PROPAMOCARB (148)

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EXPLANATION

Propamocarb hydrochloride is a carbamate fungicide with specific activity against Oomycete species that cause seed, seedling, root, foot and stem rots and foliar diseases in a number of edible crops. The compound was evaluated by the JMPR in 1984, 1986, 1987 and 2005, when an ADI of 0–0.4 mg/kg bw and an ARfD of 2 mg/kg bw were established. At the 37th Session of the CCPR it was scheduled for residue evaluation, within the periodic review programme, by the 2006 JMPR. The manufacturer submitted data on metabolism in animal and plants, degradation in soil, residues in succeeding crops; GAP, analytical methods and processing studies. Residue trials submitted were conducted on potato, radish, onion, lettuce, spinach, cabbage, cauliflower, chicory, sweet pepper, tomatoes, summer squash, cantloupe and melon. GAP information and residue trials results on lettuce, cucumber and ginger were provided by the Government of Japan.

IDENTITY

Common name: Propamocarb hydrochloride

Chemical name:

IUPAC: Propyl 3-(dimethylamino) propylcarbamate hydrochloride

CAS: Propyl [3-(dimethylamino)propyl] carbamate hydrochloride

CAS number: 25606-41-1

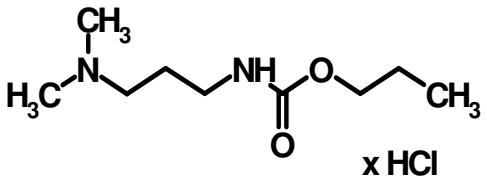
CIPAC number: 399

EEC number: 245-125-9

Molecular formula: $C_9H_{21}ClN_2O_2$

Molecular mass: 224.7 g/mol

Structural formula:



PHYSICAL AND CHEMICAL PROPERTIES

A detailed chemical and physical characterisation of the active ingredient is given below.

Property	Results	Reference Report No.
Colour and odour	Cream coloured sticky crystals with typical carbamate odour/white opaque crystalline soft liquid with weak, sickly sweet odour	(Sixl/Rexer, 1998; C001715/C001717; Walker *et al*., 1995; 722/013)
Melting point	64.2°C	(Lehne, 1990; A89312)
Relative density	1.051 g/cm³ at 20°C/1.15 g/cm³ at 20.5 $\pm$0.5°C	(Bittner/Rexer, C003480. Muehlberger and Lemke, 2004; C044109. Walker *et al*., 1995; 722/013)
Vapour pressure (extrapolated)	3.8×10^{-5} / 1.4×10^{-3} Pa at 20 °C 8.1×10^{-5} / 1.7×10^{-3} Pa at 25 °C 1.6×10^{-4} Pa at 30 °C	(Miklautz, 1990; A85057; Howarth *et al*., 1995; 722/015)

Property	Results	Reference Report No.
Volatility (calculated)	Henry's law constant at 20 °C: 8.50 x 10^{-9} Pa m^3 mol^{-1}	(Renaud, 2005; C046819)
Solubility in water at 20ºC	> 900 g/L at pH 3 > 855 g/L at pH 6.9 > 536 g/L at pH 9.6 between 89.2 and 93.5%w/w at pH 4 between 89.1 and 93.8%w/w at pH 7 between 89.6 and 94.6%w/w at pH 10	(Muehlberger, 2001; C012641/C042353; Renaud, 2004; C045318 ; Walker *et al*., 1995 ; 722/013)
Solubility in organic solvent [g/L] at 20°C s	Hexane: < 0.01 Toluene: 0.14 Methanol: > 656 Dichloromethane: > 626 Ethyl acetate: 4.34 – 4.8 Acetone: 560.3 Xylene: 1.6x10^{-2} Heptane: < 1x10^{-4}	(Müller, 1990; A85046; Walker *et al*., 1995; 722/013; Ryckel, 2002; 20528)
Dissociation constant	pKa=9.3± 0.03 at 20°C pKa=9.63± 0.03 at 20°C	(Miklautz, 1991; A85060; Poerschke, 2001; C014007; Walker *et al*., 1995; 722/013)
Partition coefficient n-octanol/water	Log Pow at 22°C = -2.87 (at pH 2), -1.21 (at pH 7) and 0.67 (at pH 9) Log Pow at 21-22°C = -0.98 (at pH 4), -1.36 (at pH 7) and 0.32 (at pH 9)	(Muehlberger, 2004; C012642; Walker *et al*., 1995; 722/013)
Hydrolysis rate	< 10% hydrolysis after 5 days at 50°C at pH 4, 7 and 9	(Shepler et al., 2001; B003419; Walker *et al*., 1995 ; 722/013)
Photochemical degradation	No photo degradation of propamocarb HCl in aqueous solution by irradiation with artificial sunlight during 22 days	(Klehr, 2003; A85564/A85466; Mullee *et al*. 1995; 722/014)

METABOLISM AND ENVIRONMENTAL FATE

All the metabolism and environmental fate studies submitted to the Meeting were conducted with ^{14}C-propamocarb hydrochloride labelled as shown on Figure 1.

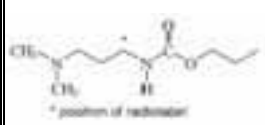
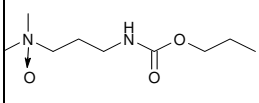
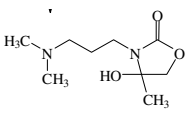
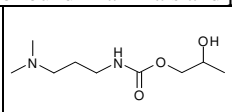
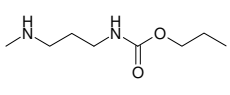
Parent compound	Metabolites of propamocarb found in animals and plants			
				
Labeled propamocarb	Propyl propamocarb N-oxide (Met IV)	Propamocarb oxazolidin-2-one (Met VI)	2-Hydroxy propamocarb	N-desmethyl propamocarb

Figure 1. Position of ^{14}C in propamocarb and the metabolites found in animals and plants.

Animal metabolism

Rat

Four studies conducted in rats with ^{14}C-propamocarb hydrochloride were submitted to the Meeting (Reynolds, 1994, A85144; O'Boyle, 1994, A85146/A91169; Reynolds, 1994, A85148/ A91170;

Morley, 1997, A8386, A84072/C000632). These studies were evaluated by the 2005 JMPR during the toxicological periodic review of propamocarb, and are detailed in the 2005 JMPR Toxicology Evaluation and Report. In summary, propamocarb was rapidly absorbed and extensively metabolised in rat, with no accumulation of parent compound or metabolites in tissues, which are mainly excreted in urine and faeces. Half-life for all tissues ranged from 11–26 hours, with 3 to 20% of the applied dose being excreted as parent compound. The proposed metabolism of propamocarb hydrochloride in the rat involved aliphatic oxidation of the propyl chain, N-oxidation of the tertiary amine and N-dealkyation. Four major metabolites were identified: 2-hydroxy propamocarb, mono-N-desmethyl propamocarb (AEB132677), propylpropamocarb N-oxide (Met IV) and the cyclic propamocarb oxazolidin-2-one (Met VI). There was no evidence of conjugation with glucuronic or sulfuric acid.

Livestock

A lactating cow was orally dosed twice daily for seven consecutive days at a dose level equal to 11.5 mg/kg [^{14}C]-propamocarb HCl equivalents in the diet. Based on dry weight of feed, this corresponds to 2.0 mg propamocarb HCl/kg body weight per day (Daniel and Rupprecht, 2000; B002935). Milk, faeces and urine were collected twice a day during the treatment period. Approximately 15 hours after the last dose, the cow was sacrificed and edible tissues (liver, kidney, muscle, fat and bile) were collected.

Samples of kidney, liver, and muscle were extracted 6 to 8 times with acidified methanol. Radioactivity in the extracts was directly counted by liquid scintillation counting (LSC). Total radioactive residues (TRR) in fat was 0.002 mg/kg propamocarb HCl eq. and no further extraction was performed. Liver and kidney extracts were directly subject to chromatography, but muscle extracts were 'de-fatted' previously with hexane. Milk was extracted with hexane to remove the fat before being dialysed with water. Faeces were extracted with acidic methanol followed by soxhlet extraction with acidic methanol. Identification and quantification of the metabolites in the extracted residue was accomplished by reverse phase and cation exchange HPLC. Samples were analyzed within 2–6 months after collection.

The majority of the administered dose was excreted (81.4%), via the urine (71.9%) and the faeces (9.5%). An overall recovery (including stall wash) of 82.9% of the administered dose was achieved. The residues in the milk were always higher in the afternoon, with a mean of 0.054 ± 0.008 mg/kg propamocarb HCl eq (n=7), and a maximum of 0.057 mg/kg on Day 6 than in the morning (mean: 0.035 ± 0.003 mg/kg propamocarb HCl eq. (n=7) and the maximum of 0.037 mg/kg on Day 5). Cumulative radioactivity recovered in the milk (0.599 mg/kg) accounted for 0.46% of the administered dose. TRR found in tissues and bile accounted for 0.7% of the administered dose. Radioactivity found in tissues, milk and faeces are summarized in Tables 1 and 2. Unextracted residues were not analyzed further.

Table 1. Extractability of residues in tissues, milk and faeces.

Matrix	TRR	Extracted Residue		Unextracted Residue	
	mg/kg[a]	%TRR	mg/kg[a]	%TRR	mg/kg[a]
Kidney	0.107	92.5	0.099	7.2	0.008
Liver	0.415	96.4	0.4	3.6	0.015
Milk[b]	0.057	100	0.057	NA	NA
Muscle	0.019	83.2	0.016	16.8	0.003
Milk fat[b]	< 0.01	NA	NA	NA	NA
Faeces[c]	NA	93.6	-	6.3	-

a. Expressed as propamocarb HCl equivalents; b. sample from day 6 afternoon; c. days 4 and 5; NA= not analysed

The majority of the residue comprised propamocarb, propamocarb N-oxide (Met IV), and the cyclic propamocarb oxazolidin-2-one (Met VI). Minor amounts of 2-hydroxy propamocarb and desmethyl propamocarb (AE B132677) were also identified (Table 2; Figure 1). The majority of the residue was identified in all matrices.

Table 2. Summary of metabolite identification in tissues, milk and excreta.

	Propamocarb		Propyl propamocarb N-oxide (Met IV)		Propamocarb oxazolidin-2-one (Met VI)		2-Hydroxy propamocarb		N-desmethyl propamocarb		Identified	
	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg
Kidney	23.5	0.025	40.8	0.044	14.1	0.015	13	0.014	nd	nd	91.4	0.098
Liver	6.2	0.026	49.0	0.203	21.7	0.09	4.8	0.02	nd	nd	81.7	0.339
Milk	6.0	0.003	21.3	0.012	23.4	0.014	37.6	0.022	3.4	0.002	91.7	0.053
Muscle	24.6	0.005	40.5	0.008	2.3	< 0.001	0.9	< 0.001	4.1	0.001	72.4	0.014
Faeces	33.7	NA	24.6	NA	2.0	NA	13.1	NA	7.6	NA	81	NA
Urine	1.2	NA	28.2	NA	59.0	NA	9.9	NA	NA	NA	98.3	NA

Figure 2 shows the proposed metabolic pathway for propamocarb hydrochloride in the cow. The compound is oxidised or N-demethylated at the di-methyl amine group, or is hydroxylated at the propyl side chain, with the subsequent cyclization to form propamocarb oxazolidin-2-one (metabolite VI).

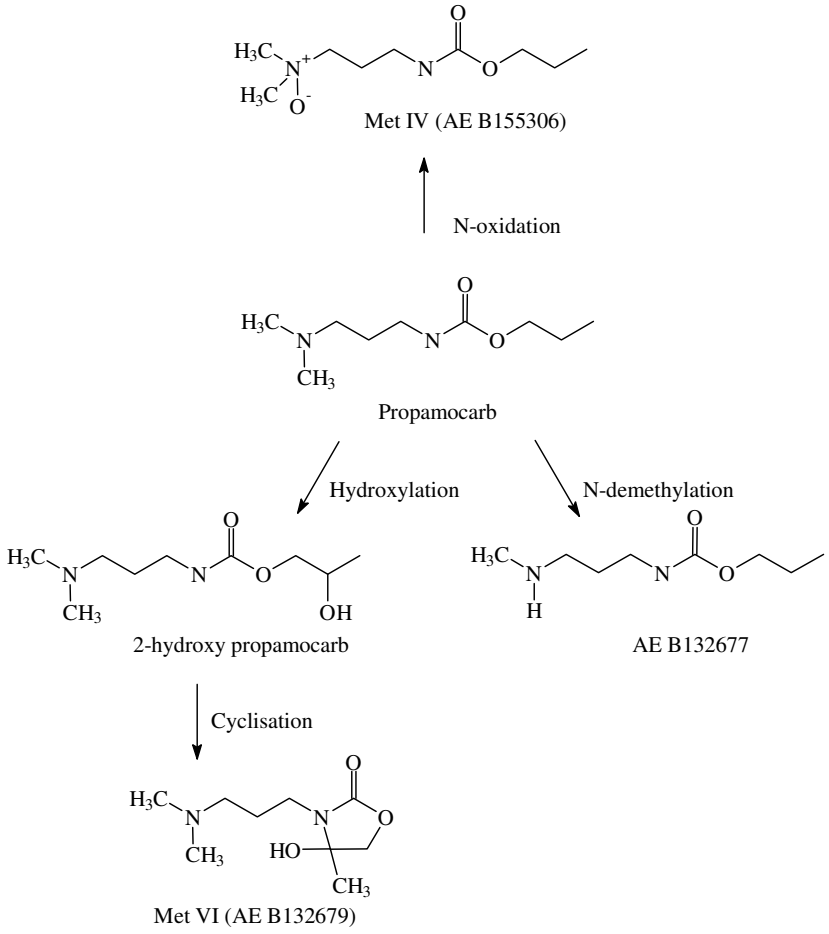


Figure 2. Proposed metabolic pathway of propamocarb hydrochloride in the cow.

Plant metabolism

Spinach

In a study conducted in USA in 2000, [^{14}C]-propamocarb HCl was applied twice to spinach by foliar spray at a rate of 2.53 kg ai/ha (Rupprecht and Daniel, 2000; B002936)**.** Duplicate samples were harvested immediately following the 1st application (day 0), just prior to the second application (Day 20) and 3 days after the second application (Day 23). Samples were extracted three times with methanol/1M hydrochloric acid (99:1), the extract filtered and the ^{14}C content determined by LSC. The filter cake was extracted with acidic methanol in a soxhlet system. Sample extracts were analysed by HPLC and TLC using a radioactive detector. Propamocarb and a selected number of targeted metabolites were used as external standards to identify the residues present. The results are presented in Table 3. Propamocarb was the main residues found in all samples collected.

Table 3. Distribution of metabolites in spinach extracts.

Sample time	TRR, mg/kg[a]	Propamocarb, %TRR	Propyl propamocarb N-oxide (Met IV),%TRR	Propamocarb oxazolidin-2-one (Met VI),%TRR	2-Hydroxy propamocarb, %TRR	N-desmethyl propamocarb, %TRR	Total identified, %TRR
Day 0	203.0	89.2	2.2	1.8	0.0	0.0	93.2
Day 20	207.3	76.0	3.5	2.6	7.1	3.6	92.7
Day 23	236.9	83.1	3.6	2.8	5.4	1.1	96.1

a. Expressed as propamocarb HCl equivalents; mean values from duplicate samples

Lettuce

In one study conducted in UK in 2002, [^{14}C]-Propamocarb HCl (>98% radiochemical purity) was applied (a) to soil on which lettuce was grown three times at 7.22 g ai/m^2, corresponding to 72.2 kg ai/ha immediately after sowing and at intervals of 14 and 28 days thereafter, and (b) three times as a foliar spray in a greenhouse at 1.08 kg ai/ha with 10 day intervals (Goodyear, 2002a; 16669/6-D2149).

Plants were harvested at mature size 38 days after the final soil treatment and 21 days after final foliar treatment. Samples were homogenized in dry ice and stored frozen until analyzed. Portions (approximately 20g) of the homogenates were extracted with methanol, the extracts centrifuged and the radioactivity present determined by LSC. The plant residue remaining was air-dried and the unextracted radioactivity determined by LSC following combustion. The results are shown in Table 4.

Table 4. Radioactive residues in lettuce after soil and foliar treatment.

Treatment, days after the last treatment	TRR (mg/kg)[a]	Methanol (mg/kg)[a]	Methanol (%)	Unextracted (mg/kg)[a]	Unextracted (%)
Soil, 38 days	10.7	3.8	35.5	6.9	64.5
Foliar, 21 days	9.51	8.04	84.3	1.47	15.5
Control	0.35	0.10	29.1	0.24	70.9

a. As propamocarb HCl equivalents.

Larger sub-samples (about 100 g) were extracted sequentially with methanol and water. The plant residue remaining was re-extracted by refluxing with 2M HCl and with 2M NaOH. The liquid extracts in each case were separated by centrifugation and the radioactivity present determined by

LSC. The unextracted radioactivity accounted for 7.1 and 0.2% of the total residue in soil and foliar treated sample respectively (Table 5).

Table 5. Distribution of radioactivity in extracts of lettuce.

Treatment[a]	TRR (mg/kg)	Methanol (mg/kg)	(%)	Water (mg/kg)	(%)	2M HCl (mg/kg)	(%)	2M NaOH (mg/kg)	(%)	Unextracted (mg/kg)	(%)
Soil	8.19	4.37	53.3	0.95	11.7	1.58	19.3	0.71	8.6	0.58	7.1
Foliar	10.7	9.76	91.5	0.69	6.5	0.15	1.4	0.04	0.4	0.02	0.2
Control	0.292	0.20	68.4	NA	NA	0.05	16.9	0.03	11.2	0.01	3.5

a. After 38 days of the last soil treatment and 21 days after foliar application; NA = not analyzed

Methanol and water extracts of plants following soil and the foliar treatments, containing 65% and 98% of TRR, were analysed by HPLC. Table 6 shows that propamocarb formed only in a small proportion of the residue (2.8%) in the lettuce plants grown in treated soil. The residue was composed mainly of an unidentified polar region, Unknown 1. Extracts from the foliar treated samples showed predominantly unchanged propamocarb (90.2%) (Table 7).

Table 6. Profile of radioactive residues in (^{14}C)-propamocarb soil treated lettuce.

Compound	Methanol Extract		Water Extract		Total	
	Residue (mg/kg)	%TRR	Residue (mg/kg)	% TRR	Residue (mg/kg)	%TRR
Propamocarb	0.215	2.6	0.015	0.2	0.230	2.8
Unknown 1	3.650	44.6	0.811	10.0	4.461	54.6
Unknown 4	0.158	1.9	ND	ND	0.158	1.9
Unknown 8	0.274	3.4	0.069	0.8	0.343	4.2
Unknown 10	ND	ND	0.050	0.6	0.050	0.6
Unallocated	0.070	0.8	0.010	0.1	0.080	0.9
Extracted residue	4.367	53.3	0.954	11.7	5.321	65.0
			2M HCl reflux		1.579	19.3
			2M NaOH reflux		0.708	8.6
			Unextracted		0.580	7.1
			TRR = 8.19mg/kg			

Table 7. Profile of radioactive residues in (^{14}C)-propamocarb foliar treated lettuce.

Compound	Methanol Extract		Water Extract		Total	
	Residue (mg/kg)	Percent TRR	Residue (mg/kg)	Percent TRR	Residue (mg/kg)	Percent TRR
Propamocarb	9.016	84.6	0.599	5.6	9.615	90.2
Unknown 1	0.081	0.8	0.053	0.5	0.134	1.3
Unknown 4	0.284	2.7	0.019	0.2	0.303	2.9
Unknown 7	0.318	3.0	0.020	0.2	0.338	3.2
Unallocated	0.057	0.5	0.001	< 0.1	0.058	0.5
Extracted residue	9.756	91.5	0.692	6.5	10.448	98.0
			2M HCl reflux		0.151	1.4
			2M NaOH reflux		0.043	0.4
			Unextracted		0.020	0.2
			TRR = 10.662mg/kg			

A total radioactive residue of 0.346 mg/kg was observed in samples from the untreated control lettuce, 29% of which was extracted with methanol. More exhaustive extraction of a second sub-sample of control lettuce using methanol, water, acid and base reflux, showed that 68% of the total residue was extracted with methanol, 17% with acid and 11% with base.

Potato

In a greenhouse study conducted in 1989 in Germany, [^{14}C]-Propamocarb hydrochloride was applied three times to potato plants, at a rate corresponding to 2.45 kg ai/ha (approximately 20 days between applications) (Förtsch, 1991; A85140).

Potatoes samples were harvested 6 weeks after the final application, extracted using acidified methanol and the radioactivity of the combined extracts measured by LSC. On average, 45.5% TRR was found in the extracts (10 samples), corresponding to a TRR of 0.82 mg/kg propamocarb HCl equivalents. The ^{14}C residue present was equally distributed between peel and flesh (0.96 mg/kg and 0.84 mg/kg, respectively). Control potatoes which were grown in the vicinity of the treated plants contained up to 0.3 mg/kg of propamocarb equivalents, the bulk of which was not extracted with acidified methanol.

Further extraction and partitioning of the extracted residue into chloroform was conducted, following the acidification and alkalisation of the extracts. Between 22 to 31% of the residue partitioned into the aqueous phase (mean = 25.5%) while 14 to 29% of the residue (mean = 23.6%) was present in the organic fraction (n=6). HPLC analysis of the crude methanol extract of sample No. 10 indicated that propamocarb was the main component, representing 58.4% of the total radioactivity extracted (Table 8). The identities of the metabolites shown on Table 8 were not confirmed in the study, but M1 had the same chromatographic behaviour as propyl propamocarb-N-oxide (Met IV).

Table 8. Extracted resides in potato treated with propamocarb.

	Crude methanol extract		After purification	
	% TRR*	mg/kg prop HCl equ.	Chloroform,% TRR*	Aqueous,% TRR*
Propamocarb HCl	27.8	0.23	11.8	1.5
M1	8.6	0.07	2.3	18.8
M2	7.2	0.06	3.5	-
M3	2.0	0.02	1.6	-
M4	-	-	2.5	1.4
Undefined region	2.0	-	0.6	3.6
Total	47.6	0.32	22.3	25.3

* % of the total amount of recovered radiolabel residues of sample No. 10 (47.6% TRR)

In another greenhouse study conducted in German in 1994, potato plants were treated as in the previous study and tubers harvested about 6 weeks after the final treatment (Förtsch, 1994; A85141). Samples were macerated and soxhlet extracted with acidified methanol or acetonitrile followed by alkaline and acid hydrolysis of the remaining material. About 90% of the radiolabeled material was recovered by this method. One sample containing 1.12 mg/kg propamocarb eq, had 31.8% of this residue extracted by acetonitrile and 6.6% unextracted. Table 9 shows the chromatographic profile of this sample using different HPLC elution systems. About 7% of TRR was identified as the parent compound in the two HPLC systems, about 50% of TRR showed the same chromatographic behavior as radiolabeled natural products formed from the exposure of spinach plants with $^{14}CO_2$ gas, and identified as d-glucose.

Table 9. Metabolic patterns of the extracted residues present in plant extracts.

HPLC peak i.d.	Retention time (min)	Macerate extract (%)	Soxhlet extract (%)	HCl hydrolysate (%)	NaOH hydrolysate (%)	Total (%)
Normal phase HPLC analysis of potato tubers, System 1						
Si-1	2- 3	0.17	0.6	1.84	5.86	8.47
Si-2 – d-glucose	3.5-6	5.62	6.18	28.46	13.58	53.84
Si-3	6.5-7	0.14	1.79	1.89	0.5	4.32
Si-4 – propamocarb HCl	8- 10.5	2.75	4.41	n.d.	n.d.	7.16
Si-5	11- 12.5	0.07	0.38	n.d.	n.d.	0.45
Si-6	13- 15	0.35	0.67	n.d.	n.d.	1.02
Si-7	15.5- 18	0.19	n.d.	n.d.	n.d.	0.19

HPLC peak i.d.	Retention time (min)	Macerate extract (%)	Soxhlet extract (%)	HCl hydrolysate (%)	NaOH hydrolysate (%)	Total (%)
Si-8	22- 25	0.06	0.11	n.d.	n.d.	0.17
Total characterized		9.95	14.14	32.19	19.94	75.62
Unassigned ^{14}C		1.6	0.5	6.2	2.9	11.2
% of ^{14}C lost		1.1	5.1	--	--	6.2
% of ^{14}C recovered.		12.1	19.7	38.4	22.8	93
Reverse phase HPLC analysis of potato tubers, System 2						
RP-1 - d-glucose	2 – 4.5	4.83	5.89	27.38	7.4	45.5
RP-2	5.5- 8.5	1.01	0.96	1.61	4016	7.74
RP-3	9 – 11.5	0.72	0.74	1.18	1.16	3.8
RP-4	14 – 16.5	0.32	0.56	1.1	3.53	5.51
RP-5	17 – 19.5	0.29	0.28	n.d.	0.5	1.07
RP-6	20 – 22	0.31	0.64	n.d.	n.d.	0.95
RP-7 propamocarb HCl	23.5 – 25.5	2.5	3.26	0.68	0.47	6.91
RP-8	26 - 28	0.5	1.07	2.03	1.79	5.39
Total characterized		10.47	13.4	33.98	19.01	76.86
Unassigned ^{14}C		0.5	1.2	4.4	3.8	9.9
% of ^{14}C lost		1.1	5.1	--	--	6.2
% of ^{14}C recovered.		12.1	19.7	38.4	22.8	93

In a third study conducted with potato in the UK in 2002 (Goodyear, 2002b; 1669/5-D2149) [^{14}C]-Propamocarb (> 98% radiochemical purity) was applied 6 times as a foliar spray to potatoes grown outdoors in crates at a rate of 2.2 kg ai/ha and at 10.8 kg ai/ha. Initially the treatment solution was applied to the foliage and the drift to soil was small, however by the sixth application the foliage had died back to such an extent that the majority of the treatment solution was sprayed on soil.

Samples were harvested when the tubers reached maturity, about 7 days after the last treatment, or 161 days after sowing. Samples of tubers were washed with water and divided equally into two samples, one of which was peeled. Samples of foliage and roots were also taken.

Fresh sub-samples of the whole tuber, peel, flesh and foliage were extracted sequentially with methanol, water and refluxed in 2M HCl acid and 2M NaOH base. The liquid extracts in each case were separated by centrifugation and the radioactivity present determined by LSC (Table 10).

Table 10. Distribution of residues of [^{14}C]-propamocarb in extracts of parts of treated potato.

Extract	Whole tuber		Peel		Flesh		Foliage	
	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg
2.2 kg ai/ha								
Methanol	48.5	0.054	59.2	0.029	60.2	0.013	38.7	33.260
Water	27.3	0.031	18.6	0.009	15.7	0.003	14.7	12.670
2M HCl	19.4	0.022	11.5	0.006	15.2	0.003	20.4	17.511
2M NaOH	ND	ND	ND	ND	ND	ND	13.9	11.952
Unextracted Residue	4.8	0.005	10.7	0.005	9.0	0.002	12.2	10.520
	TRR =0.112mg/kg		TRR =0.05mg/kg		TRR =0.02mg/kg		TRR =85.9mg/kg	
10.8 kg ai/ha								
Methanol	39.2	0.02	59.9	0.119	52.0	0.164	52.5	249.8
Water	32.3	0.016	16.4	0.033	18.7	0.059	15.5	73.6
2M HCl	22.0	0.011	13.3	0.027	21.2	0.067	14.0	66.62
2M NaOH	ND	ND	ND	ND	ND	ND	11.7	55.93
Unextracted Residue	6.6	0.003	10.3	0.021	8.1	0.025	6.3	30.0
	TRR =0.050 mg/kg		TRR =0.199 mg/kg		TRR =0.316 mg/kg		TRR =476.0 mg/kg	

The methanol, water and acid extract of whole tuber and foliage from the lower rate treatment were analysed by HPLC, TLC and LC-MS (Table 11). Only a small proportion of the residue (< 2% TRR) in whole tuber was identified as propamocarb. The residue was composed predominantly of an

unidentified region (Unknown 1) and five smaller regions containing each ≤ 6% of TRR. In foliage extracts, a greater proportion of the residue was present as unchanged propamocarb (29%). The remainder of the residue showed a similar pattern of metabolites to those seen in the tuber.

HPLC with positive ion mass spectrometry analysis using reference standards tentatively identified the compounds 4, 6 and 7 as being a hydroxypropyl-propamocarb, N-methyl-propamocarb and propamocarb-N-oxide. There was no indication which carbon atom in the propane chain has been hydroxylated. Unknown compounds 2, 3, 5, 8, 9 and 10 were not identified.

Table 11. Total amounts of propamocarb and metabolites in potato tuber and foliage.

Compound	Whole tuber		Foliage	
	Residue (mg/kg)	% TRR	Residue (mg/kg)	% TRR
Propamocarb	0.002	1.9	24.506	28.6
Unknown 1	0.087	77.4	25.843	30.0
Unknown 3	< 0.001	0.4	0.675	0.8
Compound 4: Hydroxypropyl propamocarb	0.001	0.5	1.188	1.4
Unknown 5	0.006	6.0	1.095	1.3
Compound 6: N-methyl propamocarb	ND	ND	4.838	5.7
Compound 7: Propamocarb N-oxide	0.004	3.2	3.543	4.1
Unknown 8	ND	ND	0.359	0.4
Unknown 9	ND	ND	0.567	0.7
Unknown 10	0.001	0.8	ND	ND

The nature of the metabolites was investigated using the water extract of foliage treated at the higher rate. The radioactivity present in the water extract was composed mainly of the polar materials (Unknown 1 and Unknown 5). These materials were isolated and subjected to different treatments: 2M HCl at 60 ºC; β-glycosidase in 0.1M ammonium acetate (pH5) at 37 ºC; cellulase in 0.1M ammonium acetate (pH5) at 37 ºC; hesperidinase in 0.1M ammonium formate (pH3.8) at 37ºC; 0.1M ammonium acetate (pH5) at 37 ºC. Between 91−106% radioactivity was recovered following each treatment. The reaction products analysed by HPLC showed that the treatments had no observable effect on the nature of the radioactivity present and no unchanged propamocarb was released.

Cucumbers

In a greenhouse study, conducted in Germany in 1998, cucumbers were grown in soil treated once with [^{14}C]-propamocarb HCl applied at 2.9 kg ai/ha (11.8 mg ai/plant) and samples harvested at 30 days PHI. Hydroculture-grown cucumbers were treated once at a rate of 53.4 mg ai/plant, applied directly to the hydroponic solution and samples were harvested at 21 days post-application. Analysis of the hydroponic nutrient solution used to feed the cucumber plants showed that propamocarb hydrochloride was the only ^{14}C active compound present. Plant samples were separated into fruit, leaves/stems and roots and were analysed by LSC and by HPLC (Feyerabend and Rupprecht, 1998; A85149).

Cucumber samples were first extracted by maceration with methanol/1 M hydrochloric acid (99:1), centrifuged and the extracted solids re-extracted using the same solvent system in a soxhlet. Sample extracts were analysed using both normal phase and reverse phase HPLC conditions. The majority of the radioactivity was extracted by maceration (about 81% TRR) with unextracted residues representing < 8% of TRR. In the foliar treatment, propamocarb represented < 20% of TRR, and it was the major source of the extracted radioactivity in the hydroponic treatment (Table 12). The polar metabolites were not identified in the study. As part of the same study, sample extracts from spinach grown in a $^{14}CO_2$ enriched atmosphere were analysed in a similar manner and demonstrated that apart

from parent propamocarb the majority of the remaining ^{14}C residues detected were present as a result of the incorporation of ^{14}C into natural products.

Table 12. Extraction profile of cucumber fruit after soil and hydroponic treatments with propamocarb hydrochloride.

