QUINTOZENE (064)

EXPLANATION

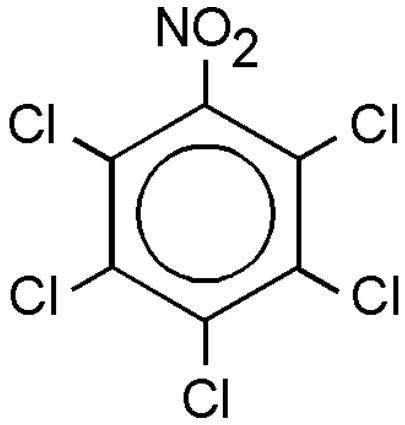
Quintozene, originally evaluated by the JMPR in 1969 and re-evaluated for residues several times up to 1977, is included in the CCPR periodic review programme as the ADI was established before 1976 (ALINORM 89/24A, para 298 and Appendix V). The 1991 CCPR scheduled the periodic review for the 1995 JMPR as the manufacturer had reported that new data would be available (ALINORM 91/24A, para 316 and Appendix VI para 15).

The Meeting received animal and plant metabolism studies, information on analytical methods and updated GAP, supervised residue trials on vegetables and oilseed, and information on residues after storage and processing from the manufacturer (Gaydosh, 1995a). Information on analytical methods and national MRLs was supplied by The Netherlands (Anon., 1994a) and on GAP by Australia (Anon., 1995a), Canada and the UK (Anon., 1995b; 1994b). Germany and The Netherlands informed the Meeting that there were no registered uses in their countries.

IDENTITY

Iso common name: quintozene
Chemical name
IUPAC and CA: pentachloronitrobenzene
CAS No: 82-68-8
CIPAC No: 78
Synonyms: PCNB

Structural formula:



quintozene

Molecular formula: $C_6Cl_5NO_2$
Molecular weight: 295.34

Physical and chemical properties

Pure active ingredient and technical material[1]

Vapour pressure: 9.5×10^{-5} mm HG at 25°C (Thomson, 1989), corresponding 1.27×10^{-2} Pa at 25°C
Melting point: 142-145°C
Boiling point: 328°C (760 mm HG)
Octanol/water partition coefficient: 10^5-10^6 (Polakoff, 1987)
Solubility:

Acetonitrile	70 g/kg
Cyclohexane	70 g/kg
Ethanol	20 g/kg
Ethyl acetate	210 g/kg
Heptane	30 g/kg
Methanol	20 g/kg
Toluene	1400 g/kg
Water	1×10^{-6} g/l at 25°C (Batorewicz, 1988)

Specific gravity: 1.718 at 25°C
Hydrolysis: no hydrolysis in the pH range 5-7 (Bowman, 1988)
Purity: >99%

Hexachlorobenzene content

Hexachlorobenzene (HCB) occurs as an impurity in the manufacture of quintozene. Before 1988, the

[1] The current technical material is >99% pure, so the "pure active ingredient" and "technical material" are effectively the same

HCB content of the technical material was approximately 0.5%. In 1988 modifications to the manufacturing process reduced the level of HCB to 0.1% or less.

The marketing and use in plant protection products of quintozene containing more than 1 g/kg of HCB or more than 10 g/kg pentachlorobenzene (PB) is prohibited in the European Union (Anon., 1990).

Formulations

Emulsifiable concentrate (EC)
Dustable powder (DP)
Flowable concentrate for seed treatment (FS)
Granule (GR)
Solution for seed treatment (LS)
Seed coated with a pesticide (PS)
Suspension concentrate (flowable concentrate, SC)
Wettable powder (WP)

METABOLISM AND ENVIRONMENTAL FATE

Animal metabolism

Metabolism of quintozene was investigated in rats, goats and chickens. The biochemical pathways of quintozene in all these species were found to be nearly the same. The major routes were (1) displacement of nitro group by (a) the sulfhydryl group of reduced glutathione or of an SH-containing amino acid or peptide, or (b) a hydroxyl group to yield pentachlorophenol; (2) reduction of the nitro group to form *N*-pentachlorophenylhydroxylamine, pentachloroaniline and conjugated pentachloroaniline; (3) dechlorination to yield tetrachloro analogues of the above metabolites.

Figure 1 shows the metabolic pathways.

Rats. Three male and three female rats were given [^{14}C]quintozene in cotton seed oil as a single dose of 5 mg/kg bw by oral intubation. Whole blood was taken at 0, 0.5, 1, 2, 4, 8, 12, 48, 72, 96, 120 and 144 hours after treatment. The average level of ^{14}C reached a maximum after 12 hours. The half-life was calculated to be 22 hours.

Urine and faeces were collected at 24-hour intervals and analysed for ^{14}C activity. Both urinary and faecal excretion showed a sex difference. The total ^{14}C activity in the urine ranged from 7.8 to 12% of the dose in the males and 24 to 38% in the females. That in the faeces ranged from 57 to 91% in the males and 38 to 76% in the females.

After 144 hours, when the rats were killed, various organs were combusted to determine the ^{14}C activity. The liver, kidneys and carcase contained an average of 0.03, 0.02 and 0.2% of the dose, respectively. The total recovery of ^{14}C from the six animals averaged 85%.

In another study, ten female rats were dosed with 5 mg/kg [^{14}C]quintozene. After 72 hours 32% of the dose was recovered from the urine. The major metabolite was identified as *N*-acetyl-*S*-pentachlorophenylcysteine, which accounted for 59% of the ^{14}C in the urine. A further 24% was identified as a conjugate of pentachloroaniline, 5% as pentachlorophenol and traces as methyl pentachlorophenyl sulfone, methyl pentachlorophenyl sulfide and tetrachlorophenol.

The faeces contained mainly pentachloroaniline (PCA) and phenols, but much of the

radioactivity remained bound (Adamovics, 1980; O'Grodnick, 1978a,b, 1979).

Goats. In a study by Daun (1990) two lactating goats were dosed with [^{14}C]quintozene labelled uniformly in the ring for five consecutive days before slaughter, one at 20 and the other at 50 mg/kg bw/day. Analysis of tissues, milk, urine, and faeces from the high-dose animal indicated that the majority of the activity was eliminated in the urine and faeces (38% and 19% of the dose respectively). The highest concentrations of the remaining activity were found in the kidneys (49 mg/kg as quintozene equivalents) and liver (46 mg/kg). Renal fat contained slightly higher concentrations of ^{14}C than omental fat (33 mg/kg v 27 mg/kg). The lowest concentrations of radioactivity were found in the blood (9.8 mg/kg), milk (5.2 to 8.4 mg/kg) and muscle (2.3 mg/kg). A total of 0.41% of the dose was excreted in the milk over the test period. The low-dose animal showed a similar distribution of radioactivity at lower levels, except in the faeces where 26% of the dose was eliminated.

McManus (1989) identified the metabolites in the high-dose animal. The major metabolite of the four found in the urine accounted for 85% of the urinary radioactivity and was identified as pentachloroaniline sulfamate. The three minor components were *N*-pentachlorophenylhydroxylamine (*N*-hydroxylated pentachloroaniline), tetrachlorothioanisole, and a conjugate of pentachloroaniline (PCA).

The liver, kidneys, fat and muscle (investigated later) showed radioactive levels above background. Six metabolites were identified in the kidneys, of which two accounted for more than 80% of the radioactivity. They were identified as PCA and PCA glucuronide. The four minor metabolites were pentachlorothiophenol, tetrachloro(methylthio)benzenethiol, tetrachlorothioanisole and tetrachloromethylsulfinylaniline (methyl tetrachloroaniline sulfoxide).

Six metabolites were detected in the liver, mainly PCA and a PCA glucuronide conjugate. Trace amounts of four other products were found: pentachlorothiophenol dimer, *N*-pentachlorophenylhydroxylamine, pentachlorothiophenol and tetrachloro(methylthio)benzenethiol.

Milk, omental fat and renal fat each contained only one metabolite which was identified as PCA. No unchanged quintozene was detected in the tissues, milk or urine. The metabolic pathway is mainly reduction to PCA followed by conjugation to form polar products that can be hydrolyzed to PCA. The presence of thiol metabolites indicated that displacement of the nitro group by glutathione also occurred.

The results show that quintozene is converted in goats mainly to PCA and a PCA glucuronide conjugate. Some thiols are also formed to a much smaller extent. The quantitative distribution of the metabolic products in the urine, kidneys, liver, milk and fat is shown in Table 1. These results are in good agreement with those reported previously in a ruminant metabolism study by Aschbacker and Feil (1983) at comparable treatment rates.

Table 1. Distribution of quintozene metabolites in a goat (McManus, 1989).

Sample	Metabolite, % of ^{14}C in sample									
	II	III	IV	V	VI	VII	VIII	IX	X	XI
Urine	85	5	6	4						
Kidneys			4.5		3.3	2.1	26	2.3		55
Liver		4.7	1		2.9		17		2.7	73
Milk							96			
Omental fat							100			

Sample	Metabolite, % of ^{14}C in sample									
	II	III	IV	V	VI	VII	VIII	IX	X	XI
Renal fat							100			

II pentachloroaniline sulfamate
III *N*-pentachlorophenylhydroxylamine (*N*-hydroxypentachloroaniline)
IV tetrachloro(methylthio)benzenethiol
V pentachloroaniline mercapturic acid
VI pentachlorothiophenol
VII tetrachloroanisole
VIII pentachloroaniline
IX tetrachloromethylsulfinylaniline (methyl tetrachloroaniline sulfoxide)
X pentachlorothiophenol dimer
XI *N*-glucuronide of pentachloroaniline

The muscle samples were investigated in an additional study (McManus, 1990a). The total radioactive residue in the muscle was 2.2 mg/kg expressed as quintozene equivalents. Analysis by HPLC showed four metabolites: PCA, tetrachlorothioanisole, pentachlorothiophenol, and methyl tetrachlorophenyl sulfoxide. No unchanged quintozene was detected.

Chickens. Laying hens were treated with [^{14}C]quintozene uniformly labelled in the ring (Parkins 1990a,b, 1991). Three groups of 5 hens were dosed orally by capsule for six consecutive days at 15, 37.5 and 75 mg quintozene per hen per day, with a fourth group as controls. The average feed consumption was approximately 150 g per hen per day, so the doses were equivalent to dietary levels of about 100, 250 and 500 ppm. Table 2 shows the levels of total ^{14}C in the tissues, eggs and excreta.

Table 2. Total ^{14}C residues in tissues and eggs of hens (Parkins, 1990a).

Sample	Residues, mg/kg as quintozene		
	15 mg/day	37.5 mg/day	75 mg/day
Liver	0.87	2.7	3.8
Kidneys	1.8	5.1	7.3
Thigh muscle	0.13	0.36	0.71
Breast muscle	0.07	0.17	0.30
Fat	2.6	6.2	10
Skin (with fat)	1.7	3.8	5.9
Egg yolk	1.7	3.5	5.8[1]
Egg white	0.06	0.24	0.29[1]

[1] Day 5

The major metabolic pathway appears to involve the displacement of the nitro group by the sulfhydryl group of glutathione, followed by catabolic cleavage of the peptide. This pathway led to pentachlorothioanisole, pentachlorothiophenol and conjugates of pentachlorothiophenol with cysteine, malonocysteine, pyruvate and acetate in various tissues, eggs and excreta. Other metabolites included tetrachlorothioanisole, tetrachlorothioanisole sulfone, pentachlorothioanisole sulfoxide and tetrachloromethylsulfinylaniline (methyl tetrachloroaniline sulfoxide). A second pathway involved reduction of the nitro group to produce pentachloroaniline and *N*-pentachlorophenylhydroxylamine

(*N*-hydroxypentachloroaniline).

Table 3 shows the percentage distribution of all metabolites found in the highest dose group (500 ppm) of the study by Parkins (1990a). The levels of ^{14}C in the breast muscle and egg whites were too low for the isolation and identification of metabolites.

quintozene

Figure 1. Metabolism of quintozene in animals.

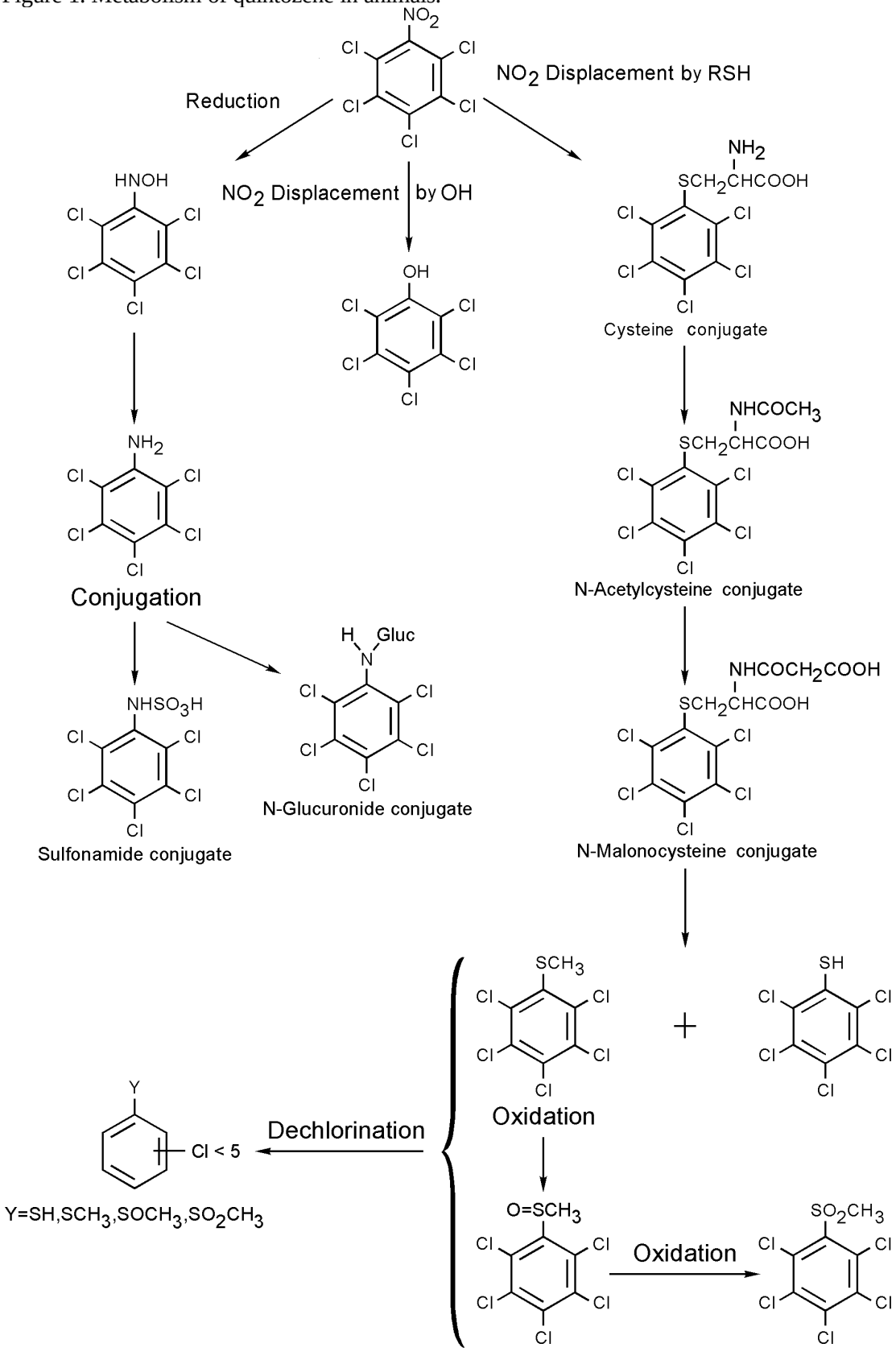


Table 3. Distribution of quintozene metabolites in chickens (Parkins, 1990a).

