97	91	94	90	88	84	98	107	88	97
6	105	96	98	104	105	100	110	110	94	96	85	97
12	92	98	76	89	110	96	95	90	89	99	64	81
18	85	87	90	98	84	92	99	110	90	92	96	95
24	79	80	96	102	87	86	103	116	85	72	105	100
	Sunflower seed				Almond kernel				Spinach			
0	92	95	94	105	82	87	91	92	98	83	107	89
1	86	88	89	103	74	87	89	92	84	96	98	106
2	84	93	107	119	74	72	87	101	77	84	91	106
3	74	80	86	100	74	84	98	94	87	94	89	100
4	73	74	80	81	74	77	86	83	97	85	82	101
6	84	82	84	97	66	79	79	90	91	95	78	103
12	75	85	73	89	75	84	87	88	100	93	67	89
18	82	79	94	91	68	84	110	115	60	81	84	113
24	74	96	92	117	65	87	100	111	95	100	72	118
	Green peppers				Orange				Clover			
0	86	77	84	80	103	99	99	95	81	85	110	101
1	75	84	78	98	90	96	94	96	88	87	103	104

Months	parathion		paraoxon		parathion		paraoxon		parathion		paraoxon	
	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov
2	81	95	89	101	83	89	92	98	88	74	114	106
3	88	84	90	96	82	82	98	95	84	82	81	106
4	87	89	73	94	80	81	78	83	95	85	95	113
6	82	98	66	92	85	74	93	91	88	87	85	102
12	84	94	45	80	92	93	80	84	99	100	82	105
18	93	82	69	89	71	72	100	104	105	104	73	98
24	74	80	83	85	68	87	80	114	89	92	77	102

Owen (1995) fortified homogenized canola seed and its processed commodities with parathion, paraoxon, parathion-methyl and paraoxon-methyl, and sorghum flour with parathion and paraoxon, all samples with 1 mg/kg of each compound. The analyses for parathion-methyl and paraoxon-methyl are not reported here. Sub-samples of 10 g each were stored in individual 250 ml bottles at -5°C, and duplicate bottles were withdrawn at intervals for analysis (Table 18). Parathion residues were generally stable for the duration of the study except in canola meal, where the stability was marginal. Paraoxon had decreased after 6 and 14 months in canola crude oil where recoveries were poor at 6 months and divergent duplicates of 38% and 108% occurred in the 14-month samples.

Table 18. Stability testing of parathion and paraoxon in canola commodities and sorghum flour fortified at 1 mg/kg and stored at -5°C (Owen, 1995). The reported % remaining is not adjusted for procedural recoveries.

Storage period	parathion		paraoxon		parathion		paraoxon		parathion		paraoxon	
	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov
	Canola seed				Canola crude oil				Canola meal			
0	77	80	82	85	88	89	95	96	80	78	90	86
30 days	96	93	99	105	87	89	101	104	87	85	100	105
3 months	89	91	82	96	75	79	75	79	79	81	84	86
5 months	87	92	87	100	85	95	81	87	99	97	111	103
6 months	82	86	72	87	76	84	69	72	76	84	77	86
14 months	77	88	51	76	82	85	38 108	58	67	89	67	92
	Canola processing waste				Sorghum flour							
0	84	80	77	75	94	99	95	99				
30 days	87	89	80	89	93	96	91	96				
3 months	81	84	81	86	87	91	86	96				
5 months	83	89	69	74								
6 months	83	84	76	82	83	91	80	88				
12 months					104	110	102	110				
14 months	86	94	84	104								
19 months					94	90	92	101				

McKinney and Crotts (1998) tested the stability of residues of parathion and paraoxon in untreated control samples from a maize processing study. Well-mixed samples (10 g for grain, grits and meal, 2 g for oil, 25 g for starch and flour) were weighed into glass jars, individually and separately fortified with parathion and paraoxon at 0.10 mg/kg, and stored at or below -10°C. The initial day zero and procedural recovery values are the means of the same 3 analyses. At other times the % remaining value is the mean result from duplicate samples and the procedural recovery is determined at 0.10 mg/kg.

Residues of parathion and paraoxon in maize commodities were stable during 4 months of freezer storage, but a decrease of less than 30% would not have been evident at 0.1 mg/kg.

Table 19. Stability of parathion and paraoxon in maize commodities fortified at 0.1 mg/kg and stored at -10°C (McKinney and Crotts, 1998). The reported % remaining is not adjusted for procedural recoveries.

Storage period	parathion		paraoxon		parathion		paraoxon		parathion		paraoxon	
	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov	% remain	% proced recov
	Maize grain				Maize flour				Maize starch			
0 day	73	73	81	81	98	98	97	97	95	95	109	109
1 month	68	68	77	75	108	109	112	118	97	100	100	94
2 months	76	70	75	84	90	92	99	92	96	95	100	100
4 months	90	90	73	97	97	106	78	105	78	77	87	99
	Maize oil				Corn grits				Maize meal			
0 day	102	102	97	97	79	79	80	80	72	72	85	85
1 month	102	107	103	117	68	77	76	93	73	79	73	84
2 months	85	89	93	96	72	82	69	88	68	73	68	81
4 months	103	106	101	111	77	79	68	89	84	72	62	74

Definition of the residue

Parathion and paraoxon are the main components. Parathion is the major part of the residue at shorter intervals and at the higher levels. At low levels in some circumstances paraoxon may constitute a significant proportion of the residue. There were 227 cases where both parathion and paraoxon levels exceeded the LOQ in trials according to GAP on food and feed commodities. There was generally a close relation between the combined residue level and the parathion level.

The Meeting recommended that the definition of the residue for compliance with MRLs should continue to be parathion and for the estimation of dietary intake the sum of parathion and paraoxon expressed as parathion.

The log P_{ow} of 3.2 and the results of the animal metabolism studies suggest that parathion is at the borderline of fat-solubility. In the goat metabolism study parathion residues in the renal fat, 0.15 mg/kg, were substantially higher than in the muscles, 0.019 mg/kg, but were 0.56 mg/kg in the liver and 0.48 mg/kg in kidney.

The Meeting recommended that parathion should be described as fat-soluble.

USE PATTERN

Parathion is an anti-cholinesterase compound used as a non-systemic insecticide and acaricide to control sucking and chewing insects in a wide range of agricultural and horticultural crops.

Information on registered uses was reported to the Meeting and is shown in Table 20.

Table 20. Registered uses of parathion.

Crop	Country	Form.	Application				PHI, days
			Method[1]	Rate, kg ai/ha	Spray conc. kg ai/hl	Number	
Agricultural and horticultural crops	Netherlands	EC, GR	soil treatment in glasshouse	0.8-5.0		1	note[1]
Alfalfa	Germany	EC	foliar	0.11	0.018	2	21
Alfalfa	USA	EC 960 g/l	foliar (	0.28-0.56			15
Almond	France	EC 93 g/l	foliar		0.019		15
Apple[2]	France		foliar		0.019-0.025		14
Apricot	France	EC 93 g/l	foliar		0.019		15
Artichoke	Italy	EC 185 g/l	foliar		0.03-0.04		20
Artichoke	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Asparagus	Italy	EC 185 g/l	foliar		0.03-0.04		20
Asparagus	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Barley	Germany	EC	bait	0.051-0.15		2	
Barley	Germany	EC	cutworm bait	0.10		1	28
Barley	Germany	EC	foliar	0.11	0.018-0.028	1	21
Barley	Germany	EC	spray	0.15-0.23	0.025-0.038	2	note[3]
Barley	USA	EC 960 g/l	foliar (	0.28-0.84			15[4]
Broad beans	Germany	EC	cutworm bait	0.10		1	14
Broad beans	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Broccoli	Germany	EC	cutworm bait	0.10		1	14
Broccoli	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Brussels sprouts	Germany	EC	cutworm bait	0.10		1	14
Brussels sprouts	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Bulb vegetables	Italy	EC 185 g/l	foliar		0.03-0.04		20
Bulb vegetables	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Cabbage	France	EC 100 g/l	foliar		0.02		15
Cabbage	France	EC 30 g/l	foliar		0.02		15
Cabbage	France	EC 30 g/l + oil	foliar	0.23			15
Cabbage	Italy	EC 185 g/l	foliar		0.03-0.04		20
Cabbage	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Cauliflower	Germany	EC	cutworm bait	0.10		1	14
Cauliflower	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Cereals	Italy	EC 185 g/l	foliar		0.03-0.04		20
Cereals	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Cherries	France	EC 93 g/l	dormant spray		0.047		
Cherries	France	EC 30 g/l + oil	foliar		0.023		15
Cherries	France	EC 93 g/l	foliar		0.019		15
Chinese cabbage	Germany	EC	cutworm bait	0.10		1	14
Chinese cabbage	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Citrus fruit	France	EC 93 g/l	foliar		0.023		15
Citrus fruits	Greece	EC 200 g/l	foliar		0.016-0.024		14
Citrus fruits	Italy	EC 185 g/l	foliar		0.02-0.04		20
Citrus fruits	Italy	EC 185 g/l	foliar + mineral oil		0.02-0.04		30
Citrus fruits	Spain	EC 30 g/l	winter spray		0.022-0.06		
Citrus fruits	Spain	EC 50 g/l	winter spray		0.05		
Citrus fruits	Uruguay	CS 560 g/l	foliar + 1% oil		0.067-0.078		15

[1] Before planting or sowing or at an early stage of crop development.

[2] Information from Index Phytosanitaire ACTA, 36th edition.

[3] Barley, oats, rye, triticale, wheat. Treatment at beginning of infestation, autumn and spring.

[4] Application rate 0.11 kg ai/ha for plants <50 cm. Application rate 0.16 kg ai/ha for plants >50 cm.

[5] Wheat, barley. Do not apply within 15 days of harvest, cutting or forage use.

Crop	Country	Form.	Application				PHI, days
			Method[1]	Rate, kg ai/ha	Spray conc. kg ai/hl	Number	
Climbing French beans	Germany	EC	cutworm bait	0.10		1	14
Climbing French beans	Germany	EC	foliar[1]	0.11-0.21	0.018	2	14
Clover	Germany	EC	foliar	0.11	0.018	2	21
Cotton	Greece	EC 200 g/l	foliar		0.016-0.024		14
Cotton	USA	EC 960 g/l	foliar (	0.28-1.1			7[2]
Crucifers	France	EC 100 g/l	foliar	0.30			15
Cucumbers	Germany	EC	cutworm bait	0.10		1	14
Cucumbers	Germany	EC	foliar	0.11	0.018	2	14
Currants	France	EC 93 g/l	foliar		0.019		15
Currants	Germany	EC	foliar	0.26	0.017	2	14
Dwarf French beans	Germany	EC	cutworm bait	0.10		1	14
Dwarf French beans	Germany	EC	foliar	0.11	0.012-0.018	2	14
Figs	France	EC 93 g/l	foliar		0.019		15
Fodder beet	Germany	EC	bait	0.051-0.15		2	
Fodder beet	Germany	EC	foliar	0.11-0.18	0.027-0.044	2	28
Fruit trees	France	EC 100 g/l	dormant spray		0.15		
Fruiting vegetables	Italy	EC 185 g/l	foliar		0.03-0.04		20
Fruiting vegetables	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Garden peas	Germany	EC	cutworm bait	0.10		1	14
Garden peas	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Gooseberries	Germany	EC	foliar	0.26	0.017	2	14
Grapes	France	EC 30 g/l + oil	dormant spray		0.045		
Grapes	Greece	EC 200 g/l	foliar		0.016-0.024		14
Grapes	Italy	EC 185 g/l	foliar		0.02-0.04		20
Grapes	Italy	EC 185 g/l	foliar + mineral oil		0.02-0.04		30
Grapes	Spain	EC 30 g/l	winter spray		0.022-0.06		
Grapes	Spain	EC 50 g/l	winter spray		0.05		
Grapes [2]	France		foliar		0.020		35
Kale	Germany	EC	cutworm bait	0.10		1	14
Kale	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Kohlrabi	Germany	EC	cutworm bait	0.10		1	14
Kohlrabi	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Leafy vegetables	Italy	EC 185 g/l	foliar		0.03-0.04		20
Leafy vegetables	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Leek	Germany	EC	cutworm bait	0.10		1	14
Leek	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Legume animal feeds	France	EC 93 g/l	foliar		0.019		15
Lettuce	France	EC 100 g/l	foliar		0.02		15
Lettuce	France	EC 30 g/l	foliar		0.02		15
Lettuce	France	EC 30 g/l + oil	foliar	0.23			15
Lettuce	Germany	EC	cutworm bait	0.10		1	14
Lettuce	Germany	EC	foliar	0.11	0.018	2	14
Lupin	Germany	EC	foliar	0.11	0.018	1	21
Maize	Greece	EC 200 g/l	foliar		0.016-0.024		14
Maize	USA	EC 960 g/l	foliar (	0.28-0.84			12[3]
Oats	Germany	EC	bait	0.051-0.15		2	

[1] Application rate 0.11 kg ai/ha for plants <50 cm, 0.16 kg ai/ha for 50-125 cm, 0.21 kg ai/ha for >125 cm.

[2] 15 days PHI if cotton trash is to be used for animal feed.

[3] Maize. Do not apply within 12 days of harvest, cutting or forage use.

Crop	Country	Form.	Application				PHI, days
			Method[1]	Rate, kg ai/ha	Spray conc. kg ai/hl	Number	
Oats	Germany	EC	cutworm bait	0.10		1	28
Oats	Germany	EC	foliar	0.11	0.018-0.028	1	21
Oats	Germany	EC	spray	0.15-0.23	0.025-0.038	2	note[31]
Oats	Uruguay	CS 560 g/l	foliar	0.19-0.24			42
Oilseed	France	EC 100 g/l	foliar	0.20			15
Oilseed rape	France	EC 30 g/l	foliar	0.21-0.30			15
Oilseed rape	France	EC 30 g/l + oil	foliar	0.21-0.30			15
Oilseed rape	France	EC 93 g/l	foliar	0.19-0.28			15
Oilseed rape	USA	EC 960 g/l	foliar (	0.56[2]			28[3]
Olive	Greece	EC 200 g/l	foliar		0.016-0.024		60
Olive	Italy	EC 185 g/l	foliar		0.02-0.04		20
Olive	Italy	EC 185 g/l	foliar + mineral oil		0.02-0.04		30
Pasture	Germany	EC	bait	0.075-0.15		2	28
Pasture	Germany	EC	spraying	0.15-0.23	0.025-0.038	2	28
Peach	France	EC 93 g/l	dormant spray		0.047		
Peach	France	EC 100 g/l	foliar		0.020-0.025		15
Peach	France	EC 93 g/l	foliar		0.019		15
Peach	France	EC 30 g/l	foliar		0.025		15
Peach	France	EC 30 g/l + oil	foliar		0.023		15
Peas	France	EC 100 g/l	foliar		0.02		15
Peas	France	EC 30 g/l	foliar		0.02		15
Peas	France	EC 30 g/l + oil	foliar	0.23			15
Plums	France	EC 93 g/l	dormant spray		0.047		
Plums	France	EC 93 g/l	foliar		0.019		15
Pome fruits	France	EC 30 g/l	dormant spray		0.05		
Pome fruits	France	EC 30 g/l + oil	dormant spray		0.045		
Pome fruits	France	EC 93 g/l	dormant spray		0.047		
Pome fruits	France	EC 100 g/l	foliar		0.020-0.025		15
Pome fruits	France	EC 30 g/l	foliar		0.025		15
Pome fruits	France	EC 30 g/l + oil	foliar		0.023		15
Pome fruits	France	EC 93 g/l	foliar		0.019		15
Pome fruits	Greece	EC 200 g/l	foliar		0.016-0.024		14
Pome fruits	Italy	EC 185 g/l	foliar		0.02-0.04		20
Pome fruits	Italy	EC 185 g/l	foliar + mineral oil		0.02-0.04		30
Pome fruits	Spain	EC 30 g/l	winter spray		0.022-0.06		
Pome fruits	Spain	EC 50 g/l	winter spray		0.05		
Pome fruits	Uruguay	CS 560 g/l	foliar		0.034-0.078		15
Potato	Germany	EC	foliar	0.18-0.27	0.045-0.068	3	21
Potato	Greece	EC 200 g/l	foliar		0.016-0.024		14
Potato	Italy	EC 185 g/l	foliar		0.03-0.04		20
Potato	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Potato	Uruguay	CS 560 g/l	foliar	0.28-0.49			15
Rape	Germany	EC	bait	0.051-0.15		2	
Rape	Germany	EC	foliar	0.11	0.018	2	
Red cabbage	Germany	EC	cutworm bait	0.10		1	14
Red cabbage	Germany	EC	foliar[54]	0.11-0.16	0.018	2	14

[1] Barley, oats, rye, triticale, wheat. Treatment at beginning of infestation, autumn and spring.

[2] Spray volume 30-100 l/ha

[3] Rapeseed. Do not graze treated fields or feed treated forage or threshing waste to livestock.

[4] Application rate 0.11 kg ai/ha for plants <50 cm, 0.16 kg ai/ha for 50-125 cm, 0.21 kg ai/ha for >125 cm.

Crop	Country	Form.	Application				PHI, days
			Method[1]	Rate, kg ai/ha	Spray conc. kg ai/hl	Number	
Root vegetables	Italy	EC 185 g/l	foliar		0.03-0.04		20
Root vegetables	Italy	EC 185 g/l	foliar + mineral oil		0.03-0.04		30
Rye	Germany	EC	bait	0.051-0.15		2	
Rye	Germany	EC	cutworm bait	0.10		1	28
Rye	Germany	EC	foliar	0.11	0.018-0.028	1	21
Rye	Germany	EC	spray	0.15-0.23	0.025-0.038	2	note[1]
Savoy cabbage	Germany	EC	cutworm bait	0.10		1	14
Savoy cabbage	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Sorghum	USA	EC 960 g/l	foliar (	0.28-1.1			12[2]
Soybean	USA	EC 960 g/l	foliar (	0.28-0.84			20[3]
Spinach	Germany	EC	cutworm bait	0.10		1	14
Spinach	Germany	EC	foliar	0.11	0.018	2	14
Stone fruits	Greece	EC 200 g/l	foliar		0.016-0.024		14
Stone fruits	Italy	EC 185 g/l	foliar		0.02-0.04		20
Stone fruits	Italy	EC 185 g/l	foliar + mineral oil		0.02-0.04		30
Stone fruits	Spain	EC 30 g/l	winter spray		0.022-0.06		
Stone fruits	Spain	EC 50 g/l	winter spray		0.05		
Stone fruits	Uruguay	CS 560 g/l	foliar		0.034-0.078		15
Strawberry	Germany	EC	foliar	0.36	0.018	1	note[4]
Strawberry	Italy	EC 185 g/l	foliar		0.02-0.04		20
Strawberry	Italy	EC 185 g/l	foliar + mineral oil		0.02-0.04		30
Sugar beet	France	EC 100 g/l	foliar	0.20			15
Sugar beet	France	EC 30 g/l	foliar	0.225			15
Sugar beet	France	EC 30 g/l + oil	foliar	0.23			15
Sugar beet	France	EC 93 g/l	foliar	0.14			15
Sugar beet	Germany	EC	bait	0.051-0.15		2	
Sugar beet	Germany	EC	foliar	0.11-0.18	0.027-0.044	2	28
Sugar beet	Greece	EC 200 g/l	foliar		0.016-0.024		14
Sugar beet	Italy	EC 185 g/l	foliar		0.02		
Sunflower	USA	EC 960 g/l	foliar (	0.56-1.1			30
Sweet corn	USA	EC 960 g/l	foliar (	0.28-0.84			12
Tomato	Germany	EC	cutworm bait	0.10		1	14
Tomato	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Tomato	Uruguay	CS 560 g/l	foliar		0.039		15
Tree nuts	France	EC 93 g/l	foliar		0.019		15
Triticale	Germany	EC	bait	0.051-0.15		2	
Triticale	Germany	EC	cutworm bait	0.10		1	28
Triticale	Germany	EC	foliar	0.11	0.018-0.028	1	21
Triticale	Germany	EC	spray	0.15-0.23	0.025-0.038	2	note[5]
Turnips	Germany	EC	foliar	0.11	0.018	1	21
Vegetables	Greece	EC 200 g/l	foliar		0.016-0.024		14
Vines	France	EC 100 g/l	dormant spray		0.15		
Vines	France	EC 30 g/l	dormant spray		0.05		
Vines	France	EC 93 g/l	dormant spray		0.047		
Vines	France	EC 100 g/l	foliar		0.020-0.025		15
Wheat	Germany	EC	bait	0.051-0.15		2	
Wheat	Germany	EC	cutworm bait	0.10		1	28
Wheat	Germany	EC	foliar	0.11	0.018-0.028	1	21

[1] Barley, oats, rye, triticale, wheat. Treatment at beginning of infestation, autumn and spring.

[2] Sorghum. Do not apply within 12 days of harvest, cutting or forage use.

[3] Soya bean. Do not apply within 20 days of harvest, cutting or forage use.

[4] Strawberries, use at beginning of infestation (biting insects) before flowering or after harvest.

[5] Barley, oats, rye, triticale, wheat. Treatment at beginning of infestation, autumn and spring.

Crop	Country	Form.	Application				PHI, days
			Method[1]	Rate, kg ai/ha	Spray conc. kg ai/hl	Number	
Wheat	Germany	EC	spray	0.15-0.23	0.025-0.038	2	note[1]
Wheat	Uruguay	CS 560 g/l	foliar	0.19-0.24			42
Wheat	USA	EC 960 g/l	foliar (	0.28-0.84			15[2]
White cabbage	Germany	EC	cutworm bait	0.10		1	14
White cabbage	Germany	EC	foliar[5]	0.11-0.16	0.018	2	14
Wine grapes	Germany	EC	foliar	0.03-0.06	0.0075	1	note[3]

(aerial application. The US label states that parathion may only be applied aerially and only by a certified commercial applicator.

RESIDUES RESULTING FROM SUPERVISED TRIALS

The Meeting received information on the following supervised field trials.

Fruits	Table 22.	Grapefruit, lemon, orange
	Table 23.	Apples
	Table 24.	Pears
	Table 25.	Apricots
	Table 26.	Cherries
	Table 27.	Plums and prunes
	Table 28.	Blackberries
	Table 29.	Grapes
	Table 30.	Strawberries
	Table 31.	Olives
Vegetables	Table 32.	Garlic
	Table 33.	Onions
	Table 34.	Broccoli
	Table 35.	Cabbage
	Table 36.	Peppers
	Table 37.	Sweet corn
	Table 38.	Tomatoes
	Table 39.	Field peas
	Table 40.	Kale
	Table 41.	Lettuce
	Table 42.	Spinach
	Table 43.	Snap beans
	Table 44.	Dry beans
	Table 45.	Soya beans
	Table 46.	Carrots
	Table 47.	Potatoes
	Table 48.	Radish
	Table 49.	Sugar beet
	Table 50.	Turnips
	Table 51.	Celery
Tree nuts	Table 52.	Almonds
	Table 53.	Pecans, walnuts

[1] Barley, oats, rye, triticale, wheat. Treatment at beginning of infestation, autumn and spring.

[2] Wheat, barley. Do not apply within 15 days of harvest, cutting or forage use.

[3] Wine grapes, use at beginning of infestation (grape berry moth) at growth stages 12-55.

Cereals	Table 54.	Barley
	Table 55.	Maize
	Table 56.	Rice
	Table 57.	Sorghum
	Table 58.	Wheat
Oilseeds	Table 59.	Canola
	Table 60.	Cotton seed
	Table 61.	Sunflower seed
Feeds	Table 62.	Barley hay and straw
	Table 63.	Maize forage and fodder
	Table 64.	Rice straw
	Table 65.	Sorghum hay, forage and stover
	Table 66.	Wheat hay, straw and forage
	Table 67.	Alfalfa forage, hay
	Table 68.	Clover
	Table 69.	Bean forage and vines
	Table 70.	Field pea forage and vines
	Table 71.	Soya bean hay
	Table 72.	Almond hulls
	Table 73.	Cotton gin trash
	Table 74.	Sugar beet fodder
	Table 75.	Sunflower forage

Trials were generally well documented with full laboratory and field reports. Laboratory reports included method validation with batch recoveries at spiking levels similar to those occurring in samples from the supervised trials. Dates of analyses or duration of sample storage, data on sprayers and their calibration, plot sizes, sample sizes and sampling dates were reported.

Where residues were not detected, results are recorded in the Tables as below the limit of quantification (LOQ) e.g. <0.01 mg/kg. Residues, 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 included in the Tables except where residues in control samples exceeded the LOQ. The results are not adjusted for analytical recoveries.

Some results of trials on alfalfa, broccoli, cabbages, carrots, garlic, kale, olives, onion, pecans, potatoes, radish, sugar beet, tomatoes, turnips, walnuts and wheat were based on unvalidated analytical data from Craven Laboratories and could not be used.

The conditions of the supervised trials are shown in Table 21. Most trials were not replicated or were duplicate applications to a split plot. Replicate residues shown in the Table represent samples from the split plots or replicate field samples from the single treated plot.

Periods of freezer storage between sampling and analysis were recorded for all trials and were within the acceptable proven stability period of 2 years except in a few cases. Snap bean samples from US trials in 1987 were stored for 680-700 days before analysis, which is acceptable for parathion residues but not for paraoxon. The stability of paraoxon in snap bean samples was poor after 6 months. Walnut samples from trials in 1987 for 970 days and prune samples from trials in 1987 were stored for 800-820 days before analysis. The validity of data from samples stored for more than 2 years must be questioned.

Table 21. Sprayers, plot sizes and field sample sizes in the parathion supervised trials.

Crop	Country	Year	Sprayer	Plot size	Sample size
lemon	USA	1988	Helicopter	5-6 trees	16 fruit
lemon	USA	1989	commercial sprayer and power hand-gun sprayer	2-3 trees	16 fruit
orange	USA	1987-89	aerial - fixed wing and helicopter, and commercial sprayer	3 trees - 1 ha	16 fruit
apple	USA	1988	aerial - fixed wing and helicopter	0.5 ha - 210 trees	16 fruit
apple	France	1994	calibrated knapsack		1 kg and 4 kg
apple	USA	1988	calibrated knapsack	12-14 trees	16 fruit
pear	USA	1988	aerial - helicopter, power hand-gun sprayer	2-18 trees	16 fruit
apricot	USA	1989	aerial – helicopter	56 trees	1.1 kg
apricot	USA	1989	commercial sprayer	4 trees	1.1 kg
cherries	USA	1988	CO_2 powered backpack, commercial sprayer and handheld with diaphragm pump	2-12 trees	1.1-1.6 kg
prunes	USA	1987-88	aerial - helicopter	6-25 trees	1.1 kg
prunes	USA	1987-88	commercial and hand-gun sprayer	2-4 trees	1.1 - 4 kg
blackberries	USA	1988	aerial - fixed wing and helicopter	0.2-1.6 ha	1.1-3 kg
blackberries	USA	1988-89	CO_2 powered backpack, commercial sprayer	6-93 m^2	1.1-1.4 kg
grapes	France	1994	knapsack airblast sprayer	140-300 m^2	1 kg
grapes	USA	1987	helicopter	35 m^2 - 0.35 ha	1.1 kg
grapes	USA	1987	power hand-gun sprayer	33-100 m^2	1.1 kg
strawberry	USA	1988	aerial - fixed wing	200-1800 m^2	1.1-2 kg
strawberry	USA	1988	CO_2 powered backpack	45 m^2	1.1-1.5 kg
olives	USA	1988	aerial - fixed wing and helicopter, and commercial sprayer	3 trees - 1.2 ha	1.1 kg
garlic	USA	1988-89	aerial - fixed wing	60 m^2 - 1.2 ha	0.4 kg
garlic	USA	1988-89	CO_2 powered backpack	60 m^2	0.4 kg
onion	USA	1987-89	aerial - fixed wing and helicopter	200 m^2 - 1.2 ha	1.1-2 kg
onion	USA	1987-89	CO_2 powered backpack and self propelled research sprayer	59-70 m^2	1.1-2 kg
broccoli	USA	1989	aerial - fixed wing and helicopter	0.017-0.4 ha	12-20 heads
broccoli	USA	1989	CO_2 powered backpack	3-4 rows of 10-14 m	12-20 heads
cabbage	USA	1988	aerial - fixed wing and helicopter	0.017-0.1 ha	12 heads
cabbage	USA	1987-89	CO_2 powered backpack	4 rows of 14 m	12-14 heads
kale	USA	1987-88	aerial - fixed wing	170-740 m^2	1.1 kg
kale	USA	1987-88	CO_2 powered backpack	33-930 m^2	1.1 kg
lettuce	USA	1987-89	aerial - fixed wing and helicopter	84-2000 m^2	12 heads
lettuce	USA	1987-89	CO_2 powered backpack	28-88 m^2	12 heads
spinach	USA	1987-88	aerial - helicopter, and CO_2 powered backpack	28-50 m^2	0.8-1.6 kg
snap beans	USA	1987	aerial - fixed wing, and CO_2 powered backpack	46 m^2 - 1.2 ha	1 kg forage, pods, vines
beans, dry	USA	1987-88	aerial - fixed wing	0.14-0.4 ha	1.1 kg
beans, dry	USA	1987-88	CO_2 powered backpack, self-propelled research and tractor mounted	51-150 m^2	1.1 kg
peas, dried	USA	1988	aerial - fixed wing and helicopter, and CO_2 powered backpack	31 - 2900 m^2	1.1 kg
peppers	USA	1987-88	aerial - fixed wing, commercial sprayer and CO_2 powered backpack	28-3500 m^2	1.1 kg
sweet corn	USA	1987-88	aerial - fixed wing and helicopter	170-510 m^2	12 ears, 2 kg forage
sweet corn	USA	1987-88	CO_2 powered backpack	16-110 m^2	12 ears, 2 kg forage

Crop	Country	Year	Sprayer	Plot size	Sample size
tomato	USA	1987-88	aerial	0.012-0.4 ha	16 fruit
tomato	USA	1987-88	CO_2 powered backpack	45-100 m^2	16 fruit
carrot	USA	1987-88	aerial - fixed wing	1.2 ha	1.1-2 kg
carrot	USA	1987-88	CO_2 powered backpack	23-50 m^2	1.1- 4 kg
potatoes	USA	1989	aircraft - fixed wing	1400 m^2	16 tubers
potatoes	USA	1989	CO_2 powered backpack, self-propelled research sprayer and tractor mounted	53-850 m^2	16 tubers
radish	USA	1988	aerial - fixed wing and helicopter	100 m^2	1.1 kg
radish	USA	1987-88	CO_2 powered backpack	23-74 m^2	1.1 kg
sugar beet	USA	1988	aerial - fixed wing and helicopter	0.13-1.6 ha	2.3 kg
sugar beet	USA	1987-88	CO_2 powered backpack, self-propelled research sprayer and tractor mounted	74-150 m^2	2.3 kg
turnip	USA	1987-88	aerial - fixed wing and helicopter	70-200 m row	1.1 kg
turnip	USA	1987-88	CO_2 powered backpack	29-46 m^2	1.1 kg
celery	USA	1987-89	aerial - fixed wing and helicopter	84 m^2 - 0.4 ha	12 stalks
celery	USA	1988-89	aerial - fixed wing and helicopter	84 m^2 - 0.4 ha	12 stalks
almond	USA	1989	aerial - fixed wing and helicopter	0.34-4 ha	1.1 kg
almond	USA	1988-89	commercial sprayer	2-3 trees	1.1 kg
barley	USA	1997-98	aerial - fixed wing and helicopter	0.37-0.63 ha	1.1-2.3 kg
maize	USA	1987-89	aerial - fixed wing and helicopter	93-1300 m^2	1.1 kg grain, 0.8 kg forage
maize	USA	1987-89	CO_2 powered backpack and tractor mounted	93-110 m^2	1.1 kg grain, 0.8 kg forage
rice	USA	1987-88	aerial - fixed wing, and CO2 powered backpack	56-2800 m^2	1.1 kg grain 0.4 kg straw
sorghum	USA	1987	aerial - fixed wing	0.9 ha	1.1 kg
sorghum	USA	1087	CO_2 powered backpack	186 m^2	1.1 kg
sorghum	USA	1992	aerial - fixed wing	0.21-0.61 ha	1.1-2.7 kg
wheat	USA	1994	aerial - fixed wing	560 m^2	1 kg
wheat	USA	1989	aerial - fixed wing and helicopter	560-730 m^2	1 kg grain, forage, straw
wheat	USA	1989	CO_2 powered backpack, bicycle sprayer and tractor mounted	81-150 m^2	0.5 kg straw, 1 kg forage, grain
wheat	USA	1993	aerial - fixed wing and helicopter	0.16-0.70 ha	0.5-5 kg
canola	USA	1992	aerial - fixed wing	0.4-0.5 ha	0.8-1.2 kg
cotton	USA	1997-98	aerial - fixed wing and helicopter	0.45-2.4 ha	1.1-2.8 kg seed, 0.4 kg gin trash
cotton	USA	1989	CO_2 powered backpack and tractor mounted	59-70 m^2	2.5 kg
soya bean	USA	1988	aerial - fixed wing	0.12-0.49 ha	2.2 kg
soya bean	USA	1988	CO_2 powered backpack and tractor mounted	46-400 m^2	2.2 kg
sunflower	USA	1989	aerial -fixed wing	0.14-0.67 ha	1.1 kg
sunflower	USA	1988-89	CO_2 powered backpack, bicycle sprayer and tractor mounted	56-260 m^2	1.1 kg
alfalfa	USA	1995	aerial - fixed wing and helicopter	0.15-0.75 ha	1.1 kg
alfalfa	USA	1989	CO_2 powered backpack, bicycle sprayer and tractor mounted	46-139 m^2	1.1 kg forage, 0.4 kg hay
alfalfa	USA	1989	aerial - fixed wing and helicopter	0.35-1.8 m^2	1.1 kg forage, 0.4 kg hay
clover	USA	1988	aerial - fixed wing	450 m^2	0.8 kg forage, 0.4 kg hay

Crop	Country	Year	Sprayer	Plot size	Sample size
clover	USA	1988	CO_2 powered backpack and tractor mounted	46-116 m^2	0.8 kg forage, 0.4 kg hay

Table 22. Parathion residues in citrus fruits from supervised trials in the USA.

FRUIT, State, year (variety)	Application					PHI	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.	days	parathion	paraoxon	
GRAPEFRUIT									
FL, 1987 (Pink seedless)	WP	19.5	0.24	8100	3	14 30	6.0 11 4.4 5.2	0.26 0.48 0.29 0.41	EP-GF-5118
FL, 1987 (Pink seedless)	WP	19.5 +oil	0.24	8100	3	14 30	7.2 6.2 3.4 2.9	0.3 0.25 0.34 0.33	EP-GF-5118
CA, 1989 (Marsh White)	WP	11.2	0.24	4700	3	14 30	1.8 1.0 0.92 0.92	0.13 0.06 0.10 0.07	EP-GF-1036
CA, 1989 (Marsh White)	WP	11.2 +oil	0.24	4700	3	14 30	2.3 3.8 1.0 0.58	0.09 0.18 0.10 <0.05	EP-GF-1036
FL, 1989 (unknown, white)	EC	11.2		77	(3	14 30	0.32 0.18 0.11 0.16	<0.05 (2) <0.05 (2)	EP-GF-5119
CA, 1989 (Marsh White)	EC	11.2	0.24	4700	3	14 30	2.9 1.4 1.2 0.76	0.12 0.06 0.09 0.07	EP-GF-1037
LEMON, SWEET									
CA, 1988 (Lisbon)	WP +oil		0.24	4700	3	14 30	9.3 10.2 4.7 5.8	0.27 0.2 0.24 0.27	EP-LM-1045
CA, 1988 (Lisbon)	WP		0.24	4700	3	14 30	6.0 6.4 4.8 3.9	0.26 0.32 0.32 0.26	EP-LM-1045
CA, 1988 (Lisbon)	WP		0.24	3700	3	14 30 14	5.5 3.7 3.9 3.2 c 0.11	0.28 0.11 0.30 0.22	EP-LM-1043
CA, 1988 (Lisbon)	EC	11.2		94	(3	14 30	1.6 0.39 0.46 0.34	0.08 <0.05 <0.05 (2)	EP-LM-1047
CA, 1988 (Lisbon)	EC	11.2		94	(3	14 28 28	0.22 0.14 0.14 0.15 c 0.07	<0.05 (2) <0.05 (2)	EP-LM-1048
CA, 1988 (Lisbon)	EC		0.24	4700	3	14 30 14	4.8 4.6 2.8 3.7 c 0.05	0.16 0.13 0.12 0.15	EP-LM-1046
CA, 1988 (Lisbon)	EC		0.24	3700	3	14 30 14	2.7 2.1 1.5 1.7 c 0.11	0.09 0.10 0.06 0.12	EP-LM-1044
ORANGE, SWEET									

FRUIT, State, year (variety)	Application					PHI	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.	days	parathion	paraoxon	
CA, 1988 (Nucellar)	EC	9.0	0.24	3700	3	14 30	2.3 1.8 0.56 1.6	0.06 0.05 <0.05 0.05	EP-OR-1061
CA, 1988 (Nucellar)	WP	9.0	0.24	3700	3	14 30	2.0 1.0 2.0 1.0	<0.05 0.06 0.08 <0.05	EP-OR-1062
CA, 1988 (Washington Navel)	EC	11.2		110	(3	14 28 14 28	0.13 0.80 1.3 0.09 c 0.06 c 0.18	<0.05 0.05 0.06 <0.05	EP-OR-1063
FL, 1987 (Hamlin)	WP +oil	19.5	0.24	8100	3	14 30	6.8 12.2 4.4 7.2	0.11 0.20 0.18 0.35	EP-OR-5116
FL, 1987 (Hamlin)	WP	19.5	0.24	8100	3	14 30	9.0 7.2 4.6 9.2	0.27 0.16 0.19 0.42	EP-OR-5116
FL, 1989 (Parson Brown)	EC	11.2		94	(3	14 30	0.18 0.18 <0.05 0.18	<0.05 <0.05 (2)	EP-OR-5117

(aerial application c: sample from control plot

Table 23. Parathion residues in apples from supervised trials. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

Country, year (variety)	Application					PHI,	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.	days	parathion	paraoxon	
USA (NY), 1988 (Twenty Ounce)	EC EC	9.0 6.7	0.24	3700 370	6 6	14 14	2.4 2.7 3.7 3.5	0.05 0.06 0.06 0.10	EP-AP-5140
USA (NY), 1988 (McIntosh)	EC	6.7		46	(6	14	0.2 6.0	<0.05 0.14	EP-AP-5141
USA (WA), 1988 (Rome)	EC	6.7		190	(6	14	0.10 0.095	<0.05 (2)	EP-AP-1154
USA (WA), 1988 (Rome)	EC EC	6.7 6.7	0.24	2800 470	6	14 14	1.4 1.6 0.2 2.7	0.05 <0.05 <0.05 0.10	EP-AP-1155
France, 1994 (Red Chief)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.21 0.14 0.24 0.11 0.08	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51C/952132 Site II
France, 1994 (Golden Delicious)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.51 0.28 0.16 0.13 0.08	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51C/952132 F4

Country, year (variety)	Application					PHI,	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.	days	parathion	paraoxon	
France, 1994 (Golden Delicious)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.40 0.10 0.06 0.02 0.01	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51C/952132 Site I
France, 1994 (Melrose)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.13 0.09 0.06 0.02 0.01	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51C/952132 F1
France, 1994 (Golden Delicious)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.16 0.07 0.02 0.02 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51C/952132 F2
France, 1994 (Golden Delicious)	EC	0.36	0.036	1000	2	0 3 7 14 21	0.26 0.10 0.06 0.04 0.02	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51C/952132 F3
France, 1994 (Red Chief)	CS	0.36	0.036	1000	2	0 3 7 14 21	0.44 0.27 0.18 0.19 0.14	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51A/952131 Site II
France, 1994 (Golden Delicious)	CS	0.36	0.036	1000	2	0 3 7 14 21	0.39 0.37 0.21 0.18 0.16	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51A/952131 F4
France, 1994 (Golden Delicious)	CS	0.36	0.036	1000	2	0 3 7 14 21	0.36 0.15 0.09 0.09 0.02	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51A/952131 Site I
France, 1994 (Melrose)	CS	0.36	0.036	1000	2	0 3 7 14 21	0.14 0.11 0.09 0.05 0.03	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51A/952131 F1
France, 1994 (Golden Delicious)	CS	0.36	0.036	1000	2	0 3 7 14 21	0.18 0.19 0.09 0.03 0.02	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51A/952131 F2

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
France, 1994 (Golden Delicious)	CS	0.36	0.036	1000	2	0 3 7 14 21	0.23 0.15 0.11 0.07 0.05	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 51A/952131 F3

(aerial application

Table 24. Parathion residues in pears from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
WA, 1987 (D'Anjou)	WP	2.2	0.060	3700	4	14	0.88 0.52	<0.05 (2)	EP-PR-1067
CA, 1988 (Bartlett)	WP	2.2	0.060	3700	4	14	0.36 0.82	0.1 0.26	EP-PR-1064
WA, 1987 (D'Anjou)	EC EC	3.9 2.2	 0.060	190 3700	4 4	14 14	0.51 0.13 0.28 0.40	<0.05 (2) <0.05 (2)	EP-PR-1068
WA, 1987 (Bosc)	EC	3.9		94	(4	14	<0.05 (2)	<0.05 (2)	EP-PR-1069
CA, 1988 (Bosc)	EC	3.9		190	(4	14	<0.05 0.06	<0.05 (2)	EP-PR-1066
CA, 1988 (Bartlett)	EC	3.9		280	4	14	0.18 0.05	<0.05 (2)	EP-PR-1065
CA, 1988 (Bartlett)	EC		0.060	3700	4	14	0.18 0.33	0.08 0.08	EP-PR-1065

(aerial application

Table 25. Parathion residues in apricots from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
WA, 1988 (Tilton)	WP	3.4		470	4	14	<0.05 (2)	<0.05 (2)	EP-AT-1162
CA, 1988 (Modesto)	WP	3.4		750	4	14	0.18 <0.05	<0.05 (2)	EP-AT-1157
CA, 1988 (Blemheim)	WP	3.4		470	4	14	<0.05 (2)	<0.05 (2)	EP-AT-1159
WA, 1988 (Tilton)	EC EC	3.0 3.4	0.08	3700 470	4 4	14 14	<0.05 (2) <0.05 0.06	<0.05 (2) <0.05 (2)	EP-AT-1161
CA, 1989 (Modesto)	EC	3.4		190	(3	13	<0.05 (2)	<0.05 (2)	EP-AT-1249
CA, 1988 (Modesto)	EC EC	1.8 3.4	0.08	2200 770	4 4	14 14	<0.05 (2) 0.10 0.19	<0.05 (2) <0.05 (2)	EP-AT-1156
CA, 1988 (Blemheim)	EC EC	1.5 3.4	0.08	1900 470	4 4	14 14	<0.05 (2) 0.07 0.07	<0.05 (2) <0.05 (2)	EP-AT-1158

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
CA, 1988 (Blemheim)	EC	3.4		190	(4	14	<0.05 (2)	<0.05 (2)	EP-AT-1160

(aerial application

Table 26. Parathion residues in sour cherries from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
MI, 1988 (Montmorency)	WP WP	1.1 2.2	0.060 0.60	1900 370	6 6	14 14	0.1 0.09 0.65 0.37	0.18 0.18 0.46 0.28	EP-CH-5149
MI, 1988 (Napoleon)	WP WP	1.1 2.2	0.060 0.39	1900 570	4 4	14 14	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CH-5152
CA, 1989 (Bing)	WP WP	1.1 2.2	0.060	1900 470	4 4	14 14	0.10 0.08 0.09 0.46	<0.05 (2) <0.05 0.05	EP-CH-1217
WA, 1988 (Bing)	WP WP	1.1 2.2	0.060	1900 470	4 4	14 14	1.6 1.3 2.0 3.0	0.22 0.21 0.22 0.28	EP-CH-1215
MI, 1988 (Montmorency)	EC	1.1	0.060	1900	6	14	0.20 0.08	0.24 0.13	EP-CH-5148
MI, 1988 (Gold)	EC	1.1	0.060	1900	4	14	<0.05 (2)	<0.05 (2)	EP-CH-5151
CA, 1988 (Bing)	EC EC	1.1 2.2	0.060	1900 470	4 4	14 14	0.06 0.08 0.29 0.25	<0.05 (2) <0.05 (2)	EP-CH-1216
WA, 1988 (Bing)	EC	2.2	0.060	3700	4	14	1.0 0.72	0.16 0.11	EP-CH-1214

Table 27. Parathion residues in fresh and dried plums or prunes from supervised residue trials and processing in the USA (Cañez, 1990e).