	Foliar (TRR = 0.069 mg/kg eq.) mg/kg eq. (% TRR)			Hydroponic (TRR = 3.09 mg/kg eq.) mg/kg eq. (% TRR)		
Acid methanol extract	Total in extract	Propamocarb HCl	Polar metabolites	Total in extract	Propamocarb HCl	Polar metabolites
Maceration	0.056 (81.2)	0.012 (17.4)	0.029 (42)	2.57 (83.3)	1.59 (51.4)	0.885 (28.6)
Soxhlet	0.008 (11.6)	0.0013 (1.9)	0.005 (7.2)	0.341 (11.0)	0.217 (7.0)	0.107 (3.5)
Unextracted	0.005 (7.2)	-	-	0.18 (5.8)	-	-

Tomatoes

In a greenhouse study conducted, in the UK in 2001, on tomato [^{14}C]-propamocarb (> 98% radiochemical purity) was applied 4 times to soil at rates of 0.007 and 0.036 kg ai/ha, and as a single foliar treatment at 2.2 kg ai/ha (Goodyear, 2001; 1669/3-D2149). Immature foliage (BBCH Stage 18, 8 true leaves unfolded) was harvested 7 days after the second soil treatment, i.e., 45 days after sowing. Mature tomatoes from the soil treatment were harvested at intervals of 14, 21, 28 and 35 days following the last application. Mature tomatoes, from foliar treated plants, were harvested at intervals of 7, 14, 21 and 28 days following application. Plant foliage was also sampled at the final harvest interval for both treatments. Samples were homogenised in dry ice and stored until analysis.

Plant material was extracted by maceration with methanol and water, with further extraction in 0.1M HCl and 0.1M NaOH (maceration and reflux) performed as necessary. The resulting extracts were separated by centrifugation and the radioactivity determined by LSC. The residue remaining was air-dried and the unextracted radioactivity was determined by LSC following combustion. Table 13 shows the radioactivities recovered from the foliage from soil and foliar treatments.

Table 13. Radioactivity from foliage extracts.

Treatment, kg ai/ha	PHI	TRR mg/kg eq.	mg/kg eq. (% TRR)				
			Water	methanol	0.1M HCl	0.1M NaOH	Non-extracted
Soil,	7	11.8	6.6 (56.5)	0.792 (8.2)	0.31 (2.6)	1.02 (8.6)	2.8 (23.9)
0.007 (1X)	35	4.9	-	2.1 (43.1)			2.8 (56.9)
Soil,	7	69.4	38.5 (55.5)	5.4 (7.9)	1.76 (2.5)	6.04 (8.7)	17.6 (25.4)
0.036 (5X)	35	19.8	-	8.2 (41.4)	-	-	11.6 (59.6)
Foliar, 2.2	28	5.21	-	367 (70.6)	-	-	1.53 (29.4)

The water and methanol extracts from the homogenised immature foliage (7 days PHI) were partitioned with chloroform and the resulting aqueous fractions contained 43% of TRR for the 1× treated samples and 37% of TRR for the 5× treated samples. HPLC of the extracts showed about 5% of TRR (0.61 and 3.1 mg/kg eq) as propamocarb, and four unidentified regions of radioactivity ranging from 2 to 22% TRR. The largest single region was polar in nature.

Residues in tomato fruit extracts harvested at each interval from the soil and foliar treated plants are shown in Table 14.

Table 14. Residues in mature tomato fruit.

Treatment	Interval (days)	TRR mg/kg eq	Methanol		Unextracted	
			mg/kg eq.	% TRR	mg/kg eq.	% TRR
Soil 1× / 5×	14	1.48 / 8.4	1.0 / 5.35	67.5 / 63.4	0.41 / 3.03	32.5 / 36.1
	21	1.34 / 7.32	0.89 / 4.84	66.3 / 66.1	0.45 / 2.48	33.7 / 33.9
	28	1.39 / 6.17	0.93 / 4.01	67.0 / 65.0	0.46 / 2.16	33.0 / 35.0

Treatment	Interval (days)	TRR mg/kg eq	Methanol		Unextracted	
			mg/kg eq.	% TRR	mg/kg eq.	% TRR
	35	1.23 / 7.17	0.80 / 4.49	65.1 / 62.7	0.43 / 2.68	34.9 / 37.35
Foliar	7	0.09	0.04	46.5	0.01	13.2
	14	0.12	0.10	82.9	0.02	17.1
	21	0.21	0.18	84.4	0.03	15.6
	28	0.27	0.23	85.7	0.04	14.3

HPLC analysis of the methanol and water extracts from the 1× soil treated fruit showed that propamocarb was not present in the sample. The radioactive residue was composed mainly of Unknown 1 and five other unidentified regions, each one with < 0.06 mg/kg eq. (Table 15). Analysis of the corresponding 5× soil treated fruit extracts gave similar results. HPLC analysis of the water and methanol extract from the foliar treated fruit contained mainly propamocarb (0.07mg/kg). The water wash contained mainly propamocarb (0.04 mg/kg) while the methanol extract contained only propamocarb (0.03mg/kg).

Table 15. Distritution of residues in tomatoes extracts.

Sample	Compound	Residue (mg/kg eq.)	% TRR
14 days, 1X soil TRR = 1.48 mg/kg eq.	Propamocarb	Not detected	Not detected
	Unknown 1	1.01	68.4
	Unknown 2 - 6	1.57	10.6
	Unallocated	0.004	0.2
	2M HCL reflux	0.170	11.5
	2M NaOH reflux	0.136	9.2
	Non-extracted	0.002	0.1
7 days, foliar treated fruit TRR = 0.086 mg/kg eq.	Propamocarb	0.065	75.2
	Unknown 1	0.014	16.6
	Unallocated	< 0.001	0.3
	2M HCL reflux	0.003	3.5
	2M NaOH reflux	0.002	2.6
	Non-extracted	0.002	1.8

Total radioactive residues of between 0.32 and 0.39 mg/kg were observed in samples of untreated control fruit, with methanol extraction releasing between 56 and 64% of the residue. When a second sub-sample was extracted 73% appeared in the methanol extract, 15% in the acid extract and the remaining 12% was unextracted. When the methanol extract was analysed by HPLC the radioactivity was present as a single region of polar material. The Unknown 1 observed in treated plants was also observed in control plants when extracts were analysed by HPLC. No explanation was given for the high residue foud in control samples.

The proposed metabolic pathway for propamocarb HCl in crops is presented in Figure 3

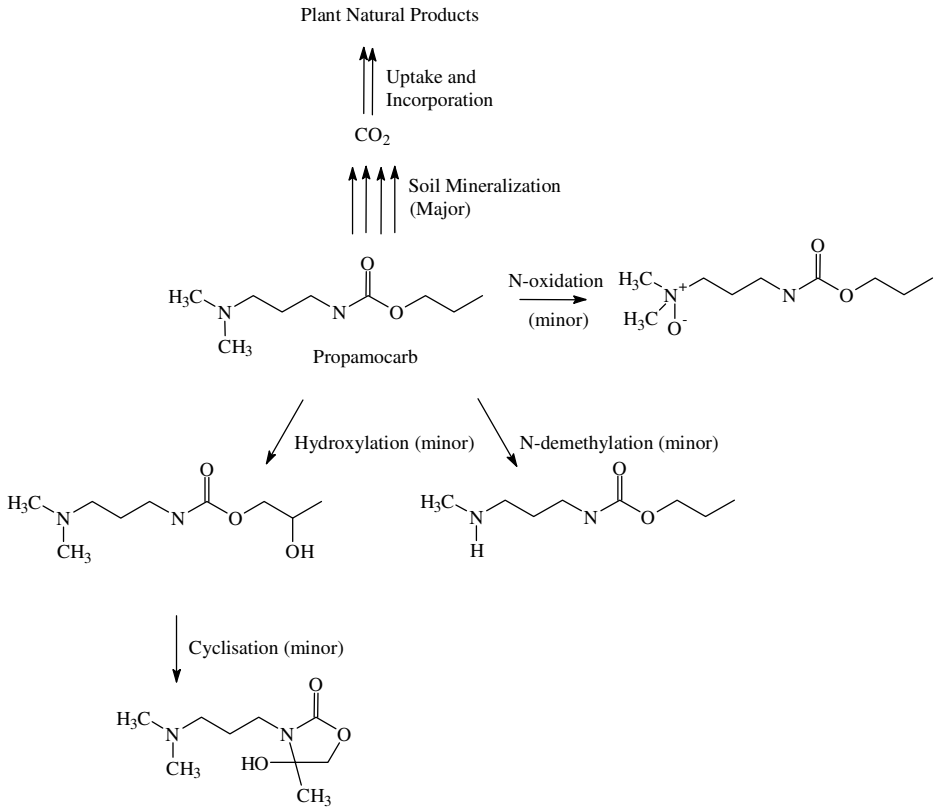


Figure 3. Proposed metabolic pathway for propamocarb hydrochloride in plants.

Rotational crops – confined

In one study conducted in USA under confined conditions, bare soil was treated at 5.96 – 6.16 kg/ha, representing 1.2 times the annual maximum application rate for propamocarb hydrochloride (Meyer, 2000, Report No. B002934). Leafy lettuce, radishes and wheat were planted at 30 days, 120 days and 365 days after treatment. Mature plants and immature wheat were harvested for analysis.

Residues were extracted with acidic methanol at either ambient temperature or by soxhlet and quantified by LSC. Residues remaining in the extracted fibber, as well as total residues in the RACs before extraction, were determined by combustion. Acid and base hydrolysis at elevated temperature was used to release non-extracted residues in the fibber. Methanol extracts and residues released from the fibber were analysed by reverse-phase HPLC and TLC using certified reference standards.

Total residues in the rotational crops, planted into the 30 day aged soil, ranged from 0.36 (radish roots) to 2.33 mg/kg (wheat straw) (Table 16). Total residues were much lower in crops planted in 120 days and 365 days aged soil.

Table 16. Mean Total Radioactive Residue, as mg/kg propamocarb eq.

	Aged treated soil		
Crop	**30 days**	**120 days**	**365 days**
Lettuce	0.79	0.03	0.02
Radish Tops	1.35	0.02	0.02
Radish Roots	0.36	0.03	0.01
Immature Wheat	1.10	0.04	0.04
Wheat Grain	0.66	0.09	0.06
Wheat Straw	2.33	0.08	0.08

Analysis of the extracts at 30 days and also from a wheat sample at 365 days showed a similar profile as in all crops at both time points. Propamocarb was found consistently in all samples and was frequently the major component. The identification of the metabolites is summarized in Table 17. The remaining metabolites identified comprised of 2-hydroxy propamocarb (lettuce and wheat) and the oxazolidine (Met VI) with traces of N-oxide (Met IV) and desmethyl propamocarb (30 days wheat only). The remainding radioactivity was composed of a complex mixture of highly polar components, which eluted at the solvent front on HPLC and at, or close to the origin on TLC.

Residues released after acid and base hydrolysis indicated a similar pattern of metabolites to those in the extracted residues, albeit with generally a higher proportion of the very polar components. Residues which remained unextracted after hydrolysis were less than 10% of the total radioactive residue.

Table 17. Summary of the compounds identified in the extracted residues from crops cultivated on soil treated with propamocarb 30 days befor planting.

	Methanol acidic extract		Propamocarb		Propyl propamocarb N-oxide (Met IV)		Propamocarb oxazolidin-2-one (Met VI)		2-Hydroxy propamocarb		Largest unknown detected	
Crop	mg/kg eq	% TRR	mg/kg eq	% TRR	mg/kg eq	% TRR	mg/kg eq	%	mg/kg eq	%	mg/kg eq	% TRR
Lettuce	0.551	74.6	0.302	40.9	0.045	6.1	0.049	6.6	0.031	4.1	0.029	4.0
Radish tops	1.103	81.7	0.911	67.4	0.042	3.1	0.06	4.4	nd	nd	0.035	2.6
Radish roots	0.24	72.6	0.104	31.5	0.015	4.6	0.018	5.5	0.01	2.9	0.01	3.0
Wheat forage	0.753	68.8	0.496	45.3	0.035	3.2	0.033	3.0	nd	Nd	0.039	3.6
Wheat grain	0.271	41.2	0.009	1.3	0.008	1.2	0.131	19.9	0.038	5.7	0.004	0.6
Wheat straw	1.06	45.3	0.359	15.4	0.131	5.6	0.231	9.9	0.064	2.6	0.021	0.9
Wheat straw[1]	0.014	16.8	nd	nd	--	--	nd	nd	0.002	2.3	0.069	3.0

1. Planted 365 day after soil treatment

A field study was conducted in the USA to determine residues in soil of propamocarb in rotational crops resulting from four applications to bare ground (Singer, 1999; C003451). The rotational crops selected were those anticipated to be grown after potatoes, in line with the typical agricultural cropping practices for each location. Four applications at a nominal rate of 1.68 kg ai/ha of propamocarb were made to bare soil at five-day intervals. Crops were planted 30, 60 or 365 days after the final soil treatment (Table 18).

Table 18. Summary of rotational crop trials.

Trial	Sate	Soil age	Crops planted		
R01-01	NY	30 and 60	Winter wheat		Soybean
R02-01	NC	30 and 60	Winter wheat		Soybean
R02-02	NJ	30 and 60	Winter wheat		Soybean
R03-01	FL	30 and 60	Winter wheat		Soybean
R05-01	WI	365	Spring wheat		Soybean
R05-02	ND	365	Spring wheat	Sugar beet	Soybean
R06-01	TX	30 and 60	Winter wheat	Sugar beet	
R08-01	CO	30 and 60	Winter wheat	Sugar beet	Dry beans
R10-01	CA	30 and 60	Spring wheat	Table beet	Dry beans
R10-02	CA	30 and 60	Winter wheat		Dry beans
R11-01	ID	365	Spring wheat	Sugar beet	Dry beans

Samples of wheat grain, forage, hay and straw, soybean seed, forage and hay, beets root and tops, and dry bean were harvested at typical harvest times. Winter wheat in some instances yielded a forage crop before the winter dormant period, while in other areas it did not yield forage until spring. All

samples from the 30 days plant back soil and all 60 days wheat forage samples were analysed for propamocarb.

Wheat was the only crop grown on 30 days aged soils which contained residues at or above LOQ. Therefore, only wheat samples were analysed for crops grown in the 60 days aged soil.

Wheat forage grown in soils treated 30 days before seeding contained detectable residues ranging from 0.055 to 0.229 mg/kg. The residues in 60 day wheat forage samples were generally below the LOQ of 0.05 mg/kg. In a few cases where detectable residues were found, they were around the LOQ level, i.e., 0.05–0.07 mg/kg. It was therefore decided that it would be unnecessary to analyse the crops grown in soil treated 365 days before seeding.

The 30 day plant back wheat hay samples, from four trials, contained residues in the range of 0.057 to 0.225 mg/kg, while no residue was detected in the other samples. The samples from the corresponding 60 day sites did not contain residues above LOQ.

All wheat straw samples derived from the 30 day and 60 day plant back sites contained residues below the LOQ of 0.05 mg/kg, with the exception of one replicate (0.05 mg/kg) from a 30 day site and one (0.055 mg/kg) from a 60 day plant back site.

ENVIRONMENTAL FATE

Aerobic soil degradation

The route of degradation for [^{14}C]-propamocarb hydrochloride, under aerobic conditions, has been extensively investigated under a range of temperatures, i.e., 10 to 25 °C. Five studies were conducted from 1978 to 1986 in loamy sand soil treated at 200 mg/kg and incubated at 15 or 25 ^{o}C in the dark (Bruhl and Celorio, 1978; Bruhl, 1979; Bruhl and Celorio, 1980a, b; Bruhl and Celorio, 1986). Propamocarb degraded very rapidly to several unidentified products, each having < 3% TRR, with a half life ranging from 10 to 28 days. After 60 days of incubation, about 80% of the radioactivity had been mineralized.

Fent and Hein (2001a, b, c) conducted three soil degradation studies with [^{14}C[-propamocarb HCl. In one study conducted at 20 ^{o}C (C012748), clay loam (Minnesota), loamy silt (Sarotti), loamy sand (Abington) and silty sand (Borstel) soils were incubated for 120 days with 0.48 mg/kg propamocarb, which corresponded to a field rate of 3.61 kg ai/ha. The amount of parent compound at the end of the study varied from < 2% TRR for loamy and silty sand soils to 27.1% TRR in clay loam soil (higher clay and organic matter content, Table 19). The formation of $^{14}CO_2$ increased steadily in all soils, ranging from 22.8% TRR in Minnesota soil to 66.2% TRR in Sarotti soil after 120 days. Up to eight non-identified metabolites were found in the soil extracts, which represented a total < 10% TRR in the course of the experiment. In another study conducted with loamy silt soil (Sarotti) at the same rate as previously, but at 10 ^{o}C incubation temperature (C012749), 79.1% TRR was assigned to propamocarb on Day 0, which decreased to 2.7% TRR on Day 120, with six unidentified metabolites, each one with < 6% TRR. Non-extracted residues ranged from 14.3% TRR at Day 0 to 21.1% TRR at Day 120, when 59.8% TRR was $^{14}CO_2$.

In the third study (C012750), silty sand soil (Borstel) was incubated at a rate 100 times lower than the previous studies (corresponding to 0.00361 kg ai/ha in the field) for 120 days, at 10 ^{o}C with the residue profile investigated at different soil depth layers. At the end of the study, the radioactivity assigned as propamocarb ranged from 25.7% TRR at 20 cm to 58.1% TRR at 90 cm. Up to nine non-identified metabolites were found in the extracts, none at > 6% TRR. DT_{50} and DT_{90} of the studies conducted by Fent and Hein were reported by Kley (2001a, b, and c) and are shown on Table 19.

Table 19. DT_{50} and DT_{90} of various soils treated with propamocarb HCl under aerobic conditions.

Soil	Clay,% (< 2 µm)	Organic carbon,%	Temperature	Rate, kg ai/ha	DT_{50}, days	DT_{90}, days
Clay loam (Minnesota)	32.2	3.15	20°C	3.61	136	452
Loamy silt (Sarotti)	17.7	1.3	20°C	3.61	11.7	38.9
Loamy sand (Abington	6.4	1.86	20°C	3.61	10.9	23.1
Silty sand (Borstel)	4.0	1.04	20°C	3.61	29.7	98.8
Loamy silt (Sarotti)	17.7	1.3	10°C	3.61	25.3	84.2
Silty sand (Borstel) 20 cm	4.0	1.04	10°C	0.00361	73.7	245
Silty sand (Borstel) 40 cm	4.0	1.04	10°C	0.00361	136	452
Silty sand (Borstel) 60 cm	4.0	1.04	10°C	0.00361	239	794
Silty sand (Borstel) 90 cm	4.0	1.04	10°C	0.00361	267	886

Schnöder (2002a/2003) conducted a study with four sandy loam soils and two clay loam soils incubated with 250 or 10 mg/kg [^{14}C]-propamocarb HCl at 20 or 10 °C for 120 or 365 days (soil A) (Table 20). For all soils, the majority of the radioactivity was assigned to propamocarb, decreasing from > 90% TRR at Day 0 to < 1%TRR in soils A, B, C and E, to 2.3% TRR in soil F and to 22.1% TRR in soil D. Soil D had the lowest organic carbon content and biomass amongst all soils used. The major metabolite was a polar unidentified component, with < 8% TRR after 90 days. Half life ranged from 14.1 to 87.7 days. The amount of $^{14}CO_2$ increased to 42.7% TRR after 365 days (soil A) and to 30.7–48.4% after 120 days (soils B-F). Non-extracted radioactivity increase to 31.1% TRR after 365 days in soil A and from 29.4 to 47.4% TRR after 120 days in soils B to F.

Table 20. DT_{50} and DT_{90} of sandy and clay soils treated with propamocarb HCl under aerobic conditions.

Soil	A	E	F	D	B	C
Type	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Clay loam	Clay loam
PH, in 0.01MCaCL$_2$	6.7	6.7	6.7	4.9	6.2	7.3
Organic carbon (%)	2.5	2.5	2.5	1.3	4.5	2.7
Biomass, ugC/g	451.4	451.4	451.4	198.8	620.6	394.9
Rate, mg/kg	250	250	10	250	250	250
Temperature, °C	20	10	20	20	20	20
DT_{50} (days)	22.4	47.2	14.1	87.7	23.4	17.8
DT_{90} (days)	74.3	156.9	46.8	291.5	77.6	59.0

The metabolism of propamocarb HCl by soil micro-organisms was tested in sterilized and non-sterilized German standard soil 2.2 (Iwan, 1979: A85480; Iwan, 1980: A85481). After 14 days of incubation, recoverable propamocarb contents of sterilized samples remained constant (approximetaely 60% of applied material) the initial decrease being due to adsorption. In microbially active soil, extensive mineralization occurred following a lag-phase of 7 days. Degradation of propamocarb under these conditions was described by zero-order kinetics with a half-life of about 18 days. A mixed culture of bacteria and fungi capable of degrading the pesticide was identified. Intermediate metabolic products did not accumulate in any of the samples investigated.

Anaerobic soil degradation

Two studies were conducted to investigate the degradation of ^{14}C-propamocarb hydrochloride under anaerobic conditions. In one study conducted by Bruhl in 1979 (A85478), a loamy sand soil treated at a rate of 200 mg/kg and kept at 25 °C, propamocarb degraded very slowly, with a half life of 459 days. Three unidentified degradation products were detected at levels < 2.5% TRR. In the second study, a sandy loam soil flooded with water up to 3 cm above the surface was kept in the dark in a chamber at 20°C and purged continuously with nitrogen (Schneider, 2002b). After > 30 days, the system was treated with propamocarb HCl and kept under anaerobic conditions for 365 days (A) or

120 days (B). Total soil and water samples were sampled during the period of the study. Propamocarb rapidly dissipated from the water phase into the soils, leading to increases in radioactivity extracted from the soil. Propamocarb extracted from the soil decreased during the experiment with a consequent increase of the radioactivity in non-extracted residues. The major degradation product detected reached a maximum of 6.6% TRR in the system after 365 days. The half life for propamocarb in the system is shown in Table 21.

Table 21. DT_{50} and DT_{90} of flooded sandy loam treated soil under anaerobic conditions.

	Group A: 250 mg/kg		Group B: 10 mg/kg	
	DT_{50}	DT_{90}	DT_{50}	DT_{90}
Total system	308.2	1024	65.7	218.2
Water phase[a]	72.9/14.7	242.0/318.9	10.7/7.0	35.1/53.1

a. values correspond to 1-phase/2-phase models

Photolysis on soil surfaces

In one study conducted by Tschampel (1990/1994), [^{14}C]-propamocarb HCl was sprayed on to metal plates covered with a loamy sand soil at a concentration corresponding to typical agricultural use. The plates were irradiated with filtered light simulating natural sunlight. The estimated DT_{50} value under irradiated conditions was 35.4 days and over 97% TRR was recovered from the dark controls after 30 days. No degradation products exceed 10% TRR.

Field dissipation

Field dissipation studies (Willard, 2002, AA010716) were conducted in the USA, California (sandy loam) and Georgia (loamy sandy). A SL formulation of propamocarb hydrochloride was applied 4 times to soils, with 7 day intervals, at an application rate of 9.35 kg ai/ha. In each trial there was a treated plot covered in turf grass and a bare soil plot. In the turf grass plots, grass, thatch (0–7.5 cm deep) and turf soil (> 7.5 cm deep) samples were collected. In the bare soil plots, samples were collected up to 56 cm deep. Samples were collected from 1 day before treatment to 4 months after treatment. No residues (< 0.002 mg/kg) were detected at any time in samples > 15 cm deep collected from the bare soil from the Georgia loamy sand and > 30 cm deep from the bare soil from the California sandy loam. DT_{50} and DT_{90} from this study are shown on Table 22.

Table 22. Results from field dissipation studies conducted in USA.

Sample	DT_{50} (days)	DT_{90} (days)
Loamy sand	17.6	58.6
Sandy loam	22.1	73.3
Loamy sand thatch	17.4	57.7
Sandy loam thatch	23.7	78.6
Grass	13.2	43.9
Grass	18.1	60.1

RESIDUE ANALYTICAL METHODS

The residue methods used for plant, animal tissues and soil are based on either the analysis of propamocarb (free base) or propamocarb hydrochloride, depending on the internal standard used and the preparation of the standard solutions (calculated for the molecular weight of propamocarb or propamocarb hydrochloride). The methods involve a solvent extraction step (mostly diluted acetic

acid) followed by different matrix dependant clean up steps. The final determination is carried out by HPLC/MS/MS, GC/N-FID or GC/MSD.

Plant matrices

An enforcement method was validated for the determination of residues of propamocarb hydrochloride in various crops by LC-MS/MS (Diot and Rosati, 2005). For all sample materials, propamocarb hydrochloride was extracted with a mixture of water/acetic acid (99/1). For cauliflower, two extractions were necessary and avocado extracts were de-fatted with n-hexane. After centrifugation and dilution of the final extract, the residues are quantified by HPLC/MS with electrospray ionisation. The quantification was done by an external standardisation in solvent or using matrix matched standards. The LOQ was set at 0.01 mg/kg for propamocarb hydrochloride in all the sample materials. Mean recovery values and relative standard deviations at each fortification level are presented in Table 23.

Table 23. Recovery of propamocarb HCl from plant materials (n=5).

Crop	Level [mg/kg]	Mean [%]	RSD [%]
Lettuce head	0.01	79	13
	0.10	89	4
Chicory Witloof root	0.01	82	7
Chicory Witloof leaf	0.10	84	8
Pepper	0.01	73	4
	0.10	90	3
Potato	0.01	77	2
	0.10	98	3
Spinach	0.01	97	2
	0.10	97	1
Leek*	0.01	92	8
	0.10	77	7
Onion*	0.01	87	7
	0.10	93	13
Cabbage	0.01	75	18
	0.10	87	2
Cauliflower	0.01	73	10
	0.10	73	6
Brussels sprout	0.01	79	4
	0.10	73	4
Broccoli	0.01	88	7
	0.10	79	7
Cucumber	0.01	102	16
	0.10	89	4
Avocado*	0.01	73	4
	0.10	74	9
Wheat grain	0.01	86	8
	0.10	80	5

*recovery rates obtained using matrix matched standards

In another method, propamocarb (free base) was extracted with dilute acetic acid, the extract clean-up by C18 solid-phase-extraction (SPE) and propamocarb eluted with acetonitrile/water/acetic acid (Mende, 2001). Final determination was performed by HPLC-MS/MS, with quantification at m/z 102 and/or 144 (daughter ions). No peaks interfering with propamocarb were detectable (< 0.003 mg/kg) in control samples of all matrices. The limits of quantification for propamocarb were established at 0.01 mg/kg. Mean recovery values and relative standard deviations at each fortification level are presented in Table 24.

Table 24. Recovery of propamocarb (free base) from plants.

Matrix	Fortification level [mg/kg]	Mean recovery [%]	RSD [%]	n
Cabbage head	0.01	82	14	5
	0.1	91	19	5
	1.0	106	13	3
Cabbage plant	0.01	100	4	4
	0.1	97	10	5
	1.0	94	16	3
	100	91	--	1
Cauliflower head	0.01	81	16	9
	0.1	97	10	4
	1.0	106	--	1
Cauliflower plant	0.01	102	8	3
	0.1	91	20	4
	1.0	109	--	1
	100	82	--	1
Cucumber fruit	0.01	98	4	3
	0.1	94	7	7
	1.0	93	1	7
	2.0	108	3	2
	100	82	--	1
Head lettuce	0.01	88	12	3
	0.1	91	5	5
	1.0	87	12	5
	3.0	93	8	2
	10	80	--	1
	30	87	5	2
	50	97	--	1
	100	86	--	1
Melon pulp	0.01	88	8	3
	0.1	92	9	3
	2.0	102	2	3
	10	91	--	1
Melon peel	0.01	105	10	3
	0.1	97	3	4
	10	101	--	1
Melon fruit	0.01	94	4	4
	0.1	94	15	6
	1.0	95	7	4
	10	94	6	3
Sweet pepper fruit	0.01	83	19	13
	0.1	91	16	7
	1.0	95	4	5
Tomato fruit	0.01	82	12	6
	0.1	89	7	6
	1.0	89	2	3

The previous analytical method was validated by independent laboratories for the analysis of propamocarb (free base) in potato tubers and potato products (Class, 2002a and b), lettuce and tomato (Wrede, 2001). The results from both studies are shown in Table 25.

Table 25. Recovery of propamocarb (free base) from plant materials.

Matrix	Fortification Level [mg/kg]	Mean Recovery [%]	RSD [%]	n
Potato	0.01	97	5	3
	0.10	109	0	2
Puree	0.01	78	11	3
	0.10	103	4	3

Matrix	Fortification Level [mg/kg]	Mean Recovery [%]	RSD [%]	n
Fries	0.01	82	32	4
	0.10	91	5	3
Crisp	0.01	99	9	4
	0.10	140	29	3
Flakes	0.01	79	17	3
	0.10	92	12	3
Lettuce	0.01	67	14	5
	0.1	74	11	10
	30	101	4	5
Tomato	0.01	86	3	5
	0.1	77	10	10
Lettuce*	0.01	84	14	5
	0.1	95	10	5
	30	110	4	5
Tomato*	0.01	115	3	5
	0.1	102	10	10

* Matrix matched standards

A GC method was validated for propamocarb hydrochloride in different vegetables matrices after acidified methanol extraction followed by different clean-up steps of the extract (Wrede, 1988). The extract was basified with sodium hydroxide solution, extracted with chloroform and re-extracted with acidic water solution and further with di-isopropryl ether. The free base formed by alkaline hydrolysis was quantitatively determined by GC/N-FID. The method was validated at fortification levels of 0.1–10 mg/kg (Table 26). The same method was validated in another study (Scheuermann, 1983), with the results shown also in Table 26.

Table 26. Recovery of Propamocarb hydrochloride from plant materials (GC/N-FID).

Matrix	Fortification level [mg/kg]	Mean recovery [%]	RSD [%]	n
Cabbage	0.1	71	5	3
Lettuce	0.1	91	1	3
	0.2	105	4	3
	0.5	105	2	3
	1	98	8	3
	5	103	8	6
	10	108	10	3
Potato	0.1	82	3	2
	1.0	117	4	3
Pepper	0.1	82	2	3
	10	107	5	3
Radish	0.1	97	10	2
	1.0	110	3	2
Lettuce	0.1	120	17	7
	0.5	83	--	2
	1	91	5	4
	5	74	--	2
Cucumber	0.2	73	8	3
	1	71	6	6
	5	91	3	5
Spinach	0.5	106	--	2
	2	112	--	2
	20	65	--	2
Tomato	0.2	66	6	5
	1	63	--	2
Radish, Small radish	0.2	83	10	4
	0.5	124	21	4
	10	79	14	4

Matrix	Fortification level [mg/kg]	Mean recovery [%]	RSD [%]	n
Brussels sprouts	0.05	106	18	2
	0.2	63	10	5
	0.5	70	--	2
Cornsalad	0.2	100	--	2
	0.5	93	--	2
	1	99	--	2
	10	77	--	2
	50	91	--	2
	200	80	--	2
Celery	0.5	81	12	4
	1	63	--	2
Red beet roots	0.2	73	--	1
	0.5	76	--	1

This GC method was optimized for the analysis of propamocarb hydrochloride in potato samples (Wrede-Rücker, 1991) and various other crops (Chambers *et al.,* 1997), with the free base quantitatively determined by GC/MSD. For validation of the method, recovery experiments were performed at fortification levels from 0.05 mg/kg (LOQ) to 2.0 mg/kg (Table 27). Calibration curves of 2nd order were applicable over the tested range of 0.1 to 2.5µg/mL. No apparent residue (< 0.3 × LOQ) were detected in the control samples (Chambers *et al.*, 1997).

Table 27. Recovery of Propamocarb hydrochloride from plant samples.