Sample	Metabolite, % of ^{14}C in sample													
	III	VIII	IX	XII	XIII	XIV	XV	XVI	XVII	XVIII	XVIV	XX	XXI	XXII
Fat		16	31		48								1	
Liver							21	71		7				
Kidneys	50								8	35				7
Thigh						8				88[1]				88[1]
Yolk		70		4		9		18						
Excreta								30		17	26	19		

III *N*-pentachlorophenylhydroxylamine (*N*-hydroxypentachloroaniline)
VIII pentachloroaniline
IX tetrachloromethylsulfinylaniline (methyl tetrachloroaniline sulfoxide)
XII pentachlorobenzene
XIII pentachloronitrobenzene
XIV pentachlorothioanisole
XV pentachlorothioanisole sulfoxide
XVI pentachlorothiophenol
XVII *S*-(pentachlorophenyl)cysteine
XVIII *S*-pentachlorophenyl thioacetate
XVIV *S*-pentachlorophenyl thiopyruvate
XX *S*-(pentachlorophenyl)-*N*-malonyocysteine
XXI tetrachlorothioanisole
XXII tetrachlorothioanisole sulfone

[1] Either XVIII or XXII

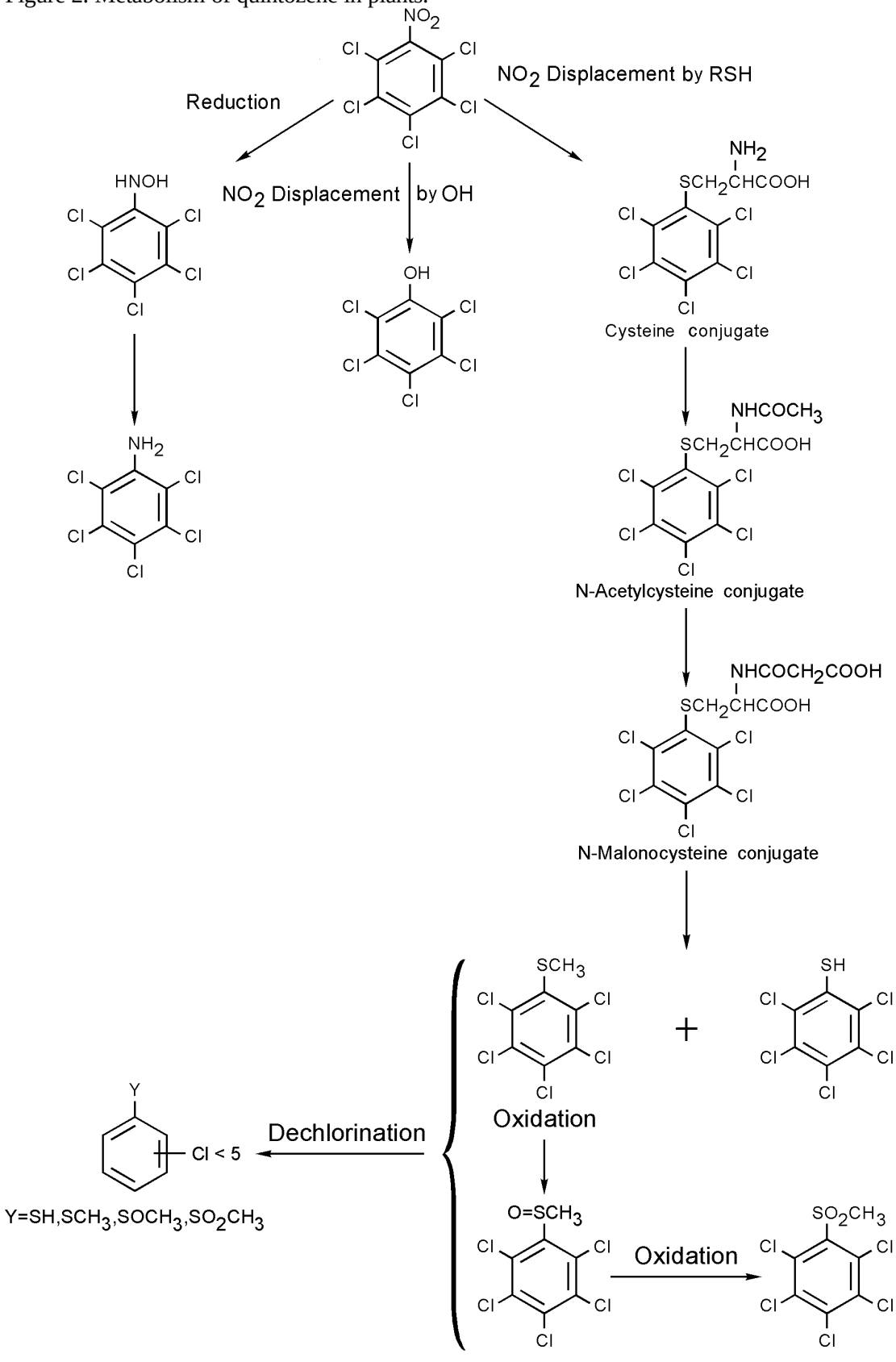
Plant metabolism

Studies of the metabolism of quintozene in cabbages (McManus and Maisonet, 1990), potatoes (Parkins, 1990c) and peanuts (McManus, 1990b) indicated three major pathways, broadly similar to those in animals: (1) reduction of the nitro group to form *N*-pentachlorophenylhydroxylamine (*N*-hydroxypentachloroaniline) and pentachloroaniline; (2) displacement of the nitro group (a) by the sulfhydryl group of glutathione to give a glutathione adduct which is metabolized further, and (b) to a lesser extent by a hydroxyl group to give pentachlorophenol; (3) dechlorination involving (a) reductive replacement of Cl by H and (b) oxidative replacement of Cl by OH.

Figure 2 shows the pathways.

quintozene

Figure 2. Metabolism of quintozene in plants.



The results agree well with those reported in the literature for peanuts (Lamoureaux *et al*., 1980, 1981), onions (Begum *et al*., 1979), spinach (Cairns *et al*., 1983), parsnips (Cairns *et al*., 1987) and cress (Renner and Hopfer, 1983).

Cabbages. Cabbage plants were grown in soil treated with a single application of [^{14}C]quintozene before planting, at 54 kg ai/ha. Plants were harvested at approximately one-quarter, one-half and full maturity (after 49, 70 and 154 days respectively). The two earlier samples of whole plants showed concentrations of radioactivity ranging from 5 to 8 mg/kg as quintozene. The highest levels of radioactivity were found at maturity in the outer leaves (11-18 mg/kg), with lower levels in the heads of 0.79-2.6 mg/kg. Seven metabolites observed in leaf extracts were identified. The two main compounds were methyl tetrachlorophenyl sulfoxide and methyl tetrachlorophenyl sulfone. Five minor components were identified as a methyl trichlorophenyl sulfoxide, a methyl trichlorophenyl sulfone, *N*-hydroxylated pentachloroaniline, methyl pentachlorophenyl sulfoxide and pentachlorothioanisole.

Potatoes. Potatoes were grown in soil treated with [^{14}C]quintozene applied as an EC formulation by pre-plant incorporation at a rate of 21 kg ai/ha, being exposed to quintozene in the soil for 80 days. The total residues, determined by combustion and calculated as the parent compound, were 2.4 mg/kg in the whole potatoes, 0.76 mg/kg in the potato pulp, and 11 mg/kg in the peel. Most of the radioactivity was solubilized by aqueous methanol and then separated into chloroform-soluble, ether soluble and water-soluble fractions. The distribution of ^{14}C in these fractions was 24% in chloroform, 30% in ether and 45% in water from whole potatoes, 28% in chloroform, 22% in ether and 50% in water from pulp, and 71%, 14% and 15% respectively from peel.

The chloroform fraction contained mainly quintozene and pentachloroaniline with lesser amounts of pentachlorothioanisole, tetrachloronitrobenzene, tetrachlorophenol, and *N*-pentachlorophenylhydroxylamine. Ether- and water-soluble residues were mainly conjugates of pentachlorothiophenol, notably with *S*-glycosides, glutamylcysteine, malonocysteine and cysteine.

Peanuts. Peanuts were planted in soil that had been treated with [^{14}C]quintozene at a rate of 38 kg ai/ha and grown to maturity. The highest levels of ^{14}C were found in the roots (1520 mg/kg expressed as quintozene). The vines, shells and kernels had lower residues ranging from 42 mg/kg in the vines to 5.2 mg/kg in the kernels. Extraction with aqueous methanol removed 64-88% of the ^{14}C. The extract contained seven metabolites; the two main ones were identified as *S*-pentachlorophenyl-*N*-malonocysteine and tetrachloroaniline, which were found in the roots, vines and shells. Of the five minor metabolites, one was identified as *S*-[(methylthio)tetrachlorophenyl]-2-thioacetic acid. The other four metabolites were also found in roots, vines, shells and kernels, but at too low a level for identification.

The unextractable ^{14}C residues ranged from 454 mg/kg (as quintozene) in the roots to 0.94 mg/kg in the kernels. An average of more than 90% of these residues in the shells, vines and kernels was liberated by hydrolysis with methanolic HCl.

Seed treatment. Seeds of maize, peas, sugar beet, wheat and soya bean were treated with [^{14}C]quintozene at the highest recommended rates (Selman, 1988). The treated crops were grown in an open-sided greenhouse which allowed exposure to natural sun and weather conditions while eliminating the potential for flooding from rain. There was uptake of [^{14}C] by all the crops. The highest levels were measured in the harvested pea vines and soya bean stems at 1.8 and 1.5 mg/kg quintozene equivalents respectively. The levels in fresh pea vines, sugar beet roots, soya bean hay and wheat forage were 0.57, 0.46, 0.74, and 0.54 mg/kg respectively, and in maize stover and wheat straw 0.02 and 0.06 mg/kg. None of the harvested seeds or grains from maize, wheat, soya bean or peas

contained residues above the LOD.

Rotational crops. Soil was treated with uniformly ring-labelled [^{14}C]quintozene and aged for periods of 30, 120 and 365 days before planting rotational wheat, lettuce and turnips (Murty, 1993). The metabolites were characterized as described above. Considering the high treatment rate of 280 kg ai/ha, the levels of radioactivity found in the lettuce, turnips and wheat grain were not high and they decreased with the age of the soil. The total residues as quintozene equivalents after 365 days were 0.44 mg/kg in lettuce, 1.4 mg/kg in turnip roots and 0.42 mg/kg in wheat grain.

Environmental fate in soil and in water/sediment systems

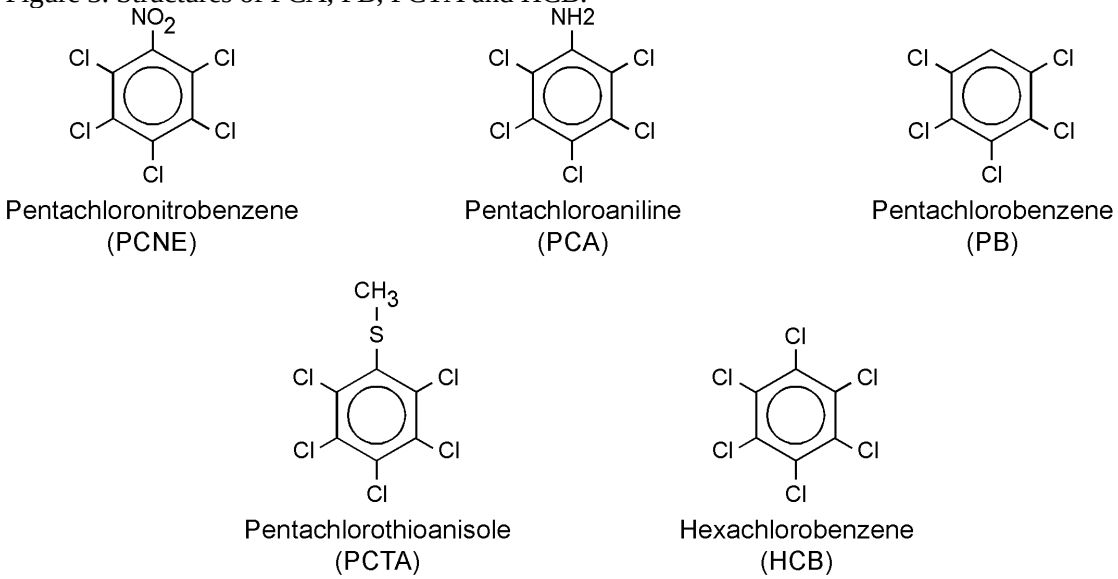
No data were available.

METHODS OF RESIDUE ANALYSIS

Analytical methods

Residues of quintozene, hexachlorobenzene (HCB), pentachlorobenzene (PB), pentachloro-thioanisole (PCTA) and pentachloroaniline (PCA) are determined by GLC with electron-capture detection. The structures of the compounds of interest are shown in Figure 3.

Figure 3. Structures of PCA, PB, PCTA and HCB.



Samples are ground or homogenized in a blender with hexane. The resulting solution is centrifuged, the supernant decanted and filtered, and the residue rinsed with hexane. The combined extracts are evaporated to near dryness and the determination is completed according to the clean-up required.

Oily samples such as peanut kernels and cotton seed are partitioned with acetonitrile and the sample is then extracted several times with a mixture of organic solvents and water. The extracts are combined and dried with anhydrous sodium sulfate, the solvent is evaporated and the residue taken up

in hexane. The hexane solution is filtered and reserved for further GPC and/or Florisil clean-up.

If GPC clean-up is required the sample is eluted with a mixture of toluene and hexane, and the eluate concentrated, evaporated again with petroleum ether, and reserved for clean-up on a Florisil column.