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
ID, 1988 (Empress)	WP		0.060		4	14	fresh dried	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-PL-1073
ID, 1988 (Empress)	EC		0.060		4	14	fresh dried	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-PL-1074
ID, 1988 (Empress)	EC	4.5			4	14	fresh dried	<0.05 (2) 0.05 <0.05	<0.05 (2) <0.05 (2)	EP-PL-1074
OR, 1987 (Italian)	WP		0.060		4	14	fresh [1] dried [1]	0.28 0.22 0.17 0.13	<0.05 (2) <0.05 (2)	EP-PL-1075

State, year (variety)	Application					PHI,	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.	days		parathion	paraoxon	
OR, 1987 (Italian)	8F		0.060		4	14	fresh [1] dried [1]	0.30 0.24 0.13 0.12	<0.05 (2) <0.05 (2)	EP-PL-1076
OR, 1987 (Italian)	8F	4.5			4	14	fresh [1] dried [1]	1.0 0.66 0.38 0.38	0.08 <0.05 0.05 0.05	EP-PL-1076
WA, 1987 (Late Italian)	EC		0.060		4	14	fresh [1] dried [1]	0.66 0.59 0.38 0.32	<0.05 (2) <0.05 (2)	EP-PL-1077
WA, 1987 (Late Italian)	EC	4.5			4	14	fresh [1] dried [1]	0.76 0.74 0.35 0.27	<0.05 (2) 0.05 <0.05	EP-PL-1077
WA, 1987 (Late Italian)	WP		0.060		4	14	fresh [1] dried [1]	0.45 0.30 0.45 0.42	<0.05 (2) 0.06 0.06	EP-PL-1078
WA, 1987 (Late Italian)	EC	4.5			(4	14	fresh [1] dried [1]	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-PL-1079
CA, 1988 (French)	EC		0.060		4	14	fresh dried	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-PL-1080
CA, 1988 (French)	EC	4.5			4	14	fresh dried	0.28 0.23 0.21 0.20	<0.05 (2) <0.05 (2)	EP-PL-1080
CA, 1988 (French)	WP		0.060		4	14	fresh dried	0.05 0.08 <0.05 (2)	<0.05 0.06 <0.05 (2)	EP-PL-1081
CA, 1988 (French)	EC	4.5			(4	14	fresh dried	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-PL-1082
WA, 1987 (President)	WP		0.060		4	14	fresh [1]	0.18 0.14	<0.05 (2)	EP-PL-1139
WA, 1987 (President)	EC		0.060		4	14	fresh [1]	0.18 <0.05	<0.05 (2)	EP-PL-1140
WA, 1987 (President)	EC	4.5			4	14	fresh [1]	0.07 0.86	<0.05 0.06	EP-PL-1140
WA, 1988 (President)	EC	4.5			(4	14	fresh	<0.05 (2)	<0.05 (2)	EP-PL-1141
OR, 1988 (Italian)	WP		0.060		4	14	fresh	0.30 0.25	<0.05 (2)	EP-PL-1198
OR, 1988 (Italian)	EC		0.060		4	14	fresh	0.32 0.27	<0.05 (2)	EP-PL-1199
OR, 1988 (Italian)	EC	4.5			4	14	fresh	2.4 2.1	0.09 0.07	EP-PL-1199
ID, 1988 (Simka)	WP		0.060		4	14	fresh	<0.05 (2)	<0.05 (2)	EP-PL-1200
ID, 1988 (Simka)	EC		0.060		4	14	fresh	<0.05 (2)	<0.05 (2)	EP-PL-1201
ID, 1988 (Simka)	EC	4.5			4	14	fresh	0.06 <0.05	<0.05 (2)	EP-PL-1201
CA, 1988 (Angelina)	EC	4.5			(4	14	fresh	<0.05 (2)	<0.05 (2)	EP-PL-1202

State, year (variety)	Application					PHI,	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.	days		parathion	paraoxon	
CA, 1988 (Late Santa Rosa)	EC		0.060		4	14	fresh	0.19 0.18	<0.05 (2)	EP-PL-1203
CA, 1988 (Late Santa Rosa)	EC	4.5			4	14	fresh	0.31 0.47	0.05 0.07	EP-PL-1203
CA, 1988 (Late Santa Rosa)	WP		0.060		4	14	fresh	<0.05 0.08	<0.05 (2)	EP-PL-1204
CA, 1988 (French)	EC		0.060		4	14	fresh	<0.05	<0.05	EP-PL-2040
CA, 1988 (French)	EC		0.30		4	14	fresh dried	0.07 0.08	<0.05 <0.05	EP-PL-2040
CA, 1988 (French)	EC		0.060		4	14	fresh	<0.05	<0.05	EP-PL-2041
CA, 1988 (French)	EC		0.30		4	14	fresh dried	0.62 0.45	<0.05 0.08	EP-PL-2041

[1] stored for 800-820 days between sampling and analysis.

(aerial application

Table 28. Parathion residues in blackberries from supervised trials in the USA.

State, year (variety)	Application					PHI,	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.	days	parathion	paraoxon	
TX, 1988 (Cherokee)	EC EC	1.1 1.1	0.12	970 490	3 3	15 15	0.05 0.09 0.06 0.06	<0.05 (2) <0.05 (2)	EP-BB-1165
TX, 1988 (Cherokee)	WP	1.1		470	3	15	0.07 <0.05	<0.05 (2)	EP-BB-1166
OR, 1988 (Evergreen)	EC EC	2.8 1.1	0.12	2300 470	3 3	15 15	2.1 2.2 0.20 0.24	0.17 0.15 <0.05 (2)	EP-BB-1167
OR, 1988 (Evergreen)	WP	1.1		470	3	15	0.20 0.20	<0.05 (2)	EP-BB-1168
OR, 1988 (Evergreen)	EC	1.1		94	(4	15	0.05 <0.05	<0.05 (2)	EP-BB-1169
CA, 1988 (Olallie)	EC EC	2.2 1.1	0.12	1900 470	3 3	15 15	0.72 0.60 0.25 0.24	<0.05 (2) <0.05 (2)	EP-BB-1171
CA, 1988 (Olallie)	WP	1.1		470	3	15	0.24 0.24	<0.05 (2)	EP-BB-1172
CA, 1988 (Olallie)	EC	1.1		190	(3	15	0.06 0.06	<0.05 (2)	EP-BB-1173
MI, 1989 (Evergreen)	EC EC	2.2 1.1	0.12	1900 470	6 6	15 15	0.28 0.28 0.16 0.27	0.28 0.30 0.22 0.25	EP-BB-1251
MI, 1989 (Chester)	WP	1.1		470	6	15	0.46 0.12	0.32 0.20	EP-BB-1252

(aerial application

Table 29. Parathion residues in wine grapes from supervised trials in France and the USA.

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
USA (CA), 1987 (Emperor)	EC	1.7		190	(3	14	<0.05 (2)	<0.05 (2)	EP-GR-1029
USA (CA), 1987 (Emperor)	EC	1.7		470	3	14	0.30 0.25	<0.05 (2)	EP-GR-1030
USA (CA), 1987 (Emperor)	EC	2.8	0.12	2300	3	14	0.63 0.39	<0.05 (2)	EP-GR-1030
USA (CA), 1987 (Emperor)	WP WP	2.8 1.7	0.12	2300 470	3 3	14 14	0.23 2.4 0.73 0.33	<0.05 0.06 0.06 <0.05	EP-GR-1031
USA (WA), 1987 (Concord)	EC EC	1.7 2.2	 0.12	190 1900	3 3	14 14	<0.05 (2) 0.85 0.29	<0.05 (2) <0.05 (2)	EP-GR-1032
USA (WA), 1987 (Concord)	WP WP	1.7 2.2	 0.12	190 1900	3 3	14 14	0.06 0.10 0.85 0.68	<0.05 (2) <0.05 (2)	EP-GR-1033
USA (WA), 1987 (Concord)	EC	1.7		93	(3	14	<0.05 (2)	<0.05 (2)	EP-GR-1035
France, 1994 (Grenache)	CS	0.30	0.15	200	2	0 3 7 14 21	0.51 0.17 0.17 0.11 0.08	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50A/952129 Site II
France, 1994 (Chenin Blanc)	CS	0.30	0.15	200	2	0 3 7 14 21	0.16 0.11 0.15 0.07 0.13	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50A/952129 F1
France, 1994 (Grenache)	CS	0.30	0.15	200	2	0 3 7 14 21	0.11 0.12 0.09 0.12 0.06	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50A/952129 Site I
France, 1994 (Cabernet)	CS	0.30	0.15	200	2	0 3 7 14 21	0.23 0.19 0.18 0.19 0.10	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50A/952129 F3
France, 1994 (Cabernet)	CS	0.30	0.15	200	2	0 3 7 14 21	0.12 0.15 0.12 0.15 0.10	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50A/952129 F4
France, 1994 (Grenache)	EC	0.30	0.15	200	2	0 3 7 14 21	0.31 0.14 0.09 0.05 0.02	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50C/952130 Site II

Country, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
France, 1994 (Chenin blanc)	EC	0.30	0.15	200	2	0 3 7 14 21	0.10 0.06 0.05 0.03 0.02	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50C/952130 F1
France, 1994 (Grenache)	EC	0.30	0.15	200	2	0 3 7 14 21	0.06 0.06 0.03 0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50C/952130 Site I
France, 1994 (Cabernet Franc)	EC	0.30	0.15	200	2	0 3 7 14 21	0.16 0.10 0.05 0.07 0.03	<0.01 <0.01 <0.01 <0.01 <0.01	CHV 50C/952130 F3
France, 1994 (Cabernet)	EC	0.30	0.15	200	2	0 3 7 14 21	0.11 0.13 0.08 0.07 0.05	<0.01 <0.01 <0.01 0.01 <0.01	CHV 50C/952130 F4

(aerial application

Table 30. Parathion residues in strawberries from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
OR, 1988 (Shukson)	WP	0.90		190	4	14	<0.05 (2)	<0.05 (2)	EP-ST-1134
OR, 1988 (Shukson)	EC EC	1.3 0.90	0.095	1400 190	4 4	14 14	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-ST-1135
OR, 1988 (Totem)	EC	0.90		94	(4	14	<0.05 (2)	<0.05 (2)	EP-ST-1136
CA, 1988 (Douglas)	EC EC	1.3 0.90	0.095	1400 280	4 4	14 14	0.20 0.20 0.29 0.06	<0.05 (2) <0.05 (2)	EP-ST-1137
CA, 1988 (Douglas)	WP	0.90		280	4	14	0.08 0.08	<0.05 (2)	EP-ST-1138
FL, 1988 (Salva)	EC EC	1.4 0.96	0.095	1460 210	6 6	14 14	1.1 1.2 0.35 0.27	0.08 0.09 <0.05 (2)	EP-ST-5120
FL, 1988 (Salva)	WP	0.96		210	6	14	0.42 0.21	<0.05 (2)	EP-ST-5121
FL, 1988 (Salva)	EC	0.90		72	(6	14	<0.05 (2)	<0.05 (2)	EP-ST-5122

(aerial application

Table 31. Parathion residues in olives from supervised trials in the USA.

State year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
CA, 1988 (Manzanillo)	EC EC	1.8 5.6	0.096 1.2	1870 470	3 3	39 39	<0.05 (2) 0.29 0.35	<0.05 (2) <0.05 0.05	EP-OL-1190 [1]
CA, 1988 (Manzanillo)	EC	5.6		190	(3	42	<0.05 (2)	<0.05 (2)	EP-OL-1191 [1]
CA, 1988 (Manzanillo)	EC EC	5.7 5.7	0.096	5950 470	3 3	42 42	7.3 9.1 0.34 0.17	0.16 0.19 <0.05 (2)	EP-OL-1192 [1]
CA, 1988 (Manzanillo)	EC	5.6		94	(3	42	<0.05 (2)	<0.05 (2)	EP-OL-1193 [1]

[1] unvalidated analytical data
(aerial application

Table 32. Parathion residues in garlic from supervised trials in the USA. Bulbs analysed.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
CA, 1988 (Rogers Virus Free)	EC	0.56		190	(4	15	<0.05 (2)	<0.05 (2)	EP-GA-1180 [1]
CA, 1988 (Rogers Virus Free)	EC	0.56		190	4	15	<0.05 (2)	<0.05 (2)	EP-GA-1181 [1]
CA, 1988 (Rogers Virus Free)	WP	0.56		190	4	15	<0.05 (2)	<0.05 (2)	EP-GA-1182 [1]
TX, 1989 (Crystal Pear)	EC	0.56		190	4	15 15	0.09 0.10 c 0.11	<0.05 (2) c <0.05	EP-GA-1183 [1]
TX, 1989 (Crystal Pear)	WP	0.56		190	4	15 15	0.11 0.11 c 0.10	<0.05 (2) c <0.05	EP-GA-1184 [1]
TX, 1989 (Crystal Pear)	EC	0.56		47	(4	15 15	<0.05 (2) c 0.11	<0.05 (2) c <0.05	EP-GA-1186 [1]

[1] unvalidated analytical data
(aerial application c: sample from control plot

Table 33. Parathion residues in onions from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		sample	parathion	paraoxon	
CA, 1987 (Evergreen)	EC	0.90		370	6	15 15	green	0.16 0.11 c 0.16	<0.05 (2) c <0.05	EP-ON-1058 [1]
CA, 1987 (Evergreen)	WP	0.90		370	6	15 15	green	0.34 0.33 c 0.13	<0.05 (2) c <0.05	EP-ON-1059 [1]

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		sample	parathion	paraoxon	
CA, 1987 (Evergreen)	EC	0.90		190	(6	15 15	green	0.24 0.18 c 0.08	<0.05 (2) c <0.05	EP-ON-1060 [1]
CA, 1989 (K99)	EC	0.90		190	(6	15	green	<0.05 (2)	<0.05 (2)	EP-ON-1187 [1]
CA, 1989 (K99)	EC	0.90		280	6	15	green	<0.05 (2)	<0.05 (2)	EP-ON-1188 [1]
CA, 1988 (K99)	WP	0.90		280	6	15	green	<0.05 (2)	<0.05 (2)	EP-ON-1189 [1]
CA, 1988 (Southport Late)	EC	0.90		190	6	15	bulb	<0.05 (2)	<0.05 (2)	EP-ON-1224 [1]
CA, 1988 (Southport Late)	WP	0.90		190	6	15	bulb	<0.05 (2)	<0.05 (2)	EP-ON-1225 [1]
CA, 1988 (Southport Late)	EC	0.90		190	(6	15	bulb	<0.05 (2)	<0.05 (2)	EP-ON-1226 [1]
WA, 1988 (Yellow Sweet Spanish)	EC	0.90		210	6	15	bulb	<0.05 (2)	<0.05 (2)	EP-ON-1227 [1]
WA, 1988 (Yellow Sweet Spanish)	WP	0.90		215	6	15	bulb	<0.05 (2)	<0.05 (2)	EP-ON-1228 [1]
WA, 1988 (Yellow Sweet Spanish)	EC	0.90		39	(6	15	bulb	<0.05 (2)	<0.05 (2)	EP-ON-1229 [1]
CO, 1988 (Winters)	EC	0.90		200	6	15	bulb	<0.05 (2)	<0.05 (2)	EP-ON-5168 [1]
CO, 1988 (Winters)	WP	0.90		200	6	15	bulb	<0.05 (2)	<0.05 (2)	EP-ON-5169 [1]
NY, 1988 (Early Yellow Globe)	EC	0.90		190	4	15	green	<0.05 (2)	<0.05 (2)	EP-ON-5170 [1]
NY, 1988 (Early Yellow Globe)	WP	0.90		190	4	15	green	<0.05 (2)	<0.05 (2)	EP-ON-5171 [1]

[1] unvalidated analytical data

(aerial application c: sample from control plot

Table 34. Parathion residues in broccoli from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
CA, 1989 (501 Green Valiant)	EC	0.56		190	(6	7	0.22 0.22	<0.05 (2)	EP-BR-1004 A [1]
CA, 1989 (501 Green Valiant)	EC	0.84		190	(6	7	0.17 0.15	<0.05 (2)	EP-BR-1004 B [1]
CA, 1989 (501 Green Valiant)	EC	1.1		190	(6	7 14	0.24 0.17 0.11 0.11	<0.05 (2) <0.05 (2)	EP-BR-1004 C [1]
CA, 1989 (501 Green Valiant)	EC	0.56		370	6	7	0.28 0.22	<0.05 (2)	EP-BR-1005 A [1]

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
CA, 1989 (501 Green Valiant)	EC	0.84		370	6	7	0.27 0.33	<0.05 (2)	EP-BR-1005 B [1]
CA, 1989 (501 Green Valiant)	EC	1.1		370	6	7 14	0.90 0.49 0.15 0.14	<0.05 (2) <0.05 (2)	EP-BR-1005 C [1]
CA, 1988 (Green Duke)	EC	0.56		280	6	7	0.23 0.30	<0.05 (2)	EP-BR-1006 A [1]
CA, 1988 (Green Duke)	EC	1.7		280	6	21	<0.05	<0.05	EP-BR-1006 B [1]
CA, 1989 (501 Green Valiant)	WP	0.56		370	6	7	0.61 0.81	<0.05 (2)	EP-BR-1007 [1]
CA, 1989 (Green Duke)	WP	0.56		280	6	7	0.11 0.11	<0.05 (2)	EP-BR-1008 [1]
CA, 1988 (Shogun)	EC	0.56		200	(6	7	<0.05 (2)	<0.05 (2)	EP-BR-1009 A [1]
CA, 1988 (Shogun)	EC	1.7		200	(6	21	<0.05 (2)	<0.05 (2)	EP-BR-1009 B [1]

[1] unvalidated analytical data
(aerial application

Table 35. Parathion residues in cabbage from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1989 (Headstart)	EC	0.28		190	6	7	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-1010 A [1]
CA, 1989 (Headstart)	EC	0.28		190	6	7	including wrapper leaves	0.11 0.17	<0.05 (2)	EP-CB-1010 A [1]
CA, 1989 (Headstart)	EC	0.56		190	6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-1010 B [1]
CA, 1989 (Headstart)	EC	0.56		190	6	10	including wrapper leaves	0.07 0.12	<0.05 (2)	EP-CB-1010 B [1]
CA, 1989 (Headstart)	EC	0.84		190	6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-1010 C [1]
CA, 1989 (Headstart)	EC	0.84		190	6	10	including wrapper leaves	0.35 0.44	<0.05 (2)	EP-CB-1010 C [1]
CA, 1989 (Headstart)	EC	1.1		190	6	14	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-1010 D [1]
CA, 1989 (Headstart)	EC	1.1		190	6	14	including wrapper leaves	0.30 0.10	<0.05 (2)	EP-CB-1010 D [1]
CA, 1989 (Headstart)	WP	0.28		190	6	7	including wrapper leaves	0.14 0.12	<0.05 (2)	EP-CB-1011 [1]

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
TX, 1987 (Savoy Chieftain)	EC	0.28		150	6	7	including wrapper leaves	0.29 0.37	<0.05 (2)	EP-CB-1012 A [1]
TX, 1987 (Savoy Chieftain)	EC	0.56		150	6	10	including wrapper leaves	0.76 1.4	<0.05 (2)	EP-CB-1012 B [1]
TX, 1987 (Savoy Chieftain)	EC	1.7		150	6	21	including wrapper leaves	0.20 0.27	<0.05 (2)	EP-CB-1012 C [1]
TX, 1987 (Savoy Chieftain)	WP	0.28		150	6	7	including wrapper leaves	0.61 0.38	<0.05 (2)	EP-CB-1013 A [1]
TX, 1987 (Savoy Chieftain)	WP	0.56		150	6	10	including wrapper leaves	1.6 1.4	0.06 <0.05	EP-CB-1013 B [1]
TX, 1987 (Savoy Chieftain)	WP	1.7		150	6	21	including wrapper leaves	0.40 0.62	<0.05 (2)	EP-CB-1013 C [1]
CA, 1988 (Headstart)	EC	0.28		200	(6	7	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-1014 A [1]
CA, 1988 (Headstart)	EC	0.28		200	(6	7	including wrapper leaves	0.22 0.12	0.06 0.11	EP-CB-1014 A [1]
CA, 1988 (Headstart)	EC	0.56		200	(6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-1014 B [1]
CA, 1988 (Headstart)	EC	0.56		200	(6	10	including wrapper leaves	0.16 0.27	<0.05 0.07	EP-CB-1014 B [1]
CA, 1988 (Headstart)	EC	0.84		200	(6	10	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-1014 C [1]
CA, 1988 (Headstart)	EC	1.1		200	(6	14	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-1014 C [1]
CA, 1988 (Headstart)	EC	0.84		200	(6	10	including wrapper leaves	0.25 0.23	0.13 0.06	EP-CB-1014 C [1]
CA, 1988 (Headstart)	EC	1.1		200	(6	14	including wrapper leaves	0.12 0.18	0.06 0.09	EP-CB-1014 C [1]
FL, 1987 (Bravo)	EC	0.28		650	6	7	including wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-5001 A [1]
FL, 1987 (Bravo)	EC	0.56		650	6	10 21	including wrapper leaves	<0.05 0.08 0.20 <0.05	<0.05 (2) <0.05 (2)	EP-CB-5001 B [1]
FL, 1987 (Bravo)	WP	0.28		650	6	7	including wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-5002 [1]

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
FL, 1988 (Bravo)	EC	0.28		58	(6	7	including wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-5003 A [1]
FL, 1988 (Bravo)	EC	0.56		58	(6	10	including wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-5003 B [1]
FL, 1988 (Bravo)	EC	1.7		58	(6	21	including wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-5003 C [1]
NY, 1987 (King Cole Hybrid)	EC	0.28		230	6	30	including wrapper leaves	<0.05 (2)	<0.05 (2)	EP-CB-5005 A [1]
NY, 1987 (King Cole Hybrid)	EC	0.56		230	6	30	including wrapper leaves	0.19 <0.05	<0.05 (2)	EP-CB-5005 B [1]
NY, 1987 (King Cole Hybrid)	EC	1.7		230	6	30	including wrapper leaves	0.28 <0.05	<0.05 (2)	EP-CB-5005 C [1]
NY, 1987 (King Cole Hybrid)	WP	0.28		230	6	7	including wrapper leaves	<0.05 0.07	<0.05 (2)	EP-CB-5006 [1]

[1] unvalidated analytical data
(aerial application

Table 36. Parathion residues in peppers from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
TX, 1988 (Grande Rio 66)	WP	0.90		150	6	15	<0.05 (2)	<0.05 (2)	EP-PP-1120
TX, 1988 (Grande Rio 66)	EC	0.90		150	6	15	<0.05 (2)	<0.05 (2)	EP-PP-1121
CA, 1987 (Jupiter)	EC	0.90		370	6	15	<0.05 (2)	<0.05 (2)	EP-PP-1122
CA, 1987 (Jupiter)	WP	0.90		370	6	15	<0.05 (2)	<0.05 (2)	EP-PP-1123
CA, 1987 (Jupiter)	EC	0.90		190	(6	15	<0.05 (2)	<0.05 (2)	EP-PP-1124
FL, 1987 (Belle Captain)	EC	0.90		670	6	7	0.57 0.95	<0.05 (2)	EP-PP-5065
FL, 1988 (Belle Captain)	WP	0.90		670	6	7	0.94 0.72	<0.05 (2)	EP-PP-5066
FL, 1988 (Jupiter)	EC	0.90		58	(6	7	<0.05 (2)	<0.05 (2)	EP-PP-5067
NJ, 1988 (Yolo Wonder)	EC	0.90		540	6	7	0.09 0.08	<0.05 (2)	EP-PP-5069
NJ, 1988 (Yolo Wonder)	WP	0.90		540	6	7	0.17 0.10	<0.05 (2)	EP-PP-5070

(aerial application

Table 37. Parathion residues in sweet corn (ears) from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
WA, 1989 (Jubilee)	EC	1.1		94	(6	12	<0.05 (2)	<0.05 (2)	EP-CN-1246
WA, 1989 (Jubilee)	EC	1.1		190	6	12	<0.05 (2)	<0.05 (2)	EP-CN-1247
WA, 1989 (Jubilee)	WP	1.1		190	6	12	<0.05 (2)	<0.05 (2)	EP-CN-1248
FL, 1988 (Silver Queen)	EC	1.1		700	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5007
FL, 1988 (Silver Queen)	WP	1.1		700	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5008
FL, 1988 (Merrit)	EC	1.1		58	(6	12	<0.05 (2)	<0.05 (2)	EP-CN-5009
NY, 1987 (Early Sunray)	EC	1.1		230	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5011
NY, 1987 (Early Sunray)	WP	1.1		230	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5012
WI, 1987 (Incredible)	EC	1.1		200	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5013
WI, 1987 (Incredible)	WP	1.1		200	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5014

(aerial application

Table 38. Parathion residues in tomatoes from supervised trials in the USA.

State, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	no.		parathion	paraoxon	
CA, 1987 (UC 7879)	EC	1.1	6	10	0.42 0.52	<0.05 (2)	EP-TO-1128 [1]
CA, 1988 (Roma)	EC	1.1	6	10	0.14	<0.05	EP-TO-2009 [1]
CA, 1988 (Murietta)	EC	1.1	5	10	0.19	<0.05	EP-TO-2010 [1]
FL, 1987 (Sunny)	EC	1.1	6	10	<0.05 0.10	<0.05 (2)	EP-TO-5107 [1]
OH, 1988 (Heinz 1810)	EC	1.1	6	10	<0.05 (2)	<0.05 (2)	EP-TO-5109 [1]
CA, 1987 (UC 7879)	EC	1.1	(6	10	0.10 0.40	<0.05 (2)	EP-TO-1129 [1]
OH, 1988 (Heinz 1810)	EC	1.1	(6	10	<0.05 (2)	<0.05 (2)	EP-TO-5111 [1]
CA, 1987 (UC 7879)	WP	1.1	6	10	0.50 1.2	<0.05 (2)	EP-TO-1127 [1]
FL, 1987 (Sunny)	WP	1.1	6	10	<0.05 (2)	<0.05 (2)	EP-TO-5108 [1]
OH, 1988 (Heinz 1810)	WP	1.1	6	10	<0.05 (2)	<0.05 (2)	EP-TO-5110 [1]

[1] unvalidated analytical data
(aerial application

Table 39. Parathion residues in field peas from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		Sample	parathion	paraoxon	
WA, 1989 (Dark Skin 49)	EC	0.56		187	6	10	pod	0.27 0.33	0.31 0.23	EP-PE-1176
WA, 1989 (Dark Skin 49)	WP	0.56		187	5	10	pod	0.15 0.11	<0.05 (2)	EP-PE-1177
WA, 1989 (Dark Skin 49)	EC	0.56		94	(6	10	pod	<0.05 (2)	<0.05 0.06	EP-PE-1179
WA, 1988 (Fraiser)	WP	0.56		140	6	10	pod	<0.05 (2)	<0.05 (2)	EP-PE-1205
WA, 1988 (Fraiser)	EC	0.56		140	6	10	pod	0.07 <0.05	0.06 <0.05	EP-PE-1206
WA, 1988 (Fraiser)	EC	0.56		47	(6	10	pod	0.30 0.27	0.08 0.08	EP-PE-1208
WI, 1988 (Ego)	EC	0.56		240	5	9	pod	<0.05 (2)	<0.05 (2)	EP-PE-5172
WI, 1988 (Ego)	WP	0.56		240	5	9	pod	<0.05 (2)	<0.05 (2)	EP-PE-5173
WI, 1988 (9888F)	EC	0.56		38	(5	10	pod	<0.05 (2)	<0.05 (2)	EP-PE-5174

(aerial application

Table 40. Parathion residues in kale from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
TX, 1987 (Blue Scotch Curled)	EC	0.28		152	6	7	0.21 0.27	<0.05 (2)	EP-KA-1039 [1]
TX, 1987 (Blue Scotch Curled)	EC	0.56		152	6	10	0.10 0.05	<0.05 (2)	EP-KA-1039 [1]
TX, 1987 (Blue Scotch Curled)	WP	0.28		152	6	7	0.27 0.11	<0.05 (2)	EP-KA-1040 [1]
TX, 1987 (Blue Scotch Curled)	WP	0.56		152	6	10 15	0.17 0.19 0.22 <0.05	<0.05 (2) <0.05 (2)	EP-KA-1040 [1]
TX, 1987 (Blue Scotch Curled)	EC	0.28		47	(6	7	0.11 0.15	<0.05 (2)	EP-KA-1041 [1]
TX, 1987 (Blue Scotch Curled)	EC	0.56		47	(6	10 15	0.11 0.15 0.06 0.06	<0.05 (2) <0.05 (2)	EP-KA-1041 [1]
FL, 1987 (Blue Curly/Purple Curly)	EC	0.30		720	6	7	0.60 1.4	<0.05 0.13	EP-KA-5075 [1]
FL, 1987 (Blue Curly/Purple Curly)	EC	0.61		720	6	10 15	0.92 0.90 0.18 0.18	<0.05 0.06 <0.05 (2)	EP-KA-5075 [1]

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
FL, 1987 (Blue Curly/Purple Curly)	WP	0.30		720	6	7	0.65 0.22	0.06 <0.05	EP-KA-5076 [1]
FL, 1987 (Blue Curly/Purple Curly)	WP	0.61		720	6	10 15	0.96 1.4 0.16 0.13	0.06 <0.05 <0.05 (2)	EP-KA-5076 [1]
FL, 1988 (NA6060)	EC	0.28		58	(6	7	<0.05 (2)	<0.05 (2)	EP-KA-5077 [1]
FL, 1988 (NA6060)	EC	0.56		58	(6	10 15	0.07 0.09 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-KA-5077 [1]
NJ, 1987 (Vates)	EC	0.28		360	6	7	0.11 0.08	<0.05 (2)	EP-KA-5079 [1]
NJ, 1987 (Vates)	EC	0.56		360	6	10 15	0.21 0.10 0.10 0.05	<0.05 (2) <0.05 (2)	EP-KA-5079 [1]
NJ, 1987 (Vates)	WP	0.28		360	6	7	0.13 0.10	<0.05 (2)	EP-KA-5080 [1]
NJ, 1987 (Vates)	WP	0.56		360	6	10 15	0.16 0.12 0.10 0.06	<0.05 (2) <0.05 (2)	EP-KA-5080 [1]
VA, 1987 (Dwarf Blue Curled Vates)	EC	0.27		143	6	7	0.53 0.73	<0.05 0.10	EP-KA-5081 [1]
VA, 1987 (Dwarf Blue Curled Vates)	EC	0.54		143	6	10 15	1.1 0.41 0.11 0.06	0.07 0.05 <0.05 (2)	EP-KA-5081 [1]
VA, 1987 (Dwarf Blue Curled Vates)	WP	0.27		143	6	7	1.3 0.78	0.08 0.08	EP-KA-5082 [1]
VA, 1987 (Dwarf Blue Curled Vates)	WP	0.55		143	6	10 15	0.40 0.68 0.15 0.20	<0.05 0.06 <0.05 (2)	EP-KA-5082 [1]

[1] unvalidated analytical data
(aerial application

Table 41. Parathion residues in lettuce from supervised trials in the USA.