Matrix	Fortification level [mg/kg]	Mean recovery [%]	RSD [%]	n
Potato	0.10	83	19	16
Leek	0.05	91	0	2
	0.10	98	7	3
	0.50	89	18	3
	1.0	83	5	3
Onion	0.05	86	5	3
	0.10	87	10	3
	0.50	87	9	4
Brassicae	0.05	89	6	8
	0.50	91	2	8
Tomato	0.05	78	3	2
	0.10	78	3	4
	0.50	83	3	2
Potato	0.05	83	2	2
	0.50	109	--	1
Melon	0.05	99	6	2
	0.10	91	7	4
	0.20	85	15	5
	0.50	86	4	4
	2.0	72	--	1

Animal matrices

Residues of propamocarb were extracted from animal products with 1.0% HCL in methanol and analyzed by HPLC-MS/MS (Leonard and Oden, 2001). Recovery experiments were performed at fortification levels of 0.01 mg/kg (LOQ) and 0.10 mg/kg. A linear calibration function was applicable over the tested range of 0.02 to 0.10 ng/mL. No peaks interfering with propamocarb were detectable (< 0.003 mg/kg) in the samples. This method was independently validated by another laboratory in milk, meat and eggs (Perez and Perez, 2001). Mean recovery values and relative standard deviations at each fortification level found in both studies are presented in Table 28.

Table 28. Recovery of propamocarb (free base) from animal tissues, milk and egg (n=5).

Matrix	Fortification level [mg/kg]	Mean recovery [%]	RSD [%]
Beef Muscle	0.01	85.5	11.4
	0.10	92.0	3.9
Beef Liver	0.01	86.8	7.4
	0.10	88.3	5.6
Beef Kidney	0.01	87.4	3.8
	0.10	90.0	3.7
Beef Milk	0.01	82.6	3.3
	0.10	91.4	3.0
Chicken Eggs	0.01	100	6.4
	0.10	101	4.1
Milk	0.01	101	8.4
	0.10	88.1	6.2
Meat	0.01	94.3	4.6
	0.10	107	3.5
Egg	0.01	83.7	9.5
	0.10	97.8	15.1

Soil

Residues of propamocarb hydrochloride are extracted from soil using HCL or acidified methanol, followed by different clean-up steps with chloroform and di-isopropyl ether and the free base formed by alkaline hydrolysis is quantitatively determined by GC/N-FID or GC/MSD (Scheuermann, 1983; Moede, 1991; Wrede, 2001). The extraction/clean-up procedure is similar to the one described previoulsly for plants (Wrede, 1988).

For method validation, recovery experiments were performed at fortification levels of 0.026 mg/kg (LOQ) to 50 mg/kg. The results are shown on Table 29.

Table 29. Recovery of Propamocarb hydrochloride from soil.

Reference	Fortification level [mg/kg]	Mean recovery [%]	RSD [%]	n
Scheuermann, 1983	1.0	94	--	2
	50	89	--	2
Moede, 1991	0.026	88	7	3
	0.05	89	8	3
	0.1	76	1	3
	1.0	88	5	3
Wrede, 2001	0.026	88	7	3
	0.05	99	8	11
	0.1	83	14	9
	1.0	79	16	6
Wrede, 2001	0.1	81	7	5
	0.1	50	10	5
	1.0	57	20	16

In another method (Mende, 2002), residues of propamocarb (free base) were extracted from soil using hydrochloric acid, followed by a clean-up of the extract on a C18 column. The final extract is basified with ammonia solution and the free base of propamocarb is quantitatively determined by LC-MS/MS (ratio of m/z = 102 to m/z =144). A linear calibration function was applicable over the tested range of 3 to 800 ng/mL. No peaks interfering with propamocarb were detected (< 0.003 mg/kg) in control samples. The LOQ for propamocarb were established at 0.02 mg/kg in soil (mean recovery of 89%, RSD of 8%; n=5). At 0.20 mg/kg, mean recovery and RSD were 102 and 5%, respectively (n=5). Mean recovery at 0.002 mg/kg was 54%.

Stability of residues in stored analytical samples

The stability of propamocarb HCl under freeze conditions (-18 to -20 °C) was investigated in tomato and lettuce samples stored for up to 26 months. A range of 59 to 106% of the added residues remained after the storage period (Table 30).

Table 30. Stability of propamocarb HCl residues under frozen conditions.

Crop	Fortification level, mg/kg	Storage period, months	% remained	Reference
Tomato	0.5	14.5	82, 83, 98	Moede, 1990; A85300
	5.0	14.5	59, 75, 67	
	0.5*	4	90, 98, 106	Sutton and Charter, 1999 C003740
		8	80, 78, 106	
		17	78, 88, 82	
		26	90, 88, 86	
Lettuce	0.5	14	109, 115	Wrede-Rücker, 1990; A85303
	5.0	14	100, 87.8	

* as free base

USE PATTERN

Formulations containing Propamocarb hydrochloride, alone or co-formulated with other active substances, are registered for use on a wide variety of crops in over 100 countries. Registrations cover foliar treatment of vegetable crops and potatoes, soil drench, application via drip irrigation to vegetables and ornamentals and as seed treatments. Registered uses of propamocarb hydrochloride in crops and countries which were relevant to this evaluation are shown on Table 31. All the labels were provided to the Meeting.

Table 31. Registered uses of propamocarb hydrochloride.

Crop	Country	F/G	Formulation Content ai	Application				PHI days
				Method	ai kg/ha	water L/ha	Max. No.	
Cabbage (brassica)	Belgium	G	SL 722 g/L	Seedbed Drench	36.1	10000	2	n.a.
Cabbage (brassica)	Spain	G	SL 530 g/L	Seedbed drench	15.9	10000-20000	2	14
Cabbage, head	Germany	F	SL 722 g/L	Foliar spray	1.08	400-600	2	21
Cabbage, head	Greece	G	SL 722 g/L	Seedbed drench	36.1	20000-40000	2	n.a.
Cabbage, head	Greece	F/G	SL 722 g/L	Soil drench	21.6	20000-40000	3	21
Cabbage, head	Italy	F/G	SL 722 g/L	Seedbed Incorporation	57.8-86.6	40000-80000	2	20
Cabbage, head	Italy	F/G	SL 722 g/L	Foliar spray	1.08-2.17	1500-2000	3	20
Cabbage, head	Italy	G	SL 530 g/L	Seedbed drench	16	20000-40000	2	20
Cabbage, head	Netherlands	F/G	SL 722 g/L	Seedbed drench	3.61	1000	2	14
Cabbage, head	Netherlands	F/G	SL 722 g/L	Foliar spray	2.2-3.6	500	2	14
Cabbage, head	UK	G	SL 722 g/L	Drench preplanting	72.2	20000-40000	1	n.a.
Cabbage, head	UK	G	SL 722 g/L	Drench postplanting	72.2	20000-40000	1	n.a.
Cauliflower	Belgium	F	SL 722 g/L	Foliar spray	2.17	500-1000	2	n.a.
Cauliflower	Germany	F	SL 722 g/L	Foliar spray	1.08	400-600	2	21
Cauliflower	Greece	G	SL 722 g/L	Seedbed drench	36.1	20000-40000	2	n.a.

Crop	Country	F/G	Formulation Content ai	Application				PHI days
				Method	ai kg/ha	water L/ha	Max. No.	
Cauliflower	Greece	F/G	SL 722 g/L	Soil Drench	21.6	20000-40000	3	21
Cauliflower	Italy	G	SL 530 g/L	Seedbed drench	31.8	20000-40000	1	20
Cauliflower	Italy	F/G	SL 722 g/L	Foliar spray	1.08-2.17	1500-2000	3	20
Cauliflower	Italy	G	SL 530 g/L	Seedbed drench	15.9	20000-40000	2	20
Cauliflower	Luxembourg	F	SL 722 g/L	Foliar spray	2.17	500	2	n.a.
Cauliflower	Netherlands	G	SL 722 g/L	Seedbed drench	3.61	1000	2	14
Cauliflower	Netherlands	F/G	SL 722 g/L	Foliar spray	2.2-3.6	500	2	14
Cauliflower	UK	F/G	SL 722 g/L	Drench preplanting	72.2	20000-40000	1	n.a.
Cauliflower	UK	F/G	SL 722 g/L	Drench postplanting	72.2	20000-40000	1	n.a.
Cauliflower	UK	F/G	SL 722 g/L	Seedbed Foliar spray	3.61	1000	2	14
Cauliflower	UK	F	SL 722 g/L	Foliar spray	1.81	1000	2	21
Chicory	Belgium	*	SL 722 g/L	Hydroponic forcing irrigation	9 g/hL	-	-	n.a.
Chicory Witloof	Cyprus	F	SL 722 g/L	Foliar spray	0.722 kg ai/hL		3	20
Chicory Witloof	France	*	SL 722 g/L	Watering roots after planting	72.2	30000-50000	1	21
Chicory Witloof	France	*	SL 722 g/L	Irrigation via nutrient solution	9 g/hL	-	1	21
Chicory Witloof	Greece	*	SL 722 g/L	Seedbed drenching	0.18 kg ai/hl	20000-40000	2	-
Chicory Witloof	Greece	F/G	SL 722 g/	Soil drench post planting	0.11 kg ai/hl	200-300 ml/plant	3	21
Chicory	Luxembourg	*	SL 722 g/L	Hydroponic forcing irrigation	9 g/hL	-	-	n.a.
Chicory	Luxembourg	F	SL 722 g/L	Foliar spray	1.1	500-1000	3	21
Chicory Witloof	Malta	*	SL 722 g/L	Spray roots after planting	57.8 86.6	40000 60000	1	14
Cucumber	Belgium	G	SL 722 g/L	Seedbed drench	36.1	50000	1	n.a.
Cucumber	Belgium	F/G	SL 722 g/L	Drip appl.	1.1 0.07-0.11 g/plant	-	4	n.a.
Cucumber	Bulgaria	F	SL 722 g/L	Foliar spray	1.81	-	5	14
Cucumber	France	F/G	SL 722 g/L	Foliar spray	2.17	200-1000	1	3
Cucumber	France	F/G	SC 375 g/L	Foliar spray	1.13	200-800	6	3
Cucumber	Germany	G	SL 722 g/L	Seedbed drench	65.0	60000	2	n.a.
Cucumber	Germany	F	SL 722 g/L	Foliar spray	2.2	600	4	4
Cucumber	Greece	*	SL 722 g/L	Seedbed drench	0.18 kg ai/hl	20000-40000	2	n.a.
Cucumber	Greece		SL 722 g/L	Soil drench	0.11 kg ai/hl	200-300 ml/plant	3	21
Cucumber	Greece	F/G	SL 722 g/L	Foliar spray	0.72-5.42	500-2500	3	3
Cucumber	Greece	F/G	SC 248 g/L	Foliar spray	1.44-3.61	500-1000	3	3
Cucumber	Italy	F	SC 375 g/L	Foliar spray	0.94-1.13	1000	3	20
Cucumber	Italy	G	SL 722 g/L	Seed treatment	7.2-28.9 mg/kg seed	-	1	n.a.
Cucumber	Italy	F/G	SL 722 g/L	Soil incorporation before drilling	300 ml/m³	20 l/m³	1	20
Cucumber	Italy	F/G	SL 722 g/L	Seedbed incorporation after drilling	57.8-86.6	40000 - 80000	2	20

Crop	Country	F/G	Formulation Content ai	Application				PHI days
				Method	ai kg/ha	water L/ha	Max. No.	
Cucumber	Italy	F/G	SL 722 g/L	Soil treatment pre- and transplanting via spraying	57.8-86.6	30000-50000	1	20
Cucumber	Italy	F/G	SL 722 g/L	Soil treatment post planting via spraying	0.14 kg ai/hl	0.1-0.2 l/plant	4	20
Cucumber	Italy	F/G	SL 722 g/L	Foliar spray	1.1-2.2	1500-2000	3	20
Cucumber	Italy	G	SL 530 g/L	Seedbed drench	31.8 or 15.9	20000-40000	1 2	20
Cucumber	Italy	F/G	SL 530 g/L	Soil treatment with dripping	1.1-1.6	20000	2	20
Cucumber	Japan	F/G	640 g/kg	Soil drench	4.8	30000	3	21
Cucumber	Luxembourg	G	SL 722 g/L	Seedbed drench	36.1	50000	1	n.a.
Cucumber	Luxembourg	F/G	SL 722 g/L	Plant drench	1.01	1400	2	n.a.
Cucumber	Netherlands	G	SL 722 g/L	Seedbed drenching	36.10	50000	3	n.a.
Cucumber	Netherlands	G	SL 722 g/L	Drench postplanting	1.01	100-150 ml/plant	2	n.a
Cucumber	Netherlands	G	SL 722 g/L	Drip application	0.72-1.44	20000	3	3
Cucumber	Poland	G	SL 530 g/L	Drench	10.6-23.9	20000-30000	2	3
Cucumber	Spain	G	SL 722 g/L	Seedbed treatment	14.4 – 21.7 kg ai./hl	80000-100000	1	-
Cucumber	Spain	F/G	SL 722 g/L	Soil drench (preventive)	0.18 – 0.36 kg ai/hl	20000-30000	1	-
Cucumber	Spain	F/G	SL 722 g/L	Drench to plant root	0.11 kg ai/hl	100ml/plant	1	-
Cucumber	Spain	F/G	SL 722 g/L	Dripping Treatment	1.44-2.17	1500-2000	1	3
Cucumber	Spain	F/G	SL 722 g/L	Foliar spray	0.144 – 0.22 kg ai/hl	300-1500	2	3
Cucumber	Spain	G	SL 530 g/L	Seedbed treatment	15.9	10000-20000	2	3
Cucumber	Spain	F/G	SL 530 g/L	Drip irrigation (preventive)	0.53	3000-15000	2	3
Cucumber	Spain	F/G	SL 530 g/L	Drip irrigation (curative)	1.1-1.6	20000	2	3
Cucumber	Sweden	G	SL 722 g/L	Seedbed drench	1.5-3.03	1400-2800	1	21
Cucumber	UK	F/G	SL 722 g/L	Drench at planting	72.2	20000-40000	4	3
Cucumber	UK	F/G	SL 722 g/L	Compost incorporation	2166-2888	200000-1000000	4	3
Cucumber	UK	F/G	SL 722 g/L	Trickle Irrigation	0.072 kg ai/hl	0.1-0.2 l /plant	4	3
Cucumber	UK	F/G	SL 722 g/L	Rockwood trickle Irrigation	0.009 kg ai/hl	0.1-0.2 l /plant	4	3
Cucumber	UK	F/G	SL 722 g/L	Drench postplanting	72.2	20000-40000	2	3
Cucumber	UK	F/G	SL 722 g/L	Foliar spray	1.81	1000	3	3
Cucumber (cucurbits)	USA	F	SL 722 g/L	Foliar or drip irrigation	1.0 kg ai/ha	140-935	5	2
Ginger	Japan	F	640 g/kg	Soil drench	3.21-4.8	30000	5	30
Lettuce	Belgium	F	SL 722 g/L	Foliar spray	1.08	500-1000	3	21
Lettuce	Germany	F	SL 722 g/L	Foliar spray	1.08	1000	3	21
Lettuce	Greece	G	SL 722 g/L	Seedbed Drench	1.8 g/L	2-4l/m^2	2	n.a.
Lettuce	Greece	F/G	SL 722 g/L	Soil drench postplanting	1.08 g/L	0.2-0.3l/plant	3	21

Crop	Country	F/G	Formulation Content ai	Application				PHI days
				Method	ai kg/ha	water L/ha	Max. No.	
Lettuce	Italy	G	SL530 g/L	Seedbed	16	20000-40000	2	20
Lettuce	Italy	F/G	SL 530 g/L	Foliar spray	1.1-1.6	400-1000	2	14
Lettuce	Japan	F/G	640 g/kg	Foliar spray	0.384	3000	3	14
Lettuce	Netherlands	F/G	SL 722 g/L	Seedbed drench	36.1	500-1000	2	n.a.
Lettuce	Netherlands	F/G	SL 722 g/L	Foliar spray	1.1	1000	2	21
Lettuce	Spain	-	SL 530 g/L	Seedbed treatment	16	10000-20000	2	14
Lettuce	Spain	F	SL 530 g/L	Foliar spray	1.06-1.33	300-800	2	14
Lettuce	UK	F/G	SL 722 g/L	Foliar spray	1.1-1.4	600-1500	3	21
Lettuce	USA	F	SL 722g/L	Foliar spray or Drip irrigation	1.68	GA:140-935 Aerial: 95	4	2
Melon	Belgium	G	SL 722 g/L	Seedbed drench	36.1	50000	1	n.a.
Melon	Belgium	G	SL 722 g/L	Drip appl. (preventive)	1.01	1400	2	n.a.
Melon	Belgium	G	SL 722 g/L	Drip appl. (curative)	1.0-2.0	1400-2800	2	n.a.
Melon	France	F/G	SL 722 g/L	Foliar spray	2.17	200-1000	1	3
Melon	France	F/G	SC 375 g/L	Foliar spray	1.13	200-800	6	3
Melon	Germany	F	SL 722 g/L	Foliar spray	2.17	400-600	4	4
Melon	Greece	G	SL 722 g/L	Seedbed drench	36.1-72.2	20000-40000	2	n.a.
Melon	Greece	F/G	SL 722 g/L	Soil drench	0.18 kg ai/hl	0.2-0.3 ml/plant	3	21
Melon	Italy	F/G	SC 375 g/L	Foliar spray	0.94-1.13	1000	3	20
Melon	Italy	F/G	SL 722 g/L	Seedbed incorporation	57.8-86.6	40000-80000	2	20
Melon	Italy	F/G	SL 722 g/L	Soil spraying Pre and transplanting	57.8-86.6	300000-580000	1	20
Melon	Italy	F/G	SL 722 g/L	Soil post planting	0.14 kg ai/hl	0.1-0.2l/plant	4	20
Melon	Italy	F/G	SL 722 g/L	Foliar	1.1-2.2	1500-2000	2	20
Melon	Italy	G	SL 530 g/L	Seedbed disinfection	31.8 or 15.9	20000-40000	1 2	20
Melon	Italy	G	SL 530 g/L	Drip irrigation	1.06-1.59	20000	2	20
Melon	Netherlands	G	SL 722 g/L	Drench preplanting	36.1	50000	3	3
Melon	Netherlands	G	SL 722 g/L	Drench postplanting	1.01	1400	2	3
Melon	Netherlands	G	SL 722 g/L	Drip Irrigation	0.72-1.44	300-600	3	1
Melon	Spain	G	SL 530 g/L	Seedbed treatment	15.9	20000	2	14
Melon	Spain	F/G	SL 530 g/L	Drip irrigation (preventive)	0.53	3000-15000	2	14
Melon	Spain	F/G	SL 530 g/L	Drip irrigation (curative)	1.06-1.59	20000	2	14
Onion	Poland	F	SC 375 g/L	Foliar spray	0.94	700	5	7
Onion	Sweden	F	SC 248 g/L	Foliar spray	0.5 / 1	150-300	8 / 4	30
Onion	UK	F	SL 722 g/L	Drench preplanting	72.2	20000-40000	1	133
Onion	UK	F	SL 722 g/L	Foliar spray	1.8-3.6	500	2	133
Onion	UK	F	SL 722 g/L	Seed treatment	21.7g/kg seed	-	1	n.a.
Onion	UK	F	SL 722 g/L	Bulb dipping preplanting	2.2 g/L	-	1	n.a.
Peppers	Greece	G	SL 722 g/L	Seedbed drench	1.8 kg ai/hl	20000-40000	2	21

Crop	Country	F/G	Formulation Content ai	Application				PHI days
				Method	ai kg/ha	water L/ha	Max. No.	
Peppers	Greece	F/G	SL 722 g/L	Soil drench	1.1 kg ai/hl	0.2-0.3 l/plant	3	21
Peppers	Italy	G	SL 530 g/L	Seedbed drench	31.8 or 15.9	20000-40000	1 2	20
Peppers	Italy	F/G	SL 530 g/L	Soil treatment with dripping	1.1-1.6	20000	2	20
Peppers	Italy	F/G	SL 722 g/L	Seedbed incorporation	57.8-86.6	40000-80000	2	20
Peppers	Italy	F/G	SL 722 g/L	Soil spraying Pre and transplanting	57.8-86.6	300000-580000	1	20
Peppers	Italy	F/G	SL 722 g/L	Soil treatment post planting	0.14 kg ai/hl	0.1-0.2l/plant	4	20
Peppers	Italy	F/G	SL 722 g/L	Foliar	1.1-2.2	1500-2000	2	
Peppers	USA	F	SL 722 g/L	Foliar Spray or drip irrigation	1.0	GA-average 400 Aerial 47	-	5
Potato	France	F	SC 375 g/L	Foliar spray	1.01	-	-	21
Potato	Germany	F	SC 248 g/L	Foliar spray	0.99	400-600	6	7
Potato	UK	F	SC 375 g/L	Foliar spray	0.56-0.94	200-400	6	7
Potato	USA	F	SL 66.5%	Foliar spray	0.59-1.01	400	8–5	14
Radish	Germany	F/G	SL 722 g/L	Seed treatment	7.22 g/kg seed	-	1	14
Radish	Germany	F/G	SL 722 g/L	Foliar spray	0.72	1000	2	14
Radish	Netherlands	F/G	SL 722 g/L	Foliar spray	1.08	500	2	14
Spinach	Italy	F/G	SL 722 g/L	Seed treatment	0.722-28.9 g/kg seed	-	1	n.a.
Spinach	Italy	G	SL 722 g/L	Seedbed Incorporation	57.8-86.6	40000-80000	2	20
Spinach	Italy	F/G	SL 722 g/L	Foliar spray	1.1-2.2	1500-2000	3	20
Summer squash (cucurbits)	USA	F	SL 66.5%	Foliar spray or drip irrigation	1.0	GA average=400 Aerial 47	5	2
Sweet pepper	Belgium	G	SL 722 g/L	Seedbed drench	36.1	-	1	n.a.
Sweet pepper	Belgium	F/G	SL 722 g/L	Drip appl.	1.1 0.07-0.11 g/plant	-	4	n.a.
Sweet pepper	Netherlands	G	SL 722 g/L	Seedbed drenching	36.1	50000	3	n.a.
Sweet pepper	Netherlands	G	SL 722 g/L	Drench postplanting	1.01	100-150 ml/plant	2	n.a
Sweet pepper	Netherlands	G	SL 722 g/L	Drip application	0.72-1.44	20000	3	3
Sweet pepper	Spain	F/G	SL 722 g/L	Seedbed drench	1200-1800	80000-10000	1	14
Sweet pepper	Spain	F/G	SL 722 g/L	Soil drench (preventive)	36.1-72.2	20000-30000	1	14
Sweet pepper	Spain	F/G	SL 722 g/L	Soil drench to plant root	3.8	3500	1	14
Sweet pepper	Spain	F/G	SL 722 g/L	Dripping treatment	1.44-2.17	1500-2000	1	14
Sweet pepper	Spain	G	SL 530 g/L	Seedbed treatment	15.9	20000	2	3
Sweet pepper	Spain	F/G	SL 530 g/L	Soil drip irrigation (preventive)	0.53	3000-15000	2	3
Sweet pepper	Spain	F/G	SL 530 g/L	Soil drip irrigation (curative)	1.01-1.6	20000	2	3
Sweet pepper	UK	F/G	SL 722 g/L	Foliar spray	2.2-3.6	600-1000	2	14
Tomato	Belgium	G	SL 722 g/L	Seedbed drench	36.1	50000	1	n.a.
Tomato	Belgium	F/G	SL 722 g/L	Drip appl.	1.1 0.07-0.11 g/plant	-	4	n.a.

Crop	Country	F/G	Formulation Content ai	Application				PHI days
				Method	ai kg/ha	water L/ha	Max. No.	
Tomato	Germany	G	SL 722 g/L	Watering before and after planting	65.0	60000	2	n.a.
Tomato	Greece	G	SL 722 g/L	Seedbed drench	1.8 kg ai/hl	20000-40000	2	21
Tomato	Greece	F/G	SL 722 g/L	Soil drench	1.1 kg ai/hl	0.2-0.3 l/plant	3	21
Tomato	Italy	G	SC 375 g/L	Foliar spray	0.94-1.13	1000	5	20
Tomato	Italy	F	SC 375 g/L	Foliar spray	0.94-1.13	1000	3	20
Tomato	Italy	F/G	SL 722 g/L	Seed treatment	7.22-28.88 mg/kg seed	-	1	n.a.
Tomato	Italy	G	SL 530 g/L	Seedbed drench	31.8 or 15.9	20000-40000	1 2	20
Tomato	Italy	F/G	SL 530 g/L	Soil treatment with dripping	1.1-1.6	20000	2	20
Tomato	Italy	F/G	SL 722 g/L	Seedbed incorporation	57.8-86.6	40000-80000	2	20
Tomato	Italy	F/G	SL 722 g/L	Soil spraying Pre and transplanting	57.8-86.6	300000-580000	1	20
Tomato	Italy	F/G	SL 722 g/L	Soil post planting	0.14 kg ai/hl	0.1-0.2l/plant	4	20
Tomato	Italy	F/G	SL 722 g/L	Foliar	1.1-2.2	1500-2000	2	
Tomato	Luxembourg	G	SL 722 g/L	Seedbed drench	36.1	50000	1	n.a.
Tomato	Luxembourg	F/G	SL 722 g/L	Plant drench	1.01	1400	2	n.a.
Tomato	Netherlands	G	SL 722 g/L	Seedbed drenching	36.1	50000	3	n.a.
Tomato	Netherlands	G	SL 722 g/L	Drench postplanting	1.01	100-150 ml/plant	2	n.a
Tomato	Netherlands	G	SL 722 g/L	Drip application	0.72	20000	3	3
Tomato	Spain	F/G	SL722 g/L	Seedbed drench	1200-1800	80000-10000	1	14
Tomato	Spain	F/G	SL 722 g/L	Soil drench (preventive)	36.1-72.2	20000-30000	1	14
Tomato	Spain	F/G	SL 722 g/L	Soil drench to plant root	3.8	3500	1	14
Tomato	Spain	F/G	SL 722 g/L	Dripping treatment	1.44-2.17	1500-2000	1	14
Tomato	Spain	G	SL 530 g/L	Seedbed treatment	15.9	20000	2	3
Tomato	Spain	F/G	SL 530 g/L	Soil drip irrigation (preventive)	0.53	3000-15000	2	3
Tomato	Spain	F/G	SL 530 g/L	Soil drip irrigation (curative)	1.01-1.6	20000	2	3
Tomato	UK	F/G	SL 722 g/L	Drench at planting	72.2	20000-40000	4	14
Tomato	UK			Compost incorporation	2888	20000-1000000		
Tomato	UK	F/G	SL 722 g/L	Trickle Irrigation	2.53-5.05	3500-7000		
Tomato	UK	F/G	SL 722 g/L	Rockwood trickle Irrigation	2.53-3.16	14000-17500		
Tomato	UK	F/G	SL 722 g/L	Foliar spray	1.81-2.17	1000	3	7
Tomato	USA	F	SL 66.5%	Foliar spray	0.59 0.84 1.26	GA average=400 Aerial 47	8 7 5	5 5 5

* protected site = dark forcing room; ** application to roots after transplanting in hydroponic container via drench, spray or irrigation via nutrient solution; GA = ground application

RESIDUE FROM SUPERVISED TRIALS

A number of residue trials have been performed with propamocarb hydrochloride on several vegetable crops. Table 32 provides a summary of the data provided to the Meeting. All studies were conducted according to GLP and the reports included detailed information on trial conditions and analytical method validation with the exception of radish trials conducted in the 80´s. The trials were conducted either in glasshouses (GH) or in the field (F). The Japanese trial results were submitted to the Meeting by the Japanese Government in a summary table.

When residues were reported in the studies as propamocarb hydrolcholoride, the values were multiplied by 0.84 (MW propamocarb/MWpropamocarb HCl) and expressed as propamocarb. Residues within 30% GAP are underlined and were considered for recommendation of STMR, HR and MRL. Residues on the crop pulp were double underlined and considered only for recommendation of STMR and HR.

Table 32. Summary of supervised trials conducted with propamocarb hydrolcoride.

Crop	Number of trials	Countries	Table
Onion	7	France, Germany, Netherlands, Spain, UK	33
Cabbage	18	France, Germany, Italy, Spain	34
Cauliflower	23	France Germany, Greece, Italy, Spain, UK	35
Cucumber	41	Belgium, France, Germany, Greece, Italy, Netherlands, Spain, USA, Japan	36
Melons	55	France, Germany, Greece, Italy, Netherlands, Portugal, Spain, USA	37
Summer Squash	6	USA	38
Sweet peper	35	Belgium, Germany, Greece, Italy, Netherlands, Spain, USA	39
Tomato	45	Belgium, France, Germany, Greece, Italy, Netherlands, Spain, USA	40
Lettuce	26	France, Germany, Greece, Italy, Netherlands, Spain, USA, Japan	41
Spinach	7	Belgium, Germany, Italy, Spain	42
Potato	32	France, Germany, UK, USA	43
Radish	13	Germany and Netherlands	44
Chicory witloof	20	France Germany, Netherlands	45
Ginger	4	Japan	46

Onion

Seven field trials were conducted with propamocarb hydrochloride on onion in Europe from 1988 to 2003. The results are shown in Table 33.

Table 33. Residue field trials with propamocarb hydrochloride conducted with foliar treatment on onion.

Country, Year *Variety*	Application				PHI (Days)	Residues, as Propamocarb mg/kg	Residues, as propamocarb HCl, mg/kg	Report
	Form.	kg ai/ha	Water L/ha	No.				
France, 2003 *Barito*	450 SC 375 g ai/L	0.75	300	4	0 14	0.25 0.04	0.30* 0.05*	C047478
Germany 2003 *Stuttgarter Riesen*	450 SC 375 g ai/L	0.75	300	4	0 14	0.075 < 0.008	0.09* < 0.01*	C047478
Germany 2003 *Stuttgarter Riesen*	450 SC 375 g ai/L	0.75	300	4	0 14	0.08 < 0.008	0.10* < 0.01*	C047478
Netherlands 2003 *Hyskin*	450 SC 375 g ai/L	0.75	300	4	0 14	0.29 0.03	0.35* 0.04*	C047478

Country, Year *Variety*	Application				PHI (Days)	Residues, as Propamocarb mg/kg	Residues, as propamocarb HCl, mg/kg	Report
	Form.	kg ai/ha	Water L/ha	No.				
Spain, 1988 *Babosa*	722 SL 722 g ai/L	1.8		4	14	< 0.08	< 0.1*	A85277
Spain, 1988 *Babosa*	722 SL 722 g ai/L	2.9		4	14	0.17	0.2*	A85277
UK, 2003	450 SC 375 g ai/L	0.75	300	4	0 14	0.23 0.03	0.27* 0.04*	C047478

* value reported

Cabbage

Eighteen field trials were conducted with propamocarb hydrochloride on cabbage in Europe using a seedbed drench followed by foliar spray applications. The results are shown in Table 34.

Table 34. Residue field trials with propamocarb hydrochloride conducted on cabbage.