The sample is transferred to a Florisil column topped with a little sodium sulfate and eluted with a small quantity of 3% diethyl ether in petroleum ether. The eluate is concentrated by rotary evaporation under nitrogen and taken up in iso-octane for GLC (Griffith, 1973; Gaydosh, 1990). The limits of detection of quintozene, HCB, PB, PCTA and PCA in vegetables, nuts, oil seeds, milk, eggs and animal tissues ranged from 0.0005 to 0.05 mg/kg, and recoveries from 86 to 104% at fortification levels of 0.025 to 0.2 mg/kg.

In the multi-residue method of The Netherlands (Anon., 1988), the compounds are extracted with a mixture of toluene and 2-propanol. The propanol is removed by washing with water, and the toluene phase is cleaned up with an adsorbent mixture of activated carbon and Celite for the determination of quintozene only or a mixture of Attagel and Hyflo Supercel for the determination of quintozene, PCA and PCTA. After filtration, the compounds are determined by gas chromatography with electron-capture detection (LOD 0.01 mg/kg; recovery >80%).

Stability of pesticide residues in stored analytical samples

Studies of storage stability were conducted on relevant crops (Ball, 1988a, 1990a,b; Gaydosh, 1991a,b) with the results shown in Tables 4-8. It can concluded that residues of quintozene and its metabolites and impurities are stable in head cabbages, kidney beans, potatoes, wheat, cotton seed, and peanuts when stored at -20°C up to one year. A decrease to about 60-70% of the initial level was found in peppers and tomatoes and their processed products after 6 months, and in maize and soya beans after 8 months.

Table 4. Storage stability of quintozene and metabolites added to cotton seed and peanuts at 0.2 mg/kg.

Compound and commodity	Recovery, %, after interval (months)							Ref.
	0	1	2	3	4	6	12	
Cotton seed								
PB	103	98	88	101		92	100	Gaydosh, 1991a
HCB	102	99	86	103		85	101	
quintozene	103	95	86	74		93	99	
PCA	99	98	87	104		88	110	
PCTA	94	98	89	102		102	121	
Peanuts								
PB	98	94	107	98	91	88	106	Gaydosh, 1991b
HCB	97	93	110	102	90	87	109	
quintozene	91	86	111	91	90	90	105	
PCA	96	83	89	93	86	83	112	
PCTA	95	94	105	99	88	89	108	

Table 5. Storage stability of quintozene and metabolites added to tomatoes and their processed products at 0.025 mg/kg (Ball, 1998a).

Compound	Recovery, %, after interval (months)											
	Fruits				Ketchup				Dry pomace			
	0	2	4	6	0	2	4	6	0	2	4	6
PB	88	74	59	60	93	86	52	37	90	71	58	57
HCB	90	79	69	71	94	80	62	54	94	74	60	60
quintozene	89	85	69	72	96	79	61	59	91	73	58	59
PCA	86	82	73	76	91	74	69	60	58	65	56	57
PCTA	90	83	75	78	94	79	69	66	86	71	57	62

Table 6. Storage stability of quintozene and metabolites added to head cabbages and potatoes (Ball, 1990a).

Compound	Spike, mg/kg	Control analytical recovery, %		Recovery after 12 months, %	
		cabbage	potato	cabbage	potato
quintozene	0.2	95	103	91	86
HCB	0.04	98	98	91	85
PCA	0.2	98	90	93	92
PB	0.2	96	101	95	95
PCTA	0.2	99	96	98	96

Table 7. Storage stability of quintozene and metabolites added to peppers and kidney beans at 0.025 mg/kg (Ball, 1988a).

Compound and commodity	Recovery, %, after interval (months)			
	0	2	4	6
Peppers				
PB	94	59	59	48
HCB	96	71	81	58
quintozene	97	67	77	57
PCA	94	70	83	60
PCTA	99	67	85	60
Kidney beans				
PB	102	90	78	82
HCB	104	91	89	90
quintozene	104	91	89	88
PCA	102	97	98	95
PCTA	105	94	98	96

Table 8. Storage stability of quintozene and metabolites added to soya beans (dry), maize and wheat at 0.025 mg/kg (Ball, 1988a).

Compound	Recovery, %, after interval (months)					
	0	2	3	4	6	8
Soya beans (dry)						
PB	100	50	58	81	70	77
HCB	100	54	60	77	67	73
quintozene	98	50	56	75	75	74
PCA	95	58	68	83	83	75
PCTA	98	52	60	75	69	74
Maize						
PB	83	67	77	75	65	65
HCB	91	62	66	80	64	65
quintozene	93	65	92	71	66	69
PCA	95	69	79	80	78	80
PCTA	89	59	69	73	64	69
Wheat						
PB	90	70	86	102	91	125
	93	71	80	98	91	98
quintozene	93	76	62	98	80	88
PCA	95	75	90	98	86	98
PCTA	98	71	84	100	91	91

Residue definition

The Meeting considered that the residue definition for risk assessment purposes for plant and animal commodities should be the sum of quintozene, PCTA and PCA, expressed as quintozene. This definition is also suitable for animal commodities for enforcement purposes since the parent quintozene is not an adequate indicator compound in such commodities. Quintozene alone is a suitable definition of the residue in crops for enforcement purposes. On the basis of the metabolism and animal transfer studies the residue should be described as fat-soluble.

USE PATTERN

Quintozene is applied to garlic, beans, other vegetable seeds, potatoes, cereals and oilseed as a single seed treatment with DS, EC, FS, LS, PS or WP formulations (Table 9), and to bulb, brassica, fruiting, leafy, legume, root and tuber vegetables, pulses, oilseed and coffee beans in one or two soil or plant treatments before or at planting with an EC, DP, GR, SC or WP (Table 10). The PHI is not of importance because the interval between application and harvest is long in most cases. In Spain alone however two or three treatments are registered for peppers and tomatoes, from 15 days post-planting to maturity, but no PHI was reported.

Table 9. Registered uses of quintozene for seed treatment. All single applications.

Crop	Country	Form.	Application

			Rate, kg ai/ha	Concentration, kg ai/hl
Barley	Spain	PS 20%		0.04 -0.2
		PS 24%		0.036-0.19
	USA	FS, DS		0.048-0.11
Beans	Brazil	WP		0.11 -0.23
	USA	FS		0.16 -0.23
Cotton	Australia	WP		0.75 -0.1
		FS		0.1
		LS		0.18 -0.2
	Brazil	WP		0.225-0.45
	Israel	PS	0.75-1.13	0.075-0.11
	South Africa	WP		0.15
	Spain	PS 20%		0.04 -0.2
		PS 24%		0.036-0.19
	Thailand	EC		0.168-1.13
	USA	FS, DS		0.15 -0.2
Garlic	USA	WP 75%		1.0
Oats	USA	FS		0.088-0.18
Maize	Spain	PS 20%		0.04 -0.2
		PS 24%		0.036-0.19
	USA	DS		0.025
		FS		0.048
Peanuts	Brazil	WP		0.22
	Thailand	EC		0.168-1.13
	USA	DS		0.025-0.05
		FS		0.048
Peas	USA	FS		0.048-0.096
Potatoes	Israel	WP		1.0
Safflower	USA	DS		0.025-0.05
Rice	USA	FS		0.064-0.13
Sorghum	USA	DS, FS		0.025
Soya beans	USA	FS		0.048-0.096
Sugar beet	USA	DS		0.075-0.15
		FS		0.088-0.18
Vegetables	New Zealand	WP		0.3[1]
Wheat	Brazil	WP		0.19
	USA	FS		0.048

[1] disinfection of empty seed boxes (0.3 g ai/l/m^2)

Table 10. Registered uses of quintozene for soil and plant treatments.

Crop	Country	Form.	Application				PHI, days
			Method	Rate, kg ai/ha	Spray conc., kg ai/hl	No.	
Alfalfa	Saudi Arabia	WP	soil incorp. pre-plant		0.11-0.23		7-10
Beans	Australia	WP	soil incorp. at planting (band)	12-17		1	28
	Cyprus	WP	soil incorp. pre-plant	7.5		1	
	Israel	WP	soil spray in-furrow, pre-plant	0.12		1	
	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
	Spain	WP	spray at planting	0.75-2.3		1	
	South Africa	WP	row treatment, pre-plant	3.8		1	
	USA	WP, SC, EC, GR	soil spray in-furrow, at planting	0.84-1.7		1	
Beets	Israel	WP	soil treatment after harvest	600		1	21
Brassica vegetables	Australia	WP	soil drench at planting (band)	12-17		1	28
		WP	seed bed	38-56		1	
	UK	DP	soil incorp. pre-plant	70		1	
	USA	WP, SC, GR	soil treatment, pre-plant (band)		11	1	
	USA	WP, SC, GR	soil incorp. treatment, pre-plant (broadcast)	34	12	1	
	USA	WP, SC	soil drench	8.4-17	2.6-3.9	1	
	USA	WP, SC, EC	soil treatment transplant	0.0005 kg/plant corresp.to ~5 kg ai/ha	0.2	1	
	USA	GR 10%	row applic. to seeding	12-17		1	
Broccoli	Canada	WP	at transplanting		0.18-0.56	1	
	Spain	WP	spray at planting	0.75-2.3		1	
Brussels sprouts	Canada	WP	at transplanting		0.18-0.56	1	
	Spain	WP	spray at planting	0.75-2.3		1	
Cabbages, Head	Canada	WP	at transplanting		0.18-0.56	1	
	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
	Spain	WP	spray at planting	0.75-2.3		1	
Cauliflower	Canada	WP	at transplanting		0.18-0.56	1	
	Cyprus	WP	soil incorp. pre-plant	7.5	75	1	
	Saudi Arabia	WP	root drench, post-plant		0.11-0.23	1	
	Spain	WP	spray at planting	0.75-2.3		1	
Coffee	Thailand	EC	soil drench, incorp. pre-plant	108-216	0.18-0.56	1	
Cole Crops	Canada	WP	at transplanting		0.18-0.56	1	
Cotton	Australia	WP	spray at planting	3.8		1	
	Australia	EC	soil treatment in-furrow at planting	1.1-1.7		1	

quintozene

Crop	Country	Form.	Application				PHI, days
			Method	Rate, kg ai/ha	Spray conc., kg ai/hl	No.	
	Israel	WP	soil treatment	600 corresp. to 80 g/m^2		1	21
	Saudi Arabia	WP	soil incorp., pre-plant		0.11-0.23		7-10
	Spain	WP	spray at planting	0.75-2.3			1
	South Africa	WP	soil treatment at planting	3.8-5.3			1
	USA	WP, SC, EC, GR	soil spray in-furrow, at planting	0.84-2.3	0.8-1.7	1	
	USA	GR	drill at planting	0.87-1.1		1	
	USA	GR	hill-drop at planting	0.29-0.36		1	
Cucumbers	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
	UK	DP	soil incorp. pre-plant	70		1	
Egg plants	Cyprus	WP	soil incorp. pre-plant	7.5	75	1	
Endive	UK	DP	dusting, pre-plant	70		1	
Garlic	Cyprus	WP	soil incorp. pre-plant	7.5	75	1	
	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
	USA	WP, SC, EC, GR	soil spray in-furrow, at planting	22-23		1	
Ginseng	Canada	WP	spray prior to bud break	6.8	0.15-0.2	1	
Leafy herbs	UK	DP	dusting, pre-plant	70		1	
Lettuce	Australia	WP	soil applic. at singling (band)		0.075-0.11	1	28
	Cyprus	WP	soil incorp. pre-plant	7.5	75	1	
	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
	UK	DP	soil incorp. pre-plant	70		1	
Mushrooms	Cyprus	WP	at planting		0.75	1	
Onions	Cyprus	WP	soil incorp. pre-plant	7.5	75	1	
	South Africa	WP	dry dressing seedling, pre-plant or at planting		1.5	1	
	South Africa	WP	soil treatment, pre-plant or at planting	25		1	
Peas	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
Peanuts	Australia	WP	directed spray at pegging	12-17		1-2	28
	Cyprus	WP	soil incorp. pre-plant	7.5	75	1	
	Israel	WP	soil treatment, after harvest	600		1	21
	Saudi Arabia	WP	soil incorp., pre-plant		0.11-0.23		7-10
	USA	WP, SC, EC	soil spray in-furrow, at planting	1.1-2.2		1-2	45
	USA	WP, SC, GR	soil applic. at pegging (band)	11		1-2	45
	USA	WP, SC	at cultivation	3.6		1-2	45
	USA	GR	soil-mix cultivation	3.7		1-2	45
	USA	GR	soil applic. split pegging; soil-mix; band	2.8-5.6		1-2	45
Peppers	Cyprus	WP	soil incorp., pre-plant	7.5	75	1	
	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
	Spain	EC	irrigation, 15 days post-planting	3.6-6		2-3	

Crop	Country	Form.	Application				PHI, days
			Method	Rate, kg ai/ha	Spray conc., kg ai/hl	No.	
			to maturity[1]				
	Spain	WP	spray at planting	0.75-2.3		1	
	UK	DP	dusting, pre-plant	70		1	
	USA	WP	soil applic. at transpl.	2.5	0.27	1	
	USA	WP	soil spray in-furrow, at planting	5.5-8.4	0.58-0.9	1	
Potatoes	Australia	WP	soil applic. at planting (band)	25-30		1	28
	Cyprus	WP	soil incorp. pre-plant	7.5	75	1	
	Israel	WP	soil incorp.	75		1	
	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
	South Africa	WP	soil applic. pre-plant or at planting	23-30		1	
Tomatoes	Australia	WP	soil applic. at transplanting		0.23-0.38	1	28
	Cyprus	WP	spray at planting		0.19	1	
	Saudi Arabia	WP	root drench, post-plant		0.11-0.23		
	Spain	EC	irrigation, 15 days post planting to maturity[1]	3.6-6		2-3	
	Spain	WP	spray at planting	0.75-2.3		1	
	UK	DP	soil incorp. pre-plant	70		1	
	USA	WP 75%	transplant treatment	2.5	0.27	1	
	USA	WP 75%	soil spray in-furrow at planting	5.5-8.4	0.58-0.9	1	
Vegetables	New Zealand	WP	soil applic. pre-plant	90		1	
	New Zealand	WP	drench, post-planting		0.05	1	

[1] field and glasshouse use

RESIDUES RESULTING FROM SUPERVISED TRIALS

The Meeting reviewed US data on supervised residue trials with soil or plant treatment for broccoli, head cabbages, peppers, tomatoes, beans, potatoes, cotton seed and peanuts, and with seed treatment for sugar beets, peas, barley, maize and soya beans. Residues of quintozene (PCNB), its metabolites pentachlorothioanisole (PCTA) and pentachloroaniline (PCA), and the impurities hexachlorobenzene (HCB) and pentachlorobenzene (PB) were determined in all the trials. In the trials before 1990 the technical quintozene contained not more than 0.5% of the impurity HCB. Subsequently the maximum HCB content was reduced to <0.1% by the manufacturer.