Sample, State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
Bibb lettuce. CA, 1988 (Dark Green Boston)	WP WP	0.28 0.56		370 370	6 6	14 21	excluding wrapper leaves	1.2 1.6 1.1 0.83	<0.05 (2) <0.05 (2)	EP-LE-1049
Bibb lettuce. CA, 1988 (Dark Green Boston)	WP WP	0.28 0.56		370 370	6 6	14 21	including wrapper leaves	2.5 2.8 1.3 0.99	<0.05 0.06 <0.05 (2)	EP-LE-1049

Sample, State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
Bibb lettuce. CA, 1988 (Dark Green Boston)	EC EC	0.28 0.56		370 370	6 6	14 21	excluding wrapper leaves	1.2 1.3 0.96 0.76	<0.05 (2) <0.05 (2)	EP-LE-1050
Bibb lettuce. CA, 1988 (Dark Green Boston)	EC EC	0.28 0.56		370 370	6 6	14 21	including wrapper leaves	1.7 2.4 2.1 1.6	0.05 <0.05 <0.05 (2)	EP-LE-1050
Bibb lettuce. CA, 1988 (Allermaran Butter)	EC	0.56		200	(4	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-LE-1051
Bibb lettuce. CA, 1988 (Allermaran Butter)	EC	0.28		200	(4	14	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-LE-1051
Bibb lettuce. CA, 1988 (Allermaran Butter)	EC EC	0.28 0.56		200 200	(4 (4	14 21	including wrapper leaves	<0.05 0.06 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-LE-1051
Head lettuce. CA, 1988 (Salinas)	EC	0.56		370	6	7	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-LE-1052
Head lettuce. CA, 1988 (Salinas)	EC	0.56		370	6	7	including wrapper leaves	0.90 0.90	<0.05 (2)	EP-LE-1052
Head lettuce. CA, 1988 (Salinas)	WP	0.56		370	6	7	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-LE-1053
Head lettuce. CA, 1988 (Salinas)	WP	0.56		370	6	7	including wrapper leaves	0.85 0.60	<0.05 (2)	EP-LE-1053
Head lettuce. CA, 1988 (Salinas)	EC	0.56		200	(6	7	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-LE-1054
Head lettuce. CA, 1988 (Salinas)	EC	0.56		200	(6	7	including wrapper leaves	0.49 0.53	<0.05 (2)	EP-LE-1054
Leaf lettuce. CA, 1988 (Green Leaf)	EC	0.28		200	(4	14	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-LE-1055
Leaf lettuce. CA, 1988 (Green Leaf)	EC	0.56		200	(4	21	excluding wrapper leaves	<0.05 (2)	<0.05 (2)	EP-LE-1055
Leaf lettuce. CA, 1988 (Green Leaf)	EC EC	0.28 0.56		200 200	(4 (4	14 21	including wrapper leaves	0.10 0.06 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-LE-1055
Leaf lettuce. CA, 1989 (Royal Green Mountain)	WP	0.28		370	6	14	excluding wrapper leaves	1.4 0.75	0.06 <0.05	EP-LE-1056
Leaf lettuce. CA, 1989 (Royal Green Mountain)	WP	0.56		370	6	21	excluding wrapper leaves	0.25 0.25	<0.05 (2)	EP-LE-1056

Sample, State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
Leaf lettuce. CA, 1989 (Royal Green Mountain)	WP WP	0.28 0.56		370 370	6 6	14 21	including wrapper leaves	2.0 2.8 0.72 0.97	<0.05 0.09 <0.05 (2)	EP-LE-1056
Leaf lettuce. CA, 1988 (Royal Green Mountain)	EC EC	0.28 0.56		370 370	6 6	14 21	excluding wrapper leaves	0.77 1.0 0.28 0.31	<0.05 (2) <0.05 (2)	EP-LE-1057
Leaf lettuce. CA, 1988 (Royal Green Mountain)	EC EC	0.28 0.56		370 370	6 6	14 21	including wrapper leaves	1.1 0.81 0.98 1.2	<0.05 (2) <0.05 (2)	EP-LE-1057
Head lettuce. FL, 1987 (Ithaca)	EC	0.61		710	6	7 7	including wrapper leaves	0.60 0.06 0.65 0.07	<0.05 (2) <0.05 (2)	EP-LE-5047
Head lettuce. FL, 1987 (Ithaca)	WP	0.61		720	6	7 7	including wrapper leaves	<0.05 0.62 <0.05 0.28	<0.05 (2) <0.05 (2)	EP-LE-5048
Head lettuce. FL, 1987 (Ithaca)	EC	0.56		72	(6	7 7	including wrapper leaves	<0.05 (2) <0.05 0.16	<0.05 (2) <0.05 (2)	EP-LE-5049
Head lettuce. NY, 1987 (Ithaca)	EC	1×6.7 preplant +6×0.56		230	6	7 7	including wrapper leaves	<0.05 1.1 c 1.1	<0.05 (2) c <0.05	EP-LE-5051
Head lettuce. NY, 1987 (Ithaca)	WP	1×6.7EC preplant +6×0.56		230	6	7	including wrapper leaves	1.3 1.6	<0.05 (2)	EP-LE-5052
Leaf lettuce. FL, 1987 (Salad Bowl)	EC EC	0.30 0.60		720 720	6 6	14 21 14	including wrapper leaves	0.35 0.09 0.34 0.65 c 0.05	<0.05 (2) <0.05 (2) c <0.05	EP-LE-5053
Leaf lettuce. FL, 1987 (Salad Bowl)	WP WP	0.30 0.59		720 720	6 6	14 21 14	including wrapper leaves	0.42 <0.05 0.48 0.90 c 1.3	<0.05 (2) <0.05 (2) c <0.05	EP-LE-5054
Leaf lettuce. FL, 1988 (Royal Red Leaf)	EC EC	0.28 0.56		54 54	(6 (6	14 21	including wrapper leaves	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-LE-5055
Leaf lettuce. NY, 1987 (Black Seeded Simpson)	EC	1×6.7 preplant +6×0.28		230	6	14	including wrapper leaves	0.06 <0.05	<0.05 (2)	EP-LE-5057-A
Leaf lettuce. NY, 1987 (Black Seeded Simpson)	EC	1×6.7 preplant +6×0.56		230	6	21	including wrapper leaves	0.05 0.07	<0.05 (2)	EP-LE-5057-B
Leaf lettuce. NY, 1987 (Black Seeded Simpson)	WP	1×6.7EC preplant +6×0.28		230	6	14	including wrapper leaves	0.07 0.07	<0.05 (2)	EP-LE-5058-A
Leaf lettuce. NY, 1987 (Black Seeded Simpson)	WP	1×6.7EC preplant +6×0.56		230	6	21	including wrapper leaves	0.11 0.14	<0.05 (2)	EP-LE-5058-B

Sample, State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
Bibb lettuce. FL, 1987 (Bibb)	EC EC	0.30 0.60		720 720	6 6	14 21	including wrapper leaves	0.57 0.32 0.14 <0.05	<0.05 (2) <0.05 (2)	EP-LE-5059
Bibb lettuce. FL, 1987 (Bibb)	WP	0.30		720	6	14 14	including wrapper leaves	0.56 <0.05 c 0.49	<0.05 (2) c <0.05	EP-LE-5060
Bibb lettuce. FL, 1987 (Flori-Bibb)	WP	0.60		720	6	21	including wrapper leaves	0.13 0.49	<0.05 (2)	EP-LE-5060
Bibb lettuce. FL, 1988 (Flori-Bibb)	EC EC	0.28 0.56		54 54	(6 (6	14 21	including wrapper leaves	<0.05 (2) 0.10 0.08	<0.05 (2) <0.05 (2)	EP-LE-5061
Bibb lettuce. NY, 1987 (Buttercrunch)	EC	1×6.7 preplant +6×0.28		230	6	14	including wrapper leaves	0.22 0.29	<0.05 (2)	EP-LE-5063-A
Bibb lettuce. NY, 1987 (Buttercrunch)	EC	1×6.7 preplant +6×0.56		230	6	21	including wrapper leaves	0.28 0.31	<0.05 (2)	EP-LE-5063-B
Bibb lettuce. NY, 1987 (Buttercrunch)	WP	1×6.7EC preplant +6×0.28		230	6	14	including wrapper leaves	0.27 0.35	<0.05 (2)	EP-LE-5064-A
Bibb lettuce. NY, 1987 (Buttercrunch)	WP	1×6.7EC preplant +6×0.56		230	6	21	including wrapper leaves	0.44 0.32	<0.05 (2)	EP-LE-5064-B

(aerial application c: sample from control plot

Table 42. Parathion residues in spinach from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		Sample	parathion	paraoxon	
NJ, 1988 (America)	WP	0.56		540	6	14	greens	0.56 0.61	0.09 0.09	EP-SP-5176
CA, 1988 (St Helens)	WP	0.56		280	6	14	greens	0.12 0.15	0.06 0.06	EP-SP-1093
TX, 1987 (Dixie Market)	WP	0.56		150	6	14	greens	0.36 0.28	0.09 0.07	EP-SP-1096
CA, 1988 (St Helens)	EC	0.56		190	(6	14	greens	0.12 0.12	0.09 0.16	EP-SP-1094

(aerial application

Table 43. Parathion residues in snap beans from supervised trials in the USA. The samples were stored for 680-700 days before analysis, which is acceptable for parathion residues, but excessive for paraoxon in snap beans. The duplicate values are for duplicate field samples.

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		Sample	parathion	paraoxon	
OR, 1987 (Roma II)	WP	0.90		110	3	15	pods	0.17 0.39	<0.05 (2)	EP-LB-1130
OR, 1987 (Roma II)	WP	0.56		110	3	7	pods	0.09 0.23	0.06 0.07	EP-LB-1130
OR, 1987 (Roma II)	EC EC	0.56 0.90		120	3	7 15	pods	0.14 0.14 0.11 0.08	<0.05 (2) 0.05 0.05	EP-LB-1131
OR, 1987 (OSU91)	EC EC	0.56 0.90		110	(3 (3	7 15	pods	<0.05 0.05 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-LB-1133
NY, 1987 (Improved Tendergreen)	EC EC	0.56 0.90		280	6	7 15	pods	0.06 <0.05 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-LB-5083
NY, 1987 (Improved Tendergreen)	WP WP	0.56 0.90		280	6 6	7 15	pods	<0.05 0.05 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-LB-5084
WI, 1987 (FLO)	EC EC	0.56 0.90		60	(6 (6	7 15	pods	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-LB-5085
WI, 1987 (FLO)	EC EC	0.56 0.90		260	6 6	7 15	pods	<0.05 0.08 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-LB-5087
WI, 1987 (FLO)	WP WP	0.56 0.90		260	6 6	7 15	pods	0.07 <0.05 <0.05 0.05	<0.05 (2) <0.05 (2)	EP-LB-5088

(aerial application

Table 44. Parathion residues in dry beans from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1987 (Kidney)	WP WP	0.56 0.90		280 280	6	7 14	pods	0.05 <0.05 0.17 0.13	<0.05 (2) 0.06 <0.05	EP-DB-1113
CA, 1987 (Kidney)	EC EC	0.56 0.90		280 280	6 6	7 14	pods	0.13 0.06 0.06 <0.05	<0.05 (2) <0.05 (2)	EP-DB-1114
CA, 1987 (Kidney)	EC EC	0.56 0.90		94 94	(6 (6	7 14	pods	<0.05 (2) <0.05 (2)	0.05 <0.05 <0.05 (2)	EP-DB-1115
ID, 1988 (Pinto)	EC EC	0.56 0.90		94 94	(6 (6	7 15	pods	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-DB-1116
ID, 1988 (Pinto)	WP WP	0.56 0.90		190 190	6	7 15	pods	<0.05 (2) <0.05 (2)	<0.05 0.05 <0.05 (2)	EP-DB-1118

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
ID, 1988 (Pinto)	EC EC	0.56 0.90		190 190	6 6	7 15	pods	<0.05 (2) <0.05 0.26	<0.05 (2) <0.05 0.27	EP-DB-1119
MI, 1988 (Seafarer Navy Bean)	EC EC	0.56 0.90		215 215	6 6	15 15	beans	<0.05 <0.05	<0.05 <0.05	EP-DB-5142
MI, 1988 (Seafarer Navy Bean)	EC EC	0.56 0.90		215 215	6 6	7 7	pods	0.11 0.12	<0.05 <0.05	EP-DB-5142
MI, 1988 (Seafarer Navy Bean)	WP WP	0.56 0.90		215 215	6 6	15 15	beans	<0.05 <0.05	<0.05 <0.05	EP-DB-5143
MI, 1988 (Seafarer Navy Bean)	WP WP	0.56 0.90		215 215	6 6	7 7	pods	0.07 0.095	<0.05 <0.05	EP-DB-5143
NE, 1988 (Pinto)	EC	0.56		190	7	7 15	dry seed	<0.05 <0.05	<0.05 <0.05	EP-DB-5144
NE, 1988 (Pinto)	EC	0.90		190	7	7 15	dry seed	<0.05 <0.05	<0.05 <0.05	EP-DB-5144
NE, 1988 (Pinto)	WP	0.56		190	7	7 15	dry seed	<0.05 <0.05	<0.05 <0.05	EP-DB-5145
NE, 1988 (Pinto)	WP	0.90		190	7	7 15	dry seed	<0.05 <0.05	<0.05 <0.05	EP-DB-5145

(aerial application

Table 45. Parathion residues in soya beans from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
IL, 1988 (BSR 201)	EC	0.90		240	2	20	dry seed	<0.05 (2)	<0.05 (2)	EP-SY-5197
IL, 1988 (BSR 201)	WP	0.90		240	2	20	dry seed	<0.05 (2)	<0.05 (2)	EP-SY-5198
IL, 1988 (BSR 201)	EC	0.90		9	(2	20	dry seed	<0.05 (2)	<0.05 (2)	EP-SY-5199
MN, 1988 (AP 1776)	EC	0.90		190	2	20	dry seed	<0.05 (2)	<0.05 (2)	EP-SY-5200
MN, 1988 (AP 1776)	WP	0.90		190	2	20	dry seed	<0.05 (2)	<0.05 (2)	EP-SY-5201
MN, 1988 (AP 1776)	EC	0.90		37	(2	20	dry seed	<0.05 (2)	<0.05 (2)	EP-SY-5202
GA, 1988 (Coker 488)	EC	0.90		61	2	20	dry seed	<0.05 (2)	<0.05 (2)	EP-SY-5203
GA, 1988 (Coker 488)	WP	0.90		61	2	20	dry seed	<0.05 (2)	<0.05 (2)	EP-SY-5204

(aerial application

Table 46. Parathion residues in carrots from supervised trials in the USA..

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
CA, 1988 (Champion)	EC	1.1		190	6	15	0.26 0.41	<0.05 (2)	EP-CT-1015 [1]
CA, 1988 (Champion)	WP	1.1		190	6	15	0.35 0.47	<0.05 (2)	EP-CT-1016 [1]
CA, 1988 (Champion)	EC	1.1		190	(6	15	0.17 0.18	<0.05 (2)	EP-CT-1017 [1]
TX, 1987 (Imperator #58)	WP	1.1		150	6	15	0.26 0.33	<0.05 (2)	EP-CT-1018 [1]
TX, 1987 (Imperator #58)	EC	1.1		150	6	15	0.62 0.29	<0.05 (2)	EP-CT-1019 [1]
TX, 1987 (Danver)	EC	1.1		47	(6	15	0.05 0.08	<0.05 (2)	EP-CT-1021 [1]
WA, 1988 (Montes Coulesa)	WP	0.28		280	6	15	<0.05 0.07	<0.05 (2)	EP-CT-1174 [1]
WA, 1988 (Montes Coulesa)	EC	1.1		280	6	15	0.06 0.23	<0.05 (2)	EP-CT-1175 [1]
MI, 1987 (Scarlet Nantes)	EC	1.1		50	6	15	0.29 0.34	<0.05 (2)	EP-CT-5099 [1]
MI, 1987 (Scarlet Nantes)	WP	1.1		50	6	15	0.17 0.19	<0.05 (2)	EP-CT-5100 [1]

[1] unvalidated analytical data
(aerial application

Table 47. Parathion residues in potatoes from supervised trials in the USA.

State, year (variety)	Application			PHI, days	Commodity	Residues, mg/kg		Ref.
	Form	kg ai/ha	no.			parathion	paraoxon	
ID, 1988 (Russet Burbank)	EC	1.1	(6	5	tuber	<0.05 (2)	<0.05 (2)	EP-PO-1194 [1]
ID, 1988 (Russet Burbank)	WP	1.1	6	5	tuber	<0.05 (2)	<0.05 (2)	EP-PO-1196 [1]
ID, 1988 (Russet Burbank)	EC	1.1	6	5	tuber	<0.05 (2)	<0.05 (2)	EP-PO-1197 [1]
ID, 1988 (Russet Burbank)	EC	1.1	6	5	tuber	<0.05	<0.05	EP-PO-2001 [1]
WA, 1988 (Russet Burbank)	EC	1.1	6	5	tuber	<0.05	<0.05	EP-PO-2002 [1]
ME, 1988 (Atlantic)	EC	1.2	6	5	tuber	<0.05 (2)	<0.05 (2)	EP-PO-5039 [1]
ME, 1988 (Atlantic)	WP	1.2	6	5	tuber	<0.05 (2)	<0.05 (2)	EP-PO-5040 [1]
ND, 1988 (Norchip)	EC	1.1	6	5	tuber	<0.05 (2)	<0.05 (2)	EP-PO-5041 [1]

State, year (variety)	Application			PHI, days	Commodity	Residues, mg/kg		Ref.
	Form	kg ai/ha	no.			parathion	paraoxon	
ND, 1988 (Norchip)	WP	1.1	6	5	tuber	<0.05 (2)	<0.05 (2)	EP-PO-5042 [1]
WI, 1988	EC	1.1	(6	5	tuber	<0.05 (2)	<0.05 (2)	EP-PO-5043 [1]
WI, 1987 (Norchip)	EC	1.1	6	5	tuber [2]	<0.05 (2)	<0.05 (2)	EP-PO-5045 [1]
WI, 1987 (Norchip)	WP	1.1	6	5	tuber [2]	0.10 0.10	<0.05 (2)	EP-PO-5046 [1]

[1] unvalidated analytical data
[2] samples stored for 2 years before analysis.
(aerial application

Table 48. Parathion residues in radishes from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1988 (Comet)	WP	0.56		280	3	15	roots	<0.05 0.11	<0.05 (2)	EP-RD-1083 [1]
CA, 1988 (Comet)	WP	0.56		280	3	15	roots and tops	1.0 0.97	<0.05 (2)	EP-RD-1083 [1]
CA, 1988 (Comet)	EC	0.56		280	3	15	roots	0.17 0.15	<0.05 (2)	EP-RD-1084 [1]
CA, 1988 (Comet)	EC	0.56		280	3	15	roots and tops	1.1 1.2	<0.05 (2)	EP-RD-1084 [1]
CA, 1988 (Comet)	EC	0.56		190	(2	15	roots	<0.05 (2)	<0.05 (2)	EP-RD-1085 [1]
CA, 1988 (Comet)	EC	0.56		190	(2	15	roots and tops	0.21 0.33	<0.05 (2)	EP-RD-1085 [1]
MN, 1987 (Red Scarlet Globe)	EC	0.56		47	3	15	tops	0.15 0.21	<0.05 (2)	EP-RD-5095 [1]
MN, 1987 (Red Scarlet Globe)	EC	0.56		47	3	15	roots	0.05 0.07	<0.05 (2)	EP-RD-5095 [1]
MN, 1987 (Red Scarlet Globe)	WP	0.56		47	3	15	tops	0.35 0.25	<0.05 (2)	EP-RD-5096 [1]
MN, 1987 (Red Scarlet Globe)	WP	0.56		47	3	15	roots	0.09 0.07	<0.05 (2)	EP-RD-5096 [1]
MI, 1987 (Cherry Belle)	EC	0.56		50	3	15	tops	3.6 2.8	0.11 0.06	EP-RD-5097 [1]
MI, 1987 (Cherry Belle)	EC	0.56		50	3	15	roots	0.28 0.15	<0.05 (2)	EP-RD-5097 [1]
MI, 1987 (Cherry Belle)	WP	0.56		50	3	15	tops	2.7 3.0	0.06 0.06	EP-RD-5098 [1]

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
MI, 1987 (Cherry Belle)	WP	0.56		50	3	15	roots	0.15 0.22	<0.05 (2)	EP-RD-5098 [1]
FL, 1987 (Red Globe)	EC	0.56		720	3	15	tops	0.64 1.6 2.6	<0.05 (2) 0.07	EP-RD-5124 [1]
FL, 1987 (Red Globe)	EC	0.56		720	3	15	roots	<0.05 (3)	<0.05 (3)	EP-RD-5124 [1]
FL, 1987 (Red Globe)	WP	0.56		720	3	15	tops	3.0 0.48 2.9	0.08 <0.05 0.13	EP-RD-5125 [1]
FL, 1987 (Red Globe)	WP	0.56		720	3	15	roots	<0.05 (3)	<0.05 (3)	EP-RD-5125 [1]
FL, 1987 (Red Globe)	EC	0.56		72	(3	15	tops	0.23 0.16 0.07	<0.05 (3)	EP-RD-5126 [1]
FL, 1987 (Red Globe)	EC	0.56		72	(3	15	roots	<0.05 (3)	<0.05 (3)	EP-RD-5126 [1]

[1] unvalidated analytical data
(aerial application

Table 49. Parathion residues in sugar beet roots from supervised trials in the USA.

State, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	no.		parathion	paraoxon	
CA, 1988 (SS NB2)	EC	0.90	(6	15	<0.05 (2)	<0.05 (2)	EP-SB-1097 [1]
CA, 1988 (SS NB2)	WP	0.90	6	15	<0.05 (2)	<0.05 (2)	EP-SB-1098 [1]
CA, 1988 (SS NB2)	EC	0.90	6	15	<0.05 (2)	<0.05 (2)	EP-SB-1099 [1]
ID, 1988 (WS 88)	EC	0.90	6	15	<0.05 (2)	<0.05 (2)	EP-SB-1125 [1]
ID, 1988 (WS 88)	WP	0.90	6	15	<0.05 (2)	<0.05 (2)	EP-SB-1126 [1]
CA, 1988 (SS NB2)	EC	0.90	6	15	<0.05	<0.05	EP-SB-2003 [1]
ND, 1988 (ACS ACH176)	EC	0.90	6	15	0.06	<0.05	EP-SB-2004 [1]
MN, 1988 (Ultramono)	EC	0.90	6	15	0.06 0.08	<0.05 (2)	EP-SB-5089 [1]
MN, 1988 (Ultramono)	WP	0.90	6	15	0.08 0.07	<0.05 (2)	EP-SB-5090 [1]
ND, 1988 (ACS ACH176)	EC	0.90	6	15	0.07 <0.05	<0.05 (2)	EP-SB-5177 [1]
ND, 1988 (ACS ACH176)	WP	0.90	6	15	0.07 0.05	<0.05 (2)	EP-SB-5178 [1]
MN, 1988 (Ultramono)	EC	0.90	(6	15	0.05 <0.05	<0.05 (2)	EP-SB-5179 [1]

[1] unvalidated analytical data
(aerial application

Table 50. Parathion residues in Chinese turnips from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
TX, 1987 (Purple Top White Globe)	EC	0.56		47	(6	21	greens	0.13 0.20	<0.05 (2)	EP-TU-1103 [1]
TX, 1987 (Purple Top White Globe)	EC	0.28		47	(6	7	greens	0.30 1.9	<0.05 (2)	EP-TU-1103 [1]
TX, 1987 (Purple Top White Globe)	EC	0.56		150	6	21	greens	0.06 <0.05	<0.05 (2)	EP-TU-1104 [1]
TX, 1987 (Purple Top White Globe)	EC	0.28		150	6	7	greens	0.47 0.26	<0.05 (2)	EP-TU-1104 [1]
TX, 1987 (Purple Top White Globe)	WP	0.56		150	6	21	greens	0.06 <0.05	<0.05 (2)	EP-TU-1105 [1]
TX, 1987 (Purple Top White Globe)	WP	0.28		150	6	7	greens	0.35 0.75	<0.05 (2)	EP-TU-1105 [1]
CA, 1988 (Purple Top White Globe)	EC	0.56		190	(6	21	greens	0.15 0.18	<0.05 (2)	EP-TU-1106 [1]
CA, 1988 (Purple Top White Globe)	EC	0.28		190	(6	7	greens	3.2 2.9	0.26 0.25	EP-TU-1106 [1]
CA, 1988 (Purple Top White Globe)	WP	0.56		280	6	21	greens	0.10 0.08	<0.05 (2)	EP-TU-1107 [1]
CA, 1988 (Purple Top White Globe)	WP	0.28		280	6	7	greens	0.46 0.77	<0.05 (2)	EP-TU-1107 [1]
CA, 1988 (Purple Top White Globe)	EC	0.56		280	6	21	greens	0.12 0.14	<0.05 (2)	EP-TU-1108 [1]
CA, 1988 (Purple Top White Globe)	EC	0.28		280	6	7	greens	0.63 0.73	<0.05 (2)	EP-TU-1108 [1]
OH, 1988 (Purple Top White Globe)	EC	0.28		240	6	7	greens	0.34 0.23	<0.05 (2)	EP-TU-5183 [1]
OH, 1988 (Purple Top White Globe)	EC	0.56		240	6	10	greens	0.12 0.20	<0.05 (2)	EP-TU-5183 [1]
OH, 1988 (Purple Top White Globe)	WP	0.28		240	6	7	greens	0.08 0.07	<0.05 (2)	EP-TU-5184 [1]
OH, 1988 (Purple Top White Globe)	WP	0.56		240	6	10	greens	<0.05 0.10	<0.05 (2)	EP-TU-5184 [1]
GA, 1988 (Purple Globe)	EC	0.56		290	6	10	greens	0.79 0.95	<0.05 (2)	EP-TU-5185 [1]
GA, 1988 (Purple Globe)	EC	0.28		290	6	7	greens	0.52 0.53	<0.05 (2)	EP-TU-5185 [1]

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
GA, 1988 (Purple Globe)	WP	0.56		290	6	10	greens	0.23 0.26	<0.05 0.05	EP-TU-5186 [1]
GA, 1988 (Purple Globe)	WP	0.28		290	6	7	greens	0.31 0.32	<0.05 (2)	EP-TU-5186 [1]
NJ, 1988 (Purple Top (Agway))	EC	0.56		137	6	7	greens	1.3 0.96	<0.05 (2)	EP-TU-5187 [1]
NJ, 1988 (Purple Top (Agway))	EC	1.1		137	6	10	greens	1.5 1.4	<0.05 (2)	EP-TU-5187 [1]
NJ, 1988 (Purple Top (Agway))	WP	0.28		137	6	7	greens	0.23 0.43	<0.05 (2)	EP-TU-5188 [1]
NJ, 1988 (Purple Top (Agway))	WP	0.56		137	6	10	greens	0.34 0.50	<0.05 (2)	EP-TU-5188 [1]
OH, 1988 (Purple Top White Globe)	EC	0.28		240	6	7	root	<0.05 (2)	<0.05 (2)	EP-TU-5183 [1]
OH, 1988 (Purple Top White Globe)	EC	0.56		240	6	10	root	<0.05 (2)	<0.05 (2)	EP-TU-5183 [1]
OH, 1988 (Purple Top White Globe)	WP	0.28		240	6	7	root	<0.05 (2)	<0.05 (2)	EP-TU-5184 [1]
OH, 1988 (Purple Top White Globe)	WP	0.56		240	6	10	root	<0.05 (2)	<0.05 (2)	EP-TU-5184 [1]
GA, 1988 (Purple Globe)	EC	0.56		290	6	10	root	<0.05 (2)	0.06 0.05	EP-TU-5185 [1]
GA, 1988 (Purple Globe)	EC	0.28		290	6	7	root	<0.05 (2)	<0.05 (2)	EP-TU-5185 [1]
GA, 1988 (Purple Globe)	WP	0.56		290	6	10	root	<0.05 (2)	<0.05 0.05	EP-TU-5186 [1]
GA, 1988 (Purple Globe)	WP	0.28		290	6	7	root	<0.05 (2)	<0.05 (2)	EP-TU-5186 [1]
NJ, 1988 (Purple Top (Agway))	EC	0.56		137	6	7	root	0.08 0.08	<0.05 (2)	EP-TU-5187 [1]
NJ, 1988 (Purple Top (Agway))	EC	1.1		137	6	10	root	<0.05 0.06	<0.05 (2)	EP-TU-5187 [1]
NJ, 1988 (Purple Top (Agway))	WP	0.28		137	6	7	root	<0.05 (2)	<0.05 (2)	EP-TU-5188 [1]
NJ, 1988 (Purple Top (Agway))	WP	0.56		137	6	10	root	<0.05 (2)	<0.05 (2)	EP-TU-5188 [1]

[1] unvalidated analytical data

(aerial application

Table 51. Parathion residues in celery from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1989 (5270R)	EC	0.28		190	(2	15 22	excluding foliage	0.15 0.13 0.10 0.10	<0.05 (2) <0.05 (2)	EP-CY-1232 (a)
CA, 1989 (5270R)	EC	0.56		190	(2	21 28	excluding foliage	0.19 0.10 0.14 0.18	<0.05 (2) <0.05 (2)	EP-CY-1232 (b)
CA, 1988 (Florida 683)	EC	0.28		370	(2	15 22	excluding foliage	0.06 0.08 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-1233 (a)
CA, 1988 (Florida 683)	EC	0.56		370	(2	21 28	excluding foliage	0.10 0.07 0.06 0.08	<0.05 (2) <0.05 (2)	EP-CY-1233 (b)
CA, 1988 (Florida 683)	EC	1.1		370	(2	30 37	excluding foliage	0.12 0.08 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-1233 (c)
CA, 1988 (Florida 683)	WP	0.28		370	2	15 22	excluding foliage	0.07 <0.05 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-1234 (a)
CA, 1988 (Florida 683)	WP	0.56		370	2	21 28	excluding foliage	0.07 0.06 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-1234 (b)
CA, 1988 (Florida 683)	WP	1.1		370	2	30 37	excluding foliage	0.11 0.18 0.08 0.12	<0.05 (2) <0.05 (2)	EP-CY-1234 (c)
FL, 1988 (#683)	EC	0.28		71	(2	15 22	excluding foliage	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-5103 (a)
FL, 1988 (#683)	EC	0.56		71	(2	21 28	excluding foliage	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-5103 (b)
FL, 1988 (#683)	EC	1.1		71	(2	30 37	excluding foliage	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-5103 (c)
MI, 1988 (Utah Tall 52-70R1MP)	EC	0.28		215	2	15 22	excluding foliage	0.09 0.11 0.09 0.10	0.10 0.12 0.12 0.12	EP-CY-5105 (a)
MI, 1988 (Utah Tall 52-70R1MP)	EC	0.56		215	2	21 28	excluding foliage	0.12 0.10 0.07 <0.05	<0.05 (2) <0.05 (2)	EP-CY-5105 (b)
MI, 1988 (Utah Tall 52-70R1MP)	EC	1.1		215	2	30 37	excluding foliage	0.14 0.10 0.11 0.12	<0.05 (2) <0.05 (2)	EP-CY-5105 (c)
MI, 1988 (Utah Tall 52-70R1MP)	WP	0.28		215	2	15 22	excluding foliage	0.06 <0.05 <0.05 0.06	<0.05 (2) <0.05 (2)	EP-CY-5106 (a)
MI, 1988 (Utah Tall 52-70R1MP)	WP	0.56		215	2	21 28	excluding foliage	0.09 0.10 <0.05 0.06	<0.05 (2) 0.07 <0.05	EP-CY-5106 (b)
MI, 1988 (Utah Tall 52-70R1MP)	WP	1.1		215	2	30 37	excluding foliage	0.15 0.16 0.17 0.13	<0.05 (2) <0.05 (2)	EP-CY-5106 (c)
FL, 1988 (#683)	EC	0.28		270	6	15 22	excluding foliage	0.08 0.09 0.05 0.08	<0.05 (2) <0.05 (2)	EP-CY-5213 (a)

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
FL, 1988 (#683)	EC	0.56		270	6	21 28	excluding foliage	0.11 0.07 0.06 0.06	<0.05 (2) <0.05 (2)	EP-CY-5213 (b)
FL, 1988 (#683)	EC	1.1		270	6	30 37	excluding foliage	0.17 0.28 0.14 <0.05	<0.05 (2) <0.05 (2)	EP-CY-5213 (c)
FL, 1988 (#683)	WP	0.28		270	6	15 22	excluding foliage	0.06 <0.05 0.07 0.08	<0.05 (2) <0.05 (2)	EP-CY-5214 (a)
FL, 1988 (#683)	WP	0.56		270	6	21 28	excluding foliage	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-5214 (b)
FL, 1988 (#683)	WP	1.1		270	6	30 37	excluding foliage	<0.05 0.08 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-5214 (c)
CA, 1987 (Tall Utah 5275)	WP	0.28		370	6	15	including foliage	0.20 0.38	<0.05 (2)	EP-CY-1022 (a)
CA, 1987 (Tall Utah 5275)	WP	0.56		370	6	21	including foliage	0.58 0.51	<0.05 (2)	EP-CY-1022 (b)
CA, 1987 (Tall Utah 5275)	WP	1.1		370	6	30	including foliage	2.4 2.5	0.05 0.06	EP-CY-1022 (c)
CA, 1987 (Tall Utah 5275)	EC	0.28		370	6	15	including foliage	0.33 0.80	<0.05 (2)	EP-CY-1023 (a)
CA, 1987 (Tall Utah 5275)	EC	0.56		370	6	21	including foliage	0.46 0.35	<0.05 (2)	EP-CY-1023 (b)
CA, 1987 (Tall Utah 5275)	EC	1.1		370	6	30	including foliage	1.0 1.7	<0.05 (2)	EP-CY-1023 (c)
CA, 1987 (Tall Utah 5275)	EC	0.28		190	(6	15	including foliage	1.7 0.60	0.07 <0.05	EP-CY-1024 (a)
CA, 1987 (Tall Utah 5275)	EC	0.56		190	(6	21	including foliage	1.8 0.31	0.06 <0.05	EP-CY-1024 (b)
CA, 1987 (Tall Utah 5275)	EC	1.1		190	(6	30	including foliage	0.88 1.5	<0.05 (2)	EP-CY-1024 (c)
CA, 1989 (5270R)	EC	0.28		190	(2	15 22	including foliage	0.17 0.46 0.18 0.14	<0.05 (2) <0.05 (2)	EP-CY-1232 (a)
CA, 1989 (5270R)	EC	0.56		190	(2	21 28	including foliage	0.72 0.55 0.13 0.22	<0.05 (2) <0.05 (2)	EP-CY-1232 (b)
CA, 1988 (Florida 683)	EC	0.28		370	2	15 22	including foliage	1.3 0.33 0.18 0.63	<0.05 (2) <0.05 (2)	EP-CY-1233 (a)
CA, 1988 (Florida 683)	EC	0.56		370	2	21 28	including foliage	0.33 0.53 0.16 0.18	<0.05 (2) <0.05 (2)	EP-CY-1233 (b)
CA, 1988 (Florida 683)	EC	1.1		370	2	30 37	including foliage	0.15 0.20 0.17 0.20	<0.05 (2) <0.05 (2)	EP-CY-1233 (c)

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1988 (Florida 683)	WP	0.28		370	2	15 22	including foliage	0.13 0.74 0.06 0.12	<0.05 (2) <0.05 (2)	EP-CY-1234 (a)
CA, 1988 (Florida 683)	WP	0.56		370	2	21 28	including foliage	0.11 0.49 <0.05 0.08	<0.05 (2) <0.05 (2)	EP-CY-1234 (b)
CA, 1988 (Florida 683)	WP	1.1		370	2	30 37	including foliage	0.23 0.26 0.07 0.13	<0.05 (2) <0.05 (2)	EP-CY-1234 (c)
FL, 1988 (5270R)	EC	0.30		720	6	15	including foliage	12 12	0.16 0.16	EP-CY-5101 (a)
FL, 1988 (5270R)	EC	0.61		720	6	21	including foliage	7.8 9.9	0.12 0.12	EP-CY-5101 (b)
FL, 1988 (5270R)	EC	1.2		720	6	30	including foliage	8.9 5.9	0.14 0.11	EP-CY-5101 (c)
FL, 1988 (5270R)	WP	0.30		720	6	15	including foliage	9.3 8.3	0.12 0.11	EP-CY-5102 (a)
FL, 1988 (5270R)	WP	0.61		720	6	21	including foliage	8.6 9.0	0.11 0.12	EP-CY-5102 (b)
FL, 1988 (5270R)	WP	1.2		720	6	30	including foliage	6.3 5.7	0.24 0.20	EP-CY-5102 (c)
FL, 1988 (#683)	EC	0.28		71	(2	15 22	including foliage	0.23 0.12 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-5103 (a)
FL, 1988 (#683)	EC	0.56		71	(2	21 28	including foliage	0.16 0.07 0.05 <0.05	<0.05 (2) <0.05 (2)	EP-CY-5103 (b)
FL, 1988 (#683)	EC	1.1		71	(2	30 37	including foliage	0.09 0.11 <0.05 (2)	<0.05 (2) <0.05 (2)	EP-CY-5103 (c)
MI, 1988 (Utah Tall 52-70R1MP)	EC	0.28		215	2	15 22	including foliage	1.0 0.92 1.5 1.2	1.1 1.6 1.3 0.68	EP-CY-5105 (a)
MI, 1988 (Utah Tall 52-70R1MP)	EC	0.56		215	2	21 28	including foliage	2.2 1.4 1.5 1.2	0.58 0.30 0.36 0.23	EP-CY-5105 (b)
MI, 1988 (Utah Tall 52-70R1MP)	EC	1.1		215	2	30 37	including foliage	2.1 1.3 1.4 0.78	0.09 0.05 0.06 <0.05	EP-CY-5105 (c)
MI, 1988 (Utah Tall 52-70R1MP)	WP	0.28		215	2	15 22	including foliage	0.60 1.5 0.70 0.92	0.16 0.22 0.14 0.12	EP-CY-5106 (a)
MI, 1988 (Utah Tall 52-70R1MP)	WP	0.56		215	2	21 28	including foliage	2.3 1.9 0.68 0.78	0.45 0.39 0.47 0.19	EP-CY-5106 (b)
MI, 1988 (Utah Tall 52-70R1MP)	WP	1.1		215	2	30 37	including foliage	2.2 2.0 1.8 0.69	0.07 0.06 0.08 <0.05	EP-CY-5106 (c)
FL, 1988 (#683)	EC	0.28		270	6	15 22	including foliage	0.26 0.12 0.34 0.37	<0.05 (2) <0.05 (2)	EP-CY-5213 (a)

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
FL, 1988 (#683)	EC	0.56		270	6	21 28	including foliage	0.45 0.18 0.17 0.18	<0.05 (2) <0.05 (2)	EP-CY-5213 (b)
FL, 1988 (#683)	EC	1.1		270	6	30 37	including foliage	1.0 0.96 0.46 0.64	0.08 <0.05 <0.05 0.06	EP-CY-5213 (c)
FL, 1988 (#683)	WP	0.28		270	6	15 22	including foliage	1.1 1.3 0.50 0.70	0.05 0.08 <0.05 0.05	EP-CY-5214 (a)
FL, 1988 (#683)	WP	0.56		270	6	21 28	including foliage	0.34 0.12 <0.05 0.10	0.08 <0.05 <0.05 (2)	EP-CY-5214 (b)
FL, 1988 (#683)	WP	1.1		270	6	30 37	including foliage	0.20 1.0 0.29 0.06	<0.05 0.05 <0.05 (2)	EP-CY-5214 (c)

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Table 52. Parathion residues in almonds from supervised trials in the USA. Kernels analysed.

State, year (variety)	Application					Growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1988 (Non-Pareil)	WP	1.4	0.060	2300	1	dormant	180	<0.05 (2)	<0.05 (2)	EP-AL-1148 (a)
CA, 1988 (Non-Pareil)	WP	2.8		650	1	dormant	180	<0.05 (2)	<0.05 (2)	EP-AL-1148 (b)
CA, 1988 (Non-Pareil)	WP	1.4	0.060	2300	3	1-2% hull split	14	<0.05 0.06	<0.05 0.33	EP-AL-1148 (c)
CA, 1988 (Non-Pareil)	WP	2.8		650	3	1-2% hull split	14	0.06 0.09	<0.05 (2)	EP-AL-1148 (d)
CA, 1988 (Non-Pareil)	EC	1.4	0.060	2300	1	dormant	180	<0.05 (2)	<0.05 (2)	EP-AL-1149 (a)
CA, 1988 (Non-Pareil)	EC	2.8		650	1	dormant	180	<0.05 (2)	<0.05 (2)	EP-AL-1149 (b)
CA, 1988 (Non-Pareil)	EC	1.4	0.060	2300	3	1-2% hull split	14	<0.05 0.06	0.16 0.19	EP-AL-1149 (c)
CA, 1988 (Non-Pareil)	EC	2.8		650	3	1-2% hull split	14	0.06 0.06	0.07 0.05	EP-AL-1149 (d)
CA, 1988 (Non-Pareil)	WP	1.4	0.060	2300	1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1150 (a)
CA, 1988 (Non-Pareil)	WP	2.8		650	1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1150 (a)
CA, 1988 (Non-Pareil)	WP	1.4	0.060	2300	3	1-2% hull split	14	0.06 <0.05	<0.05 (2)	EP-AL-1150 (c)

State, year (variety)	Application					Growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1988 (Non-Pareil)	WP	2.8		650	3	1-2% hull split	14	0.07 0.08	<0.05 (2)	EP-AL-1150 (d)
CA, 1988 (Non-Pareil)	EC	1.4	0.060	2300	1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1151 (a)
CA, 1988 (Non-Pareil)	EC	2.8		650	1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1151 (b)
CA, 1988 (Non-Pareil)	EC	1.4	0.060	2300	3	1-2% hull split	14	0.08 0.05	0.24 0.22	EP-AL-1151 (c)
CA, 1988 (Non-Pareil)	EC	2.8		650	3	1-2% hull split	14	0.06 0.08	0.09 0.06	EP-AL-1151 (d)
CA, 1988 (Non-Pareil)	EC	2.8		190	(1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1152 (a)
CA, 1988 (Non-Pareil)	EC	2.8		190	(3	1-2% hull split	14	<0.05 (2)	<0.05 (2)	EP-AL-1152 (b)
CA, 1989 (Non-Pareil)	EC	2.8		190	(3	1 week pre-hulls	28	<0.05 (2)	<0.05 (2)	EP-AL-1237 (a)
CA, 1989 (Non-Pareil)	EC	2.8		190	(1	dormant	181	<0.05 (2)	<0.05 (2)	EP-AL-1237 (b)
CA, 1989 (Non-Pareil)	EC	2.5	0.060	4100	3	1 week pre-hulls	28	<0.05 (2)	<0.05 (2)	EP-AL-1238 (a)
CA, 1989 (Non-Pareil)	EC	2.8		420	3	1 week pre-hulls	28	<0.05 (2)	<0.05 (2)	EP-AL-1238 (b)
CA, 1989 (Non-Pareil)	EC	2.5	0.060	4100	1	dormant	186	<0.05 (2)	<0.05 (2)	EP-AL-1238 (c)
CA, 1989 (Non-Pareil)	EC	2.8		420	1	dormant	186	<0.05 (2)	<0.05 (2)	EP-AL-1238 (d)
CA, 1989 (Non-Pareil)	WP	2.5	0.060	4100	3	1 week pre-hulls	28	<0.05 (2)	<0.05 (2)	EP-AL-1239 (a)
CA, 1989 (Non-Pareil)	WP	2.8		420	3	1 week pre-hulls	28	<0.05 (2)	<0.05 (2)	EP-AL-1239 (b)
CA, 1989 (Non-Pareil)	WP	2.5	0.060	4100	1	dormant	186	<0.05 (2)	<0.05 (2)	EP-AL-1239 (c)
CA, 1989 (Non-Pareil)	WP	2.8		420	1	dormant	186	<0.05 (2)	<0.05 (2)	EP-AL-1239 (d)

(aerial application

Table 53. Parathion residues in pecans and walnuts from supervised trials in the USA. Walnut samples had been stored for approximately 970 days before analysis, which exceeds the 2 years storage stability demonstrated on almond kernels.