Country, Year of trial *Variety*	Application					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report
	Form.	Method	kg ai/ha application	Water L/ha	No.					
France 2001 *Tex 600 F1*	722 SL 722 g ai/L	Seedbed drench Spray	72.5-36.3 2.1-3.1	20000 486-714	2 2	0 42 54	Head Head Head	8.2 0.02 0.02	9.8* 0.03* 0.02*	C022939
France 2001 *Delus*	722 SL 722 g ai/L	Seedbed drench Spray	72.8-36.4 2.2	20156 500	2 2	0 42 54	Head Head Head	3.9 0.008 0.02	4.6* 0.01* 0.02*	C022939
France, 2001 *Milan*	722 SL 722 g ai/L	Seedbed drench Spray	72.2-36.1 2.2	20000 500	2 2	0 45 56	Whole Plant Head Head	23 0.20 0.43	28* 0.24* 0.51*	C022953
France 2000 *Destiny F1*	722 SL 722 g ai/L	Seedbed drench Spray	72.2-36.1 3.7	20000 616-829	2 2	0 14 34 47 55	Whole Plant Whole Plant Head Head Head	36 1.1 < 0.008 < 0.008 < 0.008	43* 1.3* < 0.01* < 0.01* < 0.01*	C015430
France 2000 *Delus F1*	722 SL 722 g ai/L	Seedbed drench Spray	72.2-36.1 3.8-3.5	20000 630-770	2 2	0 14 55 62 69	Whole Plant Whole Plant Head Head Head	56.0 7.7 < 0.008 < 0.008 < 0.008	66* 9.2* < 0.01* < 0.01* < 0.01*	C015430
Germany 2000 *Bartolo*	722 SL 722 g ai/L	Seedbed drench Spray	71-36.1 3.6	20000 500	2 2	0 12 47 68 96	Whole Plant Whole Plant Head Head Head	39 0.9 < 0.008 < 0.008 < 0.008	46* 1.1* < 0.01* < 0.01* < 0.01*	C015430
Germany 2000 *Lennox*	722 SL 722 g ai/L	Seedbed drench Spray	71.5-37.7 3.5	20000 500	2 2	0 6 42 63 93	Whole Plant Whole Plant Head Head Head	42 8.0 < 0.008 < 0.008 < 0.008	51* 9.5* < 0.01* < 0.01* < 0.01*	C015430
Germany 2000 *Perfecta F1*	722 SL 722 g ai/L	Seedbed drench Spray	72.2-36.1 3.65	20000 603-827	2 2	0 12 36 50 55	Whole Plant Whole Plant Head Head Head	37 2.8 < 0.008 < 0.008 < 0.008	44* 3.4* < 0.01* < 0.01* < 0.01*	C015430
Germany 2001 *Tex 600 F1*	722 SL 722 g ai/L	Seedbed drench Spray	72.5-36.3 2..2	20000 500	2 2	0 42 56	Head Head Head	9.2 0.02 0.01	11* 0.02* 0.01*	C022939
Germany 2001 *Bartolo*	722 SL 722 g ai/L	Seedbed drench Spray	73.6-36.1 2.2	20000 500	2 2	0 45 59	Head Head Head	11 < 0.008 < 0.008	13* < 0.01* < 0.01*	C022939

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha application	Water L/ha	No.	PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report
Italy	722 SL	Seedbed	72.2-36.1	20000	2	0	Whole Plant	58	69*	C022953
2001	722 g	drench				44	Head	< 0.008	< 0.01*	
Marcanta	ai/L	Spray	2.1	490	2	58	Head	< 0.008	< 0.01*	
Italy, 2000	722 SL	Seedbed	69.5-36.9	20000	2	0	Whole Plant	40	48*	C015431
Mercato di	722 g	drench				23	Whole Plant	0.04	0.5*	
Copenhage	ai/L					30	Head	< 0.008	< 0.01*	
n		Spray	3.6	500	2	36	Head	< 0.008	< 0.01*	
						41	Head	< 0.008	< 0.01*	
Italy, 2000	722 SL	Seedbed	75.2-35.8	20000	2	0	Whole Plant	109	130*	C015431
Mercato di	722 g	drench				26	Whole Plant	1.0	1.1*	
Copenhage	ai/L					34	Head	0.02	0.02*	
n		Spray	3.6	600	2	41	Head	< 0.008	< 0.01*	
						46	Head	< 0.008	< 0.01*	
Italy, 2000	722 SL	Seedbed	72.3-36.9	20000	2	0	Whole Plant	43	52*	C015431
Mercato di	722 g	drench				15	Whole Plant	3.7	4.4*	
Copenhage	ai/L					22	Head	0.03	0.04*	
n		Spray	3.81-3.57	600	2	29	Head	0.02	0.02*	
						36	Head	0.008	0.01*	
Spain, 2001	722 SL	Seedbed	71.9-36.1	20000	2	0	Whole Plant	98	117*	C022953
Sentinel	722 g	drench				48	Head	< 0.008	< 0.01*	
	ai/L	Spray	2.2	500	2	64	Head	< 0.008	< 0.01*	
Spain, 2001	722 SL	Seedbed	72.1-36.7	20000	2	0	Whole Plant	30	36*	C022953
Sentinel	722 g	drench				49	Head	< 0.008	< 0.01*	
	ai/L	Spray	2.2	500	2	61	Head	< 0.008	< 0.01*	
Spain, 2000	722 SL	Seedbed	72.2-36.1	20000	2	0	Whole Plant	24	29*	C015431
Sentinel	722 g	drench				82	Whole Plant	0.04	0.05*	
	ai/L					113	Head	< 0.008	< 0.01*	
		Spray	3.7-3.5	550	2	123	Head	< 0.008	< 0.01*	
						138	Head	< 0.008	< 0.01*	
Spain, 2000	722 SL	Seedbed	72.2-36.1	20000	2	0	Whole Plant	96	115*	C015431
Sentinel	722 g	drench				71	Whole Plant	0.1	0.1*	
	ai/L					89	Head	< 0.008	< 0.01*	
		Spray	3.5-3.8	481-637	2	110	Head	< 0.008	< 0.01*	
						125	Head	< 0.008	< 0.01*	

*actual value reported

Cauliflower

Twenty three field trials were conducted on cauliflower with propamocarb hydrochloride in Europe using a seedbed drench followed by a foliar application. The results are shown in Table 35.

Table 35. Residue field trials with propamocarb hydrochloride conducted on cauliflower.

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Sample analysed	Residues Propamocarb mg/kg	Residues as Propamocarb HCl, mg/kg	Report
France	722 SL	Seedbed	72.2-36.0	20000	2	0	Head	1.4	1.7*	C033812
2002	722 g	drench				7	Head	0.05	0.06*	
Cortes	ai/L					14	Head	0.05	0.06*	
		Spray	3.6	500	2	20	Head	0.03	0.04*	
						28	Head	0.02	0.03*	
France	722 SL	Seedbed	72.2-36.0	20000	2	0	Head	0.24	0.29*	C033812
2002	722 g	drench				7	Head	0.03	0.04*	
Amerigo	ai/L					15	Head	0.03	0.03*	
		Spray	3.6	500	2	21	Head	0.09	0.11*	
						28	Head	0.11	0.13*	

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Sample analysed	Residues Propamocarb mg/kg	Residues as Propamocarb HCl, mg/kg	Report
Germany	722 SL	Seedbed	72.2-	20000	2	0	Shoots	42	50*	C033812
2002	722 g	drench	36.0			7	Shoots	13	16*	
Spacestar	ai/L					14	Shoots	7.9	9.4*	
		Spray	3.6	600	2	21	Shoots	0.69	0.82*	
						41	Head	0.02	0.03*	
Germany	722 SL	Seedbed	72.2-	20000	2	0	Shoots	47	56*	C033812
2002	722 g	drench	36.0			7	Shoots	10	12*	
Fremont	ai/L					14	Shoots	0.51	0.61*	
		Spray	3.6	600	2	21	Head	0.02	0.03*	
						28	Head	0.08	0.10*	
France	722 SL	Seedbed	72.8-	20156	2	0	Whole	71	84*	C023895
2001	722 g	drench	36.4			44	Plant	0.008	0.01*	
CLX 33903	ai/L	Spray		482-	2	58	Head	< 0.008	< 0.01*	
			2.1-2.3	528			Head			
France	722 SL	Seedbed	72.5-	20156	2	0	Whole	79	94*	C023895
2001	722 g	drench	36.23			44	Plant	0.03	0.03*	
Aviso F1	ai/L	Spray		482-	2	58	Head	< 0.008	< 0.01*	
			2.15	528			Head			
France	722 SL	Seedbed	72.3-	20000	2	0	Whole	60	72*	C024417
2001	722 g	drench	33.2			49	Plant	< 0.008	< 0.01*	
Fremont	ai/L	Spray		498	2	56	Head	< 0.008	< 0.01*	
			2.2				Head			
France,	722 SL	Seedbed	72.2-	20000	2	0	Whole	95	113*	C015428
2000	722 g	drench	36.0			34	Plant	0.03	0.04*	
Fremont F1	ai/L					55	Whole	< 0.008	< 0.01*	
RS		Spray	3.68-	612-	2	62	Plant	< 0.008	< 0.01*	
			3.48	772		64	Head	< 0.008	< 0.01*	
							Head			
							Head			
France	722 SL	Seedbed	72.2-	20000	2	0	Whole	100	119*	C015428
2000	722 g	drench	36.0			26	Plant	0.03	0.04*	
Fremont	ai/L					39	Whole	< 0.008	< 0.01*	
		Spray	3.8	625-	2	43	Plant	< 0.008	< 0.01*	
				852		47	Head	< 0.008	< 0.01*	
							Head			
							Head			
Germany	722 SL	Seedbed	69.0-	19200	2	0	Whole	70	83*	C015428
2000	722 g	drench	35.8	19834		12	Plant	2.7	3.2*	
Aviso	ai/L					47	Whole	< 0.008	< 0.01*	
		Spray	3.7	513-	2	54	Plant	< 0.008	< 0.01*	
				510		57	Head	0.008	0.01*	
							Head			
							Head			
Germany	722 SL	Seedbed	72.4-	20000	2	0	Whole	95	113*	C015428
2000	722 g	drench	35.9			6	Plant	13.4	16.0*	
BK Fargo	ai/L					42	Whole	< 0.008	< 0.01*	
		Spray	3.6	500	2	48	Plant	< 0.008	< 0.01*	
						51	Head	< 0.008	< 0.01*	
							Head			
							Head			
Germany	722 SL	Seedbed	72.2-	20000	2	0	Whole	85	101*	C015428
2000	722 g	drench	36.0			28	Plant	1.3	1.5*	
Fremont F1	ai/L					43	Whole	< 0.008	< 0.01*	
RS		Spray	3.7-3.6	620-	2	50	Plant	< 0.008	< 0.01*	
				806		55	Head	< 0.008	< 0.01*	
							Head			
							Head			
Germany	722 SL	Seedbed	72.2-	20156	2	0	Whole	49	58*	C023895
2001	722 g	drench	36.0			49	Plant	< 0.008	< 0.01*	
Aviso	ai/L			482-	2	58	Head	< 0.008	< 0.01*	
		Spray	2.4-2.3	528			Head			

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Sample analysed	Residues Propamocarb mg/kg	Residues as Propamocarb HCl, mg/kg	Report
Germany 2001 *Aviso F1*	722 SL 722 g ai/L	Seedbed drench Spray	72.5- 36.3 2.2	20156 482- 528	2 2	0 45 60	Whole Plant Head Head	52 < 0.008 < 0.008	62* < 0.01* < 0.01*	C023895
Greece 2001 *Siria*	722 SL 722 g ai/L	Seedbed drench Spray	72.2- 36.0 2.0	20000 487- 453	2 2	0 49 65	Whole Plant Head Head	52 0.09 0.12	62* 0.11* 0.14*	C024417
Italy, 2000 *Aviso*	722 SL 722 g ai/L	Seedbed drench Spray	70.236. 5 3.5-3.62	19450 20236 588- 602	2 2	0 47 64 70 76	Whole Plant Whole Plant Head Head Head	57 0.02 < 0.008 < 0.008 < 0.008	68* 0.02* < 0.01* < 0.01* < 0.01*	C015429
Italy, 2000 *Aviso*	722 SL 722 g ai/L	Seedbed drench Spray	70.9- 35.8 3.60	19646 19842 600	2 2	0 55 73 80 84	Whole Plant Whole Plant Head Head Head	106 0.02 < 0.008 < 0.008 < 0.008	127* 0.02* < 0.01* < 0.01* < 0.01*	C015429
Italy, 2000 *Aviso*	722 SL 722 g ai/L	Seedbed drench Spray	71.6- 36.89 3.5-3.6	19842 20432 587- 599	2 2	0 40 56 63 68	Whole Plant Whole Plant Head Head Head	59 0.03 < 0.008 < 0.008 < 0.008	70* 0.04* < 0.01* < 0.01* < 0.01*	C015429
Spain, 2001 *Arizona*	722 SL 722 g ai/L	Seedbed drench Spray	72.6- 36.0 2.3	20000 540	2 2	0 49 63	Whole Plant Head Head	52 0.008 < 0.008	62* 0.01* < 0.01*	C024417
Spain, 2001 *Arizona*	722 SL 722 g ai/L	Seedbed drench Spray	71.8- 35.9 2.3-2.2	19880 532- 512	2 2	0 44 56	Whole Plant Head Head	39 0.03 0.008	46* 0.03* 0.01*	C024417
UK 2002 *Freedom*	722 SL 722 g ai/L	Seedbed drench Spray	72.2- 36.0 3.6	20000 600	2 2	0 7 14 22 28	Head Head Head Head Head	1.3 0.10 0.008 <u>0.008</u> 0.05	1.6* 0.12* 0.01* 0.01* 0.06*	C033812
Spain, 2000 *Dunkel*	722 SL 722 g ai/L	Seedbed drench Spray	72.3- 36.0 3.8-3.61	20000 526- 603	2 2	0 116 125 138 141	Whole Plant Whole Plant Head Head Head	54 < 0.008 < 0.008 < 0.008 < 0.008	64* < 0.01* < 0.01* < 0.01* < 0.01*	C015429
Spain, 2000 *Dunkel*	722 SL 722 g ai/L	Seedbed drench Spray	72.2- 36.1 3.4-3.65	20000 472- 607	2 2	0 104 110 113 125	Whole Plant Whole Plant Head Head Head	117 < 0.008 < 0.008 0.05 < 0.008	140* < 0.01* < 0.01* 0.06* < 0.01*	C015429

*actual value reported

Cucumber

Thirty seven trials with propamocarb hydrochloride on cucumber were reported from Europe and the USA. The propamocarb hydrochloride was applied using either drench irrigation, drip irrigation and or spray application. The results are shown in Table 36.

Table 36. Results of residue trials with propamocarb hydrochloride conducted on cucumber receiving drench, drip and/or foliar treatments.

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha or kg ai/hL[a]	Water L/ha	No.	PHI (Days)	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report F/GH
Belgium 2004 *Grendel*	840 SL 530 g ai/L	Drench irrig. Drip Irrigation	15.9 1.59		2 4	0 1 3 7 14	1.3* 2.1* 1.4* 0.98* 0.51*		RA 2552/04 GH
France, 2000 *Kansas*	722 SL 722 g ai/L	Seedbed drench Drip irrig. Spray Drip irrig	72.2-36.0 0.144[a] 0.36/0.18[a] 0.144[a]	20000 1215 470-498 1215	2 1 2 1	0 1 4 7 14	1.0* 0.9* 0.8* 1.1* 0.8*	1.2* 1.1* 1.0* 1.3* 0.9*	C016108 GH
Germany 1992, *Orthello*	722 SL 722 g ai/L	Spray	2.2	600	4	0 2 4 7 9	2.9 1.0 0.9 0.67 0.66	3.5* 1.2* 1.1* 0.82* 0.79*	A85339 F
Germany 1992 *Orthello*	722 SL 722 g ai/L	Spray	2.2	600	4	0 2 4 7 9	2.6 1.2 0.9 0.68 0.68	3.1* 1.4* 1.1* 0.81* 0.81*	A85339 F
Germany 1992 *Passavia*	722 SL 722 g ai/L	Spray	2.2	600	4	0 2 4 6 8	1.2 0.9 0.55 0.68 0.55	1.4* 1.1* 0.66* 0.81* 0.65*	A85339 F
Germany 1992 *Profi*	722 SL 722 g ai/L	Spray	2.2	600	4	0 2 4 6 8	0.9 0.62 0.54 0.7 0.62	1.1* 0.74* 0.64* 0.83* 0.74*	A85339 F
Germany 1992 *Profi*	722 SL 722 g ai/L	Spray	2.2	600	4	0 2 4 6 8	4.9 2.5 1.3 1.3 1.1	5.9* 3.0* 1.5* 1.5* 1.3*	A85339 F
Germany 1992 Nienhagen *Alexis*	722 SL 722 g ai/L	Spray	2.5	700	4	0 2 4 7 8	2.1 1.6 1.0 0.9 1.0	2.5* 1.9* 1.2* 1.1* 1.2*	A85339 F
Germany 1991 *Paramount F*	722 SL 722 g ai/L	Spray	2.2	600	4	0 2 4 6 8	2.0 0.69 0.6 0.4 0.54	2.4* 0.82* 0.71* 0.5* 0.64*	A85341 F
Germany 1991 *Orestes*	722 SL 722 g ai/L	Spray	2.2	600	4	0 2 4 6 8	3.5 0.6 0.9 0.54 0.62	4.2* 0.73* 1.1* 0.65* 0.74*	A85341 F

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha or kg ai/hL[a]	Water L/ha	No.	PHI (Days)	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report F/GH
Germany 2000 *Korinda*	722 SL 722 g ai/L	Seedbed drench Soil drench Spray Soil drench	29.0 2.6 2.8 2.7	10000 1823 430-630 1860	1 2 2 2	0 3 5 7	1.1* <u>1.3</u>* 0.8* 0.7*	1.3* 1.5* 0.9* 0.8*	C015432 GH
Germany 2000 *Europa*	722 SL 722 g ai/L	Seedbed drench Soil drench Spray Soil drench	28.44 2.7 2.7 2.65	98490 1850 416-604 1832	1 2 2 2	0 3 5 7	1.3* 1.4* <u>1.7</u>* 0.9*	1.5* 1.6* 2.0* 1.1*	C015432 GH
Germany 2000 *Europa*	722 SL 722 g ai/L	Seedbed drench Soil drench Spray Soil drench	28.50 2.2 2.2-2.1 2.2	98680 1714 410-590 1720	1 2 2 2	0 3 5 7	1.6* 1.1* <u>1.4</u>* 0.8*	1.9* 1.3* 1.7* 1.0*	C015432 GH
Germany 2000 *Paramos F1*	722 SL 722 g ai/L	Seedbed drench Soil drench Spray Soil drench	29.0 2.90 3.0 2.90	416667 2000 316-530 2000	1 2 2 2	0 3 5 7	1.2* <u>1.0</u>* 0.8* 0.6*	1.5* 1.2* 1.0* 0.7*	C015432 GH
Germany 2000 *Sudica*	722 SL 722 g ai/L	Seedbed drench Soil drench Spray Soil drench	29.0 2.87 2.8-2.98 2.9	390625 1990 290-515 2000	1 2 2 2	0 3 5 7	0.5* <u>0.7</u>* 0.6* 0.6*	0.6* 0.8* 0.7* 0.7*	C015432 GH
Germany 2000 *Paramos F1*	722 SL 722 g ai/L	Seedbed drench Soil drench Spray Soil drench	29.0 1.9 2.0-1.71 1.9	416667 1300 314-455 1300	1 2 2 2	0 3 5 7	0.7* <u>1.0</u>* 0.9* 0.5*	0.8* 1.2* 1.1* 0.6*	C015432 GH
Germany 2000 *Dominica*	722 SL 722 g ai/L	Seedbed drench Soil drench Spray Soil drench	29.0 1.9 1.9-1.8 1.9	390625 1294 310-481 1315	1 2 2 2	0 3 5 7	0.8* <u>0.8</u>* 0.5* 0.6*	1.0* 1.0* 0.6* 0.7*	C015432 GH
Germany 2001 *Indira RZ F1*	840 SL 530 g ai/L	Seedbed drench Drip irrigation[1]	16 1.5-2.0	20000 1500-1910	2 4	0 3	1.4 <u>0.59</u>	1.7* 0.70*	C021346 GH
Germany 2004 *Pinto F1*	840 SL 530 g ai/L	Drench irrig. Drip Irrigation	15.9 1.59		2 4	0 3	0.04* 0.06*		RA 2552/04 GH
Germany 2004 *Ladner*	840 SL 530 g ai/L	Drench irrig. Drip Irrigation	15.9 1.59		2 4	0 3	0.37* 0.42*		RA 2552/04 GH
Greece 2000 *Palmera*	722 SL 722 g ai/L	Seedbed drench Drip irrig. Spray Drip irrig.	72.2-36.0 2.40 2.0 2.41	20000 1665 570-548 1665	2 1 2 1	0 1 4 7 14	4.0* 3.4* <u>4.8</u>* 4.1* 2.1*	4.7* 4.0* 5.7* 4.8* 2.5*	C016108 GH
Italy, 2000 40026 Imola Emilia-Romag *Kansas*	722 SL 722 g ai/L	Seedbed drench Drip irrig. Spray Drip irrig.	72.5-35.23 3.0 3.0-3.1 3.0	20000 2023 592-618 2083	2 1 2 1	0 1 4 7 14	0.8* 0.9* <u>0.6</u>* 0.5* 0.4*	1.0* 1.0* 0.7* 0.6* 0.5*	C016108 GH
Japan, 1980	SL 640g/kg	sowing	0.16 kg ai/L	300 ml/plant	3	21 35 49	0.39 0.19 0.09	0.46* 0.23* 0.11*	(1) GH

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha or kg ai/hL[a]	Water L/ha	No.	PHI (Days)	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report F/GH
Japan, 1980	SL 640g/kg	sowing	0.16 kg ai/L	300 ml/plant	3	21 35 49	0.37 0.33 0.31	0.44* 0.39* 0.37*	(1) GH
Japan, 1980	SL 640g/kg	sowing	0.16 kg ai/L	300 ml/plant	3	21 35 49	0.34 0.16 0.07	0.41* 0.19* 0.09*	(1) GH
Japan, 1980	SL 640g/kg	sowing	0.16 kg ai/L	300 ml/plant	3	21 35 49	0.42 0.22 0.13	0.50* 0.26* 0.16*	(1) GH
Netherlands 2001, *Toledo*	840 SL 530 g ai/L	Seedbed drench Drip irrigation[1]	16 2.66	20000 2500	2 4	0 3	0.78 0.83	0.93* 0.99*	C021346 GH
Netherlands 2001, *Enduro*	840 SL 530 g ai/L	Seedbed drench Drip irrigation[1]	16 2.66	20000 2500	2 4	0 3	0.78 1.0	0.93* 1.2*	C021346 GH
Netherlands 2004 *Grendel*	840 SL 530 g ai/L	Drench irrig Drip Irrigation	15.9 1.59		2 4	0 1 3 7 14	0.39* 1.3* 1.5* 0.75* 0.19*		RA 2552/04 GH
Spain 2000 *Serena*	722 SL 722 g ai/L	Seedbed drench Drip irrig. Spray Drip irrig	72.2-36.0 3.0 2.2-2.1 3.01	20000 2083 399-590 2083	2 1 2 1	0 1 4 7 14	0.5* 0.4* 0.4* 0.4* 0.4*	0.6* 0.5* 0.5* 0.4* 0.4*	C016108 GH
Spain 2000 46800 Xativa Valencia *Cornichon*	722 SL 722 g ai/L	Seedbed drench Drip irrig. Spray Drip irrig	72.2-36.0 2.1 2.2 2.1	20000 1464 397-519 1464	2 1 2 1	0 1 4 7 14	1.4* 1.1* 1.0* 0.6* 0.3*	1.7* 1.3* 1.2* 0.7* 0.4*	C016108 GH
Spain 2000 *Serena*	722 SL 722 g ai/L	Seedbed drench Soil drench Spray Soil drench	29.0 3.2 3.2 3.2	20000 2201 585-734 3669-4403	1 2 2 2	0 3 5 7	1.5* 1.2* 1.4* 1.2*	1.8* 1.4* 1.7* 1.4*	C015432 GH
Spain 2000 *Serena*	722 SL 722 g ai/L	Seedbeddrench Soil drench Spray Soil drench	29.0 3.3 3.5-3.2 3.30	20000 2286 491-589 3810-4571	1 2 2 2	0 3 5 7	0.9* 1.1* 1.7* 1.8*	1.1* 1.3* 2.0* 2.2*	C015432 GH
Spain, 2001 *Serena*	840 SL 530 g ai/L	Seedbed drench Drip irrigation[1]	16 1.99	20000 1875-2343	2 4	0 3	0.56 0.54	0.67* 0.64*	C021346 GH
USA, 1997 *Poinsett 76*	750 SC 375 g ai/L	Spray	1.0	195-200	5	2	0.29*		B002741 F
USA, 1997 *Poinsett 76*	750 SC 375 g ai/L	Spray	1.0	183-187	5	2	0.32*		B002741 F
USA, 1997 *Poinsett 76*	750 SC 375 g ai/L	Spray	1.0	187	5	2	0.26*		B002741 F
USA, 1997 *Dasher 2*	750 SC 375 g ai/L	Spray	1.0	180-199	5	2	0.62*		B002741 F
USA, 1997 *SMR 58*	750 SC 375 g ai/L	Spray	1.0	184-196	5	2	0.69*		B002741 F

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha or kg ai/hL[a]	Water L/ha	No.	PHI (Days)	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report F/GH
USA, 1997 *Straight Eight*	750 SC 375 g ai/L	Spray	1.0	183-201	5	2	0.75*		B002741 F
USA, 1997 *Pointsett 76*	750 SC 375 g ai/L	Spray	1.0	186-196	5	1 2 4 6 8	0.55* 0.61* 0.26* 0.19* 0.16*		B002741 F

*actual value reported; 1. only a summary report of the trial was provided;

Melons

Fourty eight field and glasshouse trials in melons were reported from Europe, spanning 1993 to 2004. Seven trials were also reported in field grown cantaloupe, conducted in 1997, from the USA. Methods of application included the use of drench, drip and/or foliar spray (Table 37).

Table 37. Residue trials with propamocarb hydrochloride conducted in melon in the field and glass house.

Country, Year of trial *Variety*	Aplication Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residue Propamocab HCl, mg/kg	Report F/GH
France 1993 *Delta*	750 SC 375 g ai/L	Spray	2.2	333	5	3 5 7	Fruit Fruit Fruit	0.44 0.81 0.17	0.53* 0.97* 0.2*	A89361 F
France 1993 *Bastion*	750 SC 375 g ai/L	Spray	2.2	333	4	3 5 7	Fruit Fruit Fruit	0.49 0.13 0.3	0.58* 0.15* 0.3*	A89361 F
France 1994 *Manta*	750 SC 375 g ai/L	Spray	1.1	333	3	0 3 0 3	Fruit Fruit Pulp Pulp	0.60 0.38 < 0.08 ≤ 0.08	0.72* 0.45* < 0.1* < 0.1*	A89363 F
France 1994 *Bastion*	750 SC 375 g ai/L	Spray	1.1	333	3	0 3 0 3	Fruit Fruit Pulp Pulp	0.32 0.11 < 0.08 ≤ 0.08	0.38* 0.13* < 0.1* < 0.1*	A89363 F
France 1994 *Delta*	750 SC 375 g ai/L	Spray	1.1	333	3	0 3 0 3	Fruit Fruit Pulp Pulp	0.18 0.23 < 0.08 ≤ 0.08	0.21* 0.28* < 0.1* < 0.1*	A89363 F
France 1994 *Delta*	750 SC 375 g ai/L	Spray	1.1	333	3	0 3 0 3	Fruit Fruit Pulp Pulp	0.18 0.24 0.13 0.21	0.22* 0.29* 0.15* 0.25*	A89363 F
France 1994 *Manta*	750 SC 375 g ai/L	Spray	2.2	333	3	0 3 0 3	Fruit Fruit Pulp Pulp	0.49 0.44 < 0.08 ≤ 0.08	0.58* 0.52* < 0.1* < 0.1*	A89363 F
France 1994 *Bastion*	750 SC 375 g ai/L	Spray	2.2	333	3	0 3 0 3	Fruit Fruit Pulp Pulp	0.32 0.28 < 0.08 ≤ 0.08	0.38* 0.34* < 0.1* < 0.1*	A89363 F
France *Delta*	750 SC 375 g ai/L	Spray	2.2	333	3	0 3 0 3	Fruit Fruit Pulp Pulp	0.44 0.40 0.11 ≤ 0.08	0.52* 0.48* 0.13* < 0.1*	A89363 F

Country, Year of trial *Variety*	Aplication						Sample analysed	Residues as Propamocarb mg/kg	Residue Propamocab HCl, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)				
France	750 SC	Spray	2.2	333	3	0	Fruit	0.70	0.83*	A89363
1994	375 g ai/L					3	Fruit	1.1	1.3*	F
Delta						0	Pulp	0.13	0.16*	
						3	Pulp	0.13	0.15*	
France	722 SL	Spray	2.1	300	3	0	Fruit	0.54	0.64*	A83662
1995	722 g ai/L					3	Fruit	0.65	0.78*	F
Alpha						0	Pulp	0.08	0.1*	
						3	Pulp	0.07	0.08*	
France	722 SL	Spray	2.1	300	3	0	Fruit	1.8	2.2*	A83662
1995	722 g ai/L					3	Fruit	0.92	1.1*	F
Sierra						0	Pulp	0.09	0.11*	
						3	Pulp	0.04	0.05*	
France	722 SL	Spray	2.1	300	3	0	Fruit	1.17	1.4*	A83662
1995	722 g ai/L					3	Fruit	0.57	0.68*	F
Averell						0	Pulp	0.1	0.12*	
						3	Pulp	≤ 0.04	< 0.05*	
France	722 SL	Spray	2.1	300	3	0	Fruit	0.84	1.0*	A83662
1995	722 g ai/L					3	Fruit	0.38	0.45*	F
Dalton						0	Pulp	< 0.04	< 0.05*	
						3	Pulp	≤ 0.04	< 0.05*	
France	722 SL	Seedbed	22	20000	2	0	Fruit	0.84*	1.0*	C017451
2000	722 g ai/L	drench				3	Fruit	0.50*	0.6*	F
Galonbet		Spray	2.2	1046	2	7	Fruit	0.25*	0.3*	
						14	Fruit	0.25*	0.3*	
						21	Fruit	0.25*	0.3*	
						0	Peel	3.2*	3.9*	
						3	Peel	1.0*	1.2*	
						7	Peel	1.5*	1.8*	
						14	Peel	0.59*	0.7*	
						21	Peel	0.7*	0.9*	
						0	Pulp	< 0.01*	< 0.01*	
						3	Pulp	< 0.01*	< 0.01*	
						7	Pulp	< 0.01*	< 0.01*	
						14	Pulp	< 0.01*	< 0.01*	
						21	Pulp	0.02*	0.02*	
France	722 SL	Seedbed	22	20000	2	0	Fruit	0.42*	0.5*	C017451
2000	722 g ai/L	drench				3	Fruit	0.34*	0.4*	F
Innenheim		Spray	2.2	1025	2	7	Fruit	0.17*	0.2*	
Bastion						14	Fruit	0.09*	0.1*	
						21	Fruit	0.17*	0.2*	
						0	Peel	1.0*	1.2*	
						3	Peel	1.1*	1.3*	
						7	Peel	0.43*	0.5*	
						14	Peel	0.25*	0.3*	
						21	Peel	0.25*	0.3*	
						0	Pulp	< 0.01*	< 0.01*	
						3	Pulp	< 0.01*	< 0.01*	
						7	Pulp	< 0.01*	< 0.01*	
						14	Pulp	< 0.01*	< 0.01*	
						21	Pulp	≤ 0.008*	< 0.01*	