List of Tables in this section

Table No

beans (dry).
17 Residues of quintozene, its metabolites and impurities in potatoes.
18 Residues of quintozene, its metabolites and impurities in cotton seed.
19 Residues of quintozene, its metabolites and impurities in peanut.
20 Residues of quintozene, its metabolites and impurities in barley, maize, peas, soya beans and sugar beets after seed treatment.

Residues in crops from soil treatment

Broccoli. Broccoli in Oregon and California were treated by broadcast, band and transplant water applications (Ball, 1988b), and in Oregon also by direct seeded (broadcast) applications. The broccoli were harvested at maturity, a PHI of 64-83 days. Forty eight samples were analysed (Table 11). The residues from direct seeded applications of both WP and GR formulations were lower than those from the other modes of application. Broadcast and band applications gave comparable residues. Plants treated at transplanting had the highest residues.

Table 11. Residues of quintozene, its metabolites and impurities in broccoli, USA, 1993. All single applications.

Application		PHI, days	Residues, mg/kg				
Form, method	kg, ai/ha		PCNB	PB	HCB	PCTA	PCA
WP direct seed	34	73-78	0.004 0.005 0.006 (2)	<0.002 (4)	<0.002 (4)	<0.002 (4)	0.003 (4)
WP broad-cast	34	64-77	<0.002 <0.002 <0.002 0.002 0.003 0.005 0.018 0.023	<0.002 (8)	<0.002 (8)	<0.002 (7) 0.002	<0.002 <0.002 0.002 0.002 0.003 0.004 0.01 0.017
WP band	25	72 - 83	0.004 0.004 0.004 0.006 0.006 0.01 0.02 0.024	<0.002 (8)	<0.002 (8)	<0.002 (7) 0.003	0.003 0.004 0.004 0.005 0.006 0.009 0.012 0.014
WP transplant	5.0	72 - 83	0.017 0.019 0.024 0.027 0.038 0.05	<0.002 (6)	<0.002 (6)	0.005 0.007 0.003 0.002 0.004 0.004	0.016 0.028 0.03 0.015 0.03 0.04
WP drench	5.0	64	0.014 0.015	<0.002 (2)	<0.002 (2)	<0.002 0.003	0.01 (2)
GR direct seed	34	73 - 78	0.004 0.005 0.006 0.009	<0.002 (4)	<0.002 (4)	<0.002 <0.002 <0.002 0.003	0.002 0.002 0.002 0.007
GR band	22	64 -83	0.003 0.007 0.007	<0.002 (8)	<0.002 (8)	0.002 0.002 <0.002	0.004 0.006 0.004

Application		PHI, days	Residues, mg/kg				
Form, method	kg, ai/ha		PCNB	PB	HCB	PCTA	PCA
			0.008 0.009 0.023 0.007 0.023			0.003 <0.002 <0.002 0.003 0.002	0.006 0.003 0.012 0.007 0.016
GR broad-cast	34	73 - 83	0.004 0.006 0.006 0.007 0.008 0.008 0.028 0.027	<0.002 (8)	<0.002 (8)	0.003 <0.002 <0.002 0.002 0.002 0.004 0.002 <0.002	0.004 0.006 0.006 0.006 0.006 0.005 0.021 0.014

Head cabbages. Residue trials on head cabbages (4 varieties of white and 1 of savoy cabbage) were carried out at eight locations in California, Illinois, Florida, New York and Wisconsin, representing the commercial production areas in the USA (Ball, 1988c). The soil was treated with quintozene by broadcast or band application. In the transplant solution treatments the soil was treated after the seedlings were planted. Cabbage plants were grown to maturity (67-125 days after application). Cabbage heads with and without wrapper leaves were analysed (Table 12).

Table 12. Residues of quintozene, its metabolites and impurities in head cabbages, USA, 1987. All single applications (Ball, 1988c).

Application		PHI, days	Residues, mg/kg				
Form, method	kg, ai/ha		PCNB	PB	HCB	PCTA	PCA
With wrapper leaves							
WP broadcast	34	67-125	0.036 0.038 0.041 0.019 0.013 0.009 0.005 <0.002 (4) 0.004 0.006 0.004	<0.002 (12) 0.002 (2)	<0.002 (14)	<0.002 (14)	0.014 0.029 0.025 0.02 0.008 0.005 0.003 <0.002 (4) <0.002 0.005 0.004
WP band	25	67-125	0.005 0.005 0.015 0.015 <0.002 (7) 0.004 0.002 0.002	<0.002 (13) 0.002	<0.002 (14)	<0.002 (14)	0.005 0.005 0.02 0.02 <0.002 (7) 0.003 0.003 0.002
WP transplant solution	5.0	67-125	<0.002 (8) 0.009 0.037 0.062 0.002 0.004 0.005	<0.002 (12) 0.002 0.003	<0.002 (14)	<0.002 (12) 0.006 0.004	<0.002 (8) 0.01 0.038 0.041 0.003 0.003 0.005
GR broadcast	34	67-125	0.01 0.016 0.046 0.014 0.009 0.009 0.003 0.003 <0.002 <0.002 (5)	<0.002 (14)	<0.002 (14)	<0.002 (14)	0.005 0.012 0.03 0.009 0.009 0.003 0.003 0.007 0.002 <0.002 (5)
GR band	22	67-125	0.009 0.009 0.05 0.026 <0.002 (10)	<0.002 (13) 0.003	<0.002 (14)	<0.002 (14)	0.008 0.01 0.042 0.031 <0.002 (10)
Without wrapper leaves							
WP broadcast	34	67-125	0.004 0.003 0.003 <0.002 (10)	<0.002 (13)	<0.002 (13)	<0.002 (13)	0.003 0.003 0.002 <0.002 (10)
WP band	25	67-125	<0.002 (10) 0.002 0.005	<0.002 (12)	<0.002 (12)	<0.002 (12)	<0.002 (10) 0.003 0.003
WP solution	5.0	67-125	<0.002 (9) 0.008 0.004	<0.002 (13)	<0.002 (13)	<0.002 (13)	<0.002 (9) <0.002 0.003

quintozene

Application		PHI, days	Residues, mg/kg				
Form, method	kg, ai/ha		PCNB	PB	HCB	PCTA	PCA
			0.006 0.002				0.004 0.002
GR broadcast	34	67-125	0.016 0.003 0.013 0.01 <0.002 (6) <0.002 <0.002 <0.002	<0.002 (13)	<0.002 (13)	<0.002 (13)	<0.002 (10) 0.003 0.008 0.009
GR band	22	67-125	<0.002 (10) 0.015 0.002 0.012	<0.002 (13)	<0.002 (13)	<0.002 (13)	<0.002 (11) 0.002 0.012

Peppers, sweet. Trials were carried out at six sites in Florida (2), New Jersey (1), Texas (1) and California (2), representing a substantial pepper-growing segment of the USA (Ball, 1988d, 1989a). Applications were by in-furrow treatment and drench at transplanting. Twenty samples of peppers were analysed (Table 13).

Table 13. Residues of quintozene, its metabolites and impurities in peppers, USA, 1957. All single applications of WP formulation.

Application kg, ai/ha	PHI, days	Residues, mg/kg					Reference
		PCNB	PB	HCB	PCTA	PCA	
8.4	104	<0.05 (2)	<0.05 (2)	<0.05 (2)	<0.05 (2)	<0.05 (2)	Ball, 1989a
4.2	104	<0.05 (2)	<0.05 (2)	<0.05 (2)	<0.05 (2)	<0.05 (2)	Ball, 1988d
8.4	71-91	<0.05 (8)	<0.05 (8)	<0.05 (8)	<0.05 (8)	<0.05 (8)	
4.2	71-91	<0.05 (8)	<0.05 (8)	<0.05 (8)	<0.05 (8)	<0.05 (8)	

Tomatoes. Ball (1990c) ran trials at eight locations in California, Florida, Indiana, Michigan and New Jersey, using in-furrow treatments and drench at transplanting. The analytical method used to determine the residues of quintozene, PB, HCB, PCA and PCTA was validated at an LOD of 0.05 mg/kg, at which level no residues were detectable. Eighteen of the original 37 samples were re-analysed (Ball, 1990d) by a modified method with an LOD of 0.002 mg/kg. The results by the modified method are shown in Table 14.

Table 14. Residues of quintozene, its metabolites and impurities in tomatoes, USA 1990. All single applications.

Application		PHI, days	Residues, mg/kg					Reference
Form, method	kg, ai/ha		PCNB	PB	HCB	PCTA	PCA	
WP in-furrow	8.4	73-113	<0.002 (7) 0.003 0.006 0.012	<0.002 (10)	<0.002 (10)	<0.002 (10)	<0.002 (10)	Ball, 1990d
WP transplant solution	3.9	73-113	<0.002 (6) 0.003 (2)	<0.002 (8)	<0.002 (8)	<0.002 (8)	<0.002 (8)	

Common beans (pods and/or immature seeds). Three formulations of quintozene were applied to snap beans at each location in New York, Oregon and North Carolina as a directed spray in the seed furrow (single applications). At all sites the sample consisted of mature snap beans (Gaydosh, 1993). In 1987 quintozene was applied four times to snap and succulent lima beans (Ball, 1988e, 1990e) and the beans harvested at maturity, with a 14-day PHI for snap beans and a 35-day PHI for lima beans. In total, 44 samples were analysed (Table 15).

Table 15. Residues of quintozene, its metabolites and impurities in common beans (pods and/or immature seeds), USA.

Year, commodity	Application			PHI, days	Residues, mg/kg					Ref.
	Form	No.	kg ai/ha		PCNB	PB	HCB	PCTA	PCA	
1993, snap beans	WP	1	1.7	42 -	<0.0005 (2)	<0.0005 (6)	<0.0005	<0.0005	<0.0005 (4)	Gaydosh,

Year, commodity	Application			PHI, days	Residues, mg/kg					Ref.
	Form	No.	kg ai/ha		PCNB	PB	HCB	PCTA	PCA	
				62	0.012 0.014 0.043 0.053		(6)	(6)	 0.007 0.007	1993
	EC	1	1.7	42 - 62	<0.0005 (2) 0.081 0.068 0.017 0.018	<0.0005 (6)	<0.0005 (6)	<0.0005 (4) 0.01 0.007	<0.0005 (2) 0.01 0.009 0.008 0.007	
	SC	1	1.7	42 - 62	<0.0005 (2) 0.069 0.062 0.012 0.013	<0.0005 (6)	<0.0005 (6)	<0.0005 (4) 0.006 0.007	<0.0005 (3) 0.006 0.007 0.006	
1987, lima beans	EC	4	2.2	35	0.009 0.012 0.026 <0.002 0.003 0.006	<0.002 (6)	<0.002 (6)	<0.002 <0.002 0.002 <0.002 <0.002 <0.002	0.007 0.004 0.01 <0.002 <0.002 <0.002	Ball, 1988e, 1990e
	WP	4	2.2	35	0.004 0.009 0.025 0.003 0.004 0.006	<0.002 (6)	<0.002 (6)	<0.002 <0.002 0.003 <0.002 (3)	<0.002 0.003 0.01 0.003 0.002 <0.002	
1987, snap beans	EC	4	2.2	14	0.021 0.033 0.031 0.01 0.047 0.029	<0.002 (6)	<0.002 (6)	<0.002 0.004 0.005 <0.002 0.008 <0.002	0.004 0.007 0.019 0.041 0.043 0.047	
	WP	4	2.2	14	0.016 0.021 0.037 0.01 0.13 0.041 0.007 0.06	<0.002 (8)	<0.002 (8)	<0.002 0.002 0.005 <0.002 (5)	0.004 0.005 0.006 0.024 0.025 0.026 0.053 0.1	

Common beans (dry). In trials in 1993 in Michigan, North Dakota, and California three common varieties of beans were treated by single ground applications and samples of mature beans were analysed (Gaydosh, 1994a). In 1987 kidney, navy and pinto beans were treated with four applications of quintozene. The first spray treatment was pre-emergence, the second and the third at plant heights of 7.5 and 20 cm, and the fourth at row closure (Ball, 1988e, 1990e). Beans were harvested at maturity, 35-78 days after treatment. In total 37 samples were analysed (Table 16).

Table 16. Residues of quintozene, its metabolites and impurities in common beans (dry), USA.

Year, commodity	Application	PHI, days	Residues, mg/kg	Ref.

	Form	No	kg ai/ha		PCNB	PB	HCB	PCTA	PCA	
1993, dry red kidney beans, pinto beans	WP	1	1.7	77 - 106	<0.0005 (4) 0.005 0.004	<0.0005 (6)	<0.0005 (6)	<0.0005 (6)	<0.0005 (4) 0.002 0.001	Gaydosh, 1994a
	EC	1	1.7	77 - 106	<0.0005 (4) 0.013 0.02	<0.0005 (5) 0.001	<0.0005 (6)	<0.0005 (5) 0.002	<0.0005 (4) 0.003 0.007	
	SC	1	1.7	77 - 106	<0.0005 (4) 0.008 0.005	<0.0005 (6)	<0.0005 (6)	<0.0005 (5) 0.0006	<0.0005 (4) 0.0015 (2)	
1987, dry red kidney beans; navy beans; pinto beans	WP	4	2.2	35 - 78	<0.002 (5) 0.029 0.013 0.015 0.017 0.003	<0.002 (10)	<0.002 (10)	<0.002 (10)	<0.002 (5) 0.01 0.009 0.006 0.004 <0.002	Ball 1988e, 1990e
	EC	4	2.2	35 - 78	<0.002 (4) 0.021 0.01 0.028 0.052 0.009	<0.002 (9)	<0.002 (9)	<0.002 (9)	<0.002 (4) 0.019 0.009 0.005 0.009 <0.002	

Potatoes. In residue trials by Ball (1988f) at 12 locations in 10 States (Florida, Oregon, Michigan, Maine, Minnesota, Washington, California, Idaho, North Dakota and Wisconsin) potatoes were treated in-furrow and by broadcast applications and harvested at maturity, after 3-4.5 months. The analytical method used to determine the residues of quintozene, PB, HCB, PCA and PCTA was validated at an LOD of 0.002 mg/kg. The results (Table 17) showed higher residues of quintozene from the in-furrow applications. Of the five compounds determined, quintozene, PCA and PCTA were present at the highest levels.

Table 17. Residues of quintozene, its metabolites and impurities in potatoes, USA, 1987. Single applications (Ball, 1988f).