State, year (variety)	Application					growth stage	PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
Pecans											
TX, 1988 (Desirable)	WP	4.0	0.11	3400	4	full develop	15	nuts	<0.05 (2)	<0.05 (2)	EP-PC-1070 [1]
TX, 1988 (Desirable)	WP	2.8	0.60	470	4	full develop	15	nuts	<0.05 (2)	<0.05 (2)	EP-PC-1070 [1]
GA, 1987 (Stuart)	WP	1.0	0.11	840	6	shuck split	15	nuts and shells	<0.05 (2)	<0.05 (2)	EP-PC-5114 [1]
GA, 1987 (Stuart)	WP	2.8	0.33	840	6	shuck split	15	nuts and shells	<0.05 (2)	<0.05 (2)	EP-PC-5114 [1]
TX, 1988 (Desirable)	EC	3.8	0.11	3400	4	full develop	15	nuts	<0.05 (2)	<0.05 (2)	EP-PC-1071 [1]
GA, 1987 (Stuart)	EC	1.0	0.12	840	6	shuck split	15	nuts and shells	<0.05 (2)	<0.05 (2)	EP-PC-5113 [1]
Walnuts											
CA, 1987 (Sunland)	EC	8.4		2300	3	mature nuts	14	nut in shell	<0.05 (2)	<0.05 (2)	EP-WA-1110 [1]
CA, 1987 (Sunland)	EC	11.2		470	3	mature nuts	14	nut in shell	<0.05 (2)	<0.05 (2)	EP-WA-1110 [1]
CA, 1987 (Sunland)	EC	11.2		190	(3	mature nuts	14	nut in shell	<0.05 (2)	<0.05 (2)	EP-WA-1111 [1]

[1] unvalidated analytical data

(aerial application

Table 54. Parathion residues in barley grain from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
MT, 1997 (Lewis)	EC	0.84		54	(6	16	0.075 0.15	<0.01 0.01	MGB 97003.MT2 (b)
MT, 1997 (Pirolene)	EC	0.84		54	(6	16	0.24 0.25	0.02 0.02	MGB 97003.MT1 (b)
ND, 1997 (Robust)	EC	0.84		45	(6	15	0.78 0.59	0.03 0.03	MGB 97003.ND2 (b)
ND, 1997 (Stander)	EC	0.84		45	(6	15	0.54 0.47	0.07 0.06	MGB 97003.ND1 (b)

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
WI, 1997 (Robust)	EC	0.84		19	(6	14	2.2 2.2	0.092 0.083	MGB 97003.WI1 (c)
NY, 1997	EC	0.84		28	(6	15	1.6 1.4	0.095 0.075	MGB 97003.NY1 (b)
MN, 1997 (Hazen)	EC	0.81		19	(6	15	1.3 1.2	0.11 0.087	MGB 97003.MN2 (b)
UT, 1997 (Idagold)	EC	0.84		32	(6	14	1.9 2.2	0.11 0.12	MGB 97003.UT1 (b)
ID, 1997 (Colter)	EC	0.84		32	(6	15	3.5 4.9	0.15 0.19	MGB 97003.ID1 (b)
MN, 1997 (Chilton)	EC	0.81		19	(6	15	2.0 1.9	0.17 0.17	MGB 97003.MN1 (b)
ID, 1997 (Russell)	EC	0.84		32	(6	15	4.1 2.6	0.29 0.23	MGB 97003.ID2 (b)
AZ, 1998 (Orea)	EC	0.86		48	(6	14	3.3 3.0	0.29 0.25	MGB 97003.AZ1 (b)

(aerial application

Table 55. Parathion residues in maize from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
IA, 1989 (DeKalb 547)	EC	1.1		190	5	12	0.06	<0.05	EP-CN-2042
MO, 1989 (Funks G-4500)	EC	1.1		190	6	12	<0.05	<0.05	EP-CN-2043
IL, 1987 (Asgrow 788)	EC	1.1		49	(6	12	<0.05 (2) [1]	<0.05 (2) [1]	EP-CN-5027
IL, 1987 (Asgrow 788)	EC	1.1		190	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5029
IL, 1987 (Asgrow 788)	WP	1.1		190	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5030
MN, 1988 (Pioneer 3906)	EC	1.1		37	(6	12	<0.05 (2)	<0.05 (2)	EP-CN-5031
MN, 1987 (Pioneer 3969)	EC	1.1		190	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5033
MN, 1987 (Pioneer 3969)	WP	1.1		190	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5034
NE, 1987 (Pioneer 3475)	EC	1.1		190	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5035
NE, 1987 (Pioneer 3475)	WP	1.1		190	6	12	<0.05 0.09	<0.05 (2)	EP-CN-5036
OH, 1987 (DeKalb 636)	EC	1.1		150	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5037
OH, 1987 (DeKalb 636)	WP	1.1		150	6	12	<0.05 (2)	<0.05 (2)	EP-CN-5038

(aerial application
[1] samples stored for 790 days between harvest and analysis.

Table 56. Parathion residues in rice grain from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
TX, 1987 (Lemont)	EC	1.1		206	3	1	4.0 3.2	0.72 0.69	EP-RI-1088
CA, 1988 (L202)	EC	0.11		75	(3	1	0.28 0.33	0.07 0.05	EP-RI-1235
TX, 1987 (Lemont)	EC	0.11		47	(3	1	0.064 0.059	<0.05 (2)	EP-RI-1236
LA, 1987 (Lemont)	EC	1.1		250	6	1	11 11	1.7 1.7	EP-RI-5071
LA, 1987 (Lemont)	EC	1.1		75	(6	1	5.1	0.53	EP-RI-5072
LA, 1988 (Lemont)	EC	0.11		94	(6	1	0.21 0.23	<0.05 (2)	EP-RI-5215
LA, 1988 (Lemont)	EC	0.11		240	6	1	0.90 0.90	0.42 0.39	EP-RI-5216

(aerial application c: sample from control plot

Table 57. Parathion residues in sorghum grain from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
TX, 1994	CS	1.1		44	(2	12 21 28	0.29 0.17 0.14	<0.01 <0.01 <0.01	94-TX-GS-989-01 (b)
TX, 1994	EC	1.1		44	(2	12 21 28	0.44 0.54 0.51	0.01 0.01 0.01	94-TX-GS-988-01 (b)
KS, 1992 (NK 2030)	EC	0.56		44	(2	12 21 28	0.24 0.36 0.27 0.29 0.18 0.18	0.04 0.04 0.05 0.05 0.04 0.03	92150b-4
MO, 1992 (Topaz)	EC	1.1		45	(2	12 21 28	0.71 0.69 0.44 0.49 0.23 0.37	0.051 0.05 0.04 0.04 0.03 0.04	92150f-8
NE, 1992 (NK 2030/Pioneer 8379)	EC	1.1		47	(2	12 21 28	1.5 2.0 1.5 1.6 1.1 1.3	0.052 0.052 0.04 0.05 0.03 0.05	92150a-4
TX, 1992 (Pioneer 8313)	EC	1.1		46	(2	12 21 28	1.3 1.3 0.87 0.86 0.64 0.68	0.053 0.068 0.03 0.03 0.03 0.03	92150d-4
OK, 1992 (NK 2030)	EC	1.1		47	(2	12 21 28	0.69 0.60 0.19 0.23 0.11 0.09	0.06 0.06 0.03 0.04 <0.05 (2)	92150c-4
TX, 1987 (PAG6670)	EC	1.1		28	(6	12	0.61 0.59	0.12 0.13	EP-SG-1090

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
KS, 1987 (Paymaster 1022)	EC	1.1		47	6	12	1.6 1.3	0.17 0.16	EP-SG-5091
KS, 1987 (Paymaster 1022)	WP	1.1		47	6	12	1.7 1.7	0.18 0.19	EP-SG-5092
TX, 1987 (NK2660)	EC	1.1		47	6	12	0.85 0.85	0.20 0.16	EP-SG-1092
SD, 1992 (NK 1210)	EC	1.1		51	(2	12 21 28	3.3 3.2 2.4 1.8 1.8 1.5	0.20 0.18 0.17 0.12 0.17 0.12	92150e-4
TX, 1987 (NK2660)	WP	1.1		47	6	12	0.70 0.79	0.25 0.23	EP-SG-1091
KS, 1987 (Paymaster 1022)	EC	1.1		9	(6	12	3.8 3.8	0.38 0.39	EP-SG-5093

(aerial application

Table 58. Parathion residues in wheat grain from supervised trials in the USA. Residues are expressed on a fresh weight basis. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
WHEAT									
MN, 1994 (Krona)	EC	0.84		47	(2	15 21 36	0.08 0.07 0.04	<0.01 <0.01 <0.01	94-MN-WH-735-02
MN, 1994 (Krona)	CS	0.84		47	(2	15 21 36	0.11 0.10 0.07	<0.01 <0.01 <0.01	94-MN-WH-736-02
ND, 1994 (Pioneer 2375)	EC	0.84		47	(2	15 21 36	0.02 <0.01 0.02	<0.01 <0.01 <0.01	94-ND-WH-735-01
ND, 1994 (Pioneer 2375)	CS	0.84		47	(2	16 21 36	0.05 0.04 0.02	<0.01 <0.01 <0.01	94-ND-WH-736-01
CA, 1988 (Anza)	EC	1.1		94	(6	15	0.44 0.75	<0.05 (2)	EP-WH-1219 [1]
CA, 1988 (Anza)	WP	1.1		190	6	15	0.29 0.29	<0.05 (2)	EP-WH-1220 [1]
CA, 1988 (Anza)	EC	1.1		190	6	15	0.61 0.60	<0.05 (2)	EP-WH-1221 [1]

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
WA, 1988 (Stephens)	WP	1.1		110	6	15	0.11 0.10	<0.05 (2)	EP-WH-1222 [1]
WA, 1988 (Stephens)	EC	1.1		110	6	15	0.13 0.12	<0.05 (2)	EP-WH-1223 [1]
MO, 1989 (Caldwell)	WP	0.90		190	6	15	0.68 0.80	<0.05 (2)	EP-WH-1253 [1]
KS, 1988 (Pioneer 2157)	EC	1.1		120	6	15	1.0 0.94	<0.05 (2)	EP-WH-5189 [1]
KS, 1988 (Pioneer 2157)	WP	1.1		120	6	15	0.86 0.78	<0.05 (2)	EP-WH-5190 [1]
MO, 1988 (Caldwell)	EC	1.1		26	(6	15	<0.05 (2)	<0.05 (2)	EP-WH-5191 [1]
MO, 1988 (Caldwell)	EC	1.1		190	6	15	1.3 1.1	<0.05 (2)	EP-WH-5193 [1]
ND, 1988 (Marshall)	EC	1.1		94	6	15	0.18 0.19	<0.05 (2)	EP-WH-5195 [1]
ND, 1988 (Marshall)	WP	1.1		94	6	15	0.12 0.13	<0.05 (2)	EP-WH-5196 [1]
SPRING WHEAT									
WA, 1992 (Penawawa)	EC	0.56		47	(2	15 20 25	0.32 0.32 0.25 0.28 0.28 0.24	<0.02 (2) <0.02 ndr ndr (2)	92148a (a)
WA, 1992 (Penawawa)	EC	0.85		47	(2	15 20 25	0.54 0.53 0.45 0.40 0.30 0.49	<0.02 (2) <0.02 (2) ndr <0.02	92148a (b)
ID, 1992 (Penawawa)	EC	0.56		49	(2	15 20 25	0.48 0.46 0.51 0.51 0.49 0.56	<0.02 (2) <0.02 (2) 0.02 0.02	92148b (a)
ID, 1992 (Penawawa)	EC	0.85		49	(2	15 20 25	0.74 0.67 0.79 0.80 0.92 0.6	0.02 0.02 0.03 0.02 0.04 0.03	92148b (b)
MT, 1992 (Amadon)	EC	0.56 -0.69		48, 57	(2	15 25	0.05 0.04 0.04 0.05	ndr (2) ndr (2)	92148c (a)
MT, 1992 (Amadon)	EC	0.90 -0.93		51	(2	15 25	0.05 0.059 0.05 0.04	ndr (2) ndr (2)	92148c (b)
ND, 1992 (Gus)	EC	0.56		46	(2	15 20 25	0.03 0.02 0.02 <0.02 <0.02 (2)	<0.02 (2) ndr (2) ndr (2)	92148d (a)

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
ND, 1992 (Gus)	EC	0.84		46	(2	15 20 25	0.074 0.04 0.04 0.05 0.02 0.02	<0.02 (2) <0.02 (2) ndr (2)	92148d (b)
MN, 1992 (Vance)	EC	0.56		46	(2	15 20 25	0.075 0.062 0.02 0.02 0.04 0.04	ndr (2) ndr (2) ndr (2)	92148e (a)
MN, 1992 (Vance)	EC	0.84		46	(2	15 20 25	0.16 0.15 0.062 0.12 0.12 0.11	<0.05 (2) ndr (2) ndr (2)	92148e (b)
SD, 1992 (Bute 86)	EC	0.60 +0.48		51 +40	(2	15 20 25	0.29 0.30 0.18 0.19 0.18 0.17	<0.02 (2) ndr (2) ndr (2)	92148f (a)
SD, 1992 (Bute 86)	EC	0.88 +0.80		50 +44	(2	15 20 25	0.57 0.63 0.50 0.48 0.43 0.45	0.02 0.02 <0.02 (2) <0.02 (2)	92148f (b)
WINTER WHEAT									
KS, 1993 (Karl)	EC	0.56		47	(2	15 20 25	0.03 0.03 <0.02 (2) <0.02 (2)	<0.02 (2) ndr (2) ndr (2)	93240a (c)
KS, 1993 (Karl)	EC	0.83		47	(2	15 20 25	0.12 0.095 0.03 0.03 0.04 <0.02	0.03 0.03 ndr (2) ndr (2)	93240a (d)
TX, 1993 (DK 49 S)	EC	0.61		55	(2	15 20 25	0.04 0.03 0.04 0.04 0.04 0.03	ndr (2) ndr (2) ndr (2)	93240b (c)
TX, 1993 (DK 49 S)	EC	0.90		54	(2	15 20 25	0.12 0.11 0.13 0.12 0.13 0.14	<0.02 (2) ndr (2) ndr (2)	93240b (d)
OK, 1993 (McNair)	EC	0.56		47	(2	15 20 25	0.12 0.10 0.11 0.086 0.075 0.062	ndr (2) ndr (2) ndr (2)	93240c (c)
OK, 1993 (McNair)	EC	0.84		47	(2	15 20 25	0.20 0.20 0.21 0.17 0.14 0.14	<0.02 (2) <0.02 (2) ndr (2)	93240c (d)
CO, 1993 (Buckskin)	EC	0.56		47	(2	15 20 25	0.02 <0.02 ndr <0.02 <0.02 (2)	<0.02 (2) ndr (2) ndr (2)	93240d (c)
CO, 1993 (Buckskin)	EC	0.84		47	(2	15 20 25	0.05 0.062 <0.02 (2) <0.02 (2)	0.02 0.02 <0.02 (2) ndr (2)	93240d (d)
NE, 1993 (Buckskin)	EC	0.56		47	(2	15 20 25	0.03 <0.02 <0.02 (2) <0.02 (2)	<0.02 (2) ndr (2) ndr (2)	93240e (c)

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
NE, 1993 (Buckskin)	EC	0.84		47	(2	15 20 25	0.11 0.12 0.02 <0.02 0.03 0.03	0.03 0.04 <0.02 (2) ndr (2)	93240e (d)

[1] unvalidated analytical data

(aerial application

Table 59. Parathion residues in canola from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					growth stage	PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
MT, 1992 (Tobin)	EC	0.56		51	(2	early flowering	28	seed	0.12 0.13	<0.05 (2)	92145b
MT, 1992 (Tobin)	EC	1.1		51	(2	early flowering	28	seed	0.28 0.20	<0.05 (2)	92145b
WA, 1992 (Series)	EC	0.56		51	(2	post bloom	28	seed	<0.05 (2)	<0.05 (2)	92145c
WA, 1992 (Series)	EC	1.1		51	(2	post bloom	28	seed	0.23 0.19	<0.05 (2)	92145c
ID, 1992 (#104)	EC	0.56		42	(2	5% bloom	28	seed	<0.05 (2)	<0.05 (2)	92145d
ID, 1992 (#104)	EC	1.1		42	(2	5% bloom	28	seed	<0.05 (2)	<0.05 (2)	92145d
ND, 1992 (Legend)	EC	2×0.56 +2×1.1		47	(4	post flowering	28	seed	0.17 0.17	<0.05 (2)	92145a
ND, 1992 (Legend)	EC	2×0.28 +2×0.56		47	(4	post flowering	28	seed	0.073 0.088	<0.05 (2)	92145a
GA, 1994 (Iris)	EC	0.50		43	(2	mature seed	28	seed	0.12 0.081		94361a

(aerial application

Table 60. Parathion residues in cotton seed from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					Growth stage	PHI, days	Sample	% moisture	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.					parathion	paraoxon	
AR, 1997 (PM 1220.BG,RR)	EC	1.1		37	(6	mature	8	seed	13	0.15 0.10	<0.01 (2)	MGB 97004.AR1
AR, 1997 (NuCotn 33B)	EC	1.1		37	(6	mature	8	seed	14	0.19 0.16	<0.01 (2)	MGB 97004.AR2

State, year (variety)	Application					Growth stage	PHI, days	Sample	% moisture	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.					parathion	paraoxon	
AZ, 1997 (Delta Pine 50)	EC	1.1		47	(6	bolls open	7	seed	9	0.19 0.20	0.01 0.01	MGB 97004.AZ1
AZ, 1997 (DPL 33B)	EC	1.1		64	(6	top bolls open	6	seed	11	0.20 0.17	0.01 0.02	MGB 97004.AZ2
AZ, 1997 (DPL BT35)	EC	1.1		45	(6	upper bolls open	7	seed	13	0.65 0.61	0.02 0.02	MGB 97004.AZ3
GA, 1997 (BollGuard 33B)	EC	1.1		23	(6	open bolls	7	seed	11	0.78 1.3	0.03 0.05	MGB 97004.GA1
MS, 1997 (Suregrow 125)	EC	1.1		19	(6	80% open	7	seed	11	0.40 0.29	0.04 0.03	MGB 97004.MS1
TX, 1997 (Suregrow 125)	EC	1.1		28	(6			seed	9	2.0 1.4	0.12 0.074	MGB 97004.TX2
TX, 1997 (Explorer)	EC	1.1		28	(6	2 nodes above ?	7	seed	11	1.1 0.63	0.03 0.01	MGB 97004.TX2
TX, 1997 (HS-26)	EC	1.1		28	(6	5 nodes above ?	7	seed	11	0.20 0.30	<0.01 0.01	MGB 97004.TX3
TX, 1997 (HS-26)	EC	1.1		28	(6	4 nodes above ?	7	seed	9	0.33 0.32	0.054 0.04	MGB 97004.TX4
TX, 1997 (M-1)	EC	1.1		28	(6	6 nodes above ?	7	seed	9	0.11 0.13	<0.01 (2)	MGB 97004.TX5
CA, 1987 (GO510)	WP	1.1		280	6	bolls open	7	seed cotton		0.56 0.97	0.10 0.21	EP-CS-1025
CA, 1987 (GO510)	EC	1.4		280	6	immature	7	seed cotton		0.25 0.66	<0.05 0.087	EP-CS-1026
TX, 1987 (Stoneville 825)	WP	1.1		47	6	bolls open	7	seed cotton		0.12 0.15	<0.05 (2)	EP-CS-1027
TX, 1987 (Stoneville 825)	EC	1.4		47	6	bolls ½ open	7	seed cotton		0.26 0.14	<0.05 (2)	EP-CS-1028
MS, 1987 (DES 119)	EC	1.4		94	6	full boll	7	seed cotton		0.16 0.21	<0.05 (2)	EP-CS-5073
MS, 1987 (DES 119)	WP	1.1		94	6	full boll	7	seed cotton		0.48 0.43	<0.05 (2)	EP-CS-5074

(aerial application
seed cotton: lint + seed

Table 61. Parathion residues in sunflower seed from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
ND, 1989 (Sigco Hybrid 465A)	EC	1.1		190	3	post-flower	30	<0.05 (2)	<0.05 (2)	EP-SS-1240
ND, 1989 (Sigco Hybrid 465A)	WP	1.1		190	3	post-flower	30	<0.05 (2)	<0.05 (2)	EP-SS-1241
ND, 1989 (Sigco Hybrid 465A)	EC	1.1		47	(3	post-flower	30	<0.05 (2)	<0.05 (2)	EP-SS-1242
TX, 1989 (Sun Valley 230)	EC	1.1		190	3	10th true leaf	30	<0.05 (2)	<0.05 (2)	EP-SS-1243
TX, 1989 (Sun Valley 230)	WP	0.1		190	3	10th true leaf	30	<0.05 (2)	<0.05 (2)	EP-SS-1244
TX, 1989 (Sun Valley 230)	EC	1.1		59	(3	10th true leaf	30	<0.05 (2)	<0.05 (2)	EP-SS-1245
ND, 1988 (Sigco Hybrid 465A)	EC	1.1		190	3	post-flower	30	<0.05 (2)	<0.05 (2)	EP-SS-5181

(aerial application

Table 62. Parathion residues in barley hay and straw from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Sample	% moisture	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
ND, 1997 (Stander)	EC	0.84		45	(6	15	hay	37	0.096 0.073	0.01 0.01	MGB 97003.ND1 (a)
ND, 1997 (Robust)	EC	0.84		45	(6	15	hay	33	0.072 0.097	0.02 0.02	MGB 97003.ND2 (a)
NY, 1997	EC	0.84		28	(6	15	hay	27	0.059 0.18	0.02 0.03	MGB 97003.NY1 (a)
MT, 1997 (Pirolene)	EC	0.81		54	(6	14	hay	38	0.056 0.16	<0.01 0.05	MGB 97003.MT1 (a)
WI, 1997 (Robust)	EC	0.78		19	(6	14	hay	31	0.54 0.55	0.03 0.04	MGB 97003.WI1 (a)
ID, 1997 (Colter)	EC	0.84		32	(6	14	hay	25	0.21 0.20	0.04 0.03	MGB 97003.ID1 (a)

State, year (variety)	Application					PHI, days	Sample	% moisture	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
UT, 1997 (Idagold)	EC	0.84		32	(6	14	hay	36	0.70 0.39	0.051 0.04	MGB 97003.UT1 (a)
MN, 1997 (Chilton)	EC	0.78		19	(6	16	hay	32	0.72 1.1	0.057 0.071	MGB 97003.MN1 (a)
MT, 1997 (Lewis)	EC	0.81		54	(6	14	hay	27	0.17 0.19	0.059 0.078	MGB 97003.MT2 (a)
MN, 1997 (Hazen)	EC	0.78		19	(6	16	hay	39	2.5 3.6	0.17 0.17	MGB 97003.MN2 (a)
ID, 1997 (Russell)	EC	0.84		32	(6	14	hay	27	0.73 0.72	0.54 0.50	MGB 97003.ID2 (a)
AZ, 1998 (Orea)	EC	0.85		48	(6	14	hay	28	4.7 3.7	1.1 0.93	MGB 97003.AZ1 (a)
MT, 1997 (Pirolene)	EC	0.84		54	(6	16	straw	43	0.72 0.48	0.10 0.04	MGB 97003.MT1 (b)
MN, 1997 (Hazen)	EC	0.81		19	(6	15	straw	50	1.3 1.3	0.25 0.25	MGB 97003.MN2 (b)
MT, 1997 (Lewis)	EC	0.84		54	(6	16	straw	39	0.61 0.56	0.33 0.25	MGB 97003.MT2 (b)
ND, 1997 (Stander)	EC	0.84		45	(6	15	straw	54	2.8 1.6	0.53 0.40	MGB 97003.ND1 (b)
WI, 1997 (Robust)	EC	0.84		19	(6	14	straw	47	6.0 7.6	0.61 0.66	MGB 97003.WI1 (b)
NY, 1997	EC	0.84		28	(6	15	straw	31	3.5 2.6	0.73 0.34	MGB 97003.NY1 (b)
ID, 1997 (Russell)	EC	0.84		32	(6	15	straw	55	2.9 2.0	0.75 0.67	MGB 97003.ID2 (b)
ND, 1997 (Robust)	EC	0.84		45	(6	15	straw	51	3.5 2.7	0.77 0.59	MGB 97003.ND2 (b)
ID, 1997 (Colter)	EC	0.84		32	(6	15	straw	38	2.0 2.0	0.89 0.85	MGB 97003.ID1 (b)
MN, 1997 (Chilton)	EC	0.81		19	(6	15	straw	59	5.0 8.0	1.0 1.9	MGB 97003.MN1 (b)
UT, 1997 (Idagold)	EC	0.84		32	(6	14	straw	22	9.6 6.1	1.5 1.2	MGB 97003.UT1 (b)
AZ, 1998 (Orea)	EC	0.86		48	(6	14	straw	20	8.5 13	1.9 2.6	MGB 97003.AZ1 (b)

(aerial application

Table 63. Parathion residues in maize forage, fodder and silage from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
WA, 1989 (Jubilee)	EC	1.1		94	(6	12	fodder	<0.05 (2)	<0.05 (2)	EP-CN-1246
WA, 1989 (Jubilee)	EC	1.1		190	6	12	fodder	0.26 0.74	<0.05 0.06	EP-CN-1247
WA, 1989 (Jubilee)	WP	1.1		190	6	12	fodder	0.92 0.82	0.06 0.06	EP-CN-1248
FL, 1988 (Silver Queen)	EC	1.1		700	6	12	fodder	0.05 0.10	0.07 0.07	EP-CN-5007
FL, 1989 (Silver Queen)	WP	1.1		700	6	12	fodder	<0.05 0.06	0.06 0.06	EP-CN-5008
FL, 1988 (Merrit)	EC	1.1		59	(6	12	fodder	0.12 0.12	0.12 0.10	EP-CN-5009
NY, 1987 (Early Sunray)	EC	1.1		230	6	12	fodder	0.30 0.39	0.12 0.11	EP-CN-5011
NY, 1987 (Early Sunray)	WP	1.1		230	6	12	fodder	0.35 0.45	0.10 0.12	EP-CN-5012
WI, 1987 (Incredible)	EC	1.1		200	6	12	fodder	1.6 0.76	0.35 0.12	EP-CN-5013
WI, 1987 (Incredible)	WP	1.1		200	6	12	fodder	1.4 1.2	0.16 0.21	EP-CN-5014
IL, 1987 (Asgrow 788)	EC	1.1		49	(6	12	fodder [1]	0.39 0.86	<0.05 (2)	EP-CN-5027
IL, 1987 (Asgrow 788)	EC	1.1		190	(6	12	fodder	0.71 2.3	0.05 0.05	EP-CN-5029
IL, 1987 (Asgrow 788)	WP	1.1		190	6	12	fodder	5.7 6.3	0.56 0.43	EP-CN-5030
MN, 1988 (Pioneer 3906)	EC	1.1		37	(6	12	fodder	6.5 8.0	1.5 1.2	EP-CN-5031
MN, 1988 (Pioneer 3969)	EC	1.1		190	6	12	fodder	2.2 2.6	0.17 0.18	EP-CN-5033
MN, 1987 (Pioneer 3969)	WP	1.1		190	6	12	fodder	2.7 1.8	0.24 0.16	EP-CN-5034
NE, 1987 (Pioneer 3475)	EC	1.1		190	6	12	fodder	5.5 0.07	0.40 0.07	EP-CN-5035
NE, 1987 (Pioneer 3475)	WP	1.1		190	6	12	fodder	8.4 7.2	0.64 0.74	EP-CN-5036
OH, 1987 (DeKalb 636)	EC	1.1		150	6	12	fodder	19 15	2.9 1.2	EP-CN-5037

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
OH, 1987 (DeKalb 636)	WP	1.1		150	6	12 12	fodder	7.8 13 c 0.05	0.47 0.71 c <0.05	EP-CN-5038
WA, 1989 (Jubilee)	EC	1.1		94	(6	0 6 12 18 24	forage	0.15 <0.05 <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)	EP-CN-1246
WA, 1989 (Jubilee)	EC	1.1		190	6	0 6 12 18 24	forage	14 9.0 2.6 1.8 1.1 1.0 0.10 0.27 0.39 0.35 c 0.11	1.7 0.24 0.11 0.08 <0.05 (2) <0.05 (2) <0.05 (2) c <0.05	EP-CN-1247
WA, 1989 (Jubilee)	WP	1.1		190	6	0 6 12 18 24	forage	11 14 1.5 1.4 1.5 1.3 0.23 0.37 0.19 0.21	2.2 <0.05 0.19 0.12 <0.05 (2) <0.05 (2) <0.05 (2)	EP-CN-1248
FL, 1988 (Silver Queen)	EC	1.1		700	6	0 6 12 18 24	forage	5.6 4.8 0.18 0.19 0.10 0.10 <0.05 (2) <0.05 (2)	0.71 0.61 0.09 0.12 0.06 0.06 0.11 0.10 <0.05 (2)	EP-CN-5007
FL, 1989 (Silver Queen)	WP	1.1		700	6	0 6 12 18 24 18	forage	8.3 5.9 0.19 0.13 <0.05 0.05 0.05 (2) <0.05 (2) c <0.05	1.4 0.66 0.09 0.09 <0.05 0.07 0.08 0.08 <0.05 (2) c 0.09	EP-CN-5008
FL, 1988 (Merrit)	EC	1.1		58	(6	0 6 12 18 24	forage	5.8 5.4 0.16 0.26 <0.05 0.09 <0.05 (2) <0.05 (2)	0.30 0.21 <0.05 0.11 <0.05 0.06 <0.05 (2) 0.06 0.06	EP-CN-5009
NY, 1987 (Early Sunray)	EC	1.1		230	6	0 12 18 24	forage	33 0.56 0.46 0.18 0.10 0.17 0.15	0.48 0.16 0.09 0.07 <0.05 0.07 0.07	EP-CN-5011
NY, 1987 (Early Sunray)	WP	1.1		230	6	0 12 18 24	forage	22 1.3 0.95 0.12 0.21 0.17 0.15	0.24 0.19 0.17 0.08 0.08 0.11 0.11	EP-CN-5012
WI, 1987 (Incredible)	EC	1.1		200	6	0 7 12 18 7	forage	26 20 0.98 2.0 0.64 1.4 0.37 0.57 c 0.13	2.4 2.9 0.11 0.13 0.10 0.15 0.14 0.17 c <0.05	EP-CN-5013

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
WI, 1987 (Incredible)	WP	1.1		200	6	0 7 12 18 7	forage	30 20 1.2 1.1 2.1 0.96 0.31 0.33 c 0.10	2.9 0.29 0.11 0.15 0.19 0.21 0.12 0.12 c <0.05	EP-CN-5014
IL, 1987 (Asgrow 788)	EC	1.1		48	(6	0 6 18 24	forage	2.2 5.6 1.1 0.53 0.25 0.28 0.36 0.21	0.10 0.11 0.08 0.05 <0.05 (2) 0.06 <0.05	EP-CN-5015
IL, 1987 (Asgrow 788)	EC	1.1		190	6	0 6 18 24 6 24	forage [2]	9.6 29 0.43 3.3 1.4 1.0 0.62 0.62 c 0.07 c 0.07	0.40 0.92 0.51 0.18 0.13 0.11 0.08 0.09 c <0.05 c <0.05	EP-CN-5017
IL, 1987 (Asgrow 788)	WP	1.1		190	6	0 6 18 24	forage	30 20 2.3 3.3 1.2 0.98 0.95 1.6	1.1 0.73 0.20 0.26 0.13 0.12 0.11 0.18	EP-CN-5018
MN, 1988 (Pioneer 3732)	EC	1.1		230	6	0 6 18 25	forage	8.4 12 2.0 2.9 0.71 0.78 0.62 0.78	0.31 0.45 0.10 0.15 0.10 0.07 0.06 0.09	EP-CN-5019
MN, 1987 (Pioneer 3732)	WP	1.1		230	6	0 6 18 25	forage	11 9.7 1.2 1.8 0.90 0.86 0.48 0.44	0.56 0.47 0.07 0.12 0.09 0.09 <0.05 0.07	EP-CN-5020
MN, 1988 (Pioneer 3906)	EC	1.1		37	(6	0 8 18 24	forage	11 11 1.7 2.1 1.2 1.0 1.2 0.97	0.07 0.08 0.15 0.14 0.16 0.14 0.15 0.16	EP-CN-5021
NE, 1987 (Funk's 4500)	EC	1.1		190	6	0 6 18 24	forage	20 10 1.5 1.5 1.0 1.2 0.48 0.72	0.09 0.05 0.33 0.22 0.10 0.12 0.06 0.07	EP-CN-5023
NE, 1987 (Funk's 4500)	WP	1.1		190	6	0 0 6 18 24	forage	12 6.6 0.52 0.24 1.3 1.1 1.4 0.60	0.32 0.16 <0.05 0.18 0.11 <0.05 (2) <0.05	EP-CN-5024
OH, 1987 (Pioneer 3352)	EC	1.1		150	6	0 6 18 24 0 18 24	forage	23 19 6.3 8.1 0.26 0.30 0.31 c 0.21 c 0.14 c 0.20	1.0 1.2 0.32 0.35 0.28 0.25 0.28 c <0.05 c <0.05 c <0.05	EP-CN-5025

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
OH, 1987 (DeKalb 636)	WP	1.1		150	6	0 6 18 24 0 6 18 24	forage	5.5 15 7.2 8.1 6.0 4.1 3.9 4.3 c 0.21 c 0.21 c 0.18 c 0.17	0.21 0.89 0.40 0.45 0.43 0.33 0.28 0.29 c <0.05 c <0.05 c <0.05 c <0.05	EP-CN-5026
IL, 1987 (Asgrow 788)	EC	1.1		48	(6	12	silage	0.20 0.34	<0.05 (2)	EP-CN-5015
IL, 1987 (Asgrow 788)	EC	1.1		190	6	12	silage [2]	2.4 0.78	0.28 0.07	EP-CN-5017
IL, 1987 (Asgrow 788)	WP	1.1		190	6	12	silage	0.54 0.78	0.097 0.11	EP-CN-5018
MN, 1988 (Pioneer 3732)	EC	1.1		190	6	12	silage	1.4 2.6	0.13 0.24	EP-CN-5019
MN, 1987 (Pioneer 3732)	WP	1.1		230	6	12	silage	0.90 1.2	0.09 0.10	EP-CN-5020
MN, 1988 (Pioneer 3906)	EC	1.1		37	(6	12	silage	1.8 1.2	0.24 0.20	EP-CN-5021
NE, 1987 (Funk's 4500)	EC	1.1		190	6	12	silage	1.3 0.81	0.13 0.11	EP-CN-5023
NE, 1987 (Funk's 4500)	WP	1.1		190	6	12	silage	0.90 1.1	<0.05 (2)	EP-CN-5024

(aerial application c: sample from control plot

[1] samples stored for 790 days before analysis

[2] samples stored for 2 years before analysis.