Country, Year of trial *Variety*	Aplication					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residue Propamocab HCl, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.					
France	722 SL	Seedbed	22	20000	2	0	Fruit	1.5*	1.7*	C017451
2000	722 g ai/L	drench				3	Fruit	0.67*	0.8*	
Ardor F1		Spray	2.2	1007	2	7	Fruit	0.76*	0.9*	F
						14	Fruit	0.50*	0.6*	
						21	Fruit	0.67*	0.8*	
						0	Peel	3.4*	4.1*	
						3	Peel	1.9*	2.2*	
						7	Peel	3.2*	3.8*	
						14	Peel	1.3*	1.6*	
						21	Peel	1.0*	1.2*	
						0	Pulp	< 0.01*	< 0.01*	
						3	Pulp	< 0.01*	< 0.01*	
						7	Pulp	0.02*	0.02*	
						14	Pulp	0.02*	0.02*	
						21	Pulp	0.02*	0.02*	
France	722 SL	Seedbed	24	22292	2	0	Fruit	2.5*	3.0*	C017451
2000	722 g ai/L	drench				3	Fruit	0.59*	0.7*	F
Heliobel		Spray	2.2	1039	2	7	Fruit	0.50*	0.6*	
						14	Fruit	0.67*	0.8*	
						21	Fruit	0.17*	0.2*	
						0	Peel	1.1*	1.3*	
						3	Peel	1.0*	1.1*	
						7	Peel	2.2*	2.6*	
						14	Peel	1.4*	1.6*	
						21	Peel	0.84*	1.0*	
						0	Pulp	0.59*	0.7*	
						3	Pulp	0.09*	0.1*	
						7	Pulp	0.07*	0.08*	
						14	Pulp	0.06*	0.07*	
						21	Pulp	0.03*	0.04*	
France	722 SL	Seedbed	22	11146	2	0	Fruit	1.8*	2.2*	C017451
2000	722 g ai/L	drench				3	Fruit	2.5*	2.9*	F
Buffalo		Spray	2.2	995	2	7	Fruit	1.5*	1.8*	
						14	Fruit	1.5*	1.8*	
						21	Fruit	0.3*	0.4*	
						0	Peel	5.4*	6.4*	
						3	Peel	9.7*	12.0*	
						7	Peel	5.5*	6.5*	
						14	Peel	4.8*	5.8*	
						21	Peel	1.1*	1.3*	
						0	Pulp	0.34*	0.4*	
						3	Pulp	0.08*	0.1*	
						7	Pulp	0.04*	0.05*	
						14	Pulp	0.07*	0.08*	
						21	Pulp	0.02*	0.02*	
France	722 SL	Seedbed	21.6	19966	2	0	Fruit	0.52*	0.62*	C020966
2001	722 g ai/L	drench				13	Fruit	0.51*	0.61*	F
Marlene		Spray	2.33	538	2	0	Peel	3.3*	3.9*	
						13	Peel	1.4*	1.7*	
						0	Pulp	0.39*	0.47*	
						13	Pulp	0.02*	0.02*	
France	722 SL	Seedbed	21.5	19886	2	0	Fruit	0.80*	0.95*	C020966
2001	722 g ai/L	drench				14	Fruit	0.34*	0.41*	F
Sierra		Spray	2.2	511	2	0	Peel	3.8*	4.5*	
						14	Peel	0.62*	0.74*	
						0	Pulp	0.07*	0.08*	
						14	Pulp	< 0.01*	0.01*	

Country, Year of trial *Variety*	Aplication							Residues as Propamocarb mg/kg	Residue Propamocab HCl, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Sample analysed			
France	722 SL	Seedbed	22	20000	2	0	Fruit	0.15*	0.17*	C020952
2001	722 g ai/L	drench				14	Fruit	0.18*	0.21*	GH
Fiesta		Spray	2.1	492	2	0	Peel	1.4*	1.7*	
						14	Peel	1.3*	1.5*	
						0	Pulp	0.05*	0.06*	
						14	Pulp	0.02*	0.02*	
Germany	840 SL	Drench	16.0	20030	2	0	Fruit	0.44	0.53*	C024908
2001	530 g ai/L			-		13	Fruit	1.42	1.7*	GH
Melina F1		Drip	2.0	21380	2	0	Peel	0.60	0.71*	
		Irrigation		1860-		13	Peel	0.32	0.38*	
				1900		0	Pulp	0.14	0.17*	
						13	Pulp	0.08	0.09*	
Greece	722 SL	Seedbed	21.4	19770	2	0	Fruit	2.4*	2.9*	C017451
2000	722 g ai/L	drench				3	Fruit	1.2*	1.5*	F
Ananas		Spray	2.2	1045	2	7	Fruit	1.7*	2.0*	
						14	Fruit	0.76*	0.9*	
						21	Fruit	0.08*	0.1*	
						0	Peel	6.3*	7.6*	
						3	Peel	5.2*	6.2*	
						7	Peel	2.6*	3.1*	
						14	Peel	1.4*	1.7*	
						21	Peel	0.25*	0.3*	
						0	Pulp	0.50*	0.6*	
						3	Pulp	0.17*	0.2*	
						7	Pulp	0.08*	0.1*	
						14	Pulp	0.04*	0.05*	
						21	Pulp	0.02*	0.02*	
Greece	722 SL	Seedbed	22	20000	2	0	Fruit	1.2*	1.5*	C016109
2000	722 g ai/L	drench				3	Fruit	2.6*	3.1*	
Gallia		Spray	2.1	1013	2	7	Fruit	1.9*	2.3*	GH
						14	Fruit	1.5*	1.8*	
						21	Fruit	2.2*	2.6*	
						0	Peel	2.0*	2.4*	
						3	Peel	5.3*	6.3*	
						7	Peel	3.1*	3.7*	
						14	Peel	4.1*	4.9*	
						21	Peel	5.6*	6.6*	
						0	Pulp	0.08*	0.1*	
						3	Pulp	0.17*	0.2*	
						7	Pulp	0.07*	0.08*	
						14	Pulp	0.08*	0.1*	
						21	Pulp	0.08*	0.1*	
Italy, 2000	722 SL	Seedbed	22	20722	2	0	Fruit	2.7*	2.6*	C016109
Scudo	722 g ai/L	drench				3	Fruit	1.0*	1.2*	
		Spray	2.2	1029	2	7	Fruit	0.84*	1.0*	GH
						14	Fruit	0.76*	0.9*	
						21	Fruit	0.67*	0.8*	
						0	Peel	1.8*	2.2*	
						3	Peel	1.3*	1.6*	
						7	Peel	1.9*	2.2*	
						14	Peel	1.5*	1.7*	
						21	Peel	0.76*	0.9*	
						0	Pulp	0.08*	0.1*	
						3	Pulp	0.02*	0.02*	
						7	Pulp	0.02*	0.02*	
						14	Pulp	0.02*	0.02*	
						21	Pulp	0.02*	0.02*	

Country, Year of trial *Variety*	Aplication					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residue Propamocab HCl, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.					
Italy	722 SL	Seedbed	21	19760	2	0	Fruit	1.5*	1.8*	C017451
2000	722 g ai/L	drench				3	Fruit	0.67*	0.8*	
Bingo		Spray	2.1	992	2	7	Fruit	1.0*	1.2*	F
						14	Fruit	0.42*	0.5*	
						21	Fruit	0.59*	0.7*	
						0	Peel	2.2*	2.6*	
						3	Peel	1.7*	2.0*	
						7	Peel	1.4*	1.6*	
						14	Peel	1.0*	1.2*	
						21	Peel	0.17*	0.2*	
						0	Pulp	0.02*	0.02*	
						3	Pulp	0.02*	0.02*	
						7	Pulp	< 0.01*	< 0.01*	
						14	Pulp	0.02*	0.02*	
						21	Pulp	0.03*	0.04*	
Italy	722 SL	Seedbed	22	19966	2	0	Fruit	0.53*	0.63*	C020952
2001	722 g ai/L	drench				14	Fruit	0.19*	0.22*	GH
Bingo		Spray	2-2.2	484-516	2	0	Peel	1.1*	1.3*	
						14	Peel	0.34*	0.4*	
						0	Pulp	0.02*	0.02*	
						14	Pulp	< 0.01*	0.01*	
Italy	722 SL	Drench	20-22.0	18604 -	2	0	Fruit	0.59*	0.7*	C020966
2001	722 g ai/L					14	Fruit	0.11*	0.13*	F
Bingo		Spray	2.2	20000	2	0	Peel	1.6*	1.8*	
				513		14	Peel	0.19*	0.23*	
						0	Pulp	0.02*	0.03*	
						14	Pulp	< 0.01*	< 0.01*	
Italy, 2004	840 SL	Drench	15.9	20000	2	0	Fruit	< 0.008*	< 0.01	RA 2554/04
Proteo	530 g ai/L	Drip Irrigation	1.59	100	2	14	Fruit	< 0.008*	< 0.01	GH
Italy, 2004	840 SL	Drench	15.9	20000	2	0	Fruit	< 0.008*	< 0.01	RA 2554/04
H. Best Jumbo	530 g ai/L	Drip Irrigation	1.59	100	2	14	Fruit	< 0.008*	< 0.01	GH
Netherlands	722 SL	Spray	2.1	1543	3	0	Fruit	0.80	0.96*	C004255
1997	722 g ai/L					3	Fruit	0.12	0.14*	
Lunastar						0	Peel	1.1	1.3*	GH
						3	Peel	0.31	0.37*	
						0	Pulp	< 0.04	< 0.05*	
						3	Pulp	< 0.04	< 0.05*	
Netherlands	722 SL	Spray	2.1	1493	3	0	Fruit	0.61	0.73*	C004255
1997	722 g ai/L					3	Fruit	0.1	0.15*	
Lunastar						0	Peel	1.3	1.5*	GH
						3	Peel	0.55	0.66*	
						0	Pulp	0.04	0.05*	
						3	Pulp	< 0.04	< 0.05*	
Netherlands	722 SL	Spray	2.2	1547	3	0	Fruit	0.52	0.62*	C004255
1997	722 g ai/L					3	Fruit	0.14	0.17*	
Lunastar						0	Peel	1.3	1.5*	GH
						3	Peel	0.9	1.1*	
						0	Pulp	0.04	0.05*	
						3	Pulp	< 0.04	< 0.05*	
Portugal	840 SL	Drench	15.9	20000	2	0	Fruit	< 0.008*	< 0.01	RA 2554/04
2004, *Galas*	530 g ai/L	Drip Irrigation	1.59	100	2	14	Fruit	0.12*	0.14	GH
Portugal	840 SL	Drench	15.9	20000	2	0	Fruit	< 0.008*	< 0.01	RA 2554/04
2004	530 g ai/L	Drip	1.59	100	2	1	Fruit	0.02*	0.02	GH
Ananas de America		Irrigation				3	Fruit	0.173*	0.2	
						7	Fruit	0.02*	0.02	
						14	Fruit	0.04*	0.05	

Country, Year of trial *Variety*	Aplication						Sample analysed	Residues as Propamocarb mg/kg	Residue Propamocab HCl, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)				
Spain, 2004	840 SL	Drench	15.9	20000	2	0	Fruit	< 0.008*	< 0.01	RA 2554/04
Vulcano	530 g ai/L	Drip	1.59	100	2	1	Fruit	< 0.008*	< 0.01	
		Irrigation				3	Fruit	< 0.008*	< 0.01	GH
						7	Fruit	< 0.008*	< 0.01	
						14	Fruit	< 0.008*	< 0.01	
Spain, 2001	840 SL	Drench	16.0	20300	2	0	Fruit	0.63	0.75*	C024908
Deltex F1	530 g ai/L			-		15	Fruit	1.0	1.2*	GH
(Galia)		Drip	2.0	19930	2	0	Peel	1.9	2.3*	
		Irrigation		1600		15	Peel	2.0	2.4*	
						0	Pulp	0.62	0.74*	
						15	Pulp	0.53	0.63*	
Spain, 2001	840 SL	Drench	16.0	20000	2	0	Fruit	0.18	0.22*	C024908
Deltex F1	530 g ai/L	Drip	2.0	2340	2	14	Fruit	0.21	0.25*	GH
(Galia)		Irrigation				0	Peel	0.35	0.42*	
						14	Peel	0.4	0.48*	
						0	Pulp	0.04	0.05*	
						14	Pulp	0.06	0.07*	
Spain, 2001	840 SL	Drench	16.0	20000	2	0	Fruit	0.36	0.43*	C024908
Deltex F	530 g ai/L	Drip	2.0	2610	2	13	Fruit	0.45	0.54*	GH
(Galia)		Irrigation				0	Peel	1.1	1.3*	
						13	Peel	1.0	1.2*	
						0	Pulp	0.29	0.35*	
						13	Pulp	0.17	0.2*	
Spain	722 SL	Drench	22.0	20000	2	0	Fruit	0.17*	0.20*	C020966
2001	722 g ai/L	Spray	2.1-2.3	492-	2	13	Fruit	0.10*	0.12*	F
Pinonet				538		0	Peel	0.07*	0.09*	
						13	Peel	0.30*	0.36*	
						0	Pulp	0.03*	0.04*	
						13	Pulp	0.01*	0.02*	
Spain	722 SL	Drench	22.0	20000	2	0	Fruit	1.4*	1.7*	C020966
2001	722 g ai/L	Spray	2.1	500	2	14	Fruit	0.93*	1.1*	F
Pinonet						0	Peel	1.7*	2.0*	
						14	Peel	1.3*	1.6*	
						0	Pulp	0.29*	0.35*	
						14	Pulp	0.03*	0.03*	
Spain	722 SL	Drench	22.0	20000	2	0	Fruit	0.35*	0.41*	C020952
2001	722 g ai/L	Spray	2.2	514	2	14	Fruit	0.12*	0.15*	GH
Pinonet						0	Peel	0.73*	0.87*	
						14	Peel	0.39*	0.46*	
						0	Pulp	0.08*	0.1*	
						14	Pulp	0.02*	0.02*	
Spain	722 SL	Drench	22.0	20000	2	0	Fruit	0.81*	0.97*	C020952
2001	722 g ai/L	Spray	2.2	521	2	14	Fruit	0.56*	0.67*	GH
Pinonet						0	Peel	1.4*	1.7*	
						14	Peel	0.92*	1.1*	
						0	Pulp	0.19*	0.23*	
						14	Pulp	0.03*	0.04*	
Spain	722 SL	Drench	22	20000	2	0	Fruit	0.84*	1.0*	C017451
2000	722 g ai/L	Spray	2.1	999	2	3	Fruit	0.34*	0.4*	F
Sancho						7	Fruit	0.92*	1.1*	
						14	Fruit	0.25*	0.3*	
						21	Fruit	0.17*	0.2*	
						0	Peel	1.0*	1.2*	
						3	Peel	1.0*	1.2*	
						7	Peel	0.50*	0.6*	
						14	Peel	0.67*	0.8*	
						21	Peel	0.42*	0.5*	
						0	Pulp	0.008*	0.01*	
						3	Pulp	0.008*	0.01*	
						7	Pulp	0.008*	0.01*	
						14	Pulp	0.008*	0.01*	
						21	Pulp	0.008*	0.01*	

Country, Year of trial *Variety*	Aplication					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residue Propamocab HCl, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.					
France	722 SL	Drench	24	22230	2	0	Fruit	0.84*	1.0*	C016109
2000	722 g ai/L	Spray	2.1	1004	2	4	Fruit	0.42*	0.5*	
Lunastar						7	Fruit	0.42*	0.5*	GH
						14	Fruit	0.17*	0.2*	
						21	Fruit	0.08*	0.1*	
						0	Peel	1.8*	2.2*	
						4	Peel	1.1*	1.3*	
						7	Peel	1.8*	2.2*	
						14	Peel	0.7*	0.8*	
						21	Peel	0.25*	0.3*	
						0	Pulp	0.08*	0.1*	
						4	Pulp	0.08*	0.1*	
						7	Pulp	0.04*	0.05*	
						14	Pulp	0.02*	0.02*	
						21	Pulp	0.08*	0.01*	
Spain	722 SL	Drench	22	20000	2	0	Fruit	0.4*	0.5*	C016109
2000	722 g ai/L	Spray	2.2	1031	2	3	Fruit	0.34*	0.4*	
Sancho						7	Fruit	0.34*	0.4*	GH
						14	Fruit	0.25*	0.3*	
						21	Fruit	0.07*	0.08*	
						0	Peel	1.0*	1.2*	
						3	Peel	0.34*	0.4*	
						7	Peel	0.34*	0.4*	
						14	Peel	0.42*	0.5*	
						21	Peel	0.25*	0.3*	
						0	Pulp	0.25*	0.21*	
						3	Pulp	0.01*	0.01*	
						7	Pulp	0.02*	0.02*	
						14	Pulp	< 0.01*	< 0.01*	
						21	Pulp	0.01*	0.01*	
Spain	722 SL	Drench	22	20000	2	0	Fruit	0.17*	0.2*	C016109
2000	722 g ai/L	Spray	2.1	992	2	3	Fruit	0.18*	0.2*	
Sancho						7	Fruit	0.18*	0.2*	GH
						14	Fruit	0.08*	0.1*	
						21	Fruit	0.04*	0.05*	
						0	Peel	0.50*	0.6*	
						3	Peel	0.60*	0.8*	
						7	Peel	0.3*	0.3*	
						14	Peel	0.20*	0.3*	
						21	Peel	0.17*	0.2*	
						0	Pulp	< 0.01*	< 0.01*	
						3	Pulp	< 0.01*	< 0.01*	
						7	Pulp	< 0.01*	< 0.01*	
						14	Pulp	< 0.01*	< 0.01*	
						21	Pulp	0.17*	0.2*	
USA, 1997	750 SC	Spray	1.0	191-195	5	2	Fruit	0.29*		B002741 F
Hale´s best										
USA, 1997	750 SC	Spray	1.0	187	5	2	Fruit	1.4*		B002741 F
USA, 1997	750 SC	Spray	1.0	179-199	5	1	Fruit	0.34*		B002741 F
Perlita										
USA, 1997	750 SC	Spray	1.0	182-195	5	2	Fruit	0.77*		B002741 F
Tam uvalde										
USA, 1997	750 SC	Spray	1.0	185-198	5	2	Fruit	0.44*		B002741 F

Country, Year of trial *Variety*	Aplication					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residue Propamocab HCl, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.					
USA, 1997	750 SC	Spray	1.0	185-198	5	2	Fruit	0.29		B002741 F
USA, 1997 *Top mark*	750 SC	Spray	1.0	187-188	5	1 2 4 6 8	Fruit	0.90* 0.66* 0.60* 0.50* 0.26*		B002741 F

*actual value reported

Summer squash

Six field trials were reported with propamocarb in summer squash, from the USA, conducted in 1997 (Table 38).

Table 38: Residue field trials with propamocarb hydrochloride conducted in summer squash received foliar treatment (Report B002741).

Country, Year of trial *Variety*	Application					PHI (Days	Residues as Propamocarb mg/kg
	Form.	Method	kg ai/ha	Water L/ha	No.		
USA, 1997 *Supreme*	750 SC	Spray	1.0	191-195	5	2	0.99*
USA, 1997 *E Yellow Straightneck*	750 SC	Spray	1.0	187	5	2	0.49*
USA, 1997 *Dark Green Zucchini*	750 SC	Spray	1.0	179-199	5	2	0.37*
USA, 1997 *Early Polific Strain*	750 SC	Spray	1.0	182-195	5	2	1.1*
USA, 1997 Samma Yellow	750 SC	Spray	1.0	185-198	5	2	0.43*
USA, 1997 *Straightneck Early*	750 SC	Spray	1.0	187-188	5	1 2 4 6 8	0.51* 0.64* 0.63* 0.58* 0.48*

Peppers, sweet

Thirty five trials were conducted with propamocarb hydrochloride on greenhouse (GH) grown sweet peppers in Europe from 1999 to 2004 and 10 trials in field (F) grown sweet peppers from the USA in 1997 using drench, drip or foliar treatment (Table 39).

Table 39. Residue trials with propamocarb hydrochloride conducted on sweet pepper in the greenhouse (Europe) and in the field (USA).

Country, Year of trial *Variety*	Application					PHI (Days	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no.
	Form.	Method	kg ai/ha	Water L/ha	No.				
Belgium 2004, *Rapido*	840 SL 530 g ai/L	Drench irrig. Drip irrig.	31.8-15.9 1.59	20000 250	2 1 4	0 1 3	0.20* 0.12* 0.16*	0.24 0.14 0.19	RA 2559/04
Germany 2001 *Bell Boy F1*	840 SL 530 g ai/L	Seedbed drench Drench/drip.	16-32 1.9	20000 1800	2 4	0 3	0.08 0.10	0.10* 0.13*	C024482

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No	PHI (Days	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no.
Germany,2001	840 SL	Seedbed	15-32	20000	2	0	0.09	0.11*	C024482
Mazurka RZ	530 g ai/L	drench Drench/drip.	1.9-2.5	1800	4	3	0.11	0.13*	
Greece	722 SL	Seedbed	72.2-36	20000	2	0	< 0.03*	< 0.04*	C016110
2000	722 g	drench				1	0.05*	0.06*	
Balo	ai/L	Drench/drip.	2.4	1667	3	3	< 0.008*	< 0.01*	
						7	< 0.008*	< 0.01*	
						14	< 0.008*	< 0.01*	
Greece	840 SL	Seedbed	16-32	20000	2	0	0.16	0.19*	C024482
2001 *Florina*	530 g ai/L	drench Drench/drip.	3.31	3125	4	3	1.0	1.2*	
Greece, 2003	840 SL	Seedbed	15.9	5000-	1	0	0.07	0.08*	C048490
Raiko RZ	530 g ai/L	drench Drench irrig..	1.59	10000 1267	1 4	3	0.14	0.17*	
Italy	722 SL	Seedbed	74.4-	20000	2	0	< 0.008*	< 0.01*	C016110
2000	722 g	drench	35.7			1	< 0.008*	< 0.01*	
Linares	ai/L	Drench/drip.	1.93	1333	3	3	< 0.008*	< 0.01*	
						7	< 0.008*	< 0.01*	
						14	< 0.008*	< 0.01*	
Italy, 2001	840 SL	Seedbed	16-32	20000	2	0	0.61	0.73*	C024482
Magnigold	530 g ai/L	drench Drench/drip	3.22	3030	4	3	0.22	0.26*	
Italy	840 SL	Drench irrig.	31.8-	20000	2	0	0.01*	0.01	RA 2559/04
2004	530 g		15.9			1	0.02*	0.02	
Adina	ai/L	Drip irrig.	1.59	100	4	3	0.02*	0.02	
Italy, 2003	840 SL	Seedbed	15.9	5000-	2	0	0.008	< 0.01*	C048490
Valdor	530 g ai/L	drench Drench irrig..	1.59	10000 1267	4	3	0.008	< 0.01*	
Netherlands	722 SL	Seedbed	29.0	50000	1	0	< 0.008	< 0.01*	C016842
1999	722 g	drench	0.72-	1500-	4	3	< 0.008	< 0.01*	
Mazurka	ai/L	Drench	2.17	3000		5	< 0.008	< 0.01*	
						7	< 0.008	< 0.01*	
Netherlands	722 SL	Seedbed	29.0	50000	1	0	< 0.008	< 0.01*	C016842
1999	722 g	drench	0.72-	1500-	4	3	< 0.008	< 0.01*	
Fiesta	ai/L	Drench	2.17	3000		5	< 0.008	< 0.01*	
						7	< 0.008	< 0.01*	
Netherlands	722 SL	Seedbed	29.0	50000	1	0	< 0.008	< 0.01*	C016842
1999	722 g	drench				3	< 0.008	< 0.01*	
Mazurka	ai/L	Drench	0.72-	1500-	4	5	< 0.008	< 0.01*	
			2.17	3000		7	< 0.008	< 0.01*	
Netherlands	722 SL	Seedbed	29.0	50000	1	0	< 0.008	< 0.01*	C016842
1999	722 g	drench				3	< 0.008	< 0.01*	
Fiesta	ai/L	Drench	0.72-	1500-	4	5	< 0.008	< 0.01*	
			2.17	3000		7	< 0.008	< 0.01*	
Netherlands	722 SL	Seedbed	29.0	50000	1	0	< 0.008	< 0.01*	C016842
1999	722 g	drench				3	0.06	0.07*	
Spirit	ai/L	Drench	0.72-	1500-	4	5	< 0.008	< 0.01*	
			2.17	3000		7	< 0.008	< 0.01*	
Netherlands	722 SL	Seedbed	29.0	50000	1	0	< 0.008	< 0.01*	C016842
1999	722 g	drench				3	< 0.008	< 0.01*	
Basanova	ai/L	Drench	0.72-	1500-	4	5	< 0.008	< 0.01*	
			2.17	3000		7	< 0.008	< 0.01*	

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No	PHI (Days	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no.
Netherlands 1999 *Spirit*	722 SL 722 g ai/L	Seedbed drench Drench	29.0 0.72- 2.17	50000 1500- 3000	1 4	0 3 5 7	0.10 <u>< 0.008</u> < 0.008 0.008	0.12* < 0.01* < 0.01* 0.01*	C016842
Netherlands 1999 *Basanova*	722 SL 722 g ai/L	Seedbed drench Drench	29.0 0.72- 2.17	50000 1500- 3000	1 4	0 3 5 7	< 0.008 <u>< 0.008</u> < 0.008 < 0.008	< 0.01* < 0.01* < 0.01* < 0.01*	C016842
Netherlands 2003, *Zerto*	840 SL 530 g ai/L	Seedbed drench Drench irrig..	15.9 1.59	5000- 10000 1267	2 4	0 3	0.02 <u>0.03</u>	0.02* 0.03*	C048490
Netherlands 2004, *Festivo*	840 SL 530 g ai/L	Drench irrig. Drip irrig..	31.8- 15.9 1.59	20000 250	2 4	0 1 3	0.15* 0.18* <u>0.15*</u>	0.18 0.21 0.18	RA 2559/04
Spain, 2003 *Flamenco*	840 SL 530 g ai/L	Seedbed drench Drench irrig..	15.9 1.59	5000- 10000 1267	2 4	0 3	0.02 <u>0.008</u>	0.02* < 0.01*	C048490
Spain 2004 *Olmo*	840 SL 530 g ai/L	Drench irrig. Drip irrig.	31.8- 15.9 0.60 1.59	20000 - 100	2 1 4	0 1 3	0.12* 0.11* <u>0.08*</u>	0.14 0.13 0.10	RA 2559/04
Spain 2000 *Turia*	722 SL 722 g ai/L	Seedbed drench Drench/drip.	72.2-36 5.55	20000 3846	2 3	0 1 3 7 14	0.04* 0.02* 0.05* 0.03* 0.03*	0.05* 0.02* 0.06* 0.04* 0.04*	C016110
Spain 2000 *Taliano*	722 SL 722 g ai/L	Seedbed drench Drench/drip.	72.2-36 2.7	20000 1860- 9354	2 3	0 1 3 14	< 0.008* < 0.008* < 0.008* 0.02*	< 0.01* < 0.01* < 0.01* 0.02*	C016110
Spain 2000 *Cipari*	722 SL 722 g ai/L	Seedbed drench Drench/drip.	72.2-36 1.5	20000 1082	2 3	0 1 3 7 14	< 0.008* 0.008* 0.008* 0.008* 0.008*	< 0.01* 0.01* 0.01* 0.01* 0.01*	C016110
USA, 1997 *Wonder*	750 SC 375 g ai/L	Spray	1.0	186- 191	5	5	<u>0.27*</u>	0.32	B003364
USA, 1997 *Enterprise*	750 SC 375 g ai/L	Spray	1.0	165- 182	5	5	<u>0.62*</u>	0.74	B003364
USA, 1997 *Camelot X3R*	750 SC 375 g ai/L	Spray	1.0	182- 192	5	4	<u>0.32*</u>	0.38	B003364
US, 1997 *Jupiter*	750 SC 375 g ai/L	Spray	1.0	183- 189	5	5	<u>0.07*</u>	0.08	B003364
USA, 1997 *Bell*	750 SC 375 g ai/L	Spray	1.0	174- 197	5	5	<u>1.8*</u>	1.4	B003364
USA, 1997 *Jalepeno*	750 SC 375 g ai/L	Spray	1.0	187- 190	5	5	<u>0.16*</u>	0.19	B003364
USA, 1997 *Big Jim*	750 SC 375 g ai/L	Spray	1.0	176- 195	5	5	<u>0.23*</u>	0.27	B003364

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No	PHI (Days	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no.
USA, 1997 *Jupiter*	750 SC 375 g ai/L	Spray	1.0	188-190	5	5	0.26*	0.31	B003364
USA, 1997 *TMR23*	750 SC 375 g ai/L	Spray	1.0	187-190	5	5	0.98*	1.2	B003364
USA, 1997 *Yolo Wonder B*	750 SC 375 g ai/L	Spray	1.0	187-190	5	1 3 5 7 9	0.18* 0.32* 0.20* 0.16* 0.18*	0.21 0.38 0.24 0.19 0.21	B003364

*actual value reported

Tomato

Fourty four tomato trials from Europe and 18 trials from the USA were reported. The European results were reported from either greenhouses (GH) or field (F) trials while the US data was all from field trials. The results are shown in Table 40.

Table 40. Field and glass house residue trials with propamocarb hydrochloride conducted on tomato.