Form	kg, ai/ha	PHI, days	PCNB, mg/kg	PB, mg/kg	HCB, mg/kg	PCTA, mg/kg	PCA, mg/kg
EC broad-cast	28	82-136	0.15 0.16 0.05 0.05 0.082 0.11 0.052 0.052 0.082 0.005 0.01 0.07 0.008 0.14 0.14 0.14 <0.002 (5) 0.017 0.014 0.023 0.013 0.016	0.058 0.052 0.028 0.022 0.029 0.038 0.019 0.031 0.003 0.004 0.020 0.006 0.014 0.014 0.11 0.089 <0.002 (5) 0.068 0.056 0.023 0.014 0.03	0.007 0.008 0.005 0.003 0.01 0.01 0.007 0.01 <0.002 <0.002 0.005 0.005 0.003 0.024 0.02 0.018 <0.002 (5) 0.004 0.004 0.003 <0.002 0.004	0.05 0.05 0.026 0.019 0.054 0.062 0.031 0.057 <0.002 <0.002 0.044 0.033 0.01 0.3 0.16 0.13 <0.002 (5) 0.01 0.006 0.01 0.004 0.015	0.11 0.087 0.020 0.015 0.03 0.03 0.024 0.025 0.045 0.002 0.003 0.023 0.029 0.01 0.2 0.16 <0.002 (5) 0.056 0.046 0.026 0.012 0.03

Form	kg, ai/ha	PHI, days	PCNB, mg/kg	PB, mg/kg	HCB, mg/kg	PCTA, mg/kg	PCA, mg/kg
			0.012 0.004 0.009	0.015 0.005 0.012	0.002 <0.002 <0.002	0.007 0.004 0.01	0.01 0.004 0.009
EC in furrow	11	82-135	0.033 0.021 0.33 0.17 0.2 0.12 0.08 0.96 0.81 0.03 0.024 0.026 0.21 0.15	0.03 0.027 0.036 0.022 0.019 0.034 0.022 0.064 0.041 0.008 0.017 0.011 0.045 0.052	0.003 0.002 0.019 0.013 0.013 0.007 0.005 0.033 0.022 0.003 0.003 0.003 0.014 0.014	0.017 0.01 0.10 0.042 0.059 0.033 0.021 0.24 0.17 0.014 0.013 0.012 0.19 0.17	0.044 0.033 0.058 0.036 0.044 0.04 0.024 0.25 0.2 0.01 0.021 0.017 0.13 0.13
EC in furrow	13	103-135	0.34 <0.002 0.29 0.072 0.076 0.21 0.39 0.26	0.022 <0.002 0.03 0.028 0.011 0.023 0.011 0.007	0.011 <0.002 0.007 0.003 0.002 0.006 0.009 0.006	0.052 <0.002 0.034 0.01 0.01 0.035 0.06 0.046	0.049 <0.002 0.01 0.053 0.028 0.014 0.013 0.041

Cotton seed. Seven trials in 1988 (Gaydosh, 1992) in California (2), Louisiana (2), Mississippi (2) and Georgia (1) were with single in-furrow treatments. The crops were sampled at maturity, about four to five months after the application. The analytical method used to determine the residues of quintozene PB, HCB, PCA and PCTA was validated at a LOD of 0.005 mg/kg.

In 1994 Gaydosh (1994b) carried out trials in two growing regions, in Mississippi and Texas, with single ground applications in-furrow at planting. Mature cotton was harvested at both sites (Mississippi 142-day PHI, Texas 160-day PHI) and ginned to provide cotton seed. The analytical method used at an LOD of 0.002 mg/kg for all the analytes. The results are shown in Table 18.

Peanuts. In trials in 1988 (Ball, 1989b) at three locations in Virginia (1) and Georgia (2), peanut plants were treated by small-scale irrigation at pegging and 45 days before harvest. The analytical method had an LOD of 0.005 mg/kg for all the compounds determined.

In three trials by Gaydosh (1994c,d,e) in Georgia, Oklahoma and Texas, applications were also at pegging and again 45 days before harvest. The analytical method used in the first trial (1994c) had an LOD of 0.005 mg/kg for quintozene, PB, PCA and PCTA and 0.001 mg/kg for HCB, and that in the other trials (1994d,e) had LODs of 0.001 mg/kg and 0.0005 mg/kg respectively. In all three trials mature peanuts were harvested and the kernels and hulls analysed (Table 19).

Table 18. Residues of quintozene, its metabolites and impurities in cotton seed, USA. All single applications at 2.2 kg ai/ha.

Year	Form	PHI, days	Residues, mg/kg					Ref.
			PCNB	PB	HCB	PCTA	PCA	

Year	Form	PHI, days	Residues, mg/kg					Ref.
			PCNB	PB	HCB	PCTA	PCA	
1988 1988	EC	140-166	<0.005 (13) 0.008	<0.005 (14)	<0.005 (14)	<0.005 (14)	<0.005 (12) 0.008 0.014	Gaydosh, 1992
	FL	140-166	<0.005 (14)	<0.005 (14)	<0.005 (14)	<0.005 (13) 0.010	<0.005 (12) 0.008 0.009	
1994	G	142-160	<0.002 (4)	<0.002 (4)	<0.002 (4)	<0.002 (4)	<0.002 (3) 0.002	Gaydosh, 1994b
	EC	142-160	<0.002 (4)	<0.002 (4)	<0.002 (4)	<0.002 (4)	<0.002 0.002 (3)	

Table 19. Residues of quintozene, its metabolites and impurities in peanuts, USA. Two applications.

Year, sample	Application		PHI, days	Residues, mg/kg					Ref.
	Form	kg ai/ha		PCNB	PB	HCB	PCTA	PCA	
1988, kernel	EC	2 x 5.6	45	0.008 0.006 0.17 0.23 0.25 0.17	<0.005 <0.005 0.034 0.047 0.045 0.027	<0.005 <0.005 <0.005 <0.005 0.006 0.005	<0.005 <0.005 0.028 0.039 0.04 0.036	<0.005 <0.005 0.052 0.072 0.07 0.056	Ball, 1989b Project No. RP-88002
hull				<0.005 0.007 0.45 0.70 0.37 0.43	<0.005 <0.005 0.050 0.074 0.043 0.043	<0.005 <0.005 <0.005 <0.005 0.005 0.005	<0.005 <0.005 0.10 0.16 0.075 0.096	<0.005 <0.005 0.13 0.21 0.10 0.14	
1988, kernel	SC	2 x 4.7	45	<0.005 (2)	<0.005 (2)	<0.005 (2)	<0.005 (2)	<0.005 (2)	Ball, 1989b Project No. RP-88002
hull				<0.005 0.056	<0.005 <0.005	<0.005 <0.005	<0.005 <0.005	<0.005 <0.005	
1994, kernel	WP	6.7 4.5	45	0.007 0.008 0.006 0.005	0.011 0.008 0.006 0.008	0.002 0.001 0.001 0.001	0.004 0.004 0.003 0.003	0.015 0.016 0.02 0.019	Gaydosh, 1994c
hull				0.014 0.033 0.018 0.018	0.001 0.004 0.004 0.009	<0.001 0.001 0.003 0.018	0.005 0.012 0.012 0.003	0.015 0.044 0.023 0.038	
1994, kernel	GR	2 x 5.6	45	0.051 0.048 0.045 0.007	0.012 0.012 0.009 0.005	0.0035 0.0048 0.0094 0.0016	0.017 0.016 0.01 0.002	0.025 0.02 0.045 0.014	Gaydosh, 1994d
hull				0.85 0.94 0.056 0.092	0.027 0.032 0.003 0.003	0.012 0.013 0.0005 0.0006	0.21 0.19 0.006 0.008	0.2 0.16 0.023 0.032	
1994, kernel	WP	7.8 3.6	45	0.005 0.005 0.002 0.002	0.008 0.008 0.002 <0.001	0.0059 0.0028 0.0024 <0.0005	0.004 0.005 0.002 <0.001	0.011 0.011 0.01 0.008	
hull				0.034	0.006	0.0014	0.035	0.025	

Year, sample	Application		PHI, days	Residues, mg/kg					Ref.
	Form	kg ai/ha		PCNB	PB	HCB	PCTA	PCA	
				0.047 0.006 0.006	0.003 <0.001 0.001	0.0013 0.0007 0.0007	0.039 <0.001 <0.001	0.029 0.018 0.017	
1994, kernel	EC	2 x 2.6	45-47	0.13 0.11 0.045 0.037 0.15 0.15	0.06 0.066 0.020 0.022 0.056 0.046	0.008 0.0064 0.0025 0.0022 0.016 0.017	0.065 0.06 0.006 0.005 0.11 0.12	0.17 0.14 0.05 0.05 0.16 0.16	Gaydosh, 1994e
hull				0.13 0.10 0.31 0.37 0.28 0.29	0.034 0.032 0.022 0.016 0.12 0.18	0.0033 0.0025 0.0019 0.0023 0.0029 0.0024	0.065 0.057 0.034 0.033 0.16 0.17	0.13 0.11 0.25 0.3 0.27 0.27	
kernel	SC	2 x 4.7	45-47	0.047 0.04 0.01 0.011 0.058 0.068	0.014 0.014 0.003 0.004 0.027 0.060	0.0022 0.0027 0.001 0.001 0.01 0.007	0.011 0.01 <0.001 0.001 0.046 0.052	0.043 0.037 0.011 0.015 0.077 0.086	
hull				0.055 0.051 0.069 0.071 0.11 0.085	0.014 0.009 0.003 0.003 0.092 0.065	0.002 0.001 0.0011 0.0015 0.0028 0.0014	0.022 0.021 0.005 0.007 0.082 0.083	0.048 0.043 0.041 0.045 0.13 0.12	

Residues in crops from seed treatment

Sixty two US residue trials with quintozene applied as a seed treatment were carried out on peas(dry) in Idaho, New York, California and Montana, on sugar beet in Idaho, North Dakota, California and Montana, on barley in Idaho, North Dakota, Oregon, California and Montana, on maize in Illinois, Oklahoma, Ohio, New York, Missouri and Virginia, on wheat in North Dakota (2), Idaho, Mississippi, California, Ohio, Oregon and Kansas, and on soya beans in Montana, Illinois, Ohio, Iowa, Missouri, Mississippi, Virginia and Georgia (Gaydosh, 1991c-h). The results are shown in Table 20.

Table 20. Residues of quintozene, its metabolites and impurities in barley, maize, wheat, peas, soya beans and sugar beets after seed treatment, USA, 1987. All single applications of FS.

Crop	kg ai/100 kg seed	Sample	Residues, mg/kg					Ref.
			PCNB	PB	HCB	PCTA	PCA	
barley	0.13	forage, green[1]	<0.005 (5) 0.11	<0.005 (6)	<0.005 (6)	<0.005 (5) 0.009	<0.005 (5) 0.013	Gaydosh, 1991c
		grain	<0.005 (6)	<0.005 (6)	<0.005 (6)	<0.005 (6)	<0.005 (6)	
		straw	<0.005 (4)	<0.005 (4)	<0.005 (4)	<0.005 (4)	<0.005 (4)	
maize	0.052	whole plant	<0.005 (14)	<0.005 (14)	<0.005 (13) 0.019	<0.005 (14)	<0.005 (14)	Gaydosh, 1991d
		ear with husk, milk-stage	<0.005 (14)	<0.005 (14)	<0.005 (13) 0.01	<0.005 (14)	<0.005 (14)	
		forage, milk-stage	<0.005 (13)	<0.005 (13)	<0.005 (13)	<0.005 (13)	<0.005 (13)	

Crop	kg ai/100 kg seed	Sample	Residues, mg/kg					Ref.
			PCNB	PB	HCB	PCTA	PCA	
		grain, mature	<0.005 (12)	<0.005 (12)	<0.005 (12)	<0.005 (12)	<0.005 (12)	
		fodder, mature	<0.005 (12) 0.006	<0.005 (13)	<0.005 (13)	<0.005 (13)	<0.005 (13)	
wheat	0.052	forage, green[1]	<0.005 (6) 0.028 0.04 0.011 0.019 0.38 0.82	<0.005 (10) 0.009 0.008	<0.005 (10) 0.006 0.008	<0.005 (10) 0.018 0.014	<0.005 (8) 0.009 0.008 0.006 0.007	Gaydosh, 1991h
		grain	<0.005 (19) 0.0061	<0.005 (20)	<0.005 (20)	<0.005 (20)	<0.005 (20)	
		straw	<0.005 (17) 0.006 0.007 0.023	<0.005 (20)	<0.005 (19) 0.014	<0.005 (20)	<0.005 (20)	
peas	0.12	peas with pods	<0.005 (8)	<0.005 (8)	<0.005 (8)	<0.005 (8)	<0.005 (8)	Gaydosh, 1991e
		pea forage	<0.005 (4) 0.006 (2) 0.01 0.011	<0.005 (8)	<0.005 (8)	<0.005 (8)	<0.005 (8)	
		peas, dried	<0.005 (6) 0.005 0.007	<0.005 (8)	<0.005 (8)	<0.005 (8)	<0.005 (8)	
		hay, dried	0.013 0.02 0.016 0.015 <0.005 <0.005 <0.005 <0.005	<0.005 (8)	<0.005 (8)	<0.005 <0.005 0.009 <0.005 <0.005 <0.005 <0.005 <0.005	0.008 0.015 <0.005 <0.005 0.006 <0.005 <0.005 <0.005	
soya beans	0.10	whole plant, green[1]	<0.005 (16)	<0.005 (16)	<0.005 (16)	<0.005 (16)	<0.005 (16)	Gaydosh, 1991f
		whole plant at harvest	<0.005 (14)	<0.005 (14)	<0.005 (14)	<0.005 (14)	<0.005 (13) 0.014	
		beans at harvest	<0.005 (16)	<0.005 (16)	<0.005 (16)	<0.005 (16)	<0.005 (16)	
		hay at harvest	<0.005 (16)	<0.005 (16)	<0.005 (16)	<0.005 (16)	<0.005 (16)	
sugar beet	0.19	leaves, green	<0.005 (6)	<0.005 (6)	<0.005 (6)	<0.005 (6)	<0.005 (6)	Gaydosh, 1991g
		leaves, at harvest	<0.005 (6)	<0.005 (6)	<0.005 (6)	<0.005 (6)	<0.005 (6)	
		roots, at harvest	<0.005 (6)	<0.005 (6)	<0.005 (6)	<0.005 (6)	<0.005 (6)	

[1] green forage or green plant 45 days after sowing

Animal transfer studies

Cow feeding study. Groups of three lactating cows were fed quintozene (98.2% PCNB, 0.1% PB, 1.4% HCB) at nominal levels of 0.1, 1 and 10 ppm in the diet for 12-15 weeks. Samples of the milk were taken on days 0, 1, 7, and then at weekly intervals to day 56. Samples of kidneys, muscle and fat were analysed at slaughter, 16 weeks after the start of feeding (Griffith *et al*., 1969).

The LODs of PB, PCA, HCB and quintozene in milk were 0.001, 0.001, 0.005 and 0.01

mg/kg. PCTA could not be quantified because of interference. HCB reached a plateau at about five weeks at 0.014 mg/kg and PCA almost immediately at 0.005 mg/kg in the milk from the cows at the 10 ppm feeding level. The other compounds were detected sporadically at or below the LOD (Table 21).

Table 21. Residues of quintozene, its metabolites and impurities in milk (average of three cows per feeding group).