Table 64. Parathion residues in rice straw from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
TX, 1987 (Lemont)	EC	1.1		206	3	1	straw	19 20	1.3 1.1	EP-RI-1088
CA, 1988 (L202)	EC	0.11		75	(3	1	straw	0.87 0.68	<0.05 (2)	EP-RI-1235
TX, 1987 (Lemont)	EC	0.11		47	(3	1	straw	0.44 0.38	<0.05 (2)	EP-RI-1236
LA, 1987 (Lemont)	EC	1.1		250	6	1	straw	163 45	10 3.7	EP-RI-5071
LA, 1987 (Lemont)	EC	1.1		75	(6	1	straw	15 19	1.3 1.3	EP-RI-5072

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
LA, 1988 (Lemont)	EC	0.11		94	(6	1	straw	1.3 0.94	0.13 0.07	EP-RI-5215
LA, 1988 (Lemont)	EC	0.11		240	6	1	straw	3.8 3.6	0.47 0.38	EP-RI-5216

(aerial application

Table 65. Parathion residues in sorghum hay, forage and stover from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Sample	% dry matter	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
TX, 1994	CS	1.1		44	(2	12 21 28	fodder	29 26 29	0.87 0.44 0.28	0.05 <0.05 <0.05	94-TX-GS-989-01 (b) 41988
TX, 1994	EC	1.1		44	(2	12 21 28	fodder	28 27 29	1.2 0.76 0.24	0.11 0.06 <0.05	94-TX-GS-988-01 (b) 41989
NE, 1992 (NK 2030/Pioneer 8379)	EC	0.55		47	(2	28	forage	26	<0.05 (2)	<0.05 (2)	92150a-1
KS, 1992 (NK 2030)	EC	0.56		44	(2	28	forage	24	<0.05 (2)	<0.05 (2)	92150b-1
OK, 1992 (NK 2030)	EC	0.56		47	(2	28	forage	25	<0.05 (2)	<0.05 (2)	92150c-1
TX, 1992 (Pioneer 8313)	EC	0.55		45	(2	28	forage	21	<0.05 (2)	<0.05 (2)	92150d-1
SD, 1992 (NK 1210)	EC	0.58		51	(2	28	forage	25	<0.05 (2)	<0.05 (2)	92150e-1
MO, 1992 (Funks - G1506)	EC	0.55		44	(2	28	forage	16	<0.05 (2)	<0.05 (2)	92150f-1
NE, 1992 (NK 2030/Pioneer 8379)	EC	1.1		47	(2	12 28	forage	25 28	0.087 0.082 <0.05 (2)	<0.05 (2) <0.05 (2)	92150a-2
KS, 1992 (NK 2030)	EC	1.1		44	(2	12 28	forage	23 25	0.59 0.72 0.11 0.18	<0.05 (2) <0.05 (2)	92150b-2
OK, 1992 (NK 2030)	EC	1.1		47	(2	12 28	forage	15 23	0.31 0.40 <0.05 0.08	<0.05 (2) <0.05 (2)	92150c-2
TX, 1992 (Pioneer 8313)	EC	1.1		46	(2	28	forage	17 18	0.13 0.12 <0.05 (2)	<0.05 (2) <0.05 (2)	92150d-2
SD, 1992 (NK 1210)	EC	1.3		51	(2	12 28	forage	20 26	1.7 1.0 0.40 0.35	<0.05 (2) <0.05 (2)	92150e-2
MO, 1992 (Funks - G1506)	EC	1.1		45	(2	12 28	forage	16 16	0.56 0.30 <0.05 0.07	<0.05 (2) <0.05 (2)	92150f-2

State, year (variety)	Application					PHI, days	Sample	% dry matter	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
TX, 1994	EC	1.1		44	(2	12 21 28	forage	30 35 37	0.34 0.25 <0.05 0.14 0.10 0.07	<0.05 (2) <0.05 (2) <0.05 (2)	94-TX-GS-988-01 (a) 41988
TX, 1994	CS	1.1		44	(2	12 21 28	forage	29 36 40	0.87 1.1 0.50 0.40 0.34 0.52	<0.05 (2) <0.05 (2) <0.05 (2)	94-TX-GS-989-01 (a)
NE, 1992 (NK 2030/Pioneer 8379)	EC	0.55		47	(2	28	hay	48	<0.05 (2)	<0.05 (2)	92150a-1
KS, 1992 (NK 2030)	EC	0.56		44	(2	28	hay	43	<0.05 (2)	<0.05 (2)	92150b-1
OK, 1992 (NK 2030)	EC	0.56		47	(2	28	hay	42	<0.05 (2)	<0.05 (2)	92150c-1
TX, 1992 (Pioneer 8313)	EC	0.55		45	(2	28	hay	34	<0.05 (2)	<0.05 (2)	92150d-1
SD, 1992 (NK 1210)	EC	0.58		51	(2	28	hay	42	0.07 0.10	<0.05 (2)	92150e-1
MO, 1992 (Funks - G1506)	EC	0.55		44	(2	28	hay	43	<0.05 (2)	<0.05 (2)	92150f-1
NE, 1992 (NK 2030/Pioneer 8379)	EC	1.1		47	(2	12 28	hay	47 47	0.18 0.13 <0.05 (2)	<0.05 (2) <0.05 (2)	92150a-2
KS, 1992 (NK 2030)	EC	1.1		44	(2	12 28	hay	41 43	1.5 1.6 0.25 0.22	<0.05 (2) <0.05 (2)	92150b-2
OK, 1992 (NK 2030)	EC	1.1		47	(2	12 28	hay	25 42	0.15 0.34 0.05 <0.05	<0.05 (2) <0.05 (2)	92150c-2
TX, 1992 (Pioneer 8313)	EC	1.1		46	(2	12 28	hay	32 36	0.23 0.25 0.065 0.086	<0.05 (2) <0.05 (2)	92150d-2
SD, 1992 (NK 1210)	EC	1.3		51	(2	12 28	hay	43 43	4.3 3.4 0.37 0.71	<0.05 (2) <0.05 (2)	92150e-2
MO, 1992 (Funks - G1506)	EC	1.1		45	(2	12 28	hay	22 36	0.33 0.52 0.08 0.08	<0.05 (2) <0.05 (2)	92150f-2
OK, 1992 (NK 2030)	EC	1.1		47	(2	28	stover	25	0.67 0.50	0.02 0.02	92150c-4
KS, 1992 (NK 2030)	EC	1.1		44	(2	28	stover	32	0.44 0.39	0.04 0.03	92150b-4
MO, 1992 (Topaz)	EC	1.1		45	(2	28	stover	31	0.96 0.78	0.04 0.04	92150f-8
NE, 1992 (NK 2030/Pioneer 8379)	EC	1.1		47	(2	28	stover	25	3.5 3.1	0.14 0.11	92150a-4
SD, 1992 (NK 1210)	EC	1.1		51	(2	28	stover	39	1.3 1.1	0.15 0.12	92150e-4
TX, 1992 (Pioneer 8313)	EC	1.1		46	(2	28	stover	33	4.0 0.83	0.18 0.071	92150d-4

(aerial application

Table 66. Parathion residues in wheat hay, straw and forage from supervised trials in the USA. Residues are expressed on a fresh weight basis. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Sample	% dry matter	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
MN, 1994 (Krona)	EC	0.84		47	(2	15 21 35	forage	[2]	0.12 0.08 <0.05	<0.05 <0.05 <0.05	94-MN-WH-735-02
MN, 1994 (Krona)	CS	0.84		47	(2	15 21 35	forage	[2]	<0.05 <0.05 <0.05	<0.05 <0.05 <0.05	94-MN-WH-736-02
ND, 1994 (Pioneer 2375)	EC	0.84		47	(2	15 21 35	forage	[2] 20 32	0.09 <0.05 <0.05	<0.05 <0.05 <0.05	94-ND-WH-735-01
ND, 1994 (Pioneer 2375)	CS	0.84		47	(2	15 21 35	forage	[2] 32	0.10 <0.05 0.10	<0.05 <0.05 <0.05	94-ND-WH-736-01
CA, 1988 (Anza)	EC	1.1		94	(6	0 5 10 15 20 25	forage		8.3 14 9.0 10 5.9 7.0 5.1 7.5 5.6 6.1 4.2 6.9	0.36 1.1 1.2 1.4 1.0 1.3 0.82 1.4 1.2 1.4 1.0 1.4	EP-WH-1219 [1]
CA, 1988 (Anza)	WP	1.1		190	6	0 5 9 15 20 25	forage		5.4 17 6.1 6.6 8.9 4.7 3.7 4.8 3.1 3.3 3.6 3.4	0.49 1.2 0.64 0.72 0.92 0.48 0.54 0.66 0.45 0.49 0.63 0.59	EP-WH-1220 [1]
CA, 1988 (Anza)	EC	1.1		190	6	0 5 10 15 20 25	forage		19 5.9 5.1 6.4 4.3 7.0 2.3 6.5 6.7 7.3 5.5 15	1.1 0.57 0.52 0.77 0.53 0.85 0.10 0.92 1.0 0.80 0.73 1.3	EP-WH-1221 [1]
WA, 1988 (Stephens)	WP	1.1		110	6	0 5 10 15 20 25 25	forage		20 31 2.9 1.8 0.91 0.46 0.54 0.74 0.84 0.95 0.73 0.62 0.05	0.53 0.85 0.62 0.37 0.32 0.22 0.22 0.22 0.24 0.31 0.26 0.21	EP-WH-1222 [1]

State, year (variety)	Application					PHI, days	Sample	% dry matter	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
WA, 1988 (Stephens)	EC	1.1		110	6	0 5 10 15 20 25 25	forage		17 14 1.6 1.6 1.5 1.4 0.58 0.56 0.75 0.84 1.1 0.79 c 0.06	0.52 0.59 0.47 0.45 0.43 0.39 0.20 0.18 0.28 0.35 0.54 0.35	EP-WH-1223 [1]
MO, 1989 (Caldwell)	WP	0.90		190	6	0 7 10 15 20 25	forage		8.6 9.3 2.6 3.6 1.5 2.0 2.3 1.2 2.3 2.3 1.4 1.5	0.64 0.95 0.36 0.50 0.19 0.25 0.40 0.19 0.39 0.36 0.20 0.26	EP-WH-1253 [1]
KS, 1988 (Pioneer 2157)	EC	1.1		120	6	0 5 10 15 20 25	forage		34 24 14 11 10 6.4 5.8 5.6 6.2 4.8 1.7 1.4 c 0.13 0.07	1.3 1.1 1.4 1.1 1.1 0.62 0.63 0.63 0.49 0.56 0.13 0.11	EP-WH-5189 [1]
KS, 1988 (Pioneer 2157)	WP	1.1		120	6	0 5 10 15 20 25 0 5	forage		28 30 11 14 8.0 10 6.6 5.4 3.9 4.3 1.3 1.6 c 0.12 c 0.12	0.92 1.1 0.92 1.3 0.58 0.75 0.54 0.42 0.41 0.43 0.09 0.15	EP-WH-5190 [1]
MO, 1988 (Caldwell)	EC	1.1		26	(6	0 5 10 15 20 25 0 15 20	forage		0.19 0.16 0.12 0.11 0.14 0.13 0.08 0.12 0.12 0.07 0.05 0.09 c 0.12 c 0.06 c 0.06	0.13 0.10 0.09 0.12 0.15 0.16 0.09 0.12 0.09 0.12 0.08 <0.05 c 0.05	EP-WH-5191 [1]
MO, 1988 (Caldwell)	EC	1.1		190	6	0 5 10 15 20 25	forage		26 30 9.2 13 7.4 8.8 5.5 5.7 2.8 5.7 4.6 4.2 c 0.05	1.3 1.3 0.99 1.5 1.2 1.2 1.1 1.0 0.71 1.1 0.96 0.73	EP-WH-5193 [1]
ND, 1988 (Marshall)	EC	1.1		94	6	0 5 10 15 20 25	forage		11 7.8 6.4 5.0 4.9 4.7 2.7 2.1 2.4 2.5 1.2 1.0	0.67 0.61 0.73 0.72 0.65 0.70 0.32 0.33 0.31 0.35 0.21 0.17	EP-WH-5195 [1]

State, year (variety)	Application					PHI, days	Sample	% dry matter	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
ND, 1988 (Marshall)	WP	1.1		94	6	0 5 10 15 20 25	forage		12 18 3.0 3.2 2.9 3.1 1.9 2.1 1.1 1.2 0.58 0.69	0.79 0.89 0.57 0.44 0.60 0.64 0.28 0.26 0.17 0.25 0.12 0.11	EP-WH-5196 [1]
MN, 1994 (Krona)	EC	0.84		47	(2	42 48 62	hay	[3] 62	0.10 0.05 <0.05	<0.05 <0.05 <0.05	94-MN-WH-735-02
MN, 1994 (Krona)	CS	0.84		47	(2	42 48 62	hay	[3] 67	<0.05 <0.05 <0.05	<0.05 <0.05 <0.05	94-MN-WH-736-02
ND, 1994 (Pioneer 2375)	EC	0.84		47	(2	42 48 62	hay	67 72 63 [3]	<0.05 <0.05 <0.05	<0.05 <0.05 <0.05	94-ND-WH-735-01
ND, 1994 (Pioneer 2375)	CS	0.84		47	(2	42 48 62	hay	[3] 67	0.07 <0.05 0.05	<0.05 <0.05 <0.05	94-ND-WH-736-01
MN, 1994 (Krona)	EC	0.84		47	(2	15 21 36	straw	[4]	3.1 2.1 1.4	0.24 0.16 0.09	94-MN-WH-735-02
MN, 1994 (Krona)	CS	0.84		47	(2	15 21 36	straw	[4]	3.1 1.5 0.65	0.15 0.10 <0.05	94-MN-WH-736-02
ND, 1994 (Pioneer 2375)	EC	0.84		47	(2	15 21 36	straw	[4] 65	0.94 0.54 0.98	0.07 <0.05 0.06	94-ND-WH-735-01
ND, 1994 (Pioneer 2375)	CS	0.84		47	(2	16 21 36	straw	[4] 67	0.67 0.49 0.36	<0.05 <0.05 <0.05	94-ND-WH-736-01
CA, 1988 (Anza)	EC	1.1		94	(6	15	straw		6.9 7.7	1.0 1.1	EP-WH-1219 [1]
CA, 1988 (Anza)	WP	1.1		190	6	15	straw		3.4 3.6	0.53 0.51	EP-WH-1220 [1]
CA, 1988 (Anza)	EC	1.1		190	6	15	straw		3.9 5.0	0.44 0.58	EP-WH-1221 [1]
WA, 1988 (Stephens)	WP	1.1		110	6	15	straw		1.2 1.1	0.12 0.13	EP-WH-1222 [1]
WA, 1988 (Stephens)	EC	1.1		110	6	15	straw		1.4 0.51	0.23 0.10	EP-WH-1223 [1]
MO, 1989 (Caldwell)	WP	0.90		190	6	15	straw		3.9 3.7	0.52 0.52	EP-WH-1253 [1]

State, year (variety)	Application					PHI, days	Sample	% dry matter	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
KS, 1988 (Pioneer 2157)	EC	1.1		120	6	15	straw		8.7 11	0.82 0.92	EP-WH-5189 [1]
KS, 1988 (Pioneer 2157)	WP	1.1		120	6	15	straw		9.4 8.5	0.74 0.83	EP-WH-5190 [1]
MO, 1988 (Caldwell)	EC	1.1		26	(6	15	straw		0.11 0.12	0.11 0.10	EP-WH-5191 [1]
MO, 1988 (Caldwell)	EC	1.1		190	6	15	straw		6.0 6.9 c 0.08	1.1 1.2	EP-WH-5193 [1]
ND, 1988 (Marshall)	EC	1.1		94	6	15	straw		2.8 4.3	0.24 0.33	EP-WH-5195 [1]
ND, 1988 (Marshall)	WP	1.1		94	6	15	straw		2.7 2.7	0.21 0.22	EP-WH-5196 [1]
WA, 1992 (Penawawa)	EC	0.56		47	(2	15 20 25	straw	87 92 86	3.6 3.4 3.1 2.8 2.0 2.1	0.25 0.26 0.27 0.26 0.20 0.23	92148a (a)
WA, 1992 (Penawawa)	EC	0.85		47	(2	15 20 25	straw	91 93 90	6.7 7.5 5.9 6.6 5.6 4.9	0.47 0.53 0.51 0.52 0.51 0.43	92148a (b)
ID, 1992 (Penawawa)	EC	0.56		49	(2	15 20 25 15	straw	92 91 62	1.4 1.4 1.9 1.8 1.2 1.1 c 0.05	0.19 0.19 0.29 0.32 0.15 0.13	92148b (a)
ID, 1992 (Penawawa)	EC	0.85		49	(2	15 20 25	straw	91 90 69	3.2 3.2 2.9 3.8 2.7 2.8	0.37 0.32 0.36 0.45 0.27 0.29	92148b (b)
MT, 1992 (Amadon)	EC	0.56 -0.69		48, 57	(2	15 25	straw	77 91	0.50 0.55 1.4 0.73	0.11 0.13 0.28 0.15	92148c (a)
MT, 1992 (Amadon)	EC	0.90 -0.93		51	(2	15 25	straw	69 86	0.63 0.86 0.86 1.0	0.16 0.20 0.26 0.31	92148c (b)
ND, 1992 (Gus)	EC	0.56		46	(2	15 20 25	straw	39 38 36	0.44 0.35 0.32 0.36 0.48 0.39	0.053 0.03 0.03 0.03 0.03 0.03	92148d (a)
ND, 1992 (Gus)	EC	0.84		46	(2	15 20 25	straw	35 34 39	0.91 1.2 1.1 0.92 0.99 0.90	0.055 0.084 0.052 0.05 0.05 0.051	92148d (b)
MN, 1992 (Vance)	EC	0.56		46	(2	15 20 25	straw	41 52 59	1.7 2.6 1.3 1.5 1.5 1.3	0.17 0.21 0.085 0.097 0.074 0.065	92148e (a)
MN, 1992 (Vance)	EC	0.84		46	(2	15 20 25	straw	40 59 60	5.2 7.3 5.4 2.9 4.2 6.1	0.34 0.43 0.25 0.12 0.19 0.27	92148e (b)

State, year (variety)	Application					PHI, days	Sample	% dry matter	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
SD, 1992 (Bute 86)	EC	0.88 +0.80		50 +44	(2	15 20 25	straw	87 91 63	9.5 8.7 6.8 6.5 7.6 4.9	0.81 0.53 0.48 0.56 0.45 0.45	92148f (b)
SD, 1992 (Bute 86)	EC	0.60 +0.48		51 +40	(2	15 20 25	straw	83 90 87	3.4 4.5 4.3 3.7 2.6 2.3	0.39 0.35 0.37 0.30 0.17 0.19	92148f (a)
KS, 1993 (Karl)	EC	0.56		47	(2	15	forage	18	0.073 0.061	0.02 <0.02	93240a (a)
KS, 1993 (Karl)	EC	0.84		47	(2	15	forage	19	0.087 0.051	0.02 <0.02	93240a (b)
TX, 1993 (DK 49 S)	EC	0.56		52	(2	15	forage	33	0.098 0.14	0.05 0.060	93240b (a)
TX, 1993 (DK 49 S)	EC	0.84		51	(2	15	forage	32	0.13 0.15	0.05 0.052	93240b (b)
OK, 1993 (McNair)	EC	0.55		45	(2	15	forage	19	0.32 0.34	0.092 0.079	93240c (a)
OK, 1993 (McNair)	EC	0.83		45	(2	15	forage	22	0.37 0.48	0.097 0.13	93240c (b)
CO, 1993 (Buckskin)	EC	0.56		46	(2	15	forage	26	0.057 0.15	<0.02 (2)	93240d (a)
CO, 1993 (Buckskin)	EC	0.83		46	(2	15	forage	25	0.31 0.79	0.073 0.091	93240d (b)
NE, 1993 (Buckskin)	EC	0.56		46	(2	15	forage	29	0.72 0.43	0.11 0.072	93240e (a)
NE, 1993 (Buckskin)	EC	0.83		46	(2	15	forage	27	0.52 0.48	0.13 0.11	93240e (b)
KS, 1993 (Karl)	EC	0.56		47	(2	15 20 25	straw	60 69 87	0.84 0.92 0.42 0.44 0.44 0.35	0.092 0.083 0.02 0.03 0.02 <0.02	93240a (c)
KS, 1993 (Karl)	EC	0.83		47	(2	15 20 25	straw	55 65 87	1.8 1.3 0.79 0.91 1.2 0.67	0.17 0.087 0.04 0.055 0.04 0.03	93240a (d)
TX, 1993 (DK 49 S)	EC	0.61		55	(2	15 20 25	straw	43 51 65	0.78 0.51 1.5 0.64 0.41 0.69	0.051 0.04 0.10 0.05 0.02 0.04	93240b (c)
TX, 1993 (DK 49 S)	EC	0.90		54	(2	15 20 25	straw	51 65 70	2.1 2.4 2.6 3.1 2.7 3.5	0.15 0.16 0.15 0.20 0.14 0.15	93240b (d)
OK, 1993 (McNair)	EC	0.56		47	(2	15 20 25	straw	65 77 87	0.80 3.3[5] 0.53 0.59 0.41 0.34	0.04 0.14 0.02 <0.02 <0.02 (2)	93240c (c)
OK, 1993 (McNair)	EC	0.84		47	(2	15 20 25	straw	56 76 87	1.0 1.9 1.5 1.1 0.63 0.44	0.04 0.063 0.03 0.03 <0.02 (2)	93240c (d)

State, year (variety)	Application					PHI, days	Sample	% dry matter	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
CO, 1993 (Buckskin)	EC	0.56		47	(2	15 20 25	straw	63 76 79	0.21 0.22 0.13 0.29 0.16 0.27	0.058 0.066 0.04 0.089 0.03 0.05	93240d (c)
CO, 1993 (Buckskin)	EC	0.84		47	(2	15 20 25	straw	64 71 80	0.25 0.47 0.39 0.50 0.38 0.33	0.066 0.13 0.12 0.14 0.062 0.055	93240d (d)
NE, 1993 (Buckskin)	EC	0.56		47	(2	15 20 25	straw	55 63 70	0.20 0.32 0.26 0.27 0.12 0.13	0.058 0.11 0.094 0.082 0.03 0.02	93240e (c)
NE, 1993 (Buckskin)	EC	0.84		47	(2	15 20 25	straw	57 68 77	1.4 1.8 0.92 0.92 1.4 1.5	0.22 0.30 0.16 0.20 0.22 0.24	93240e (d)

[1] unvalidated analytical data
[2] % dry matter was measured for selected forage samples in trials 94-xx-WH-735 and -736. Mean 30%
[3] % dry matter was measured for selected hay samples in trials 94-xx-WH-735 and -736. Mean 66%
[4] % dry matter was measured for selected straw samples in trials 94-xx-WH-735 and -736. Mean 64%
[5] Results on day 15 verified by re-extraction and analysis.
(aerial application c: sample from control plot

Table 67. Parathion residues in alfalfa from supervised trials in the USA.

State, year (variety)	Application					PHI, days	Sample[1]	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			% water	parathion	paraoxon	
IA, 1994	CS	1.1		47	(2	7 15 25 49	forage	69 75 71 75	7.5 2.5 0.81 <0.05	0.50 0.29 <0.05 <0.05	94-IA-AL-873-01
IA, 1994	CS	1.1		47	(2	7 15 25 49	hay	63 47 20 54	6.0 4.2 2.3 0.23	0.47 0.38 0.14 <0.05	94-IA-AL-873-01
ID, 1994	CS	1.1		47	(2	7 15 26 51	forage	83 81 77 79	4.6 2.5 1.4 <0.05	0.23 0.17 0.09 <0.05	94-ID-AL-873-04
ID, 1994	CS	1.1		47	(2	7 15 26 51	hay	24 21 26 57	15 5.9 2.9 0.11	0.64 0.63 0.20 <0.05	94-ID-AL-873-04
KS, 1994	CS	1.1		47	(2	7 15 25 50	forage	69 68 65 72	17 3.9 0.70 0.23	1.1 0.42 <0.05 <0.05	94-KS-AL-873-12

State, year (variety)	Application					PHI, days	Sample[1]	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			% water	parathion	paraoxon	
KS, 1994	CS	1.1		47	(2	7	hay	30	9.9	0.80	94-KS-AL-873-12
						15		17	5.2	0.48	
						25		22	1.6	0.09	
						50		42	0.20	<0.05	
MN, 1994	CS	1.1		47	(2	7	forage	78	4.4	0.51	94-MN-AL-873-08
						15		74	2.0	0.30	
						25		72	0.56	0.14	
						57		76	0.28	<0.05	
MN, 1994	CS	1.1		47	(2	7	hay	41	9.0	0.86	94-MN-AL-873-08
						15		49	3.9	0.63	
						25		32	1.8	<0.05	
						57		29	0.37	<0.05	
MO, 1994	CS	1.1		47	(2	7	forage	75	8.8	0.34	94-MO-AL-873-13
						15		73	2.4	0.10	
						25		74	0.28	<0.05	
						50		74	0.06	<0.05	
MO, 1994	CS	1.1		47	(2	7	hay	34	18	0.84	94-MO-AL-873-13
						15		43	3.6	0.22	
						25		39	0.82	<0.05	
						50		42	0.08	<0.05	
MT, 1994	CS	1.1		47	(2	7	forage	76	13	0.46	94-MT-AL-873-06
						15		75	7.3	0.38	
						25		72	5.7	0.28	
						50		70	1.9	<0.05	
MT, 1994	CS	1.1		47	(2	7	hay	47	36	0.77	94-MT-AL-873-06
						15		42	16	0.85	
						25		37	10	0.51	
						50		46	3.7	0.07	
ND, 1994	CS	1.1		47	(2	7	forage	81	2.0	0.26	94-ND-AL-873-07
						15		80	0.64	0.10	
						25		77	0.65	<0.05	
						56		77	0.25	<0.05	
ND, 1994	CS	1.1		47	(2	7	hay	52	4.2	0.57	94-ND-AL-873-07
						15		61	0.97	0.20	
						25		51	0.79	<0.05	
						56		31	0.42	<0.05	
NE, 1994	CS	1.1		47	(2	7	forage	80	3.3	0.29	94-NE-AL-873-09
						15		80	0.95	0.09	
						25		78	0.23	<0.05	
						50		83	<0.05	<0.05	
NE, 1994	CS	1.1		47	(2	7	hay	33	7.5	0.67	94-NE-AL-873-09
						15		48	1.4	0.14	
						25		27	1.0	<0.05	
						50		45	<0.05	<0.05	

State, year (variety)	Application					PHI, days	Sample[1]	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			% water	parathion	paraoxon	
NY, 1994	CS	1.1		47	(2	7 15 25 50	forage	74 79 75 81	6.6 2.5 2.3 0.06	0.40 0.10 0.08 <0.05	94-NY-AL-873-03
NY, 1994	CS	1.1		47	(2	7 15 25 50	hay	55 28 36 45	12 7.3 5.7 0.43	0.73 0.38 0.23 <0.05	94-NY-AL-873-03
OK, 1994	CS	1.1		47	(2	7 15 25 49	forage	76 73 76 80	24 8.2 1.2 <0.05	0.67 0.29 0.06 <0.05	94-OK-AL-873-11
OK, 1994	CS	1.1		47	(2	7 15 25 49	hay	32 14 34 25	30 25 3.4 <0.05	1.0 0.91 0.27 <0.05	94-OK-AL-873-11
SD, 1994	EC	1.1		47	(2	7 15 25 50	forage	77[3]	15 6.6 1.9 0.10	1.0 0.53 0.11 <0.05	94-SD-AL-737-02 41737
SD, 1994	EC	1.1		47	(2	7 15 25 50	hay	28[4]	31 9.5 1.5 0.22	1.9 0.49 0.09 <0.05	94-SD-AL-737-02
SD, 1994	CS	1.1		47	(2	7 15 25 50	forage	77[3]	12 3.4 1.1 0.11	0.59 0.33 0.08 <0.05	94-SD-AL-763-02
SD, 1994	CS	1.1		47	(2	7 15 25 50	hay	28[4]	35 5.3 2.9 0.31	1.5 0.28 0.13 <0.05	94-SD-AL-763-02
UT, 1994	CS	1.1		47	(2	7 15 26 56	forage	80 76 72 76	3.9 2.2 1.1 <0.05	0.19 0.16 0.11 <0.05	94-UT-AL-873-05
UT, 1994	CS	1.1		47	(2	7 15 26	hay	25 17 27	13 5.4 3.2	0.85 0.54 0.35	94-UT-AL-873-05
WA, 1994	CS	1.1		47	(2	7 15 25 50	forage	84 83 79 83	1.9 0.44 0.33 <0.05	0.16 <0.05 <0.05 <0.05	94-WA-AL-873-02
WA, 1994	CS	1.1		47	(2	7 15 25 50	hay	54 62 70 61	5.8 1.2 1.3 <0.05	0.54 0.17 0.10 <0.05	94-WA-AL-873-02

State, year (variety)	Application					PHI, days	Sample[1]	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			% water	parathion	paraoxon	
WI, 1994	EC	1.1		47	(2	7 15 25 67	forage	77[3]	11 4.5 1.5 <0.05	1.0 0.48 0.12 <0.05	94-WI-AL-737-01
WI, 1994	EC	1.1		47	(2	7 15 25 67	hay	28[4]	33 9.9 2.2 <0.05	2.2 1.1 0.24 <0.05	94-WI-AL-737-01
WI, 1994	CS	1.1		47	(2	7 15 25 67	forage	77[3]	6.4 2.8 0.68 <0.05 (2)	0.39 0.23 <0.05 <0.05 (2)	94-WI-AL-763-01
WI, 1994	CS	1.1		47	(2	7 15 25 67	hay	28[4]	19 7.0 1.7 <0.05	1.0 0.52 0.12 <0.05	94-WI-AL-763-01
CA, 1987 (Millet Mix)	EC	0.90		94	(4	15 15 37 15 15 37	forage 1 forage 2 forage 3 hay 1 hay 2 hay 3		1.5 1.2 0.63 0.38 <0.05 (2) 0.63 0.96 0.96 1.4 0.11 <0.05	0.29 0.24 0.08 0.06 <0.05 (2) 0.08 0.07 <0.05 0.06 <0.05 (2)	EP-AF-1001 [2]
CA, 1987 (Millet Mix)	EC	0.90		190	4	15 15 37 15 15 63	forage 1 forage 2 forage 3 hay 1 hay 2 hay 3		12 21 1.2 0.69 <0.05 (2) 32 34 2.1 6.1 0.05 <0.05	1.6 2.6 0.12 0.09 <0.05 (2) 2.3 3.9 0.24 0.40 <0.05 (2)	EP-AF-1002 [2]
CA, 1987 (Millet Mix)	WP	0.90		190	4	15 15 37 15 15 37	forage 1 forage 2 forage 3 hay 1 hay 2 hay 3		3.9 5.9 0.63 0.36 <0.05 0.06 1.7 2.5 1.8 2.5 <0.05 0.06	0.64 1.1 0.06 0.06 <0.05 (2) 0.23 0.29 0.40 0.36 <0.05 (2)	EP-AF-1003 [2]
CA, 1988 (Cuff 101)	EC	0.90		190	2	15	hay 1		1.9	0.20	EP-AF-2032 [2]
CA, 1988 (Cuff 101)	EC	4.5		190	2	15	hay 1 meal 1		11 12	0.56 1.4	EP-AF-2032 [2]
CA, 1988 (Cuff 101)	EC	0.90		190	2	15	hay 1		<0.05 c 0.11 0.39	<0.05 c <0.05 (2)	EP-AF-2033 [2]
CA, 1988 (Cuff 101)	EC	4.5		190	2	15	hay 1 meal 1		0.09 0.08	<0.05 <0.05	EP-AF-2033 [2]

State, year (variety)	Application					PHI, days	Sample[1]	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			% water	parathion	paraoxon	
IA, 1988	EC	0.90		170	4	13	forage 1		3.4 1.4	0.26 0.11	EP-AF-5128 [2]
						14	forage 2		1.1 1.6	0.09 0.13	
						46	forage 3		<0.05 (2)	<0.05 (2)	
						13	hay 1		3.6 1.2	0.28 0.10	
						14	hay 2		2.6 2.6	0.27 0.23	
						46	hay 3		0.09 0.11	<0.05 (2)	
IA, 1988	WP	0.90		170	4	13	forage 1		3.5 2.9	0.33 0.25	EP-AF-5129 [2]
						14	forage 2		0.43 0.42	<0.05 (2)	
						46	forage 3		<0.05 (2)	<0.05 (2)	
						13	hay 1		5.1 4.3	0.59 0.53	
						14	hay 2		0.98 0.63	0.11 0.09	
						46	hay 3		0.14 0.10	<0.05 (2)	
WI, 1988 (True Blue (Renk))	EC	0.90		240	5	15	forage 1		3.5 2.6	0.53 0.38	EP-AF-5130 [2]
						15	forage 2		1.0 1.3	0.19 0.25	
						21	forage 3		0.23 0.25	<0.05 (2)	
						15	hay 1		6.2 6.2	0.77 0.77	
						15	hay 2		1.2 1.2	0.16 0.17	
						21	hay 3		1.0 0.51	0.08 <0.05	
WI, 1988 (True Blue (Renk))	WP	0.90		240	5	15	forage 1		1.3 2.0	0.19 0.23	EP-AF-5131 [2]
						15	forage 2		0.42 0.38	0.09 0.07	
						21	forage 3		0.22 0.21	<0.05 (2)	
						15	hay 1		2.0 2.3	0.33 0.43	
						15	hay 2		1.5 0.74	0.16 0.10	
						21	hay 3		3.4 0.70	0.21 <0.05	
IA, 1988	EC	0.90		19	(4	15	forage 1		0.86 0.78	0.05 0.05	EP-AF-5132 [2]
						13	forage 2		0.14 0.16	<0.05 (2)	
						46	forage 3		<0.05 (2)	<0.05 (2)	
						15	hay 1		1.9 2.7	0.17 0.21	
						13	hay 2		0.43 0.63	<0.05 (2)	
						46	hay 3		<0.05 (2)	<0.05 (2)	
SD, 1988 (Coyote 990)	EC	0.90		75	4	14	forage 1		0.79 4.6	0.11 0.06	EP-AF-5134 [2]
						15	forage 2		1.7 1.8	0.19 0.18	
						63	forage 3		<0.05 (2)	<0.05 (2)	
						14	hay 1		2.4 5.5	0.25 0.60	
						15	hay 2		2.9 2.7	0.44 0.40	
						63	hay 3		<0.05 (2)	<0.05 (2)	
SD, 1988 (Coyote 990)	WP	0.90		75	4	14	forage 1		2.5 1.2	0.23 0.10	EP-AF-5135 [2]
						15	forage 2		2.5 0.99	0.15 0.11	
						63	forage 3		<0.05 (2)	<0.05 (2)	
						14	hay 1		3.0 2.8	0.31 0.26	
						15	hay 2		2.4 0.47	0.26 0.06	
						63	hay 3		<0.05 (2)	<0.05 (2)	
NE, 1988 (Wrangler)	EC	0.90		190	4	15	forage 1		3.0 5.8	0.17 0.32	EP-AF-5136 [2]
						15	forage 2		0.22 0.14	<0.05 (2)	
						49	forage 3		<0.05 (2)	<0.05 (2)	
						15	hay 1		6.2 5.6	0.31 0.32	
						15	hay 2		0.86 1.0	0.15 0.15	
						49	hay 3		<0.05 (2)	<0.05 (2)	

State, year (variety)	Application					PHI, days	Sample[1]	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			% water	parathion	paraoxon	
NE, 1988 (Wrangler)	WP	0.90		190	4	15 15 49 15 15 49	forage 1 forage 2 forage 3 hay 1 hay 2 hay 3		3.0 1.9 0.10 0.38 <0.05 (2) 3.0 6.0 0.39 0.48 <0.05 (2)	0.16 0.10 <0.05 0.06 <0.05 (2) 0.09 0.34 0.07 0.10 <0.05 (2)	EP-AF-5137 [2]
MN, 1988 (Iroquois)	EC	0.90		190	4	15 15 63 15 15 63	forage 1 forage 2 forage 3 hay 1 hay 2 hay 3		0.92 1.1 0.51 0.62 <0.05 (2) 1.9 1.2 1.1 0.82 <0.05 (2)	0.08 0.07 0.06 0.08 <0.05 (2) 0.19 0.12 0.14 0.20 <0.05 (2)	EP-AF-5138 [2]
MN, 1988 (Iroquois)	WP	0.90		190	4	15 15 63 15 15 63	forage 1 forage 2 forage 3 hay 1 hay 2 hay 3		1.1 0.64 0.33 0.35 <0.05 (2) 1.4 1.8 0.62 0.49 <0.05 (2)	0.06 <0.05 <0.05 (2) <0.05 (2) 0.09 0.20 0.09 0.05 <0.05 (2)	EP-AF-5139 [2]

[1] forage 1, forage 2, hay 1, etc refer to forage 1st cut, forage 2nd cut, hay 1st cut, etc
[2] unvalidated analytical data
[3] % moisture was measured for selected forage samples in trials 94-xx-AL-737 and -763. Mean 77%
[4] % moisture was measured for selected hay samples in trials 94-xx-AL-737 and -763. Mean 28%
(aerial application

Table 68. Parathion residues in red clover from supervised trials in the USA.

State, year (variety)	Application					growth stage	PHI, days	Sample[1]	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
MO, 1988	EC	0.90		187	3	flowering	15	forage 2	1.4 1.4	0.07 0.07	EP-CL-5154
MO, 1988	EC	0.90		187	3	flowering	15	hay 2	3.0 2.8	0.16 0.16	EP-CL-5154
MO, 1988	WP	0.90		187	4	flowering	15	forage 1	0.12 1.7	<0.05 0.14	EP-CL-5155
MO, 1988	WP	0.90		187	4	flowering	15	forage 2	1.6 1.0	0.07 0.06	EP-CL-5155
MO, 1988	WP	0.90		187	4	flowering	15	hay 1	1.1 1.5	0.09 0.11	EP-CL-5155
MO, 1988	WP	0.90		187	4	flowering	15	hay 2	2.1 2.1	0.08 0.09	EP-CL-5155
MO, 1988	EC	0.90		24	(4	80% flowering	15	forage 1	0.13 0.27	<0.05 (2)	EP-CL-5156
MO, 1988	EC	0.90		24	(4	80% flowering	15	forage 2	0.61 1.0	<0.05 (2)	EP-CL-5156

State, year (variety)	Application					growth stage	PHI, days	Sample[1]	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
MO, 1988	EC	0.90		24	(4	80% flowering	15	hay 1	<0.05 0.08	0.10 <0.05	EP-CL-5156
MO, 1988	EC	0.90		24	(4	80% flowering	15	hay 2	1.2 1.8	0.06 0.09	EP-CL-5156
NY, 1988	EC	0.90		260	4	bud stage	15	forage 1	3.2 1.0	0.19 0.06	EP-CL-5158
NY, 1988	EC	0.90		260	4	bud stage	15	forage 2	1.8 1.8	0.06 0.08	EP-CL-5158
NY, 1988	EC	0.90		260	4	bud stage	15	hay 1	2.1 5.8	0.08 0.38	EP-CL-5158
NY, 1988	EC	0.90		260	4	bud stage	15	hay 2	1.4 2.8	0.05 0.11	EP-CL-5158
NY, 1988	WP	0.90		260	4	bud stage	15	forage 1	3.0 1.6	0.26 0.10	EP-CL-5159
NY, 1988	WP	0.90		260	4	bud stage	15	forage 2	1.7 1.6	0.12 0.09	EP-CL-5159
NY, 1988	WP	0.90		260	4	bud stage	15	hay 1	2.6 3.9	0.18 0.26	EP-CL-5159
NY, 1988	WP	0.90		260	4	bud stage	15	hay 2	4.0 2.1	0.28 0.12	EP-CL-5159
OH, 1988 (Medium)	EC	0.90		190	4	pre-bloom	14	forage 1	1.5 1.6	0.12 0.14	EP-CL-5160
OH, 1988 (Medium)	EC	0.90		190	4	pre-bloom	15	forage 2	0.57 0.78	<0.05 (2)	EP-CL-5160
OH, 1988 (Medium)	EC	0.90		190	4	pre-bloom	14	hay 1	4.8 2.8	0.36 0.20	EP-CL-5160
OH, 1988 (Medium)	EC	0.90		190	4	pre-bloom	15	hay 2	1.4 1.5	0.06 0.06	EP-CL-5160
OH, 1988 (Medium)	WP	0.90		190	4	pre-bloom	14	forage 1	1.6 1.6	0.12 0.14	EP-CL-5161
OH, 1988 (Medium)	WP	0.90		190	4	pre-bloom	15	forage 2	1.2 1.6	<0.05 0.08	EP-CL-5161
OH, 1988 (Medium)	WP	0.90		190	4	pre-bloom	14 14	hay 1	5.2 5.2 c 0.54	0.38 0.40 c <0.05	EP-CL-5161
OH, 1988 (Medium)	WP	0.90		190	4	pre-bloom	15	hay 2	5.7 3.2	0.14 0.10	EP-CL-5161
PA, 1988	EC	0.90		260	4	bloom	15	forage 1	1.6 1.5	0.06 0.08	EP-CL-5162

State, year (variety)	Application					growth stage	PHI, days	Sample[1]	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.				parathion	paraoxon	
PA, 1988	EC	0.90		260	4	bloom	15	forage 2	1.2 0.85	0.06 0.05	EP-CL-5162
PA, 1988	EC	0.90		260	4	bloom	15	hay 1	3.5 5.0	0.22 0.31	EP-CL-5162
PA, 1988	EC	0.90		260	4	bloom	15	hay 2	1.6 2.2	0.24 0.16	EP-CL-5162
PA, 1988	WP	0.90		260	4	bloom	15	forage 1	2.3 1.5	0.18 0.08	EP-CL-5163
PA, 1988	WP	0.90		260	4	bloom	15	forage 2	0.75 0.85	<0.05 (2)	EP-CL-5163
PA, 1988	WP	0.90		260	4	bloom	15	hay 1	3.4 5.3	0.22 0.33	EP-CL-5163
PA, 1988	WP	0.90		260	4	bloom	15	hay 2	1.8 3.1	0.10 0.16	EP-CL-5163
WI, 1988 (Medium)	EC	0.90		240	4		15	forage 1	0.30 0.22	<0.05 (2)	EP-CL-5164
WI, 1988 (Medium)	EC	0.90		240	4		15	forage 2	4.4 6.0	0.14 0.20	EP-CL-5164
WI, 1988 (Medium)	EC	0.90		240	4		15 15	hay 1	0.44 0.64 c 0.12	<0.05 0.08	EP-CL-5164
WI, 1988 (Medium)	EC	0.90		240	4		15	hay 2	23 21	0.75 0.61	EP-CL-5164
WI, 1988 (Medium)	WP	0.90		240	4		15	forage 1	0.34 0.41	<0.05 0.05	EP-CL-5165
WI, 1988 (Medium)	WP	0.90		240	4		15	forage 2	5.4 12	0.18 0.34	EP-CL-5165
WI, 1988 (Medium)	WP	0.90		240	4		15 15	hay 1	0.32 0.50 c 2.9	<0.05 0.06 c 0.10	EP-CL-5165
WI, 1988 (Medium)	WP	0.90		240	4		15 15	hay 2	28 25 c 0.05	1.0 0.80 c <0.05	EP-CL-5165
OH, 1988 (Medium)	EC	0.90		47	(4	pre-bloom	14	forage 1	0.35 0.68	<0.05 0.11	EP-CL-5166
OH, 1988 (Medium)	EC	0.90		47	(4	pre-bloom	15	forage 2	0.90 1.3	<0.05 0.05	EP-CL-5166
OH, 1988 (Medium)	EC	0.90		47	(4	pre-bloom	14	hay 1	0.86 2.4	0.06 0.18	EP-CL-5166
OH, 1988 (Medium)	EC	0.90		47	(4	pre-bloom	15	hay 2	2.5 3.2	0.14 0.14	EP-CL-5166

[1] forage 1, forage 2, hay 1, etc refer to forage 1st cut, forage 2nd cut, hay 1st cut, etc
(aerial application

Table 69. Parathion residues in bean forage and vines from supervised trials in the USA. The duplicate values reported are for duplicate field samples.