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no. F/GH
Belgium 2004 *Clotilde*	840 SL 530 g ai/L	Drench irrig. Drip irrig.	15.9 1.59	20000 250[2]	2 4	0 1 3 7 14	0.06* 0.05* 0.07* 0.04* 0.02*	0.07 0.06 0.08 0.05 0.02	RA 2506/04 GH
Germany 2004 *Culina*	840 SL 530 g ai/L	Drench irrig. Drip irrig.	15.9 1.59	20000 100[2]	2 4	0 1 3 7 14	< 0.008* < 0.008* < 0.008* < 0.008* < 0.008*	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	RA 2506/04 GH
Italy, 2004 *Conchita*	840 SL 530 g ai/L	Drench irrig. Drip irrig.	15.9 1.59	20000 100[2]	2 4	1 3	< 0.008* < 0.008*	< 0.01 < 0.01	RA 2506/04 GH
Spain, 2004 *Pitenza*	840 SL 530 g ai/L	Drench irrig. Drip irrig.	15.9 0.60-1.59	20000 100	2 5	1 3	0.02* 0.02*	0.02 0.02	RA 2506/04 GH
Germany, 2001, *Rougella RZ F1*	840 SL 530 g ai/L	Seedbed drench Drench/Drip	15.92 1.89-2.02	20026 1763-1914	2 4	1 3	0.02 < 0.008	0.02* < 0.01*	C021852 GH
Netherlands 2001 *Fergie*	840 SL 530 g ai/L	Seedbed drench Drench/Drip	15.78 2.65	19860 2500	2 4	1 3	0.05 0.04	0.06* 0.05*	C021852 GH
Netherlands 2001, *Rapsodie*	840 SL 530 g ai/L	Seedbed drench Drench/Drip	15.90 2.66	20000 2500	2 4	1 3	0.03 0.03	0.03* 0.04*	C021852 GH
Spain, 2001 *Salvador*	840 SL 530 g ai/L	Seedbed drench Drench/Drip	15.96 1.99	20074 2300	2 4	1 3	0.04 0.08	0.05* 0.10*	C021852
France, 2001 *Cobra*	722 SL 722 g ai/L	Seedbed drench Drench	72.2-36.0 3.77-3.62	20000 2607-2328	2 2	0 3 5 7	< 0.008 < 0.008 < 0.008 < 0.008	< 0.01* < 0.01* < 0.01* < 0.01*	C023899 F

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no. F/GH
Greece, 2001 *ACE*	722 SL 722 g ai/L	Seedbed drench Drench	72.2-36.0 3.6	20000 2500	2 2	0 3 5 7	< 0.008 < 0.008 < 0.008 < 0.008	< 0.01* < 0.01* < 0.01* < 0.01*	C023899 F
Italy, 2001 *Italdor*	722 SL 722 g ai/L	Seedbed drench Drench	72.2-36.0 2.41	20000 1667	2 2	0 3 5 7	< 0.008 < 0.008 < 0.008 < 0.008	< 0.01* < 0.01* < 0.01* < 0.01*	C023899 F
Spain, 2001 *Robin*	722 SL 722 g ai/L	Seedbed drench Drench	72.2-36.8 2.9	20000 25000	2 2	0 3 5 7	< 0.008 0.02 0.008 < 0.008	< 0.01* 0.02* 0.01* < 0.01*	C023899 F
Spain 2001 *Robin*	722 SL 722 g ai/L	Seedbed drench Drench	72.2-36.8 2.87	20000 29800	2 2	0 3 5 7	< 0.008 < 0.008 < 0.008 < 0.008	< 0.01* < 0.01* < 0.01* < 0.01*	C023899 F
Germany 2000 *Jamaica*	722 SL 722 g ai/L	Seedbed drench Drench	29.0 2.74-2.77	10000 0 1897-1917	1 4	0 3 5 7	< 0.01* < 0.01* < 0.01* 0.01*	< 0.01* < 0.01* < 0.01* 0.01*	C015427 GH
Germany 2000 *Rougella*	722 SL 722 g ai/L	Seedbed drench Drench	28.5 2.6-2.77	98530 1621-1905	1 4	0 3 5 7	0.05* 0.05* 0.09* 0.04*	0.06* 0.06* 0.1* 0.05*	C015427 GH
Germany 2000 *Rougella*	722 SL 722 g ai/L	Seedbed drench Drench	28.4 2.2	98426 1841	1 4	0 3 5 7	< 0.01* < 0.01* < 0.01* 0.02*	< 0.01* < 0.01* < 0.01* 0.02*	C015427 GH
Germany 2000 *Rabor*	722 SL 722 g ai/L	Seedbed drench Drench	29.0 3.6	39062 5 2500	1 4	0 3 5 7	< 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01*	C015427 GH
Germany 2000 *Transfero*	722 SL 722 g ai/L	Seedbed drench Drench	29.2 3.6	39523 2 2500	1 4	0 3 5 7	< 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01*	C015427 GH
Germany 2000 *Rougella*	722 SL 722 g ai/L	Seedbed drench Drench	29.0 4.6	15703 1 3185	1 4	0 3 5 7	< 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01*	C015427 GH
Germany 2000 *Halifax*	722 SL 722 g ai/L	Seedbed drench Drench	29.0 4.6	15429 7 3185	1 4	0 3 5 7	< 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01*	C015427 GH
Spain, 2000 *Daniela*	722 SL 722 g ai/L	Seedbed drench Drench	29.0 3.3	20000 2301-4603	1 4	0 3 5 7	< 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01*	C015427 GH
Spain, 2000 *Daniela*	722 SL 722 g ai/L	Seedbed drench Drench	29.0 3.3	20000 2286-4571	1 4	0 3 5 7	< 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01*	C015427 GH

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no. F/GH
France, 2000 *Frya*	722 SL 722 g ai/L	Drench Drench/Drip Irrigation	72.2-36.0 2.0	20000 1877	2 2	0 1 3 7 14	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	C015573 GH
Greece, 2000 *Garnell 534 Emben*	722 SL 722 g ai/L	Drench Drench/Drip Irrigation	72.2-36.0 1.8	20000 1664	1 2	0 1 3 7 14	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	C015573 GH
Italy, 2000 *Vivaldi HY*	722 SL 722 g ai/L	Drench Drench/Drip Irrigation	72.2-36.0 4.3	20118 4000	1 2	0 1 3 7 14	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	C015573 GH
Spain, 2000 *James Bond*	722 SL 722 g ai/L	Drench Drench/ Drip Irrigation	72.2-36.0 2.6-2.7	20000 2389-2535	1 2	0 1 3 7 14	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	C015573 GH
Spain, 2000 *Raff*	722 SL 722 g ai/L	Drench Drench/ Drip Irrigation	73.6-36.0 2.0-2.1	20384 1844-1984	1 2	0 1 3 7 14	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	< 0.01* < 0.01* < 0.01* < 0.01* < 0.01*	C015573 GH
USA, 1996 *Celebrity*	750 SC 375 g ai/L	Spray	1.32	210	5	5	0.16*	0.19	C002417 F
USA, 1996 *8892*	750 SC 375 g ai/L	Spray	1.32	195	5	5	0.25*	0.30	C002417 F
USA, 1996 *UC-82B*	750 SC 375 g ai/L	Spray	1.32	190	5	5	0.86*	1.0	C002417 F
USA, 1996 *Jackpot*	750 SC 375 g ai/L	Spray	1.32	192	5	5	0.94*	1.1	C002417 F
USA, 1996 *3155*	750 SC 375 g ai/L	Spray	1.32	188	5	5	0.65*	0.78	C002417 F
USA, 1996 *512*	750 SC 375 g ai/L	Spray	1.32	187	5	5	0.68*	0.81	C002417 F
USA, 1996 *Rio Grande*	750 SC 375 g ai/L	Spray	1.32	193	5	5	0.60*	0.72	C002417 F
USA, 1996 *6229*	750 SC 375 g ai/L	Spray	1.32	187	5	5	0.61*	0.73	C002417 F
USA, 1996 *Rio Grande*	750 SC 375 g ai/L	Spray	1.32	187	5	5	0.23*	0.27	C002417 F
USA, 1996 *Rio Grande*	750 SC 375 g ai/L	Spray	1.32	195	5	5	0.51*	0.61	C002417 F
USA, 1996 *Celebrity*	750 SC 375 g ai/L	Spray	1.32	224	5	5	0.14*	0.17	C002417 F
USA, 1996 *AgriSet*	750 SC 375 g ai/L	Spray	1.32	192	5	5	0.40*	0.48	C002417 F

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no. F/GH
USA, 1996 *AgriSet*	750 SC 375 g ai/L	Spray	1.32	184	5	5	0.61*	0.73	C002417 F
USA, 1996 *Heinz 9035*	750 SC 375 g ai/L	Spray	1.32	190	5	5	0.34*	0.41	C002417 F
USA, 1996 *CAL-ACE*	750 SC 375 g ai/L	Spray	1.32	195	5	5	0.37*	0.44	C002417 F
USA, 1996 *Apex 1000*	750 SC 375 g ai/L	Spray	1.32	190	5	5	1.4*	1.6	C002417 F
USA, 1996 *Better Boy*	750 SC 375 g ai/L	Spray	1.32	190	5	1 3 5 7 9	0.52* 0.47* 0.38* 1.1* 0.46*	0.62 0.56 0.45 1.3 0.55	C002417 F
USA, 1996 *Shady Lady*	750 SC 375 g ai/L	Spray	1.32	193	5	1 3 5 7 9	0.97* 0.62* 0.52* 0.35* 0.35*	1.2 0.74 0.44 0.42 0.42	C002417 F

*actual value reported

Lettuce

Sixty eight greenhouse (GH) and field (F) trials were with propamocarb hydrochloride were reported for lettuce. The propamocarb was applied either as a drench and/or foliar spray in Europe and USA between 1997 and 2003. The results are shown in Table 41.

Table 41. Results of residue trials with propamocarb hydrochloride conducted in lettuce.

Country, Year, *Variety*	Application Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues as Propamocarb HCL, mg/kg	Report F/GH
France, 1993 *Batavia*	722 SL 722g ai/L	Spray	1.08	1000	4	21 40	Head	20 10	24* 12*	A85676 GH
France, 1993 *Batavia*	722 SL 722g ai/L	Spray	1.44	1000	4	21 40	Head	39 11	47* 13*	A85676 GH
France. 1993 *Batavia*	722 SL 722g ai/L	Spray	1.44	1000	4	21 28	Head	40 23	48* 28*	A85676 GH
France, 1993 *Ramona*	722 SL 722g ai/L	Spray	1.08	1000	4	21 28	Head	14 9.2	17* 11*	A85676 GH
France, 1993 *Ramona*	722 SL 722g ai/L	Spray	1.44	1000	4	21 28	Head	15 18	18* 14*	A85676 GH
France, 1993 *Ramona*	722 SL 722g ai/L	Spray	1.44	1000	4	20	Head	24	29*	A85676 GH
France,. 1994 *Samourai*	722 SL 722g ai/L	Spray	1.1	500	3	0 21	Head	24 4.9	29* 5.9*	A83358 GH
France, 1994 *Canasta*	722 SL 722g ai/L	Spray	1.1	1000	3	0 20	Head	22 1.2	26* 1.4*	A85675 GH
France, 1994 *Canasta*	722 SL 722g ai/L	Spray	1.3	1000	3	0 20	Head	24. 1.7	29* 2.0*	A85675 GH
France, 1994 *Rosalba*	722 SL 722g ai/L	Spray	1.1	-	3	0 21	Head	18 6.5	21* 7.8*	A85679 GH

Country, Year, *Variety*	Application					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues as Propamocarb HCL, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.					
France	840 SL	Seedbed	15.9	20000	2	0	Head	17	20*	C01573
2000	530 g ai/L	drench				14	Head	7.1	8.5*	4
Macarena		Spray	1.25-1.43	470-540	2	21	Head	0.56	0.90*	GH
						28	Head	0.08	0.1*	
France	SL	Seedbed	72.2-36.1	20000	2	0	Head	54	65*	C02295
2001	722g ai/L	drench				7	Head	12*	15*	1
Nadine						14	Head	3.2*	3.8*	F
		Spray		400-1000	2	21	Head	0.3*	0.4*	
			1.66			14	Head [1]	1.7*	2.0*	
						14	Outer Leaves	11*	13*	
France	SL	Seedbed	72.2-36.1	20000	2	0	Head	103*	123*	C02295
2001	722g ai/L	drench				7	Head	7.9*	9.5*	1
Macarena						14	Head	1.0*	1.2*	
		Spray		400-1000	2	21	Head	0.1*	0.2*	F
			1.66			14	Head [1]	0.1*	0.2*	
						14	Outer Leaves	3.2*	3.8*	
France	SL	Seedbed	72.2-36.1	20000	2	0	Head	11	13*	C02415
2001	722g ai/L	drench				13	Head	8.1	9.7*	7
Sensai		Spray		400-1000	2	21	Head	2.9	3.5*	
			1.66							
France, 2003	840 SL	Seedbed	15.90	20000	2	0	Head	31*	43*	RA
Sensai	530g ai/L	drench				3	Head	16*	19*	2712/03
		Spray	1.33	400	2	7	Head	16*	19*	GH
						14	Head	13*	15*	
						21	Head	8.2*	9.8*	
France, 2002	722 SL	Seedbed	72.2-36.1	20000	2	0	Head	69*	83*	C03377
Laitue Batavia	722g ai/L	drench				21	Head	0.17*	0.2*	F
Eole		Spray		400	2					
			1.66							
France	722 SL	Seedbed	72.2-36.1	20000	2	0	Head	81*	97*	C03371
2002	722g ai/L	drench				21	Head	2.2*	2.7*	7
Autan		Spray		400	2					F
			1.66							
France	722 SL	Seedbed	72.2-36.1	20000	2	0	Head	25	30*	C01557
2000	722g ai/L	drench				14	Head	14	17*	2
Mistral						21	Head	11	13*	F
		Spray		1000	2	28	Head	10	12*	
			1.66							
France	722 SL	Seedbed	72.2-36.1	20000	2	0	Head	39	46*	C01557
2000	722g ai/L	drench				14	Head	31	37*	2
Mistral						20	Head	31	37*	F
		Spray		1000	2	27	Head	23	28*	
			1.66							
France	722 SL	Seedbed	72.2-36.1	20000	2	0	Head	71	85*	C01542
2000	722g ai/L	drench				14	Head	40	48*	3
Flandra RZ						21	Head	32	31*	GH
		Spray		472-830	2	28	Head	14	17*	
			1.66			35	Head	13	16*	
France	722 SL	Seedbed	72.2-36.1	20000	2	0	Head	25	30*	C01542
2000	722g ai/L	drench				14	Head	7.9	9.4*	3
RZ 42-77						21	Head	1.5	1.8*	GH
		Spray		475-838	2	28	Head	0.08	0.1*	
			1.66			35	Head	< 0.08	< 0.1*	

Country, Year, *Variety*	Application					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues as Propamocarb HCL, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.					
France	722 SL	Seedbed	72.2-	20000	2	0	Head	22	26*	C01542
2001	722g ai/L	drench	36.1			14	Head	9.2	11*	6
Macarena		Spray		480-520	2	21	Head	0.7	0.8*	GH
			1.66			28	Head	0.1	0.14*	
France	722 SL	Seedbed	72.2-	20000	2	0	Head	5.1	6.1*	C01542
2002	722g ai/L	drench	36.1			14	Head	2.0	2.4*	6
Macarena		Spray		470-520	2	21	Head	1.7	2.0*	GH
			1.66			28	Head	< 0.008	< 0.01*	
Germany	840 SL	Seedbed	15.9	20000	2	0	Head	26	31*	C01573
2000	530 g ai/L	drench				14	Head	4.5	5.4*	4
Macarena		Spray	1.3-1.4	500-820	2	21	Head	1.7	2.0*	GH
						28	Head	0.03	0.04*	
Germany	840 SL	Seedbed	15.9	20000	2	0	Head	25	30*	C01573
2000	530 g ai/L	drench				14	Head	8.1	9.6*	4
Flandria		Spray	1.3-1.4	400-630	2	21	Head	1.1	1.3*	GH
						28	Head	0.05	0.06*	
Germany	SL	Seedbed	72.2-	20000	2	0	Head	44*	53*	C02295
2001	722g ai/L	drench	36.1			7	Head	6.9*	8.3*	1
Comina						14	Head	1.9*	2.3*	F
		Spray		400-	2	21	Head	0.3*	0.4*	
			1.66	1000		14	Head [1]	0.6*	0.7*	
						14	Outer Leaves	14*	16*	
Germany	SL	Seedbed	72.2-	20000	2	0	Head	60*	72*	C02295
2001	722g ai/L	drench	36.1			7	Head	9.3*	11*	1
Einstein						14	Head	4.2*	5.0*	
		Spray		400-	2	21	Head	2.5*	3.0*	F
			1.66	1000		14	Head [1]	0.3*	0.3*	
						14	Outer Leaves	7.5*	9.0*	
Germany	SL	Seedbed	72.2-	20000	2	0	Head	62*	74*	C02295
2001	722g ai/L	drench	36.1			7	Head	4.6*	5.5*	1
Nadine						14	Head	0.7*	0.8*	
		Spray		400-	2	21	Head	0.04*	0.05*	F
			1.66	1000		14	Head [1]	0.1*	0.2*	
						14	Outer Leaves	4.5*	5.3*	
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	37	44*	C01542
2000	722g ai/L	drench	36.1			14	Head	16	19*	3
Trobadur RZ						21	Head	10	12*	GH
Greenhouse		Spray		380-630	2	28	Head	9.2	11*	
			1.66			34	Head	5.5	6.6*	
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	50	60*	C01542
2000	722g ai/L	drench	36.1			14	Head	20	24*	3
Tzigone RZ						21	Head	15	18*	GH
Greenhouse		Spray		400-640	2	28	Head	21	25*	
			1.66			34	Head	13	16*	
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	49	59*	
2000	722g ai/L	drench	36.1			14	Head	29	34*	C01542
RZ 42-77						21	Head	12	14*	3
Greenhouse		Spray		476-838	2	28	Head	18	21*	GH
			1.66			35	Head	6.6	7.9*	
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	11	13*	C01542
2000	722g ai/L	drench	36.1			14	Head	17	20*	3
RZ 42-77						21	Head	9.2	11*	GH
Greenhouse		Spray		495-819	2	28	Head	4.3	5.1*	
			1.66			35	Head	7.7	9.2*	

Country, Year, *Variety*	Application					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues as Propamocarb HCL, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.					
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	82	98*	C03371
2002	722g ai/L	drench	36.1			21	Head	0.64	0.76*	7
Nadine		Spray		600	2					F
			1.66							
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	105	125*	C03371
2002	722g ai/L	drench	36.1			21	Head	0.57	0.68*	7
Nadine		Spray		400	2					F
			1.66							
Germany	840 SL	Seedbed	15.9	18750	2	0	Head	37*	44*	RA
2003	530g ai/L	drench				3	Head	14*	17*	2712/03
Alexandria		Spray	1.33	400	2	7	Head	11*	13*	GH
						14	Head	3.9*	4.7*	
						21	Head	0.64*	0.76*	
Germany	840 SL	Seedbed	15.9	18750	2	0	Head	31*	37*	RA
2003	530g ai/L	drench				3	Head	16*	19*	2712/03
Alexandria		Spray	1.33	400	2	7	Head	7.4*	8.8*	GH
						14	Head	4.0*	4.8*	
						21	Head	0.71*	0.85*	
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	20	24*	C01542
2000	722g ai/L	drench	36.1			14	Head	13	15*	6
Elton		Spray		399-	2	21	Head	1.8	2.2*	GH
			1.66	1019		28	Head	< 0.008	< 0.01*	
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	12	14*	C01542
2000	722g ai/L	drench	36.1			14	Head	7.4	8.8*	6
Flandria		Spray		562-638	2	21	Head	0.4	0.5*	GH
			1.66			28	Head	0.008	0.01*	
Germany	722 SL	Seedbed	72.2-	20000	2	0	Head	31	37*	C01542
2000	722g ai/L	drench	36.1			14	Head	6.5	7.7*	6
Macarena		Spray		480-840	2	21	Head	1.8	2.2*	GH
			1.66			28	Head	1.8	0.05*	
Greece	SL	Seedbed	72.2-	20000	2	0	Head	76	91*	C02415
2001	722g ai/L	drench	36.1			14	Head	13	15*	7
Estivena		Spray		400-	2	21	Head	12	14*	
			1.66	1000						F
Greece	722 SL	Seedbed	72.2-	20000	2	0	Head	28	33*	C01557
2000	722g ai/L	drench	36.1			7	Head	9.2	11*	2
Romana		Spray		581-	2	14	Head	6.0	7.2*	F
			1.66	1018		21	Head	3.3	3.9*	
Greece	840 SL	Seedbed	14.1	18000	2	0	Head	19*	23	C01557
2000	530 g ai/L	drench				14	Head	11*	13	7
Romana		Spray	1.3	600-970	2	21	Head	2.2*	2.6	F
						28	Head	0.84*	1.0	
Italy	840 SL	Seedbed	16.7-	20000	2	0	Head	43*	51	C01557
2000	530 g ai/L	drench	17.2			14	Head	1.8*	2.2	7
Titan		Spray		500-700	2	21	Head	0.07*	0.08	
			1.3			28	Head	< 0.008*	< 0.01	F
Italy, 2000	722 SL	Seedbed	72.2	20000	2	0	Head	35	42*	C01557
Titan	722g ai/L	drench	36.1			14	Head	1.0	1.2*	2
		Spray	1.66	493-727	2	21	Head	0.04	0.05*	F
						28	Head	< 0.008	< 0.01*	

Country, Year, *Variety*	Application: Form.	Method	kg ai/ha	Water L/ha	No.	PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues as Propamocarb HCL, mg/kg	Report F/GH
Italy	840 SL	Seedbed	15.9	20000	2	0	Head	65*	78*	RA
2003	530g ai/L	drench				3	Head	27*	32*	2712/03
Settelune						7	Head	14*	17*	GH
		Spray	1.33	400	2	14	Head	0.92*	1.1*	
						21	Head	0.08*	0.1*	
Japan, 1991	SL	?	1.28	1000	3	7	leaf	22	26*	(2)
Gokuwase	640 g/kg					14		1.8	2.1*	F
shisuko						21		0.10	0.12*	
						28		0.15	0.18*	
Japan, 1991	SL	?	1.28	1000	3	7	leaf	14	17*	(2)
Shinanogreen	640 g/kg					14		0.28	0.33*	F
						21		0.08	0.10*	
						28		0.04	0.05*	
Japan, 1991	SL	?	1.28	1000	3	7	leaf	20	24*	(2)
Gokuwase	640 g/kg					14		1.6	1.9*	F
shisuko						21		0.10	0.12*	
						28		0.09	0.11*	
Japan, 1991	SL	?	1.28	1000	3	7	leaf	16	19*	(2)
Shinanogreen	640 g/kg					14		0.60	0.68*	F
						21		0.11	0.13*	
						28		0.06	0.07*	
Netherland	840 SL	Seedbed	15.9	20000	2	0	Head	58*	69*	RA
2003	530g ai/L	drench				3	Head	32*	38*	2712/03
Alexandria		Spray	1.33	400	2	7	Head	25*	30*	GH
						14	Head	9.8*	12*	
						21	Head	4.2*	5.0*	
Netherland	840 SL	Seedbed	15.9	20000	2	0	Head	53*	63*	RA
2003	530g ai/L	drench				3	Head	30*	36*	2712/03
Alexandria		Spray	1.33	400	2	7	Head	21*	25*	GH
						14	Head	9.4*	11*	
						21	Head	4.0*	4.8*	
Spain, 2000	722 SL	Seedbed	72.2	20000	2	0	Head	27	32*	C01557
Inverna	722g ai/L	drench	36.1			14	Head	4.7	5.6*	2
		Spray	1.66	670-988	2	21	Head	0.08	0.1*	F
						28	Head	< 0.008	< 0.01*	
Spain, 2000	722 SL	Seedbed	72.2	20000	1	0	Head	10	12*	C01542
Cabezo	722g ai/L	drench	36.1	20000	1	14	Head	3.4	4.1*	3
Greenhouse		Spray	1.66	401-941	1	21	Head	3.3	4.0*	GH
					1	28	Head	1.0	1.2*	
						35	Head	4.4	5.3*	
Spain, 2000	722 SL	Seedbed	72.2-	20000	2	0	Head	29	35*	C01542
Cabezo	722g ai/L	drench	36.1			14	Head	15	18*	3
Greenhouse		Spray		404-	2	21	Head	15	18*	GH
			1.66	1004		28	Head	6.9	8.2*	
						35	Head	2.2	2.6*	
Spain, 2000	722 SL	Seedbed	72.2-	20000	2	0	Head	28	33*	C01542
Cabezo	722g ai/L	drench	36.1			14	Head	14	17*	3
Greenhouse		Spray		384-980	2	21	Head	16	19*	GH
			1.66			28	Head	10	12*	
						35	Head	5.7	6.8*	
Spain	SL	Seedbed	72.2-	20000	2	0	Head	87	104*	C02415
2001	722g ai/L	drench	36.1			13	Head	3.3	4.0*	7
Estivena		Spray		400-	2	21	Head	0.34	0.41*	
			1.66	1000						F
Spain, 2001	SL	Seedbed	72.2-	20000	2	0	Head	86	103*	C02415
Estivena	722g ai/L	drench	36.1			13	Head	2.8	3.4*	7
		Spray		400-	2	20	Head	0.56	0.67*	
			1.66	1000						F

Country, Year, *Variety*	Application					PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues as Propamocarb HCL, mg/kg	Report F/GH
	Form.	Method	kg ai/ha	Water L/ha	No.					
Spain, 2000 *Inverna*	840 SL 530 g ai/L	Seedbed drench Spray	15.8 1.3-1.76	20000 700-1000	2 2	0 14 21 28	Head Head Head Head	24* <u>10</u>* 0.50* 0.03*	29 12 0.60 0.04	C01557 7 F
USA, 1997 *Gene Corp* *Green*	724.5 SL 724.5 g ai/L	Spray	1.6	154-189	4	2	Leaves	<u>41</u>*	49	B002740 F
USA, 1997 *Darkland* *Romaine*	724.5 SL 724.5 g ai/L	Spray	1.6	185-189	4	2	Leaves	<u>31</u>*	36	B002740 F
USA, 1997 *Presidio*	724.5 SL 724.5 g ai/L	Spray	1.6	176-195	4	2	Leaves	<u>10</u>*	12	B002740 F
USA, 1997 *Rapids Waldman*	724.5 SL 724.5 g ai/L	Spray	1.6	187-193	4	1 2 4 6 8	Leaves Leaves Leaves Leaves Leaves	88* <u>60</u>* 60* 45* 50*	105 71.3 72.1 53.2 59.3	B002740 F
USA, 1997 *Black Seeded* *Simpson*	724.5 SL 724.5 g ai/L	Spray	1.6	182-187	4	2	Leaves	<u>51</u>*	61	B002740 F
USA, 1997 *Romaine*	724.5 SL 724.5 g ai/L	Spray	16	171-190	4	2	Leaves	<u>17</u>*	20	B002740 F
USA, 1997 *Blacks Simpson*	724.5 SL 724.5 g ai/L	Spray	1.6	187	4	2	Leaves	<u>86</u>*	102	B002740 F
USA, 1997 *Crispino*	SL 724.5 g ai/L	Spray	1.6	184-191	4	2	Head Head[1]	<u>48</u>* 8.0*	58 9.6	B002740 F
USA, 1997 *Iceberg*	SL 724.5 g ai/L	Spray	1.6	171-190	4	2	Head Head[1]	<u>8.2</u>* 0.21*	9.8 0.3	B002740 F
USA, 1997 *Ithaca*	SL 724.5 g ai/L	Spray	1.6	191	4	1	Head Head[1]	<u>11</u>* 0.31*	13 0.4	B002740 F
USA, 1997 *Magnum*	SL 724.5 g ai/L	Spray	1.6	154-189	4	2	Head Head[1]	<u>11</u>* 0.23*	13 0.3	B002740 F
USA, 1997 *Lagacy*	SL 724.5 g ai/L	Spray	1.6	183-194	4	2	Head Head[1]	<u>19</u>* 0.34*	22 0.4	B002740 F
USA, 1997 *Top Gun*	SL 724.5 g ai/L	Spray	1.6	184-191	4	2	Head Head[1]	<u>9.7</u>* 1.5*	12 1.8	B002740 F
USA 1997	SL 724.5 g ai/L	Spray	1.6	187-193	4	1 2 4 6 8 1 2 4 6 8	Head Head[1]	38* <u>41</u>* 34* 27* 20* 2.1* 2.1* 0.99* 0.64* 0.52*	46 49 41 32 24 2.5 2.5 1.2 0.8 0.6	B002740 F

1 Head without wrapper leaves;

2. only a summary of the trial was provided;

*actual value reported

Spinach

Seven field trials were conducted with propamocarb hydrochloride on spinach were reported from Belgium, Germany, Italy and Spain using foliar application. The results are shown in Table 42.

Table 42. Residues from field trials with Propamocarb hydrochloride conducted in spinach.

Country, Year of trial *Variety*	Application					PHI (Days)	Residues as Propamocarb mg/kg	Report
	Form.	Method	kg ai/ha	Water L/ha	No.			
Belgium 2004, *Mig*	840 SL	Spray	1.325	300	3	0 14	83* 1.6*	RA 2558/04
Germany 2004, *Matador*	840 SL	Spray	1.325	300	3	0 14	73* 18*	RA 2558/04
Germany 2003 *Fentos*	840 SL 530 g ai/L	Spray	1.325	300	3	0 3 7 14 21	79* 22* 13* 2.9* 0.41*	RA-2619/03
Germany 2003 *Matador*	840 SL 530 g ai/L	Spray	1.325	300	3	0 3 7 14	49* 27* 18* 10*	RA-2619/03
Italy, 2004 *Riccio D'america*	840 SL 530 g ai/L	Spray	1.59	500	2	0 3 7 14 21	100* 53* 42* 16* 14*	RA 2557/04
Italy, 2004 *Riccio D'america*	840 SL 530 g ai/L	Spray	1.59	450	2	0 3 7 14 21	54* 52* 37* 8.3* 8.4*	RA 2557/04
Spain 2004 *Dolfin*	840 SL 530 g ai/L	Spray	1.59	400	2	0 3 7 14 21	99* 58* 46* 45* 29*	RA 2557/04

*actual value reported

Potato

Thirty two field trials on potatoes were reported with propamocarb HCl, conducted between 1990 and 2003, using foliar application in Europe (13) and USA (19). The results are shown in Table 43.

Table 43. Residues from field trials with propamocarb hydrochloride conducted in potato, foliar spray.

Country, Year of trial *Variety*	Form.	Application			PHI (Days)	Sample analysed	Residues, as Propamocarb mg/kg	Residues, as propamocarb HCl, mg/kg	Report
		kg ai/ha	Water L/ha	No.					
France 2003, *Spunta*	450 SC 386 g ai/L	0.75	400	6	0 7	Tuber Tuber	< 0.01* < 0.01*	< 0.012 < 0.012	C042791
Germany 1990 *Akula*	549.6 SC 248 g ai/L	0.99	400	6	0 2 5 7	Tuber Tuber Tuber Tuber	< 0.08 < 0.08 < 0.08 < 0.08	< 0.1* < 0.1* < 0.1* < 0.1*	A85312
Germany 1990 *Bintje*	549.6 SC 248 g ai/L	0.99	400	6	0 3 5 7	Tuber Tuber Tuber Tuber	0.25 < 0.08 < 0.08 < 0.08	0.3* < 0.1* < 0.1* < 0.1*	A85312

Country, Year of trial *Variety*	Form.	Application kg ai/ha	Application Water L/ha	Application No.	PHI (Days)	Sample analysed	Residues, as Propamocarb mg/kg	Residues, as propamocarb HCl, mg/kg	Report
Germany 1990 *Hansa*	549.6 SC 248 g ai/L	0.99	400	6	0	Tuber	0.25	0.3*	A85312
					3	Tuber	0.08	0.1*	
					5	Tuber	0.17	0.2*	
					7	Tuber	0.17	0.2*	
Germany 1990 *Hansa*	549.6 SC 248 g ai/L	0.99	400	6	0	Tuber	0.17	0.2*	A85312
					3	Tuber	0.08	0.1*	
					5	Tuber	0.17	0.2*	
					7	Tuber	0.17	0.2*	
Germany 1991 *Celena*	549.6 SC 248 g ai/L	0.99	400	6	0	Tuber	< 0.08	< 0.1*	A85332
					3	Tuber	0.08	0.1*	
					5	Tuber	< 0.08	< 0.1*	
					7	Tuber	< 0.08	< 0.1*	
					0	Tuber, washed	< 0.08	< 0.1*	
					7	Tuber, washed	< 0.08	< 0.1*	
					0	Tuber, peeled	< 0.08	< 0.1*	
					7	Tuber, peeled	≤ 0.08	< 0.1*	
					0	Peel, washed	< 0.08	< 0.1*	
					7	Peel, washed	< 0.08	< 0.1*	
Germany 1991 *Roxy*	549.6 SC 248 g ai/L	0.99	400	6	0	Tuber	< 0.08	< 0.1*	A85332
					3	Tuber	0.08	0.1*	
					5	Tuber	< 0.08	< 0.1*	
					7	Tuber	< 0.08	< 0.1*	
					0	Tuber, washed	< 0.08	< 0.1*	
					7	Tuber, washed	< 0.08	< 0.1*	
					0	Tuber, peeled	< 0.08	< 0.1*	
					7	Tuber, peeled	≤ 0.08	< 0.1*	
					0	Peel, washed	0.08	0.1*	
					7	Peel, washed	< 0.08	< 0.1*	
Germany 1991 *Grandifolia*	549.6 SC 248 g ai/L	0.99	400	6	0	Tuber	0.08	0.1*	A85332
					3	Tuber	< 0.08	< 0.1*	
					5	Tuber	< 0.08	< 0.1*	
					7	Tuber	< 0.08	< 0.1*	
Germany 1992 *Grandifolia*	549.6 SC 248 g ai/L	1.2	400	6	0	Tuber	< 0.08	< 0.1*	A85349
					3	Tuber	< 0.08	< 0.1*	
					5	Tuber	< 0.08	< 0.1*	
					7	Tuber	< 0.08	< 0.1*	
Germany 1992 *Sommergold*	549.6 SC 248 g ai/L	0.995	400	6	0	Tuber	< 0.08	< 0.1*	A85349
					3	Tuber	< 0.08	< 0.1*	
					5	Tuber	< 0.08	< 0.1*	
					7	Tuber	< 0.08	< 0.1*	
Germany 1992 *Anosta*	549.6 SC 248 g ai/L	1.2 – 1.33	400	6	0	Tuber	< 0.08	< 0.1*	A85349
					3	Tuber	< 0.08	< 0.1*	
					5	Tuber	< 0.08	< 0.1*	
					7	Tuber	< 0.08	< 0.1*	
Germany 2003, *Cilena*	450 SC 375 g ai/L	0.75	600	6	0	Tuber	< 0.01*	< 0.012	C042791
					7	Tuber	< 0.01*	< 0.012	
UK, 2003 *Spey*	450 SC 375 g ai/L	0.75	400	6	0	Tuber	< 0.01*	< 0.012	C042791
					7	Tuber	< 0.01*	< 0.012	
USA, 1996 *Superior*	750 SC 375 g ai/L	1.9	187	5	15	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *Chippewa*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *Superior*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *WF31-4*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	0.05*	0.06	
USA, 1996 *Red Pontiac*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	0.05*	0.05	A91233
USA, 1996 *Superior*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233

Country, Year of trial *Variety*	Form.	Application kg ai/ha	Application Water L/ha	Application No.	PHI (Days)	Sample analysed	Residues, as Propamocarb mg/kg	Residues, as propamocarb HCl, mg/kg	Report
USA, 1996 *N. Dark Red*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *Atlantic*	750 SC 375 g ai/L	1.0	187	5	10 12 14 16 18	Tuber Tuber Tuber Tuber Tuber	< 0.05* < 0.05* < 0.05* < 0.05* < 0.05*	< 0.06 < 0.06 < 0.06 < 0.06 < 0.06	A91233
USA, 1996 *Atlantic*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *Atlantic*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *Norkotah*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *Chieftan*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *R. Burbank*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *R. Burbank*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *R.Burbank*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *Mac*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *R. Burbank*	750 SC 375 g ai/L	1.0	187	5	14	Tuber	< 0.05*	< 0.06	A91233
USA, 1996 *Russet Burbank*	750 SC 375 g ai/L	1.0	187	5	10 12 14 16 18	Tuber	< 0.05* < 0.05* < 0.05* < 0.05* < 0.05*	< 0.06 < 0.06 < 0.06 < 0.06 < 0.06	A91233

* value reported

Radish

Eleven glasshouse trials with radish, conducted between 1984 and 2002, were reported from Germany and the Netherlands using seed and/or foliar treatment. The results are shown in Table 44.