Days	Residues, mg/kg[1]											
	Feeding level 0.1 ppm				Feeding level 1 ppm				Feeding level 10 ppm			
	PB	HCB	PCNB	PCA	PB	HCB	PCNB	PCA	PB	HCB	PCNB	PCA
0	<0.001	<0.001	<0.01	<0.005	<0.001	<0.001	<0.01	<0.005	<0.001	<0.001	<0.01	<0.005
1	<0.001	<0.001	<0.01	<0.005	<0.001	<0.001	<0.01	<0.005	<0.001	0.002	<0.01	<0.005
7	<0.001	<0.001	<0.01	<0.005	<0.001	<0.001	<0.01	<0.005	<0.001	0.003	<0.01	<0.005
14	<0.001	<0.001	<0.01	<0.005	<0.001	0.001	<0.01	<0.005	<0.001	0.01	<0.01	0.006
21	<0.001	<0.001	<0.01	<0.005	<0.001	0.001	<0.01	<0.005	<0.001	<0.008	<0.01	<0.005
28	<0.001	<0.001	<0.01	<0.005	<0.001	0.002	<0.01	<0.005	<0.001	0.012	<0.01	0.005
35	<0.001	<0.001	<0.01	<0.005	<0.001	0.002	<0.01	<0.005	<0.001	0.031	<0.01	0.005
42	<0.001	<0.001	<0.01	<0.005	<0.001	0.003	<0.01	<0.005	<0.001	0.016	<0.01	0.008
49	<0.001	<0.001	<0.01	<0.005	<0.001	0.001	<0.01	<0.005	<0.001	0.012	<0.01	<0.005
56	<0.001	<0.001	<0.01	<0.005	<0.001	0.003	<0.01	<0.005	<0.001	0.015	<0.01	0.006

[1] PCTA could not be quantified owing to interference

Tissues. The LODs of PB, HCB, quintozene and PCA in tissues are indicated in Table 22 at the 0.1 ppm feeding level. PCTA could not be quantified owing to interference.

In an additional experiment a single cow was fed at 1,000 ppm and slaughtered after one month. PCTA was detected, and could be quantified in the muscle and fat (Table 23).

Table 22. Residues of quintozene, its metabolites and impurities in cow tissues (maximum single values).

Sample	Residues, mg/kg[1]											
	Feeding level 0.1 ppm				Feeding level 1 ppm				Feeding level 10 ppm			
	PB	HCB	PCNB	PCA	PB	HCB	PCNB	PCA	PB	HCB	PCNB	PCA
Kidneys	<0.004	<0.01	<0.05	<0.05	<0.004	<0.01	<0.05	<0.05	<0.004	0.06	<0.05	0.1
Liver	<0.003	<0.02	<0.05	<0.05	<0.003	<0.02	<0.05	<0.05	<0.003	0.11	<0.05	<0.05
Muscle	<0.003	<0.02	<0.05	<0.05	<0.003	<0.02	<0.05	<0.05	0.004	0.11	<0.05	<0.05
Fat, abdominal	<0.008	<0.02	<0.1	<0.08	<0.008	0.1	<0.1	<0.08	<0.008	0.8	<0.1	0.5
Fat, subcutaneous	<0.008	<0.02	<0.1	<0.08	<0.008	0.08	<0.1	<0.08	<0.008	0.7	<0.1	0.38

[1] PCTA could not be quantified

Table 23. Residues of quintozene, its metabolites and impurities in cow tissues after feeding for 1 month with 1000 ppm quintozene in the diet.

Sample	Residues, mg/kg				
	PB	HCB	PCNB	PCA	PCTA
Kidneys	0.005	0.036	<0.05	0.25	<0.08
Liver	0.001	0.093	<0.05	0.029	<0.05
Muscle	0.004	0.095	<0.05	0.089	0.014
Fat, abdominal	0.049	2.3	<0.1	1.2	0.14
Fat, subcutaneous	0.036	1.3	<0.1	1.1	0.075

Chicken feeding study. Chickens were fed with quintozene at levels of 0, 0.05, 1, 5, 15, 75 and 300 ppm in the diet for four months (Griffith and Kuchar, 1975). Eggs, collected each day, and fat, meat and liver were analysed for quintozene, HCB, PB, PCA and PCTA. The LODs are given in Tables 24 and 25.

Residues of PB and HCB became constant in egg yolks at about three weeks and in fat at about seven weeks, whereas quintozene, PCA and PCTA reached equilibrium in less than a week in both egg yolk and fat (Table 24).

Table 24. Residues of quintozene, its metabolites and impurities in chicken egg yolks and fat (average levels at equilibrium).

Feeding level, ppm	Residues in egg yolk, mg/kg					Residues in fat, mg/kg				
	PB	HCB	PCNB	PCA	PCTA	PB	HCB	PCNB	PCA	PCTA
LOD	0.005	0.008	0.01	0.01	0.01	0.006	0.01	0.03	0.02	0.02
0.05	<0.005	<0.008	<0.01	<0.01	<0.01	<0.006	0.05	<0.03	0.04	<0.02
1	<0.005	0.012	<0.01	<0.01	<0.01	0.008	0.06	<0.03	0.03	<0.02
5	<0.005	0.078	<0.01	<0.01	<0.01	0.023	0.36	0.03	0.03	<0.02
15	0.011	0.36	<0.01	0.01	<0.01	0.064	1.4	0.09	0.05	0.02
75	0.072	2.1	0.02	0.08	0.01	0.33	6.7	0.23	0.1	0.04
300	0.22	8.1	0.02	0.17	0.02	1.6	26	1.4	0.28	0.12

Table 25. Residue of quintozene, its metabolites and impurities in chicken egg whites, meat and liver (maximum single values).

Feeding level, ppm	Residues in egg white, mg/kg					Residues in meat, mg/kg					Residues in liver, mg/kg				
	PB	HCB	PCNB	PCA	PCTA	PB	HCB	PCNB	PCA	PCTA	PB	HCB	PCNB	PCA	PCTA
LOD	0.002	0.005	0.01	0.009	0.008	0.01	0.01	0.04	0.04	0.03	0.006	0.01	0.03	0.02	0.02
0.05	<0.002	<0.005	<0.01	<0.009	<0.008	<0.01	<0.01	<0.04	<0.04	<0.03	<0.006	0.017	<0.03	<0.02	<0.02
1	<0.002	<0.005	<0.01	<0.009	<0.008	<0.01	<0.01	<0.04	<0.04	<0.03	<0.006	0.03	<0.03	<0.02	<0.02
5	<0.002	<0.005	<0.01	<0.009	<0.008	<0.01	<0.01	<0.04	<0.04	<0.03	<0.006	0.12	<0.03	<0.02	<0.02
15	<0.002	<0.005	<0.01	<0.009	<0.008	<0.01	<0.01	<0.04	<0.04	<0.03	0.006	0.17	<0.03	<0.02	<0.02
75	<0.002	<0.005	<0.01	<0.009	<0.008	<0.01	0.05	<0.04	<0.04	<0.03	0.04	1.02	<0.03	<0.02	<0.02
300	<0.002	0.02	0.01	0.01	<0.008	0.03	0.7	<0.04	<0.04	<0.03	0.24	6.6	<0.03	<0.02	0.17

FATE OF RESIDUES IN STORAGE AND PROCESSING

In storage

No data were received.

In processing

Processing studies were conducted on tomatoes and potatoes. Data on residues in processed cotton seed and peanuts were also provided (Ball, 1989c, 1990f) but the studies were not accepted by the US EPA. No current data were received.

Tomatoes. For the processing study tomatoes were treated with a WP formulation at 42 kg ai/ha, 5 times the maximum label rate. After washing, the tomatoes were fed through a disintegrator and then heated. The hot tomato juice (106°C) was passed through a finisher to remove skins and seeds and collected to produce canned juice and concentrate. Canned juice: some of the juice was filled into cans which were sealed and cooked for an additional 10 minutes in boiling water to ensure sterility before cooling. Concentrate: the remaining hot juice from each lot was concentrated, then filled in cans, sealed and cooked for 30 min in boiling water before cooling.

The wet pomace (skins and seeds) from the concentrator was weighed and divided into two equal lots, one of which was dried in a hot-air dehydrator at 66°C.

To produce whole-pack tomatoes the tomatoes were blanched in boiling water to remove the skins, then canned and covered with juice from the corresponding lots. The cans were then vacuum-sealed and cooked for 30 min in a rotary cooker before cooling.

The results are shown in Table 26 (Ball, 1990c). Samples of all the processed products except dry pomace were re-analysed (Ball, 1990d) by a modified analytical method with an LOD of 0.002 mg/kg.

Table 26. Residues of quintozene, its metabolites and impurities in processed products of tomatoes treated with single applications of WP at 42 kg ai/ha, USA, 1990.

Sample	Residues, mg/kg					Ref.
	PCNB	PB	HCB	PCTA	PCA	
Tomato[1], unwashed	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	Ball, 1990c
Tomato, washed	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	
Canned tomato	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	
Tomato juice	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	
Tomato ketchup	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	
Tomato purée	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	
Tomato paste	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	<0.05 (4)	
Pomace, dry	0.13 0.14 0.14 0.14 0.15 <0.05 0.17 0.2	<0.05 (8)	<0.05 (8)	<0.05 (8)	0.08 0.09 0.08 <0.05 0.1 <0.05 0.08 <0.05	

Sample	Residues, mg/kg					Ref.
	PCNB	PB	HCB	PCTA	PCA	
Pomace, wet	0.06 (3) 0.07 (2) 0.08 (2) 0.09	<0.05 (7) 0.05	<0.05 (8)	<0.05 (8)	<0.05 (8)	
Re-analysed						Ball, 1990d
Tomato,[1] unwashed	<0.002 0.003	<0.002 (2)	<0.002 (2)	<0.002 (2)	<0.002 (2)	
Tomato, washed	0.002 0.007	<0.002 (2)	<0.002 (2)	<0.002 (2)	<0.002 0.003	
Canned tomato	<0.002 (2)	<0.002 (2)	<0.002 (2)	<0.002 (2)	<0.002 (2)	
Tomato juice	<0.002 (3)	<0.002 (3)	<0.002 (3)	<0.002 (3)	<0.002 (3)	
Tomato ketchup	<0.002 (3)	<0.002 (3)	<0.002 (3)	<0.002 (3)	<0.002 (3)	
Tomato purée	<0.002 (2)	<0.002 (2)	<0.002 (2)	<0.002 (2)	0.003 <0.002	
Tomato paste	<0.002 (3)	<0.002 (3)	<0.002 (3)	<0.002 (3)	0.003 <0.002	
Pomace, wet	0.047 0.044	<0.002 (2)	<0.002 (2)	<0.002 0.003	0.015 0.013	

[1] PHI 111-124 days

Potatoes. For the processing study, potatoes were treated with two, four, five or ten times the maximum label rate.

To produce chips unpeeled potatoes were washed, sliced and fried in maize oil for 2.5 to 2.8 min at 185°C to a final moisture content of approximately 2%. For flakes and granules the potatoes were lightly peeled in a peeler for 45 sec. The slices were washed and cooked with steam at 99°C for 20 min. A smooth, uniform slurry was prepared, which was used for the production of both flakes and granules. For flakes, a portion of the slurry was dried in a thin layer at 49°C to a final moisture content of 5-6%. To produce granules the slurry was homogenized and pumped into a mixed flow spray drier (149°C). The final moisture content was approximately 4-6%. The results are shown in Table 27 (Ball, 1987).

Table 27. Residues of quintozene, its metabolites and impurities in processing products of potatoes, USA 1967. All single applications (Ball, 1987).

Form, method	kg, ai/ha	Sample	Residues, mg/kg				
			PCNB	PB	HCB	PCTA	PCA
GR in-furrow	56	tuber[1], raw, whole	0.085 0.086	0.02 0.034	0.005 0.013	0.014 0.04	0.002 0.077
		chips, raw	0.080 0.12	0.01 0.017	0.005 0.007	0.012 0.024	0.017 0.037
		chips, cooked	0.04 0.068	0.005 0.01	0.002 0.005	0.008 0.03	0.005 0.012
		slurry	0.003 (2)	0.006 0.009	<0.002 0.004	<0.002 0.003	0.005 0.017
		flakes	0.005 0.009	0.004 0.012	0.003 0.01	0.003 0.01	0.005 0.042
		granules	0.004 <0.002	0.004 <0.002	0.007 0.002	0.007 <0.002	0.041 0.013
GR in-furrow	112	tuber,[1] raw, whole	0.12 0.28	0.029 0.037	0.010 0.009	0.033 0.025	0.061 0.047
		chips, raw	0.061 0.33	0.012 0.015	0.004 0.006	0.015 0.020	0.030 0.029
		chips, cooked	0.12 0.046	0.017 0.003	0.007 0.002	0.048 0.009	0.026 0.002
		slurry	<0.002 0.009	0.006 0.012	0.003 (2)	0.002 0.003	0.013 0.011
		flakes	0.005 0.016	0.004 0.008	0.010 0.004	0.005 0.006	0.038 0.009
		granules	<0.002 0.002	<0.002 (2)	<0.002 0.004	<0.002 0.002	0.013 0.014
EC broadcast	140	tuber,[1] raw, whole	0.11 0.61	0.072 0.053	0.019 0.014	0.059 0.047	0.13 0.064
		chips, raw	0.11 0.62	0.052 0.033	0.015 0.011	0.050 0.042	0.11 0.053
		chips, cooked	0.15 0.14	0.036 0.011	0.017 0.003	0.094 0.021	0.024 0.009
		slurry	0.002 0.019	0.019 0.018	0.006 0.005	0.004 0.007	0.030 0.015
		flakes	0.008	0.025	0.013	0.015	0.073

Form, method	kg, ai/ha	Sample	Residues, mg/kg				
			PCNB	PB	HCB	PCTA	PCA
			0.025	0.010	0.007	0.009	0.012
		granules	<0.002 0.002	0.004 <0.002	0.006 0.009	0.007 0.002	0.047 0.018
EC broad-cast	280	tuber,[1] raw, whole	0.25 0.99	0.083 0.064	0.029 0.018	0.084 0.054	0.16 0.070
		chips, raw	0.46 0.72	0.099 0.019	0.040 0.008	0.16 0.025	0.22 0.031
		chips, cooked	0.44 0.13	0.054 0.009	0.027 0.005	0.16 0.028	0.053 0.011
		slurry	0.006 0.016	0.030 0.012	0.013 0.003	0.012 0.005	0.054 0.009
		flakes	0.022 0.024	0.046 0.009	0.029 0.008	0.039 0.007	0.12 0.015
		granules	0.006 0.003	0.013 <0.002	0.011 0.007	0.018 <0.002	0.090 0.013

[1] PHI 133-139 days

Residue in the edible portion of food commodities

Beans. Mean residues in snap beans and bean cannery waste (culls, leaves, stems) found in three studies are shown in Table 28. Residues of the five compounds (quintozene, PB, HCB, PCA and PCTA) in the whole beans and the waste were similar. The slight increase in PB, HCB and PCA in the waste (1.2 to 1.5 times) is of little significance at these levels (Ball, 1990e).