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
NY, 1987 (Improved Tendergreen)	EC EC	0.56 0.90		280	6	7 15	vines	0.38 0.34 0.35 0.26	0.12 0.11 0.23 0.23	EP-LB-5083
NY, 1987 (Improved Tendergreen)	WP WP	0.56 0.90		280	6 6	7 15	vines	0.89 0.50 0.26 0.35	0.06 0.09 0.09 0.12	EP-LB-5084
WI, 1987 (FLO)	EC EC	0.56 0.90		60	(6 (6	7 15	vines	0.14 0.20 0.30 0.19	<0.05 (2) 0.06 <0.05	EP-LB-5085
WI, 1987 (FLO)	EC EC	0.56 0.90		260	6 6	7 15	vines	0.38 0.31 0.52 0.74	<0.05 (2) <0.05 (2)	EP-LB-5087
WI, 1987 (FLO)	WP WP	0.56 0.90		260	6 6	7 15	vines	0.44 0.75 0.36 0.49	<0.05 0.13 <0.05 (2)	EP-LB-5088
OR, 1987 (Roma II)	WP	0.90		110	3	0 7 15 21 28	forage	28 18 1.9 1.9 0.52 1.2 2.2 1.2 0.40 0.96	2.4 0.40 0.83 1.0 0.34 0.33 0.40 0.31 0.25 0.43	EP-LB-1130
OR, 1987 (Roma II)	WP	0.56		110	3	0 7 15 21 28	forage	17 12 0.92 1.3 0.34 0.50 0.21 0.15 0.13 0.27	0.38 0.33 0.46 0.66 0.33 0.35 0.11 0.11 0.09 0.23	EP-LB-1130
OR, 1987 (Roma II)	EC	0.56		120	3	0 7 15 21 28	forage	19 12 0.56 0.84 0.08 0.10 0.23 0.24 0.39 0.30	1.0 0.75 0.09 0.13 <0.05 (2) <0.05 0.07 0.29 0.17	EP-LB-1131
OR, 1987 (Roma II)	EC	0.90		120	3	0 7 15 21 28	forage	43 57 3.3 2.3 7.5 3.8 0.32 0.75 1.9 1.9	2.9 3.8 0.19 0.16 0.46 0.28 0.08 0.07 0.24 0.24	EP-LB-1131
OR, 1987 (OSU91)	EC	0.56		110	(3	0 7 15 21 28 21	forage	17 16 0.28 0.25 <0.05 (2) <0.05 (2) <0.05 (2) c 0.07	0.21 0.20 0.11 0.09 <0.05 (2) <0.05 (2) <0.05 (2)	EP-LB-1133
OR, 1987 (OSU91)	EC	0.90			(3	0 7 15 21 28	forage	25 17 1.1 1.5 <0.05 0.07 0.07 0.08 <0.05 (2)	0.29 0.21 0.21 0.24 0.06 0.07 <0.05 (2) <0.05 (2)	EP-LB-1133

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
NY, 1987 (Improved Tendergreen)	EC	0.56		280	6	0 7 15 21 28	forage	19 24 0.28 0.15 0.08 0.11 0.10 0.08 0.06 0.05	0.20 0.23 0.05 0.05 0.08 0.10 <0.05 (2) <0.05 (2)	EP-LB-5083
NY, 1987 (Improved Tendergreen)	EC	0.90			6	0 7 15 21 28	forage	41 27 0.41 0.47 0.14 0.25 0.19 0.12 0.17 0.14	<0.05 0.31 0.11 0.09 0.12 0.13 0.09 0.06 0.09 0.09	EP-LB-5083
NY, 1987 (Improved Tendergreen)	WP	0.56		280	6	0 7 15 21 28 0 28	forage	31 30 0.37 0.49 0.09 0.06 0.09 0.10 0.06 0.17 c 0.24 c 0.06	0.35 0.28 <0.05 0.05 <0.05 (2) 0.08 0.10 <0.05 (2)	EP-LB-5084
NY, 1987 (Improved Tendergreen)	WP	0.90			6	0 7 15 21 28 0 28	forage	53 52 0.49 0.48 0.14 0.15 0.08 0.09 0.11 0.11 c 0.24 c 0.06	0.51 0.51 0.09 0.06 0.09 0.07 0.11 0.08 0.06 0.09	EP-LB-5084
WI, 1987 (FLO)	EC	0.56		60	(6	0 7 15 21	forage	4.6 5.6 0.11 0.20 0.05 0.07 <0.05 (2)	0.05 0.07 <0.05 (2) <0.05 (2) <0.05 (2)	EP-LB-5085
WI, 1987 (FLO)	EC	0.90			(6	0 7 15 21	forage	8.8 12 0.33 0.22 0.10 0.13 <0.05 (2)	0.41 0.11 0.10 <0.05 <0.05 (2) <0.05 (2)	EP-LB-5085
WI, 1987 (FLO)	EC	0.56		260	6	0 7 15 21	forage	18 14 0.41 0.30 0.18 0.10 0.06 0.06	0.30- 0.33 0.07 0.05 <0.05 (2) <0.05 (2)	EP-LB-5087
WI, 1987 (FLO)	EC	0.90			6	0 7 15 21 0	forage	16 17 0.52 0.55 0.24 0.28 0.13 0.11 c 0.46	0.25 0.30 0.06 0.08 <0.05 0.05 <0.05 (2)	EP-LB-5087
WI, 1987 (FLO)	WP	0.56		260	6	0 7 15 21	forage	18 11 0.34 0.41 0.13 0.12 <0.05 0.06	0.15 0.15 <0.05 (2) <0.05 (2) <0.05 (2)	EP-LB-5088
WI, 1987 (FLO)	WP	0.90		260	6	0 7 15 21	forage	32 31 0.67 0.63 0.21 0.23 0.15 0.08	0.22 0.19 0.07 0.10 0.07 <0.05 <0.05 (2)	EP-LB-5088

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1987 (Kidney)	WP WP	0.56 0.90		280 280	6	7 14	vines	0.54 0.57 0.43 0.47	0.07 0.08 0.09 0.12	EP-DB-1113
CA, 1987 (Kidney)	EC EC	0.56 0.90		280 280	6 6	7 14 7	vines	0.69 0.88 0.13 0.52 c <0.05	0.23 0.21 0.21 0.33 c 0.05	EP-DB-1114
CA, 1987 (Kidney)	EC EC	0.56 0.90		94 94	(6 (6	7 14 14	vines	0.07 0.33 0.14 <0.05 c 0.11	<0.05 (2) <0.05 (2) c <0.05	EP-DB-1115
ID, 1988 (Pinto)	EC EC	0.56 0.90		94 94	(6 (6	7 15	vines	<0.05 (2) <0.05 (2)	<0.05 (2) <0.05 (2)	EP-DB-1116
ID, 1988 (Pinto)	WP WP	0.56 0.90		190 190	6	7 15	vine	1.1 1.9 0.39 0.36	0.12 0.09 0.05 <.05	EP-DB-1118
ID, 1988 (Pinto)	EC EC	0.56 0.90		190 190	6 6	7 15	vines	0.78 0.49 0.29 0.37	0.09 0.06 <0.05 (2)	EP-DB-1119
MI, 1988 (Seafarer Navy Bean)	EC	0.56		215	6	7 15	vines	0.80 0.77	0.10 <0.05	EP-DB-5142
MI, 1988 (Seafarer Navy Bean)	EC	0.90		215	6	7 15	vines	0.93 0.66	0.10 <0.05	EP-DB-5142
MI, 1988 (Seafarer Navy Bean)	WP	0.56		215	6	7 15	vine	0.51 0.40	<0.05 0.11	EP-DB-5143
MI, 1988 (Seafarer Navy Bean)	WP	0.90		215	6	7 15	vine	0.40 0.47	<0.05 0.10	EP-DB-5143
NE, 1988 (Pinto)	EC	0.56		190	7	7 15	vines - dried	0.16 0.11	<0.05 <0.05	EP-DB-5144
NE, 1988 (Pinto)	EC	0.90		190	7	7 15	vines - dried	0.36 0.30	<0.05 <0.05	EP-DB-5144
NE, 1988 (Pinto)	WP	0.56		190	7	7 15	vines - dried	0.08 0.09	<0.05 <0.05	EP-DB-5145
NE, 1988 (Pinto)	WP	0.90		190	7	7 15	vines - dried	0.27 0.27	<0.05 0.14	EP-DB-5145
CA, 1987 (Kidney)	WP	0.56		280	6	0 7 14 21 28	forage	5.4 3.5 0.17 0.37 0.09 0.09 0.12 0.09 0.06 0.09	0.31 0.24 0.05 0.09 <0.05 (2) 0.07 0.06 <0.05 (2)	EP-DB-1113
CA, 1987 (Kidney)	WP	0.90		280	6	0 7 14 21 28	forage	15 6.4 0.47 0.93 0.22 0.13 0.43 0.21 0.35 0.35	0.82 0.50 0.08 0.10 0.06 <0.05 0.12 0.11 0.07 <0.05	EP-DB-1113

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1987 (Kidney)	EC	0.56		280	6	0 7 14 21 28	forage	6.8 9.0 0.20 0.45 0.15 0.12 0.09 0.09 0.09 0.11	0.24 0.32 0.12 0.20 0.07 0.07 <0.05 (2) <0.05 (2)	EP-DB-1114
CA, 1987 (Kidney)	EC	0.09		280	6	0 7 14 21 28	forage	13 14 0.45 0.49 0.14 0.18 0.13 0.18 0.14 0.14	0.36 0.41 0.18 0.12 0.07 0.19 0.07 0.09 0.08 0.08	EP-DB-1114
CA, 1987 (Kidney)	EC	0.56		94	(6	0 7 14 21 28 0	forage	8.6 4.3 0.07 0.06 <0.05 (2) <0.05 (2) <0.05 (2) c 0.07	0.18 0.13 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) c <0.05	EP-DB-1115
CA, 1987 (Kidney)	EC	0.90		94	(6	0 7 14 21 28	forage	11 6.2 0.07 0.19 0.05 <0.05 0.06 0.07 <0.05 (2)	0.21 0.17 <0.05 0.08 <0.05 (2) <0.05 (2) <0.05 (2)	EP-DB-1115
ID, 1988 (Pinto)	EC	0.56		94	(6	0 7 15 21 28	forage	0.48 3.4 0.07 <0.05 <0.05 (2) <0.05 (2) <0.05 (2)	<0.05 0.08 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-DB-1116
ID, 1988 (Pinto)	EC	0.90		94	(6	0 7 15 21 28	forage	5.7 3.0 <0.05 (2) 0.06 0.07 <0.05 (2) <0.05 (2)	0.16 0.08 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-DB-1116
ID, 1988 (Pinto)	WP	0.56		190	6	0 7 15 21 28	forage	15 31 1.1 1.2 0.21 0.13 0.16 0.21 <0.05 0.06	0.15 0.28 <0.05 0.14 0.06 <0.05 <0.05 (2) 0.06 0.07	EP-DB-1118
ID, 1988 (Pinto)	WP	0.90		190	6	0 7 15 21 28	forage	25 31 1.6 2.8 0.28 0.25 0.08 0.07 0.05 0.30	0.26 0.32 0.19 0.21 0.07 0.06 <0.05 (2) 0.13 0.08	EP-DB-1118
ID, 1988 (Pinto)	EC	0.56		190	6	0 7 15 21 28	forage	14 19 0.86 0.93 <0.05 0.13 0.07 0.09 <0.05 (2)	0.07 0.08 0.06 0.11 <0.05 (2) <0.05 (2) <0.05 (2)	EP-DB-1119

State, year (variety)	Application					PHI, days	Sample	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
ID, 1988 (Pinto)	EC	0.90		190	6	0 7 15 21 28	forage	37 21 2.0 1.3 0.13 0.22 0.08 0.09 0.06 0.06	0.17 0.11 0.14 0.10 0.08 0.08 <0.05 (2) <0.05 (2)	EP-DB-1119
MI, 1988 (Seafarer Navy Bean)	EC	0.56		215	6	0 7 15 21 28	forage	6.2 4.1 0.30 0.25 0.32 0.25 0.22 0.17 0.09 0.09	0.18 0.12 0.10 0.11 0.05 <0.05 <0.05 (2) <0.05 (2)	EP-DB-5142
MI, 1988 (Seafarer Navy Bean)	EC	0.90		215	6	0 7 15 21 28	forage	11 0.56 0.67 0.37 0.58 0.59 0.35 0.07 0.11	0.31 0.17 0.17 <0.05 0.07 0.08 0.07 <0.05 (2)	EP-DB-5142
MI, 1988 (Seafarer Navy Bean)	WP	0.56		215	6	0 7 15 21 28	forage	5.1 7.3 0.47 0.47 0.06 0.10 0.10 0.15 0.12 0.16	0.21 0.25 0.06 <0.05 <0.05 (2) <0.05 (2) <0.05 (2)	EP-DB-5143
MI, 1988 (Seafarer Navy Bean)	WP	0.90		215	6	0 7 15 21 28	forage	7.3 7.6 1.0 0.82 0.16 0.29 0.16 0.16 0.26 0.24	0.29 0.36 0.08 0.08 <0.05 (2) <0.05 (2) <0.05 (2)	EP-DB-5143
NE, 1988 (Pinto)	EC	0.56		190	7	0 7 15 21 28	forage	11 10 0.18 0.24 0.08 0.08 <0.05 (2) <0.05 (2)	0.09 0.11 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-DB-5144
NE, 1988 (Pinto)	EC	0.90		190	7	0 7 15 21 28	forage	12 16 0.62 0.88 0.18 0.20 0.09 0.08 0.13 0.09	0.12 0.25 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-DB-5144
NE, 1988 (Pinto)	WP	0.56		190	7	0 7 15 21 28 28	forage	8.8 7.3 0.12 0.09 0.05 0.13 <0.05 (2) <0.05 (2) c 0.06	0.29 0.24 0.06 0.06 <0.05 0.06 <0.05 (2) <0.05 (2) c <0.05	EP-DB-5145
NE, 1988 (Pinto)	WP	0.90		190	7	0 7 15 21 28	forage	18 18 0.47 0.45 0.13 0.23 <0.05 (2) 0.05 <0.05	0.47 0.53 0.11 0.12 0.09 0.09 <0.05 (2) <0.05 (2)	EP-DB-5145

(aerial application c: sample from control plot

Table 70. Parathion residues in field pea forage and vines from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		Sample	parathion	paraoxon	
WA, 1989 (Dark Skin 49)	EC	0.56		187	6	0 5 10 15	forage	5.1 8.1 2.4 2.5 1.7 1.4 0.89 0.69	0.38 1.1 0.65 0.53 0.93 0.42 0.60 0.35	EP-PE-1176
WA, 1989 (Dark Skin 49)	WP	0.56		187	5	0 5 10 15	forage	2.3 12 1.9 3.5 2.0 3.0 0.19 0.36	0.41 1.2 0.81 1.1 1.1 0.91 <0.05 0.14	EP-PE-1177
WA, 1989 (Dark Skin 49)	EC	0.56		94	(6	0 5 10 15 20 25	forage	<0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) 0.11 0.11 0.08 0.05	0.44 <0.05 <0.05 (2) 0.19 0.25 0.28 0.36 <0.05 (2) <0.05 (2)	EP-PE-1179
WA, 1988 (Fraiser)	WP	0.56		140	6	0 5 10 15 20 25	forage	6.8 7.1 0.52 0.67 0.20 0.15 0.05 0.11 0.05 <0.05 <0.05 0.12	0.23 0.23 0.11 0.13 0.08 0.06 <0.05 (2) <0.05 (2) <0.05 (2)	EP-PE-1205
WA, 1988 (Fraiser)	EC	0.56		140	6	0 5 10 15 20 25	forage	6.2 7.9 1.1 0.93 0.13 0.11 0.32 0.14 0.17 0.10 0.10 0.10	0.24 0.30 0.22 0.20 0.06 0.06 0.08 <0.05 <0.05 (2) <0.05 (2)	EP-PE-1206
WA, 1988 (Fraiser)	EC	0.56		47	(6	0 5 10 15 20 25	forage	7.4 6.4 1.3 1.0 <0.05 (2) 0.07 0.12 0.07 0.08 0.08 <0.05	0.23 0.18 0.22 0.19 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-PE-1208
WI, 1988 (Ego)	EC	0.56		240	5	0 5 9 14 19 24	forage	2.1 2.1 0.10 0.07 <0.05 (2) <0.05 (2) 0.05 <0.05 <0.05 0.05	0.17 0.15 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-PE-5172
WI, 1988 (Ego)	WP	0.56		240	5	0 5 9 14 19 24	forage	3.1 4.1 0.09 0.11 0.08 <0.05 <0.05 (2) <0.05 (2) 0.05 <0.05	0.16 0.18 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-PE-5173

State, year (variety)	Application					PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		Sample	parathion	paraoxon	
WI, 1988 (9888F)	EC	0.56		38	(5	0 6 10 15 20 25	forage	<0.05 0.08 <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)	EP-PE-5174
WA, 1988 (Fraiser)	WP	0.56		140	6	10	vine	0.29 0.51	0.15 0.21	EP-PE-1205
WA, 1988 (Fraiser)	EC	0.56		140	6	10	vine	0.47 0.61	0.12 0.20	EP-PE-1206
WA, 1988 (Fraiser)	EC	0.56		47	(6	10	vine	0.45 0.37	0.19 0.11	EP-PE-1208
WI, 1988 (Ego)	EC	0.56		240	5	9	vine	0.08 0.05	<0.05 (2)	EP-PE-5172
WI, 1988 (Ego)	WP	0.56		240	5	9	vine	0.08 0.07	<0.05 (2)	EP-PE-5173
WI, 1988 (9888F)	EC	0.56		38	(5	10	vine	<0.05 (2)	<0.05 (2)	EP-PE-5174

(aerial application

Table 71. Parathion residues in soya bean hay from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application					PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.		parathion	paraoxon	
IL, 1988 (BSR 201)	EC	0.90		240	2	20	0.23 0.25	<0.05 (2)	EP-SY-5205
IL, 1988 (BSR 201)	WP	0.90		240	2	20	0.13 0.08	<0.05 (2)	EP-SY-5206
IL, 1988 (BSR 201)	EC	0.90		9	(2	20	0.46 0.36	<0.05 (2)	EP-SY-5207
MN, 1988 (Evans)	EC	0.90		190	2	20	0.21 0.57	0.12 0.23	EP-SY-5208
MN, 1988 (Evans)	WP	0.90		190	2	20	0.31 0.50	0.17 0.17	EP-SY-5209
MN, 1988 (Evans)	EC	0.90		37	(2	20	0.23 0.32	0.12 0.10	EP-SY-5210
GA, 1988 (Coker 488)	EC	0.90		61	2	20	0.58 0.61	<0.05 (2)	EP-SY-5211
GA, 1988 (Coker 488)	WP	0.90		61	2	20	0.27 0.62	<0.05 (2)	EP-SY-5212

(aerial application

Table 72. Parathion residues in almond hulls from supervised trials in the USA.

State, year (variety)	Application					Growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1988 (Non-Pareil)	WP	1.4	0.060	2300	1	dormant	180	<0.05 (2)	<0.05 (2)	EP-AL-1148 (a)
CA, 1988 (Non-Pareil)	WP	2.8		650	1	dormant	180	<0.05 (2)	<0.05 (2)	EP-AL-1148 (b)
CA, 1988 (Non-Pareil)	WP	1.4	0.060	2300	3	1-2% hull split	14	1.1 0.78	0.07 0.07	EP-AL-1148 (c)
CA, 1988 (Non-Pareil)	WP	2.8		650	3	1-2% hull split	14	1.5 1.1	0.06 <0.05	EP-AL-1148 (d)
CA, 1988 (Non-Pareil)	EC	1.4	0.060	2300	1	dormant	180	<0.05 (2)	<0.05 (2)	EP-AL-1149 (a)
CA, 1988 (Non-Pareil)	EC	2.8		650	1	dormant	180	<0.05 (2)	<0.05 (2)	EP-AL-1149 (b)
CA, 1988 (Non-Pareil)	EC	1.4	0.060	2300	3	1-2% hull split	14	0.18 0.18	0.62 0.50	EP-AL-1149 (c)
CA, 1988 (Non-Pareil)	EC	2.8		650	3	1-2% hull split	14	0.09 0.06	0.20 0.17	EP-AL-1149 (d)
CA, 1988 (Non-Pareil)	WP	1.4	0.060	2300	1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1150 (a)
CA, 1988 (Non-Pareil)	WP	2.8		650	1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1150 (a)
CA, 1988 (Non-Pareil)	WP	1.4	0.060	2300	3	1-2% hull split	14	0.90 0.90	0.07 0.10	EP-AL-1150 (c)
CA, 1988 (Non-Pareil)	WP	2.8		650	3	1-2% hull split	14	1.1 0.95	<0.05 (2)	EP-AL-1150 (d)
CA, 1988 (Non-Pareil)	EC	1.4	0.060	2300	1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1151 (a)
CA, 1988 (Non-Pareil)	EC	2.8		650	1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1151 (b)
CA, 1988 (Non-Pareil)	EC	1.4	0.060	2300	3	1-2% hull split	14	0.20 0.21	0.64 0.58	EP-AL-1151 (c)
CA, 1988 (Non-Pareil)	EC	2.8		650	3	1-2% hull split	14	0.05 0.11	0.16 0.15	EP-AL-1151 (d)
CA, 1988 (Non-Pareil)	EC	2.8		190	(1	dormant	178	<0.05 (2)	<0.05 (2)	EP-AL-1152 (a)
CA, 1988 (Non-Pareil)	EC	2.8		190	(3	1-2% hull split	14	0.21 0.20	<0.05 (2)	EP-AL-1152 (b)

State, year (variety)	Application					Growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	kg ai/hl	water, l/ha	no.			parathion	paraoxon	
CA, 1989 (Non-Pareil)	EC	2.8		190	(3	1 week pre-hulls	28	<0.05 (2)	<0.05 (2)	EP-AL-1237 (a)
CA, 1989 (Non-Pareil)	EC	2.8		190	(1	dormant	181	0.41 0.19	<0.05 (2)	EP-AL-1237 (b)
CA, 1989 (Non-Pareil)	EC	2.5	0.060	4100	3	1 week pre-hulls	28	0.06 0.16	<0.05 (2)	EP-AL-1238 (a)
CA, 1989 (Non-Pareil)	EC	2.8		420	3	1 week pre-hulls	28	0.47 0.47	<0.05 (2)	EP-AL-1238 (b)
CA, 1989 (Non-Pareil)	EC	2.5	0.060	4100	1	dormant	186	0.08 0.08	<0.05 (2)	EP-AL-1238 (c)
CA, 1989 (Non-Pareil)	EC	2.8		420	1	dormant	186	0.08 0.10	<0.05 (2)	EP-AL-1238 (d)
CA, 1989 (Non-Pareil)	WP	2.5	0.060	4100	3	1 week pre-hulls	28	0.30 0.18	<0.05 (2)	EP-AL-1239 (a)
CA, 1989 (Non-Pareil)	WP	2.8		420	3	1 week pre-hulls	28	0.81 0.70	<0.05 (2)	EP-AL-1239 (b)
CA, 1989 (Non-Pareil)	WP	2.5	0.060	4100	1	dormant	186	0.10 0.13	<0.05 (2)	EP-AL-1239 (c)
CA, 1989 (Non-Pareil)	WP	2.8		420	1	dormant	186	0.10 0.08	<0.05 (2)	EP-AL-1239 (d)

(aerial application

Table 73. Parathion residues in cotton gin trash from supervised trials in the USA. All EC formulations.

State, year (variety)	Application			Growth stage	PHI, days	Residues, mg/kg			Ref.
	kg ai/ha	water, l/ha	no.			% moisture	parathion	paraoxon	
AR, 1997 (PM 1220.BG,RR)	1.1	37	(6	mature	8	45	2.2 2.4	0.080 0.075	MGB 97004.AR1
MS, 1997 (Suregrow 125)	1.1	19	(6	80% open	7	23	13 25	0.49 0.86	MGB 97004.MS1
TX, 1997 (Explorer)	1.1	28	(6	2 nodes above ?	7	25	3.6 4.8	0.13 0.16	MGB 97004.TX2
TX, 1997 (HS-26)	1.1	28	(6	5 nodes above ?	7	34	2.7 1.6	0.04 0.07	MGB 97004.TX3
TX, 1997 (HS-26)	1.1	28	(6	4 nodes above ?	7	10	5.2 5.7	0.26 0.38	MGB 97004.TX4

(aerial application

Table 74. Parathion residues in sugar beet fodder from supervised trials in the USA in 1988.

State, year (variety)	Application			PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	no.		parathion	paraoxon	
CA (SS NB2)	EC	0.90	(6	21	0.68 0.67	0.08 0.06	EP-SB-1097 [1]
CA (SS NB2)	WP	0.90	6	21	1.3 0.76	<0.05 (2)	EP-SB-1098 [1]
CA (SS NB2)	EC	0.90	6	21	0.71 0.57	<0.05 (2)	EP-SB-1099 [1]
ID (WS 88)	EC	0.90	6	21	0.27 0.29	<0.05 0.06	EP-SB-1125 [1]
ID (WS 88)	WP	0.90	6	21	0.38 0.71	0.06 0.10	EP-SB-1126 [1]
MN (Ultramono)	EC	0.90	6	21	0.79 0.71	<0.05 0.07	EP-SB-5089 [1]
MN (Ultramono)	WP	0.90	6	21	1.1 0.91	0.06 0.05	EP-SB-5090 [1]
ND (ACS ACH176)	EC	0.90	6	21	0.66 0.62	<0.05 (2)	EP-SB-5177 [1]
ND (ACS ACH176)	WP	0.90	6	21	0.79 0.80	<0.05 (2)	EP-SB-5178 [1]
MN (Ultramono)	EC	0.90	(6	21	0.13 0.23	<0.05 (2)	EP-SB-5179 [1]

[1] unvalidated analytical data
(aerial application

Table 75. Parathion residues in sunflower forage from supervised trials in the USA. Double-underlined residues are from treatments according to GAP and are valid for estimation of maximum residue levels.

State, year (variety)	Application				growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion	paraoxon	
ND, 1989 (Sigco Hybrid 465A)	EC	1.1	190	3	post-flower	0 10 20 30 40	21 26 4.4 3.8 1.6 1.9 3.2 5.5 2.0 2.8	0.14 0.20 0.13 0.11 0.09 0.14 0.16 0.22 0.10 0.12	EP-SS-1240
ND, 1989 (Sigco Hybrid 465A)	WP	1.1	190	3	post-flower	0 10 20 30 40	18 17 4.4 1.6 0.60 0.73 4.6 3.3 5.5 2.2	0.22 0.13 0.12 0.06 <0.05 (2) 0.20 0.11 0.16 0.10	EP-SS-1241
ND, 1989 (Sigco Hybrid 465A)	EC	1.1	47	(3	post-flower	0 10 20 30 40	4.2 4.2 1.6 2.4 1.2 1.2 0.76 1.3 2.2 0.47	<0.05 (2) 0.08 0.11 0.06 <0.05 0.05 0.08 0.06 <0.05	EP-SS-1242
TX, 1989 (Sun Valley 230)	EC	1.1	190	3	10th true leaf	0 10 20 30 40	32 67 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	0.06 0.13 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-SS-1243

State, year (variety)	Application				growth stage	PHI, days	Residues, mg/kg		Ref.
	Form	kg ai/ha	water, l/ha	no.			parathion	paraoxon	
TX, 1989 (Sun Valley 230)	WP	0.1	190	3	10^{th} true leaf	0 10 20 30 40	42 32 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	0.10 0.08 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-SS-1244
TX, 1989 (Sun Valley 230)	EC	1.1	59	(3	10^{th} true leaf	0 10 20 30 40	62 67 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	0.12 0.22 <0.05 (2) <0.05 (2) <0.05 (2) <0.05 (2)	EP-SS-1245

(aerial application

FATE OF RESIDUES IN STORAGE AND PROCESSING

In processing

The Meeting received information on parathion residues in processed lemons, grapefruit, oranges, apples, grapes, olives, tomatoes, potatoes, sugar beet, oats, maize, rice, sorghum, wheat sunflower seed, cotton seed and canola. Trials on olives, tomatoes, potatoes and sugar beet were based on unvalidated analytical data from Craven Laboratories and could not be used.

Lemons. In 2 trials in 1988 in California, USA, lemons treated with parathion applied with a commercial sprayer in the first trial and with a handgun sprayer in the second were harvested 30 days after the last application (LeRoy, 1990i). An EC formulation of 16 kg ai/ha, spray concentration 0.72 kg ai/hl and volume 22 hl/ha, was used at 3 times the label rate. Residues decreased in the juice during processing but increased in the cold pressed oil (Table 76). The process is outlined in Figure 4.

Table 76. Parathion residues in lemons and their processed commodities from supervised trials and processing in 1988 in the USA (LeRoy, 1990i).

Variety	Application			PHI days	Residues, mg/kg			Ref
	Form	kg ai/hl	no.		commodity	parathion	paraoxon	
Lisbon	EC	0.72	3	30	fruit, unwashed juice wet peel dried peel molasses cold pressed oil	12 0.29 5.7 14 0.40 sample lost	0.49 <0.05 0.08 0.18 <0.05 	EP-LM-2013
Lisbon	EC	0.72	3	30	fruit, unwashed juice wet peel dried peel molasses cold pressed oil	0.15 7.2 9.4 3.2 0.14 7.9 17 1.6 495	<0.05 0.09 0.11 0.07 <0.05 0.07 0.15 <0.05 4.1	EP-LM-2014

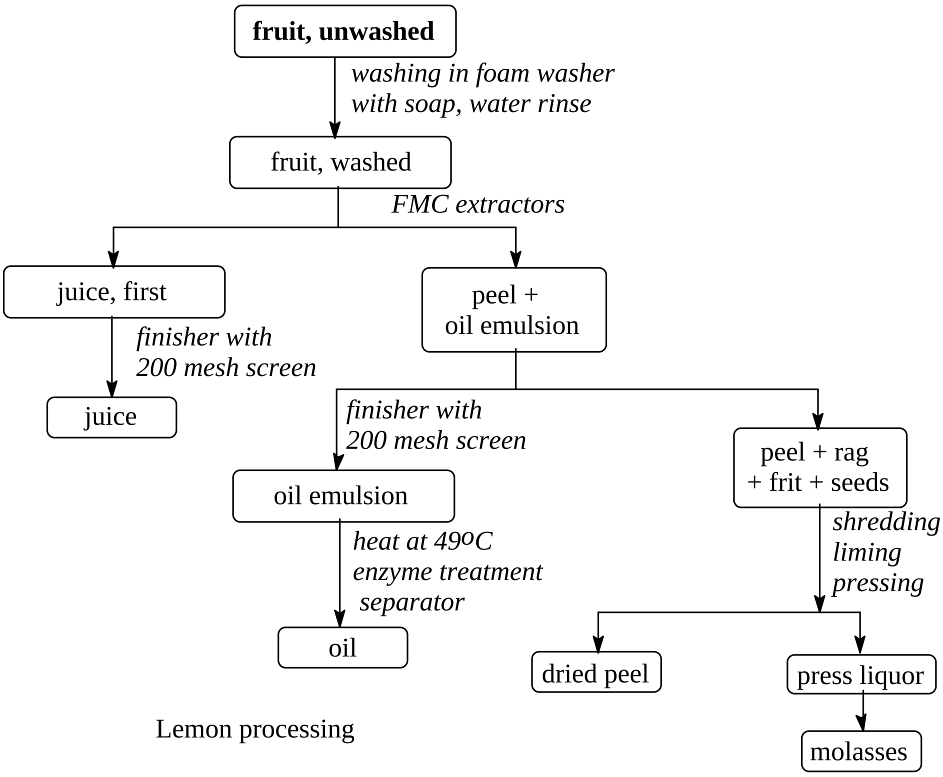


Figure 4. Processing of lemons (LeRoy, 1990i).

Grapefruit. In a trial in 1988 in Florida, USA, grapefruit were sprayed with parathion by commercial airblast equipment and harvested 31 days after the last application (LeRoy, 1990g). The application rate of 34 kg ai/ha of an EC formulation was 3 times the label concentration. Residue levels decreased in the juice during processing but increased in cold pressed oil (Table 77). The process was the same as that described for oranges below (Figure 5).

Table 77. Parathion residues in red grapefruit and its processed commodities from a supervised trial and processing in the USA (LeRoy, 1990h).

State, year	Application			PHI, days	Residues, mg/kg			Ref
	Form	kg ai/ha	no.		commodity	parathion	paraoxon	
FL, 1988	EC	34	3	31	fruit, unwashed	5.4	0.43	EP-GF-2015
					juice	<0.05	<0.05	
					wet pulp	8.7	0.71	
					dried pulp	32	1.7	
					molasses	1.2	1.3	
					cold pressed oil	1650	49	

Oranges. In one US trial in Florida in 1988 an orange orchard was sprayed with parathion by commercial airblast equipment at 0.72 kg ai/hl (34 kg ai/ha) of an EC formulation (3 times the label concentration) and the oranges were harvested 31 days after the last application (LeRoy, 1990g). "Wet" pulp is the residual juice sacs after juice separation and "dried" pulp is the residual chopped and dried peel after oil extraction (Figure 5). Residues decreased in the juice during processing but increased substantially in cold pressed oil (Table 78).

Table 78. Parathion residues in oranges and their processed commodities from a supervised trial in the USA (LeRoy, 1990g).

State, year (variety)	Application			PHI, days	Residues, mg/kg			Ref
	Form	kg ai/ha	no.		commodity	parathion	paraoxon	
FL, 1988 (Hamlin)	EC	34	3	31	fruit, unwashed	7.0	0.40	EP-OR-2011
					fruit, washed	6.3	0.38	
					juice	0.36	<0.05	
					wet pulp	4.9	0.40	
					dried pulp	34	1.4	
					molasses	4.6	0.08	
					cold pressed oil	1674	33	

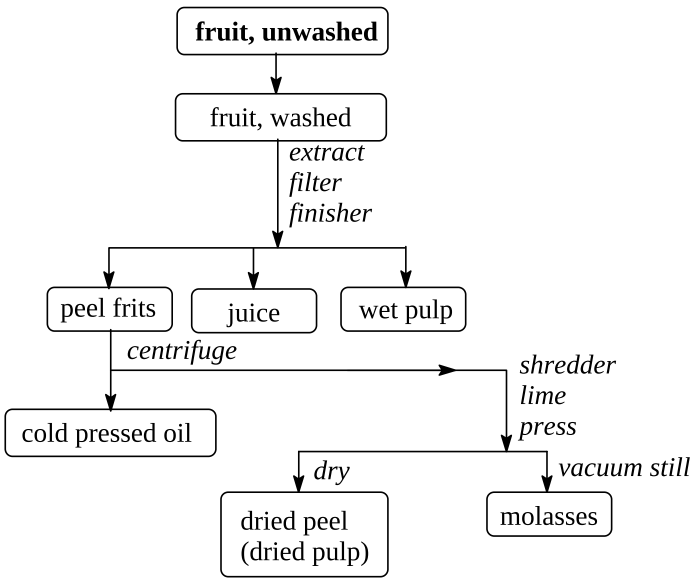
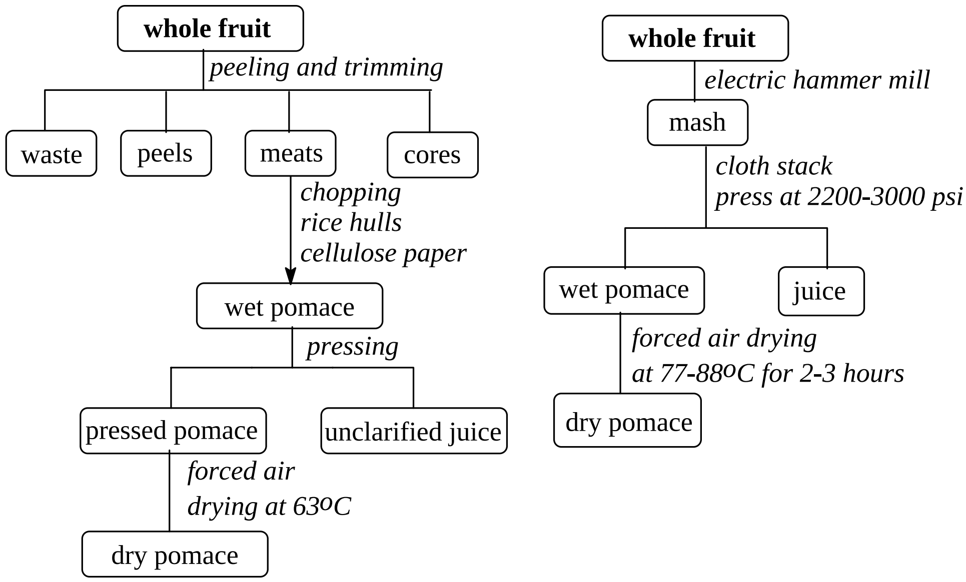


Figure 5. Processing of oranges (LeRoy, 1990g).

Apples. In a processing trial (EP-AP-2018) in 1988 in the USA (NY) apples were treated by tractor-mounted airblast equipment with parathion at 1.2 kg ai/hl (22 kg ai/ha) and harvested 31 days after the last application (Cañez, 1990f). In a second trial (EP-AP-2017) in Oregon, apples were treated by CO_2 backpack sprayer with parathion at 0.48 kg ai/hl (7.8 kg ai/ha) and processed into juice and pomace. The processing procedures were quite different (see Figure 6, e.g. peels were included or excluded in juice production). "Wet" pomace in one trial is before juice production and in the other is the residue after juice removal.

Table 79. Parathion residues in apples and processed commodities from supervised trials and processing in the USA (Cañez, 1990f).

State, year (variety)	Application			PHI, days	Residues, mg/kg			Ref
	Form	kg ai/hl	no.		commodity	parathion	paraoxon	
NY, 1988 (Romes)	WP	1.2	5	14	apples, whole	2.6 9.6	<0.05 0.20	EP-AP-2018
					juice, unclarified	0.40	0.05	
					wet pomace	19	0.45	
					dry pomace	12.5	0.32	
OR, 1988 (Red Delicious)	WP	0.48	6	14	apples, whole	2.7	0.13	EP-AP-2017
					juice, unclarified	<0.05	<0.05	
					wet pomace	0.40	0.06	
					dry pomace	1.1	0.25	



Apple processing, EP-AP-2017

Apple processing, EP-AP-2018

Figure 6. Processing of apples (Cañez, 1990f).