Table 44. Residue trials with propamocarb hydrochloride conducted in radish in the glass house.

Country, Year *Variety*	Application Form.	Application Method	Application kg ai/ha	Application Water L/ha	Application No.	PHI (Days)	Sample analysed	Residues, Propamocarb mg/kg	Residues, Propamocarb HCl, mg/kg	Report
Germany, 1984 *Hilds Karissima*	722 SL 722g ai/L	Seed Treatment	7.22 g/kg seed	n.a	1	24 31 34 38 45	Leaves Root Root Root Root	29.53 11.05 2.35 2.20 1.05	35.24* 13.19* 2.80* 2.63* 1.25*	A85238
		Spray	0.72	1000	1					
Germany 1984 *Cherry Belle*	722 SL 722g ai/L	Seed Treatment	7.22 g/kg seed	n.a	1	27 34 38 41 45 48	Leaves Leaves Root Root Root Root	0.75 0.14 0.11 0.09 < 0.08 < 0.08	0.89* 0.17* 0.13* 0.11* < 0.1* < 0.1*	A85238
		Spray	0.72	1000	1					

Country, Year *Variety*	Application					PHI (Days)	Sample analysed	Residues, Propamocarb mg/kg	Residues, Propamocarb HCl, mg/kg	Report
	Form.	Method	kg ai/ha	Water L/ha	No.					
Germany	722 SL	Seed	7.22	n.a	1	17	Leaves	1.84	2.2*	A85238
1984	722g ai/L	Treatment	g/kg			24	Root	0.33	0.39*	
Juwasprint			seed			26	Root	< 0.08	< 0.1*	
		Spray	0.72	1000	1	32	Root	< 0.08	< 0.1*	
						34	Root	< 0.08	< 0.1*	
Germany	722 SL	Seed	7.22	n.a	1	21	Leaves	3.75	4.47*	A85238
1984	722g ai/L	Treatment	g/kg			29	Root	0.36	0.43*	
Saxa			seed			31	Root	0.45	0.54*	
		Spray	0.72	1000	1	35	Root	0.39	0.46*	
						37	Root	0.15	0.18*	
						42	Root	0.18	0.22*	
Germany	722 SL	Seed	7.22	n.a	1	7	Leaves	5.6	6.7*	A85238
1984	722g ai/L	Treatment	g/kg			14	Leaves	1.76	2.1*	
Hild's Topsi			seed			17	Root	0.33	0.39*	
GS		Spray	0.72	1000	1	22	Root	0.23	0.28*	
						27	Root	0.13	0.16*	
Germany	722 SL	Seed	7.22	n.a	1	18	Leaves	0.59	0.71*	A85238
1984	722g ai/L	Treatment	g/kg			26	Root	0.09	0.11*	
Eterna			seed			28	Root	< 0.08	< 0.1*	
		Spray	0.72	1000	1	32	Root	< 0.08	< 0.1*	
						39	Root	< 0.08	< 0.1*	
Germany	722 SL	Seed	7.22	n.a	1	14	Leaves	3.85	4.59*	A85238
1984	722g ai/L	Treatment	g/kg			21	Root	0.16	0.19*	
Rota			seed			24	Root	0.15	0.18*	
		Spray	0.72	1000	1	28	Root	0.20	0.24*	
						33	Root	0.22	0.26*	
Netherlands	722 SL	Spray	1.1	500	2	13	Root	0.42	0.5*	A85223
1983	722g ai/L									
Heemskerk										
Netherlands	722 SL	Spray	1.1	500	1	15	Root	0.34	0.4*	A85223
1983	722g ai/L									
Heemskerk										
Netherlands	840 SL	Spray	1.5-1.6	533-619	2	0	Root	0.92	1.1*	C035997
2002	530g ai/L					7	Root	0.75	0.9*	
Gudar						14	Root	0.38	0.45*	
						19	Root	0.28	0.34*	
Netherlands	840 SL	Spray	1.3	548-536	2	0	Root	0.80	0.96*	C035997
2002	530g ai/L					7	Root	0.60	0.72*	
Gudar						14	Root	0.36	0.43*	
						19	Root	0.25	0.30*	
Netherlands	840 SL	Spray	1.3	548-543	2	0	Root	1.26	1.5*	C035997
2002	530g ai/L					8	Root	0.30	0.36*	
Gudar						14	Root	0.27	0.32*	
						21	Root	0.17	0.2*	
Netherlands	840 SL	Spray	1.3	452-537	2	0	Root	1.6	1.9*	C035997
2002	530g ai/L					7	Root	0.20	0.24*	
Gudar						14	Root	0.30	0.36*	
						21	Root	0.26	0.31*	

* value reported

Chicory witloof

Twenty greenhouse trials on chicory Witloof with propamocarb hydrochloride were reported from France, Germany and the Netherlands using drip or drench irrigation and foliar spray (Table 45).

Table 45. Residue greenhouse trials with propamocarb hydrochloride conducted in Chicory Witloof.

Country, Year of trial *Variety*	Application Form.	Method	kg ai/ha application	Water L/ha	No.	PHI (Days)	Sample analysed	Residues as Propamocarb mg/kg	Residues Propamocarb HCl, mg/kg	Report no.
France. 1998 *Atlas*	722 SL 722 g ai/l	Spray onto roots	53.8	26700	1	21	Leaves	0.5*		11358[a]
France, 1998 *Atlas*	722 SL 722 g ai/l	Spray onto roots	57.1	28300	1	21	Leaves	0.7*		11358[a]
France, 1998 *Atlas*	722 SL 722 g ai/l	Spray onto roots	58.9	29200	1	21	Leaves	0.6*		11358[a]
France, 1998 *Atlas*	722 SL 722 g ai/l	Spray onto roots	60.5	30000	1	21	Leaves	0.9*		11358[a]
France, 2001 *Bea*	840 SL 530 g ai/l	Nutrient solution	15.8 g/hL		1	21	Leaves	0.18	0.22*	C024398
France, 2001	840 SL 530 g ai/l	Nutrient solution	15.1 g/hL		1	21	Leaves	0.03	0.03*	C024398
France, 2003 *Opal*	840 SL 530 g ai/l	Spray onto roots	106	40000	1	21 21	Leaves Roots	1.0* 12*		RA 2709/03 [a]
France, 2003 *Atlas*	840 SL 530 g ai/l	Spray onto roots	106	40000	1	21 21	Leaves Roots	3.6* 15*		RA 2709/03 [a]
France, 2004 *Mont Blanc*	840 SL 530 g ai/l	Spray onto roots	106	60000	1	21 21	Leaf Root	0.56* 2.8*		RA 2550/04 [a]
France, 2004 *Mont Blanc*	840 SL 530 g ai/l	Spray onto roots	106	60000	1	21 21	Leaf Root	0.41* 3.2*		RA 2550/04 [a]
France, 2004 *Passion*	840 SL 530 g ai/l	Irrigation water	84.8	40000	1	21 21	Leaf Root	0.09* 0.36*		RA 2551/04
Germany 2001, *Atlas*	840 SL 530 g ai/l	Nutrient solution	12.2 g/hL		1	19	Leaves	0.1	0.12*	C024398
Germany 2001, *Focus*	840 SL 530 g ai/l	Nutrient solution	47.1 g/hL		1	22	Leaves	8.0	9.6*	C024398
Germany, 2001, *Focus*	840 SL 530 g ai/l	Nutrient solution	47.1 g/hL		1	21	Leaves	1.6	2.1*	C024398
Germany 2004, *Atlas*	840 SL 530 g ai/l	Spray onto roots	95.0	40000	1	21 21	Leaf Root	0.46* 4.4*		RA 2550/04 [a]
Germany 2004, *Plantine*	840 SL 530 g ai/l	Irrigation water	21.2 g/hL		1	22 22	Leaf Root	5.3* 24*		RA 2551/04
Netherlands 2003, *Vintor*	840 SL 530 g ai/l	Irrigation water	21.2 g/hL		1	21 21	Leaves Roots	0.1* 0.92*		RA 2709/03
Netherlands 2003, *Plantin*	840 SL 530 g ai/l	Irrigation water	21.2 g/hL		1	21 21	Leaves Roots	0.34* 2.3*		RA 2709/03
Netherlands 2004, *Vintor*	840 SL 530 g ai/l	Irrigation water	21.2 g/hL		1	20 20	Leaf Root	0.35* 2.3*		RA 2551/04
Netherlands 2004, *Vintor*	840 SL 530 g ai/l	Spray onto roots	106	50000	1	20 20	Leaf Root	0.69* 12*		RA 2550/04 [a]

*actual value reported; [a.] the roots were treated prior to the forcing step, at forcing after tranplanting of chicory roots into the forcing room as tank dilution.

Ginger

Four trials with propamocarb hydrochloride in ginger were reported from Japan (Table 46).

Table 46: Residue field trials with Propamocarb hydrochloride conducted in ginger in Japan using three drench applications of SL 640 g/kg formulation at 0.213 kg ai/hL (30,000 L/ha).

Location *Variety*	PHI (Days)	Residues as Propamocarb mg/kg	Residue Propamocab* HCl, mg/kg	Location *Variety*	PHI (Days)	Residues as Propamocarb mg/kg	Residue Propamocab* HCl, mg/kg
Ibaraki	14	1.2	1.4	Ibaraki	14	1.7	2.0
Sanshu	30	0.64	0.76	*Sanshu*	30	0.79	0.94
	60	0.19	0.23		60	0.46	0.55

Location *Variety*	PHI (Days)	Residues as Propamocarb mg/kg	Residue Propamocab* HCl, mg/kg	Location *Variety*	PHI (Days)	Residues as Propamocarb mg/kg	Residue Propamocab* HCl, mg/kg
Chiba *Zairaishu*	14 30 60	21 4.3 0.92	25 5.2 1.1	Chiba *Zairaishu*	14 30 60	12 4.5 1.3	14 5.4 1.5

FATE OF RESIDUES DURING PROCESSING

Cabbage

Four field trials were conducted with propamocarb hydrochloride in Germany with cabbage (Pollmann, 2002, C025591). The product was applied twice as a drench treatment (72.2 and 36.1 kg ai/ha 7−10 days before transplanting) with a further 2 foliar applications 14 ± 1 days after transplanting (2.17 kg and 4.33 kg ai/ha), which corresponds to approximately double the maximum label rate. Samples of whole head cabbage were taken 27−31 days after the last application.

The cabbage samples were processed to sauerkraut and cooked cabbage according to industrial processing procedures. In the procedure for sauerkraut, the cabbage heads were cut in an Alexanderwerk mill and compacted by hand into the fermentation jars and salt solution added. The jars were firmly closed so that lactic-acid fermentation would begin for a period of 3 weeks. After opening the jars the fermented sauerkraut was sieved in order to separate it from the sauerkraut juice. For pasteurisation the sauerkraut was put into glass bottles and the sauerkraut juice added and then heated up to 90 ^{o}C. For the cooked cabbage, each cabbage head was cut into 8 parts with further processing steps carried out using two parts from opposite sides of each head. The outer leaves of each cabbage head were removed. The stem was separated into inner and outer stalks and inner leaves. The inner leaves were cut and cooked until the cut cabbage was ‘well done’.

Samples were analysed for residues of propamocarb, calculated as propamocarb hydrochloride, using a validated method (C015449). For this method, recoveries of propamocarb in spiked processed samples were between 89−106%. The LOQ was 0.01 mg/kg. The residue levels and the processing factor for each sample are shown on Table 47.

Table 47. Processing factors for propamocarb in cabbage processed products.

Matrix	Trial 1		Trial 2		Trial 3		Trial 4		PF (mean)
	Residue (mg/kg)	PF	Residue (mg/kg)	PF	Residue (mg/kg)	PF	Residue (mg/kg)	PF	
Cabbage	0.17	-	0.26	-	0.84	-	0.05	-	-
Processing of sauerkraut									
Outer Leaves	0.14	0.82	1.10	4.2	8.5	10.1	0.07	1.4	4.1
Cut Cabbage	0.04	0.24	0.02	0.08	0.04	0.05	0.05	1.00	0.34
Sauerkraut	0.04	0.24	0.01	0.04	0.04	0.05	0.05	1.00	0.33
Sauerkraut Juice	0.09	0.53	0.02	0.08	0.12	0.14	0.06	1.20	0.49
Pasteurised Sauerkraut	0.05	0.29	0.02	0.08	0.06	0.07	0.05	1.00	0.36
Pasteurised Sauerkraut Juice	0.10	0.59	0.05	0.19	0.06	0.07	0.04	0.80	0.41
Cooking process									
Outer Leaves	1.0	6.1	0.86	3.3	7.7	9.2	0.15	3.0	5.4
Inner Leaves	0.03	0.18	0.05	0.19	0.01	0.01	0.04	0.80	0.29
Stem (Inner & outer stalks)	0.09	0.53	0.02	0.08	0.61	0.73	0.03	0.60	0.48
Cooked Cabbage	0.03	0.18	0.04	0.15	0.03	0.04	0.05	1.00	0.34
Cooked Liquid	0.04	0.24	0.03	0.12	0.03	0.04	0.04	0.80	0.30

Potatoes

In one study conducted with potatoes in the USA propamocarb hydrochloride was applied five times as a foliar spray at a rate of 2.4 kg ai/ha (2.5× GAP) (Williams, 1996; A89423). The potatoes were processed into potato flakes, potato chips, wet peel, and dry peel or cleaned by hand, washed, washed and peeled and washed peel. Details of the processing procedures were not given in the report. Samples were analysed by validated methods, and no residues of propamocarb were found in any raw potato or processed product (LOQ of 0.05 mg/kg).

Tomatoes

Propamocarb was applied to tomato five times as a foliar spray at a rate of 6.62 kg ai/ha, corresponding to approximately 5 times the recommended label rate in the USA. Applications were made on a seven day interval and the tomatoes were harvested at normal maturity, 3 days after the last application (Singer, 1999; C002143).

Three sub-samples were taken from the field and processed individually into tomato purée and tomato paste using a procedure that simulates typical commercial practices. The tomatoes were washed twice while being conveyed by flumes and moving belts through flume washers and spray washers. The washed tomatoes were ground and crushed while heated to approximately 93 °C. The juice was passed through a 0.033-inch mesh screen to remove peel and seeds (wet pomace), which was weighed and discarded. The filtered juice was concentrated to puree in a vacuum evaporator. The juice was assayed for the natural tomato soluble solids (NTSS) and was concentrated until it contained 10–11% NTSS. The puree was mixed to homogeneity before a sample was taken for canning. The remainder was condensed further in a steam-jacketed kettle to tomato paste which contained 25–26% NTSS. After further heating, the samples taken for canning contained 29–31% NTSS.

Samples were analysed for residues of propamocarb using a validated analytical method (A85140). The mean recovery for propamocarb in the processed samples spiked at all fortification levels was 91% and the LOQ was 0.05 mg/kg. The level of residues in the samples and the calculated processing factor is shown in Table 49.

Table 48. Processing of tomatoes to tomato purée and paste.

	Subsample A		Subsample B		Subsample C		
Matrix	Residue (mg/kg)	PF	Residue (mg/kg)	PF	Residue (mg/kg)	PF	PF (mean)
Tomato (RAC)	10.9	-	10.3	-	11.0	-	-
Tomato Purée	12.2	1.1	14.8	1.4	14.9	1.4	1.3
Tomato Paste	32.4	3.0	32.8	3.2	33.2	3.0	3.1

RESIDUES IN FOOD IN COMMERCE AND AT CONSUMPTION

No monitoring data for propamocarb/propamocarb HCl on food commodities was submitted.

APPRAISAL

Propamocarb, a carbamate fungicide, was evaluated by JMPR three times in the 1980´s and the last time in 2005, when an ADI of 0–0.4 mg/kg bw and an ARfD of 2 mg/kg bw were established. The residue evaluation of the compound was completed by the current Meeting within the periodic review program.

Data submitted by the manufacturers and evaluated at this Meeting include metabolism in animal and plant, degradation in soil, residues in succeeding crops, analytical methods, residue trials and

processing studies. The Government of Japan submitted GAP information and summary tables of residue trials.

Animal metabolism

A study was conducted with a lactating cow orally dosed twice daily for seven consecutive days at 11.5 mg/kg [^{14}C]-propamocarb HCl equivalents in the diet (2.0 mg/kg bw/day). Over 70% of the administered dose was excreted in the urine and total radioactive residues (TRR) in tissues and bile accounted for 0.7% of the administered dose. Cumulative radioactivity recovered in the milk (0.599 mg/kg) accounted for 0.46% of the administered dose. The residues in the milk were always higher in the afternoon, with a mean of 0.054 ± 0.008 mg/kg propamocarb HCl eq (n = 7), and a maximum of 0.057 mg/kg on day 6 than in the morning (mean: 0.035 ± 0.003 mg/kg propamocarb HCl eq. (n = 7) and the maximum of 0.037 mg/kg on day 5). No residues (< 0.01 mg/kg) were found in milk fat. TRR was higher in liver (0.415 mg/kg) and muscle contained < 0.02 mg/kg.

Propamocarb represented 24.6% TRR in muscle (0.005 mg/kg), 23.5% in kidney (0.025 mg/kg), 6.2% TRR in liver (0.026 mg/kg) and 6.0% TRR in milk (0.003 mg/kg). The compound was either oxidised to form propyl propamocarb N-oxide (Met IV), dimethylated at the di-methyl amine group or hydroxylated at the propyl side chain following cyclisation to form propamocarb oxazolidin-2-one (Met VI). Met IV was the main metabolite found in kidney, liver and muscle (40–49% TRR or 0.008 to 0.203 mg/kg), Met VI was mainly found in urine (59% TRR). 2-hydroxy propamocarb was the main metabolite in milk, with 37.5% TRR (0.022 mg/kg). N-desmethyl propamocarb metabolite was found in milk, muscle and faeces (< 10% TRR), but not in kidney and liver.

Rat metabolism studies provided to the Meeting and extensively reviewed by the 2005 JMPR has shown a pathway and metabolism profile similar to that found in cow.

Plant metabolism

In one study conducted in the USA in 1996 on spinach, 14C-propamocarb was applied twice as a foliar spray at 2.53 kg ai/ha. Samples were harvested immediately following the first application (day 0), just prior to the second application (day 20) and three days after the second application (day 23). Samples were extracted with acidic methanol and extracted filter cake re-extracted with acidic methanol in a Soxhlet system. On average, TRR ranged from 203 to 236 mg/kg propamocarb HCl equivalents, with over 97% TRR being extracted. Propamocarb was the main residue found in the sample extracts, with over 75% TRR. Metabolites IV, VI, 2-hydroxyl and N-desmethyl propamocarb corresponded to < 7.5% TRR

In one study conducted in UK in 2002 in lettuce, [^{14}C]-propamocarb was applied three times to soil at 72.2 kg ai/ha followed by three foliar applications in a greenhouse at 1.08 kg ai/ha. Plants were harvested 38 days after final soil treatment and 21 days after final foliar treatment. Samples were extracted sequentially with methanol and water and the remained plant residues re-extracted by refluxing with 2M HCl and 2M NaOH. TRR in the samples harvested after soil applications was 8.2 mg/kg propamocarb HCl eq., of which only 2.8% TRR (0.23 mg/kg) was the parent compound. Most of the residues (54.4% TRR) was found in an unidentified polar region. Samples harvested 21 days after the foliar treatments had a TRR of 10.7 mg/kg, of which 91% was extracted with methanol and 0.2% remained unextracted. About 90% of the radioactivity found in the methanol and water extracts was identified as propamocarb and three unknown regions accounted each for < 4% TRR. The presence of radioactive residues in the control samples (0.35 mg/kg) suggests the incorporation of volatile radioactive products, probably $^{14}CO_2$, into the structure of the plant.

Three metabolism studies conducted with potato were submitted to the Meeting. In two greenhouse studies conducted in Germany in 1989/1994, plants were treated three times by foliar application, at 2.45 kg ai/ha and potato tubers harvested approximately 6 weeks after the final treatment. In the first study, TRR present in the samples corresponded, on average, to 0.82 mg/kg propamocarb HCl

equivalents, of which 45.5% was extracted with acidic methanol. The ^{14}C residue present was equally distributed between peel and flesh. Propamocarb represented 49.6% TRR, partitioning mainly in the methanol fraction. One metabolite, representing 8.6% TRR or 0.07 mg/kg, had the same chromatographic behaviour as propyl-propamocarb-N-oxide (Met IV). In the second study, 90% of the radiolabelled material was recovered after acidic methanol or acetonitrile extraction followed by alkaline and acid hydrolysis of the remaining material. About 32% TRR was present in the organic extract and 6.6% was unextracted. HPLC analysis using normal and reverse phase showed about 7% TRR of the sample being identified as propamocarb and approximately 50% TRR as d-glucose.

In a field study conducted with potato in UK in 2001, [^{14}C]-Propamocarb was applied six times as a foliar spray at 2.2 kg ai/ha and at 10.8 kg ai/ha. Samples were harvested approximately 7 days after the last treatment and extracted with methanol, water and refluxed in HCl and NaOH base. At the lower spray rate, TRR corresponded to 0.112 mg/kg propamocarb HCl eq. in tuber, 0.05 mg/kg in peel, 0.02 mg/kg in flesh and 85.9 mg/kg in foliage. Values for samples from the higher rate ranged from 0.05 to 476 mg/kg. Unextracted residues ranged from 4.8 to 12.2% TRR. Chromatographic and MS analysis of extracts from the lower rate treatment showed < 2% TRR as propamocarb in tuber and 28.6% TRR in foliage. Residues were mainly found in an unidentified chromatographic region (77.4 and 30% TRR in tuber and foliage). Three metabolites were tentatively identified in both samples: hydroxypropyl propamocarb (0.5% TRR in the tuber), N-desmethyl propamocarb (only detected in foliage at 5.7% TRR) and propyl propamocarb N-oxide (Met IV), present at 3.2% TRR in the tuber (0.004 mg/kg). No unchanged propamocarb was released from the foliage water extract from the higher rate treatment after acid, base and enzyme treatment

In a greenhouse study conducted in Germany in 1998, cucumbers were grown in soil treated once with [^{14}C]-propamocarb HCl applied at 2.9 kg ai/ha (11.8 mg ai/plant) and harvested at 30 days post treatment. Hydroculture-grown cucumbers were treated once at a rate of 53.4 mg ai/plant and sampled with a PHI of 21 days. Samples were extracted using maceration and soxhlet with acidic methanol. Propamocarb residues represented 19.3% TRR in cucumber extracts from the soil treatment and 58.4% TRR in hydroponic treatment. Unextracted residues represented, on average, 6.5% TRR. Polar metabolites represented 59.2 and 32.1% TRR, respectively and the remaining ^{14}C residues detected were incorporated into natural products.

In one greenhouse study conducted with tomato in UK in 2001, [^{14}C]-Propamocarb was applied four times to soil at 0.007 (1×) or 0.036 kg ai/ha (5×) and as a single foliar treatment at 2.2 kg ai/ha. Samples were extracted by maceration with methanol and water, with further acid and basic extraction as necessary. Tomato samples from soil treatments harvested at 14 to 35 days PHI showed, on average, 64.3% TRR present in the methanol extract. From 46.5 to 85.7% TRR of the foliar treated samples harvested after 7 to 28 days were found in the methanol extracts. Propamocarb was not detected in the 14 days 1× soil treated sample, but was the major component of the 7 days foliar treated tomato sample (75.2% TRR; 0.065 mg/kg). The appearance of residues in the control plants, an unknown region observed also in chromatograms of treated plants, suggest the incorporation of volatile ^{14}C into plant natural products.

In summary, in spinach, lettuce and tomato treated with propamocarb as a foliar spray, the parent compound was the main residue (> 70% TRR). Lettuce, cucumber and tomato grown on treated soil showed < 20% TRR as propamocarb, but the majority of the radioactivity found was unidentified polar compounds. The parent propamocarb amounted to 1.9 to 49.6% TRR in potato plants sprayed with propamocarb. In all studies, there was evidence of volatile ^{14}C incorporation into plant material. Results from the spinach and potato studies showed that metabolites are formed by hydroxylation of the terminal propyl chain, N-demethylation and N-oxidation of the parent molecule. No metabolites were found in the samples in larger amounts than the 5% TRR.

Rotational crops

In a confined rotational crop study, bare soil was treated at approximately 6 kg ai/ha, representing 1.2 times the annual maximum application rate for propamocarb. Leafy lettuce, radish and wheat were planted 30 days, 120 days and 365 days after treatment. In crops planted in the 30 day aged soil, total residues ranged from 0.36 (radish roots) to 2.33 mg/kg (wheat straw), and declined sharply in crops planted in soil aged 120 days and 365 days to a maximum of 0.09 mg/kg propamocarb HCl eq. Propamocarb was found in all acidic methanol sample extracts from the 30 day aged soil and was the major component (15.4% TRR in wheat straw to 67.4% TRR in radish tops), except for wheat grain, where the oxazolidine metabolite (Met VI) represented 19.9% TRR. 2-hydroxy propamocarb, N-oxide (Met IV) and desmethyl propamocarb (wheat only) were not present in any sample at levels < 10% TRR. The remainder residue was a complex mixture of highly polar components. Residues released after acid and base hydrolysis (< 10% TRR) indicated a similar pattern of metabolites.

In rotational field studies conducted in 10 American states (11 trials) in 1997, four applications at 1.68 kg ai/ha of propamocarb were made to soil with a five day interval. Wheat, sugar beets, table beets, dry beans and soybeans were planted 30, 60 or 365 days after the final soil treatment. Samples of wheat grain, forage, hay and straw, soybean seed, forage and hay, beets root and tops, and dry bean were harvested at typical sampling times. Wheat was the only crop grown on 30 days aged soils which contained residues at or above LOQ. Therefore, only wheat samples were analysed from all crops grown on 60 days aged soil.

As samples from the 60 day aged soil were generally < LOQ (0.05 mg/kg), samples from the 365-day were not analysed. Residues were detected only in wheat hay and forage samples from the 30 day aged soil. Residues were in the range of 0.051 to 0.229 mg/kg or both hay and forage.

Environmental fate in soil

In five studies conducted from 1978 to 1986 with [^{14}C]-propamocarb hydrochloride incubated under aerobic conditions at 15 or 25^{o}C in loamy sand soil containing 200 mg/kg labelled compound, propamocarb degraded very rapidly with a half life (DT_{50}) ranging from 10 to 28 days. In three studies conducted at 10 or 20^{o}C, clay loam, loamy silt, loamy sand and silty sand soils were incubated with propamocarb incorporated at the rates of 0.00361 or 3.61 kg ai/ha, for 120 days. Degradation of the parent compound was slower in a clay loam soil with a higher clay and organic carbon content, reaching 27.1% TRR at the end of the study at 20^{o}C. Half life determined in the soils ranged from 10.9 days in loamy sand to 29.7 days in silty sand soil. Lower incubation temperature decreased the degradation rate of propamocarb in loamy silt soil with half lives of 11.7 and 25.3 days at 20^{o}C and 10^{o}C, respectively. The study using Borstel soil at 10°C indicated that the rate of degradation slowed with depth, with DT_{50} values ranging from 73.7 days at 20 cm to 267 days at 90 cm, probably due to decreasing microbial activity and organic carbon content in deeper soil layers.

In a study conducted with 4 sandy loam soils and 2 clay loam soils incubated with 250mg/kg and 10 mg/kg [^{14}C]-propamocarb HCl at 20 and 10 ^{o}C for 120 and 365 days, the majority of the radioactivity was assigned to propamocarb, decreasing to a maximum of 22.1% TRR in the soil with the lowest organic carbon and biomass content (sandy loam). This soil also had the highest half life among the soils (87.7 days) while for the others DT_{50} ranged from 14.1 to 42.2 days. Up to ten non-identified metabolites, none of them being present above 10% TRR, were found in the soil extracts from all the studies.

One study conducted in sterilized and non-sterilized German standard soil suggests that soil degradation of propamocarb is mediated by micro-organisms.

Degradation of ^{14}C-propamocarb hydrochloride under anaerobic conditions was much slower than in an aerobic environment, with a half life in loamy sand soil at 25^{o}C of 459 days. The half life of propamocarb in flooded sandy loam soil treated with 250 mg/kg or 10 mg/kg and kept under anaerobic conditions in the dark at 20^{o}C was 308.2 and 65.7 days respectively. Propamocarb was

quickly removed from the water phase (DT_{50} of 14.7 days at 250mg/kg rate). The major degradation product, which was not identified, reached a maximum of 6.6% TRR in the system after 365 days. In one study to investigate the photolysis of propamocarb on soil surface, the estimated half life under irradiated conditions was 35.4 days.

One field dissipation study was conducted in the USA with sandy loam and loamy sandy soils, bare or covered with turf grass, treated four times at 9.35 kg ai/ha rate. DT_{50} in bare soils, thatch and grass ranged from 13.2 to 23.7 days. No propamocarb residues (< 0.002 mg/kg) were detected during the four month period in bare soil layer deeper than 30 cm.

In summary, propamocarb is not expected to accumulate in soil. The compound degrades relatively fast to many unidentified products (each < 10% TRR) under aerobic conditions at 10–25°C, with half life ranging from 10 to 87.7 days, with the longer times occurring in soils with lower organic matter content, possibly due to lower microbial activity. Under anaerobic conditions, propamocarb degradation was very slow in bare or flooded soil (DT_{50} > 300 days). The compound is rapidly transferred from the water to the soil in a flooded system.

Analytical methods

The residue methods used to analyse propamocarb were validated using the free base or the hydrochloride. Plant materials can be extracted with 1% acetic acid and the compound quantified by HPLC/MS/MS (electrospray ionization) at m/z 102 and or 144. Avocado extracts requires a partition step with n-hexane to remove the fat before the chromatography. Some methods also include a C18 SPE clean up step of the acid extract before the final determination. These methods were validated in many laboratories, at levels from 0.01 mg/kg to 10 mg/kg, for lettuce, chicory witloof, peppers, potato, processed potato, spinach, leek, onion, cabbage, cauliflower, Brussels sprout, broccoli, cucumber, avocado, melon and wheat grain. In most cases mean recoveries were within the acceptable levels (70–120%) with a maximum CV of 20% (n = 2–9). LOQ was 0.01 mg/kg, as propamocarb (free base) or propamocarb HCl.

In some laboratories, plant materials were extracted with acidified methanol, the extract basified with NaOH solution and cleaned up with a series of extraction procedures with chloroform, acidic water and di-isopropyl ether. The free base formed was quantified by GC/N/FID or GC/MSD. This method was validated for many crops at levels from 0.05 to 10 mg/kg, with mean recovery and CV falling within the acceptable levels (n = 2–8). LOQ was either 0.05 or 0.1 mg/kg, as propamocarb HCl.

Propamocarb can be extracted from animal products with 1.0% HCl in methanol and residues analyzed by HPLC-MS/MS. Validation at fortification levels of 0.01 mg/kg (LOQ) and 0.10 mg/kg, as propamocarb (free base), for animal tissues, milk and eggs gave recoveries from 83 to 101% and CV < 20% (n = 5).

Residues of propamocarb hydrochloride can be extracted from soil using HCl or acidified methanol, followed by a sequence of clean-up steps of the extract (chloroform/1N HCl/di-isopropyl ether) and the free base determined by GC/N/FID or GC/MSD. The method was successfully validated from 0.026 to 50 mg/kg in four different studies. In another method, propamocarb was extracted with HCl, the extract was cleaned-up on a C18 column, the final extract was basified with ammonia solution and the free base was determined by LC-MS/MS. LOQ was 0.02 mg/kg, with a mean recovery of 89% and CV of 8% (n = 5).