Table 28. Average residues in beans and bean cannery waste.

Sample	No.	Residues, mg/kg				
		PCNB	PB	HCB	PCTA	PCA
Seed with pods	3	0.11	<0.002	0.003	0.016	0.12
Pods no tip	2	0.089	<0.002	0.003	0.019	0.14
Cannery waste	3	0.097	0.003	0.004	0.016	0.14

Other commodities. No data were received except those recorded in Tables 12 (cabbages with and without wrapper leaves), 19 (peanuts) and 20 (cereal grains, peas).

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

No data were received.

NATIONAL MAXIMUM RESIDUE LIMITS

The following national MRLs were reported.

Definition of the residue

quintozene

Australia, Canada, Germany, USA: quintozene

The Netherlands: quintozene including pentachloroaniline and pentachlorothioanisole, expressed as sum of quintozene, pentachloroaniline and pentachlorothioanisole.

Country	Commodity	MRL, mg/kg
Australia	banana	1
	beans, except broad beans and soya beans	0.01
	broad beans (green pods and immature seeds)	0.01
	brassica vegetables (cole or cabbage)	0.02
	common beans (dry)	0.2
	cotton seed	0.03
	lettuce, head	0.3
	lettuce, leaf	0.3
	mushrooms	10
	onion, bulb	0.2
	peanuts	0.3
	peppers, sweet	0.01
	potatoes	0.2
	tomatoes	0.1
Canada	beets	0.1
Germany	banana	1
	brassica vegetables	0.02
	lettuce and similar	0.3
	witloof	0.3
	other plant commodities	0.01
The Netherlands	banana	1
	brassicas, head	0.02
	broccoli	0.02
	cotton seed	0.03
	legume vegetables	0.01[1]
	lettuce, head	3
	peanuts	2
	peppers	0.01[1]
	potatoes	0.2[1]
	pulses	0.2[1]
	purslane	0.1[2]
	tomatoes	0.1
	radish	0.5[2]
	other food commodities	0.01*
USA	beans	0.1 (I)
	broccoli	0.1 (I)
	brussels sprouts	0.1 (I)

quintozene

Country	Commodity	MRL, mg/kg
	cabbage	0.1 (I)
	cauliflower	0.1 (I)
	collards (Georgia)	0.2 (R)
	cotton seed	0.1 (N)
	garlic	0.1 (I)
	kale (Georgia)	0.2 (R)
	mustard greens (Georgia)	0.2 (R)
	peanut	1 (I)
	peppers	0.1 (I)
	potato	0.1 (I)
	tomatoes	0.1 (I)

* limit of determination (LOD)
[1] under consideration
[2] under consideration for withdrawal
(I) interim tolerance
(N) negligible residue tolerance
(R) regional tolerance

APPRAISAL

Quintozene, originally evaluated by the JMPR in 1969 and re-evaluated for residues several times up to 1977, is included in the CCPR periodic review programme. The 1991 CCPR scheduled the periodic review for 1995 because new data were reported to be available (ALINORM 91/24A, para 316 and Appendix VI, para 15).

The Meeting received studies of animal and plant metabolism, analytical methods, updated information on GAP, data from supervised residue trials on vegetables and oilseed, and information on residues after storage and processing from the manufacturer. Information on analytical methods and national MRLs was also made available by The Netherlands, and on GAP by Australia, Canada and the UK. Germany and The Netherlands do not have registered uses.

The metabolism of quintozene was investigated in rats, goats, and chickens. In general, the metabolic pathways in all these species were similar. The major routes were (1) displacement of the nitro group by the sulfhydryl group of reduced glutathione or SH-containing amino acids and peptides, or by hydroxyl to yield pentachlorophenol; (2) reduction of the nitro group to form *N*-hydroxypentachloroaniline and conjugated pentachloroaniline; (3) dechlorination to yield tetrachloro analogues of the above compounds.

A feeding study on goats showed that quintozene was converted mainly to pentachloroaniline (PCA) and its glucuronide conjugate. Other metabolites formed in much smaller amounts were tetrachlorothioanisole, pentachlorothiophenol, and methyl tetrachlorophenyl sulfoxide. The majority of the activity was eliminated in the urine and faeces (38.3% and 19.2% respectively). Milk and fat contained only one metabolite, identified as PCA. No quintozene was detected in the tissues, milk or urine.

When quintozene was fed to laying hens, pentachlorothioanisole (methyl pentachlorophenyl sulfide, PCTA), pentachlorothiophenol and pentachlorothiophenol conjugates with cysteine, malonylcysteine, pyruvate and acetate were identified in various tissues, eggs and excreta. Other metabolites found included tetrachlorothioanisole, tetrachlorothioanisole sulfone, pentachlorothioanisole sulfoxide and tetrachloromethylsulfinylaniline ("methyl tetrachloroaniline sulfoxide"). A second pathway involved reduction of the nitro group to produce pentachloroaniline and *N*-hydroxypentachloroaniline.

Metabolism studies in plants (cabbage, potato and peanut) showed three major pathways similar to those in animals: reduction of the nitro group to form *N*-hydroxypentachloroaniline and pentachloroaniline, displacement of the nitro group by the sulfhydryl group of glutathione to give a glutathione adduct which is metabolized further or, to a lesser extent, by a hydroxyl group to give pentachlorophenol, and reductive or oxidative dechlorination, replacing chlorine by hydrogen or hydroxyl.

In cabbages grown in soil treated with [^{14}C]quintozene, the highest levels of radioactivity were found in the outer leaves. Seven metabolites were identified in leaf extracts, the two major ones being methyl tetrachlorophenyl sulfoxide and sulfone. Five minor components were identified as a methyl trichlorophenol sulfone, *N*-hydroxylated pentachloroaniline, methyl pentachlorophenyl sulfoxide and pentachlorothioanisole.

In potatoes grown in soil treated with [^{14}C]quintozene applied by pre-plant incorporation, only 6.4% of the total radioactivity was located in the potato pulp and 94% in the peel. The chloroform-soluble substances were identified mainly as pentachloronitrobenzene and pentachloroaniline with lesser amounts of pentachlorothioanisole, tetrachloronitrobenzene, tetrachlorophenol, and *N*-hydroxypentachloroaniline. Ether- and water-soluble residues were mainly conjugates of pentachlorothiophenol.

In peanuts planted in soil treated with [^{14}C]quintozene, the highest levels of ^{14}C were found in the roots (97%). The vines, shells and nuts had residues ranging from 2.7% in vines to 0.3% in nuts. Extraction with aqueous methanol removed 64-88% of the ^{14}C. The extract contained seven metabolites. The two major metabolites were identified as *S*-pentachlorothiophenyl-2-*N*-malonylcysteine and tetrachloroaniline, which were found in the roots, vines and shells.

No information on environmental fate was received. For this reason the Meeting recommended the withdrawal of all existing MRLs.

For residue analysis samples are extracted with hexane and cleaned up by liquid-liquid partition, GPC and Florisil column chromatography. Determination is by GLC with electron-capture detection. Limits of determination for quintozene, hexachlorobenzene (HCB), pentachlorobenzene (PB), pentachlorothioanisole (PCTA) and pentachloroaniline (PCA) in vegetables, nuts, oilseeds, milk, animal tissues and eggs ranged from 0.0005 to 0.05 mg/kg, and recoveries from 86 to 104% at fortification levels from 0.025 to 0.2 mg/kg.

The Meeting considered differences between the analytical conditions in specified laboratories and concluded that 0.01 or 0.05 mg/kg, depending on the commodity, were practical limits of determination of the parent compound for enforcement. For risk assessment purposes the Meeting noted that the total residues were relevant.

The residue was defined by a former JMPR as the sum of quintozene, PCTA and PCA. The present Meeting considered that the residue definition for risk assessment purposes for plant and animal commodities should be the sum of quintozene, PCTA and PCA, expressed as quintozene. This definition is also suitable for animal commodities for enforcement purposes since the parent quintozene is not an appropriate indicator compound for such commodities. Quintozene alone is a suitable definition of the residue for enforcement purposes for crops. On the basis of the metabolism and animal transfer studies the Meeting agreed that quintozene should be described as fat-soluble. The rationale for the definition of residues is given in Section 2.8.1 of this report.

Studies of the stability of stored analytical samples showed that quintozene and its metabolites or impurities are stable as residues in head cabbages, kidney beans, potatoes, wheat, cotton seed and peanuts when stored at -20°C up to one year. Residues decreased to approximately 60-70% of the initial levels in peppers, tomatoes (including processed products), maize and soya beans after storage for six to eight months.

quintozene

Quintozene is applied to garlic, beans, other vegetable seeds, potatoes, cereals and oilseed as a single seed treatment with DS, EC, FS, LS, PS or WP formulations, and to bulb, brassica, fruiting, leafy, legume, root and tuber vegetables, pulses, oilseed and coffee beans as one or two soil or plant treatments before or at planting with EC, DP, GR, SC or WP. The PHI depends on local conditions and is not relevant where the application is before or at the time of planting.

Primary food commodities of plant origin

The Meeting reviewed data on US supervised residue trials involving soil or plant treatments of broccoli, head cabbages, peppers, tomatoes, beans, potatoes, cotton seed and peanuts, and seed treatments of sugar beet, peas, barley, maize and soya beans. Residues of quintozene, the metabolites PCTA and PCA, and the impurities HCB and PB were detected.

In the calculation of the total residues, the molecular weights of quintozene (295) and PCTA (296) are effectively the same. The molecular weight of PCA is 265 and a factor of 1.1 is used to express PCA as quintozene. Where concentrations of the individual metabolite PCA are given below these have been corrected by this factor and are therefore expressed as quintozene.

Bananas. No residue data were available. The Meeting was informed that quintozene was not used on bananas and agreed to withdraw the previous recommendation of 1 mg/kg.

Broccoli, Head cabbages. The US residue trials were according to US GAP for brassica vegetables (max. 34 kg ai/ha soil treatment broadcast) and approximately according to Australian GAP (37-56 kg ai/ha).

Broccoli plants were harvested at maturity, at PHIs of 64-83 days. 48 samples were analysed with a maximum total residue of 0.094 mg/kg (0.05 mg/kg quintozene, 0.044 mg/kg PCA, 0.004 mg/kg PCTA). PB and HCB could not be determined (<0.002 mg/kg). On the basis of these data the Meeting estimated maximum residue levels of 0.1 mg/kg total residue and 0.05 mg/kg parent compound to replace the previous recommendation (0.02 mg/kg).

In the cabbage trials plants were grown to maturity and harvested 67-125 days after application. 70 samples of white and savoy cabbage were analysed. In the samples without wrapper leaves the maximum total residue was 0.02 mg/kg (0.016 mg/kg quintozene, <0.002 mg/kg PCA and PCTA) and the residues of the impurities PB and HCB <0.002 mg/kg. In the samples with wrapper leaves, the maximum total residue was 0.11 mg/kg (0.062 mg/kg quintozene, 0.045 mg/kg PCA, 0.006 mg/kg PCTA) and the residues of the impurities 0.003 mg/kg PB and <0.002 mg/kg HCB. The Meeting estimated maximum residue levels of 0.2 mg/kg total residue and 0.1 mg/kg parent compound for head cabbages, based on the residues in samples with wrapper leaves, to replace the previous recommendation (0.02 mg/kg).

Other brassica vegetables. Quintozene is registered for soil treatment in Australia, the UK and the USA for brassica vegetables and in New Zealand for vegetables, but residue data were not available. The Meeting agreed that residue data from head brassicas and broccoli could not be extrapolated to cauliflower, Brussels sprouts or kohlrabi. A maximum residue level could not be estimated.

Sweet peppers, Tomatoes. The US residue trials were in accord with US GAP (max. 8.4 kg ai/ha).

In the trials on peppers the plants were harvested at maturity, at PHIs of 71-104 days. In the 20 samples analysed, the residues of quintozene, PB, HCB, PCA and PCTA were below the limits of determination (<0.05 mg/kg). The Meeting estimated maximum residue levels of 0.2* mg/kg total residue and 0.05* mg/kg parent compound as being practical limits of determination to replace the previous recommendation (0.01 mg/kg).

In the trials on tomatoes the fruits were harvested at maturity, at PHIs of 73-113 days. In the 18 samples analysed the maximum total residue was 0.016 mg/kg (0.012 mg/kg quintozene, <0.002 mg/kg PCA and PCTA). PB and HCB were below the limit of determination of 0.002 mg/kg. The Meeting estimated a maximum residue level of 0.02 mg/kg (both the total residue and parent compound), to replace the previous recommendation (0.1 mg/kg).

Head lettuce. The use of quintozene on lettuce is registered in Australia as a soil application at singling, with a maximum of 0.11 kg ai/hl, and in New Zealand under the general GAP for vegetables. No residue data were received. The Meeting was informed that new studies were being considered but agreed to withdraw the recommendation of 3 mg/kg.

Common beans (pods and/or immature seeds), Common beans (dry). The trials at three US test locations (with treatment with three different formulations on each site) were in accordance with US GAP (1 soil treatment at max. 1.7 kg ai/ha).

Fresh beans were harvested at maturity, at PHIs of 42 to 62 days. In the samples analysed (from 18 trials) the maximum total residue was 0.093 mg/kg (0.081 mg/kg quintozene, 0.011 mg/kg PCA, <0.0005 mg/kg PCTA). PB and HCB were below the limit of determination (0.0005 mg/kg). In addition, 26 results from trials at exaggerated application rates were received. On the basis of the GAP trials, the Meeting estimated a maximum residue level of 0.1 mg/kg (both the total residue and parent compound) to replace the previous recommendation (0.01 mg/kg).

In the 18 trials on dry beans the beans were harvested at maturity, at PHIs of 77 to 106 days. 18 samples were analysed with a maximum total residue of 0.03 mg/kg (0.02 mg/kg quintozene, 0.008 mg/kg PCA, 0.002 mg/kg PCTA). PB and HCB were below the limit of determination of 0.0005 mg/kg. Results of 19 trials at exaggerated rates were also received. On the basis of the GAP trials, the Meeting estimated maximum residue levels of 0.03 mg/kg total residue and 0.02 mg/kg parent compound for common beans (dry) to replace the previous recommendation (0.2 mg/kg).

Peas (dry). Results of eight US seed treatment trials on peas (0.12 kg ai/100 kg seed) were received, approximately in accordance with US GAP (0.096 kg ai/100 kg seed). The maximum total residue in dried peas was 0.017 mg/kg (0.007 mg/kg quintozene, <0.005 mg/kg PCA and PCTA). The Meeting estimated maximum residue levels of 0.02 mg/kg total residue and 0.01 mg/kg parent compound for dry peas.