<u>Grapes</u>. In 3 trials in the USA in 1988 grapes were treated by commercial spray equipment (California) and by CO_2 backpack sprayer (Oregon) with parathion at a concentration of 0.60 kg ai/hl (application rates 11, 11 and 8.4 kg ai/ha) of an EC formulation at each site at 5 times the label concentration. and harvested 14 days after the last application for juicing and drying (LeRoy, 1990f). About 23 kg of grapes were harvested for processing into juice and pomace and 55 kg for drying (Table 890).

Table 80. Parathion residues in grapes and processed commodities from supervised trials and processing in the USA (LeRoy, 1990f).

State, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/hl	no.		commodity	parathion	paraoxon	
CA, 1988 (Thompson Seedless)	EC	0.60	3	14	grapes juice wet pomace dried pomace raisins raisin waste	2.1 0.31 0.24 8.0 10 22 19 0.58 1.4	<0.05 <0.05 (2) 0.11 0.07 0.14 0.21 0.06 0.12	EP-GR-2019
CA, 1988 (Thompson Seedless)	EC	0.60	3	14	grapes juice wet pomace dried pomace raisins raisin waste	2.7 0.36 15 15 0.90 3.8	<0.05 <0.05 0.18 0.20 0.13 0.75	EP-GR-2020
OR, 1988 (Pinot Noir)	EC	0.60	3	14	grapes juice wet pomace dried pomace	9.2 0.05 19 36	0.17 <0.05 0.36 0.36	EP-GR-2021

Olives. In 2 trials in the USA in 1988 olives were sprayed with parathion at a concentration of 0.48 kg ai/hl with an EC formulation at each site (5 times the label concentration) by commercial spray equipment and harvested 42 days after the last application for oil production (Cañez, 1990d). The olives (about 450 kg) were first washed and then ground. Oil and water were separated by centrifugation.

Table 81. Parathion residues in olives and olive oil from supervised trials and processing in the USA (Cañez, 1990d).

State, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/hl	no.		commodity	parathion	paraoxon	
CA, 1988 (Manzinella)	EC	0.48	3	42	fruit oil	0.37 4.2	<0.05 0.08	EP-OL-2036 [1]
CA, 1988 (Manzinella)	EC	0.48	3	42	fruit oil	4.1 23	0.11 0.31	EP-OL-2037 [1]
CA, 1988 (Manzinella)	EC	0.096	3	42	fruit	<0.05	<0.05	EP-OL-2036 [1]
CA, 1988 (Manzinella)	EC	0.096	3	42	fruit	0.11	<0.05	EP-OL-2037 [1]

[1] unvalidated analytical data

Tomatoes. In 2 US trials in 1988 crops were treated 5 or 6 times by ground equipment (CO_2 backpack sprayers) with parathion at 5.6 kg ai/ha with an EC formulation at each site at 5 times the label rate. and harvested 10 days after the last application (Cañez, 1990c). About 90 kg of tomatoes were sent for processing (Table 82).

Table 82. Parathion residues in tomatoes and processed commodities from supervised trials and processing in the USA.

State, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	no.		commodity	parathion	paraoxon	
CA, 1988 (Roma)	EC	5.6	6	10	fruit juice puree wet pomace dry pomace catsup	0.45 0.85 1.4 11 28 0.80	<0.05 <0.05 <0.05 0.11 1.1 <0.05	EP-TO-2009 [1]
CA, 1988 (Murietta)	EC	5.6	5	10	fruit juice puree wet pomace dry pomace catsup	0.55 0.55 1.1 9.5 25 0.58	<0.05 <0.05 <0.05 0.09 2.0 <0.05	EP-TO-2010 [1]

[1] unvalidated analytical data

Potatoes. In 2 US trials in 1988 in Washington and Idaho crops were sprayed by ground self-propelled research sprayers with 6 applications of parathion at 7-day intervals at 5.6 kg ai/ha with an EC formulation at both sites (i.e. at 5 times the label rate) and harvested 5 days after the last application for processing (Cañez, 1990a). The tubers (about 70 and 90 kg) were sent for milling to produce chips, flakes and granules (Table 83). Unfortunately residue levels were too low in both trials to provide information on the fate of parathion during processing.

Table 83. Parathion residues in potatoes and processed commodities from supervised trials and processing in the USA.

State, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	no.		commodity	parathion	paraoxon	
WA, 1988 (Russet Burbank)	EC	5.6	6	5	tuber wet peel chip chips dried peel chip wet peel flake dried peel flake flakes granules	<0.05 <0.05 <0.05 <0.05 <0.05 0.08 <0.05 <0.05	<0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05	EP-PO-2002 [1]
ID, 1988 (Russet Burbank)	EC	5.6	6	6	tuber wet peel chip chips dried peel chip wet peel flake dried peel flake flakes granules	<0.05 <0.05 <0.05 0.11 <0.05 0.14 <0.05 <0.05	<0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05	EP-PO-2001 [1]

[1] unvalidated analytical data

Sugar beet. In 2 trials in the USA in 1988 in California and North Dakota crops were sprayed (by a CO_2 backpack sprayer in trial EP-SB-2003 and a tractor mounted sprayer in trial EP-SB-2004) with 6 applications of parathion at 4.5 kg ai/ha with an EC formulation at 5 times the label rate at 7-day intervals and harvested 15 days after the last application (Cañez, 1990b). The roots (about 115 kg) were sent for processing (Table 84).

The roots were washed, sliced, and then extracted counter-current with water at c. 80°C to produce "diffusion juice". The pulp was pressed and dried to less than 3% moisture. The press water was returned to the diffusion juice, which was then treated with approximately 1.5% lime (CaO) at 80°C for 15 min and brought to a pH of about 9.5 with CO_2. After the addition of a settling aid the "thin juice" was decanted and concentrated to "thick juice" (about 70% solids) under vacuum at 65°C. After decantation from the sludge, refined sugar was produced by about 3 crystallizations; the collected and concentrated mother liquors constituted the molasses. The contact surfaces used in the processes were stainless steel, teflon, food-grade plastics and glass.

Table 84. Parathion residues in sugar beet and processed commodities from supervised trials and processing in the USA.

State, year (variety)	Application			PHI, days	Residues, mg/kg			Ref.
	Form	kg ai/ha	no.		commodity	parathion	paraoxon	
CA, 1988 (SS NB2)	EC	4.5	6	15	root dehydrated pulp molasses refined sugar	0.07 0.28 <0.05 <0.05	<0.05 <0.05 <0.05 <0.05	EP-SB-2003 [1]
ND, 1988 (ACS ACH176)	EC	4.5	6	15	root dehydrated pulp molasses refined sugar	0.19 1.2 <0.05 <0.05	<0.05 <0.05 <0.05 <0.05	EP-SB-2004 [1]

[1] unvalidated analytical data

<u>Oats</u>. In 2 US trials in Missouri and North Dakota in 1989 crops were sprayed with 6 applications at 7-day intervals of parathion at 4.2 kg ai/ha with an EC formulation (5 times the label rate) with a ground CO_2 backpack sprayer in trial EP-OT-2025, and with a commercial tractor sprayer in trial EP-OT-2024 and harvested 15 days after the last application for processing (LeRoy, 1990d). Oats (about 36 kg) were sent for milling (16 kg milled) to produce hulls, rolled oats, bran and flour

Table 85).

Table 85. Residues of parathion and paraoxon in oats and processed commodities in the USA from the milling of oats treated 6 times in the field at 4.2 kg ai/ha and harvested 15 days after the last treatment (LeRoy, 1990d).

Location, variety	Applic. rate, kg ai/ha	Commodity	Residues, mg/kg		Reference
			parathion	paraoxon	
Missouri, Otee	4.2	grain bran flour rolled oats hulls	0.96 0.39 0.40 0.38 2.5	0.23 <0.05 0.06 <0.05 0.68	EP-OT-2025
North Dakota, Dumont	4.2	grain bran flour rolled oats hulls	3.2 1.3 2.2 0.93 -	0.50 0.19 0.12 0.12 <0.05 c 1.5 [1]	EP-OT-2024

[1] c: sample from control plot. Possible mislabelling of treated and control samples.

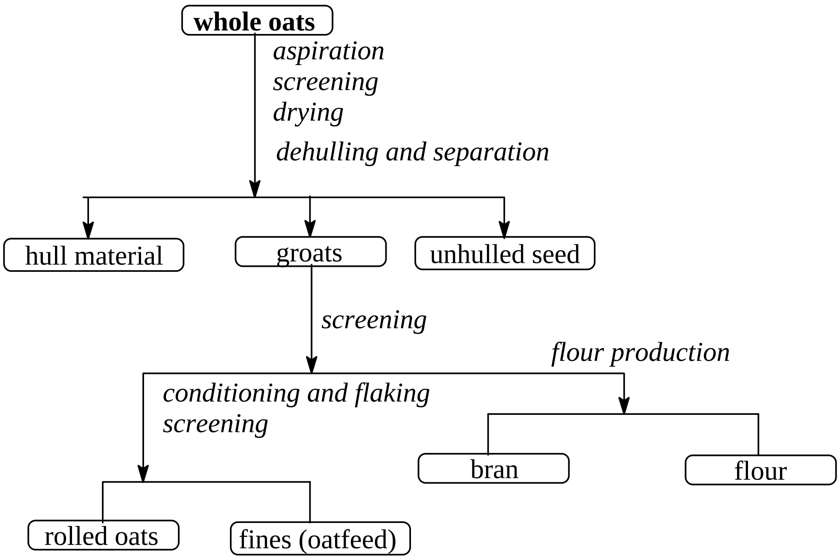


Figure 7. Milling of oats (LeRoy, 1990d).

Maize. Bookbinder (1998a) measured the residues in aspirated grain fractions (AGF or grain dust) of maize harvested from treated plots. In Wisconsin, USA, in 1997-98 maize was treated 6 times at 0.84 kg ai/ha by aerial application at approximately 5-day intervals and harvested 12 days after the last treatment. The grain (225 kg) was oven-dried at 61°C and transported 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 in sieves and an initial 220.7 kg produced 410 g. Initial residues in the grain were 0.072 mg/kg parathion and <0.01 mg/kg paraoxon, and in the AGF 0.43 mg/kg parathion and 0.027 mg/kg paraoxon.

In 2 US trials in Missouri and Iowa in 1989 crops were sprayed by a research sprayer for trial EP-CN-2042 and by a CO_2 backpack sprayer for trial EP-CN-2043 with 6 applications at 5-day intervals of parathion at 5.6 kg ai/ha with an EC formulation at 5 times the label rate, and harvested 12 days after the last application for processing (LeRoy, 1990e). The maize (about 160 kg) was sent for milling to produce flour, grits, meal, starch, crude oil and refined oil (Table 886).

Table 86. Residues of parathion and paraoxon in maize and processed commodities in the USA from the milling of maize treated 6 times in the field at 5.6 kg ai/ha and harvested 12 days after the last treatment (LeRoy, 1990e).

Location, variety	Applic. rate kg ai/ha	Commodity	Residues, mg/kg		Reference
			parathion	paraoxon	
Iowa, DeKalb 547	5.6	grain	0.137	<0.05	EP-CN-2042
		meal	0.082	<0.05	
		grits	<0.05	<0.05	
		flour	0.065	<0.05	
		starch	<0.05	<0.05	
		crude oil, dry milled	0.065	<0.05	
		crude oil, wet milled	0.18	<0.05	
		refined oil, dry milled	0.11	<0.05	
		refined oil, wet milled	0.18	<0.05	
Missouri, Funks G-4500	5.6	grain	0.181	<0.05	EP-CN-2043
		meal	0.16	<0.05	
		grits	0.18	<0.05	
		flour	0.16	<0.05	
		starch	<0.05	<0.05	

Location, variety	Applic. rate kg ai/ha	Commodity	Residues, mg/kg		Reference
			parathion	paraoxon	
		crude oil, dry milled	0.12	<0.05	
		crude oil, wet milled	0.61	<0.05	
		refined oil, dry milled	0.37	<0.05	
		refined oil, wet milled	0.63	<0.05	

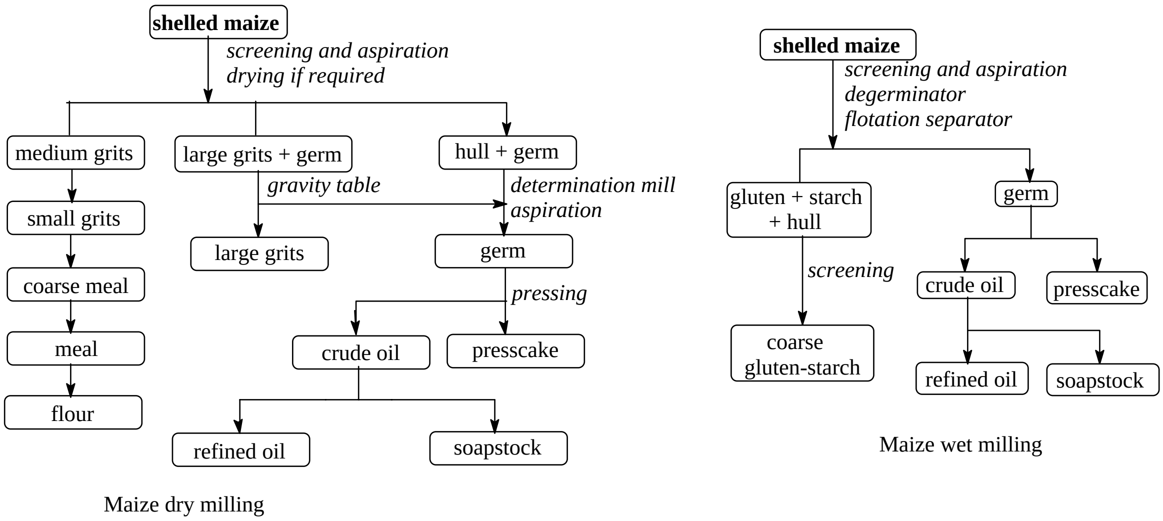


Figure 8. Milling of maize (LeRoy, 1990e).

Rice. In 2 trials in the USA (California and Texas) in 1988 rice was treated by ground equipment with parathion (3 applications at 7-day intervals) and harvested 1 day after the last application for processing (LeRoy, 1990a). An application rate of 0.56 kg ai/ha of an EC formulation at each site was 5 times the label rate. Harvested rice (about 14 kg in trial EP-RI-2026 and 23 kg in trial EP-RI-2027) was milled to produce brown rice, hulls, bran and polished rice (Table 87).

Table 87. Residues of parathion and paraoxon in milled rice grain and its processed commodities treated 3 times in the field at 0.56 kg ai/ha and harvested 1 day after the last treatment (LeRoy, 1990a).

Location, variety	Applic. rate kg ai/ha	Commodity	Residues, mg/kg		Reference
			parathion	paraoxon	
California, M201	0.56	grain	1.6	0.15	EP-RI-2026
		brown rice	0.15	<0.05	
		bran	0.59	<0.05	
		hulls	6.3	0.66	
		polished rice	<0.05	<0.05	
Texas, Gulfmont	0.56	grain	0.72	0.23	EP-RI-2027
		brown rice	0.23	<0.05	
		bran	0.68	0.19	
		hulls	2.4	0.50	
		polished rice	<0.05	<0.05	

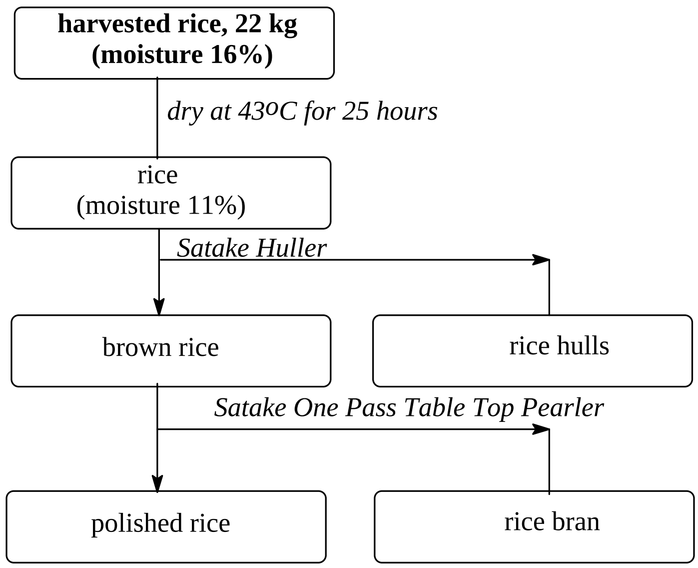


Figure 9. Processing of rice in trial EP-RI-2027 (LeRoy, 1990a).

Sorghum. In 2 US trials in Missouri and Texas in 1988 sorghum was treated 6 times at 5.6 kg ai/ha with an EC formulation (5 times the label rate) by ground equipment at 7-day intervals and harvested 12 days after the last application (LeRoy, 1990b). Harvested sorghum (minimum 27 kg) was sent for processing by wet and dry milling to produce decorticated grain, flour, grits and starch (Table 88).

Table 88. Residues of parathion and paraoxon in sorghum grain and processed commodities from the milling of sorghum treated 6 times in the field at 5.6 kg ai/ha and harvested 12 days after the last treatment (LeRoy, 1990b).

Trial, variety	Applic. rate kg ai/ha	Commodity	Residues, mg/kg		Reference
			parathion	paraoxon	
Missouri,	5.6	Grain	20.2	0.56	EP-SG-2028
Funk’s G-623		Decortication grain	7.2	0.35	
		Coarse bran	31	1.3	
		Fine bran	23	0.86	
		Grits	6.7	0.35	
		Flour	4.6	0.23	
		Starch	0.19	0.067	
Texas,	5.6	Grain	8.5	0.70	EP-SG-2029
Funk 522 DR		Decortication grain	5.2	0.40	
		Coarse bran	32	1.8	
		Fine bran	8.2	1.1	
		Grits	4.8	0.48	
		Flour	4.8	0.43	
		Starch	0.10	0.063	

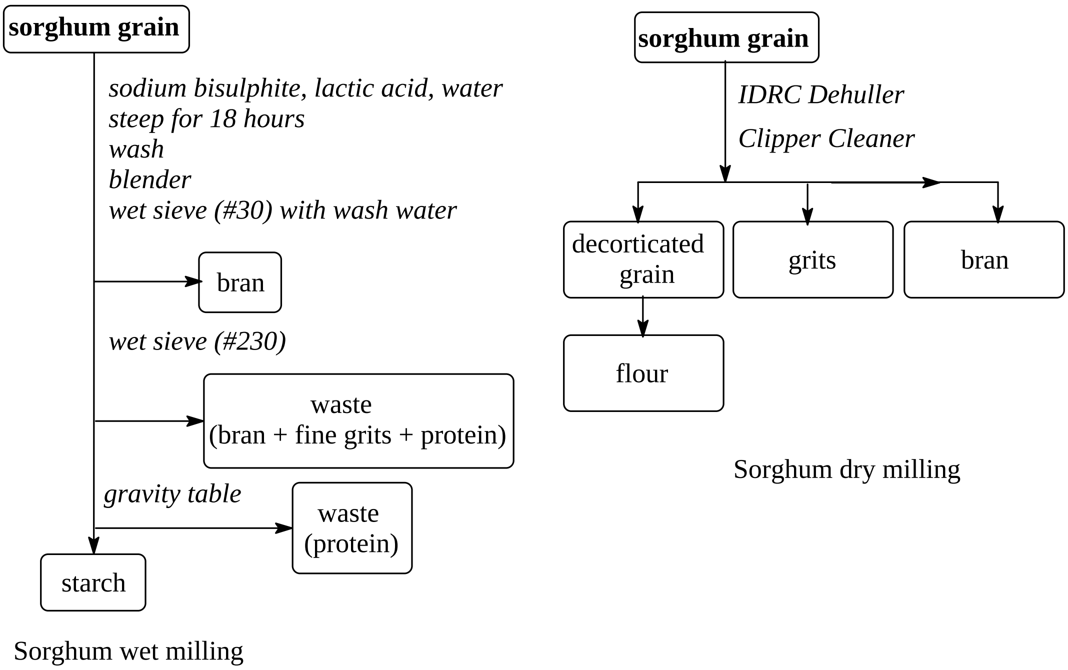


Figure 10. Processing of sorghum in Trial EP-SG-2028 (LeRoy, 1990b).

Bookbinder (1998b) measured the residues in aspirated grain (grain dust) after movement and aspiration of field-treated sorghum. In Wisconsin, USA, in 1997, the crop was sprayed 6 times from the air at 7-day intervals with parathion at 1.1 kg ai/ha and harvested 12 days after the last treatment. The harvested grain (225 kg) was oven-dried at 61°C and transported in 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 in sieves. The grain (216 kg) produced 752 g of AGF. Initial residues in the grain were 2.2 mg/kg parathion and 0.057 mg/kg paraoxon, producing residues in the AGF of 4.2 mg/kg parathion and 0.15 mg/kg paraoxon.

Wheat. Spring wheat in North Dakota, USA, in 1992 was sprayed twice with parathion EC at 4.2 kg ai/ha by a spray boom fitted to a tractor with a 14-day interval and harvested 15 days after the last application (Belcher and Norby, 1994b). The grain (67 kg) was dried and cleaned up by aspiration and screening and then, after moisture adjustment, milled.

Table 89. Parathion and paraoxon residues in wheat grown in the USA and harvested 15 days after 2 applications of parathion at 4.2 kg ai/ha and its milled commodities (Belcher and Norby, 1994b).

Commodity	Definition	Milling yield	Residues, mg/kg	
			parathion	paraoxon
Grain			1.21	0.035
Bran	broken coats of individual cleaned grain	11.8%	5.6	0.13
Shorts	low-grade mill product, principally germ and fine bran particles - an animal feed	49.9%	0.97	0.021
Flour		27.6%	0.44	<0.02
Middlings	larger particles from the endosperm of the wheat grain during milling	5.4%	1.2	0.021
Chaff and grain dust	light impurities obtained by aspiration of whole wheat		5.4	1.70

Commodity	Definition	Milling yield	Residues, mg/kg	
			parathion	paraoxon
TOTAL		94.7%		

Bookbinder (1998c) measured the residues in aspirated grain fractions (AGF or grain dust) resulting from the movement and aspiration of field-treated spring wheat. In Wisconsin, USA, in 1997 wheat was treated 6 times by aerial application at approximately 7-day intervals with parathion at 0.84 kg ai/ha and harvested 15 days after the last treatment. The harvested grain (225 kg) was oven-dried at 63°C and transported 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 in sieves. Grain (213 kg) produced 161 g of AGF. Residue levels in the grain were 1.1 mg/kg parathion and 0.019 mg/kg paraoxon, which produced residue levels in the AGF of 4.4 mg/kg parathion and 0.15 mg/kg paraoxon.

Sunflower seed. Sunflowers in Wisconsin, USA, in 1997 were treated by aerial application three times at 5- or 6-day intervals with parathion EC at 5.6 kg ai/ha (5 times the label rate) and the seed (41 kg) was harvested 30 days after the last application (Bookbinder 1998d). The seed was dried to less than 10% moisture, cleaned up by aspiration and screening, and hulled in a Bauer disc mill. The kernels, after moisture adjustment and heating, were pressed and extracted with hexane to produce crude oil and seed meal. An aliquot of crude oil was mixed with sodium hydroxide and heated to produce refined oil and soapstock.

Table 90. Parathion and paraoxon residues in sunflower seed and processed commodities from sunflowers grown in the USA and harvested 30 days after 3 applications of parathion at 5.6 kg ai/ha (Bookbinder 1998d).

Commodity	parathion, mg/kg	paraoxon, mg/kg
Sunflower seed	0.76	0.021
Sunflower seed meal	0.056	<0.01
Sunflower seed oil, refined	0.33	<0.01

Cotton seed. In 2 US trials in Texas and California in 1988 crops were sprayed by a self-propelled research sprayer (TX) and a CO_2 backpack sprayer (CA) with 6 applications of parathion at 7.0 kg ai/ha with an EC formulation (5 times the label rate) at 7-day intervals and harvested 7 days after the last application (LeRoy, 1990c). Harvested seed cotton (18 kg) was sent for processing to produce hulls, meal, crude oil, refined oil and soapstock (Table 91).

Table 91. Residues of parathion and paraoxon in seed cotton and commodities from the processing of cotton treated 6 times in the field at 7.0 kg ai/ha and harvested 7 days after the last treatment (LeRoy, 1990c).

Trial, variety	Applic. rate kg ai/ha	Commodity	Residues, mg/kg		Reference
			parathion	paraoxon	
Texas	7.0	Seed cotton	13.8	7.2	EP-CS-2034
DPL-41		Hulls	1.9	0.18	
		Cotton seed meal	0.47	<0.05	
		Cotton seed oil crude	0.24	<0.05	
		Cotton seed oil refined	0.29	<0.05	
		Soapstock	<0.05	<0.05	
California		Seed cotton	9.0	8.2	EP-CS-2035
SJ-1		Hulls	1.4	0.15	

Trial, variety	Applic. rate kg ai/ha	Commodity	Residues, mg/kg		Reference
			parathion	paraoxon	
		Cotton seed meal	<0.05	<0.05	
		Cotton seed oil crude	0.73	<0.05	
		Cotton seed oil refined	<0.05 c 0.81 [1]	<0.05 c <0.05	
		Soapstock	<0.05	<0.05	

[1] c: sample from control plot

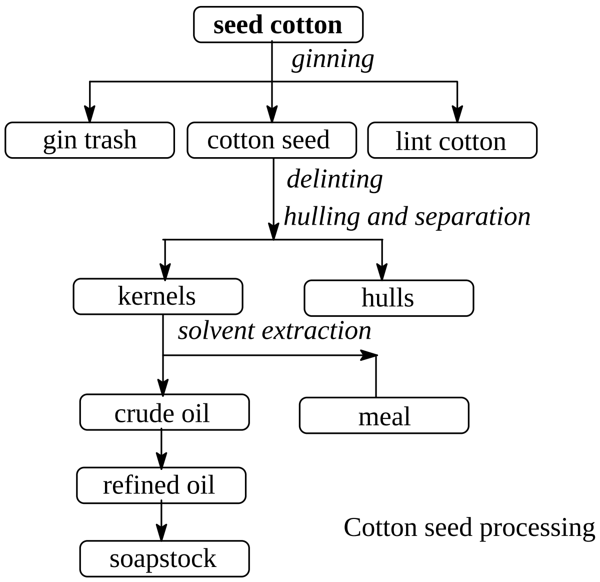


Figure 11. Processing of seed cotton (LeRoy, 1990c).

Canola. A canola crop (variety Series) in Washington State, USA, in 1992, was sprayed twice with a tractor-mounted spray boom at a 7-day interval at post-bloom stage with parathion EC at 5.6 kg ai/ha (5 times the label rate) and the seed (90 kg) was harvested 28 days after the last application (Belcher, 1993). Residues of parathion and paraoxon were determined in the seed, meal, and crude and refined oil (Table 92).

Table 92. Residues of parathion and paraoxon in canola seed harvested 28 days after 2 applications of parathion at 5.6 kg ai/ha and its processed commodities (Belcher, 1993).

Canola	parathion, mg/kg	paraoxon, mg/kg
Seed	1.1	<0.05
Meal	0.20	<0.05
Crude oil	1.72	<0.05
Refined oil	1.66	<0.05

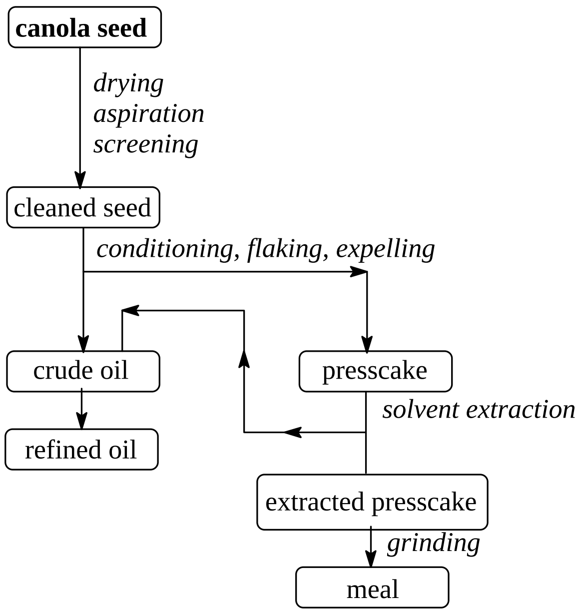


Figure 12. Processing of canola seed (Belcher, 1993).

Residues in the edible portion of food commodities

Processing factors from the results of the processing trials for parathion only and for parathion + 1.058 × paraoxon, i.e. sum of parathion and paraoxon expressed as parathion. The factors are shown in Table 93.

In the parathion-only calculation where the residue in the processed commodity was below the LOQ, the processing factor was calculated from the LOQ and is reported as less than the calculated value.

In the total-residue calculation where the residue of paraoxon was below the LOQ it was assumed to be zero except when both parathion and paraoxon residues were below the LOQ, in which case the processing factor was calculated from the LOQ and reported with a 'less than' symbol. For example:

parathion	paraoxon	total residue	processing factor
0.84	0.13	0.98	[0.95 ÷ x]
0.84	<0.05	0.84	[0.84 ÷ x]
<0.05	<0.05	<0.05	[0.05 ÷ x]

Where x is the total residue in the RAC

Because parathion is usually the dominant residue component the processing factors for parathion only and for the total residue are usually much the same.

Table 93. Calculated processing factors from the reported processing trials. Factors are calculated for parathion residues only and for the sum of parathion and paraoxon expressed as parathion.

Commodity	Residues, mg/kg				Processing factors					
	parathion		paraoxon		parathion			parathion + 1.058 × paraoxon		
	Trial A	Trial B	Trial A	Trial B	A	B	Mean	A	B	Mean
Lemons, unwashed fruit	12	6.6	0.49	0.09						
juice	0.29	0.14	<0.05	<0.05	0.024	0.021	0.023	0.023	0.021	0.022
wet peel	5.7	7.9	0.08	0.07	0.48	1.20	0.84	0.46	1.19	0.83
dried peel	14	17	0.18	0.15	1.2	2.6	1.9	1.1	2.6	1.8
molasses	0.40	1.6	<0.05	<0.05	0.033	0.242	0.14	0.03	0.24	0.14
cold pressed oil		495		4.1		75	75		75	75
Grapefruit, unwashed fruit	5.4		0.43							
juice	<0.05		<0.05		<0.009			<0.009		
wet pulp	8.7		0.71		1.6		1.6	1.6		1.6
dried pulp	32		1.7		5.9		5.9	5.8		5.8
molasses	1.2		1.3		0.22		0.22	0.44		0.44
cold pressed oil	1650		49		306		306	290		290
Oranges, unwashed fruit	7.0		0.40							
oranges, washed	6.3		0.38		0.90		0.90	0.90		0.90
juice	0.36		<0.05		0.051		0.051	0.048		0.048
wet pulp	4.9		0.40		0.70		0.70	0.72		0.72
dried pulp	34		1.4		4.9		4.9	4.8		4.8
molasses	4.6		0.08		0.66		0.66	0.63		0.63
cold pressed oil	1674		33		239		239	230		230
Apple, whole	6.1	2.7	0.20	0.13						
juice, unclarified	0.4	<0.05	0.05	<0.05	0.066	<0.019	0.066	0.072	<0.018	0.072
wet pomace	19	0.40	0.45	0.06	3.1	0.15	1.6	3.1	0.16	1.6
dry pomace	12.5	1.1	0.32	0.25	2.0	0.41	1.2	2.0	0.48	1.3
Oats, grain	0.96	3.2	0.23	0.5						
bran	0.39	1.3	<0.05	0.19	0.41	0.41	0.41	0.32	0.40	0.36
flour	0.40	2.2	0.06	0.12	0.42	0.69	0.55	0.39	0.62	0.50
rolled oats	0.38	0.93	<0.05	0.12	0.40	0.29	0.34	0.32	0.28	0.30
hulls	2.5		0.68		2.6		2.6	2.7		2.7
Maize, grain	0.137	0.181	<0.05	<0.05						
meal	0.082	0.16	<0.05	<0.05	0.60	0.88	0.74			
grits	<0.05	0.18	<0.05	<0.05	<0.36	0.99	0.99			
flour	0.065	0.16	<0.05	<0.05	0.47	0.88	0.68			
starch	<0.05	<0.05	<0.05	<0.05	<0.36	<0.28				
crude oil, dry milled	0.065	0.12	<0.05	<0.05	0.47	0.66	0.57			
crude oil, wet milled	0.18	0.61	<0.05	<0.05	1.3	3.4	2.3			
refined oil, dry milled	0.11	0.37	<0.05	<0.05	0.80	2.0	1.4			
refined oil, wet milled	0.18	0.63	<0.05	<0.05	1.3	3.5	2.4			
Maize, grain	0.072		<0.01							
grain dust	0.43		0.027		6.0		6.0	6.4		6.4
Rice, grain	1.6	0.72	0.15	0.23						
brown rice	0.15	0.23	<0.05	<0.05	0.094	0.32	0.21	0.085	0.24	0.16
bran	0.59	0.68	<0.05	0.19	0.37	0.94	0.66	0.34	0.91	0.63
hulls	6.3	2.4	0.66	0.5	3.9	3.3	3.6	4.0	3.0	3.5
polished rice	<0.05	<0.05	<0.05	<0.05	<0.031	<0.069		<0.029	<0.053	
Sorghum, grain	20.2	8.5	0.56	0.7						
decortication grain	7.2	5.2	0.35	0.40	0.36	0.61	0.48	0.36	0.61	0.49

Commodity	Residues, mg/kg				Processing factors					
	parathion		paraoxon		parathion			parathion + 1.058 × paraoxon		
	Trial A	Trial B	Trial A	Trial B	A	B	Mean	A	B	Mean
coarse bran	31	32	1.3	1.8	1.5	3.8	2.6	1.6	3.7	2.6
fine bran	23	8.2	0.86	1.1	1.14	0.96	1.05	1.15	1.01	1.08
grits	6.7	4.8	0.35	0.48	0.33	0.56	0.45	0.34	0.57	0.46
flour	4.6	4.8	0.23	0.43	0.23	0.56	0.40	0.23	0.57	0.40
starch	0.19	0.10	0.067	0.063	0.009	0.012	0.011	0.013	0.018	0.015
Sorghum, grain	2.2		0.057							
grain dust	4.2		0.15		1.9		1.9	1.9		1.9
Wheat, grain	1.21		0.035							
bran	5.6		0.13		4.6		4.6	4.6		4.6
shorts	0.97		0.021		0.80		0.80	0.80		0.80
flour	0.44		<0.02		0.36		0.36	0.35		0.35
middlings	1.2		0.021		0.99		0.99	0.98		0.98
chaff and grain dust	5.4		1.7		4.5		4.5	5.8		5.8
Wheat, grain	1.1		0.019							
grain dust	4.4		0.15		4.0		4.0	4.1		4.1
Sunflower seed	0.76		0.021							
Sunflower seed meal	0.056		<0.01		0.074		0.074	0.072		0.072
Sunflower seed oil, refined	0.33		<0.01		0.43		0.43	0.42		0.42
Seed cotton	13.8	9.0	7.2	8.2						
hulls	1.9	1.4	0.18	0.15	0.14	0.16	0.15	0.098	0.088	0.093
cotton seed meal	0.47	<0.05	<0.05	<0.05	0.0341	<0.006	0.034	0.022	<0.003	0.022
cotton seed oil, crude	0.24	0.73	<0.05	<0.05	0.017	0.081	0.049	0.011	0.041	0.026
cotton seed oil, refined	0.29	<0.05	<0.05	<0.05	0.021	<0.006	0.021	0.014	<0.003	0.014
soapstock	<0.05	<0.05	<0.05	<0.05	<0.004	<0.006		<0.002	<0.003	
Canola seed	1.1		<0.05							
canola meal	0.20		<0.05		0.18		0.18			
canola crude oil	1.7		<0.05		1.55		1.55			
canola refined oil	1.66		<0.05		1.51		1.51			
Grapes (3 trials)	2.1 2.7 9.2		<0.05 <0.05 0.17							
juice	0.275 0.36 0.05		<0.05 <0.05 <0.05		0.13 0.13 0.005		0.090	0.13 0.13 0.005		0.090
wet pomace	9.0 15 19		0.09 0.18 0.36		4.3 5.6 2.1		4.0	4.3 5.6 2.1		4.0
dried pomace	20.5 15 36		0.175 0.20 0.36		9.8 5.6 3.9		6.4	9.8 5.6 3.9		6.5
raisins	0.58 0.90		0.060 0.13		0.28 0.33		0.30	0.31 0.38		0.35
raisin waste	1.4 3.8		0.12 0.75		0.67 1.4		1.0	0.73 1.7		1.2

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

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

Information on monitoring for parathion residues was provided by the government of The Netherlands (Table 94). Very few residues exceeded the MRLs (5 samples of lettuce, 1 endive, 1 parsley, 1 other herbs, 4 celery, 2 other stem vegetables, 1 maize, 1 celeriac and 3 spinach).

Table 94. Netherlands monitoring data for parathion residues for 1994-1998. The LOQ was 0.02 mg/kg.

Commodity	No. of samples		Commodity	No. of samples	
	analysed	containing residues		analysed	residues detected
Apples	1495	3	Maize	37	1
Beans, fresh (in pods)	750	4	Melons	390	3
Billberries, cowberries, cranberries	39	1	Nectarines	221	6
Brussels sprouts	176	2	Onions	194	2
Carrots	424	6	Oranges	1237	27
Celeriac	183	4	Other arable products	699	3
Celery	525	24	Other fruits and fruit products	385	2
Chinese cabbage	413	9	Other herbs	148	3
Chives	21	1	Other leafy vegetables	292	3
Currants	576	5	Other root and tuber vegetables	87	6
Endive	1737	19	Other stem vegetables	341	25
Fennel	95	1	Parsley	426	8
Figs	48	1	Peaches	252	1
Grapefruit	301	4	Peppers	2132	6
Grapes	962	66	Plums	437	
Iceberg lettuce	471	4	Radishes	1010	8
Kiwifruit	223	2	Raspberries	315	2
Lamb's lettuce	268	2	Spinach	610	8
Leeks	441	14	Strawberries	2378	3
Lemons	243	5	Tangerines	672	19
Lettuce	4560	78			

In the 1994 Australian Market Basket Survey 77 foods were analysed for pesticide residues (Marro, 1996). The estimated daily intakes of parathion residues in food for mean energy diets expressed as a percentage of the ADI (0.005 mg/kg bw) were for adult males 0.03%, adult females 0.03%, boys aged 12 0.04%, girls aged 12 0.05%, toddlers 0.14% and infants 0.11%.

Parathion was included in the targeted enforcement monitoring programmes in Australian States for 1995-1999. In Queensland no parathion residues (LOQ 0.02-0.1 mg/kg) were detected in 413 samples of fruits, vegetables and cereals. In Victoria parathion was detected (LOQ 0.01 mg/kg) in 1 of 20 apple samples and 6 of 20 pear samples with the highest residue at 0.1 mg/kg; no parathion residues were detected (LOQ 0.01 mg/kg) in 111 cereal or vegetable samples.

NATIONAL MAXIMUM RESIDUE LIMITS

The following national MRLs were reported to the Meeting.