Stability of pesticide residues in stored analytical samples

Propamocarb residues are stable under frozen conditions, up to 26 months of storage in tomato samples fortified at 0.5 mg/kg (> 75% remained). At 5 mg/kg level, the average residue was 67% after 14.5 months of storage. Lettuce samples fortified at 0.5 and 5.0 mg/kg and stored for 14 were stable under frozen conditions (over 85% of the residues remained).

Residue definition

Metabolism studies conducted in spinach, lettuce and tomato treated with propamocarb as a foliar spray have shown that the parent compound was the main residue (> 70% TRR). Lettuce, cucumber and tomato grown on treated soil and potato samples after foliar treatment showed < 50% TRR as propamocarb. In these cases, the majority of the radioactivity (> 50% TRR) was present as unidentified polar metabolites, probably from ^{14}C incorporation into plant material, as d-glucose.

As propamocarb was the major compound present in treated plants, the Meeting agreed that the residue definition in plants for both enforcement and dietary intake purposes is propamocarb (free base).

Propamocarb represented a maximum of 24.6% TRR in cow tissues, while propyl propamocarb N-oxide (Met. IV) was the main compound detected in kidney, liver and muscle (40–49% TRR) and 2-hydroxy propamocarb was the main metabolite in milk (37.5% TRR). No metabolism study on poultry was provided.

Although propamocarb is not the main residue found in animal tissues and milk, no analytical method determining the metabolites is available that would be suitable for enforcement. No residues are expected in feed. The Meeting agreed that the residue definition for animal products for both enforcement and dietary intake purposes is propamocarb.

Propamocarb HCl has a log $P_{OW} < 0$ and animal metabolism studies have shown that it does not concentrate in fat. The Meeting concluded that propamocarb is not fat soluble.

Residues from supervised trials

Formulations containing propamocarb hydrochloride, alone or co-formulated with other active substances were used in the trials. When residues were reported in the studies as propamocarb hydrochloride, the values were multiplied by 0.84 and expressed as propamocarb.

Metabolism studies conducted in lettuce using soil treatment at a rate corresponding to 72.2 kg ai/ha have shown that < 3% TRR represented propamocarb residues in leaves after 38 days. The Meeting agreed that the seedbed drench application is not expected to contribute to final residues in crops treated with additional foliar sprays and or drip irrigation/soil drench. Consequently the trial, in which seedbed drench applications were made at higher or lower than GAP, was considered for MRL estimation.

No residue data was submitted for celery, beetroot, Brussels sprouts and strawberry. The Meeting agreed to withdraw the previous recommendations for these crops

Onion

In Europe, propamocarb is registered for use on onions in Poland (PHI of 7 days), Sweden (PHI of 30 days) and UK (PHI of 133 days). In seven trials conducted in France, Germany, the Netherlands, Spain and UK, propamocarb was applied four times at rates from 0.75–2.9 kg ai/ha and samples collected at 0 and/or 14 days. Residues, as propamocarb, ranged from < 0.008 to 0.29 mg/kg.

As no trials were conducted according to GAP, the Meeting did not recommend a maximum residue level for propamocarb in onions.

Cabbage

Propamocarb is registered to be used in Europe as a foliar application (Germany), as a seedbed or soil drench (Greece, Spain and UK) or both treatments (Italy and Netherlands). In Italy, GAP is 2 applications at 16 kg ai/ha seedbed drench applications and 3 × 1.1–2.2 kg ai/ha foliar treatment, with a PHI of 20 days.

Seventeen trials conducted in France, Germany, Italy and Spain in 2000/2001 using 72 and 36 kg ai/ha seedbed drench followed by two applications at 2.2–3.8 kg ai/ha foliar, head cabbage samples were collected from day 30 up to day 138. In one trial, samples harvested within 22 days PHI gave residues of 0.03 mg/kg.

As only one trial was conducted according to GAP, the Meeting could not recommend a maximum residue level for propamocarb in cabbage.

The Meeting also withdrew its previous recommendation for propamocarb in cabbage of 0.1 mg/kg.

Cauliflower

Propamocarb is registered to be used in Europe as a foliar application (e.g. Belgium and Germany), as a seedbed or soil drench (Greece) or both treatments (Italy, the Netherlands and UK). In Italy, GAP is 2 × 16 kg ai/ha seedbed drench up to 3 × 1.1–2.2 kg ai/ha foliar, with a PHI of 20 days. In the Netherlands, GAP is 2 × 3.61 kg ai/ha seedbed drench and 2 × 2.2–3.6 kg ai/ha foliar, with a PHI of 14 days.

Twenty three trials were conducted in France, Germany, Greece, Italy, Spain and UK from 2000 to 2002 using 72.2 and 36.1 kg ai/ha seedbed drench followed by 2 × 2.2–3.8 kg ai/ha foliar. In four trials, residues in cauliflower heads at 14 or 21 days PHI were 0.008, 0.02, 0.05 and 0.09 mg/kg. In the other trials samples harvested 30 to 138 days after the last application gave residues ranging from < 0.008 to 0.02 mg/kg.

The Meeting confirms the previous recommendation of a maximum residue level of 0.2 mg/kg for propamocarb in cauliflower and also recommends a STMR of 0.035 mg/kg and a HR of 0.09 mg/kg.

Fruiting vegetables, cucurbits

Cucumber

Thirty seven trials were conducted with propamocarb in cucumber in Europe and the USA from 1991 to 2004. In Europe, propamocarb is registered to be used as a seed treatment, soil treatment, within irrigation and/or foliar treatment.

In Spain, one label allows one seedbed drench treatment at 14.4–21.7 kg ai/ha, two soil drench treatments at 0.15 to 0.50 kg ai/hL, one treatment through dripper equipment at 1.4–2.1 kg ai/ha and two foliar treatments at rates of 0.144–0.22 kg ai/hL with a 3 day PHI (F/GH). Five trials were conducted in France, Greece, Italy and Spain using two seedbed drench applications at 72/36 kg ai/ha, followed by one drip irrigation treatment at 1.7–3 kg ai/ha, two spray applications at 1.7–3 kg ai/ha (0.36–0.6 kg ai/hL) and another drip irrigation treatment at the same previously applied rate. Nine trials were conducted in Germany and Spain using one seedbed drench (29 kg ai/ha), two soil drenches (1.7–2.9 kg ai/ha, up to 1.5 kg ai/hL), two spray applications (1.7–3.2 kg ai/ha, approximately 0.5 kg ai/hL) and two more soil drench application at the same rate as previously applied. Four trials used seedbed drench (16 kg ai/ha) and drip irrigation application (1.5–2.7 kg ai/ha). These 18 trials are within the Spanish GAP giving residues within 3 days PHI of 0.40, 0.54, 0.59, 0.60, 0.70, 0.80 (2), 0.83, 1.0 (4), 1.3, 1.4 (2), 1.7, 1.8 and 4.8 mg/kg.

In Germany, propamocarb can be used as a foliar application at 4 × 2.2 kg ai/ha. In eight trials conducted in the country in 1991/1992, within GAP, residues at 4 days PHI were 0.60, 0.68, 0.90 (3), 1.0 and 1.3 mg/kg.

Four trials using drench/drip irrigation treatment conducted in Germany, the Netherlands and Spain did not match any European GAP.

In the USA, propamocarb can be used as a foliar application at 5 × 1.0 kg ai/ha. In seven trials conducted in that country in 1997, according to GAP, residues at 2 days PHI were 0.26, 0.29, 0.32, 0.61, 0.62, 0.69 and 0.75 mg/kg.

In four trials conducted in Japan according to GAP, residues at 21 days were 0.34, 0.37, 0.39 and 0.42 mg/kg. These trials could not be considered by the Meeting as only a summary data was provided.

Residues from 33 trials conducted according to GAP in Europe and USA in cucumber gave residues within the same range and can be combined as 0.26, 0.29, 0.32, 0.40, 0.54 (2), 0.59, 0.60 (2), 0.61, 0.62, 0.68, 0.69, 0.70, 0.75, 0.80 (2), 0.83, 0.90 (3), 1.0 (5), 1.3 (2), 1.4 (2), 1.7, 1.8 and 4.8 mg/kg.

Melons

A total of 48 trials were conducted with propamocarb in melons in Europe, where the compound is registered in many countries. In Spain, the product can be applied up to four times as a seedbed drench at 15.9 kg ai/ha and as a drip irrigation treatment at 1.1–1.6 kg ai/ha with a PHI of 14 days. In nine trials conducted in Germany, Italy, Portugal and Spain from 2001–2004 conforming to Spanish GAP (two seedbed drench application), propamocarb residues in fruit were < 0.008 (3), 0.04, 0.12, 0.21, 0.45, 1.0 and 1.4 mg/kg. In four trials, melon pulp was also analysed, giving residues of 0.06, 0.08, 0.17 and 0.53 mg/kg.

In Italy, the product can be used as a seedbed incorporation after drilling (2 × 57.8–86.6 kg ai/ha) and as a foliar treatment (2 × 1.1–2.2 kg ai/ha) and a PHI of 20 days. In 13 trials conducted in France, Italy, Greece and Spain in 2000/2001 at 2 × 20–24 kg ai/ha (seedbed drench) followed by two foliar applications at 2–2.2 kg ai/ha, residues in fruit 20 days after treatment were 0.04, 0.07, 0.08 (2), 0.17 (3), 0.25, 0.3, 0.59, 0.67 (2) and 2.2 mg/kg. Residues in melon pulp were < 0.01, 0.01 (3), 0.02 (5), 0.03 (2), 0.08 and 0.17 mg/kg. As the seedbed drench application is unlikely to contribute significantly to the final residues after the foliar application, these trials can be considered to be within the Italian GAP. In nine other trials conducted at the same rate, samples harvested up to 14 days after the last application gave residues in the fruit ranging from 0.10 to 0.90 mg/kg.

In Germany, propamocarb can be used up to four times as a foliar application in the field at 2.2 kg ai/ha and a PHI of 4 days. In France, it can be applied up to six times at 1.1 kg ai/ha with a 3 day PHI. Seventeen trials conducted at 3 to 5 applications at 1.1 or 2.2 kg ai/ha can be considered as being within German or French GAP, giving residues in the fruit at a 3 day PHI of 0.10, 0.11, 0.12, 0.14, 0.23, 0.24, 0.28, 0.38 (2), 0.40, 0.44 (2), 0.57, 0.65, 0.92 and 1.1 mg/kg. Melon pulp was analyzed in 15 trials, giving residues of < 0.04 (5), 0.04, < 0.08 (6), 0.07, 0.13 and 0.21 mg/kg.

In seven trials conducted with propamocarb in cantaloupe in the USA in 1997 according to GAP (five foliar applications at 1 kg ai/ha), propamocarb residues at a two day PHI were 0.29 (2), 0.34, 0.44, 0.66, 0.77, and 1.4 mg/kg.

Residues in melon fruit from 39 trials conducted in Europe and in seven trials conducted on cantaloupe in the USA according to GAP can be combined as < 0.008 (3), 0.04 (2), 0.07, 0.08 (2), 0.10, 0.11, 0.12 (2), 0.14, 0.17 (3), 0.21, 0.23, 0.24, 0.25, 0.28, 0.29 (2), 0.34 (2), 0.38 (2), 0.40, 0.44 (3), 0.45, 0.49, 0.57, 0.59, 0.65, 0.66, 0.67 (2), 0.77, 0.92, 1.0, 1.1, 1.4, 1.42 and 2.2 mg/kg.

Residues in melon pulp from 32 trials were < 0.01, 0.01 (3), 0.02 (5), 0.03 (2), < 0.04 (5), 0.04, 0.06, 0.07, < 0.08 (6), 0.08 (2), 0.13, 0.17(2), 0.21 and 0.53 mg/kg.

Summer squash

In six trials conducted with propamocarb in summer squash in the USA in 1997 according to GAP (five foliar applications at 1 kg ai/ha), residues of propamocarb at a 2 day PHI were, 0.37, 0.43, 0.49, 0.64, 0.99 and 1.1 mg/kg.

In the USA and in some European countries, GAP for propamocarb is for the crop group cucurbits. The Meeting, therefore, agreed to combine the residue population of cucumber, melons and summer squash from 85 trials conducted in Europe and USA to make recommendations for the crop group of fruiting vegetables, cucurbits. The residues were, in rank order: < 0.008 (3), 0.04 (2), 0.07, 0.08 (2), 0.1, 0.11, 0.12 (2), 0.14, 0.17 (3), 0.21, 0.23, 0.24, 0.25, 0.26, 0.28, 0.29 (3), 0.32, 0.34 (2), 0.37, 0.38 (2), 0.4 (2), 0.43, 0.44 (3), 0.45, 0.49 (2), 0.54 (2), 0.57, 0.59 (2), 0.60 (2), 0.61, 0.62, 0.64, 0.65, 0.66, 0.67 (2), 0.68, 0.69, 0.7, 0.75, 0.77, 0.8 (2), 0.83, 0.90 (3), 0.92, 0.99, 1.0 (6), 1.1 (2), 1.3 (2), 1.4 (3), 1.42, 1.7, 1.8, 2.2 and 4.8 mg/kg.

The Meeting recommends a maximum residue level of 5 mg/kg for propamocarb in fruiting vegetables, cucurbits.

The Meeting recommends a STMR of 0.59 mg/kg and a HR of 4.8 mg/kg for propamocarb in fruiting vegetables, cucurbits, except melons and watermelons.

Based on the residue data on melon pulp, the Meeting recommends a STMR of 0.04 mg/kg and a HR of 0.53 mg/kg for melons and watermelons.

The Meeting withdraws its previous recommendation for propamocarb in cucumber of 2 mg/kg.

Peppers, sweet

Thirty five trials were conducted with propamocarb hydrochloride in sweet pepper in Europe and the USA from 1997 to 2004 using drench, drip irrigation or foliar treatment.

Propamocarb is registered in Europe and the USA for drench, drip and/or foliar treatment. In Spain, the product can be applied twice as a seedbed treatment after sowing (15.9 kg ai/ha) and up to four times as a drip irrigation treatment (1.1–1.6 kg ai/ha) with a 3 day PHI. In the Netherlands, up to three seedbed drench applications at 36.1 kg ai/ha and up to 5 drench/drip applications at 1.0/0.72 kg ai/ha are allowed, with a three day PHI.

In 18 trials conducted in greenhouses in Belgium, Italy, the Netherlands, Spain and Greece, using two seedbed applications followed by four soil drip or drench applications according to Spanish GAP, residues at three days PHI were < 0.008 (8), 0.008 (2), 0.02, 0.03, 0.06, 0.08, 0.10, 0.14, 0.15, 0.16 mg/kg as propamocarb. In three trials conducted at higher rates, residues at three days PHI ranged from < 0.008 to 0.05 mg/kg.

In the USA, propamocarb can be used in peppers as foliar application at 5 × 1.26 kg ai/ha with a 5 day PHI. In 10 trials conducted in that country according to GAP, residues were 0.07, 0.16, 0.20, 0.23, 0.26, 0.27, 0.32, 0.62, 0.98, 1.8 mg/kg. These trials gave residues at a higher range than trials conducted in Europe using drench/drip applications and the two residue population could not be combined.

The Meeting agreed to recommend a maximum residue level, based on USA trials, of 3 mg/kg, a STMR of 0.265 mg/kg and a HR of 1.8 mg/kg for propamocarb in sweet peppers.

The Meeting withdraws its previous recommendation for propamocarb in sweet peppers of 1 mg/kg.

Eggplant

Propamocarb is not registered for use in eggplant in the USA. In Europe, the compound has the same GAP as for sweet peppers. The Meeting agreed to use the residue trial data for sweet peppers in Europe to recommend a maximum residue level of 0.3 mg/kg, a STMR of 0.008 mg/kg and a HR of 0.16 mg/kg for propamocarb in eggplant.

Tomato

Forty five trials were conducted with propamocarb hydrochloride in tomato in Europe and the USA from 1997 to 2004.

Propamocarb is registered in Europe and USA for drench, drip and/or foliar treatment. In Spain, the product can be applied twice as a seedbed treatment after sowing (15.9 kg ai/ha) and up to four times as a drip irrigation treatment (1.1−1.6 kg ai/ha) with a 3 day PHI. In the Netherlands, up to three seedbed drench applications at 36.1 kg ai/ha and up to five drench/drip applications at 1.0/0.72 kg ai/ha are allowed, with a three day PHI.

In two trials conducted in greenhouses in Spain and Germany using seedbed drench followed by drench or dripping according to Spanish GAP, residues at three days PHI were < 0.008 and 0.08 mg/kg. In 16 trials conducted at higher GAP rates or number of application gave residues from < 0.008 to 0.05 mg/kg three days after the last application. In 9 trials conducted using drench treatment (1 to 2 × 15.9–72.2 kg ai/ha) followed by drench/dripping irrigation (2 to 4 treatments at 0.6–4.3 kg ai/ha), residues after three days ranged from < 0.008 to 0.07 mg/kg.

In the USA, propamocarb can be used in tomato as foliar application at 5 × 1.3 kg ai/ha and 5 days PHI. In 18 trials conducted in the country according to GAP, residues were 0.14, 0.16, 0.23, 0.25, 0.34, 0.37, 0.38, 0.40, 0.51, 0.52 0.60, 0.61 (2), 0.65, 0.68, 0.86, 0.94 and 1.4 mg/kg. Clearly, these trials gave residues at a higher range than the two trials conducted in Europe using drench/drip application and the two residue populations cannot be combined.

The Meeting agreed to recommend maximum residue level based on USA trials of 2 mg/kg, a STMR of 0.515 mg/kg and a HR of 1.4 mg/kg for propamocarb in tomato.

The Meeting withdrew its previous recommendation for propamocarb in tomato of 1 mg/kg.

Lettuce

Propamocarb is registered in lettuce in Europe and the USA. Sixty eight trials were conducted in leaf and head lettuce as a drench and/or foliar spray in France (21), Germany (18), Greece (3), Italy (3), the Netherlands (2), Spain (7) and USA (14) between 1993 and 2002.

GAP in some countries in Europe include two seedbed drench (SD) and two foliar (F) treatments, the rates being 1.6 g ai/m^2 (16 kg ai/ha) (SD) /1.1−1.6 kg ai/ha (Field, F, and Greenhouse, GH) in Italy, with 14 days PHI. In 12 trials (F or GH) conducted in Germany, Greece, Italy, the Netherlands and Spain at Italian GAP, residues at 14 days PHI were 0.92, 1.8, 3.9, 4.0, 4.5, 7.1, 8.1, 9.4, 9.8, 10, 11 and 13 mg/kg. Thirty two field trials were conducted in France, Germany, Greece, Italy and Spain using 2 seedbed drench applications at 72.2 and 36.1 kg ai/ha and 2 foliar applications at 1.66 kg/kg ai/ha. Residues at 14 days PHI determined in 28 trials were 0.7, 1.0 (2), 1.9, 2.0, 2.8, 3.2, 3.3, 4.2, 4.4, 4.7, 6.0, 6.5, 7.4, 7.9, 8.1, 9.2, 13 (2), 14, 15, 16 (2), 17, 21, 29, 31 and 40, mg/kg. In other four trials samples were harvested only after 21 days.

In Belgium, Germany and UK (F/GH), only foliar treatment is recommended, with three applications at 1.1 to 1.4 kg ai/ha and 21 days PHI. In 10 greenhouse trials conducted in France within UK GAP residues at 21 days PHI were 1.2, 1.7, 4.9, 6.5, 14, 15, 20, 24, 39 and 40 mg/kg; In other six trials with four applications, residues ranged from 14 to 40 mg/kg.

The 50 residue trials conducted with propamocarb in Europe can be combined as 0.7, 0.92, 1.0 (2), 1.2, 1.7, 1.8, 1.9, 2.0, 2.8, 3.2, 3.3, 3.9, 4.0, 4.2, 4.4, 4.5, 4.7, 4.9, 6.0, 6.5 (2), 7.1, 7.4, 7.9, 8.1 (2), 9.2, 9.4, 9.8, 10, 11, 13 (3), 14 (2), 15 (2), 16 (2), 17, 20, 21, 24, 29, 31, 39 and 40 (2) mg/kg.

GAP in the USA is four foliar applications at 1.68 kg ai/ha, two days PHI. In 14 trials conducted in the USA in leafy and head lettuce according to GAP, residues were 8.2, 9.7, 10, 11 (2), 17, 19, 31, 41 (2), 48, 51, 60 and 86 mg/kg. Residues in the head without the wrapper leaves of head lettuce ranged from 0.21 to 8.0 mg/kg.

In four trials conducted in Japan at GAP (3 × 1.28 kg ai/ha), residues at 14 days PHI were 0.28, 0.60, 1.6 and 1.8 mg/kg. These trials could not be considered by the Meeting as only summary data was provided.

The 64 European and USA trials can be combined to give one residue population as 0.7, 0.92, 1.0 (2), 1.2, 1.7, 1.8, 1.9, 2.0, 2.8, 3.2, 3.3, 3.9, 4.0, 4.2, 4.4, 4.5, 4.7, 4.9, 6.0, 6.5 (2), 7.1, 7.4, 7.9, 8.1 (2), 8.2, 9.2, 9.4, 9.7, 9.8, 10 (2), 11 (3), 13 (3), 14 (2), 15 (2), 16 (2), 17 (2), 19, 20, 21, 24, 29, 31 (2), 39, 40 (2), 41 (2), 48, 51, 60 and 86 mg/kg.

The Meeting recommended a maximum residue level of 100 mg /kg, a STMR of 9.9 mg/kg and a HR of 86 mg/kg for propamocarb in lettuce, head and leaf.

The Meeting withdrew its previous recommendation for propamocarb in lettuce, head of 10 mg/kg.

Spinach

Propamocarb is registered in Italy as seed, soil and foliar treatments. As a foliar treatment, the label recommends up to three applications at 1.1–2.2 kg ai/ha with a 20 day PHI. Seven trials were conducted in Belgium, Germany, Italy and Spain three applications at 1.3–1.6 kg ai/ha. In four trials, samples were analysed at a 21 day PHI, giving residues of propamocarb of 0.41, 8.4, 14 and 29 mg/kg.

The Meeting recommended a maximum residue level of 40 mg /kg, a STMR of 11.2 mg/kg and a HR of 29 mg/kg for propamocarb in spinach.

Potato

Thirty two trials were conducted with propamocarb HCl between 1990 and 2003 using foliar application in Europe and the USA. In one trial conducted in France and in 11 trials conducted in Germany according to German or UK GAP (6 × 0.94–0.99 kg ai/ha) at a 7 day PHI the residues, as propamocarb, were < 0.01 (2), < 0.08 (8) and 0.17 (2) mg/kg. In two German trials, residues measured in peeled tuber gave residues of < 0.08 (2) mg/kg. Nineteen trials were conducted in the USA, 18 of those at GAP (5 applications at 1.0 kg ai/ha), giving residues at 14 days PHI of < 0.05 (16) and 0.05 (2) mg/kg, measured as propamocarb. One trial conducted at higher rate gave residues of < 0.05 mg/kg.

In summary, residues according to GAP, were < 0.01 (2), ≤ 0.05 (16), 0.05 (2), < 0.08 (8) and 0.17 (2) mg/kg, as propamocarb. The Meeting recommended a maximum residue level of 0.3 mg/kg, a STMR of 0.05 mg/kg and a HR of 0.17 mg/kg for propamocarb in potato.

Radish

In Europe, propamocarb is registered in radish in Germany and the Netherlands with a 14 day PHI. In six trials conducted in Germany using one seed treatment and one foliar treatment at GAP rate (7.22 g/kg seed/0.722 kg ai/ha), root samples were collected from day 21 to 48 days after the last application, giving residues up to 11 mg/kg as propamocarb. In one trial, samples were collected 14 days after the last application, giving residues of 0.33 mg/kg. In four trials conducted in the Netherlands using two foliar applications within the GAP rate (1.08 kg ai/ha) residues at 14 days were 0.27, 0.30, 0.36, 0.42 mg/kg as propamocarb. Two trials conducted at higher or lower rates gave residues within the same range. Residues from five trials conducted according to GAP were 0.27, 0.30, 0.33, 0.36, 0.42 mg/kg

The Meeting recommended a maximum residue level of 1 mg/kg, a STMR of 0.33 mg/kg and a HR of 0.42 mg/kg for propamocarb in radish.

The Meeting withdrew its previous recommendation for propamocarb in radish of 5 mg/kg.

Chicory

In France, propamocarb is approved for application to chicory by spraying onto roots at the start of forcing at 72.2 kg ai/ha with a PHI of 21 days. In five trials conducted according to GAP in France in

1998, residues in the leaves were 0.46, 0.50, 0.60, 0.70 and 0.90 mg/kg as propamocarb. In five trials conducted in France, Germany and Netherlands at 106 kg ai/ha, residues in leaves at 21 days ranged from 0.41 to 3.6 mg/kg.

Propamocarb is also registered in France and Luxembourg to be used via a nutrient solution at 9 g/hL and 21 days PHI. In 10 trials conducted in France, Germany and Netherlands propamocarb was applied using a nutrient solution or irrigation system at 12.2 to 47.1 g/hL rate. Residues in leaves within 21 days PHI ranged from 0.03 to 0.35 mg/kg.

The Meeting recommended a maximum residue level of 2 mg /kg, a STMR of 0.60 mg/kg and a HR of 0.90 mg/kg for propamocarb in chicory.

Ginger

Results from four trials conducted at two sites in Japan with propamocarb HCl in ginger in 1986 were submitted to the Meeting as a summary table. GAP in Japan is up to five drench applications at 0.11–0.16 kg ai/hL with a 30 day PHI. The trials conducted at 3 × 0.213 kg ai/hL gave residues in the tubers at 30 days ranging from 0.64 to 4.5 mg/kg, as propamocarb.

As no trials were conducted according to GAP, the Meeting could not recommend a maximum residue level for propamocarb in ginger.

Fate of residues in processing

Four field trials were conducted in Germany with cabbage in 2001 with propamocarb hydrochloride applied twice as a drench treatment with a further two foliar applications at approximately double the maximum label rate. Samples of whole head cabbage were taken 27–31 days after the last application and processed to sauerkraut and cooked cabbage according to industrial processing procedures. Residues in cabbage head ranged from 0.05 to 0.84 mg/kg propamocarb hydrochloride. Residues decreased in sauerkraut and sauerkraut juice with mean/median processing factors (PF) of 0.33/0.15 and 0.49/0.33. PFs for the pasteurized products were 0.36/0.18 and 0.41/0.32, respectively. Residues also decreased in cooked cabbage, with a mean/median PF of 0.34/0.17.

In one study conducted with potatoes in the USA propamocarb hydrochloride was applied as a foliar spray at an exaggerated rate (2.5 × GAP). Potatoes were processed into potato flakes, potato chips, wet peel, and dry peel. Details of the processing procedures were not given. No residues were found in any raw potato or processed product (< 0.05 mg/kg).

In one study conducted in tomato in the USA in 1996, propamocarb was applied five times as a foliar spray at an exaggerated rate (5 × GAP rate). Tomatoes were harvested at normal maturity three days after the last application and three sub-samples were taken to be processed individually into tomato purée and tomato paste using a procedure that simulates typical commercial practices. Residues in RAC ranged from 10.3 to 11 mg/kg, as propamocarb. Residues concentrated in purée and paste, with a mean/median PF of 1.3/1.4 and 3.1/3, respectively.

Based on the STMR of 0.515 mg/kg for propamocarb in tomato and the median PF, the Meeting recommends a STMR of 0.721 for propamocarb in tomato purée and a STMR of 1.54 for propamocarb in tomato paste.

Residues in animal commodities

Feeding studies

No animal feeding studies were provided to this Meeting. Data from one metabolism study conducted with a lactating cow dosed with propamocarb at 2 mg/kg bw/day for seven days have shown that propyl propamocarb N-oxide (Met. IV) was the main compound detected in kidney, liver and muscle

(40–49% TRR, up to 0.203 mg/kg propamocarb eq. in liver) and 2-hydroxy propamocarb was the main residue in milk (37.5% TRR or 0.022 mg/kg eq.). Propamocarb represented a maximum of 24.6% TRR, present at levels < 0.03 mg/kg.

Dietary burden of farm animals

From all the commodities for which propamocarb uses were considered by the JMPR, potato processed products are the only ones included in the animal diets according to the *FAO Manual* (FAO 2002). In two trials conducted with potato according to GAP, residues in washed peel, were < 0.08 mg/kg. As wet peel represents 75% and 40% of beef cattle and dairy cattle diets respectively, no animal dietary burden is expected from the uses of propamocarb considered by the JMPR.

Residues in animal commodities

The Meeting recommended a maximum residue level of 0.01(*) mg/kg and a STMR of 0 mg/kg for propamocarb in eggs, milks, edible offal (mammalian), poultry edible offal, poultry meat and meat (from mammals other than marine mammals). The Meeting also recommends an HR of 0.01 mg/kg for eggs, edible offal (mammalian), poultry edible offal, poultry meat and meat (from mammals other than marine mammals).

RECOMMENDATIONS

Residue definition for compliance with MRLs and estimation of dietary intake for plant commodities: *propamocarb*

Summary of the recommendation for the MRL, STMR and HR for propamocarb.

		Recommended MRL (mg/kg)		STMR (P)	HR (P)
CCN	**Commodity name**	**New**	**Previous**	**mg/kg**	**mg/kg**
VB 0041	Cabbages, Head	W	0.1		
VB 0404	Cauliflower	0.2	0.2	0.035	0.09
VX 0624	Celery	W	0.2		
VS 0469	Chicory witloof (sprouts)	2		0.60	0.90
VC 0424	Cucumber	W	2		
VR 0574	Beetroot	W	0.2		
VB 0402	Brussels sprouts	W	1		
VC 0045	Fruiting vegetables, cucurbits	5			
	Fruiting vegetables, cucurbits, except melons, and watermelons			0.59	4.8
VL 0482	Lettuce, head	100	10	9.9	86
VL 0483	Lettuce, leaf	100	10	9.9	86
MO 0105	Edible offal (mammalians)	0.01*		0	0.01
VO0440	Eggplant	0.3		0.008	0.16
PE 0012	Eggs	0.01*		0	0.01
MM 0095	Meat (from mammals other tha	0.01*		0	0.01

CCN	Commodity name	Recommended MRL (mg/kg)		STMR (P) mg/kg	HR (P) mg/kg
		New	Previous		
	marine mammals)				
VC 0046	Melons, except watermelon			0.04	0.53
ML 0106	Milks	0.01*		0	
VO 0485	Peppers, sweet	3	1	0.265	1.8
VR 0589	Potato	0.3		0.05	0.17
PM 0111	Poultry, edible offal of	0.01*		0	0.01
PM 0110	Poultry meat	0.01*		0	0.01
VR 0494	Radish	1	5	0.33	0.42
VL 0502	Spinach	40		11.2	29
FB 0275	Strawberry	W	0.1		
VO 0448	Tomato	2	1	0.515	1.4
	Tomato purée			0.721	
	Tomato paste			1.54	
VC 0432	Watermelon			0.04	0.53

DIETARY RISK ASSESSMENT

Long-term intake

The ADI for propamocarb is 0-0.4 mg/kg bw. The International Estimated Daily Intake (IEDI) for propamocarb was estimated for the 13 GEMS/Food cluster diets using the STMR or STMR-P values estimated by the current Meeting for 11 plant commodities. The results are shown in Annex 3 of the 2006 JMPR Report. The IEDI ranged from 0 to 1% ADI. The Meeting concluded that the long-term intake of residues of propamocarb from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The ARfD for propamocarb is 2 mg/kg bw. The International Estimated Short Term Intake (IESTI) for propamocarb was calculated for the plant commodities for which STMRs and HRs were estimated and for which consumption data were available. The results are shown in Annex 4 of the 2006 JMPR Report. The IESTI ranged from 0 to 40% ARfD for the general population and from 0 to 80% ARfD for children. In both populations, the highest intake came from the consumption of lettuce. The Meeting concluded that the short-term intake of residues of propamocarb from uses that have been considered by the JMPR is unlikely to present a public health concern.

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