Soya beans (dry). Sixteen US seed treatment trials on soya beans (0.1 kg ai/100 kg seed) approximated US GAP (0.096 kg ai/100 kg seed). No residues of quintozene, PB, HCB, PCA or PCTA were found above the LOD of 0.005 mg/kg in the beans at harvest. The Meeting estimated maximum residue levels of 0.02* mg/kg total residue and 0.01* mg/kg parent compound for soya beans (dry) as being practical limits of determination.

Potatoes. Quintozene is registered in Australia, Cyprus, Israel, Saudi Arabia and South Africa, but no residue data were received. US residue results based on single applications of 28 kg ai/ha (broadcast, 28 values) and 11 to 13 kg ai/ha (in-furrow, 22 values) were provided. The potatoes were harvested at maturity, at PHIs of 82 to 135 days. The maximum total residue was 1.5 mg/kg (0.96 mg/kg quintozene, 0.28 mg/kg PCA, 0.24 mg/kg PCTA). In the same sample, 0.064 mg/kg PB and 0.033 mg/kg HCB were determined. The Meeting was informed that new studies were being considered but concluded that as the US residue data could not be related to reported GAP it could not estimate a maximum residue level and agreed to withdraw the previous recommendation of 0.2 mg/kg.

Sugar beet. In eight US seed treatment trials according to GAP (0.19 kg ai/100 kg seed) no residues of quintozene were found above the LOD of 0.005 mg/kg in green leaves, or in roots or leaves at harvest. The Meeting estimated maximum residue levels of 0.02* mg/kg total residue and 0.01* mg/kg parent compound for sugar beet as being practical limits of determination.

Barley. Six US seed treatment trials on barley (0.13 kg ai/100 kg seed) showed no residues of quintozene, PB, HCB, PCA and PCTA above the LOD of 0.005 mg/kg in the grain. The trials were approximately in accord with GAP in Spain (0.04-0.2 kg ai/100 kg seed) and the USA (max. 0.11 kg ai/100 kg seed). The Meeting estimated maximum residue levels of 0.02* mg/kg total residue and 0.01* mg/kg parent compound for barley as being practical limits of determination.

Maize. In 12 US seed treatment trials on maize (0.052 kg ai/100 kg seed) no residues of quintozene, PB, HCB, PCA and PCTA were found above the LOD of 0.005 mg/kg in the grain. The trials accorded approximately with GAP in Spain (0.04-0.2 kg ai/100 kg seed) and the USA (0.048 kg ai/100 kg seed). The Meeting estimated maximum residue levels of 0.02* mg/kg total residue and 0.01* mg/kg parent compound for maize as being practical limits of determination.

Wheat. Seed treatment with quintozene is registered in Brazil at 0.19 kg ai/100 kg seed and in the USA at 0.048 kg ai/100 kg seed. 20 US seed treatment trials at an application rate of 0.052 kg ai/100 kg seed showed a maximum total residue of 0.016 mg/kg (0.0061 mg/kg quintozene, <0.005 mg/kg PCA and PCTA) in the grain. No residues of PB or HCB were found above the LOD of 0.005 mg/kg. The Meeting estimated maximum residue levels of 0.02 mg/kg total residue and 0.01 mg/kg parent compound.

Cotton seed. The available US trials were in accordance with US GAP (1 soil treatment in-furrow at planting, maximum 2.3 kg ai/ha). Cotton seed was harvested at maturity, approximately five months after treatment. 36 samples were analysed with a maximum total residue of 0.028 mg/kg (0.008 mg/kg quintozene, 0.015 mg/kg PCA, <0.005 mg/kg PCTA). No residues of PB or HCB (<0.002, <0.005 mg/kg) were found. The Meeting estimated the previous MRL of 0.03 mg/kg as the total maximum residue level and estimated a maximum residue level of 0.01 mg/kg for the parent compound.

Peanuts. The available US trials approximated US GAP (maximum 2 soil applications of 5.6 kg ai/ha). Peanuts were harvested at maturity, 45 to 47 days after the last treatment. 32 samples of peanut kernels and hulls were analysed. In the hulls the maximum total residue was 1.3 mg/kg (0.94 mg/kg quintozene, 0.18 mg/kg PCA, 0.19 mg/kg PCTA). The same sample showed residues of 0.032 mg/kg PB and 0.013 mg/kg HCB. In the kernels the maximum total residue in any one sample was 0.45 mg/kg (0.15 mg/kg quintozene, 0.18 mg/kg PCA, 0.12 mg/kg PCTA). The same sample contained 0.046 mg/kg PB and 0.017 mg/kg HCB. The maximum residue of the parent quintozene was 0.25 mg/kg, found in another sample (0.077 mg/kg PCA, 0.04 mg/kg PCTA, 0.045 mg/kg PB, 0.006 mg/kg HCB). No results were available for whole peanuts. The Meeting estimated a maximum residue level of 0.5 mg/kg (both total residue and parent compound) for peanuts to replace the previous recommendation (2 mg/kg), and agreed to withdraw the previous recommendation for whole peanuts of 5 mg/kg.

Animal products

Cattle. The Meeting reviewed a feeding study on dairy cows in which quintozene was fed at levels of 0.1, 1 and 10 ppm for 12-15 weeks. In the samples from the 0.1 and 1 ppm levels, no residues were found above the LOD of quintozene, PB or PCA in milk (<0.01, <0.001 and <0.005 mg/kg), kidneys, liver, muscle (<0.05 mg/kg quintozene and PCA, <0.004 mg/kg PB), or fat (<0.1, <0.008 and 0.08 mg/kg). PCTA could not be quantified. Only HCB was detected in milk at the 1 ppm feeding level, with maximum residues at days 28-56 of 0.002-0-003 mg/kg. No HCB above the LOD of 0.02 mg/kg was found in the tissues, but fat showed a maximum residue of 0.1 mg/kg. Because PCTA was not analysed and the residue is defined as the sum of quintozene, PCA and PCTA the results are insufficient to estimate maximum residue levels for milk, meat or other edible products of cattle.

Chickens. Chickens were fed quintozene at levels of 0.05, 1, 5, 15, 75 and 300 ppm in the diet for four months. No residues of quintozene, PCA or PCTA were found above the LODs of 0.01 mg/kg in egg yolk and white, 0.04 mg/kg in meat and 0.03 mg/kg in liver, in the 0.05, 1, 5 or 15 ppm groups. In fat, no quintozene residues above 0.04 mg/kg could be found at levels up to 5 ppm. PB could not be found up to the 1 ppm feeding level in egg yolk (<0.005 mg/kg), egg white (<0.002 mg/kg), meat (<0.01 mg/kg) or liver (<0.006 mg/kg); 0.008 mg/kg was found in fat. HCB was determined in the 0.05 ppm group in fat (0.05 mg/kg) and liver (0.017 mg/kg) and in the 1 ppm group in egg yolk, fat and liver (0.012, 0.06 and 0.03 mg/kg), but not in egg white (<0.005 mg/kg) or meat (<0.01 mg/kg). No residues would be expected in practice from the use of quintozene, because the estimated maximum residue levels (both total and parent) in potential feeding-stuffs are generally less than 0.5 mg/kg. On the basis of the feeding levels up to 5 ppm and a maximum residue of 0.5 mg/kg to be expected in the diet, the Meeting estimated maximum total residue levels of 0.03* mg/kg for eggs and 0.1* mg/kg for chicken meat and edible offal as practical limits of determination.

Cereal fodders and straws

US seed treatment trials on barley, maize and wheat are described above, with details of the relevant GAP. Residues in the animal feed commodities were evaluated as follows.

Barley straw and fodder, dry. Four US trials on barley showed no residues of quintozene, PB, HCB, PCA or PCTA above the LOD of 0.005 mg/kg in barley straw. The Meeting estimated maximum residue levels of 0.02* mg/kg total residue and 0.01* mg/kg parent compound as being practical limits of determination for barley straw and fodder, dry.

Maize forage and fodder. Thirteen results were received. No residues of quintozene, PB, HCB, PCA or PCTA were found above the LOD of 0.005 mg/kg in maize forage or fodder, except one residue of 0.006 mg/kg quintozene in the fodder. The Meeting estimated maximum residue levels of 0.02* mg/kg total residue and 0.01* mg/kg parent compound as being practical limits of determination for maize forage, and of 0.02 mg/kg (total residue) and 0.01 mg/kg (parent compound) for maize fodder.

Pea hay (dry). Results of eight US seed treatment trials on peas (0.12 kg ai/100 kg seed) were received, which were approximately according to US GAP (0.096 kg ai/100 kg seed). Quintozene residues were found in dried pea hay at <0.005 (4), 0.013, 0.015, 0.016 and 0.02 mg/kg. The Meeting estimated a maximum residue level of 0.05 mg/kg as parent compound for pea hay (dry), based on the rather small database, with four of the eight results at or about 0.02 mg/kg of the parent quintozene. The maximum total residue was 0.042 mg/kg (0.02 mg/kg quintozene, 0.017 mg/kg PCA, <0.005 mg/kg PCTA). PB and HCB could not be determined above the LOD of 0.005 mg/kg. The Meeting estimated a maximum total residue level, also of 0.05 mg/kg.

Soya bean fodder and forage. Sixteen US seed treatment trials on soya beans (0.1 kg ai/100 kg seed) were approximately in accord with US GAP (0.096 kg ai/100 kg seed). In whole green plants no residues of quintozene, PB, HCB, PCA or PCTA were found above the LOD of 0.005 mg/kg. The Meeting estimated maximum residue levels for soya bean forage of 0.02* mg/kg total residue and 0.01* mg/kg parent compound for soya bean forage as being practical limits of determination.

No residues of quintozene, PB, HCB, PCA or PCTA were found above the LOD of 0.005 mg/kg in hay or the whole plant at harvest (except one PCA residue of 0.015 mg/kg expressed as quintozene). The maximum total residue in the fodder was calculated as 0.025 mg/kg (0.015 mg/kg PCA, <0.005 mg/kg quintozene and PCTA). The Meeting estimated maximum residue levels for soya bean fodder of 0.03 mg/kg total residue and 0.01* mg/kg parent compound.

Wheat straw and fodder, dry. 20 trials on wheat showed a maximum total residue in straw of 0.033 mg/kg (0.023 mg/kg quintozene, <0.005 mg/kg PCA and PCTA). There were no residues of PB or HCB (except 1 of 0.014 mg/kg) in any sample. The Meeting estimated maximum residue levels of 0.05 mg/kg total residue and 0.03 mg/kg parent compound.

Processing studies were conducted on tomatoes and potatoes. Processing data on cotton seed and peanuts were also provided, but not evaluated because the validity of the studies was called into question.

Tomatoes were treated at 42 kg ai/ha (5 times the maximum label rate), but residues were too low to show the effects of processing. The study is being repeated.

Potatoes were treated with two, five or ten times the maximum label rate. Residues in the processed potato chips, granules and flakes did not exceed those in the whole raw potatoes (tubers or sliced raw chips). In only two of the eight trials, quintozene residues in cooked potato chips were higher than in the raw commodity. The results indicate that quintozene and its metabolites and impurities would not be concentrated by processing.

Because of the lack of critical supporting data on environmental fate the Meeting could not recommend the maximum residue levels it estimated for use as MRLs and, as mentioned above, recommended the withdrawal of existing MRLs.

Any future reconsideration of recommendations for MRLs will require the submission of data on bioaccumulation and soil degradation and metabolism. Processing studies on tomatoes, cotton seed and peanuts will also be required. Details of the data required are given in the Report of the Meeting, Section 2.5.2.

RECOMMENDATIONS

1. In the absence of critical supporting studies for periodic review the withdrawal of the Codex MRLs listed below is recommended.

Commodity		Existing CXL, mg/kg
CCN	Name	
FI 0327	Banana[1]	1
VB 0400	Broccoli	0.02
VB 0041	Cabbages, Head	0.02
VP 0526	Common beans (pods and/or immature seeds)	0.01
VD 0526	Common beans (dry)	0.2
SO 0691	Cotton seed	0.03

quintozene

Commodity		Existing CXL, mg/kg
CCN	Name	
VL 0482	Lettuce, Head[1]	3
SO 0697	Peanut	2
SO 0703	Peanut, whole	5
VO 0445	Peppers, Sweet	0.01
VR 0589	Potato[1]	0.2
VO 0448	Tomato	0.1

[1] CXLs for banana, lettuce and potatoes are also recommended for withdrawal because uses have been discontinued and/or no residue data were available.

2. The Meeting estimated the maximum residue levels listed below, but these levels are **not** recommended for use as MRLs because critical supporting studies were not provided.

Definitions of the residue

(1) For enforcement purposes for plant commodities: quintozene (fat-soluble).
(2) For enforcement purposes for animal commodities: sum of quintozene, pentachloroaniline and methyl pentachlorophenyl sulfide, expressed as quintozene (fat-soluble).
(3) For risk assessment purposes for plant and animal commodities: sum of quintozene, pentachloroaniline and methyl pentachlorophenyl sulfide, expressed as quintozene (fat-soluble).

Commodity		Estimated max. res. level		PHI on which based, days	Existing CXL
CCN	Name	Parent	Total		
GC 0640	Barley	0.01*	0.02*		
AS 0640	Barley straw and fodder, dry	0.01*	0.02*		
VB 0400	Broccoli	0.05	0.1	64-83	0.02
VB 0041	Cabbages, Head	0.1	0.2	67-125	0.02
PO 0840	Chicken, Edible offal of	0.05*	0.1*		
PM 0840	Chicken meat	0.05*(fat)	0.1*(fat)		
VP 0526	Common beans (pods and/or immature seeds)	0.1	0.1	42-62	0.01
VD 0526	Common beans (dry)	0.02	0.03	77-106	0.2
SO 0691	Cotton seed	0.01	0.03	140-166	0.03
PE 0112	Eggs	0.01*	0.03*		
GC 0645	Maize	0.01*	0.02*		
AS 0645	Maize fodder	0.01	0.02		
AF 0645	Maize forage	0.01*	0.02*		
SO 0697	Peanut	0.5	0.5	45- 47	2
VD 0072	Peas (dry)	0.01	0.02		
AL 0072	Pea hay (dry)	0.05	0.05		
VO 0445	Peppers, Sweet	0.05*	0.2*	71-104	0.001
VD 0541	Soya beans (dry)	0.01*	0.02*		
AL 0541	Soya bean fodder	0.01*	0.03		
AL 1265	Soya bean forage	0.01*	0.02*		
VR 0596	Sugar beet	0.01*	0.02*		
VO 0448	Tomato	0.02	0.02	73-113	0.1

Commodity		Estimated max. res. level		PHI on which based, days	Existing CXL
CCN	Name	Parent	Total		
GC 0654	Wheat	0.01	0.02		
AS 0654	Wheat straw and fodder, dry	0.03	0.05		

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