Country	MRL, mg/kg	Commodity
Australia[1]	T 1	Apricot, cotton seed, peach
	T 0.7	Vegetables except carrot
	T 0.5	Carrot, cereal grains, cotton seed oil crude, fruits except apricot and peach,
	T 0.05*	Edible offal mammalian, meat mammalian, milks
Netherlands[2]	1	Citrus fruit, apricots, peaches
	0.5	Other fruit, vegetables
	0.1	Tea
	0.05	Other vegetable products
	0.02*	Other food commodities
USA[3]	5	Alfalfa hay
	3	Almond hulls, sorghum fodder, sorghum forage

Country	MRL, mg/kg	Commodity
	1.25	Alfalfa (fresh)
	1	Apples, apricots, artichokes, avocados, barley, beans, beet greens, beets, blackberries, blueberries, boysenberries, 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, lettuce, loganberries, mangoes, melons, mustard greens, nectarines, oats, okra, olives, onions, parsnips, parsnip greens, peaches, peanuts, pears, peas, pea forage, peppers, pineapples, plums, pumpkins, quinces, radishes, radish tops, raspberries, rice, rutabagas, rutabaga tops, soybean hay, spinach, squash, strawberries, summer squash, Swiss chard, tomatoes, turnips, turnip greens, vetch, wheat, youngberries
	0.75	Cotton seed
	0.2	Mustard seed, rape seed, sunflower seed
	0.1	Almonds, sugar beets, sugar beet tops, filberts, pecans, potatoes, safflower seed, sorghum, soybeans, sweet potatoes, walnuts

* indicates MRL set at or about limit of quantitation.
[1] Residue definition: parathion. MRLs temporary; parathion is no longer registered for use in Australia, the last products were withdrawn in 1999.
[2] Residue definition: parent compound, expressed as parathion.
[3] US tolerances are established for residues of parathion or its methyl homologue (parathion-methyl).

APPRAISAL

Parathion 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 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

Parathion is metabolized to paraoxon and diethyl phosphorothioate. In cattle, ruminal microorganisms are believed to be responsible for the production of aminoparathion and aminoparaoxon (Annex 6, reference 74).

When lactating goats, initially weighing 57 and 42 kg, were dosed with [^{14}C-phenyl]parathion at 188 mg/day (equivalent to 97 ppm in the diet) for 5 days, parathion was detected at 0.019 mg/kg in milk, 0.56 mg/kg in liver, 0.48 mg/kg in kidney, 0.15 mg/kg in renal fat, and 0.019 mg/kg in muscle. The major component of the residue was *para*-acetamido-paraoxon. Paraoxon itself was not detected. Approximately 40% of the administered radiolabel was recovered, leaving a large part unaccounted for.

When laying hens weighing 1.3-2.1 kg were dosed orally with [^{14}C-phenyl]parathion six times at daily intervals at a dose of 1.5 mg/day, equivalent to 16.5 ppm in the diet, parathion was detected at 0.001 mg/kg in eggs, 0.001 mg/kg in liver, 0.004 mg/kg in kidney, and 0.002 mg/kg in skin with fat. The total amounts of radiolabel in muscle were very low (<0.01% of the dose). Paraoxon was detected at 0.001 mg/kg in liver and kidney. The major identified components of the residue were *para*-nitrophenyl phosphate and *para*-acetamidophenol. The proportion of radiolabel accounted for in this study was 83%.

The studies showed that parathion is degraded by de-ethylation, 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 in wheat, cotton, and potatoes.

The main component (51-65% of the radiolabel) of the residue in wheat straw, chaff, and grain sampled from wheat plants 7 days after a second treatment with [^{14}C-phenyl]parathion at 1.3 kg ai /ha was parathion itself. The concentrations found were parathion, 66 mg/kg, and paraoxon, 4.2 mg/kg in straw; parathion, 197 mg/kg, paraoxon, 12 mg/kg in chaff; and parathion, 6.7 mg/kg, paraoxon, 0.13 mg/kg in grain. Other metabolites included *para*-nitrophenol, *S*-phenyl parathion, and *O*-desethyl parathion.

The concentration of parathion (0.019 mg/kg) in cotton seed was too low for identification 14 days after the plants were treated twice with [^{14}C-phenyl]parathion at 1.7 kg ai/ha. Parathion was the major residue component in calyx and leaf, but paraoxon, *para*-nitrophenol and other metabolites were also identified.

When potato plants were given two foliar treatments with [^{14}C-phenyl]parathion at 3.0 kg ai/ha and harvested 15 days after the second treatment, most of the radiolabel (20-31 mg/kg) remained in the stems and foliage, although small amounts (0.093-0.14 mg/kg) reached the tubers. Approximately 1% of the radiolabel in the tubers was identified by thin-layer chromatography as parathion and 10% as *para*-nitrophenol.

The plant metabolites identified indicate that hydrolysis of parathion to nitrophenol is the major pathway, but oxidation to paraoxon, some rearrangements of the thiophosphate ester, and *O*-de-ethylation also occur. Nitrophenol readily forms conjugates.

Environmental fate

Degradation in soil

Parathion was the major component of the residue in a 1-year study of degradation in aerobic soil. The half-life for disappearance of the parent parathion was 58 days. After 1 month and 1 year, 9.8% and 44%, respectively, of the dose had been mineralized. Paraoxon, nitrophenol, and *O,O*-bis(4-nitrophenyl) ethyl phosphate were identified as products.

In a study of the degradation of [^{14}C-phenyl]parathion in anaerobic soil under flooded conditions, the initial half-life for loss of parent parathion was 13 h, but the rate declined after 24 h, suggesting that some of the parathion became bound or was less readily available for microbial attack. Much of the dose (89% after 3 months) was converted to an unextractable residue. A considerable portion of the unextractable residues was incorporated into the biomass of the soil.

Fate in water and sediment systems

Parathion disappeared quickly, with an initial half-life of 2.4 days, during aerobic degradation in a water-sediment system. After 1 month, parent parathion accounted for 2.5% of the dose, while 60% was unextractable. Very little (3%) had been mineralized.

Methods of analysis

The Meeting received information on analytical methods for residues of parathion and paraoxon in supervised trials and for enforcement.

The analytical method used in supervised trials in the USA, most of which were carried out in 1988-90, were based on gas-liquid chromatography with flame photometry after solvent extraction and simple clean-up with solvent partition. A 30-min acid reflux was introduced at the extraction step because the studies of metabolism in wheat straw and grain had shown that the acid releases additional parathion and paraoxon residues. However, reflux acid extraction and extraction at room temperature with water and methanol of peppers and celery gave comparable results. The LOQ of the method was generally 0.05 mg/kg, and the analytical recovery was 80-90%. The method was tested and used on 39 substrates, including vegetables, nuts, forage, hay, olives, processed commodities, and wheat, and was tested for interference from 230 pesticides.

The method was modified by use of capillary gas-liquid chromatography to achieve an LOQ of 0.02 mg/kg for parathion and paraoxon in wheat, forage, and processed commodities. The recovery was generally 80-110%, that of paraoxon at 0.02 mg/kg tending to be higher. The method was tested on sorghum, rape seed, and their processed commodities, with an LOQ of 0.02 mg/kg for some commodities and 0.05 mg/kg for others. The recovery after fortification at 0.02 mg/kg was unacceptably high for some commodities.

An LOQ of 0.01 mg/kg was achieved for parathion and paraoxon in apples and grapes in a method based on gas-liquid chromatography with flame photometry after acetone-water extraction, solvent partition, and C_{18} column clean-up.

A method for analysis of residues in animal commodities is based on capillary gas-liquid chromatography with flame photometry after acetone extraction of the sample and clean-up by solvent partition and on carbon Celite and C_{18} columns. The LOQ for parathion and paraoxon in liver and fat was 0.05 mg/kg. The concentration of parathion residues was similar after analysis of hen fat by this method (0.12 mg/kg) and by the ^{14}C method (0.14 mg/kg). LOQs of 0.001 mg/kg and 0.01 mg/kg were achieved for milk and kidney, respectively, in a similar method.

Stability of residues in stored analytical samples

Parathion residues were stable in frozen storage for 2 years in almond kernels, apples, clover, cotton seed, green peppers, kidney beans, oranges, plums, snap beans, spinach, strawberries, and sunflower seeds; for 14 months in rape seed, crude rape seed oil, and rape seed meal; for 19 months in sorghum flour; and for 4 months in maize grain, flour, starch, oil, meal, and corn grits. Because of the reproducibility of the analytical method, a decrease of less than 30% would not be distinguishable from variability. The concentrations of parathion residues in almond kernels and oranges appeared to have decreased by an estimated 30% within 2 years. Paraoxon residues were also stable in frozen storage, except in snap beans (in which a substantial decline was seen after 12 months), spinach (borderline 30% decrease), and rape seed.

Definition of the residue

Parathion and paraoxon are the predominant components of the residue. Parathion represents the major portion of the residue, whereas paraoxon is a minor component when the residues are fresh and occur at higher concentrations. At very low concentrations in some circumstances, paraoxon may constitute a significant part of the residue. In residue trials that complied with GAP, 227 samples of food and feed commodities contained both parathion and paraoxon at concentrations that exceeded the LOQ. There was generally good agreement between the concentration of combined residues and that of parathion.

The Meeting recommended that the residue definition for compliance with MRLs continue to be parathion, and the definition for estimating dietary intake should be the sum of parathion and paraoxon expressed as parathion (parathion + 1.058 ∞ paraoxon).

The log P_{OW} of 3.2 and the results of studies of animal metabolism suggest that parathion is of borderline solubility in fat. In goats, the concentration of parathion residues in renal fat (0.15 mg/kg) was substantially higher than that in muscle tissue (0.019 mg/kg), although those in liver (0.56 mg/kg) and kidney (0.48 mg/kg) were both higher than that in fat. Paraoxon was not detected in the tissues or milk of the goat, but it was present at very low concentrations in liver and kidney of laying hens. The Meeting agreed that the residue definition for animal commodities should be reconsidered when the MRLs for animal commodities are recommended.

Results of supervised trials

Extensive data were provided from supervised trials on many crops: grapefruit, lemon, orange, apple, pear, apricot, cherry, plum and prune, blackberry, grape, strawberry, olive, garlic, onion, broccoli, cabbage, pepper, sweet corn, tomato, field pea, kale, lettuce, spinach, snap bean, dry bean, soya bean, carrot, potato, radish, sugar beet, turnip, celery, almond, pecan, walnut, barley, maize, rice, sorghum, wheat, rape seed, cotton seed, and sunflower seed. Supervised trials based on unvalidated analytical data (from Craven Laboratories) could not be considered further for the following crops: alfalfa, broccoli, cabbage, carrot, garlic, kale, olive, processed olive, onion, pecan, potato, radish, sugar beet, tomato, turnip, walnut, and wheat.

No relevant GAP was available to evaluate data for grapefruit, lemon, orange, pear, apricot, cherry, plum and prune, blackberry, grape, strawberry, pepper, field pea, lettuce, spinach, snap bean, dry bean, celery, almond, rice, alfalfa, and clover.

The Meeting agreed to withdraw the current recommendations for apricot (1 mg/kg), leek (0.05 mg/kg), lemon (0.5 mg/kg), mandarin (0.5 mg/kg), virgin olive oil (2 mg/kg), olive (0.5 mg/kg), sweet and sour orange (0.5 mg/kg), peach (1 mg/kg), and potato (0.05* mg/kg), as the MRLs are not supported by current GAP or in supervised trials evaluated against current GAP.

The residue definition for dietary intake requires the addition of parathion and paraoxon residues expressed as parathion. In this calculation, concentrations of residues of paraoxon that were <LOQ were assumed to be 0, except when the concentrations of both parathion and paraoxon residues were <LOQ. In the latter case, the total was taken to be <LOQ, which is a reasonable assumption because the concentration of paraoxon is usually much lower than that of parathion. For example:

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

Trials on *apple* in the USA were not evaluated because there was no matching GAP. In Italy, parathion is registered for use on pome fruits at a spray concentration of 0.02-0.04 kg ai/hl with a PHI of 20 days. Twelve trials conducted in France in 1994 at 0.036 kg ai/hl with a 21-day PHI were evaluated against the Italian GAP. The concentrations of parathion residues in rank order (median in italics) were <0.01, 0.01 (2 trials), 0.02 (2 trials), ***0.02***, ***0.03***, 0.05, 0.08 (2 trials), 0.14, and 0.16 mg/kg. As the values for paraoxon were all <LOQ (0.01 mg/kg), the concentration of total residue is the same as that for parathion.

The Meeting estimated a maximum residue level of 0.2 mg/kg, an STMR value of 0.025 mg/kg, and a HR value of 0.16 mg/kg for parathion in apples. The estimated maximum residue level replaces the current recommendation of 0.05* mg/kg.

Parathion is registered in the USA for use on *sweet corn* at a rate of 0.28-0.84 kg ai/ha with a PHI of 12 days. Ten trials in four states in 1987-89 involving six applications of 1.1 kg ai/ha and harvesting 12 days after the final treatment showed no residues of parathion or paraoxon in sweet corn ears that exceeded the LOQ (0.05 mg/kg). 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 in sweet corn.

Parathion is registered in the USA for use on *soya bean* at 0.28-0.84 kg ai/ha with a PHI of 20 days for harvesting, cutting, or use as forage. Eight trials in three states in 1988 with two applications of 0.90 kg ai/ha (PHI, 20 days) showed no residue (<0.05 mg/kg) of parathion or paraoxon in harvested soya beans. 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 in dry soya beans. The estimated maximum residue level confirms the current recommendation for dry soya beans of 0.05* mg/kg.

Parathion is registered in the USA for use on *barley* at 0.28-0.84 kg ai/ha with a PHI of 15 days for harvesting, cutting, or use as forage. Twelve trials in eight states in 1997 and 1998 with six aerial applications of 0.81-0.84 kg ai/ha and harvesting 14 or 15 days after the final treatment resulted in the following concentrations of parathion residues in barley grain: 0.15, 0.25, 0.54, 0.78, 1.3, 1.6, 2.0, 2.2 (2 trials), 3.3, 4.1, and 4.9 mg/kg, and those of the combined residues of parathion and paraoxon in rank order were 0.16, 0.27, 0.61, 0.81, 1.4, ***1.7***, ***2.2***, 2.3, 2.3, 3.6, 4.4, and 5.1 mg/kg.

The Meeting estimated a maximum residue level of 7 mg/kg, an STMR value of 1.95 mg/kg, and a HR value of 5.1 mg/kg for parathion in barley.

Parathion is registered in the USA for use on *maize* at 0.28-0.84 kg ai/ha with a PHI of 12 days for harvesting, cutting, or use as forage. Twelve trials in six states in 1987-89 with five or six applications of 1.1 kg ai/ha and harvesting 12 days after the final treatment resulted in the following concentrations of parathion residues in maize grain: <0.05 (10 trials), 0.06, and 0.09 mg/kg. The concentrations of paraoxon residues were all <LOQ (0.05 mg/kg).

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 in maize. The estimated maximum residue level confirms the current recommendation for maize of 0.1 mg/kg.

Parathion is registered in the USA for use on *sorghum* at 0.28-1.1 kg ai/ha with a PHI of 12 days for harvesting, cutting, or use as forage. Six trials in 1987, five in 1992, and two in 1994 in six states with two or six applications of 1.1 kg ai/ha and harvesting 12 days after the final treatment resulted in the following concentrations of parathion residues in sorghum grain: 0.29, 0.54, 0.61, 0.69, 0.71, 0.79, 0.85, 1.3, 1.6, 1.7, 2.0, 3.3, and 3.8 mg/kg, and concentrations of combined parathion and paraoxon residues in rank order of: 0.29, 0.55, 0.74, 0.75, 0.76, 1.03, ***1.06***, 1.4, 1.8, 1.9, 2.1, 3.5, and 4.2 mg/kg.

The Meeting estimated a maximum residue level of 5 mg/kg, an STMR value of 1.06 mg/kg, and a HR value of 4.2 mg/kg for parathion in sorghum. The estimated maximum residue level confirms the current recommendation for sorghum of 5 mg/kg.

Parathion is registered in the USA for use on *wheat* at 0.28-0.84 kg ai/ha with a PHI of 15 days for harvesting, cutting, or use as forage. Seven trials in 1992, five in 1993, and four in 1994 in 11 states, with two aerial applications of 0.69-0.93 kg ai/ha (most trials at 0.84 kg ai/ha) and harvesting 15 days (or longer if the residue concentration was higher than at 15 days) after the final treatment resulted in the following concentrations of parathion residues in wheat grain: 0.02, 0.05 (2 trials), 0.06

(2 trials), 0.07, 0.08, 0.11, 0.12 (2 trials), 0.14, 0.16, 0.21, 0.54, 0.63, and 0.92 mg/kg, and those of combined parathion and paraoxon residues in rank order were 0.02, 0.05 (2 trials), 0.06, 0.07, 0.08 (2 trials), ***0.11***, ***0.14***, 0.15, 0.16 (2 trials), 0.21, 0.54, 0.65, and 0.96 mg/kg.

The Meeting estimated a maximum residue level of 1 mg/kg, an STMR value of 0.125 mg/kg, and a HR value of 0.96 mg/kg for parathion in wheat.

Parathion is registered in the USA for use on *oilseed rape* at 0.56 kg ai/ha with a PHI of 28 days. Five trials in five states in 1992 and 1994, with two aerial applications of 0.56 kg ai/ha (0.50 kg ai/ha in one trial) and harvesting 28 days after the final treatment resulted in the following concentrations of parathion residues in rape seed: <0.05 (2 trials), 0.09, 0.12, and 0.13 mg/kg. The concentrations of paraoxon residues were <LOQ (0.05 mg/kg) in all trials.

The Meeting decided that five trials were too few to allow estimation of a maximum residue level.

Parathion is registered in the USA for use on *cotton* at 0.29-1.1 kg ai/ha with a PHI of 7 days. Six trials on cotton seed in 1987 and 12 in 1997 in six states, with six applications of 1.1 kg ai/ha (1.4 kg ai/ha in three trials, still considered to comply with GAP) and harvesting 7 days after the final treatment resulted in the following concentrations of parathion residues: 0.13, 0.15 (2 trials), 0.19, 0.20 (2 trials), 0.21, 0.26, 0.30, 0.33, 0.40, 0.48, 0.65, 0.66, 0.97, 1.1, 1.3, and 2.0 mg/kg, and those of the combined parathion and paraoxon residues in rank order were 0.13, 0.15 (2 trials), 0.19, 0.21 (3 trials), 0.26, ***0.31***, ***0.39***, 0.44, 0.48, 0.67, 0.75, 1.1, 1.2, 1.4, and 2.1 mg/kg.

The Meeting estimated a maximum residue level of 3 mg/kg, an STMR value of 0.35 mg/kg, and a HR value of 2.1 mg/kg for parathion in cotton seed. The estimated maximum residue level replaces the current recommendation (1 mg/kg) for cotton seed.

Parathion is registered in the USA for use on *sunflower* at 0.56-1.1 kg ai/ha with a PHI of 30 days. Seven trials in 1988 and 1999 in two states, with three applications of 1.1 kg ai/ha and harvesting 30 days after the final treatment resulted in no residues of parathion or paraoxon >LOQ (0.05 mg/kg). Residues of both compounds were detected in sunflower seed in a processing study after treatment at five times the label rate, however, indicating that, even though no residues were found at >LOQ in the supervised trials, the concentration is not effectively 0. The STMR value should therefore 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 in sunflower seed. The estimated maximum residue level confirms the current recommendation for sunflower seed of 0.05* mg/kg.

As noted above, parathion is registered in the USA for use on barley. Twelve trials in eight states in 1997 and 1998, with six aerial applications of 0.78-0.84 kg ai/ha and cutting or harvesting 14-16 days after the final treatment resulted in residues in *barley hay and straw*. As the moisture was measured, the residues could be expressed on a dry weight basis. The concentrations of parathion residues in barley hay were 0.10 (2 trials), 0.16, 0.18, 0.19, 0.21, 0.55, 0.70, 0.73, 1.1, 3.6, and 4.7 mg/kg (fresh weight) and 0.14, 0.15, 0.25, 0.26 (2 trials), 0.28, 0.80, 1.0, 1.1, 1.6, 5.9, and 6.5 mg/kg (dry weight). The concentrations of combined parathion and paraoxon residues in barley hay were 0.17, 0.18, 0.29, 0.34 (2 trials), ***0.37***, ***0.86***, 1.2, 1.7, 1.8, 6.2, and 8.1 mg/kg (dry weight). The concentrations of parathion residues in barley straw were 0.6, 0.7, 1.3, 2.0, 2.8, 2.9, 3.5 (2 trials), 7.6, 8.0, 9.6, and 13 mg/kg (fresh weight) and 1.0, 1.3, 2.6, 3.2, 5.1, 6.1, 6.4, 7.1, 12, 14, 16, and 20 mg/kg (dry weight). The concentrations of combined parathion and paraoxon residues in barley straw were 1.4, 1.6, 3.1, 4.7, 6.2, ***7.3***, ***8.2***, 8.8, 14, 16, 20, and 24 mg/kg (dry weight).

The data for barley hay and straw were combined to propose an MRL for barley straw and fodder. The concentrations of residues in straw were usually higher than those in hay in the same trial (both expressed as dry weight). The higher value (for hay or straw on a dry weight basis) in each trial was taken to represent that for the residue in barley straw and fodder in that trial. The concentrations of parathion residues in barley straw and fodder were thus: 1.0, 1.3, 3.2, 5.1, 5.9, 6.1, 6.4, 7.1, 12, 14, 16, and 20 mg/kg (dry weight), and those of the combined residues of parathion and paraoxon were 1.4, 1.6, 4.7, 6.2 (2 trials), ***7.3***, ***8.2***, 8.8, 14, 16, 20, and 24 mg/kg (dry weight).

The Meeting estimated a maximum residue level of 30 mg/kg and an STMR value of 7.75 mg/kg for parathion in barley straw and fodder (dry weight).

As noted above, parathion is registered in the USA for use on maize. A series of 27 trials in eight states in 1987-89, with six applications of 1.1 kg ai/ha and harvesting or cutting 12 days after the final treatment resulted in residues in *maize fodder, forage, and silage*. The application rate of 1.1 kg ai/ha used in the trials is 33% higher than the recommended rate (1 pint per acre in trials, 0.75 pint per acre according to GAP), but the data were considered adequate to represent residues resulting from GAP. Data were not available on moisture levels or percent dry matter.

The concentrations of the resulting parathion residues in *maize fodder* were <0.05, 0.06, 0.10, 0.12, 0.39, 0.45, 0.74, 0.86, 0.92, 1.4, 1.6, 2.3, 2.6, 2.7, 5.5, 6.3, 8.0, 8.4, 13, and 19 mg/kg (fresh weight), and those of the combined parathion and paraoxon residues were <0.05, 0.12, 0.17, 0.25, 0.51, 0.58, 0.80, 0.86, 0.98, ***1.6***, ***2.0***, 2.4, 2.8, 3.0, 5.9, 6.8, 9.3, 9.1, 14, and 22 mg/kg (fresh weight). Allowing for the standard 83% of dry matter in maize fodder (FAO, 1997, p. 123, corn stover = maize fodder), the Meeting estimated a maximum residue level of 30 mg/kg and an STMR value of 2.13 mg/kg for parathion in maize fodder (dry weight). The highest value of dry weight = 22/0.83 = 26.5.

The concentrations of parathion residues in *maize forage* were <0.05, 0.05, 0.09, 0.10, 0.56, 1.1, 1.3, 1.4, 1.5, and 2.1 mg/kg (fresh weight), and those of the combined parathion and paraoxon residues were <0.05, 0.12, 0.15, 0.16, ***0.73***, ***1.1***, 1.5 (2 trials), 1.6, and 2.3 mg/kg (fresh weight). Allowing for the standard 40% of dry matter in maize forage (FAO, 1997, p. 123), the Meeting estimated a maximum residue level of 10 mg/kg and an STMR value of 2.28 mg/kg for parathion in maize forage (dry weight). The highest value of dry weight = 2.3/0.40 = 5.75 and the STMR dry weight = 0.5 ∞ (0.73 + 1.1)/0.40 = 2.28.

The concentrations of parathion residues in *maize silage* were 0.34, 0.78, 1.1, 1.2, 1.3, 1.8, 2.4, and 2.6 mg/kg (fresh weight). No information on the percent dry matter in the silage was available, but the residues in silage should be covered by the estimated maximum residue level for fodder.

As noted above, parathion is registered in the USA for use on sorghum. Eight trials in six states in 1992 and 1994, with two aerial applications of 1.1 kg ai/ha and harvesting or cutting 12 days after the second application resulted in residues in *sorghum forage, fodder, and hay*. The percent dry matter was available for all samples.

The resulting concentrations of residues of parathion in *sorghum fodder and hay* were 0.18, 0.25, 0.34, 0.52, 0.87, 1.6, 1.2, and 4.3 mg/kg (fresh weight) or 0.38, 0.78, 1.4, 2.4, 3.0, 3.9, 4.3, and 10 mg/kg (dry weight), and those of the combined parathion and paraoxon residues were 0.18, 0.25, 0.34, ***0.52***, ***0.92***, 1.6, 1.3, and 4.3 mg/kg (fresh weight) or 0.38, 0.78, 1.4, ***2.4***, ***3.2***, 3.9, 4.7, and 10 mg/kg (dry weight). The Meeting estimated a maximum residue level of 15 mg/kg and an STMR value of 2.8 mg/kg for parathion in sorghum straw and fodder (dry weight).

The concentrations of residues of parathion in *sorghum forage* were 0.09, 0.34, 0.40, ***0.56***, 0.72, 1.1, and 1.7 mg/kg (fresh weight) or 0.35, 1.1, 2.7, ***3.1***, 3.5, 3.8 and 8.5 mg/kg (dry weight). The concentration of paraoxon residues did not exceed the LOQ (0.05 mg/kg) in any sample. The Meeting estimated a maximum residue level of 10 mg/kg and an STMR value of 3.1 mg/kg for parathion in sorghum forage (dry weight).

As noted above, parathion is registered in the USA for use on wheat. Trials in 10 states in 1992-94, with two aerial applications of 0.84 kg ai/ha and harvesting or cutting 15 days after the second application resulted in residues in *wheat forage and straw*. The percent dry matter was available for all samples in some trials and for representative samples in others.

The concentrations of residues of parathion in *wheat forage* were <0.05, 0.09 (2 trials), 0.10, 0.12, 0.15, 0.48, 0.52, and 0.79 mg/kg (fresh weight) or <0.05, 0.30, 0.33, 0.40, 0.46, 0.47, 1.9, 2.2, and 3.2 mg/kg (dry weight), and those of the combined parathion and paraoxon residues were <0.05, 0.09, 0.10, 0.11, ***0.12***, 0.21, 0.62, 0.66, and 0.89 mg/kg (fresh weight) or <0.05, 0.30, 0.33, 0.40, ***0.57***, 0.64, 2.4, 2.8, and 3.5 mg/kg (dry weight). Residues in wheat forage are covered by the recommendations for wheat straw and fodder.

The concentrations of residues of parathion in *wheat straw* were 0.50, 0.67, 0.98, 1.0, 1.2, 1.4, 1.5, 1.8 (2 trials), 1.9, 3.1 (2 trials), 3.5, 3.8, 7.3, 7.5, and 9.5 mg/kg (fresh weight) or 0.70, 0.91, 1.2, 1.5 (2 trials), 2.9, 3.2, 3.3, 3.4 (2 trials), 4.2 (3 trials), 5.0, 8.2, 11, and 18 mg/kg (dry weight). The concentrations of the combined parathion and paraoxon residues were 0.65, 0.67, 1.0, 1.3 (2 trials), 1.6, 1.7, ***2.0*** (2 trials), 2.1, 3.3, 3.4, 3.7, 4.3, 7.8, 8.1, and 10 mg/kg (fresh weight) or 0.91 (2 trials), 1.5, 1.6, 1.9, 3.1, 3.5, 3.6, ***3.7*** (2 trials), 4.4, 4.5, 4.8, 5.2, 8.9, 12, and 19 mg/kg (dry weight). The Meeting estimated a maximum residue level of 20 mg/kg and an STMR value of 3.7 mg/kg for parathion in wheat straw and fodder (dry weight).

As noted above, parathion is registered in the USA for use on soya beans. Eight trials in three states in 1988, with two aerial applications of 0.90 kg ai/ha and a PHI of 20 days resulted in the following concentrations of parathion residues in *soya bean hay*: 0.13, 0.25, 0.32, 0.46, 0.50, 0.57, 0.61, and 0.62 mg/kg (fresh weight), and those of the combined parathion and paraoxon residues were 0.13, 0.25, 0.43, ***0.46***, ***0.61***, 0.62, 0.68, and 0.81 mg/kg (fresh weight). Allowing for the standard 85% of dry matter in soya bean hay (FAO, 1997, p. 126), the Meeting estimated a maximum residue level of 2 mg/kg and an STMR value of 0.63 mg/kg for parathion in soya bean fodder (dry weight).

Fate of residues during processing

The Meeting received information on the fate of incurred residues of parathion and paraoxon during the processing of lemons, grapefruit, oranges, apples, grapes, oats, maize, rice, sorghum, wheat, sunflower seed, cotton seed, and rape seed, and processing factors were calculated for processed commodities derived from these raw agricultural commodities. The studies on apples, cotton seed, maize, sorghum, sunflower seed, and wheat are summarized below because maximum residue levels are estimated for these raw agricultural commodities.

Processing factors were calculated for parathion residues and for combined parathion and paraoxon residues. As parathion 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 estimating parathion after the processing of *apples* to dry pomace were divergent, 3.1 and 0.16, reflecting the results of two processes. The Meeting decided to use the conservative value of 3.1 rather than the mean, which would represent neither process. Residues were detected in apple juice with one process but not the other, leading to processing factors of <0.018 and 0.072, and the conservative value 0.072 was chosen. Application of these factors to the STMR value and MRL for apples provides an STMR-P value of 0.078 mg/kg and a HR-P value of 0.62 mg/kg for dry apple pomace and an STMR value for apple juice of 0.0018 mg/kg.

The processing factors for dry milling of *maize* were grits (<0.36, 0.99; best estimate, 0.99), meal (0.69, 0.88; mean, 0.74), flour (0.47, 0.88; mean, 0.68), crude oil (0.47, 0.66; mean, 0.57), and refined oil (0.80, 2.0; mean, 1.4). The processing factors for wet milling of maize were starch (<0.36, <0.28; best estimate, <0.28), crude oil (1.3, 3.4; mean, 2.3), and refined oil (1.3, 3.5; mean, 2.4). Application of the factors to the STMR value and MRL for maize provides an STMR-P value of 0.037 mg/kg and an HR-P value of 0.074 mg/kg for maize meal and STMR-P values of 0.05 mg/kg for grits, 0.034 mg/kg for maize flour, and 0.014 mg/kg for maize starch. Application of the factor for maize flour (0.68) to the MRL for maize results in a calculated highest residue of 0.068 mg/kg in maize flour. The Meeting estimated a maximum residue level of 0.1 mg/kg for parathion in maize flour.

The two processes resulted in different concentrations of residues in maize oil. The processing factors for oils were 0.57 and 1.4 with the dry process and 2.3 and 2.4 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 0.12 mg/kg for both crude oil and refined oil. Application of the processing factors to the MRL for maize results in calculated highest residues of 0.23 and 0.24 mg/kg in crude and refined oils, respectively. The Meeting estimated a maximum residue level of 0.3 mg/kg for parathion in both crude and refined maize oil.

The processing factors for parathion after milling of *sorghum* were 1.6, 3.7, 1.16, and 1.01 (mean, 1.9) for bran; 0.34 and 0.57 (mean, 0.46) for grits; 0.23 and 0.57 (mean, 0.40) for flour; and 0.012 and 0.018 (mean, 0.015) for starch. Application of the factors to the STMR value for sorghum provides STMR-P values of 2.0 mg/kg for bran, 0.49 mg/kg for grits, 0.42 mg/kg for flour, and 0.016 mg/kg for starch.

The processing factors for parathion after milling of *wheat* were 4.6 for bran, 0.80 for shorts, and 0.35 for flour. Application of the factors to the STMR value and MRL for wheat provides STMR-P and HR-P values of 0.10 and 0.80 mg/kg for wheat shorts and STMR-P values of 0.044 mg/kg for wheat flour and 0.58 mg/kg for wheat bran. Only one milling trial was available for wheat, a major commodity, and this was considered insufficient to allow estimation of maximum residue levels for wheat bran and flour.

The processing factors for *sunflower seed* were 0.072 for meal and 0.42 for refined sunflower seed oil. Application of the factors to the STMR value and MRL for sunflower seed provides STMR-P and HR-P values for sunflower seed meal of 0.0025 mg/kg and an STMR-P value for refined sunflower seed oil of 0.021 mg/kg. The Meeting noted that parathion and paraoxon residues in refined oil were depleted below the concentrations in the seed and estimated a maximum residue level of 0.05* mg/kg for edible sunflower seed oil, on the basis of the LOQ of the method in trials on sunflower seeds.

The processing studies on *cotton seed* could not be used because no data on residues were provided.

Residues in animal and poultry commodities

The Meeting estimated the dietary burden of parathion residues in farm animals on the basis of the diets listed in Appendix IX of the *FAO Manual* (FAO, 1997). Calculation from MRLs (or highest residues) provides concentrations in feed suitable for estimating maximum residue levels 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, mg/kg	Group	% dry matter	MRL/ dry matter	% of diet			Concentration of residue, mg/kg		
					Beef cattle	Dairy cows	Poultry	Beef cattle	Dairy cows	Poultry
Maize forage	10	AF	100	10	15			1.50		
Sorghum forage	10	AF	100	10						
Barley straw and fodder, dry	30	AS	100	30	25	60		7.50	18.00	
Maize fodder	30	AS	100	30						
Sorghum straw and fodder, dry	15	AS	100	15						
Wheat straw and fodder, dry	20	AS	100	30						
Soya bean fodder	2	AL	100	2	10				0.20	
Maize meal	0.074	CF	85	0.087						
Wheat shorts	0.80	CM	88	0.91						
Barley	7	GC	88	8.0	50	40	75	3.98	3.18	5.97
Maize	0.1	GC	88	0.11						
Sorghum	5	GC	86	5.81			5			0.29
Wheat	1	GC	89	1.12						
Apple pomace, dry	0.62	AB	100	0.62						
Sunflower seed meal	0.0025		92	0.003			20			0.00
Total								13.2	21.2	6.26

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
Maize forage	2.28	AF	100	2.28						
Sorghum forage	3.1	AF	100	3.10	15			0.47		
Barley straw and fodder, dry	7.75	AS	100	7.75	25	60		1.94	4.65	
Maize fodder	2.13	AS	100	2.13						
Sorghum straw and fodder, dry	2.8	AS	100	2.80						
Wheat straw and fodder, dry	3.7	AS	100	3.70						
Soya bean fodder	0.63	AL	100	0.63	10			0.06		
Maize meal	0.037	CF	85	0.044						
Wheat shorts	0.10	CM	88	0.11						
Barley	1.95	GC	88	2.22	50	40	75	1.11	0.89	1.66
Maize	0.05	GC	88	0.06						
Sorghum	1.06	GC	86	1.23			5			0.06
Wheat	0.125	GC	89	0.14						
Apple pomace, dry	0.078	AB	100	0.078						
Sunflower seed meal	0.0025		92	0.003			20			0.00
Total								3.6	5.5	1.72

The dietary burdens of parathion for estimating MRLs and STMR values (concentrations of residue in animal feeds expressed in dry weight) are 13 and 3.6 ppm in beef cattle, 21 and 5.5 ppm in dairy cows, and 6.3 and 1.7 ppm in poultry. The studies of metabolism in goats fed diets containing 97 ppm and laying hens fed diets containing 16.5 ppm provide evidence that the concentration of parathion is likely to be low in meat, milk, and eggs. However, the duration of feeding in these studies was only 5 or 6 days, only one dietary concentration was tested making interpolation or extrapolation to other concentrations difficult, and the concentration in eggs may not have reached a plateau by the end of the study.

The Meeting decided that studies of farm animal feeding were needed for estimation of MRLs and STMR values for animal and poultry commodities. The Meeting was informed that a study in dairy cows and one in laying hens were available.

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
For estimation of dietary intake: sum of parathion and paraoxon expressed as parathion

Commodity		MRL, mg/kg		STMR, mg/kg	HR, mg/kg
CCN	Name	New	Previous		
FP 0226	Apple[1]	0.2	0.05*	0.025	0.16
JF 0226	Apple juice			0.0018	
AB 0226	Apple pomace, dry			0.078	0.62
FS 0240	Apricot	W	1		
GC 0640	Barley[2]	7	-	1.95	5.1
AS 0640	Barley straw and fodder, dry	30	-	7.75	
SO 0691	Cotton seed	3	1	0.35	2.1
VA 0384	Leek	W	0.05		
FC 0204	Lemon	W	0.5		
GC 0645	Maize	0.1	0.1	0.05	0.09
CF1255	Maize flour	0.1	-	0.034	
AS 0645	Maize fodder	30	-	2.13	
AF 0645	Maize forage	10 (dry wt)	-	2.28 (dry wt)	
	Maize grits			0.05	
CF 0645	Maize meal			0.037	0.074
	Maize starch			0.014	
OC 0645	Maize oil, crude	0.3	-	0.12	
OR 0645	Maize oil, edible	0.3	-	0.12	
FC 0206	Mandarin	W	0.5		
OC 0305	Olive oil, virgin	W	2		
FT 0305	Olives	W	0.5		
FC 0004	Oranges, Sweet, Sour	W	0.5		
FS 0247	Peach	W	1		
VR 0589	Potato	W	0.05*		
GC 0651	Sorghum	5	5	1.06	4.2
	Sorghum bran			2.0	
	Sorghum flour			0.42	
	Sorghum grits			0.49	
	Sorghum starch			0.016	
AF 0651	Sorghum forage (green)	10 (dry wt)	-	3.1 (dry wt)	
AS 0651	Sorghum straw and fodder, dry	15	-	2.8	
VD 0541	Soya bean (dry)	0.05*	0.05*	0.05	0.05
AL 0541	Soya bean fodder	2	-	0.63	
SO 0702	Sunflower seed	0.05*	0.05*	0.05	0.05
	Sunflower seed meal			0.0025	0.0025
OR 0702	Sunflower seed oil, edible	0.05*	-	0.021	
VO 0447	Sweet corn (corn-on-the-cob)	0.05*	-	0.05	0.05
GC 0654	Wheat	1	-	0.125	0.96
CM 0654	Wheat bran, unprocessed			0.58	
CF 1211	Wheat flour			0.044	
	Wheat shorts - animal feed			0.10	0.80
AS 0654	Wheat straw and fodder, dry	20	-	3.7	

[1]The information provided to the JMPR precludes an estimate that the acute dietary intake for children would be below the acute reference dose
[2]The information provided to the JMPR precludes an estimate that the acute dietary intake for the general population would be below the acute reference dose

Further work or information

Desirable

1. An additional trial on milling of wheat for estimation of maximum residue levels in flour and bran.

2. Information on the fate of parathion during malting and brewing of barley.

3. Studies of farm animal feeding to permit estimation of maximum residue levels and STMR values for animal commodities. The Meeting was informed that studies in dairy cows and laying hens were available.

Dietary risk assessment

Chronic intake

The periodic review of parathion resulted in recommendations for new and revised MRLs and new STMR values for raw and processed commodities. Data on consumption were available for 10 food commodities and were used in calculating 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 7-20% of the ADI. The Meeting concluded that long-term intake of residues of parathion from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The IESTI of parathion was calculated for the food commodities (and their processing fractions) for which maximum residue levels and STMR values have been estimated and for which data on consumption were available. The results are shown in Annex 4. The IESTI represented 0-400% of the acute RfD for the general population. That representing 400% results from a direct calculation based on the residues in barley because no data were available on the fate of parathion during brewing. The IESTI represented 0-140% of the acute RfD for children. The value of 140% represents the estimated short-term intake of residues in apples, but the Meeting was informed that the large portion size (679 g) of apple consumption by children may represent total apple consumption (including apple juice) rather than consumption of whole apples only.

The Meeting concluded that the acute intake of residues of parathion from uses, other than on barley and apples, that have been considered by the JMPR is unlikely to present a public health concern.

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